COMANCHE PEAK STEAM ELECTRIC STATION

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

1990 ANNUAL REPORT

400 N. Olive Dallas, Texas 75201

T U ELECTRIC

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1990 ANNUAL REPORT

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INTRODUCTION

I. INTRODUCTION

The Radiological Environmental Monitoring Program for the Comanche Peak Steam Electric Station was conducted under contract with T U Electric. This report covers the period from January 1, 1990, through December 31, 1990 and summarizes the results of measurements and analyses of data obtained from samples collected during this interval.

A. Site and Station Description

Comanche Peak Steam Electric Station (CPSES) consists of two PWR units, each designed to operate at a power level of about 1150 megawatts (electrical). The station is located on Squaw Creek Reservoir in Somervell County about 40 miles southwest of Fort Worth, Texas. Unit 1 received a low power operating license February 8, 1990, and achieved initial criticality on April 3, 1990. A full power license for Unit One was issued on April 17, 1990, and commercial operation was declared on August 13, 1990. During 1990, Unit 1 operated for approximately 140 effective full power days. Unit 2 is still under construction with completion estimated in 1993.

B. Objectives and Overview of the CPSES Monitoring Program

United States Nuclear Regulatory Commission (USNRC) regulations require that nuclear power plants be designed, constructed, and operated to keep levels of radioactive material in effluents to unrestricted areas as low as reasonably achievable (ALARA) (10 CFR 50.34). To assure that these criteria are met, each license authorizing reactor operation includes technical specifications (10 CFR 50.36a) governing the release of radioactive effluents.

In-plant monitoring is used to assure that these predetermined release limits are not exceeded. However, as a precaution against unexpected and undefined processes which might allow undue accumulation of radioactivity in any sector of the environment, a program for monitoring the plant environs is also included.

Sampling locations were selected on the basis of local ecology, meterology, physical characteristics of the region, and demographic and land use features of the site vicinity. The radiological environmental monitoring program was designed on the basis of the USNRC Branch Technical Position on radiological environmental monitoring issued by the Radiological Assessment Branch, Revision 1 (November 1979)(1), the CPSES Technical Specifications(4), and the CPSES Offsite Dose Calculation Manual (ODCM)(5).

In 1990, the Radiological Environmental Monitoring Program included the measurement of ambient gamma radiation by thermoluminescent dosimetry; the determination of gamma emitters in sediment and fish; the determination of airborne gross beta, gamma emitters, and iodine-131; the measurement of tritium and gamma emitters in surface water; the measurement of tritium and gamma emitters in groundwater; the measurement of gross beta, tritium, I-131 and gamma emitters in drinking water; the determination of gamma emitters and I-131 in milk; and the measurement of gamma emitters in food products and gamma emitters and I-131 in broadleaf vegetation. Samples were collected by CPSES Environmental Personnel. Sample analyses were performed by Teledyne Isotopes.

The regulations governing the quantities of radioactivity in reactor effluents allow nuclear power plants to contribute, at most, only a few percent increase above normal background radioactivity. Background levels at any one location are not constant but vary with time as they are influenced by external events such as cosmic ray bombardment, weapons test fallout, and seasonal variations. These levels also can vary spatially within relatively short distances reflecting variations in geological composition. To differentiate between background radiation levels and increases resulting from operation of CPSES, the radiological surveys of the plant environs are

divided into preoperational and operational phases. The preoperational phase of the program permits a general characterization of the radiation levels and concentrations prevailing prior to plant operation along with an indication of the degree of natural variation to be expected. The operational phase of the program obtains data which, when considered along with the data obtained in the preoperational phase, assist in the evaluation of the radiological impact of plant operation.

Preoperational measurements were conducted at CPSES from 1981 to 1989. These preoperational measurements were performed to:

1. Evaluate procedures, equipment and techniques.
2. Identify potentially important pathways to be monitored after the plant is in operation.
3. Measure background levels and their variations along potentially important pathways in the area surrounding the plant.
4. Provide baseline data for statistical comparison with future operational analytical results.

The operational Radiological Environmental Monitoring Program is conducted to:

1. Verify that measurable concentrations of radioactive materials and levels of radiation are not higher than expected on the basis of the effluent measurements and modeling of the environmental exposure pathways.
2. Verify the effectiveness of in-plant measures used for controlling the release of radioactive materials.
3. Identify changes in the use of areas at and beyond the site boundary that may impact the principal pathways of exposure.

This report documents the first year of operational measurements and is submitted in accordance with the requirements of the CPSES Offsite Dose Calculation Manual, Part 1, Administrative Control 6.9.1.3. As required, reports of the preoperational Radiological Environmental Monitoring Progam

for the two years prior to initial criticality are included as appendicies to this report. Appendicies F and G contain the 1988 and 1989 reports, respectively.

PROGRAM DESCRIPTIONS

II. PROGRAM DESCRIPTION

A. Sample Locations

Seventy-five (75) locations within a radius of 20 miles from the CPSES site were included in the monitoring program for 1990. The number and location of monitoring points were determined by considering the locations where the highest off-site environmental concentrations have been predicted from plant effluent source terms, site hydrology, and site meterological conditions. Other factors considered were applicable regulations, population distribution, ease of access to sampling stations, availability of samples at desired locations, security and future program integrity. Additionally an annual land use census is conducted to identify changes in the use of areas surrounding the plant. If changes are identified that impact the principal pathways of exposure, appropriate changes to the radiological environmental monitoring program are implemented. The results of the 1990 Land Use Census are provided in Appendix E. Changes to or additions of sampling locations were not required based on the 1990 Land Use Census.

The Radiological Environmental Monitoring Program for Comanche Peak is summarized in Table 1. Figure 1 shows the locations of the various sampling points.

B. Sampling Methods and Procedures

To derive meaningful and useful data from the Radiological Environmental Monitoring Program, sampling methods and procedures are required which will provide samples representative of potential pathways of the area. The methods and procedures used for each pathway monitored are described below.

1. Direct Radiation

Thermoluminescent dosimeters (TLDs) were used to determine the direct (ambient) radiation levels at monitoring points. Sampling locations were chosen according to the criteria given in the USNRC Branch Technical Position

on Radiological Monitoring (Revision 1, November 1979).(1) The area around the station was divided into 16 radial sectors of 22-1/2 degrees each. TLDs were placed in all sectors. TLDs were located in two rings around the station. An inner ring was located at the site boundary and an outer ring was located at a distance of 4 to 6 miles from the station. Eleven additional TLDs were located at points of special interest, including two control locations. For routine TLD measurements, two dosimeters of $CaSO_4$:Dy in teflon cards were deployed at each selected location. One set of dosimeters was exchanged on a quarterly basis and the second set was exchanged on an annual basis. Additional sets of dosimeters were shipped with each exchange cycle to serve as in-transit controls.

Individual dosimeters were calibrated by exposure to an accurately known radiation field from a calibrated Cs-137 source.

2. Air Particulates/Air Iodine

Air particulate and air iodine samples were collected from the 8 locations described in Table 1.

Each air particulate sample was collected by drawing air through a 47-millimeter diameter glass-fiber filter. Air iodine was collected by drawing air through a TEDA impregnated charcoal cartridge which was connected in series behind the filter. The filters and charcoal cartridges were collected weekly by CPSES staff. In the laboratory, air particulate filters were analyzed for gross beta activity and were composited quarterly for gamma spectrometry analysis. Charcoal cartridges were analyzed for iodine-131.

3. Milk

Milk samples were collected by CPSES staff monthly for the period January through April. May through December samples were collected bi-monthly, except for July when three samples were collected. There were two milk sampling locations; one indicator location (SSE-2.2) and one control

location (SW-13.5). Upon arrival at the laboratory, the milk samples were promptly analyzed for gamma emitters and for I-131 by utilizing radiochemistry techniques.

4. Water

The CPSES staff collected water at 11 locations. Surface water was collected at four locations (N-19.3, ESE-1.4, N-1.5 and NE-7.4). Location N-1.5 provider samples representative of Squaw Creek Reservoir surface water at a location beyond significant influence of the plant discharge. Location ESE-1.4 provides samples representative of discharges from Squaw Creek Reservoir downstream to Squaw Creek and to Lake Granbury via the return line. Location NE-7.4 provides samples of Lake Granbury surface water down stream of the discharge from the return line from Squaw Creek Reservoir. A control sample is obtained from the Brazos River, upstream of Lake Granbury, at location N-19.3.

Surface water samples from Squaw Creek Reservoir locations were collected weekly and composited for monthly gamma isotopic analysis. Samples from Lake Granbury locations were collected monthly and analyzed by gamma spectoscopy. All surface water samples were also composited quarterly by location for tritium analysis.

Surface-drinking water was collected at two locations (N-9.9 and NNW-0.1). Samples of Squaw Creek Reservoir water which is used for potable water for the CPSES plant site, were collected at Location NNW-0.1. Location N-9.9 was used to sample surface water from Lake Granbury near the intake of the City of Granbury potable water plant.

Surface-drinking water samples were collected weekly and composited for I-131 analysis every two weeks and gamma isotopic and gross beta analyses monthly.

There are five groundwater locations (SSE-4.6, W-1.2, WSW-0.1, N-1.45

and N-9.8). ODCM Table 3.1, Note (5) states that groundwater supplies in the site area are not affected by plant effluents and are sampled only to provide confirmation that groundwater is not affected by plant discharges.

Groundwater samples were collected quarterly. Gamma isotopic and tritium analyses were performed by location.

5. Fish

Fish samples were collected at two locations for the 1990 program. An area 2.0 miles east-northeast of the site in Squaw Creek Reservoir was chosen as the indicator location, and a location at Lake Granbury (NNE-8) was chosen as a control location. Fish sampling was conducted in April and October for Station NNE-8 and April and September for Station ENE-2.

Fish were collected by CPSES staff. Available edible species were gutted at the time of collection. Samples were then frozen and shipped to the laboratory for analysis. Fish were filleted in the laboratory and the edible portion analyzed by gamma spectrometry.

6. Shoreline Sediment

Shoreline sediment samples were collected in February and August from Squaw Creek Reservoir at location NNE-1.0. Samples were also collected on the same dates from Lake Granbury at the control location N-9.9, and location NE-7.4, which is downstream of the discharge of the return line from Squaw Creek Reservior. CPSES staff collected the sediment samples and shipped them to the laboratory for analysis by gamma spectrometry.

