Tennessee Valley Authority, Post Office Box 2000, Soddy-Daisy, Tennessee 37384-2000

April 15, 2004

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555

Gentlemen:

In the Matter of	)	Docket Nos.	50-327
Tennessee Valley Authority	)		50-328

SEQUOYAH NUCLEAR PLANT - ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT - 2003

Enclosed is the subject report for the period of January 1 to December 31, 2003. This report is being submitted as required by Sequoyah Technical Specification 6.9.1.6 and Sequoyah's Offsite Dose Calculation Manual Administrative Control Section 5.1.

Please direct questions concerning this issue to me at (423) 843-7170 or J. D. Smith at (423) 843-6672.

Sincerely,

Pedro Salas
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Enclosure

ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT SEQUOYAH NUCLEAR PLAN 2003

TENNESSEE VALLEY AUTHORITY

April 2004

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EXECUTIVE SUMMARY

This report describes the radiological environmental monitoring program conducted by TVA in the vicinity of the Sequoyah Nuclear Plant (SQN) in 2003. The program includes the collection of samples from the environment and the determination of the concentrations of radioactive materials in the samples. Samples were collected from locations in the general area of the plant and from areas that would not be influenced by plant operations. Monitoring includes the sampling of air, water, milk, foods, soil, fish, shoreline sediment and the measurement of direct radiation levels. Results from stations near the plant are compared with data from control stations and with preoperational measurements to determine potential impacts of plant operations.

The majority of radioactivity measured in environmental samples from the SQN program resulted from naturally occurring radioactive materials. Trace quantities of Cesium-137 (Cs-137) were measured in soil, shoreline sediment and fish. The Cs-137 and the trace level of Strontium-90 (Sr-90) detected in one milk sample were typical of the levels expected to be present in the environment from past nuclear weapons testing or operation of other nuclear facilities in the region. These levels would not represent a significant contribution to the radiation exposure to Members of the Public.

INTRODUCTION

This report describes and summarizes the results of radioactivity measurements made in the vicinity of SQN and laboratory analyses of samples collected in the area. The measurements are made to comply with the requirements of 10 CFR 50, Appendix A, Criterion 64 and 10 CFR 50, Appendix I, Sections IV.B.2, IV.B.3 and IV.C and to determine potential effects on public health and safety. This report satisfies the annual reporting requirements of SQN Technical Specification 6.9.1.6 and Offsite Dose Calculation Manual (ODCM) Administrative Control 5.1. The data presented in this report include results from the prescribed program and other information to help correlate the significance of results measured by this monitoring program to the levels of environmental radiation resulting from naturally occurring radioactive materials.

Naturally Occurring and Background Radioactivity

Many materials in our world contain trace amounts of naturally occurring radioactivity. For example, approximately 0.01 percent of all potassium is radioactive potassium-40 (K-40) which has a half-life of 1.3 billion years. An individual weighing 150 pounds contains about 140 grams of potassium (Reference 1). This is equivalent to approximately 100,000 picoCuries (pCi) of K-40 which delivers a dose of 15 to 20 mrem per year to the bone and soft tissue of the body. Other examples of naturally occurring radioactive materials are beryllium (Be)-7, bismuth (Bi)-212 and 214, lead (Pb)-212 and 214, thallium (TI)-208, actinium (Ac)-228, uranium (U)-238 and 235, thorium (Th)-234, radium (Ra)-226, radon (Rn)-222, carbon (C)-14, and hydrogen (H)-3 (generally called tritium). These naturally occurring radioactive materials are in the soil, our food, our drinking water, and our bodies. The radiation from these materials makes up a part of the low level natural background radiation. The remainder of the natural background comes from cosmic ray radiation. The relative hazard of different types of radiation sources can be compared by evaluating the amount of radiation the U.S. population receives from each type of radiation source as displayed in the following table. This table was adapted from References 2 and 3.

U.S. GENERAL POPULATION AVERAGE DOSE EQUIVALENT ESTIMATES

Source	Millirem/Year Per Person
Natural background dose equivalent	
Cosmic	27
Cosmogenic	1
Terrestrial	28
In the body	39
Radon	200
Total	295
Release of radioactive material in natural gas, mining, ore processing, etc.	5
Medical (effective dose equivalent)	53
Nuclear weapons fallout	less than 1
Nuclear energy	0.28
Consumer products	0.03
Total	355 (approximately)

As can be seen from the table, natural background radiation dose equivalent to the U.S. population normally exceeds that from nuclear plants by several hundred times. The 0.28 mrem attributable to nuclear plant operations results in a population radiation dose equivalent which is insignificant compared to that which results from natural background radiation.

Electric Power Production

Nuclear power plants are similar in many respects to conventional coal burning (or other fossil fuel) electric generating plants. The basic process behind electrical power production in both types of plants is that fuel is used to heat water to produce steam which provides the force to turn turbines and generators. In a nuclear power plant, the fuel is uranium and the heat is produced in the reactor through the fission of the uranium. Nuclear plants include many complex systems to control the nuclear fission process and to safeguard against the possibility of reactor malfunction. The nuclear reactions produce radionuclides commonly referred to as fission and activation products. Very small amounts of these fission and activation products are released into the plant systems. This radioactive material can be transported throughout plant systems and some of it released to the environment.

The pathways through which radioactivity is released are monitored. Liquid and gaseous effluent monitors record the radiation levels for each release. These monitors also provide alarm mechanisms to prompt termination of any release above limits.

Releases are monitored at the onsite points of release and through the environmental monitoring program which measures the environmental radiation in areas around the plant. In this way, not only is the release of radioactive materials from the plant tightly controlled, but measurements are made in surrounding areas to verify that the population is not being exposed to significant levels of radiation or radioactive materials.

The SQN ODCM, which is required by the plant Technical Specifications, prescribes limits for the release of radioactive effluents, as well as limits for doses to the general public from the release of these effluents.

The dose to a member of the general public from radioactive materials released to unrestricted areas, as given in NRC guidelines and the ODCM, is limited as follows:

Liquid Effluents

Total body	≤3 mrem/year
Any organ	≤10 mrem/year

Gaseous Effluents

Noble gases:

Gamma radiation	≤10 mrad/year
Beta radiation	≤20 mrad/year

Particulates:

Any organ	≤15 mrem/year

The EPA limits for the total dose to the public in the vicinity of a nuclear power plant, established in the Environmental Dose Standard of 40 CFR 190, are as follows:

Total body	≤25 mrem/year
Thyroid	≤75 mrem/year
Any other organ	≤25 mrem/year

Appendix B to 10 CFR 20 presents annual average limits for the concentrations of radioactive materials released in gaseous and liquid effluents at the boundary of the unrestricted areas. Table 1 of this report compares the nominal lower limits of detection for the SQN monitoring program with the regulatory limits for maximum annual average effluent concentrations released to unrestricted areas and levels requiring special reports to the NRC. It should be noted that the levels of radioactive materials measured in the environment are typically only slightly above the lower limit of detection. The data presented in this report indicate compliance with the regulations.

SITE/PLANT DESCRIPTION

Sequoyah is located on a site near the geographical center of Hamilton County, Tennessee, on a peninsula on the western shore of Chickamauga Lake at Tennessee River Mile (TRM) 484.5. Figure 1 shows the site in relation to other TVA projects. The SQN site, containing approximately 525 acres, is approximately 7.5 miles northeast of the nearest city limit of Chattanooga, Tennessee, 14 miles west-northwest of Cleveland, Tennessee, and approximately 31 miles south-southwest of TVA's Watts Bar Nuclear Plant (WBN) site.

Population is distributed unevenly within 10 miles of the SQN site. Approximately 60 percent of the population is in the general area between 5 and 10 miles from the plant in the sectors ranging from the south, clockwise, to the northwest sector. This concentration is a reflection of suburban Chattanooga and the town of Soddy-Daisy. This area is characterized by considerable vacant land with scattered residential subdivisions. Residential subdivision growth has continued within a 10-mile radius of the plant. There is also some small-scale farming and at least one dairy farm located within 5 miles of the plant.

Chickamauga Reservoir is one of a series of highly controlled multiple-use reservoirs located on the Tennessee River whose primary uses are flood control, navigation, and the generation of electric power. Secondary uses include industrial and public water supply and waste disposal, commercial fishing, and recreation. Public access areas, boat docks, and residential subdivisions have been developed along the reservoir shoreline.

SQN consists of two pressurized water reactors: each unit is rated at 1199 megawatts (electrical). Fuel was loaded in Unit 1 on March 1, 1980, and the unit achieved critically on July 5, 1980. Fuel was loaded in Unit 2 in July 1981, and the unit achieved initial criticality on November 5, 1981.

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Most of the radiation and radioactivity generated in a nuclear power reactor is contained within the reactor itself or one of the other plant systems. Plant effluent monitors are designed to detect the small amounts of radioactive material released to the environment. Environmental monitoring provides a final verification that the systems are performing as planned. The monitoring program is designed to monitor the pathways between the plant and the general public in the immediate vicinity. Sample types are chosen so that the potential for detection of radioactivity in the environment will be maximized. The radiological environmental monitoring program is outlined in Appendix A.

There are two primary pathways by which radioactivity can move through the environment to humans: air and water (see Figure 2). The air pathway can be separated into two components: the direct (airborne) pathway and the indirect (ground or terrestrial) pathway. The direct airborne pathway consists of direct radiation and inhalation by humans. In the terrestrial pathway, radioactive materials may be deposited on the ground or on plants and subsequently be ingested by animals and/or humans. Human exposure through the liquid pathway may result from drinking water, eating fish, or by direct exposure at the shoreline. The types of samples collected in this program are designed to monitor these pathways.

A number of factors were considered in determining the locations for collecting environmental samples. The locations for the atmospheric monitoring stations were determined from a critical pathway analysis based on weather patterns, dose projections, population distribution, and land use. Terrestrial sampling stations were selected after reviewing such factors as the locations of dairy animals and gardens in conjunction with the air pathway analysis. Liquid pathway stations were selected based on dose projections, water use information, and availability of media such as fish and sediment. Table A-2 (Appendix A, Table 2: This identification system is used for all tables and figures in the appendices.) lists the sampling stations and the types of samples collected. Modifications made to the program in 2003 are described in Appendix B and deviations from the sampling and analysis schedule are presented in Appendix C.

To determine the amount of radioactivity in the environment prior to the operation of SQN, a preoperational radiological environmental monitoring program was initiated in 1971 and operated until the plant began operation in 1980. Measurements of the same types of radioactive materials that are measured currently were assessed during the preoperational phase to establish normal background levels for various radionuclides in the environment. The knowledge of pre-existing radionuclide patterns in the environment permits a determination, through comparison and trending analyses, of any impact on the environment due to the operation of SQN.

The determination of impact from the plant during the operating phase also utilizes the data from control stations that have been established in the monitoring program. Results of environmental samples taken at control stations (far from the plant) are compared with those from indicator stations (near the plant) to establish the extent of SQN influence.

Samples are analyzed by TVA's Environmental Radiological Monitoring and Instrumentation (ERM&I) group located at the Western Area Radiological Laboratory (WARL) in Muscle Shoals, Alabama. Analyses are conducted in accordance with written and approved procedures and are based on accepted methods. A summary of the analysis techniques and methodology is presented in Appendix D. Data tables summarizing the sample analysis results are presented in Appendix H.

The radiation detection devices and analysis methods used to determine the radionuclide content of samples collected in the environment are very sensitive to small amounts of radioactivity. The sensitivity of the measurements process is defined in terms of the lower limit of detection (LLD). A description of the nominal LLDs for the radioanalytical laboratory is presented in Appendix E.

The ERM&I laboratory employs a comprehensive quality assurance/quality control program to monitor laboratory performance throughout the year. The program is intended to detect any problems in the measurement process as soon as possible so they can be corrected. This program includes equipment checks to ensure that the radiation detection instruments are working

properly and the analysis of quality control samples. In 2003, the laboratory participated in a blind cross check program administrated by a vendor. This program provided an independent interlaboratory comparison program. In addition, samples split with the State of Tennessee provide an independent verification of the overall performance of the laboratory. A complete description of the laboratory's quality assurance/quality control program is presented in Appendix F.

DIRECT RADIATION MONITORING

Direct radiation levels are measured at various monitoring points around the plant site. These measurements include contributions from cosmic radiation, radioactivity in the ground, fallout from atmospheric nuclear weapons tests conducted in the past, and any radioactivity that may be present as a result of plant operations. Because of the relatively large variations in background radiation as compared to the small levels from the plant, contributions from the plant may be difficult to distinguish.

Radiation levels measured in the area around the SQN site in 2003 were consistent with levels from previous years and with levels measured at other locations in the region.

Measurement Techniques

Direct radiation measurements are made with thermoluminescent dosimeters (TLDs). The Panasonic UD-814 dosimeter is used in the radiological environmental monitoring program for the measurement of direct radiation. This dosimeter contains four elements consisting of one lithium borate and three calcium sulfate phosphors. The calcium sulfate phosphors are shielded by approximately 1000 mg/cm^2 plastic and lead to compensate for the over-response of the TLD to low energy radiation.

TLDs are placed approximately 1 meter above the ground, with two or more TLDs at each monitoring location. Sixteen monitoring points are located around the plant near the site boundary, one location in each of the 16 compass sectors. One monitoring point is also located in each of the 16 compass sectors at a distance of approximately four to five miles from the plant. Dosimeters are also placed at the perimeter and remote air monitoring sites and at 13 additional monitoring locations out to approximately 32 miles from the site. The TLDs are exchanged every 3 months and the accumulated exposure on the detectors is read with a Panasonic Model UD-710A automatic reader interfaced with a computer system.

Since the calcium sulfate phosphor is much more sensitive than the lithium borate, the measured exposure is taken as the median of the results obtained from the calcium sulfate phosphors in the dosimeter badge. The values are corrected for gamma response, system variations, and transit exposure, with individual gamma response calibrations for each element. The system meets or exceeds the performance specifications outlined in Regulatory Guide 4.13 for environmental applications of TLDs.

Results

The results for environmental TLD measurements are normalized to a standard quarter (91.25 days or 2190 hours). The monitoring locations are grouped according to the distance from the plant. The first group consists of all monitoring points within 1 mile of the plant. The second group lies between 1 and 2 miles, the third group between 2 and 4 miles, the fourth between 4 and 6 miles, and the fifth group is made up of all locations greater than 6 miles from the plant. Past data have shown that the average results from the locations more than 2 miles from the plant are essentially the same. Therefore, for purposes of this report, monitoring points 2 miles or less from the plant are identified as "onsite" stations and locations greater than 2 miles are considered "offsite."

Prior to 1976, direct radiation measurements in the environment were made with dosimeters that were not as precise at lower exposures. Consequently, environmental radiation levels reported in the early years of the preoperational phase of the SQN monitoring program exceed current measurements of background radiation levels. For this reason, data collected prior to 1976 are not utilized for the comparison to preoperational results.

The quarterly gamma radiation levels determined from the TLDs deployed around SQN in 2003 are summarized in Table H-1. The results from all measurements at individual stations are presented in Table H-2. The exposures are measured in milliroentgens (mR). For purposes of this report, one milliroentgen, one millirem (mrem) and one millirad (mrad) are assumed to be

numerically equivalent. The rounded average annual exposures, as measured in 2003, are shown below. For comparison purposes, the average direct radiation measurements made in the preoperational phase of the monitoring program are also shown.

	Annual Average Direct Radiation Levels SQN mR/Year	
	2003	1976-79
Onsite Stations	65	79
Offsite Stations	59	63

The data in Table H-1 indicate that the average quarterly direct radiation levels at the SQN onsite stations are approximately 1.5 mR/quarter higher than levels at the offsite stations. This difference is consistent with levels measured for the preoperation and construction phases of TVA nuclear power plant sites where the average levels onsite were generally 2-6 mR/quarter higher than levels offsite. The causes of these differences have not been isolated; however, it is postulated that the differences are attributable to combinations of influences such as natural variations in environmental radiation levels, earth-moving activities onsite, and the mass of concrete employed in the construction of the plant. Other undetermined influences may also play a part.

Figure H-1 compares plots of the data from the onsite or site boundary stations with those from the offsite stations over the period from 1976 through 2003.

The results reported in 2003 are consistent with direct radiation levels identified at locations which are not influenced by the operation of SQN. There is no indication that SQN activities increased the background radiation levels normally observed in the areas surrounding the plant.

ATMOSPHERIC MONITORING

The atmospheric monitoring network is divided into three groups identified as local, perimeter, and remote. Four local air monitoring stations are located on or adjacent to the plant site in the general directions of greatest wind frequency. Four perimeter air monitoring stations are located in communities out to about 10 miles from the plant, and four remote air monitors are located out to approximately 20 miles. The monitoring program and the locations of monitoring stations are identified in the tables and figures of Appendix A. The remote stations are used as control or baseline stations.

Sample Collection and Analysis

Air particulates are collected by continuously sampling air at a flow rate of approximately 2 cubic feet per minute (cfm) through a 2-inch glass fiber filter. The sampling system consists of a pump, magnehelic gauge for measuring the drop in pressure across the system, and a dry gas meter. This allows an accurate determination of the volume of air passing through the filter. This sampling system is housed in a metal building. The filter is contained in a sampling head mounted on the outside of the monitor building. The filter is replaced weekly. Each filter is analyzed for gross beta activity about 3 days after collection to allow time for the radon daughters to decay. Every 4 weeks composites of the filters from each location are analyzed by gamma spectroscopy.

The presence of gaseous radioiodine is monitored using a commercially available cartridge containing TEDA impregnated charcoal. This system is designed to collect iodine (I) in both the elemental form and as organic compounds. The cartridge is located in the same sampling head as the air particulate filter and is downstream of the particulate filter. The cartridge is changed at the same time as the particulate filter and samples the same volume of air. Each cartridge is analyzed for I-131 by gamma spectroscopy analysis.

Rainwater is sampled by use of a collection tray attached to the monitor building. The collection tray is protected from debris by a screen cover. As water drains from the tray, it is collected in one of two 5-gallon containers inside the monitor building. A 1-gallon sample is removed from the container every 4 weeks. Any excess water is discarded. Rainwater samples are held to be analyzed only if the air particulate samples indicate the presence of elevated activity levels or if fallout is expected. For example, rainwater samples were analyzed during the period of fallout following the accident at Chernobyl in 1986. Since no plant related air activity was detected in other atmospheric monitoring media in 2003, no rainwater samples from SQN were analyzed in this reporting period.

Results

The results from the analysis of air particulate samples are summarized in Table H-3. Gross beta activity in 2003 was consistent with levels reported in previous years. The average gross beta activity for samples for indicator and control locations was 0.020 pCi/m^3. The annual average of the gross beta activity in air particulate filters at these stations for the years 1971-2003 are presented in Figure H-2. Increased levels due to fallout from atmospheric nuclear weapons testing are evident, especially in 1971, 1977, 1978, and 1981. Evidence of a small increase resulting from the Chernobyl accident can also be seen in 1986. These patterns are consistent with data from monitoring programs conducted during the preoperation and construction phases at other TVA nuclear plant sites.

Only naturally occurring radionuclides were identified by the monthly gamma spectral analysis of the air particulate samples. No fission or activation products were detected. As shown in Table H-4, I-131 was not detected in any of the charcoal cartridge samples collected in 2003.

TERRESTRIAL MONITORING

Terrestrial monitoring is accomplished by collecting samples of environmental media that may transport radioactive material from the atmosphere to humans. For example, radioactive material may be deposited on a vegetable garden and be ingested along with the vegetables or it may be deposited on pasture grass where dairy cattle are grazing. When the cow ingests the radioactive material, some of it may be transferred to the milk and consumed by humans who drink the milk. Therefore, samples of milk, soil, and food crops are collected and analyzed to determine potential impacts from exposure through this pathway. The results from the analysis of these samples are shown in Tables H-5 through H-11.

A land use survey is conducted annually to locate milk producing animals and gardens within a 5-mile radius of the plant. One dairy farm was located on the east side of the river between 4 and 6 miles from the plant and one small farm with a milk cow is located approximately 1.5 miles northwest of the plant. These two locations were sampled in accordance with the SQN sampling program. The results of the 2003 land use survey are presented in Appendix G.

Sample Collection and Analysis

Milk samples are collected every 2 weeks from the indicator locations and from at least one control dairy. A specific analysis for I-131 and a gamma spectroscopy analysis are performed on each sample and Sr-89, 90 analysis is performed quarterly.

The monitoring program includes provision for sampling of vegetation from locations where milk is being produced when milk sampling cannot be conducted. There were no periods during 2003 when vegetation sampling was necessary.

Soil samples are collected annually from the air monitoring locations. The samples are collected with either a "cookie cutter" or an auger type sampler. After drying and grinding, the sample is analyzed by gamma spectroscopy. When the gamma analysis is complete, the sample is ashed and analyzed for Sr-89, 90.

Samples representative of food crops raised in the area near the plant are obtained from individual gardens. Types of foods may vary from year to year as a result of changes in the local vegetable gardens. In 2003 samples of apples, cabbage, corn, green beans, and potatoes were collected from local gardens. Samples of these same food crops were purchased from area produce markets to serve as control samples. The edible portion of each sample is analyzed by gamma spectroscopy.

Results

The results from the analysis of milk samples are presented in Table H-5. No radioactivity attributable to SQN operations was identified. The I-131 results were less than the established nominal LLD of 0.4 pCi/liter. The results for the quarterly Sr-89 analysis were also less than the nominal LLD value of 3.5 pCi/liter. One sample of milk collected from the small farm northwest of the plant did contain a low level of Sr-90. The Sr-90 concentration measured in this sample was 2.6 pCi/liter. The presence of low levels of Sr-90 in milk samples from the small farm is consistent with Sr-90 in the environment as the results of past nuclear weapons testing. By far the predominant isotope reported in milk samples was the naturally occurring K-40. The average K-40 concentration was approximately 1350 pCi/liter for milk samples analyzed in 2003.

A total of twelve soil samples were collected and analyzed. Eleven of soil samples contained measurable levels of Cs-137 with the maximum concentration being 0.68 pCi/g. These concentrations are consistent with levels previously reported from fallout. The other radionuclides reported were naturally occurring isotopes (Table H-6).

A plot of the annual average Cs-137 concentrations in soil is presented in Figure H-3. The concentrations of Cs-137 in soil are steadily decreasing as a result of the cessation of weapons testing in the atmosphere, the 30-year half-life of Cs-137 and transport through the environment.

Radionuclides reported in food samples were all naturally occurring. Analysis of these samples indicated no contribution from plant activities. The results are reported in Tables H-7 through H-11.

LIQUID PATHWAY MONITORING

Potential exposures from the liquid pathway can occur from drinking water, ingestion of edible fish, or from direct radiation exposure from radioactive materials deposited in the river sediment. The monitoring program includes the collection of samples of surface water, groundwater, drinking water supplies, fish, and shoreline sediment. Samples from the reservoir are collected both upstream and downstream from the plant.

Sample Collection and Analysis

Samples of surface water are collected from the Tennessee River downstream and upstream of the plant using automatic sampling systems. A timer turns on the system at least once every 2 hours and the sample is collected into a composite jug. A 1-gallon sample is removed from the composite jug at 4-week intervals and the remaining water in the jug is discarded. The composite sample is analyzed for gamma emitting radionuclides and for gross beta activity. A quarterly composite sample is analyzed for tritium.

Samples are collected by an automatic sampling system at the first downstream drinking water intake and at the water intake for the city of Dayton located approximately 20 miles upstream. At other selected locations, grab samples are collected from drinking water systems which use the Tennessee River as their source. The drinking water samples are analyzed every 4 weeks by gamma spectroscopy and for gross beta activity. A quarterly composite sample from each station is analyzed for tritium. The sample collected at the water intake for the city of Dayton also serves as control sample for surface water.

Groundwater is sampled from an onsite well and from a private well in an area unaffected by SQN. The quarterly composite samples are prepared for each location and analyzed by gamma spectroscopy. Analyses are also performed for gross beta activity and tritium.

Samples of commercial and game fish species are collected semiannually from each of two reservoirs: the reservoir on which the plant is located (Chickamauga Reservoir) and the upstream reservoir (Watts Bar Reservoir). The samples are collected using a combination of netting techniques and electrofishing. Samples are prepared from filleted fish. After drying and grinding, the samples are analyzed by gamma spectroscopy.

Samples of shoreline sediment are collected from two downstream recreational use areas and one upstream location. The samples are dried and ground and analyzed by gamma spectroscopy.

Results

There were no fission or activation product radionuclides identified from the gamma spectroscopy or specific analyses performed on surface water samples. Gross beta activity above the nominal LLD value was measured in most surface water samples. The gross beta concentrations in samples from the indicator locations averaged 2.4 pCi/liter and gross beta activity for control location samples averaged 2.7 pCi/liter. The values were consistent with previously reported levels. A trend plot of the gross beta activity in surface water samples from 1971 through 2003 is presented in Figure H-4. A summary table of the results is shown in Table H-12.

There were no fission or activation product radionuclides identified in drinking water samples. Average gross beta activity was 2.6 pCi/liter for the downstream stations and 2.7 pCi/liter at the control station. The results are shown in Table H-13 and a trend plot of the gross beta activity in drinking water from 1971 to the present is presented in Figure H-5.

No fission or activation products were detected by the gamma spectroscopy analyses performed on ground water samples from the two REMP monitoring locations. Gross beta concentrations in samples from the onsite well averaged 2.9 pCi/liter, while the average from the offsite well was 9.7 pCi/liter. The results from the analysis of ground water samples are presented in Table H-14.

Additional onsite ground water sampling is performed for five monitoring wells that are not included as part of the SQN REMP monitoring program. Sampling of these wells was initiated to monitor for leaks in onsite underground discharge lines. In September 2003, a low level of tritium activity was detected in one of these monitoring wells. Investigation of the source of the tritium is in progress.

Cesium-137 was identified in a total of five fish samples. The maximum Cs-137 concentration for indicator samples was 0.04 pCi/g, while the maximum Cs-137 concentration for control location samples was 0.07 pCi/g. The plot of the annual Cs-137 concentration in samples of game fish is presented in Figure H-6. Other radioisotopes found in fish were naturally occurring with the most notable being K-40. The results are summarized in Tables H-15 and H-16

Cesium-137 was detected at a concentration of 0.05 pCi/g in one sample of shoreline sediment from the downstream locations. The concentration of Cs-137 in sediment was consistent with previously identified fallout levels. Results from the analysis of shoreline sediment samples are shown in Table H-17.

Figure H-7 presents a plot of the Cs-137 concentrations measured in shoreline sediment since 1980.

ASSESSMENT AND EVALUATION

Potential doses to the public are estimated from measured effluents using computer models. These models were developed by TVA and are based on methodology provided by the NRC in Regulatory Guide 1.109 for determining the potential dose to individuals and populations living in the vicinity of a nuclear power plant. The results of the effluent dose calculations are reported in the Annual Radioactive Effluent Release Report. The doses calculated are a representation of the dose to a "maximum exposed individual." Some of the factors used in these calculations (such as ingestion rates) are maximum expected values which will tend to overestimate the dose to this "hypothetical" person. The calculated maximum doses due to plant effluents are small fractions of the applicable regulatory limits. In reality, the expected dose to actual individuals is significantly lower.

Based on the very low concentrations of radionuclides actually present in the plant effluents, radioactivity levels measured in the environment as result of plant operations are expected to be negligible. The results for the radiological environmental monitoring conducted for the SQN 2003 operations confirm this expectation.

Results

As stated earlier in this report, the estimated increase in radiation dose equivalent to the general public resulting from the operation of SQN is negligible when compared to the dose from natural background radiation. The results from environmental samples are compared with the concentrations from the corresponding control stations as well as appropriate preoperational and background data to determine influences from the plant. Measurable levels of Cs-137 were detected in fish, soil, and shoreline sediment and Sr-90 was detected in milk from one sampling location. The Cs-137 and Sr-90 concentrations are consistent with levels identified previously that are the result of fallout from past atmospheric nuclear weapons testing.

Dose estimates based on the concentrations of radioactivity found in samples of environmental media show that doses estimated for persons at indicator locations were essentially identical to

those determined for persons at control stations. More than 99 percent of the activity detected in environmental samples was the result of the naturally occurring radionuclides. Cs-137 which is present in the environment as a result of fallout from nuclear weapons testing was the primary man-made radionuclide detected in samples from the SQN REMP. Concentrations of Cs-137 are consistent with levels measured in TVA's preoperational radiological environmental monitoring programs. Figures H-3, H-6 and H-7 indicate that concentrations of Cs-137 in the environment have decreased since the cessation of atmospheric weapons testing in 1981. This decrease is the result of the radioactive decay and the redistribution of the radionuclide in the environment.

Conclusions

It is concluded from the above analysis of the environmental sampling results and from the trend plots presented in Appendix H that the exposure to members of the general public which may have been attributable to SQN is negligible. The radioactivity reported herein is primarily the result of fallout or natural background radiation. Any activity which may be present as a result of plant operations does not represent a significant contribution to the radiation exposure to Members of the Public.

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1. Merril Eisenbud, Environmental Radioactivity, Academic Press, Inc., New York, NY, 1987.

2. National Council on Radiation Protection and Measurements, Report No. 93, "Ionizing Radiation Exposure of the Population of the United States," September 1987.

3. United States Nuclear Regulatory Commission, Regulatory Guide 8.29, "Instruction Concerning Risks from Occupational Radiation Exposure," July 1981.

Table 1

COMPARISON OF
PROGRAM LOWER LIMITS OF DETECTION WITH THE REGULATORY LIMITS FOR
MAXIMUM ANNUAL AVERAGE EFFLUENT CONCENTRATIONS
RELEASED TO UNRESTRICTED AREAS
AND REPORTING LEVELS

	Concentrations in Water, pCi/Liter			Concentrations in Air, pCi/Cubic Meter		
	Effluent Concentration[1]	Reporting Level[2]	Lower limit of Detection[3]	Effluent Concentration[1]	Reporting Level[2]	Lower limit of Detection[3]
H-3	1,000,000	20,000	300	100,000		
Cr-51	500,000		45	30,000		0.02
Mn-54	30,000	1,000	5	1,000		0.005
Co-58	20,000	1,000	5	1,000		0.005
Co-60	3,000	300	5	50		0.005
Zn-65	5,000	300	10	400		0.005
Sr-89	8,000		5	1,000		0.0011
Sr-90	500		2	6		0.0004
Nb-95	30,000	400	5	2,000		0.005
Zr-95	20,000	400	10	400		0.005
Ru-103	30,000		5	900		0.005
Ru-106	3,000		40	20		0.02
I-131	1,000	2	0.4	200	0.9	0.03
Cs-134	900	30	5	200	10	0.005
Cs-137	1,000	50	5	200	20	0.005
Ce-144	3,000		30	40		0.01
Ba-140	8,000	200	25	2,000		0.015
La-140	9,000	200	10	2,000		0.01

Note: 1 pCi = 3.7×10^{-2} Bq.

Note: For those reporting levels that are blank, no value is given in the reference.

1 Source: Table 2 of Appendix B to 10 CFR 20

2 Source: SQN Offsite Dose Calculation Manual, Table 2.3-2

3 Source: Table E-1 of this report

Figure 1

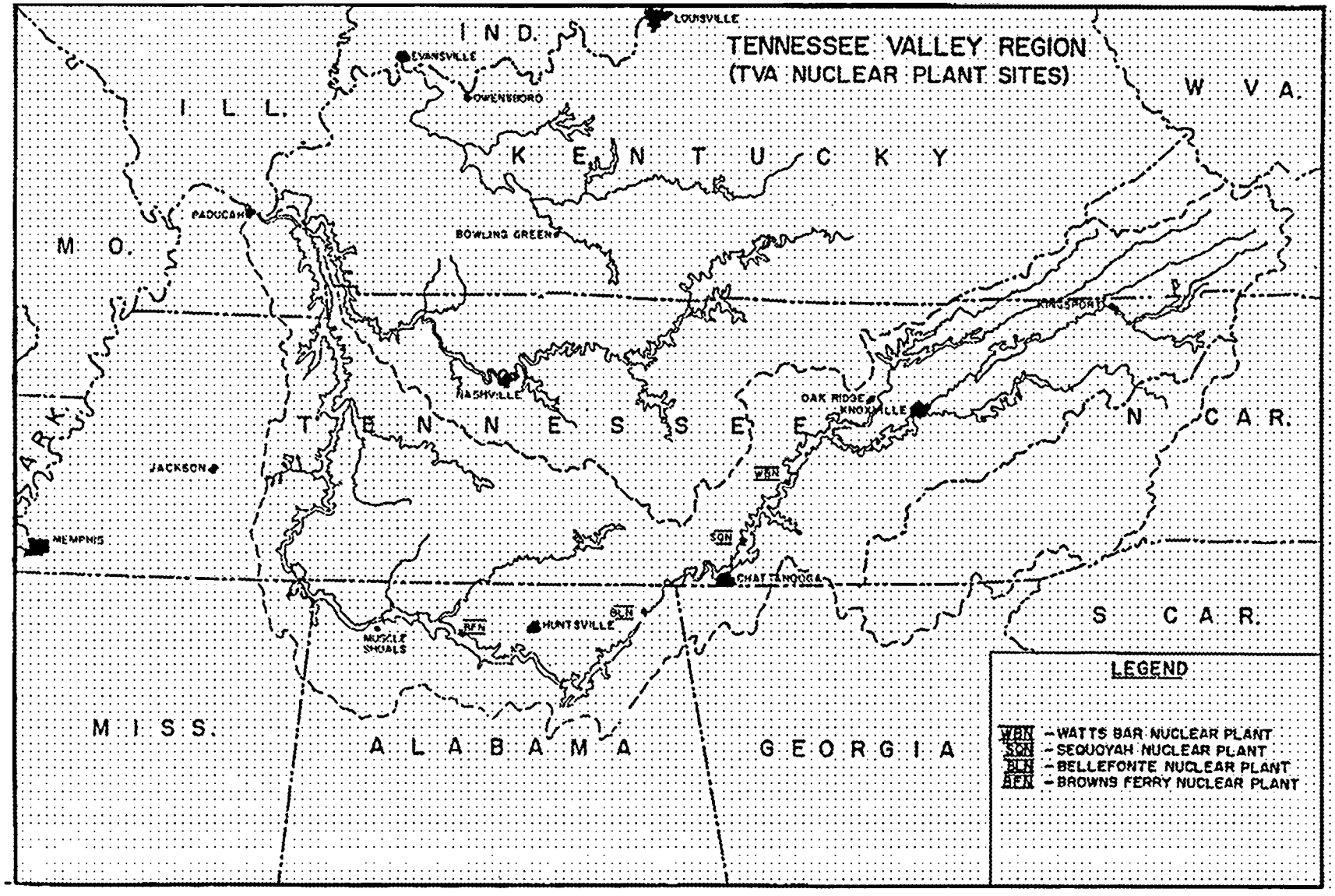
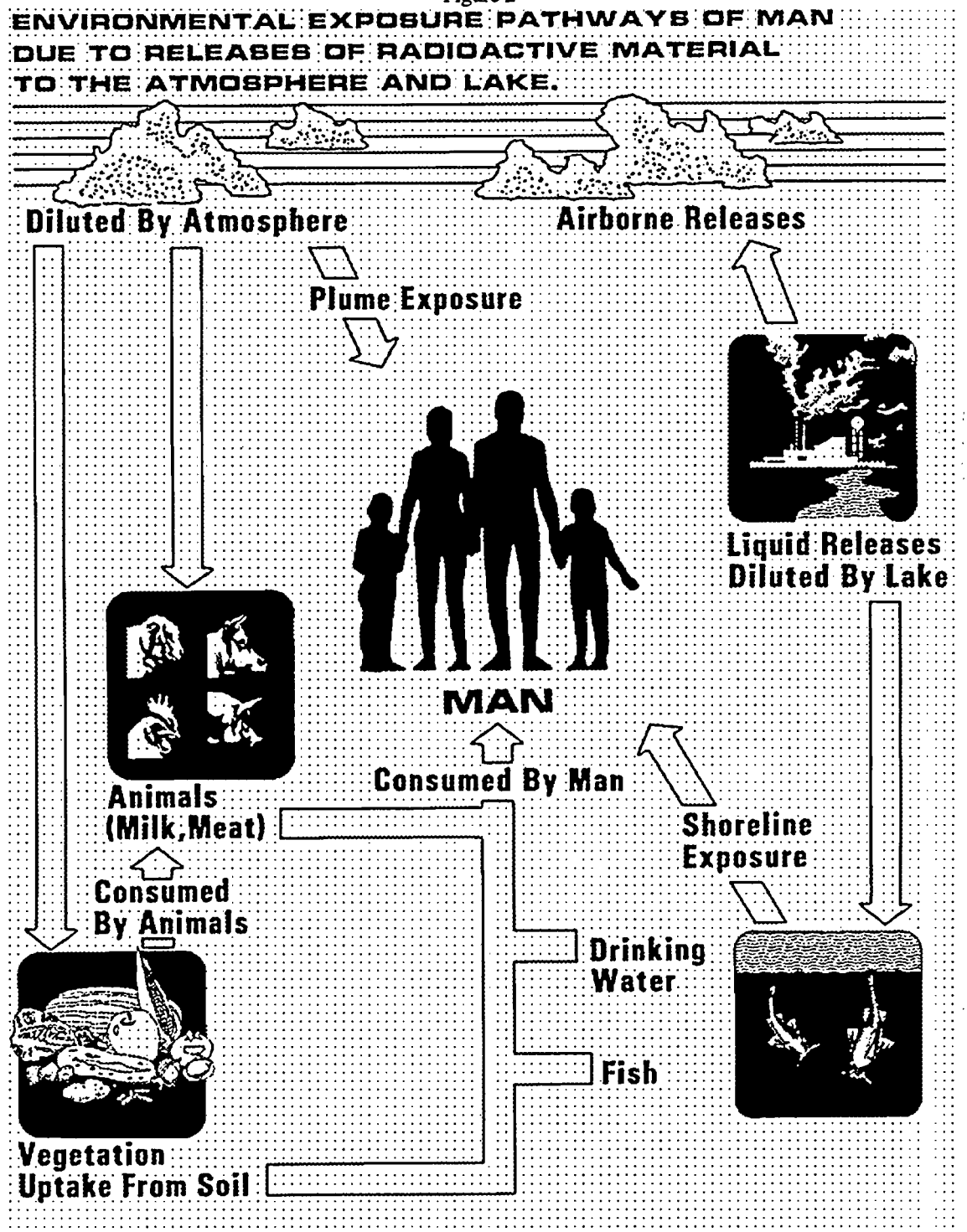