7. Food Products

During the period February through December, eleven samples were collected from three sampling locations. Food products were collected from a control (SW-13.5) and two indicator (E-4.2 and ENE-9.0) stations. A total of seven different types of food products were collected during this sampling period. Food product samples were collected by the CPSES staff and shipped

to the laboratory where they were analyzed for gamma emitters.

8. Broadleaf Vegetation

Broadleaf vegetation was collected from the control location (SW-13.5) and two indicator stations (N-1.45 and SW-1.0 near the site boundary. Collection of broadleaf vegetation started in February 1990, as part of the transition to the operational program required by the ODCM. Broadleaf samples consisted primarily of available tree leaves; if tree leaves were unavailable, native grasses and weeds were substituted.

Gamma isotopic and I-131 analyses were performed for all broadleaf vegetation samples.

C. Interlaboratory Comparison Program

To demonstrate that the results of the environmental analyses are valid, the CPSES Radiological Environmental Monitoring Program requires that independent checks on the precision and accuracy of the measurements of radioactive materials in environmental sample matrices be performed. To fulfill this requirement, Teledyne participates in the environmental sample crosscheck program conducted by the U.S. Environmental Protection Agency (EPA).

The purpose of the interlaboratory comparison program is to provide an independent check on the laboratory's analytical procedures and to alert it to any possible problems. Participant laboratories measure the concentrations of specified radionuclides and report them to the issuing agency. The agency then furnishes the known values to the participant laboratory and specifies the control limits. Results consistently higher or lower than the known values or outside the control limits indicate a need to check the instruments or procedures used.

The results of Teledyne's participation in the U.S. EPA Interlaboratory Comparison Program for 1990 are provided in Appendix A.

SUMMARY AND DISCUSSION OF 1990 ANALYTICAL RESULTS

III. SUMMARY AND DISCUSSION OF 1990 ANALYTICAL RESULTS

Data from the radiological analyses of environmental media collected during the report period are tabulated and discussed below. The procedures and specifications followed in the laboratories for these analyses are as required in the Teledyne Isotopes Quality Assurance manual, IWL-0032-395 and are detailed in Teledyne Isotopes Analytical Procedures manual. A synopsis of analytical procedures is contained in Appendix B of this report.

Radiological analyses of environmental media characteristically approach and frequently fall below the detection limits of state-of-the-art measurement methods as discussed in NCRP Report No. 50[2]. The use of "<" in the data tables symbolizes that the result is less than the lower limit of detection (LLD) as defined in Appendix B. "ND" (Not Detected) is used periodically in the tables presenting gamma analysis results for various media. It primarily appears under the "Others" column, and indicates that no other detectable gamma emitting nuclides were identified. The Teledyne Isotopes analytical methods meet the LLD requirements addressed in the CPSES Offsite Dose Calculation Manual.

Tables 2 through 19 give the radioanalytical results for individual samples. A statistical summary of the results appears in Table 20. The reported averages are based only on concentrations above the limit of detection. In Table 20, the fraction (f) of the total number of analyses with detectable activity follows in parentheses. Also given in parentheses are the minimum and maximum values of detectable activity during the report period.

A. Direct Radiation

Environmental radiation dose rates determined by thermoluminescent dosimeters (TLDs) are given in Table 2. TLD badges with four readout areas each were deployed at each location on quarterly and annual cycles. The mean values of four readings (corrected individually fo. response to a known dose and for in-transit exposure) are reported.

A statistical summary of the 1990 data is included in Table 20. For the quarterly analyses the average dose rate activity of the control locations was 0.13 mR/day with a range of 0.10-0.16 mR/day. The average of the indicator locations for the quarterly samples was 0.13 mR/day with a range of 0.05 to 0.19 mR/day. For the annual samples: The average activity for the control samples was 0.13 mR/day. The indicator locations had an average of 0.12 mR/day with a range of 0.05-0.19 mR/day.

Oakley[3] calculates an ionizing background radiation dose equivalent of 82.2 mR/year for Fort Worth including a terrestrial component of 45.6 mR/year and an ionizing cosmic ray component of 36.6 mR/year (excludes neutron component). Since Oakley's values represent averages covering wide geographical areas, the measured ambient radiation average of 47 mR/yecr for the immediate locale of CPSES is not inconsistent with Oakley's observations. Significant variations occur between geographical areas as a result of geological composition and altitude differences. Temporal variations result from changes in cosmic ray intensity, local human activities, and factors such as ground cover and soil moisture.

Anomalies in the 1990 measured doses relative to preoperational data were not noted. For 1989, the averages for the indicator locations were 0.16 mR/day (range of 0.11 to 0.22) and 0.13 mR/day (range of 0.11 to 0.17), for the quarterly and annual samples respectively. The 1988 averages for the quarterly and annual indicator locations were 0.16 mR/day (range of

0.10 to 0.20) and 0.15 mR/day (range of 0.12 to 0.18), respectively.

B. Air Particulates/Air Iodine

A total of 410 charcoal cartridges were analyzed for airborne iodine-131 by gamma spectrometry. No iodine-131 was detected at any of the sampling stations. Results of these measurements are presented in Table 3.

A total of 408 air particulate filters were collected and analyzed for gross beta activity. For 1990 the average gross beta activity for the control location was 0.023 pCi/m^3 with a range from 0.011 to 0.052 pCi/m^3. For the seven indicator locations the yearly average was 0.022 pCi/m^3 with a range from 0.0077 to 0.062 pCi/m^3. The gross beta analysis data are presented in Table 4. Anomalies in gross beta measurements relative to preoperational data were not noted.

Air filters were composited quarterly and then analyzed by gamma spectrometry. The gamma spectrometry data is presented in Table 5. Cosmogenic beryllium-7 was detected in all 32 samples; potassium-40, a naturally occurring nuclide, was measured in thirteen samples. The average beryllium-7 activity for the control location was 0.074 pCi/m^3 with a range of 0.068 to 0.080 pCi/m^3. For the indicator locations, the average beryllium-7 activity was 0.068 pCi/m^3 with a range of 0.012 to 0.111 pCi/m^3. The average potassium-40 for the control location was 0.014 with a range of 0.012 to 0.015. The average potassium-40 activity for the indicator locations was 0.013 pCi/m^3 with a range of 0.0079 to 0.021 pCi/m^3.

C. Milk

There was a total of 38 milk samples collected in 1990; 19 from the indicator location and 19 from the control location. All samples were analyzed for iodine-131 by radiochemistry and for other gamma-emitting isotopes by gamma spectrometry. Results of these measurements are presented in Table 6.

No iodine-131 was found in any of the milk samples. The lower limits of detection can be found in Table 6.

Results of the gamma spectrometry measurements are presented in Table 7. Naturally occurring potassium-40 was detected in all of the milk samples. The average activity for the control location was 1305 pCi/l with a range of 1100 to 1520 pCi/l. For the indicator location the average activity was 1233 pCi/l with a range of 1090 to 1360 pCi/l. Cesium-137 was not detected in any of the samples.

D. Water

Groundwater samples were collected from five locations during 1990. The samples were analyzed for gamma isotopic and tritium on a quarterly basis, pursuant to the ODCM requirements for groundwater. Twenty samples were analyzed for gamma emitters by gamma spectrometry. The gamma spectrometry analyses showed no detectable activity above the LLD for all samples. Quarterly composites for each sampling location were analyzed for tritium. No tritium was detected. Results of these analyses are contained in Table 8 and 9 respectively.

Surface/drinking water was collected from two stations. All samples were analyzed for gamma emitters; results were below the lower limit of detection. Thirty samples were analyzed for gross beta activity. The indicator station had an average activity of 15 pCi/l with a range of 12 to 18 pCi/l. The control station had an average activity of 11 pCi/l with a range of 5.4 to 17 pCi/l. The quarterly composites for tritium were below the lower limit of detection.

Iodine-131 analyses by radiochemistry were performed on 48 samples of surface/drinking water. There was no measurable activity. Results of these analyses are contained in Tables 10-13.

Surface water was sampled from four locations during 1990. Samples were analyzed for gamma isotopic on a monthly basis and tritium composites on a quarterly basis, per the ODCM requirements for surface water. Fifty-two samples were analyzed by gamma spectrometry. No radioactivity was detected above the lower level of detection. Sixteen composited surface water samples were analyzed for tritium and all were below the lower level of detection. Results are presented in Tables 14 and 15 respectively.

E. Fish

The results of gamma isotopic analyses of fish samples collected during 1990 are presented in Table 16. A total of ten samples were analyzed, seven from the indicator location (ENE-2) and three from the control location (NNE-8). Sampling efforts concentrated on the larger edible species of commercial and/or recreational importance.

Cesium-137 was detected in one of the samples with an average activity of 22 pCi/kg wet. This level of cesium-137 is similar to levels seen in preoperational measurements. In 1989 cesium-137 was detected in one sample at 13 pCi/kg. In 1988 three positive measurements were observed with an average activity of 16.9 pCi/kg (range 9.9 to 25.1).

Naturally occurring potassium-40 was detected in all samples. The average potassium-40 concentration for the seven indicator samples is 1782 pCi/kg wet with a range of 753 to 2990 pCi/kg wet. The average concentration for the control location is 2260 pCi/kg wet with a range of 1110 to 2870 pCi/kg wet.

F. Shoreline Sediments

The processes by which radionuclides and stable elements are concentrated in bottom sediments are complex, involving physiochemical interaction in the environment between the various organic and inorganic materials from the watershed. These interactions can proceed by a myriad of steps in

which the elements are absorbed in or displaced from the surfaces of collodial particles enriched with chelating organic materials. Biological action of bacteria and other benthic organisms also contribute to the concentration of certain elements and in the acceleration of the sedimentation process.

Results of the gamma isotopic analyses of the sediments sampled from the CPSES environment are given in Table 17. For 1990 three locations, one control and two indicators, were sampled semiannually. The average, fraction of detectables, and range of radionuclide concentrations are summarized in Table 20.

Naturally occurring gamma emitters found in detectable concentrations were K-40, Pb-212, Ra-226, Bi-214, Pb-214 and Th-228. Cesium-137 was measured in one sample from the indicator location with an activity of 19.2 pCi/kg. Cesium-137 was measured in 1989 at the same location with an activity of 20.6 pCi/kg.