TENNESSEE VALLEY REGION
(TVA NUCLEAR PLANT SITES)
LOUISVILLE
EVANSVILLE
OWENSBORO
PADUCAH
BOWLING GREEN
KINGSPORT
NASHVILLE
OAK RIDGE
KNOXVILLE
JACKSON
MEMPHIS
CHATTANOOGA
HUNTSVILLE
MUSCLE SHOALS
WBN
SQN
BLN
BFN
I N D.
I L L.
K E N T U C K Y
W V A.
M O.
T E N N E S S E E
N C A R.
S C A R.
M I S S.
A L A B A M A
G E O R G I A
LEGEND
WBN - WATTS BAR NUCLEAR PLANT
SQN - SEQUOYAH NUCLEAR PLANT
BLN - BELLEFONTE NUCLEAR PLANT
BFN - BROWNS FERRY NUCLEAR PLANT

Figure 2


ENVIRONMENTAL EXPOSURE PATHWAYS OF MAN
DUE TO RELEASES OF RADIOACTIVE MATERIAL
TO THE ATMOSPHERE AND LAKE.
Diluted By Atmosphere
Airborne Releases
Plume Exposure
Liquid Releases
Diluted By Lake
MAN
Consumed By Man
Animals
(Milk,Meat)
Shoreline
Exposure
Consumed
By Animals
Drinking
Water
Fish
Vegetation
Uptake From Soil

APPENDIX A

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM AND SAMPLING LOCATIONS

Table A-1
SEQUOYAH NUCLEAR PLANT
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM[a]

Exposure Pathway and/or Sample	Number of Samples and Locations[b]	Sampling and Collection Frequency	Type and Frequency of Analysis
1. AIRBORNE			
a. Particulates	4 samples from locations (in different sectors) at or near the site boundary (LM-2, LM-3, LM-4, and LM-5).	Continuous sampler operation with sample collection once per 7 days (more frequently if required by dust loading).	Analyze for gross beta radioactivity greater than or equal to 24 hours following filter change. Perform gamma isotopic analysis on each sample when gross beta is greater than 10 times yearly mean of control samples. Composite at least once per 31 days (by location) for gamma scan.
	4 samples from communities approximately 6-10 miles from the Plant (PM-2, 3, 8, and 9).		
	4 samples from control locations greater than 10 miles from the plant (RM-1 RM-2, RM-3and RM-4).		
b. Radioiodine	Same locations as air particulates.	Continuous sampler operation with charcoal canister collected at same time as particulate filters at least once per 7 days.	I-131 by gamma scan on each sample.
c. Soil	Samples from same locations as air particulates	Once per year.	Each sample is analyzed by gamma isotopic and for Sr-89 and Sr-90.
d. Rainwater	Same locations as air particulates.	Composite sample at least once per 31 days.	Analyzed for gamma nuclides only if radioactivity in other media indicates the presence of increased levels of fallout.

Table A-1

SEQUOYAH NUCLEAR PLANT
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM[a]

Exposure Pathway and/or Sample	Number of Samples and Locations[b]	Sampling and Collection Frequency	Type and Frequency of Analysis
2. DIRECT RADIATION	2 or more dosimeters (TLDs) placed at locations at or near the site boundary in each of the 16 sectors.	At least once per 92 days.	Gamma dose at least once per 92 days.
	2 or more dosimeters placed at stations located approximately 4 to 5 Miles from the plant in each of the 16 sectors.		
	2 or more dosimeters in approximately 20 locations of special interest.		
3. WATERBORNE			
a. Surface water	TRM 503.8[d] TRM 483.4	Collected by automatic sequential-type sampler[c] with composite samples collected over a period of less than or equal to 31 days.	Gross beta and gamma scan on each composite sample. Composite for tritium analysis at least once per 92 days.
b. Ground water	1 sample adjacent to the plant (Well No. 6).	At least once per 31 days.	Composited for gross beta, gamma scan, and tritium at least once per 92 days.
	1 sample from ground water source upgradient (Farm HW).	At least once per 92 days.	Gross beta, gamma scan, and tritium at least once per 92 days.

Table A-1

SEQUOYAH NUCLEAR PLANT
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM[a]

Exposure Pathway and/or Sample	Number of Samples and Locations[b]	Sampling and Collection Frequency	Type and Frequency of Analysis
c. Drinking Water	1 sample at the first potable Water supply downstream from the Plant (TRM 473.0).	Collected by automatic sequential-type sampler[c] with composite sample collected over a period of less than or equal to 31 days.	Gross beta and gamma scan on each composite sample. Composite for tritium at least once per 92 days.
	1 sample at the next 2 downstream potable water systems (greater than 10 miles downstream) (TRM 469.9 and TRM 465.3).	Grab sample once per 31 days.	
	1 sample at a upstream control location (TRM 503.8[d]).	Samples collected by sequential-type sampler[c] with composite sample collected over a period of less than or equal to 31 days.	
d. Shoreline sediment	TRM 485 TRM 480 TRM 479	At least once per 184 days.	Gamma scan of each sample.

Table A-1
SEQUOYAH NUCLEAR PLANT
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM[a]

Exposure Pathway and/or Sample	Number of Samples and Locations[b]	Sampling and Collection Frequency	Type and Frequency of Analysis
4. INGESTION			
a. Milk	1 sample from milk producing animals in each of 1-3 areas indicated by the cow census where doses are calculated to be highest. If samples are not available from a milk animal location, doses to that area will be estimated by projecting the doses from concentrations detected in milk from other sectors or by sampling vegetation where milk is not available. At least one sample from a control location	At least once per 15 days.	Gamma isotopic and I-131 analysis of each sample. Sr-89 and Sr-90 once per quarter.
b. Fish	1 sample each from Chickamauga and Watts Bar Reservoirs.	At least once per 184 days. One sample representing a commercially important species and one sample representing a recreationally important species.	Gamma scan on edible portion.

Table A-1
SEQUOYAH NUCLEAR PLANT
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM[a]

Exposure Pathway and/or Sample	Number of Samples and Locations[b]	Sampling and Collection Frequency	Type and Frequency of Analysis
c. Food Products	1 sample each of principal food products grown at private gardens and/or farms in the immediate vicinity of the plant.	At least once per 365 days at time of harvest. The types of foods available for sampling will vary. Following is a list of typical foods which may be available: Cabbage, lettuce, or greens Corn Green Beans Potatoes Tomatoes	Gamma scan on edible portion.
	One sample of each of the same foods grown at greater than 10 miles distance from the plant.		
d. Vegetation[e]	Samples from farms producing milk but not providing a milk sample.	At least once per 31 days.	I-131 and gamma scan at least once per 31 days.
	Control sample from one control dairy farm when sampling is performed at an indicator location.		

a. The sampling program outlined in this table is that which was in effect at the end of 2003.
b. Sample locations, sector and distance from plant, are described in Table A-2 and A-3and shown in Figures A-1, A-2, and A-3.
c. Composite samples shall be collected by collecting an aliquot at intervals not exceeding 2 hours.
d. The sample collected at this location shall be considered a control for the drinking water and surface water.
e. Vegetation sampling is applicable only for farms that meet the criteria for milk sampling and when implementation of milk sampling is not possible.

Table A-2
SEQUOYAH NUCLEAR PLANT
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
SAMPLING LOCATIONS

Map Location Number[a]	Station	Sector	Approximate Distance (Miles)	Indicator (I) or Control (C)	Samples Collected[b]
2	LM-2	N	0.7	I	AP,CF,R,S
3	LM-3	SSW	2.0	I	AP,CF,R,S
4	LM-4	NE	1.5	I	AP,CF,R,S
5	LM-5	NNE	1.8	I	AP,CF,R,S
7	PM-2	SW	3.8	I	AP,CF,R,S
8	PM-3	W	5.6	I	AP,CF,R,S
9	PM-8	SSW	8.7	I	AP,CF,R,S
10	PM-9	WSW	2.6	I	AP,CF,R,S
11	RM-1	SW	16.7	C	AP,CF,R,S
12	RM-2	NNE	17.8	C	AP,CF,R,S
13	RM-3	ESE	11.3	C	AP,CF,R,S
14	RM-4	NW	20.0	C	AP,CF,R,S
19	Farm HW	NW	1.2	I	M,W[c]
21	Farm HS	E	4.6	I	M
23	Farm EH	ENE	9.5	C	M
24	Well No. 6	NNE	0.15	I	W
25	Farm K	NE	40.0	C	M
31	TRM 473.0 (East Side Utilities)	–	10.7[d]	I	PW
32	TRM 469.9 (E. I. DuPont)	–	13.8[d]	I	PW
33	TRM 465.3 (Chattanooga)	–	18.4[d]	I	PW
35	TRM 503.8 (Dayton)	–	20.1[d]	C	PW,SW
37	TRM 485.0	–	1.3[d]	C	SS
38	TRM 483.4	–	0.3[d]	I	SW
40	TRM 479.0	–	4.7[d]	I	SS
44	TRM 480.0	–	3.7[d]	I	SS
46	Chickamauga Reservoir (TRM 471-530)		–	I	F
47	Watts Bar Reservoir (TRM 530-602)		–	C	F

a. See Figures A-1, A-2, and A-3
b. Sample codes:
AP = Air particulate filter
CF = Charcoal filter
F = Fish
M = Milk
PW = Public Water
R = Rainwater
S = Soil
SS = Shoreline Sediment
SW = Surface water
W = Well water

c. A control for well water.
d. Distance from plant discharge (TRM 483.7).

Table A-3
SEQUOYAH NUCLEAR PLANT
THERMOLUMINESCENT DOSIMETER (TLD) LOCATIONS

Map Location Number[a]	Station	Sector	Approximate Distance (miles)	Onsite (On)[b] or Offsite (Off)
3	SSW-1C	SSW	2.0	On
4	NE-1A	NE	1.5	On
5	NNE-1	NNE	1.8	On
7	SW-2	SW	3.8	Off
8	W-3	W	5.6	Off
9	SSW-3	SSW	8.7	Off
10	WSW-2A	WSW	2.6	Off
11	SW-3	SW	16.7	Off
12	NNE-4	NNE	17.8	Off
13	ESE-3	ESE	11.3	Off
14	NW-3	NW	20.0	Off
49	N-1	N	0.6	On
50	N-2	N	2.1	Off
51	N-3	N	5.3	Off
52	N-4	N	10.0	Off
53	NNE-2	NNE	4.5	Off
54	NNE-3	NNE	12.1	Off
55	NE-1	NE	2.4	Off
56	NE-2	NE	4.1	Off
57	ENE-1	ENE	0.2	On
58	ENE-2	ENE	5.1	Off
59	E-1	E	1.2	On
60	E-2	E	5.2	Off
61	ESE-A	ESE	0.3	On
62	ESE-1	ESE	1.2	On
63	ESE-2	ESE	4.9	Off
64	SE-A	SE	0.4	On
65	E-A	E	0.3	On
66	SE-1	SE	1.4	On
67	SE-2	SE	1.9	On
68	SE-4	SE	5.2	Off
69	SSE-1	SSE	1.6	On
70	SSE-2	SSE	4.6	Off
71	S-1	S	1.5	On
72	S-2	S	4.7	Off
73	SSW-1	SSW	0.6	On
74	SSW-2	SSW	4.0	Off
75	SW-1	SW	0.7	On
76	WSW-1	WSW	0.9	On
77	WSW-2	WSW	2.5	Off
78	WSW-3	WSW	5.7	Off
79	WSW-4	WSW	7.8	Off
80	WSW-5	WSW	10.1	Off
81	W-1	W	0.6	On
82	W-2	W	4.3	Off
83	WNW-1	WNW	0.4	On
84	WNW-2	WNW	5.3	Off
85	NW-1	NW	0.4	On
86	NW-2	NW	5.2	Off
87	NNW-1	NNW	0.6	On
88	NNW-2	NNW	1.7	On
89	NNW-3	NNW	5.3	Off
90	SSW-1B	SSW	1.5	On

a. See Figures A-1, A-2, and A-3.
b. TLDs designated "onsite" are located 2 miles or less from the plant; "offsite" are located more than 2 miles from the plant.

Figure A-1

Radiological Environmental Monitoring Locations

Within 1 mile of the Plant

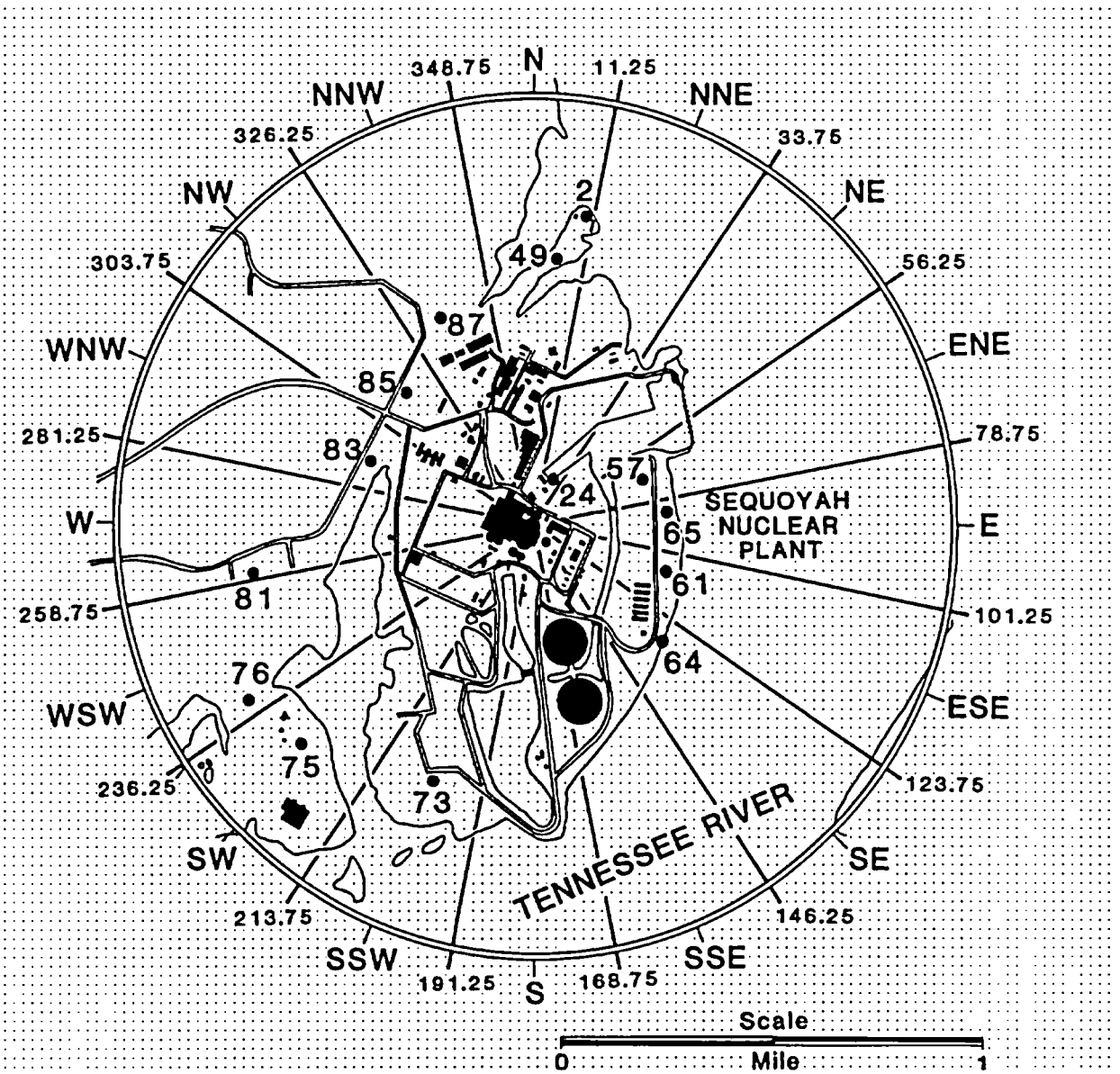


Figure A-2

Radiological Environmental Monitoring Locations

Between 1 and 5 miles from the Plant

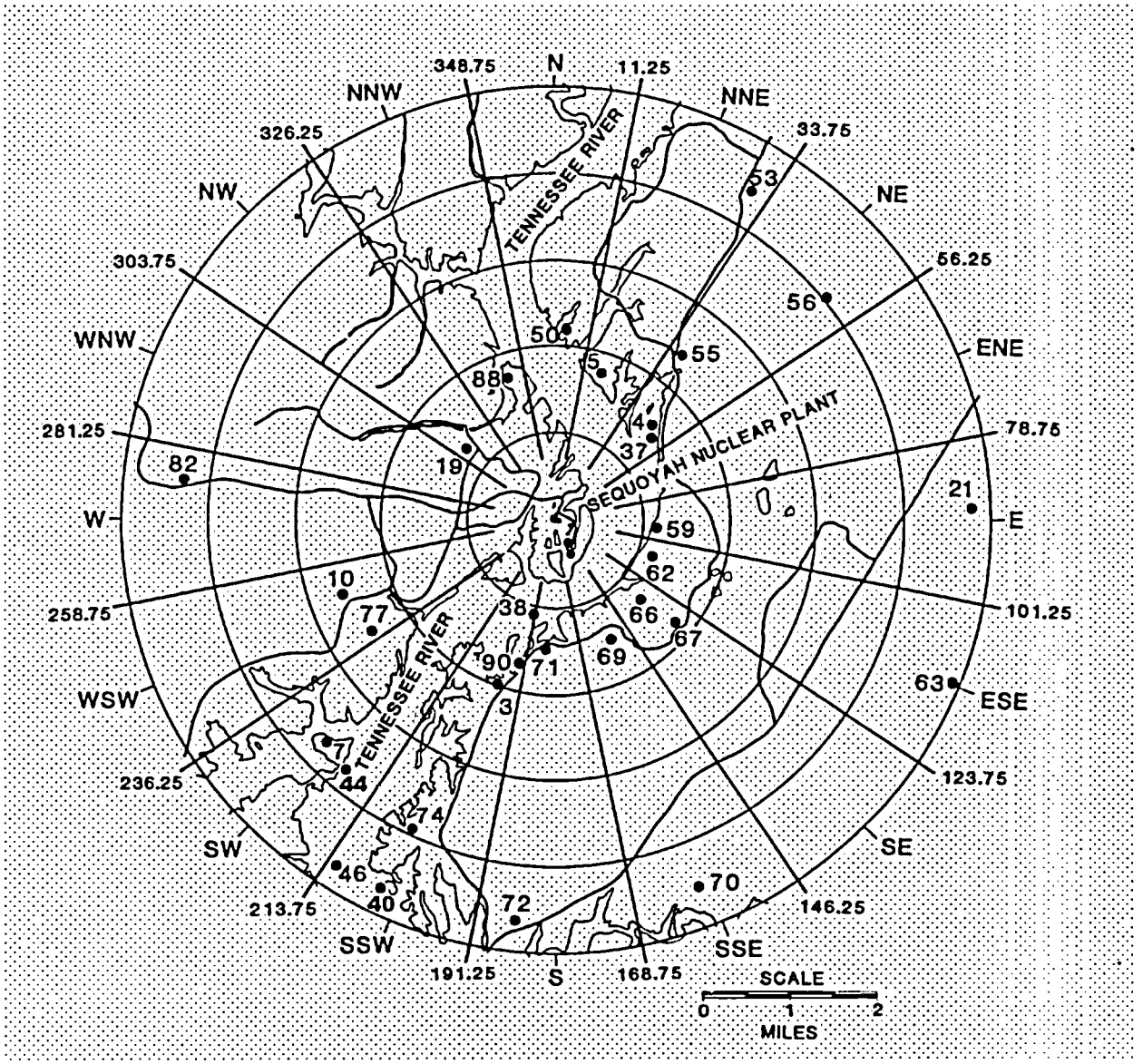
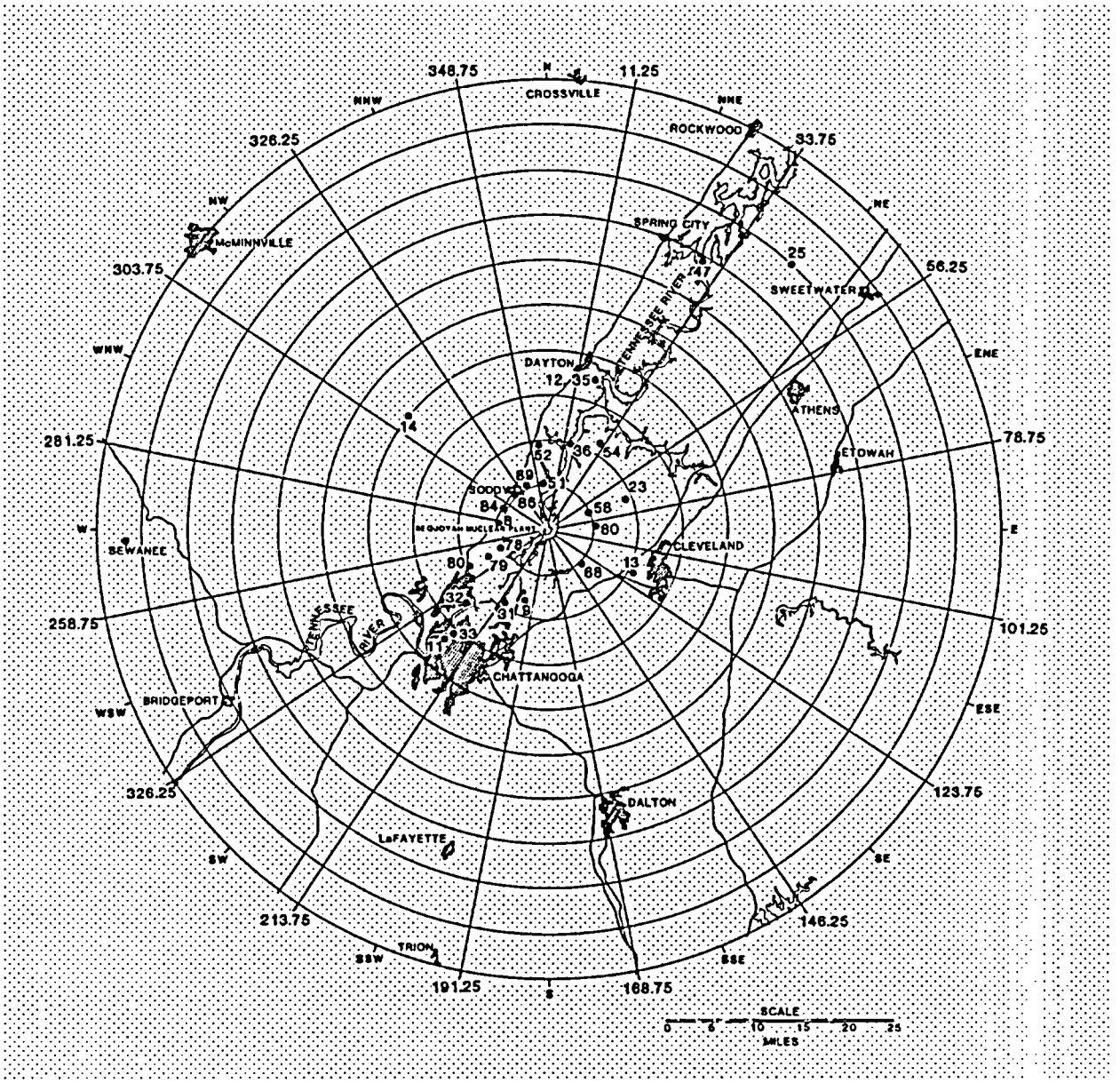


Figure A-3

Radiological Environmental Monitoring Locations

More than 5 miles from the Plant



APPENDIX B

2003 PROGRAM MODIFICATIONS

Appendix B

Radiological Environmental Monitoring Program Modification

The sample location descriptions as shown in Tables A-2 and A-3 of this report were revised for several REMP sampling locations to correct minor discrepancies in the distance from the plant. These discrepancies were identified as the result of new GPS measurements made for all REMP sampling locations. There were no actual changes in sampling locations as a result of the GPS measurement process.

Modifications were made in the milk sampling locations as the result of two diary farms going out of business. The dairy farm identified as Farm RJ went out of business at the end of the 2002 calendar year. This farm was one of the three locations sampled as indicator locations. There was no replacement sampling location available within the five radius for indicator locations. In addition, the control sampling location at Farm B went out of business during the year. A replacement farm, Farm K, was identified at 40.0 miles NE and was added to the sampling program to maintain two control sampling locations.

The SQN REMP and WBN REMP share several common sampling locations for the water pathway. Modifications were implemented in the frequency for performance of tritium and gamma analyses at water pathway monitoring locations in the WBN REMP in response to the start of the tritium production project at WBN. As a result, additional analyses were performed on several locations listed in the SQN REMP. These sample results appear in the data tables presented in Appendix H of this report, but the increased analysis frequency does not appear in the SQN REMP description in Appendix A since the modifications were not actually part of the SQN REMP.

APPENDIX C

PROGRAM DEVIATIONS

Appendix C

Program Deviations

There were two milk sampling locations that went out of business in 2003 as discussed in Appendix B of this report. In addition, milk was not available from one of the two indicator locations during two extended time periods during 2003.

Air monitoring samples were not available from one of the twelve sampling locations twice during the year.

Table C-1 provides additional details on these program deviations.

Table C-1
Radiological Environmental Monitoring Program Deviations

Date	Station	Location	Remarks
01/08/03–04/29/03	Farm HW	1.2 miles NW	There was no milk production during this time period. This is a small farm milking only one cow, and the cow was dry.
01/22/03	Farm RJ	3.9 miles ESE	The dairy farm at this location went out of business. A replacement sampling location was not available. The two other locations of milk production within the five radius around the SQN site were already being sampled in the SQN REMP.
05/06/03	LM-2	0.7 miles N	The air filter and charcoal cartridge samples from this location could not be collected due to flooding in the area. Water levels were back to normal by the next scheduled sampling period. There was no damage to the sampling pump.
07/22/03	Farm B	43.0 miles NE	The dairy farm at this location went out of business. This was one of two locations used as control sampling locations for SQN REMP. A diary farm located 40 miles NE of the site was added to the program as a replacement sampling location.
08/19/03 – 11/24/03	Farm HW	1.2 miles NW	There was no milk being produced at this farm for human consumption during this period.
09/02/03	RM-4	20.0 miles NW	The total sample volume for air filter and charcoal cartridge samples was not adequate due to failure of the sampling pump. The pump was replaced and samples were collected as scheduled for the next sampling period.

APPENDIX D

ANALYTICAL PROCEDURES

Appendix D

Analytical Procedures

Analyses of environmental samples are performed by the radioanalytical laboratory located at the Western Area Radiological Laboratory facility in Muscle Shoals, Alabama. The analysis procedures are based on accepted methods. A summary of the analysis techniques and methodology follows.

The gross beta measurements are made with an automatic low background counting system. Normal counting times are 50 minutes. Water samples are prepared by evaporating 500 ml of samples to near dryness, transferring to a stainless steel planchet and completing the evaporation process. Air particulate filters are counted directly in a shallow planchet.

The specific analysis of I-131 in milk is performed by first isolating and purifying the iodine by radiochemical separation and then counting the final precipitate on a beta-gamma coincidence counting system. The normal count time is 50 minutes. With the beta-gamma coincidence counting system, background counts are virtually eliminated and extremely low levels of activity can be detected.

After a radiochemical separation, samples analyzed for Sr-89, 90 are counted on a low background beta counting system. The sample is counted a second time after a 7-day ingrowth period. From the two counts the Sr-89 and Sr-90 concentrations can be determined.

Water samples are analyzed for tritium content by first distilling a portion of the sample and then counting by liquid scintillation. A commercially available scintillation cocktail is used.

Gamma analyses are performed in various counting geometries depending on the sample type and volume. All gamma counts are obtained with germanium type detectors interfaced with a computer based multichannel analyzer system. Spectral data reduction is performed by the computer program HYPERMET.

The charcoal cartridges used to sample gaseous radioiodine are analyzed by gamma spectroscopy using a high resolution gamma spectroscopy system with germanium detectors.

The necessary efficiency values, weight-efficiency curves, and geometry tables are established and maintained on each detector and counting system. A series of daily and periodic quality control checks are performed to monitor counting instrumentation. System logbooks and control charts are used to document the results of the quality control checks.

APPENDIX E

NOMINAL LOWER LIMITS OF DETECTION (LLD)

Appendix E

Nominal Lower Limits of Detection

A number of factors influence the Lower Limit of Detection (LLD) for a specific analysis method, including sample size, count time, counting efficiency, chemical processes, radioactive decay factors, and interfering isotopes encountered in the sample. The most probable values for these factors have been evaluated for the various analyses performed in the environmental monitoring program. The nominal LLDs are calculated from these values, in accordance with the methodology prescribed in the ODCM. The current nominal LLD values achieved by the ERM&I radioanalytical lab are listed in Table E-1. For comparison, the maximum values for the lower limits of detection specified in the ODCM are given in Table E-2.

The nominal LLDs are also presented in the data tables in Appendix H. For analyses for which LLDs have not been established, an LLD of zero is assumed in determining if a measured activity is greater than the nominal LLD.

TABLE E-1

Nominal LLD Values
A. Radiochemical Procedures

	Air Filters (pCi/m^3)	Water (pCi/L)	Milk (pCi/L)	Wet Vegetation (pCi/Kg wet)	Sediment and Soil (pCi/g dry)
Gross Beta	0.002	1.9			
Tritium		300			
Iodine-131		0.4	0.4	6.0	
Strontium-89		5.0	3.5	31.0	1.6
Strontium-90		2.0	2.0	12.0	0.4

Table E-1
Nominal LLD Values
B. Gamma Analyses

	Air Particulates pCi/m3	Charcoal Filter pCi/m3	Water and Milk pCi/L	Vegetation and Grain pCi/g, dry	Wet Vegetation pCi/kg, wet	Soil and Sediment pCi/g, dry	Fish pCi/g, dry	Clam Flesh pCi/g, dry	Foods Tomatoes Potatoes, etc. pCi/kg, wet
Ce-141	.005	.02	10	.07	35	.10	.07	.35	20
Ce-144	.01	.07	30	.15	115	.20	.15	.85	60
Cr-51	.02	0.15	45	.30	200	.35	.30	2.4	95
I-131	.005	0.03	10	.20	60	.25	.20	1.7	20
Ru-103	.005	0.02	5	.03	25	.03	.03	.25	25
Ru-106	.02	0.12	40	.15	190	.20	.15	1.25	90
Cs-134	.005	0.02	5	.03	30	.03	.03	.14	10
Cs-137	.005	0.02	5	.03	25	.03	.03	.15	10
Zr-95	.005	0.03	10	.05	45	.05	.05	.45	45
Nb-95	.005	0.02	5	.25	30	.04	.25	.25	10
Co-58	.005	0.02	5	.03	20	.03	.03	.25	10
Mn-54	.005	0.02	5	.03	20	.03	.03	.20	10
Zn-65	.005	0.03	10	.05	45	.05	.05	.40	45
Co-60	.005	0.02	5	.03	20	.03	.03	.20	10
K-40	.04	0.30	100	.40	400	.75	.40	3.50	250
Ba-140	.015	0.07	25	.30	130	.30	.30	2.4	50
La-140	.01	0.04	10	.20	50	.20	.20	1.4	25
Fe-59	.005	0.04	10	.08	40	.05	.08	.45	25
Be-7	.02	0.15	45	.25	200	.25	.25	1.9	90
Pb-212	.005	0.03	15	.04	40	.10	.04	.30	40
Pb-214	.005	0.07	20	.50	80	.15	.50	.10	80
Bi-214	.005	0.05	20	.10	55	.15	.10	.50	40
Bi-212	.02	0.20	50	.25	250	.45	.25	2.0	130
Tl-208	.002	0.02	10	.03	30	.06	.03	.25	30
Ra-224	--	--	--	--	--	.75	--	--	--
Ra-226	--	--	--	--	--	.15	--	--	--
Ac-228	.01	0.07	20	.10	70	.25	.10	.75	50

Table E-2

Maximum Values for the Lower Limits of Detection (LLD)
Specified by the SQN Offsite Dose Calculation Manual

Analysis	Water pCi/L	Airborne Particulate or Gases pCi/m^3	Fish pCi/kg, wet	Milk pCi/L	Food Products pCi/kg, wet	Sediment pCi/kg, dry
gross beta	4	1×10^{-2}	N.A.	N.A.	N.A.	N.A.
H-3	2000[a]	N.A.	N.A.	N.A.	N.A.	N.A.
Mn-54	15	N.A.	130	N.A.	N.A.	N.A.
Fe-59	30	N.A.	260	N.A.	N.A.	N.A.
Co-58,60	15	N.A.	130	N.A.	N.A.	N.A.
Zn-65	30	N.A.	260	N.A.	N.A.	N.A.
Zr-95	30	N.A.	N.A.	N.A.	N.A.	N.A.
Nb-95	15	N.A.	N.A.	N.A.	N.A.	N.A.
I-131	1[b]	7×10^{-2}	N.A.	1	60	N.A.
Cs-134	15	5×10^{-2}	130	15	60	150
Cs-137	18	6×10^{-2}	150	18	80	180
Ba-140	60	N.A.	N.A.	60	N.A.	N.A.
La-140	15	N.A.	N.A.	15	N.A.	N.A.

a. If no drinking water pathway exists, a value of 3000 pCi/liter may be used.

b. If no drinking water pathway exists, a value of 15 pCi/liter may be used.

APPENDIX F

QUALITY ASSURANCE/QUALITY CONTROL PROGRAM

Appendix F

Quality Assurance/Quality Control Program

A thorough quality assurance program is employed by the laboratory to ensure that the environmental monitoring data are reliable. This program includes the use of written, approved procedures in performing the work, provisions for staff training and certification, internal self assessments of program performance, audits by various external organizations, and a laboratory quality control program.

The quality control program employed by the radioanalytical laboratory is designed to ensure that the sampling and analysis process is working as intended. The program includes equipment checks and the analysis of quality control samples along with routine samples. Instrument quality control checks include background count rate and counts reproducibility. In addition to these two general checks, other quality control checks are performed on the variety of detectors used in the laboratory. The exact nature of these checks depends on the type of device and the method it uses to detect radiation or store the information obtained.

Quality control samples of a variety of types are used by the laboratory to verify the performance of different portions of the analytical process. These quality control samples include blanks, replicate samples, blind samples, or cross-checks.

Blanks are samples which contain no measurable radioactivity or no activity of the type being measured. Such samples are analyzed to determine whether there is any contamination of equipment or commercial laboratory chemicals, cross-contamination in the chemical process, or interference from isotopes other than the one being measured.

Duplicate samples are generated at random by the sample computer program which schedules the collection of the routine samples. For example, if the routine program calls for four milk samples every week, on a random basis each farm might provide an additional sample several

times a year. These duplicate samples are analyzed along with other routine samples. They provide information about the variability of radioactive content in the various sample media.

If enough sample is available for a particular analysis, the laboratory staff can split it into two portions. Such a sample provides information about the variability of the analytical process since two identical portions of material are analyzed side by side.

Analytical knowns are another category of quality control sample. A known amount of radioactivity is added to a sample medium. The lab staff knows the radioactive content of the sample. Whenever possible, the analytical knowns contain the same amount of radioactivity each time they are run. In this way, analytical knowns provide immediate data on the quality of the measurement process. A portion of these samples are also blanks.

Blind spikes are samples containing radioactivity which are introduced into the analysis process disguised as ordinary environmental samples. The lab staff does not know the sample contains radioactivity. Since the bulk of the ordinary workload of the environmental laboratory contains no measurable activity or only naturally occurring radioisotopes, blind spikes can be used to test the detection capability of the laboratory or can be used to test the data review process. If an analysis routinely generates numerous zeroes for a particular isotope, the presence of the isotope is brought to the attention of the laboratory supervisor in the daily review process. Blind spikes test this process since the blind spikes contain radioactivity at levels high enough to be detected. Furthermore, the activity can be put into such samples at the extreme limit of detection (near the LLD) to verify that the laboratory can detect very low levels of activity.

At present, 5 percent of the laboratory workload is in the category of internal cross-checks. These samples have a known amount of radioactivity added and are presented to the lab staff labeled as cross-check samples. This means that the quality control staff knows the radioactive content or "right answer" but the lab personnel performing the analysis do not. Such samples

test the best performance of the laboratory by determining if the lab can find the "right answer". These samples provide information about the accuracy of the measurement process. Further information is available about the variability of the process if multiple analyses are requested on the same sample. Like blind spikes or analytical knowns, these samples can also be spiked with low levels of activity to test detection limits. During 2003, all analysis results for internal cross-check samples were within agreement limits when compared to the known value.

To provide for an independent verification of the laboratory's ability to make accurate measurements, the laboratory participated in an environmental level cross-check program available through Analytics, Inc., during 2003. The results of TVA's participation in this cross-check program are presented in Table F-1.

TVA splits certain environmental samples with laboratories operated by the States of Alabama and Tennessee and the EPA National Air and Radiation Environmental Laboratory in Montgomery, Alabama. When radioactivity has been present in the environment in measurable quantities, such as following atmospheric nuclear weapons testing, following the Chernobyl incident, or as naturally occurring radionuclides, the split samples have provided TVA with another level of information about laboratory performance. These samples demonstrate performance on actual environmental sample matrices rather than on the constructed matrices used in cross-check programs.