G. Food Products

Results of gamma isotopic analyses of food samples are contained in Table 18. A total of 11 samples were analyzed from 3 locations. Potassium-40, a naturally occurring isotope, was found in 11 samples. The average potassium-40 activity for the control location was 4160 pCi/kg wet with a range of 1890 to 5610 pCi/kg wet. For the indicator locations the average potassium-40 activity was 1924 pCi/kg wet with a range of 125 to 3440 pCi/kg wet. Naturally occurring beryllium-7 was detected in one sample from control station SW-13.5; the activity was 426 pCi/kg wet. No Cs-134, Cs-137 or I-131 were detected in food products during 1990.

H. Broadleaf Vegetation

Results of gamma isotopic analyses of broadleaf vegetation samples are contained in Table 19. A total of 39 samples were analyzed from 3

locations. Potassium-40, a naturally occurring isotope, was found in 39 samples. The average potassium-40 activity for the control location was 6052 pCi/kg wet with a range of 1210 to 8510 pCi/kg wet. For the indicator locations the average potassium-40 activity was 4843 pCi/kg wet with a range of 8.4 to 11900 pCi/kg wet. Naturally occurring beryllium-7 was detected in twenty-six indicator samples with an average activity of 2910 pCi/kg wet; the range was 387 to 12200 pCi/kg wet. Thirteen samples from control station, SW-13.5 were found to have beryllium-7 with an average activity of 1533 pCi/kg (wet) and a range of 346-4280 pCi/kg (wet). One indicator sample and one control sample were found to contain cesium-137. Cesium-137 was measured at location N-1.45 with an activity of 197 pCi/kg. This sample was collected 2/13/90, prior to initial criticality of Unit 1. Analysis of a sample from the control location collected 12/18/90 showed a Cs-137 activity of 21.9 pCi/kg. Similar activities were observed in preoperational measurements.

Iodine-131 and cesium-134 were below the lower limit of detection in all samples.

CONCLUSIONS

IV. CONCLUSIONS

It is concluded from the levels obtained in environmental samples during 1990 and comparison of these levels to preoperational measurements and operational controls, that the operation of CPSES in 1990 did not result in an increase in measureable levels of radiation or radioactive materials in the environment. The atmospheric environment was sampled for airborne particulate matter, radioiodine, and direct radiation. The terrestrial environment was sampled for milk, groundwater, surface-drinking water, food products and broadleaf vegetation. The aquatic environment was sampled for surface water, fish and shoreline sediment. The analyses of these samples provided results which were either below the measurement detection limits or were indicative of natural terrestrial and cosmic ray radiation levels.

REFERENCES

V. REFERENCES

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2. National Council on Radiation Protection and Measurements, "Environmental Radiation Measurements", NCRP Report No. 50, Washington, D. C., December 27, 1976.

3. Oakley, D. C., "Natural Radiation Exposure in the United States", ORP/SID 72-1 Office of Radiation Programs, U. S. Environmental Protection Agency, Washington, D. C., June 1972.

4. Comanche Peak Steam Electric Station Technical Specifications, Unit 1.

5. Comanche Peak Steam Electric Station Offsite Dose Calculation Manual.

DATA TABLES

TABLE 1

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CPSES RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM - 1990

Media	Number of Locations	Identification by Sector and Distance (Miles)	Sampling Frequency (a)	Analyses	Analytical Frequency (a)
Gamma Exposure	43	N-1.45; N-4.4; N-6.5; N-9.4; NNE-1.1; NNE-5.65; NE-1.7; NE-4.8; ENE-2.5; ENE-5.0; E-0.5; E-1.9; E-3.5; E-4.2; ESE-1.4; ESE-4.7; SE-1.3; SE-3.85; SE-4.6; SSE-1.3; SSE-4.4; SSE-4.5; S-1.5; S-4.2; SSW-1.1; SSW-4.4; SW-0.9; SW-4.8; SW-12.3; WSW-1.0; WSW-5.35; WSW-7.0; W-1; W-2; W-5.5; WNW-1; WNW-5.0; WNW-6.7; NW-1; NW-5.7; NW-9.9; NNW-1.35; NNW-4.6	Q,A	Thermoluminescent Dosimetry	Q,A
Air Particulate, Air Iodine	8	N-9.4 E-3.5; SSE-4.5 SW-12.3; NW-1.0; N-1.45, SW/WSW-0.95 S/SSW-1.2	W	Gross Beta Gamma Spectrometry Filter Gamma Spectrometry Charcoal Cartridge	W QC W
Surface Water	4	N-19.3; ESE-1.4; N-1.5 NE-7.4.	M (b)	Gamma Spectrometry H-3	M QC
Groundwater	5	SSE-4.6 W-1.2; WSW-0.1 W-9.8; N-1.45.	Q	Gamma Spectrometry H-3	Q Q
Water-Surface Drinking	2	NNW-0.1; N-9.9	SM (c)	Gross Beta Gamma Spectrometry I-131 H-3	M M SM QC

TABLE 1

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CPSES RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM - 1990

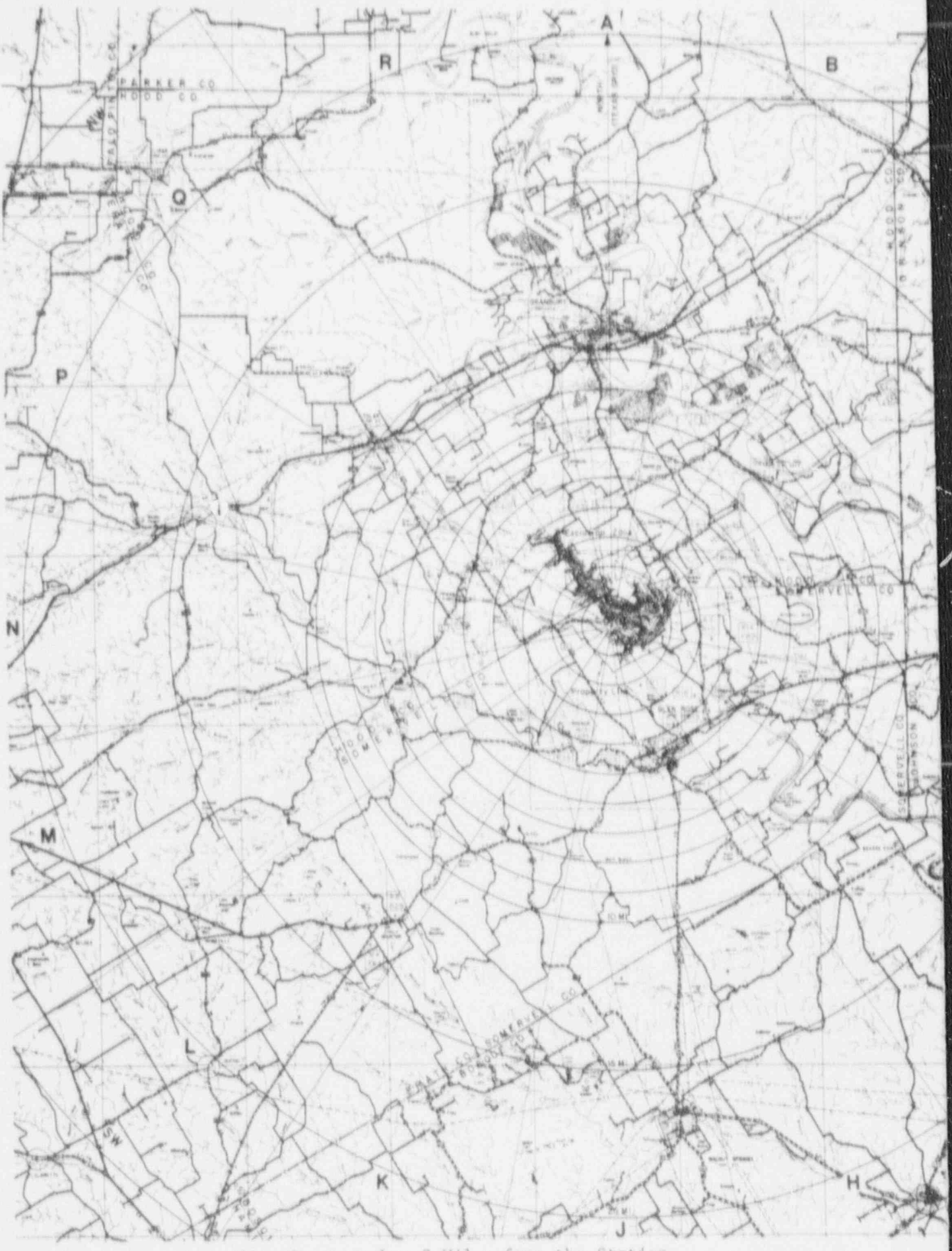
Media	Number of Locations	Identification by Sector and Distance (Miles)	Sampling Frequency (a)	Analyses	Analytical Frequency (a)
Sediment	3	N-9.9; NNE-1, NE-7.4	SA	Gamma Spectrometry	SA
Fish	2	NNE-8; ENE-2	SA	Gamma Spectrometry	SA
Milk	2	SW-13.5; SSE-2.2	SM, (d)	I-131	SM, (d)
				Gamma Spectrometry	SM, (d)
Food Products	3	E-4.2; SW-13.5; ENE-9.0,	MH	Gamma Spectrometry	MH
				I-131	MH
Broadleaf Vegetation	3	E 1.45; SW-1.0; SW-13.5	M	Gamma Spectrometry	M
				I-131	M

(a) Frequency Codes Are W = Weekly
M = Monthly
Q = Quarterly
QC = Quarterly Composite
SM = Semimonthly (i.e., once per 2 week period)
MH = Monthly during availability for harvest
SA = Semiannual
A = Annual