The quality control data are routinely collected, examined and reported to laboratory supervisory personnel. They are checked for trends, problem areas, or other indications that a portion of the analytical process needs correction or improvement. The end result is a measurement process that provides reliable and verifiable data and is sensitive enough to measure the presence of radioactivity far below the levels which could be harmful to humans.

Table F-1

Results For 2003 External Cross Checks

Test Period	Sample Type / Analysis	Results		3 Sigma Range		
		Known	TVA			
First Quarter	Water (pCi/L)					
	Gross Beta	171	188	145	-	197
First Quarter	Charcoal Filter (pCi/Filter)					
	^{131}I	70	59	49	-	91
First Quarter	Water (pCi/L)					
	^{131}I	70	74	55	-	85
	^{141}Ce	168	168	143	-	193
	^{51}Cr	238	258	167	-	309
	^{134}Cs	88	82	73	-	103
	^{137}Cs	195	186	166	-	224
	^{58}Co	42	46	27	-	57
	^{54}Mn	63	66	48	-	78
	^{59}Fe	46	52	31	-	61
	^{65}Zn	90	93	63	-	117
	^{60}Co	157	162	133	-	181
First Quarter	Water (pCi/L)					
	^{89}Sr	114	110	97	-	131
	^{90}Sr	10	12	0	-	25
Third Quarter	Water (pCi/L)					
	^{3}H	8000	7659	5600	-	10400
Third Quarter	Sand (pCi/g)					
	^{141}Ce	0.183	0.183	0.156	-	0.210
	^{51}Cr	0.496	0.462	0.347	-	0.645
	^{134}Cs	0.254	0.244	0.216	-	0.292
	^{137}Cs	0.188	0.178	0.160	-	0.216
	^{58}Co	0.210	0.200	0.179	-	0.242
	^{54}Mn	0.198	0.216	0.168	-	0.228
	^{59}Fe	0.168	0.168	0.143	-	0.193
	^{65}Zn	0.374	0.403	0.262	-	0.486
	^{60}Co	0.263	0.270	0.224	-	0.302
Third Quarter	Air Filter (pCi/Filter)					
	Gross Beta	173	143	147	-	199
Third Quarter	Air Filter (pCi/Filter)					
	^{141}Ce	52	50	37	-	67
	^{51}Cr	141	126	99	-	183
	^{134}Cs	72	59	57	-	87
	^{137}Cs	53	52	38	-	68
	^{58}Co	60	58	45	-	75
	^{54}Mn	56	61	41	-	71
	^{59}Fe	48	46	33	-	63
	^{65}Zn	106	116	74	-	138
	^{60}Co	75	78	60	-	90

APPENDIX G

LAND USE SURVEY

Appendix G

Land Use Survey

A land use survey is conducted annually to identify the location of the nearest milk producing animal, the nearest residence, and the nearest garden of greater than 500 square feet producing fresh leafy vegetables in each of 16 meteorological sectors within a distance of 5 miles from the plant.

The land use survey is conducted between April 1 and October 1 using appropriate techniques such as door-to-door survey, mail survey, telephone survey, aerial survey, or information from local agricultural authorities or other reliable sources.

In order to identify the locations around SQN which have the greatest relative potential for impact by the plant, radiation doses are projected for individuals living near SQN. These projections use the data obtained in the survey and historical meteorological data. They also assume that releases are equivalent to the design basis source terms. The calculated doses are relative in nature and do not reflect actual exposures received by individuals living near SQN. Calculated doses to individuals based on measured effluents from the plant are well below applicable dose limits.

In response to the 2003 SQN land use survey, annual dose projections were calculated for air submersion, vegetable ingestion, and milk ingestion. External doses due to radioactivity in air (air submersion) are calculated for the nearest resident in each sector, while doses from drinking milk or eating foods produced near the plant are calculated for the areas with milk producing animals and gardens, respectively.

There were no changes in the location of the nearest resident as identified in 2003 compared to 2002. There were six changes in the location for nearest gardens as identified in 2003.

For milk ingestion, the projected dose changed slightly for the two milk production locations due to changes in the feeding factor values.

Tables G-1, G-2, and G-3 show the comparative relative calculated doses for 2002 and 2003.

Table G-1

SEQUOYAH NUCLEAR PLANT

Relative Projected Annual Air Submersion Dose to the Nearest Resident
Within Five Miles of Plant
mrem/year

	2002 Survey		2003 Survey	
Sector	Approximate Distance Miles	Annual Dose	Approximate Distance Miles	Annual Dose
N	0.8	0.12	0.8	0.12
NNE	1.5	0.07	1.5	0.07
NE	1.5	0.06	1.5	0.06
ENE	1.3	0.02	1.3	0.02
E	1.0	0.02	1.0	0.02
ESE	1.0	0.02	1.0	0.02
SE	1.1	0.02	1.1	0.02
SSE	1.3	0.03	1.3	0.03
S	1.1	0.11	1.1	0.11
SSW	1.3	0.15	1.3	0.15
SW	1.4	0.06	1.4	0.06
WSW	0.6	0.05	0.6	0.05
W	0.6	0.06	0.6	0.06
WNW	1.1	0.02	0.9	0.02
NW	0.8	0.04	0.8	0.04
NNW	0.5	0.14	0.5	0.14

Table G-2

SEQUOYAH NUCLEAR PLANT

Relative Projected Annual Dose to Child's Bone from
Ingestion of Home-Grown Foods
mrem/year

	2002 Survey		2003 Survey	
Sector	Approximate Distance Miles	Annual Dose	Approximate Distance Miles	Annual Dose
N	1.1	2.25	1.1	2.25
NNE	2.1	1.42	3.3	0.74
NE	2.7	0.78	2.9	0.74
ENE	4.0	0.16	4.0	0.16
E	1.9	0.30	2.0	0.28
ESE	1.5	0.31	1.8	0.26
SE	2.0	0.30	2.0	0.30
SSE	1.3	1.00	1.3	1.00
S	2.0	1.36	2.0	1.36
SSW	1.7	3.50	2.6	1.01
SW	2.2	1.09	2.9	1.61
WSW	1.4	0.54	1.4	0.54
W	0.9	1.03	0.9	1.03
WNW	1.1	0.62	1.1	0.62
NW	0.9	1.26	0.9	1.26
NNW	0.5	4.26	0.5	4.26

Table G-3

SEQUOYAH NUCLEAR PLANT

Relative Projected Annual Dose to Receptor Thyroid
from Ingestion of Milk
mrem/year

Location	Sector	Approximate Distance (Miles)[a]	Annual Dose 2002	Annual Dose 2003	XQ s/m^3
Farm HS[b]	E	4.6	0.008	0.007	6.74 E-8
Farm HW	NW	1.2	0.051	0.052	5.48 E-7

a. Distances measured to nearest property line.
b. Grade A dairy.

APPENDIX H

DATA TABLES AND FIGURES

Table H-1

DIRECT RADIATION LEVELS

Average External Gamma Radiation Levels at Various Distances from Sequoyah Nuclear Plant for Each Quarter-2003
mR / Quarter (a)

Distance Miles	Average External Gamma Radiation Levels (b)				per annum mR/yr
	1st qtr	2nd qtr	3rd qtr	4th qtr	
0 - 1	17.8 ± 2.1	16.9 ± 2.8	17.2 ± 1.8	18.5 ± 2.0	70
1 - 2	14.8 ± 2.0	13.4 ± 1.8	14.3 ± 1.8	15.4 ± 1.8	58
2 - 4	15.0 ± 1.8	14.0 ± 1.7	14.7 ± 1.9	15.6 ± 1.9	59
4 - 6	14.7 ± 1.8	13.9 ± 1.6	14.5 ± 1.9	15.5 ± 1.9	59
> 6	14.9 ± 1.3	13.9 ± 0.9	14.4 ± 1.1	15.7 ± 1.1	59
Average, 0 - 2 miles (onsite)	16.5 ± 2.5	15.3 ± 3.0	15.9 ± 2.3	17.1 ± 2.5	65
Average, >2 miles (offsite)	14.8 ± 1.7	13.9 ± 1.5	14.5 ± 1.7	15.5 ± 1.7	59

(a) Field periods normalized to one standard quarter (2190 hours)
(b) Average of the individual measurements in the set ± 1 standard deviation of the set

TABLE H - 2

DIRECT RADIATION LEVELS

Individual Stations at Sequoyah Nuclear Plant

				Environmental Radiation Levels mR/quarter				
Map Location Number	TLD Station Number	Direction, Degrees	Approx Distance, Miles	1st Qtr Feb – Apr 2003	2nd Qtr May – Jul 2003	3rd Qtr Aug – Oct 2003	4th Qtr Nov – Jan 2003, 04	Annual Exposure mR/year
49	N-1	3	.6	16.2	13.4	16.2	18.2	64.0
50	N-2	4	2.1	15.6	14.6	14.8	15.6	60.6
51	N-3	358	5.2	12.7	12.6	12.4	14.0	51.6
52	N-4	355	10.0	15.0	14.3	14.5	15.6	59.3
5	NNE-1	13	1.8	17.9	16.6	17.3	18.6	70.4
53	NNE-2	31	4.5	14.2	12.6	13.7	14.4	54.8
54	NNE-3	32	12.1	14.4	13.7	14.1	15.3	57.5
12	NNE-4	32	17.8	13.9	13.7	14.1	15.3	57.0
55	NE-1	38	2.4	16.5	15.0	15.4	17.1	64.0
4	NE-1A	50	1.5	15.9	14.6	15.3	16.6	62.4
56	NE-2	51	4.1	12.2	11.7	11.6	12.8	48.2
57	ENE-1	73	.4	15.1	14.2	14.3	15.5	59.1
58	ENE-2	66	5.1	14.6	14.0	14.1	14.8	57.4
59	E-1	96	1.2	14.2	12.5	14.1	15.2	56.0
60	E-2	87	5.2	15.4	14.1	15.1	16.0	60.6
65	E-A	91	.3	18.5	17.4	17.1	18.1	71.1
62	ESE-1	110	1.2	14.3	12.9	13.9	14.7	55.8
63	ESE-2	112	4.9	17.5	15.8	16.7	18.4	68.3
13	ESE-3	117	11.3	14.9	14.5	14.5	16.4	60.3
61	ESE-A	110	.3	22.8	24.5	20.9	23.1	91.3
66	SE-1	131	1.4	13.2	11.3	12.0	12.9	49.4
67	SE-2	129	1.9	14.4	12.8	14.3	15.0	56.6
68	SE-4	136	5.2	17.4	16.0	16.9	17.9	68.2
64	SE-A	132	.4	16.0	15.6	15.2	16.6	63.4
69	SSE-1	154	1.6	13.1	12.1	12.5	13.6	51.3
70	SSE-2	158	4.6	16.4	16.2	16.2	17.7	66.5

TABLE H - 2 continued

DIRECT RADIATION LEVELS

Individual Stations at Sequoyah Nuclear Plant

				Environmental Radiation Levels mR/quarter				
Map Location Number	TLD Station Number	Direction, Degrees	Approx Distance, Miles	1st Qtr Feb – Apr 2003	2nd Qtr May – Jul 2003	3rd Qtr Aug – Oct 2003	4th Qtr Nov – Jan 2003, 04	Annual Exposure mR/year
71	S-1	183	1.5	18.6	16.0	17.2	18.2	70.0
72	S-2	185	4.7	12.6	11.6	(1)	12.4	48.8
73	SSW-1	203	.6	17.3	16.3	16.4	17.9	68.0
90	SSW-1B	192	1.5	12.2	11.1	12.1	13.5	48.8
3	SSW-1C	198	2.0	15.5	14.6	15.9	16.6	62.6
74	SSW-2	204	4.0	17.9	16.9	18.2	18.7	71.6
9	SSW-3	203	8.7	16.7	14.4	15.6	16.5	63.2
75	SW-1	228	.9	17.7	16.1	17.1	18.2	69.1
7	SW-2	227	3.8	13.9	13.1	13.6	14.3	54.9
11	SW-3	228	16.7	17.6	15.7	16.8	17.9	68.0
76	WSW-1	241	.9	18.3	16.8	18.3	17.9	71.2
77	WSW-2	238	2.5	12.3	11.6	12.0	12.8	48.7
10	WSW-2A	250	2.6	13.3	12.1	12.8	13.8	52.0
78	WSW-3	248	5.7	16.4	15.7	16.7	17.7	66.6
79	WSW-4	244	7.8	14.0	12.9	14.0	15.1	56.0
80	WSW-5	244	10.1	14.7	13.2	13.8	15.3	57.0
81	W-1	260	.8	19.8	18.7	19.6	20.5	78.6
82	W-2	275	4.3	11.6	11.3	11.1	12.7	46.7
8	W-3	280	5.6	16.2	14.9	16.1	16.7	63.9
83	WNW-1	292	.4	16.3	15.1	16.4	16.8	64.5
84	WNW-2	295	5.3	14.8	13.8	14.0	15.5	58.2
14	WNW-3	299	18.9	13.0	12.5	12.5	13.7	51.7
85	NW-1	315	.4	19.6	19.1	19.0	21.1	78.8
86	NW-2	318	5.2	15.2	15.2	15.2	16.7	62.3
87	NNW-1	344	.6	16.4	15.8	16.3	17.7	66.2
88	NNW-2	342	1.7	14.3	13.7	14.0	15.6	57.6
89	NNW-3	334	5.3	13.6	13.6	13.1	14.2	54.5

note (1) Sum of available quarterly data normalized to 1 year for the annual exposure value

TENNESSEE VALLEY AUTHORITY
ENVIRONMENTAL RADIOLOGICAL MONITORING AND INSTRUMENTATION
WESTERN AREA RADIOLOGICAL LABORATORY

RADIOACTIVITY IN AIR FILTER
PCI/M3 - 0.037 BQ/M3

NAME OF FACILITY: SEQUOYAH NUCLEAR PLANT
LOCATION OF FACILITY: HAMILTON TENNESSEE

DOCKET NO.: 50-327,328
REPORTING PERIOD: 2003

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION (LLD) SEE NOTE 1	ALL INDICATOR LOCATIONS MEAN (F) RANGE SEE NOTE 2	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F) RANGE SEE NOTE 2	CONTROL LOCATIONS MEAN (F) RANGE SEE NOTE 2	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GROSS BETA						
622	2.00E-03	1.98E-02(415/ 415)	PM-2 COUNTY PARK TN	2.03E-02(52/ 52)	2.02E-02(207/ 207)	
		8.16E-03- 3.50E-02	3.8 MILES SW	1.20E-02- 3.50E-02	9.80E-03- 3.54E-02	
GAMMA SCAN (GELI)						
156						
BE-7	2.00E-02	8.58E-02(104/ 104)	PM-2 COUNTY PARK TN	9.11E-02(13/ 13)	8.86E-02(52/ 52)	
		5.72E-02- 1.15E-01	3.8 MILES SW	7.43E-02- 1.15E-01	6.40E-02- 1.18E-01	
BI-214	5.00E-03	1.42E-02(69/ 104)	PM-8 HARRISON TN	1.87E-02(12/ 13)	1.33E-02(32/ 52)	
		5.20E-03- 6.44E-02	8.7 MILES SSW	6.10E-03- 6.44E-02	6.00E-03- 3.02E-02	
PB-214	5.00E-03	1.36E-02(67/ 104)	PM-8 HARRISON TN	1.94E-02(11/ 13)	1.25E-02(30/ 52)	
		5.20E-03- 6.34E-02	8.7 MILES SSW	6.60E-03- 6.34E-02	5.50E-03- 2.65E-02	

NOTE: 1. NOMINAL LOWER LIMIT OF DETECTION (LLD) AS DESCRIBED IN TABLE E-1 .
NOTE: 2. MEAN AND RANGE BASED UPON DETECTABLE MEASUREMENTS ONLY. FRACTION OF DETECTABLE MEASUREMENTS AT SPECIFIED LOCATIONS IS INDICATED IN PARENTHESES (F).

TENNESSEE VALLEY AUTHORITY
ENVIRONMENTAL RADIOLOGICAL MONITORING AND INSTRUMENTATION
WESTERN AREA RADIOLOGICAL LABORATORY

RADIOACTIVITY IN CHARCOAL FILTER
PCI/M3 - 0.037 BQ/M3

NAME OF FACILITY: SEQUOYAH NUCLEAR PLANT
LOCATION OF FACILITY: HAMILTON TENNESSEE

DOCKET NO.: 50-327,328
REPORTING PERIOD: 2003

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION (LLD) SEE NOTE 1	ALL INDICATOR LOCATIONS MEAN (F) RANGE SEE NOTE 2	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F) RANGE SEE NOTE 2	CONTROL LOCATIONS MEAN (F) RANGE SEE NOTE 2	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GAMMA SCAN (GELI) 622						
BI-214	5.00E-02	7.36E-02(23/ 415)	LM-4 SKULL ISLAND	1.04E-01(2/ 52)	9.13E-02(10/ 207)	
		5.01E-02- 1.44E-01	1.5 MILES NE	6.44E-02- 1.44E-01	5.26E-02- 1.50E-01	
K-40	3.00E-01	3.39E-01(22/ 415)	LM-3 HARRISON BAY RD	3.51E-01(4/ 52)	3.61E-01(12/ 207)	
		3.00E-01- 4.06E-01	2.0 MILES SSW	3.03E-01- 4.06E-01	3.05E-01- 5.95E-01	
PB-214	7.00E-02	1.03E-01(14/ 415)	LM-3 HARRISON BAY RD	1.18E-01(3/ 52)	1.21E-01(11/ 207)	
		7.01E-02- 1.43E-01	2.0 MILES SSW	9.88E-02- 1.38E-01	7.32E-02- 1.78E-01	

NOTE: 1. NOMINAL LOWER LIMIT OF DETECTION (LLD) AS DESCRIBED IN TABLE E-1 .
NOTE: 2. MEAN AND RANGE BASED UPON DETECTABLE MEASUREMENTS ONLY. FRACTION OF DETECTABLE MEASUREMENTS AT SPECIFIED LOCATIONS IS INDICATED IN PARENTHESES (F).
NOTE: 3. THE ANALYSIS OF CHARCOAL FILTERS WAS PERFORMED BY GAMMA SPECTROSCOPY. NO I-131 WAS DETECTED. THE LLD FOR I-131 BY GAMMA SPECTROSCOPY WAS 0.03 pCi/cubic meter.

TENNESSEE VALLEY AUTHORITY
ENVIRONMENTAL RADIOLOGICAL MONITORING AND INSTRUMENTATION
WESTERN AREA RADIOLOGICAL LABORATORY

RADIOACTIVITY IN MILK
PCI/L - 0.037 BQ/L

NAME OF FACILITY: SEQUOYAH NUCLEAR PLANT
LOCATION OF FACILITY: HAMILTON TENNESSEE

DOCKET NO.: 50-327,328
REPORTING PERIOD: 2003

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION (LLD) SEE NOTE 1	ALL INDICATOR LOCATIONS MEAN (F) RANGE SEE NOTE 2	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F) RANGE SEE NOTE 2	CONTROL LOCATIONS MEAN (F) RANGE SEE NOTE 2	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
IODINE-131						
85	4.00E-01	35 VALUES < LLD			50 VALUES < LLD	
GAMMA SCAN (GELI)						
85						
BI-214	2.00E+01	9.00E+01(1/ 35)	H. SMITH FARM	9.00E+01(1/ 26)	2.58E+01(5/ 50)	
		9.00E+01- 9.00E+01	4.6 MILES E	9.00E+01- 9.00E+01	2.19E+01- 3.61E+01	
K-40	1.00E+02	1.33E+03(35/ 35)	H. SMITH FARM	1.34E+03(26/ 26)	1.37E+03(50/ 50)	
		1.08E+03- 1.56E+03	4.6 MILES E	1.12E+03- 1.52E+03	1.16E+03- 1.71E+03	
PB-214	2.00E+01	5.99E+01(1/ 35)	H. SMITH FARM	5.99E+01(1/ 26)	2.15E+01(2/ 50)	
		5.99E+01- 5.99E+01	4.6 MILES E	5.99E+01- 5.99E+01	2.03E+01- 2.27E+01	
SR 89						
13	3.50E+00	5 VALUES < LLD			8 VALUES < LLD	
SR 90						
13	2.00E+00	2.63E+00(1/ 5)	H WALKER FARM	2.63E+00(1/ 1)	8 VALUES < LLD	
		2.63E+00- 2.63E+00	1.2 MILES NW	2.63E+00- 2.63E+00		

NOTE: 1. NOMINAL LOWER LIMIT OF DETECTION (LLD) AS DESCRIBED IN TABLE E-1 .
NOTE: 2. MEAN AND RANGE BASED UPON DETECTABLE MEASUREMENTS ONLY. FRACTION OF DETECTABLE MEASUREMENTS AT SPECIFIED LOCATIONS IS INDICATED IN PARENTHESES (F).

TENNESSEE VALLEY AUTHORITY
ENVIRONMENTAL RADIOLOGICAL MONITORING AND INSTRUMENTATION
WESTERN AREA RADIOLOGICAL LABORATORY

RADIOACTIVITY IN SOIL
PCI/GM - 0.037 BQ/G (DRY WEIGHT)

NAME OF FACILITY: SEQUOYAH NUCLEAR PLANT
LOCATION OF FACILITY: HAMILTON TENNESSEE

DOCKET NO.: 50-327,328
REPORTING PERIOD: 2003

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION (LLD) SEE NOTE 1	ALL INDICATOR LOCATIONS MEAN (F) RANGE SEE NOTE 2	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F) RANGE SEE NOTE 2	CONTROL LOCATIONS MEAN (F) RANGE SEE NOTE 2	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GAMMA SCAN (GELI)						
12						
AC-228	2.50E-01	1.06E+00(8/ 8)	LM-5 WARE POINT	1.58E+00(1/ 1)	1.03E+00(4/ 4)	
		4.10E-01- 1.58E+00	1.8 MILES NNE	1.58E+00- 1.58E+00	6.93E-01- 1.38E+00	
BE-7	2.50E-01	8 VALUES < LLD	PM-3 DAISY TN	1 VALUES < LLD	3.05E-01(1/ 4)	
			5.6 MILES W		3.05E-01- 3.05E-01	
BI-212	4.50E-01	1.11E+00(8/ 8)	LM-5 WARE POINT	1.77E+00(1/ 1)	1.02E+00(4/ 4)	
		5.11E-01- 1.77E+00	1.8 MILES NNE	1.77E+00- 1.77E+00	5.56E-01- 1.46E+00	
BI-214	1.50E-01	9.13E-01(8/ 8)	PM-8 HARRISON TN	1.17E+00(1/ 1)	7.39E-01(4/ 4)	
		5.68E-01- 1.17E+00	8.7 MILES SSW	1.17E+00- 1.17E+00	5.90E-01- 8.85E-01	
CS-137	3.00E-02	3.72E-01(7/ 8)	PM-2 COUNTY PARK TN	6.77E-01(1/ 1)	1.83E-01(4/ 4)	
		1.90E-01- 6.77E-01	3.8 MILES SW	6.77E-01- 6.77E-01	4.58E-02- 4.66E-01	
K-40	7.50E-01	6.62E+00(8/ 8)	LM-3 HARRISON BAY RD	1.17E+01(1/ 1)	9.60E+00(4/ 4)	
		2.58E+00- 1.17E+01	2.0 MILES SSW	1.17E+01- 1.17E+01	4.93E+00- 2.10E+01	
PB-212	1.00E-01	1.09E+00(8/ 8)	LM-5 WARE POINT	1.73E+00(1/ 1)	1.03E+00(4/ 4)	
		4.61E-01- 1.73E+00	1.8 MILES NNE	1.73E+00- 1.73E+00	6.48E-01- 1.46E+00	
PB-214	1.50E-01	1.00E+00(8/ 8)	LM-5 WARE POINT	1.28E+00(1/ 1)	8.24E-01(4/ 4)	
		6.51E-01- 1.28E+00	1.8 MILES NNE	1.28E+00- 1.28E+00	6.54E-01- 1.02E+00	
RA-224	7.50E-01	1.28E+00(6/ 8)	LM-5 WARE POINT	1.87E+00(1/ 1)	1.55E+00(1/ 4)	
		8.29E-01- 1.87E+00	1.8 MILES NNE	1.87E+00- 1.87E+00	1.55E+00- 1.55E+00	
RA-226	1.50E-01	9.13E-01(8/ 8)	PM-8 HARRISON TN	1.17E+00(1/ 1)	7.39E-01(4/ 4)	
		5.68E-01- 1.17E+00	8.7 MILES SSW	1.17E+00- 1.17E+00	5.90E-01- 8.85E-01	
TL-208	6.00E-02	3.43E-01(8/ 8)	LM-5 WARE POINT	5.50E-01(1/ 1)	3.29E-01(4/ 4)	
		1.36E-01- 5.50E-01	1.8 MILES NNE	5.50E-01- 5.50E-01	2.04E-01- 4.64E-01	
SR 89						
12						
	1.60E+00	8 VALUES < LLD			4 VALUES < LLD	
SR 90						
12						
	4.00E-01	8 VALUES < LLD			4 VALUES < LLD	

NOTE: 1. NOMINAL LOWER LIMIT OF DETECTION (LLD) AS DESCRIBED IN TABLE E-1 .
NOTE: 2. MEAN AND RANGE BASED UPON DETECTABLE MEASUREMENTS ONLY. FRACTION OF DETECTABLE MEASUREMENTS AT SPECIFIED LOCATIONS IS INDICATED IN PARENTHESES (F).

TENNESSEE VALLEY AUTHORITY
ENVIRONMENTAL RADIOLOGICAL MONITORING AND INSTRUMENTATION
WESTERN AREA RADIOLOGICAL LABORATORY

RADIOACTIVITY IN APPLES
PCI/KG - 0.037 BQ/KG (WET WT)

NAME OF FACILITY: SEQUOYAH NUCLEAR PLANT
LOCATION OF FACILITY: HAMILTON TENNESSEE

DOCKET NO.: 50-327,328
REPORTING PERIOD: 2003

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION (LLD) SEE NOTE 1	ALL INDICATOR LOCATIONS MEAN (F) RANGE SEE NOTE 2	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F) RANGE SEE NOTE 2	CONTROL LOCATIONS MEAN (F) RANGE SEE NOTE 2	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GAMMA SCAN (GELI)						
K-40	2.50E+02	5.55E+02(1/ 1) 5.55E+02- 5.55E+02	SQNP 1.1 MILES WNW	5.55E+02(1/ 1) 5.55E+02- 5.55E+02	8.87E+02(1/ 1) 8.87E+02- 8.87E+02	

NOTE: 1. NOMINAL LOWER LIMIT OF DETECTION (LLD) AS DESCRIBED IN TABLE E-1 .
NOTE: 2. MEAN AND RANGE BASED UPON DETECTABLE MEASUREMENTS ONLY. FRACTION OF DETECTABLE MEASUREMENTS AT SPECIFIED LOCATIONS IS INDICATED IN PARENTHESES (F).

TENNESSEE VALLEY AUTHORITY
ENVIRONMENTAL RADIOLOGICAL MONITORING AND INSTRUMENTATION
WESTERN AREA RADIOLOGICAL LABORATORY

RADIOACTIVITY IN CABBAGE
PCI/KG - 0.037 BQ/KG (WET WT)

NAME OF FACILITY: SEQUOYAH NUCLEAR PLANT
LOCATION OF FACILITY: HAMILTON TENNESSEE

DOCKET NO.: 50-327,328
REPORTING PERIOD: 2003

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION (LLD) SEE NOTE 1	ALL INDICATOR LOCATIONS MEAN (F) RANGE SEE NOTE 2	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F) RANGE SEE NOTE 2	CONTROL LOCATIONS MEAN (F) RANGE SEE NOTE 2	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GAMMA SCAN (GELI) 2						
K-40	2.50E+02	1.87E+03(1/ 1) 1.87E+03- 1.87E+03	SQNP 1.1 MILES WNW	1.87E+03(1/ 1) 1.87E+03- 1.87E+03	1.27E+03(1/ 1) 1.27E+03- 1.27E+03	

NOTE: 1. NOMINAL LOWER LIMIT OF DETECTION (LLD) AS DESCRIBED IN TABLE E-1 .
NOTE: 2. MEAN AND RANGE BASED UPON DETECTABLE MEASUREMENTS ONLY. FRACTION OF DETECTABLE MEASUREMENTS AT SPECIFIED LOCATIONS IS INDICATED IN PARENTHESES (F).

TENNESSEE VALLEY AUTHORITY
ENVIRONMENTAL RADIOLOGICAL MONITORING AND INSTRUMENTATION
WESTERN AREA RADIOLOGICAL LABORATORY

RADIOACTIVITY IN CORN
PCI/KG - 0.037 BQ/KG (WET WT)

NAME OF FACILITY: SEQUOYAH NUCLEAR PLANT
LOCATION OF FACILITY: HAMILTON TENNESSEE

DOCKET NO.: 50-327,328
REPORTING PERIOD: 2003

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION (LLD) SEE NOTE 1	ALL INDICATOR LOCATIONS MEAN (F) RANGE SEE NOTE 2	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F) RANGE SEE NOTE 2	CONTROL LOCATIONS MEAN (F) RANGE SEE NOTE 2	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GAMMA SCAN (GELI)						
K-40	2.50E+02	1.94E+03(1/ 1)	SQNP	1.94E+03(1/ 1)	2.30E+03(1/ 1)	
		1.94E+03- 1.94E+03	1.1 MILES WNW	1.94E+03- 1.94E+03	2.30E+03- 2.30E+03	

NOTE: 1. NOMINAL LOWER LIMIT OF DETECTION (LLD) AS DESCRIBED IN TABLE E-1 .
NOTE: 2. MEAN AND RANGE BASED UPON DETECTABLE MEASUREMENTS ONLY. FRACTION OF DETECTABLE MEASUREMENTS AT SPECIFIED LOCATIONS IS INDICATED IN PARENTHESES (F).

TENNESSEE VALLEY AUTHORITY
ENVIRONMENTAL RADIOLOGICAL MONITORING AND INSTRUMENTATION
WESTERN AREA RADIOLOGICAL LABORATORY

RADIOACTIVITY IN GREEN BEANS
PCI/KG - 0.037 BQ/KG (WET WT)

NAME OF FACILITY: SEQUOYAH NUCLEAR PLANT
LOCATION OF FACILITY: HAMILTON TENNESSEE

DOCKET NO.: 50-327,328
REPORTING PERIOD: 2003

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION (LLD) SEE NOTE 1	ALL INDICATOR LOCATIONS MEAN (F) RANGE SEE NOTE 2	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F) RANGE SEE NOTE 2	CONTROL LOCATIONS MEAN (F) RANGE SEE NOTE 2	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GAMMA SCAN (GELI) 2						
BI-214	4.00E+01	1 VALUES < LLD	1 MILES N	1 VALUES < LLD	4.23E+01(1/ 1) 4.23E+01- 4.23E+01	
K-40	2.50E+02	2.47E+03(1/ 1) 2.47E+03- 2.47E+03	1 MILES N	2.47E+03(1/ 1) 2.47E+03- 2.47E+03	1.56E+03(1/ 1) 1.56E+03- 1.56E+03	

NOTE: 1. NOMINAL LOWER LIMIT OF DETECTION (LLD) AS DESCRIBED IN TABLE E-1 .
NOTE: 2. MEAN AND RANGE BASED UPON DETECTABLE MEASUREMENTS ONLY. FRACTION OF DETECTABLE MEASUREMENTS AT SPECIFIED LOCATIONS IS INDICATED IN PARENTHESES (F).

TENNESSEE VALLEY AUTHORITY
ENVIRONMENTAL RADIOLOGICAL MONITORING AND INSTRUMENTATION
WESTERN AREA RADIOLOGICAL LABORATORY

RADIOACTIVITY IN POTATOES
PCI/KG - 0.037 BQ/KG (WET WT)

NAME OF FACILITY: SEQUOYAH NUCLEAR PLANT
LOCATION OF FACILITY: HAMILTON TENNESSEE

DOCKET NO.: 50-327,328
REPORTING PERIOD: 2003

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION (LLD) SEE NOTE 1	ALL INDICATOR LOCATIONS MEAN (F) RANGE SEE NOTE 2	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F) RANGE SEE NOTE 2	CONTROL LOCATIONS MEAN (F) RANGE SEE NOTE 2	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GAMMA SCAN (GELI)						
K-40	2.50E+02	3.50E+03(1/ 1)	H WALKER FARM	3.50E+03(1/ 1)	3.32E+03(1/ 1)	
		3.50E+03- 3.50E+03	1.2 MILES NW	3.50E+03- 3.50E+03	3.32E+03- 3.32E+03	

NOTE: 1. NOMINAL LOWER LIMIT OF DETECTION (LLD) AS DESCRIBED IN TABLE E-1 .
NOTE: 2. MEAN AND RANGE BASED UPON DETECTABLE MEASUREMENTS ONLY. FRACTION OF DETECTABLE MEASUREMENTS AT SPECIFIED LOCATIONS IS INDICATED IN PARENTHESES (F).

TENNESSEE VALLEY AUTHORITY
ENVIRONMENTAL RADIOLOGICAL MONITORING AND INSTRUMENTATION
WESTERN AREA RADIOLOGICAL LABORATORY

RADIOACTIVITY IN SURFACE WATER(Total)
PCI/L - 0.037 BQ/L

NAME OF FACILITY: SEQUOYAH NUCLEAR PLANT
LOCATION OF FACILITY: HAMILTON TENNESSEE

DOCKET NO.: 50-327,328
REPORTING PERIOD: 2003

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION (LLD) SEE NOTE 1	ALL INDICATOR LOCATIONS MEAN (F) RANGE SEE NOTE 2	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F) RANGE SEE NOTE 2	CONTROL LOCATIONS MEAN (F) RANGE SEE NOTE 2	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GROSS BETA						
26	1.90E+00	2.37E+00(11/ 13) 1.99E+00- 2.81E+00	TRM 483.4	2.37E+00(11/ 13) 1.99E+00- 2.81E+00	2.69E+00(9/ 13) 1.91E+00- 3.52E+00	
GAMMA SCAN (GELI)						
26						
BI-214	2.00E+01	2.61E+01(1/ 13) 2.61E+01- 2.61E+01	TRM 483.4	2.61E+01(1/ 13) 2.61E+01- 2.61E+01	13 VALUES < LLD	
PB-214	2.00E+01	2.26E+01(1/ 13) 2.26E+01- 2.26E+01	TRM 483.4	2.26E+01(1/ 13) 2.26E+01- 2.26E+01	13 VALUES < LLD	
TRITIUM						
22	3.00E+02	5 VALUES < LLD			17 VALUES < LLD	

NOTE: 1. NOMINAL LOWER LIMIT OF DETECTION (LLD) AS DESCRIBED IN TABLE E-1 .
NOTE: 2. MEAN AND RANGE BASED UPON DETECTABLE MEASUREMENTS ONLY. FRACTION OF DETECTABLE MEASUREMENTS AT SPECIFIED LOCATIONS IS INDICATED IN PARENTHESES (F).

TENNESSEE VALLEY AUTHORITY
ENVIRONMENTAL RADIOLOGICAL MONITORING AND INSTRUMENTATION
WESTERN AREA RADIOLOGICAL LABORATORY

RADIOACTIVITY IN PUBLIC WATER(Total)
PCI/L - 0.037 BQ/L

NAME OF FACILITY: SEQUOYAH NUCLEAR PLANT
LOCATION OF FACILITY: HAMILTON TENNESSEE

DOCKET NO.: 50-327,328
REPORTING PERIOD: 2003

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION (LLD) SEE NOTE 1	ALL INDICATOR LOCATIONS MEAN (F) RANGE SEE NOTE 2	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F) RANGE SEE NOTE 2	CONTROL LOCATIONS MEAN (F) RANGE SEE NOTE 2	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GROSS BETA						
52						
	1.90E+00	2.61E+00(21/ 39)	CF INDUSTRIES	2.71E+00(10/ 13)	2.69E+00(9/ 13)	
		1.92E+00- 3.55E+00	TRM 473.0	2.06E+00- 3.55E+00	1.91E+00- 3.52E+00	
GAMMA SCAN (GELI)						
52						
BI-214	2.00E+01	3.19E+01(6/ 39)	CF INDUSTRIES	3.59E+01(1/ 13)	13 VALUES < LLD	
		2.06E+01- 5.62E+01	TRM 473.0	3.59E+01- 3.59E+01		
PB-214	2.00E+01	3.62E+01(3/ 39)	E.I. DUPONT	3.93E+01(2/ 13)	13 VALUES < LLD	
		2.91E+01- 4.96E+01	TRM 470.5	2.91E+01- 4.96E+01		
TRITIUM						
44						
	3.00E+02	27 VALUES < LLD			17 VALUES < LLD	

NOTE: 1. NOMINAL LOWER LIMIT OF DETECTION (LLD) AS DESCRIBED IN TABLE E-1 .
NOTE: 2. MEAN AND RANGE BASED UPON DETECTABLE MEASUREMENTS ONLY. FRACTION OF DETECTABLE MEASUREMENTS AT SPECIFIED LOCATIONS IS INDICATED IN PARENTHESES (F).