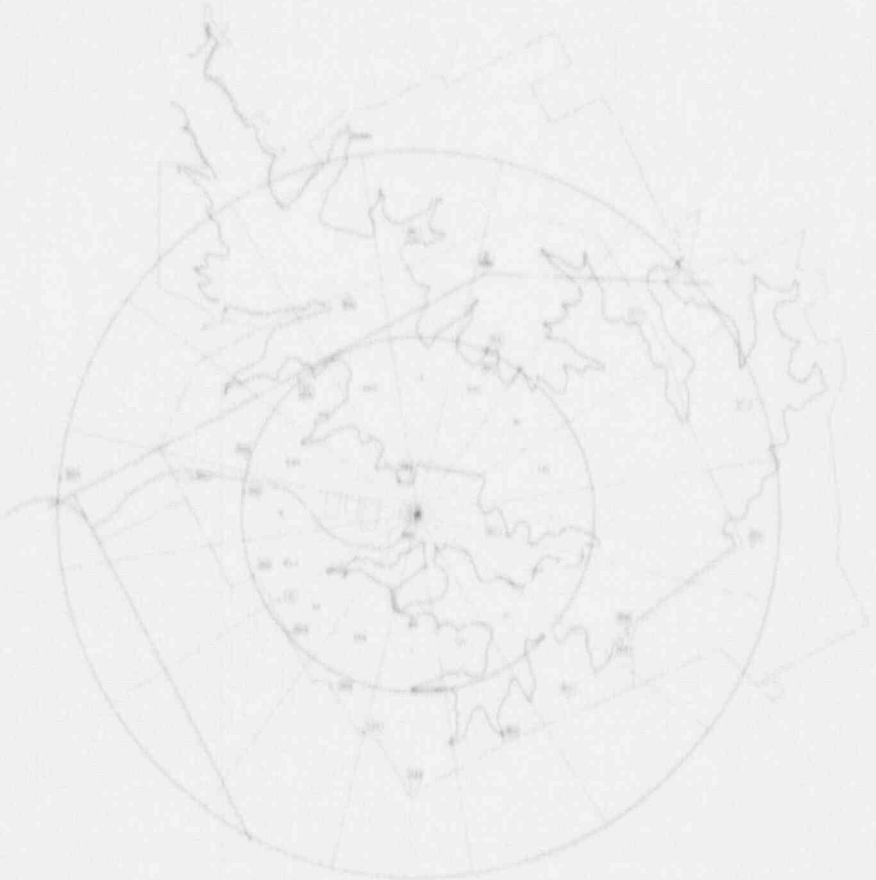
(b) Surface water samples from Squaw Creek Reservoir are monthly composites of weekly grab samples. Samples from Lake Granbury are monthly composites of weekly grab samples when Lake Granbury is receiving letdown from Squaw Creek Reservoir; otherwise they are monthly grab samples.

(c) Drinking water samples are composite of weekly grab samples over a 2 week period when I-131 analysis is performed; otherwise they are monthly composites of weekly grab samples.

(d) Milk sample collection and analysis frequency is semimonthly when animals are on pasture. Otherwise, samples are collected and analyzed monthly.



Locations Greater than 2 Miles from the Station



Locations Within 2 Miles of the Station

FIGURE 1

RADIOLOGICAL ENVIRONMENTAL

MONITORING LOCATIONS

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Figure 1

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KEY OF ENVIRONMENTAL SAMPLING LOCATIONS

Sampling Point	Location (Sector-Miles)	Sample Type*	Sampling Point	Location (Sector-Miles)	Sample Type*
A1	N-1.45	A	R28	SW-4.8	R
A2	N-9.4	A	R29	SW-12.3	R
A3	E-3.5	A	R30	WSW-1.0	R
A4	SSE-4.5	A	R31	WSW-5.35	R
A5	S/SSW-1.2	A	R32	WSW-7.0	R
A6	SW-12.3	A	R33	W-1.0	R
A7	SW/WSW-0.95	A	R34	W-2.0	R
A8	NW-1.0	A	R35	W-5.5	R
			R36	WNW-1.0	R
			R37	WNW-5.0	R
			R38	WNW-6.7	R
			R39	NW-1.0	R
			R40	NW-5.7	R
R1	N-1.45	R	R41	NW-9.9	R
R2	N-4.4	R	R42	NNW-1.35	R
R3	N-6.5	R	R43	NNW-4.6	R
R4	N-9.4	R	SW1	N-1.5	SW
R5	NNE-1.1	R	SW2	N-9.9	SW/DW
R6	NNE-5.65	R	SW3	N-19.3	SW
R7	NE-1.7	R	SW4	NE-7.4	SW
R8	NE-4.8	R	SW5	ESE-1.4	SW
R9	ENE-2.5	R	SW6	NNW-0.1	SW/DW
R10	ENE-5.0	R	GW1	W-1.2	GW/DW
R11	E-0.5	R	GW2	WSW-0.1	GW/DW
R12	E-1.9	R	GW3	SSE-4.6	GW/DW
R13	E-3.5	R	GW4	N-9.8	GW/DW
R14	E-4.2	R	GW5	N-1.45	GW/DW
R15	ESE-1.4	R	SS1	NNE-1.0	SS
R16	ESE-4.7	R	SS2	N-9.9	SS
R17	SE-1.3	R	SS3	NE-7.4	SS
R18	SE-3.85	R	M1	SSE-2.2	M
R19	SE-4.6	R	M4	SW-13.5	M
R20	SSE-1.3	R	F1	ENE-2.0	F
R21	SSE-4.4	R	F2	NNE-8.0	F
R22	SSE-4.5	R	FP1	ENE-9.0	FP
R23	S-1.5	R	FP2	E-4.2	FP
R24	S-4.2	R	FP3	SW-13.5	FP
R25	SSW-1.1	R	BL1	N-1.45	BL
R26	SSW-4.4	R	BL2	SW-1.0	BL
R27	SW-0.9	R	BL3	SW-13.5	BL

*Types:

A - Air Sample
R - Direct Radiation
SW - Surface Water
DW - Drinking Water
GW - Groundwater
SS - Shore Line Sediment
M - Milk
F - Fish
FP - Food Product
BL - Broadleaf Vegetation

TABLE 2

(PAGE 1 OF 2)

T U ELECTRIC

COMANCHE PEAK STEAM ELECTRIC STATION

Direct Radiation - Thermoluminescent Dosimetry

Results in mR/day ± 2 s. d.

Station	FIRST QUARTER 01/04-04/03/90	SECOND QUARTER 04/03/90-07/03/90	THIRD QUARTER 07/03-10/05/90	FOURTH QUARTER 10/05/90-01/09/91	AVERAGE ± 2 S.D.	ANNUAL 01/04/90-01/09/91
N-1.45	0.13±0.005	0.10±0.02	0.14±0.002	0.08±0.04	0.09±0.05	0.10±0.02
N-4.4	0.16±0.01	0.10±0.008	0.17±0.01	0.10±0.03	0.13±0.04	0.10±0.03
N-6.5	0.12±0.04	0.09±0.008	0.15±0.007	0.10±0.004	0.11±0.02	0.11±0.02
N-9.4	0.14±0.009	0.10±0.008	0.14±0.008	0.09±0.004	0.12±0.02	0.11±0.01
NNE-1.1	0.12±0.04	0.09±0.02	0.16±0.01	0.10±0.02	0.12±0.03	0.11±0.003
NNE-5.65	0.14±0.03	0.11±0.02	0.17±0.01	0.13±0.03	0.13±0.02	0.12±0.01
NE-1.7	0.13±0.02	0.09±0.03	0.14±0.02	0.10±0.02	0.11±0.02	0.11±0.01
NE-4.8	0.15±0.003	0.10±0.005	0.16±0.007	0.12±0.009	0.13±0.03	0.11±0.03
ENE-2.5	0.17±0.02	0.11±0.05	0.17±0.02	0.13±0.008	0.14±0.03	0.11±0.01
ENE-5	0.18±0.02	0.14±0.02	0.19±0.009	0.12±0.05	0.15±0.03	0.14±0.01
E-0.5	0.15±0.008	0.10±0.009	0.15±0.004	0.10±0.21	0.12±0.03	0.10±0.01
E-1.9	0.15±0.02	0.09±0.004	0.14±0.008	0.11±0.01	0.12±0.03	0.10±0.002
E-3.5	0.19±0.007	0.16±0.02	0.18±0.02	0.12±0.03	0.15±0.03	0.12±0.02
E-4.2	0.18±0.009	0.10±0.05	0.17±0.02	0.14±0.01	0.12±0.07	0.10±0.001
ESE-1.4	0.15±0.02	0.09±0.01	0.15±0.005	0.07±0.004	0.11±0.04	0.10±0.02
ESE-4.7	0.17±0.01	0.11±0.02	0.15±0.01	0.12±0.03	0.13±0.03	0.12±0.01
SE-1.3	0.16±0.004	0.10±0.02	0.16±0.04	*		*
SE-3.85	0.15±0.02	0.09±0.03	0.15±0.01	0.11±0.02	0.12±0.03	0.11±0.01
SE-4.6	0.15±0.01	0.11±0.01	0.15±0.02	0.10±0.02	0.12±0.03	0.09±0.01
SSE-1.3	0.14±0.01	0.09±0.002	0.14±0.007	0.10±0.003	0.11±0.03	0.08±0.02
SSE-4.5	0.16±0.004	0.09±0.002	0.15±0.007	0.11±0.01	0.12±0.03	0.10±0.02
SSE-4.4	0.15±0.008	0.11±0.02	0.16±0.008	0.10±0.02	0.13±0.03	0.11±0.01

TABLE 2

(PAGE 2 OF 2)

T U ELECTRIC

COMANCHE PEAK STEAM ELECTRIC STATION

Direct Radiation - Thermoluminescent Dosimetry

Results in mR/day ± 2 s. d.

Station	FIRST QUARTER 01/04-04/03/90	SECOND QUARTER 04/03/90-07/03/90	THIRD QUARTER 07/03-10/05/90	FOURTH QUARTER 10/05/90-01/09/91	AVERAGE ± 2 S.D.	ANNUAL 01/04/90-01/09/91
S-1.5	0.14±0.007	*	0.14±0.01	0.09±0.02	0.12±0.03	0.09±0.004**
S-4.2	0.15±0.02	0.09±0.008	0.15±0.004	0.10±0.02	0.12±0.03	0.11±0.01
SSW-1.1	0.15±0.01	0.09±0.04	0.17±0.004	0.10±0.02	0.12±0.03	0.11±0.01
SSW-4.4	0.16±0.03	0.10±0.05	0.14±0.02	0.10±0.01	0.12±0.03	0.12±0.004
SW-0.9	0.16±0.008	0.10±0.02	0.15±0.003	0.09±0.02	0.12±0.03	0.10±0.003
SW-4.8	0.12±0.03	0.09±0.007	0.15±0.01	0.09±0.02	0.11±0.03	0.10±0.004
SW-12.3	0.14±0.04	0.11±0.009	0.16±0.01	0.10±0.03	0.12±0.03	0.11±0.01
WSW-1	0.14±0.05	0.10±0.01	0.15±0.02	0.11±0.01	0.12±0.02	0.12±0.01
WSW-5.35	0.16±0.01	0.10±0.01	0.15±0.008	0.09±0.01	0.12±0.03	0.11±0.03
WSW-7	0.16±0.02	0.11±0.01	0.16±0.03	0.11±0.01	0.13±0.03	0.12±0.01
W-1	0.14±0.005	0.09±0.009	0.13±0.01	0.09±0.02	0.11±0.02	0.09±0.03
W-2	0.14±0.007	0.08±0.01	0.14±0.03	0.08±0.01	0.11±0.03	0.10±0.01
W-5.5	0.15±0.03	0.09±0.03	0.14±0.01	0.09±0.002	0.11±0.03	0.10±0.01
WNW-1	0.17±0.005	0.11±0.03	0.16±0.01	0.10±0.02	0.13±0.03	0.11±0.01
WNW-3	0.15±0.005	0.08±0.02	0.15±0.01	0.08±0.05	0.12±0.04	0.12±0.01
WNW-6.7	0.15±0.01	0.05±0.02	0.14±0.007	0.09±0.02	0.11±0.04	0.10±0.01
NW-1	0.15±0.01	0.08±0.009	0.15±0.003	0.08±0.03	0.11±0.04	0.11±0.01
NW-5.7	0.15±0.004	0.08±0.07	0.15±0.01	0.11±0.02	0.11±0.03	0.11±0.01
NW-9.9	0.14±0.004	0.08±0.007	0.14±0.03	0.07±0.02	0.10±0.04	0.06±0.03
NNW-1.35	0.13±0.003	0.05±0.01	0.15±0.007	0.10±0.02	0.11±0.04	0.10±0.003
NNW-4.6	0.17±0.007	0.12±0.02	0.16±0.01	0.12±0.02	0.14±0.02	0.14±0.02

*TLD not collected; see Appendix C for explanation.

**NOTE: The annual TLD S-1.5 was in the field 07/03/90-01/09/91

TABLE 3
(PAGE 1 OF 3)
T U ELECTRI
COMANCHE PEAK STEAM EL[illegible]ATION
CONCENTRATIONS OF I-131 IN [illegible]D AIR
Results in Units of $pCi/m^3 \pm 2$ s.d.

STATION COLLECTION DATE	NW-1.0	SW/WSW-0.95	S/SSW-1.2	SW-12.3	SSE-4.5	E-3.5	N-1.45	N-9.4
JANUARY								
01/02-01/09/90	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
01/09-01/16/90	<0.04	<0.04	<0.04	<0.04	<0.03	<0.[illegible]	<0.03	<0.03
01/16-01/23/90	<0.03	<0.03	<0.03	<0.03	<0.03	<0.0[illegible]	<0.03	<0.03
01/23-01/30/90	<0.03	<0.03	<0.03	<0.03	<0.02	<0.[illegible]	<0.02	<0.02
FEBRUARY								
01/30-02/06/90	<0.03	<0.03	<0.03	<0.03	<0.04	<0.04	<0.04	<0.04
02/06-02/13/90	<0.03	<0.03	<0.03	<0.03	<0.04	<0.04	<0.04	<0.04
02/13-02/20/90	<0.04	*	<0.04	<0.04	<0.02	<0.02	<0.02	<0.02
02/20-02/27/90	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
MARCH								
02/27-03/06/90	<0.06	<0.06	<0.06	<0.06	<0.04	<0.04	<0.04	<0.04
03/06-03/13/90	<0.05	<0.05	<0.05	<0.05	<0.03	<0.03	<0.03	<0.03
03/13-03/20/90	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
03/20-03/27/90	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
03/27-04/03/90	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
APRIL								
04/03-04/10/90	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
04/10-04/17/90	<0.02	<0.02	<0.02	<0.02	<0.03	<0.03	<0.03	<0.03
04/17-04/24/90	<0.02	<0.03	<0.03	<0.03	<0.02	<0.02	<0.02	<0.02
04/24-05/02/90	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03

*Sample not collected; see Appendix C for explanation.

TABLE 3
(PAGE 2 OF 3)
T U ELECTRIC
COMANCHE PEAK STEAM ELECTRIC STATION
CONCENTRATIONS OF I-131 IN FILTERED AIR
Results in Units of $pCi/m^3 \pm 2$ s.d.

STATION COLLECTION DATE	NW-1.0	SW/WSW-0.95	S/SSW-1.2	SW-12.3	SSE-4.5	E-3.1	N-1.45	N-9.4
MAY								
05/02-05/08/90	<0.04	<0.04	<0.05	<0.05	<0.04	<0.04	<0.04	<0.04
05/08-05/15/90	<0.08	<0.04	<0.04	<0.04	<0.03	<0.03	<0.03	<0.03
05/15-05/22/90	<0.03	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
05/22-05/29/90	<0.02	<0.02	<0.02	<0.02	<0.03	<0.03	<0.03	<0.03
JUNE								
05/29-06/05/90	<0.04	<0.03	<0.03	<0.04	<0.03	<0.03	<0.03	<0.03
06/05-06/12/90	<0.03	<0.03	<0.03	<0.03	<0.02	<0.02	<0.02	<0.02
06/12-06/19/90	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
06/19-06/26/90	<0.07	<0.05	<0.05	<0.06	<0.03	<0.03	<0.03	<0.03
06/26-07/03/90	<0.03	<0.02	<0.02	<0.02	<0.04	<0.04	<0.04	<0.04
JULY								
07/03-07/10/90	<0.04	<0.04	<0.04	<0.04	<0.03	<0.04	<0.04	<0.03
07/10-07/17/90	<0.02	<0.02	<0.02	<0.02	<0.02	<0.03	<0.03	<0.03
07/17-07/24/90	<0.02	<0.02	<0.02	<0.02	<0.04	<0.04	<0.04	<0.04
07/24-07/31/90	<0.02	<0.01	<0.01	<0.02	<0.02	<0.02	<0.02	<0.01
AUGUST								
07/31-08/07/90	<0.03	<0.02	<0.02	<0.02	<0.03	<0.03	<0.03	<0.03
08/07-08/14/90	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
08/14-08/21/90	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
08/21-08/28/90	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
08/28-09/04/90	<0.02	.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02

TABLE 3
(PAGE 3 OF 3)
T U ELECTRIC
COMANCHE PEAK STEAM ELECTRIC STATION
CONCENTRATIONS OF I-131 IN FILTERED AIR
Results in Units of $pCi/m^3 \pm 2$ s.d.

STATION / COLLECTION DATE	NW-1.0	SW/WSW-0.95	S/SSW-1.2	SW-12.3	SSE-4.5	E-3.5	N-1.45	N-9.4
SEPTEMBER								
09/04-09/11/90	<0.04	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
09/11-09/18/90	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
09/18-09/25/90	<0.05	<0.05	<0.05	<0.06	<0.04	<0.04	<0.03	<0.04
09/25-10/03/90	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
OCTOBER								
10/03-10/09/90	<0.02	<0.02	<0.02	<0.02	<0.04	<0.04	<0.04	<0.04
10/09-10/16/90	<0.06	<0.06	<0.06	<0.06	<0.05	<0.05	<0.05	<0.05
10/16-10/23/90	<0.03	<0.02	<0.02	<0.03	<0.02	<0.03	<0.03	<0.03
10/23-10/30/90	<0.01	<0.01	<0.01	<0.01	<0.01	*	*	<0.03
NOVEMBER								
10/30-11/06/90	<0.03	<0.03	<0.03	<0.03	<0.02	<0.02	<0.03	<0.02
11/06-11/13/90	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02
11/13-11/19/90	<0.03	<0.03	*	<0.03	<0.02	<0.02	<0.02	<0.02
11/19-11/27/90	<0.03	<0.03	*	<0.03	<0.03	<0.03	<0.03	*
DECEMBER								
11/27-12/04/90	<0.04	<0.04	<0.04	<0.04	<0.03	<0.04	<0.04	<0.04
12/04-12/11/90	<0.05	<0.04	<0.04	<0.04	<0.03	<0.03	<0.02	<0.03
12/11-12/18/90	<0.03	<0.03	<0.03	<0.02	<0.02	<0.02	<0.02	<0.02
12/18-12/26/90	<0.04	<0.04	<0.04	<0.04	<0.02	<0.02	<0.02	<0.02
12/26-01/02/91	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04

*Sample not collected; see Appendix C for explanation.

TABLE 4

(PAGE 1 OF 3)

T U ELECTRIC

COMANCHE PEAK STEAM ELECTRIC STATION

CONCENTRATIONS OF BETA EMITTERS IN AIR PARTICULATES

Results in Units of 10^{-3} pCi/m^3 ± 2 s.d.

STATION / COLLECTION DATE	NW-1.0	SW/WSW-0.95	S/SSW-1.2	SW-12.3	SSE-4.5	E-3.5	N-1.45	N-9.4
JANUARY								
01/02-01/09/90	33±4	33±4	31±4	36±4	33±4	36±4	30±4	35±4
01/09-01/16/90	17±3	19±3	15±3	17±3	7.7±2.8	15±3	13±3	17±3
01/16-01/23/90	15±3	18±3	17±3	19±3	17±3	18±3	15±3	19±3
01/23-01/30/90	16±3	16±3	15±3	17±3	18±3	18±3	16±3	15±3
FEBRUARY								
01/30-02/06/90	19±3	21±3	19±3	21±3	20±3	18±3	17±3	20±3
02/06-02/13/90	26±4	24±3	24±3	27±4	24±3	25±3	27±4	27±4
02/13-02/20/90	*	*	26±3	26±3	24±3	27±3	23±3	29±4
02/20-02/27/90	12±3	10±3	16±3	15±3	11±3	16±3	14±3	15±3
MARCH								
02/27-03/06/90	20±3	21±3	18±3	20±3	17±3	18±3	16±3	21±3
03/06-03/13/90	12±3	13±3	9.9±2.9	11±3	14±3	11±3	12±3	13±3
03/13-03/20/90	19±3	14±3	17±3	19±3	15±3	19±4	17±3	18±3
03/20-03/27/90	13±3	14±4	13±3	15±4	12±3	11±3	13±3	14±4
03/27-04/03/90	8.8±3.1	12±3	9.7±3.1	12±3	9.8±3.1	14±3	12±3	12±3
APRIL								
04/03-04/10/90	18±3	16±3	16±3	16±3	18±3	20±3	15±3	20±3
04/10-04/17/90	14±3	16±3	17±3	17±3	16±3	14±3	12±3	21±3
04/17-04/24/90	19±3	19±3	19±3	19±3	18±3	16±3	17±3	22±3
04/24-05/02/90	17±3	15±3	14±3	13±3	15±3	15±3	15±3	14±3

*Sample not collected; see Appendix C for explanations.