TENNESSEE VALLEY AUTHORITY
ENVIRONMENTAL RADIOLOGICAL MONITORING AND INSTRUMENTATION
WESTERN AREA RADIOLOGICAL LABORATORY

RADIOACTIVITY IN WELL WATER(Total)
PCI/L - 0.037 BQ/L

NAME OF FACILITY: SEQUOYAH NUCLEAR PLANT
LOCATION OF FACILITY: HAMILTON TENNESSEE

DOCKET NO.: 50-327,328
REPORTING PERIOD: 2003

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION (LLD) SEE NOTE 1	ALL INDICATOR LOCATIONS MEAN (F) RANGE SEE NOTE 2	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F) RANGE SEE NOTE 2	CONTROL LOCATIONS MEAN (F) RANGE SEE NOTE 2	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GROSS BETA						
8	1.90E+00	2.92E+00(3/ 4) 2.32E+00- 3.23E+00	SQN WELL #6 ONSITE NNE	2.92E+00(3/ 4) 2.32E+00- 3.23E+00	9.69E+00(4/ 4) 5.11E+00- 1.63E+01	
GAMMA SCAN (GELI)						
10						
BI-214	2.00E+01	6 VALUES < LLD	SQN WELL #6 ONSITE NNE	6 VALUES < LLD	2.36E+02(4/ 4) 1.37E+02- 3.45E+02	
PB-214	2.00E+01	6 VALUES < LLD	SQN WELL #6 ONSITE NNE	6 VALUES < LLD	2.45E+02(4/ 4) 1.37E+02- 3.73E+02	
TRITIUM						
11	3.00E+02	7 VALUES < LLD			4 VALUES < LLD	

NOTE: 1. NOMINAL LOWER LIMIT OF DETECTION (LLD) AS DESCRIBED IN TABLE E-1 .
NOTE: 2. MEAN AND RANGE BASED UPON DETECTABLE MEASUREMENTS ONLY. FRACTION OF DETECTABLE MEASUREMENTS AT SPECIFIED LOCATIONS IS INDICATED IN PARENTHESES (F).

TENNESSEE VALLEY AUTHORITY
ENVIRONMENTAL RADIOLOGICAL MONITORING AND INSTRUMENTATION
WESTERN AREA RADIOLOGICAL LABORATORY

RADIOACTIVITY IN COMMERCIAL FISH
PCI/GM - 0.037 BQ/G (DRY WEIGHT)

NAME OF FACILITY: SEQUOYAH NUCLEAR PLANT
LOCATION OF FACILITY: HAMILTON TENNESSEE

DOCKET NO.: 50-327,328
REPORTING PERIOD: 2003

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION (LLD) SEE NOTE 1	ALL INDICATOR LOCATIONS MEAN (F) RANGE SEE NOTE 2	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F) RANGE SEE NOTE 2	CONTROL LOCATIONS MEAN (F) RANGE SEE NOTE 2	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GAMMA SCAN (GELI) 4						
BI-214	1.00E-01	1.82E-01(2/ 2) 1.56E-01- 2.08E-01	CHICKAMAUGA RES TRM 471-530	1.82E-01(2/ 2) 1.56E-01- 2.08E-01	1.94E-01(2/ 2) 1.14E-01- 2.75E-01	
CS-137	3.00E-02	2 VALUES < LLD	CHICKAMAUGA RES TRM 471-530	2 VALUES < LLD	6.76E-02(2/ 2) 6.43E-02- 7.10E-02	
K-40	4.00E-01	1.05E+01(2/ 2) 1.00E+01- 1.10E+01	CHICKAMAUGA RES TRM 471-530	1.05E+01(2/ 2) 1.00E+01- 1.10E+01	1.24E+01(2/ 2) 1.08E+01- 1.40E+01	

NOTE: 1. NOMINAL LOWER LIMIT OF DETECTION (LLD) AS DESCRIBED IN TABLE E-1 .
NOTE: 2. MEAN AND RANGE BASED UPON DETECTABLE MEASUREMENTS ONLY. FRACTION OF DETECTABLE MEASUREMENTS AT SPECIFIED LOCATIONS IS INDICATED IN PARENTHESES (F).

TENNESSEE VALLEY AUTHORITY
ENVIRONMENTAL RADIOLOGICAL MONITORING AND INSTRUMENTATION
WESTERN AREA RADIOLOGICAL LABORATORY

RADIOACTIVITY IN GAME FISH
PCI/GM - 0.037 BQ/G (DRY WEIGHT)

NAME OF FACILITY: SEQUOYAH NUCLEAR PLANT
LOCATION OF FACILITY: HAMILTON TENNESSEE

DOCKET NO.: 50-327,328
REPORTING PERIOD: 2003

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION (LLD) SEE NOTE 1	ALL INDICATOR LOCATIONS MEAN (F) RANGE SEE NOTE 2	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F) RANGE SEE NOTE 2	CONTROL LOCATIONS MEAN (F) RANGE SEE NOTE 2	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GAMMA SCAN (GELI) 4						
BI-214	1.00E-01	1.20E-01(2/ 2) 1.01E-01- 1.38E-01	CHICKAMAUGA RES TRM 471-530	1.20E-01(2/ 2) 1.01E-01- 1.38E-01	2 VALUES < LLD	
CS-137	3.00E-02	4.42E-02(1/ 2) 4.42E-02- 4.42E-02	CHICKAMAUGA RES TRM 471-530	4.42E-02(1/ 2) 4.42E-02- 4.42E-02	5.96E-02(2/ 2) 5.39E-02- 6.53E-02	
K-40	4.00E-01	1.37E+01(2/ 2) 1.30E+01- 1.43E+01	CHICKAMAUGA RES TRM 471-530	1.37E+01(2/ 2) 1.30E+01- 1.43E+01	1.48E+01(2/ 2) 1.42E+01- 1.55E+01	

NOTE: 1. NOMINAL LOWER LIMIT OF DETECTION (LLD) AS DESCRIBED IN TABLE E-1 .
NOTE: 2. MEAN AND RANGE BASED UPON DETECTABLE MEASUREMENTS ONLY. FRACTION OF DETECTABLE MEASUREMENTS AT SPECIFIED LOCATIONS IS INDICATED IN PARENTHESES (F).

TENNESSEE VALLEY AUTHORITY
ENVIRONMENTAL RADIOLOGICAL MONITORING AND INSTRUMENTATION
WESTERN AREA RADIOLOGICAL LABORATORY

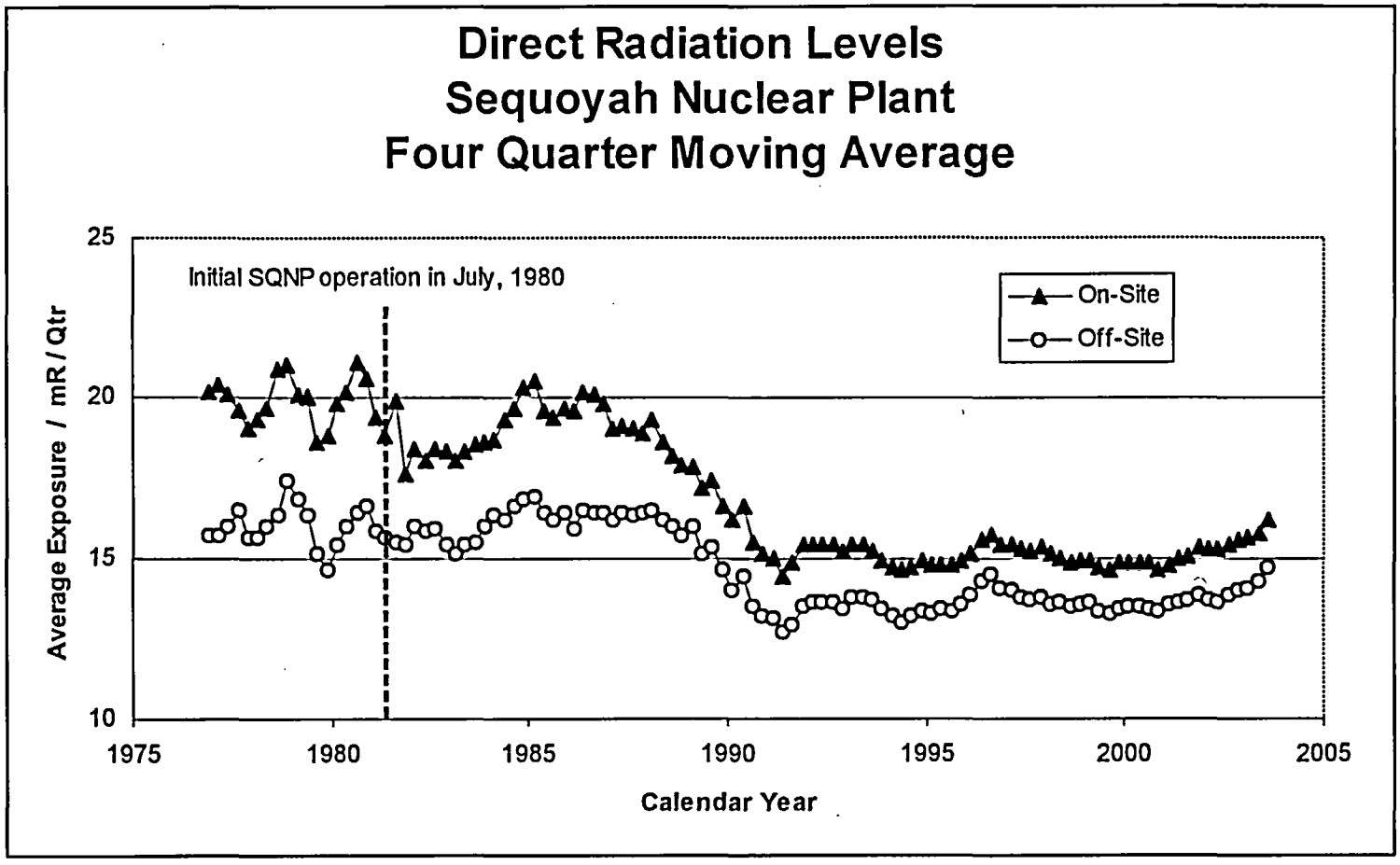
RADIOACTIVITY IN SHORELINE SEDIMENT
PCI/GM - 0.037 BQ/G (DRY WEIGHT)

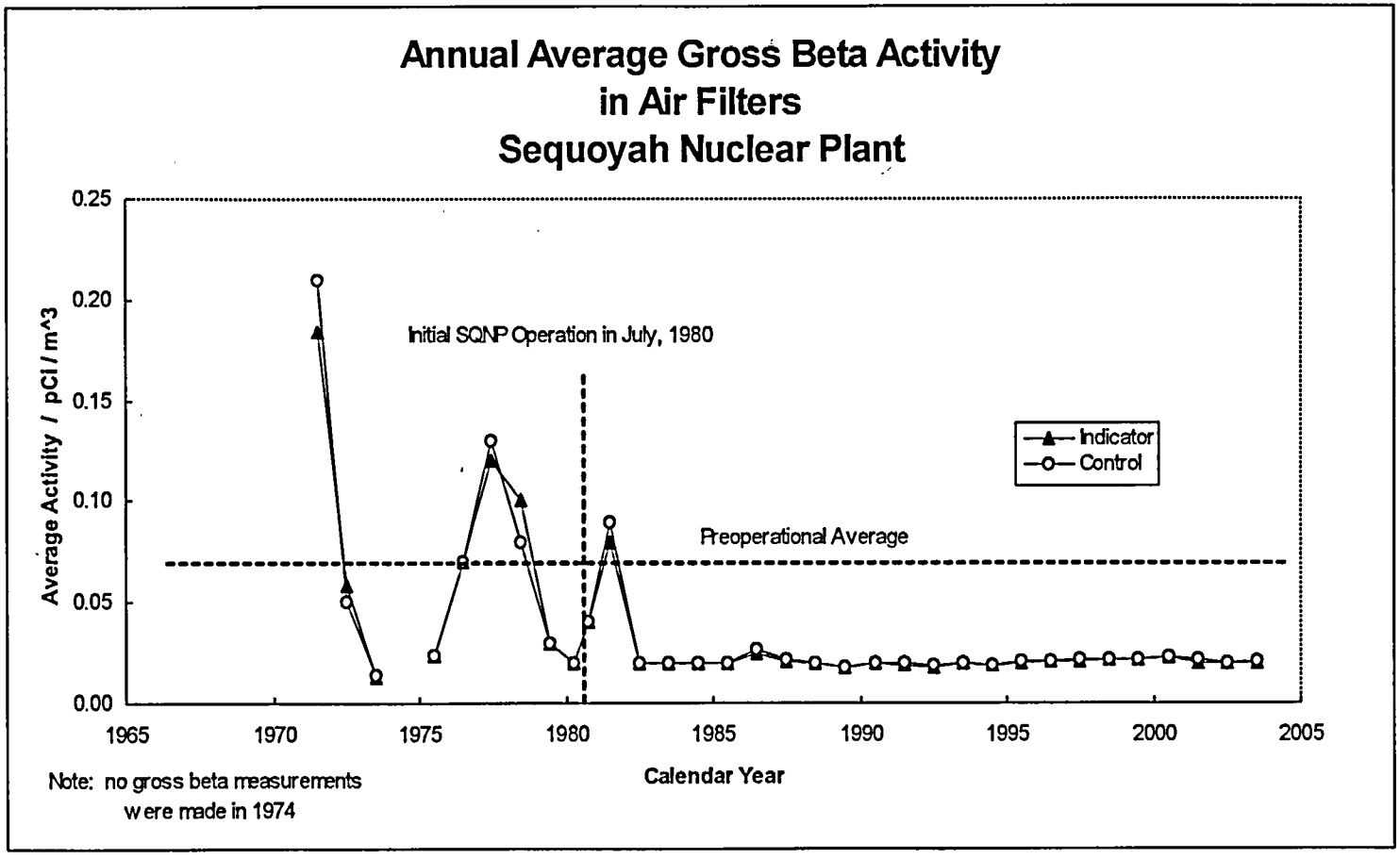
NAME OF FACILITY: SEQUOYAH NUCLEAR PLANT
LOCATION OF FACILITY: HAMILTON TENNESSEE

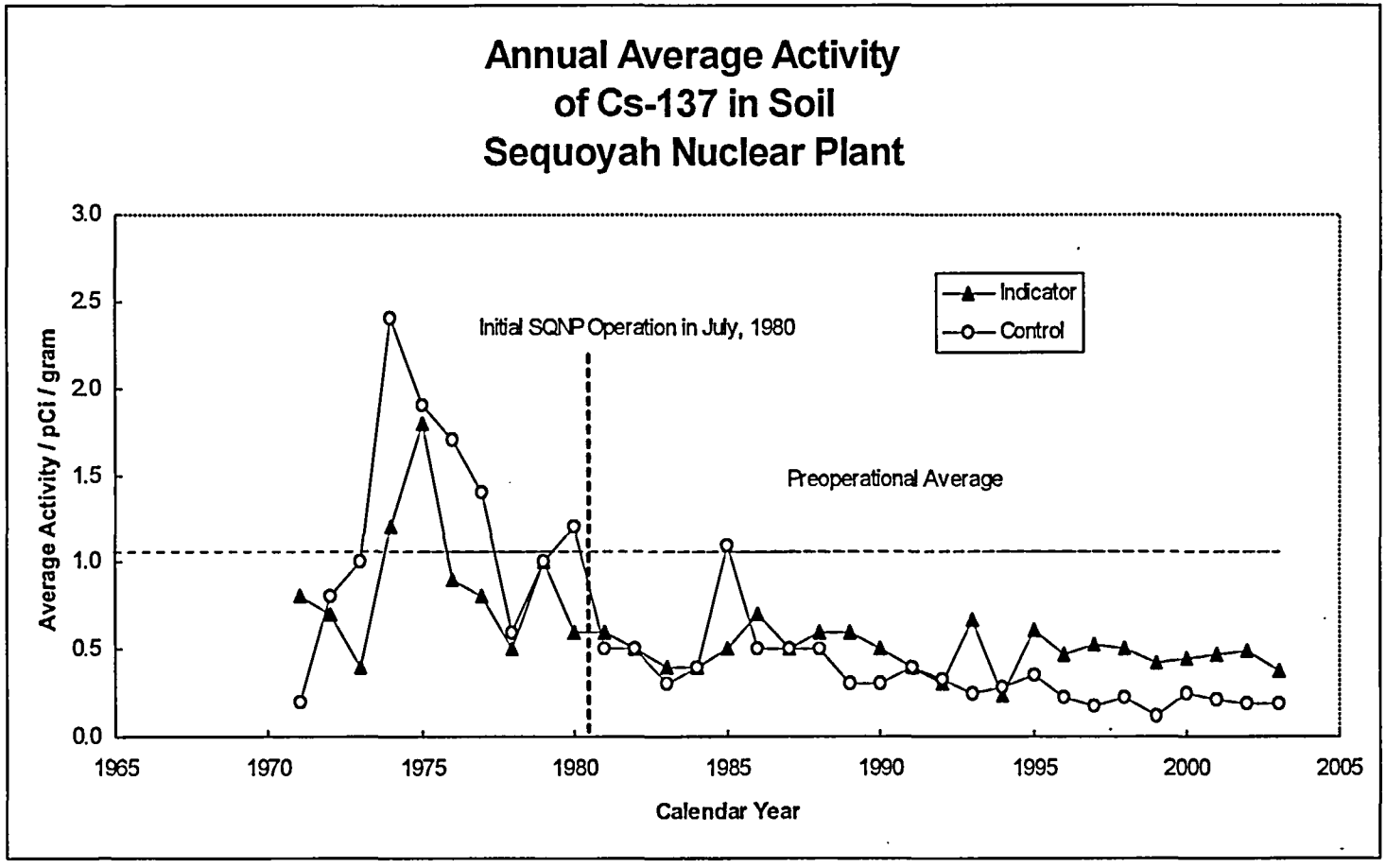
DOCKET NO.: 50-327,328
REPORTING PERIOD: 2003