TABLE 4
(PAGE 2 OF 3)
T U ELECTRIC
COMANCHE PEAK STEAM ELECTRIC STATION
CONCENTRATIONS OF BETA EMITTERS IN AIR PARTICULATES
Results in Units of 10^{-3} pCi/m^3 ± 2 s.d.

STATION / COLLECTION DATE	NW-1.0	SW/WSW-[illegible]	S/SSW-1.2	SW-12.3	SSE-4.5	E-3.5	N-1.45	N-9.4
MAY								
05/02-05/08/90	16±3	16±4	16±4	17±4	16±4	15±4	16±4	12±3
05/08-05/15/90	14±6	16±3	18±3	16±3	19±3	15±3	15±3	15±3
05/15-05/22/90	14±4	14±3	17±3	18±3	11±3	18±3	13±3	14±3
05/22-05/29/90	16±3	12±3	12±3	13±3	13±3	16±3	12±3	13±3
JUNE								
05/29-06/05/90	11±3	9.4±2.8	17±3	16±3	14±3	15±3	15±3	10±3
06/05-06/12/90	16±2	22±3	21±3	20±3	23±3	20±3	21±3	20±3
06/12-06/19/90	15±3	14±3	16±4	15±3	14±3	13±3	15±3	12±3
06/19-06/26/90	16±4	17±3	14±3	17±3	15±3	19±3	17±3	18±3
06/26-07/03/90	18±3	22±3	15±3	17±3	17±3	21±3	13±3	17±3
JULY								
07/03-07/10/90	27±3	27±3	27±3	31±4	27±3	30±4	28±4	28±3
07/10-07/17/90	15±3	18±3	15±3	17±3	33±4	14±3	16±3	13±3
07/17-07/24/90	13±3	14±3	14±3	17±3	15±3	17±3	16±3	16±3
07/24-07/31/90	25±4	30±4	27±4	27±4	23±4	35±4	21±3	31±4
AUGUST								
07/31-08/07/90	23±6	18±3	15±3	16±3	15±3	18±3	14±3	18±3
08/07-08/14/90	25±4	30±4	19±3	30±4	26±4	30±4	31±4	25±4
08/14-08/21/90	15±3	17±4	15±3	19±4	13±3	15±3	14±3	14±3
08/21-08/28/90	27±3	29±3	23±3	29±3	23±3	29±3	31±4	23±3
08/28-09/04/90	21±3	24±4	21±3	26±4	17±3	24±4	39±4	28±4

TABLE 4

(PAGE 3 OF 3)

T U ELECTRIC

COMANCHE PEAK STEAM ELECTRIC STATION

CONCENTRATIONS OF BETA EMITTERS IN AIR PARTICULATES

Results in Units of 10^{-3} pCi/m^3 ± 2 s.d.

STATION COLLECTION DATE	NW-1.0	SW/WSW-0.95	S/SSW-1.2	SW-12.3	SSE-4.5	E-3.5	N-1.45	N-9.4
SEPTEMBER								
09/04-09/11/90	30±5	22±3	17±3	25±3	21±3	22±3	23±3	22±3
09/11-09/18/90	8.1±2.8	10±3	11±3	11±3	14±3	12±3	10±3	16±3
09/18-09/25/90	19±3	20±3	18±3	21±3	19±3	22±3	18±3	21±3
09/25-10/03/90	24±3	36±4	28±4	38±4	36±4	38±4	33±4	34±4
OCTOBER								
10/03-10/09/90	15±4	17±4	12±3	17±4	17±4	17±4	18±4	17±4
10/09-10/16/90	27±4	36±4	30±4	33±4	35±4	36±4	30±4	36±4
10/16-10/23/90	24±3	29±3	24±3	37±4	30±4	28±3	28±3	29±3
10/23-10/30/90	36±4	45±4	31±4	41±4	46±4	*	*	47±4
NOVEMBER								
10/30-11/06/90	29±4	29±4	25±3	32±4	32±4	26±3	28±4	30±4
11/06-11/13/90	26±4	30±4	24±4	32±4	29±4	22±4	22±4	27±4
11/13-11/19/90	36±4	40±4	*	42±4	47±4	38±4	36±4	36±4
11/19-11/27/90	16±3	20±3	*	21±3	24±3	19±3	20±3	*
DECEMBER								
11/27-12/04/90	27±4	*	29±4	33±4	41±4	30±4	27±4	34±4
12/04-12/11/90	28±4	27±4	18±3	23±4	25±4	23±4	26±4	26±4
12/11-12/18/90	43±5	57±5	39±4	52±5	55±5	54±5	48±5	62±5
12/18-12/26/90	29±3	45±4	28±3	44±4	47±4	43±4	38±4	45±4
12/26-01/02/91	28±4	37±4	23±4	36±4	39±4	36±4	31±4	40±4

*Sample not collected; see Appendix C for explanation.

TABLE 5

(PAGE 1 OF 2)

T U ELECTRIC

COMANCHE PEAK STEAM ELECTRIC STATION

CONCENTRATIONS OF GAMMA EMITTERS* IN AIR PARTICULATE FILTERS

Results in Units of E-03 $pCi/m^3 \pm 2$ s.d.

LOCATION	COMPOSITE PERIOD	Be-7	K-40	RU-103	Cs-134	CS-137
FIRST QUARTER						
NW-1.0	01/02/90-04/03/90	65.6±6.6	<10	<0.5	<0.4	<0.4
SW/WSW-0.95	01/02/90-04/03/90	67.9±8.3	11.6±5.9	<0.8	<0.5	<0.5
S/SSW-1.2	01/02/90-04/03/90	69.5±7.7	<20	<0.9	<0.6	<0.6
SW-12.3	01/02/90-04/03/90	78.7±7.9	11.9±5.6	<0.6	<0.4	<0.4
SSE-4.5	01/02/90-04/03/90	56.4±5.9	<8	<0.6	<0.3	<0.4
E-3.5	01/02/90-04/03/90	68.8±6.9	<8	<0.5	<0.4	<0.4
N-1.45	01/02/90-04/03/90	89.3±10	14.1±8.0	<0.8	<0.6	<0.5
N-9.4	01/02/90-04/03/90	63.5±10.1	<30	<1	<0.8	<0.8
SECOND QUARTER						
NW-1.0	04/03/90-07/03/90	64.9±6.5	10.2±3.2	<0.4	<0.3	<0.4
SW/WSW-0.95	04/03/90-07/03/90	108±11	20±3.5	<0.3	<0.3	<0.3
S/SSW-1.2	04/03/90-07/03/90	63.0±7.4	14.5±5.1	<0.6	<0.5	<0.6
SW-12.3	04/03/90-07/03/90	69.6±7.0	<20	<0.5	<0.5	<0.5
SSE-4.5	04/03/90-07/03/90	67.8±7.1	<10	<0.6	<0.4	<0.4
E-3.5	04/03/90-07/03/90	16.9±5.2	<9	<0.7	<0.6	<0.6
N-1.45	04/03/90-07/03/90	12.4±4.9	<10	<0.7	<0.5	<0.5
N-9.4	04/03/90-07/03/90	72.7±7.3	14.5±4.7	<0.6	<0.4	<0.4

*All other gamma emitters were <L.L.D.

TABLE 5

(PAGE 2 OF 2)

T U ELECTRIC

COMANCHE PEAK STEAM ELECTRIC STATION

CONCENTRATIONS OF GAMMA EMITTERS* IN AIR PARTICULATE FILTERS

Results in Units of E-03 pCi/m^3 ± 2 s.d.

LOCATION	COMPOSITE PERIOD	Be-7	K-40	Cs-134	Cs-137	Ru-103
THIRD QUARTER						
NW-1.0	07/03/90-10/03/90	59.7±6.7	11.1±4.5	<0.4	<0.5	<0.6
SW/WSW-0.95	07/03/90-10/03/90	68.6±6.9	8.28±3.89	<0.4	<0.5	<0.6
S/SSW-1.2	07/03/90-10/03/90	57.5±5.9	<10	<0.5	<0.5	<0.6
SW-12.3	07/03/90-10/03/90	68.3±6.8	<10	<0.4	<0.5	<0.6
SSE-4.5	07/03/90-10/03/90	63.7±6.4	<8	<0.3	<0.3	<0.4
E-3.5	07/03/90-10/03/90	83.7±8.4	<20	<0.6	<0.6	<0.8
N-1.45	07/03/90-10/03/90	64.5±6.4	7.95±4.25	<0.4	<0.4	<0.5
N-9.4	07/03/90-10/03/90	60.5±7.2	<10	<0.4	<0.4	<0.6
FOURTH QUARTER						
NW-1.0	10/03/90-01/02/91	67.3±7.1	9.66±3.83	<0.4	<0.4	<0.5
SW/WSW-0.95	10/03/90-01/02/91	87.6±8.8	21.1±6.8	<0.7	<0.7	<0.9
S/SSW-1.2	10/03/90-01/02/91	66.6±6.7	7.88±4.29	<0.5	<0.5	<0.6
SW-12.3	10/03/90-01/02/91	80.3±8.0	15.1±6.4	<0.4	<0.4	<0.5
SSE-4.5	10/03/90-01/02/91	75.7±7.6	<10	<0.4	<0.4	<0.6
E-3.5	10/03/90-01/02/91	74.3±7.4	13.2±4.9	<0.5	<0.5	<0.5
N-1.45	10/03/90-01/02/91	78.4±7.8	<10	<0.4	<0.6	<0.7
N-9.4	10/03/90-01/02/91	111±11	<30	<0.8	<0.9	<1

TABLE 6

T U ELECTRIC

COMANCHE PEAK STEAM ELECTRIC STATION

CONCENTRATIONS OF I-131 IN MILK

Results in pCi/l ± 2 s.d.

MONTH	COLLECTION DATE	SW-13.5	SSE-2.2
JANUARY	01/16/90	<0.2	<0.3
FEBRUARY	02/13/90	<0.2	<0.2
MARCH	03/13/90	<1	<0.4
APRIL	04/10/90	<0.3	<0.2
MAY	05/08/90	<0.2	<0.3
	05/22/90	<0.2	<0.3
JUNE	06/05/90	<0.2	<0.2
	06/19/90	<0.2	<0.2
JULY	07/05/90	<0.1	<0.1
	07/10/90	<0.3	<0.3
	07/31/90	<0.2	<0.3
AUGUST	08/14/90	<0.3	<0.3
	08/28/90	<0.3	<0.3
SEPTEMBER	09/11/90	<0.2	<0.2
	09/25/90	<0.2	<0.2
OCTOBER	10/09/90	<0.2	<0.2
	10/23/90	<0.2	<0.3
NOVEMBER	11/19/90	<0.2	<0.2
DECEMBER	12/18/90	<0.2	<0.3

TABLE 7
(PAGE 1 OF 2)
T U ELECTRIC
COMANCHE PEAK STEAM ELECTRIC STATION
CONCENTRATIONS OF GAMMA EMITTERS* IN MILK
Results in Units of pCi/liter ± 2 s.d.

LOCATION	COLLECTION DATE	K-40	Cs-134	Cs-137	La-140/Ba-140
STATION SW-13.5					
JANUARY	01/16/90	1520±150	<4	<4	<6
FEBRUARY	02/13/90	1370±140	<4	<4	<6
MARCH	03/13/90	1170±120	<4	<4	<9
APRIL	04/10/90	1230±120	<4	<4	<7
MAY	05/08/90	1190±120	<5	<5	<10
	05/22/90	1300±130	<4	<4	<5
JUNE	06/05/90	1280±130	<4	<4	<8
	06/19/90	1250±130	<4	<4	<5
JULY	07/05/90	1260±130	<4	<4	<6
	07/10/90	1400±140	<3	<4	<5
	07/31/90	1270±130	<4	<4	<6
AUGUST	08/14/90	1280±130	<4	<4	<7
	08/28/90	1270±130	<4	<4	<8
SEPTEMBER	09/11/90	1460±150	<4	<4	<8
	09/25/90	1300±130	<4	<5	<7
OCTOBER	10/09/90	1310±130	<4	<5	<8
	10/23/90	1100±110	<4	<4	<8
NOVEMBER	11/19/90	1360±140	<4	<4	<7
DECEMBER	12/18/90	1480±150	<4	<4	<5
Average ± 2 s.d.					

*All other gamma emitters were <LLD.

TABLE 7
(PAGE 2 OF 2)
T U ELECTRIC
COMANCHE PEAK STEAM ELECTRIC STATION
CONCENTRATIONS OF GAMMA EMITTERS* IN MILK
Results in Units of pCi/liter ± 2 s.d.

LOCATION	COLLECTION DATE	K-40	Cs-134	Cs-137	La-140/Ba-140
STATION SSE-2.2					
JANUARY	01/16/90	1230±120	<4	<4	<6
FEBRUARY	02/13/90	1190±120	<4	<4	<6
MARCH	03/13/90	1220±120	<4	<4	<8
APRIL	04/10/90	1090±110	<4	<4	<6
MAY	05/08/90	1140±110	<4	<4	<7
	05/22/90	1170±120	<4	<4	<5
JUNE	06/05/90	1360±140	<4	<4	<9
	06/19/90	1160±120	<4	<4	<6
JULY	07/05/90	1200±120	<3	<4	<4
	07/10/90	1360±140	<4	<4	<6
	07/31/90	1330±130	<4	<4	<6
AUGUST	08/14/90	1310±130	<4	<4	<9
	08/28/90	1180±120	<4	<4	<8
SEPTEMBER	09/11/90	1130±110	<4	<4	<8
	09/25/90	1300±130	<4	<5	<6
OCTOBER	10/09/90	1300±130	<4	<4	<7
	10/23/90	1250±130	<4	<5	<7
NOVEMBER	11/19/90	1270±130	<4	<4	<7
DECEMBER	12/18/90	1240±120	<3	<4	<6
Average ± 2 s.d.					

*All other gamma emitters are <LLD.

TABLE 8

(PAGE 1 OF 1)

T U ELECTRIC

COMANCHE PEAK STEAM ELECTRIC STATION

CONCENTRATIONS OF GAMMA EMITTERS* IN GROUNDWATER

Results in Units of pCi/l ± 2 s.d.

COLLECTION DATE	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb/Zr-95	Cs-134	Cs-137	Ba/La-140
STATION N-1.45									
01/09/90	<3	<3	<6	<3	<6	<3	<3	<3	<7
04/10/90	<3	<3	<6	<3	<6	<3	<3	<3	<6
07/10/90	<2	<3	<6	<3	<6	<3	<3	<3	<7
10/09/90	<3	<3	<7	<3	<6	<3	<3	<3	<7
STATION W-1.2									
01/09/90	<3	<3	<6	<3	<6	<3	<3	<3	<6
04/10/90	<4	<4	<10	<4	<9	<4	<4	<4	<10
07/10/90	<2	<3	<6	<3	<6	<3	<2	<2	<7
10/09/90	<3	<3	<6	<3	<6	<3	<3	<3	<9
STATION WSW-0.1									
01/09/90	<3	<3	<7	<3	<6	<3	<4	<3	<6
04/10/90	<3	<3	<7	<4	<7	<3	<3	<4	<8
07/10/90	<3	<3	<6	<3	<6	<3	<3	<3	<7
10/09/90	<3	<3	<6	<3	<6	<3	<3	<3	<6
STATION SSE-4.6									
01/09/90	<4	<4	<9	<4	<10	<4	<4	<4	<8
04/10/90	<5	<5	<10	<5	<10	<5	<5	<5	<9
07/10/90	<3	<3	<7	<3	<6	<3	<3	<3	<8
10/09/90	<3	<3	<6	<3	<7	<3	<3	<3	<7
STATION N-9.8									
01/09/90	<3	<3	<6	<3	<6	<3	<3	<3	<5
04/10/90	<3	<3	<6	<3	<5	<3	<3	<4	<6
07/10/90	<3	<3	<7	<3	<6	<3	<3	<3	<7
10/09/90	<3	<3	<7	<3	<6	<3	<3	<3	<8

*All other gamma emitters were LLD.

TABLE 9

T U ELECTRIC

COMANCHE PEAK STEAM ELECTRIC STATION

CONCENTRATIONS OF TRITIUM IN GROUNDWATER

Results in pCi/l ± 2 s.d.

QUARTER	COLLECTION PERIOD	LOCATION	TRITIUM ACTIVITY
1	01/09/90	SSE-4.6	<2000
	01/09/90	N-9.8	<2000
	01/09/90	W-1.2	<2000
	01/09/90	WSW-0.1	<2000
	01/09/90	N-1.45	<2000
2	04/10/90	SSE-4.6	<2000
	04/10/90	N-9.8	<2000
	04/10/90	W-1.2	<2000
	04/10/90	WSW-0.1	<2000
	04/10/90	N-1.45	<2000
3	07/10/90	SSE-4.6	<2000
	07/10/90	N-9.8	<2000
	07/10/90	W-1.2	<2000
	07/10/90	WSW-0.1	<2000
	07/10/90	N-1.45	<2000
4	10/09/90	SSE-4.6	<900
	10/09/90	N-9.8	<900
	10/09/90	W-1.2	<900
	10/09/90	WSW-0.1	<900
	10/09/90	N-1.45	<900

TABLE 10

T U ELECTRIC

COMANCHE PEAK STEAM ELECTRIC STATION

GROSS BETA CONCENTRATIONS IN WATER-SURFACE/DRINKING

Results in pCi/l ± 2 s.d.

MONTH	COLLECTION DATE*	NNW-0.1	N-9.9
JANUARY	12/26/89-01/16/90	17±3	17±4
FEBRUARY	01/23/90-02/13/90	15±3	12±3
MARCH	02/20/90-03/13/90	16±3	14±3
	03/20/90-04/10/90	18±3	17±3
APRIL	04/17/90-05/08/90	15±3	13±3
MAY	05/15/90-05/22/90	14±3	9.7±2.3
	05/15/90-06/05/90	13±3	11±2
JUNE	06/12/90-07/05/90	13±3	9.6±2.2
JULY	07/10/90-07/31/90	16±3	6.9±2.0
AUGUST	08/07/90-08/28/90	13±3	7.5±2.0
SEPTEMBER	09/04/90-09/25/90	12±3	5.4±1.9
OCTOBER	10/03/90-10/23/90	14±3	10±3
NOVEMBER	10/30/90-11/19/90	16±3	13±3
DECEMBER	11/27/90-12/18/90	13±3	10±3
	12/26/90-01/02/91	16±3	13±3

* Samples are composites of weekly grab samples collected over a 4 week period, except for the periods 5/15/90-5/22/90 and 12/26/90-1/2/91 which were composited over a 2 week period. These two samples collected over two week periods were inadvertently analyzed for gross beta and are in addition to the required monthly composite samples.

TABLE 11

(PAGE 1 OF 2)

T U ELECTRIC

COMANCHE PEAK STEAM ELECTRIC STATION

CONCENTRATIONS OF GAMMA EMITTERS* IN WATER SURFACE/DRINKING

Results in Units of pCi/l ± 2 s.d.

COLLECTION DATE**	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb/Zr-95	Cs-134	Cs-137	Ba/La-140
STATION NNW-0.1									
12/26/89-01/16/90	<3	<3	<7	<3	<7	<3	<4	<4	<6
01/23/90-02/13/90	<3	<3	<7	<4	<7	<4	<3	<4	<7
02/20/90-03/13/90	<3	<3	<7	<4	<7	<4	<4	<4	<7
03/20/90-04/10/90	<3	<3	<7	<3	<7	<3	<3	3	<7
04/17/90-05/08/90	<4	<4	<8	<4	<8	<4	<4	<4	<9
05/15/90-05/22/90	<3	<3	<7	<4	<7	<4	<4	<4	<5
05/15/90-06/05/90	<3	<3	<7	<3	<6	<3	<3	<3	<9
06/12/90-07/05/90	<2	<3	<7	<2	<5	<3	<2	<2	<10
07/10/90-07/31/90	<3	<3	<8	<4	<7	<4	<4	<4	<7
08/07/90-08/28/90	<3	<3	<8	<4	<6	<4	<3	<3	<9
09/04/90-09/25/90	<3	<3	<6	<3	<6	<3	<3	<3	<7
10/03/90-10/23/90	<1	<2	<7	<1	<2	<2	<1	<0.9	<90***
10/30/90-11/19/90	<5	<5	<10	<5	<10	<5	<5	<5	<8
11/27/90-12/18/90	<3	<3	<6	<4	<7	<4	<3	<4	<8
12/26/90-01/02/91	<4	<4	<9	<4	<9	<5	<4	<5	<8

Average± 2 s.d.