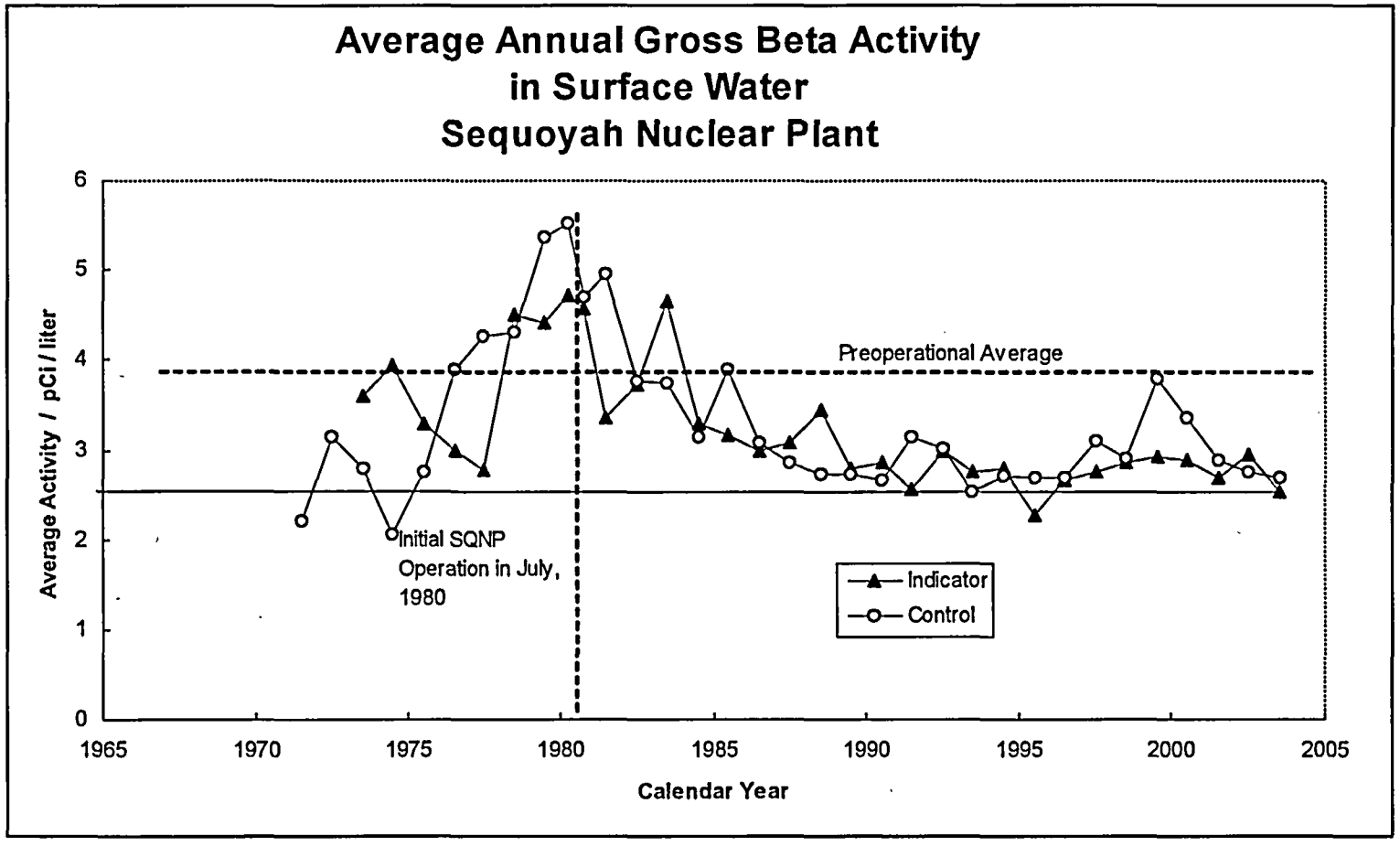
TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION (LLD) SEE NOTE 1	ALL INDICATOR LOCATIONS MEAN (F) RANGE SEE NOTE 2	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F) RANGE SEE NOTE 2	CONTROL LOCATIONS MEAN (F) RANGE SEE NOTE 2	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GAMMA SCAN (GELI) 6						
AC-228	2.50E-01	1.41E+00(4/ 4)	TRM 479.0	1.79E+00(2/ 2)	1.37E+00(2/ 2)	
		9.92E-01- 2.00E+00	TRM 479.0	1.59E+00- 2.00E+00	1.31E+00- 1.44E+00	
BI-212	4.50E-01	1.44E+00(4/ 4)	TRM 479.0	1.81E+00(2/ 2)	1.43E+00(2/ 2)	
		1.06E+00- 1.88E+00	TRM 479.0	1.74E+00- 1.88E+00	1.42E+00- 1.44E+00	
BI-214	1.50E-01	8.31E-01(4/ 4)	TRM 479.0	1.18E+00(2/ 2)	1.01E+00(2/ 2)	
		4.78E-01- 1.27E+00	TRM 479.0	1.09E+00- 1.27E+00	9.99E-01- 1.03E+00	
CS-137	3.00E-02	5.46E-02(1/ 4)	TRM 479.0	5.46E-02(1/ 2)	2 VALUES < LLD	
		5.46E-02- 5.46E-02	TRM 479.0	5.46E-02- 5.46E-02		
K-40	7.50E-01	2.02E+01(4/ 4)	TRM 480.0	3.14E+01(2/ 2)	6.76E+00(2/ 2)	
		6.99E+00- 3.17E+01	TRM 480.0	3.12E+01- 3.17E+01	5.41E+00- 8.11E+00	
PB-212	1.00E-01	1.43E+00(4/ 4)	TRM 479.0	1.78E+00(2/ 2)	1.38E+00(2/ 2)	
		1.07E+00- 1.96E+00	TRM 479.0	1.60E+00- 1.96E+00	1.33E+00- 1.44E+00	
PB-214	1.50E-01	9.36E-01(4/ 4)	TRM 479.0	1.32E+00(2/ 2)	1.14E+00(2/ 2)	
		5.41E-01- 1.40E+00	TRM 479.0	1.24E+00- 1.40E+00	1.13E+00- 1.15E+00	
RA-224	7.50E-01	1.70E+00(3/ 4)	TRM 479.0	1.99E+00(2/ 2)	1.36E+00(2/ 2)	
		1.12E+00- 2.14E+00	TRM 479.0	1.84E+00- 2.14E+00	1.31E+00- 1.42E+00	
RA-226	1.50E-01	8.31E-01(4/ 4)	TRM 479.0	1.18E+00(2/ 2)	1.01E+00(2/ 2)	
		4.78E-01- 1.27E+00	TRM 479.0	1.09E+00- 1.27E+00	9.99E-01- 1.03E+00	
TL-208	6.00E-02	4.42E-01(4/ 4)	TRM 479.0	5.39E-01(2/ 2)	4.41E-01(2/ 2)	
		3.40E-01- 5.85E-01	TRM 479.0	4.93E-01- 5.85E-01	4.40E-01- 4.42E-01	

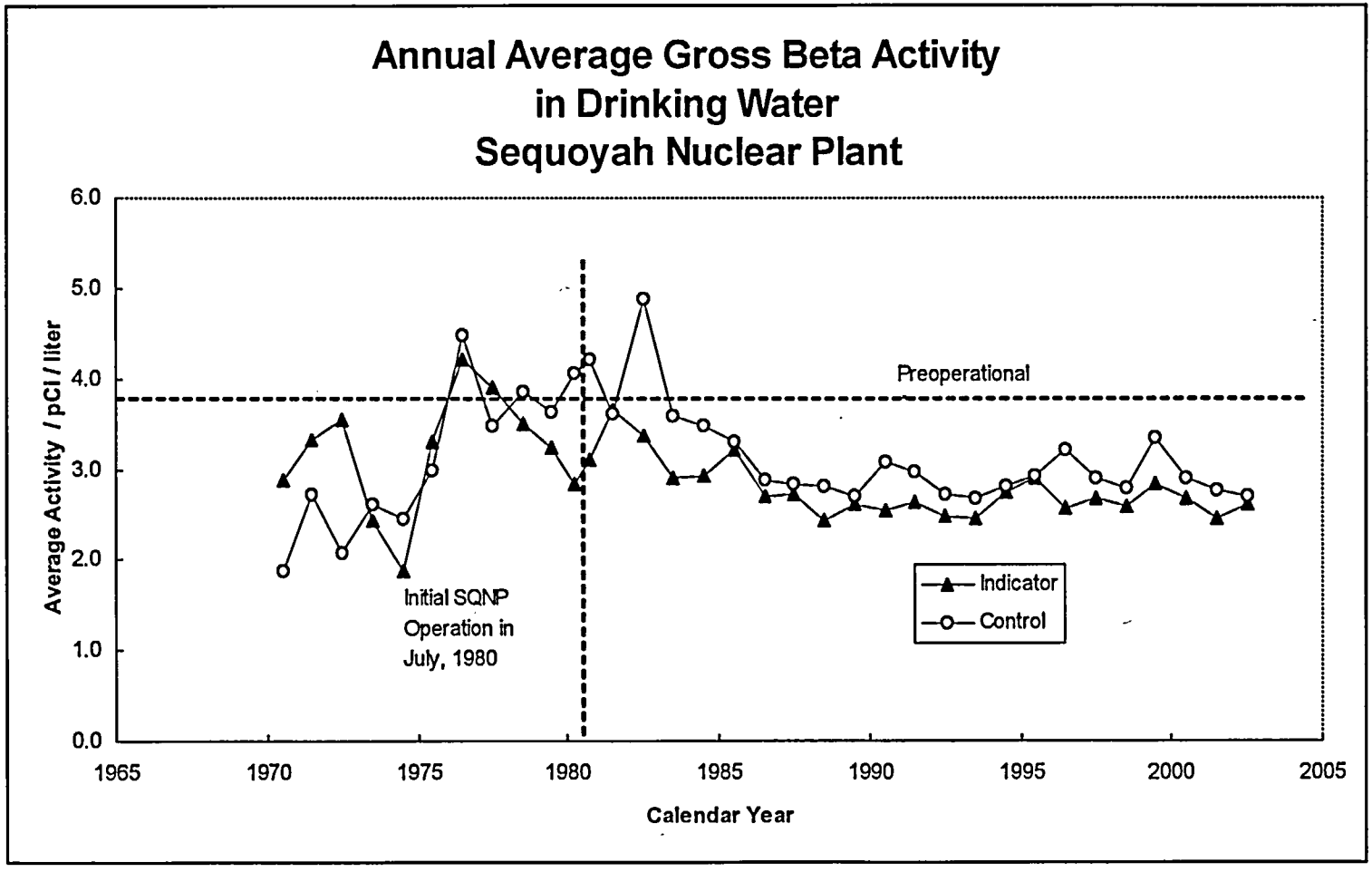
NOTE: 1. NOMINAL LOWER LIMIT OF DETECTION (LLD) AS DESCRIBED IN TABLE E-1 .
NOTE: 2. MEAN AND RANGE BASED UPON DETECTABLE MEASUREMENTS ONLY. FRACTION OF DETECTABLE MEASUREMENTS AT SPECIFIED LOCATIONS IS INDICATED IN PARENTHESES (F).

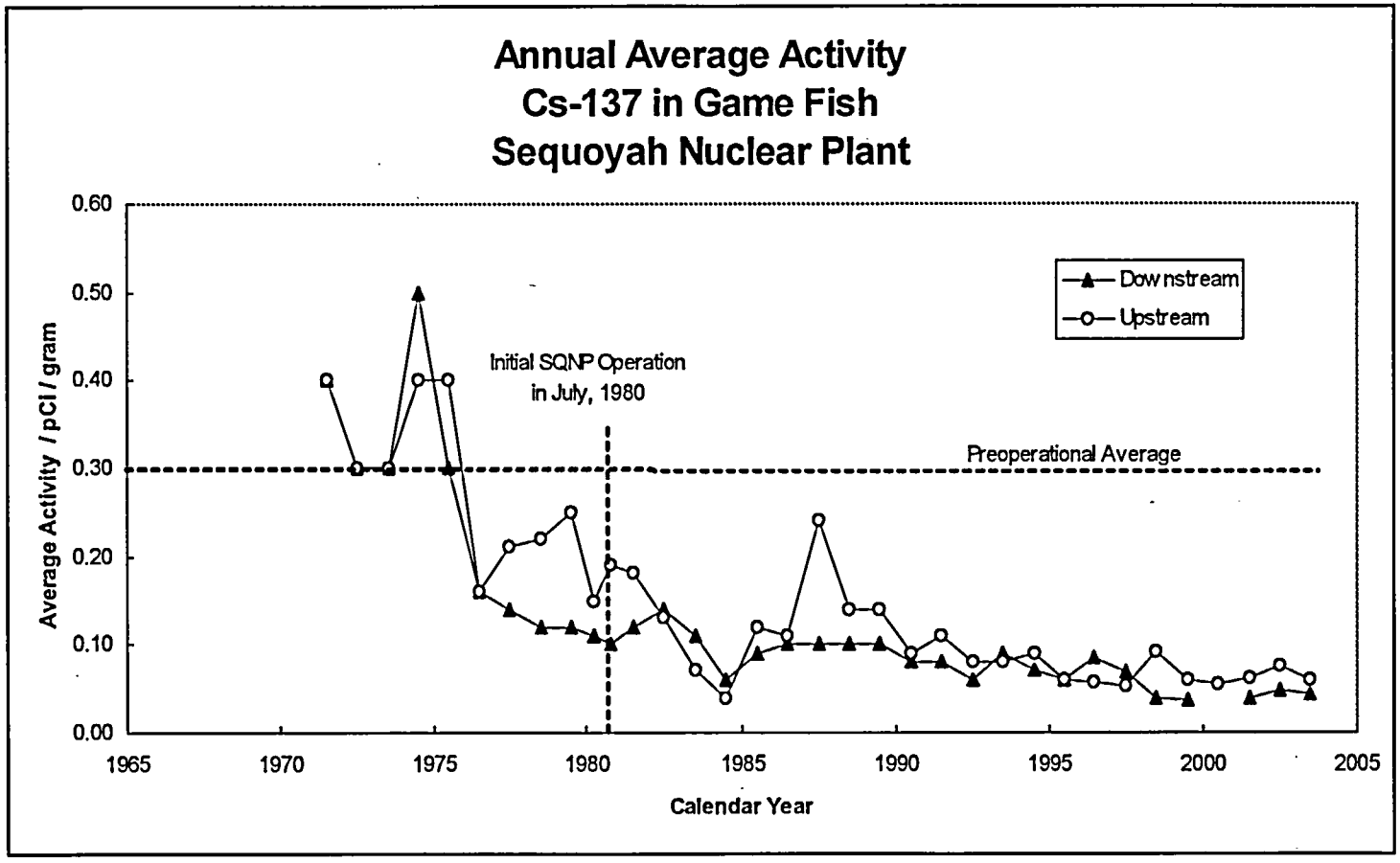

Direct Radiation Levels
Sequoyah Nuclear Plant
Four Quarter Moving Average
Initial SQNP operation in July, 1980
On-Site
Off-Site
Average Exposure / mR / Qtr
25
20
15
10
1975
1980
1985
1990
1995
2000
2005
Calendar Year

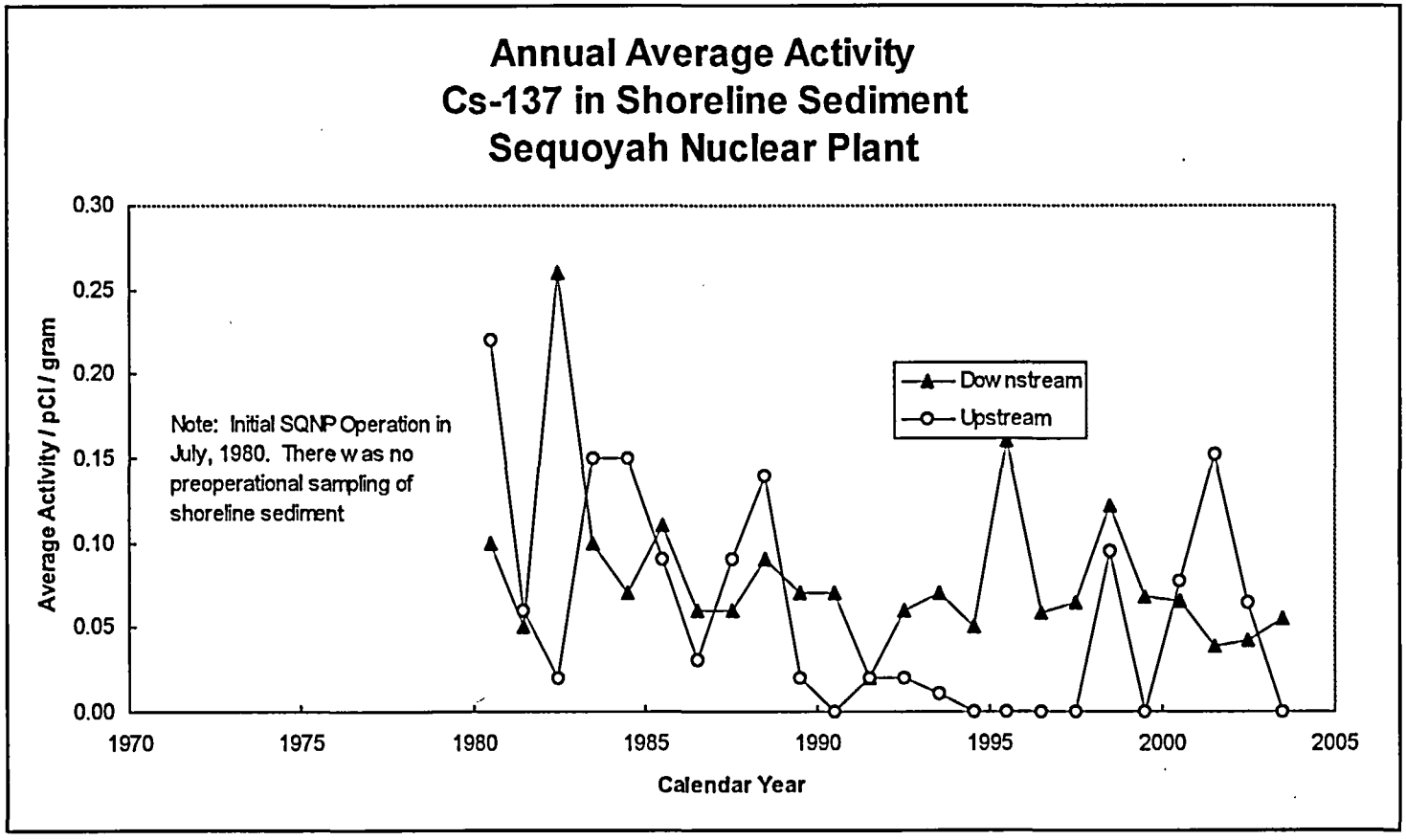

Annual Average Gross Beta Activity
in Air Filters
Sequoyah Nuclear Plant
Average Activity / pCi / m^3
0.25
0.20
0.15
0.10
0.05
0.00
Initial SQNP Operation in July, 1980
Indicator
Control
Preoperational Average
1965
1970
1975
1980
1985
1990
1995
2000
2005
Calendar Year
Note: no gross beta measurements
were made in 1974


Annual Average Activity
of Cs-137 in Soil
Sequoyah Nuclear Plant
Average Activity / pCi / gram
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1965
1970
1975
1980
1985
1990
1995
2000
2005
Calendar Year
Initial SQNP Operation in July, 1980
Preoperational Average
Indicator
Control


Average Annual Gross Beta Activity
in Surface Water
Sequoyah Nuclear Plant
Average Activity / pCi / liter
Calendar Year
Preoperational Average
Initial SQNP
Operation in July,
1980
Indicator
Control
0
1
2
3
4
5
6
1965
1970
1975
1980
1985
1990
1995
2000
2005


Annual Average Gross Beta Activity
in Drinking Water
Sequoyah Nuclear Plant
Average Activity / pCi / liter
6.0
5.0
4.0
3.0
2.0
1.0
0.0
1965
1970
1975
1980
1985
1990
1995
2000
2005
Calendar Year
Preoperational
Initial SQNP
Operation in
July, 1980
Indicator
Control


Annual Average Activity
Cs-137 in Game Fish
Sequoyah Nuclear Plant
Average Activity / pCi / gram
0.60
0.50
0.40
0.30
0.20
0.10
0.00
1965
1970
1975
1980
1985
1990
1995
2000
2005
Calendar Year
Downstream
Upstream
Initial SQNP Operation
in July, 1980
Preoperational Average


Annual Average Activity
Cs-137 in Shoreline Sediment
Sequoyah Nuclear Plant
Average Activity / pCi / gram
0.30
0.25
0.20
0.15
0.10
0.05
0.00
1970
1975
1980
1985
1990
1995
2000
2005
Calendar Year
Note: Initial SQNP Operation in July, 1980. There was no preoperational sampling of shoreline sediment
Downstream
Upstream