* All other gamma emitters were LLD.

** Samples are composites of weekly grab samples collected over a 4 week period, except for the periods 5/15/90-5/22/90 and 12/26/90-1/2/91 which were composited over a 2 week period. These samples were analyzed for gamma emitters in addition to the required monthly composite samples.

*** Required LLD not achieved; see Appendix C for explanation.

TABLE 11
(PAGE 2 OF 2)
T U ELECTRIC
COMANCHE PEAK STEAM ELECTRIC STATION
CONCENTRATIONS OF GAMMA EMITTERS* IN WATER SURFACE/DRINKING
Results in Units of pCi/l ± 2 s.d.

COLLECTION DATE**	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb/Zr-95	Cs-134	Cs-137	Ba/La-140
STATION N-9.9									
12/26/89-01/16/90	<3	<3	<8	<4	<7	<4	<4	<4	<6
01/23/90-02/13/90	<3	<3	<6	<4	<6	<3	<3	<3	<6
02/20/90-03/13/90	<3	<3	<8	<4	<7	<4	<3	<4	<8
03/20/90-04/10/90	<4	<4	<9	<4	<9	<4	<4	<4	<10
04/17/90-05/08/90	<3	<3	<7	<3	<6	<4	<3	<4	<8
05/15/90-05/22/90	<4	<4	<10	<4	<10	<4	<5	<5	<7
05/15/90-06/05/90	<3	<3	<7	<3	<6	<4	<3	<3	<9
06/12/90-07/05/90	<2	<3	<7	<2	<5	<3	<2	<2	<10
07/10/90-07/31/90	<4	<4	<9	<4	<10	<5	<5	<5	<6
08/07/90-08/28/90	<3	<3	<9	<4	<7	<4	<3	<3	<10
09/04/90-09/25/90	<3	<3	<7	<3	<6	<3	<3	<3	<7
10/03/90-10/23/90	<0.9	<2	<6	<1	<2	<2	<1	<0.8	<90***
10/30/90-11/19/90	<3	<3	<7	<4	<7	<3	<3	<4	<7
11/27/90-12/18/90	<3	<3	<7	<4	<7	<4	<3	<4	<9
12/26/90-01/02/91	<3	<3	<7	<3	<7	<3	<3	<3	<6

Average± 2 s.d.

* All other gamma emitters were LLD.

** Samples are composites of weekly grab samples collected over a 4 week period, except for the periods 5/15/90-5/22/90 and 12/26/90-1/2/91 which were composited over a 2 week period. These samples were analyzed for gamma emitters in addition to the required monthly composite samples.

*** Required LLD not achieved; see Appendix C for explanation.

TABLE 12

T U ELECTRIC

COMANCHE PEAK STEAM ELECTRIC STATION

CONCENTRATIONS OF I-131 IN WATER-SURFACE/DRINKING

Results in pCi/l ± 2 s.d.

MONTH	COLLECTION DATE*	NNW-0.1	N-9.9
JANUARY	12/26/89-01/16/90*	<0.4	<0.3
	01/23/90-01/30/90	<0.2	<0.2
FEBRUARY	01/23/90-02/13/90	<0.5	<0.7
	02/20/90-02/27/90	<0.3	<0.4
MARCH	02/20/90-03/13/90	<0.4	<1
	03/20/90-03/27/90	<0.2	<0.3
	03/20/90-04/10/90	<0.2	<0.2
APRIL	04/17/90-04/24/90	<0.2	<0.2
	04/17/90-05/08/90	<0.5	<0.5
MAY	05/15/90-05/22/90	<0.2	<0.4
	05/22/90-06/05/90	<0.2	<0.3
JUNE	06/12/90-06/19/90	<0.2	<0.2
	06/12/90-07/05/90	<0.1	<0.1
JULY	07/10/90-07/17/90	<0.4	<0.4
	07/10/90-07/31/90	<0.2	<0.2
AUGUST	08/07/90-08/14/90	<0.2	<0.2
	08/07/90-08/28/90	<0.2	<0.1
SEPTEMBER	09/04/90-09/11/90	<0.1	<0.1
	09/04/90-09/25/90	<0.2	<0.2
OCTOBER	10/03/90-10/09/90	<0.3	<0.2
	10/03/90-10/23/90	<0.1	<0.2
NOVEMBER	10/30/90-11/06/90	<0.2	<0.2
	10/30/90-11/20/90	<0.1	,0.4
DECEMBER	11/27/90-12/04/90	<0.4	<0.3
	11/27/90-12/18/90	<0.2	<0.2
	12/26/90-01/02/91	<0.5	<0.5

* Samples are composites of weekly grab samples collected over a 2 or 4 week period, as indicated.

TABLE 13

T U ELECTRIC

COMANCHE PEAK STEAM ELECTRIC STATION

CONCENTRATIONS OF TRITIUM IN WATER-SURFACE/DRINKING

Results in pCi/l ± 2 s.d.

QUARTER	COLLECTION PERIOD	NNW-0.1	N-9.9
1	12/26/89-03/27/90	<2000	<2000
2	03/20/90-06/05/90	<2000	<2000
3	06/12/90-09/25/90	<1000	<1000
4	10/03/90-01/02/91	<2000	<2000

TABLE 14

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T U ELECTRIC

COMANCHE PEAK STEAM ELECTRIC STATION

CONCENTRATIONS OF GAMMA EMITTERS* IN SURFACE WATER

Results in Units of pCi/l ± 2 s.d.

COLLECTION DATE**	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb/Zr-95	Cs-134	Cs-137	Ba/La-140
STATION ESE-1.4									
12/26/89-01/16/90	<4	<4	<8	<4	<8	<4	<4	<4	<7
01/23/90-02/13/90	<3	<3	<6	<3	<7	<3	<3	<3	<6
02/20/90-03/13/90	<3	<3	<8	<4	<7	<4	<4	<3	<9
03/20/90-04/10/90	<3	<3	<6	<3	<6	<3	<3	<3	<6
04/17/90-05/08/90	<3	<3	<8	<3	<7	<4	<4	<4	<7
05/15/90-06/05/90	<5	<5	<10	<5	<10	<5	<6	<6	<9
06/12/90-07/05/90	<3	<3	<7	<3	<6	<3	<3	<4	<6
07/10/90-07/31/90	<3	<2	<6	<4	<7	<3	<3	<3	<6
08/07/90-08/28/90	<3	<3	<7	<4	<7	<4	<3	<4	<8
09/04/90-09/25/90	<3	<3	<7	<4	<7	<4	<3	<4	<8
10/03/90-10/23/90	<3	<3	<7	<3	<6	<3	<3	<3	<6
10/30/90-11/19/90	<5	<5	<10	<6	<10	<5	<5	<5	<8
11/27/90-12/18/90	<3	<3	<6	<4	<6	<3	<3	<4	<6
Average ± 2 s.d.									
STATION N-1.5									
12/26/89-01/16/90	<3	<3	<8	<4	<7	<3	<3	<3	<7
01/23/90-02/13/90	<3	<4	<9	<4	<9	<4	<4	<5	<9
02/20/90-03/13/90	<5	<5	<10	<6	<10	<6	<5	<6	<10
03/20/90-04/10/90	<2	<2	<5	<3	<5	<3	<3	<3	<6
04/17/90-05/08/90	<4	<4	<10	<4	<9	<5	<4	<5	<9
05/15/90-06/05/90	<4	<4	<8	<4	<9	<4	<5	<5	<8
06/12/90-07/05/90	<3	<3	<7	<4	<6	<3	<3	<3	<7
07/10/90-07/31/90	<3	>3	<7	<4	<7	<4	<4	<4	<6
08/07/90-08/28/90	<3	<4	<9	<4	<7	<4	<4	<4	<10
09/04/90-09/25/90	<3	<3	<7	<3	<7	<3	<3	<3	<8
10/03/90-10/23/90	<3	<3	<7	<3	<7	<3	<3	<3	<7
10/30/90-11/19/90	<4	<4	<10	<5	<10	<5	<5	<5	<7
11/27/90-12/18/90	<4	<4	<9	<4	<9	<5	<4	<5	<7
Average ± 2 s.d.									

* All other gamma emitters were <LLD.

** Samples from Squaw Creek Reservoir (ESE-1.4 and N-1.5) are composites of weekly grab samples collected over a 4 week period. Samples from Lake Granbury (NE-7.4 and N-19.3) are grab samples collected on the date indicated.

TABLE 14

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T U ELECTRIC

COMANCHE PEAK STEAM ELECTRIC STATION

CONCENTRATIONS OF GAMMA EMITTERS* IN SURFACE WATER

Results in Units of pCi/l ± 2 s.d.

COLLECTION DATE**	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb/Zr-95	Cs-134	Cs-137	Ba/La-140
STATION NE-7.4									
01/16/90	<3	<3	<7	<4	<7	<4	<3	<4	<6
02/13/90	<5	<5	<10	<5	<10	<5	<6	<6	<10
03/13/90	<3	<3	<7	<4	<7	<4	<3	<3	<7
04/10/90	<3	<3	<6	<3	<6	<3	<3	<3	<6
05/08/90	<3	<3	<7	<3	<6	<4	<3	<3	<7
06/05/90	<5	<6	<10	<6	<10	<6	<6	<6	<9
07/05/90	<3	<3	<6	<3	<7	<4	<4	<3	<7
07/31/90	<3	<3	<7	<3	<7	<3	<4	<4	>6
08/28/90	<3	<4	<8	<3	<6	<4	<3	<4	<8
09/25/90	<3	<3	<8	<3	<7	<4	<4	<4	<9
10/23/90	<3	<3	<6	<3	<6	<3	<3	<3	<8
11/19/90	<3	<3	<6	<3	<7	<3	<3	<3	<5
12/18/90	<3	<3	<6	<3	<7	<3	<3	<3	<6
Average ± 2 s.d.									
STATION N-19.3									
01/16/90	<3	<3	<8	<3	<7	<4	<4	<4	<7
02/13/90	<4	<3	<8	<4	<7	<4	<3	<4	<6
03/13/90	<4	<4	<9	<4	<8	<5	<5	<5	<10
04/10/90	<3	<3	<6	<3	<5	<3	<3	<3	<5
05/08/90	<3	<3	<7	<3	<7	<3	<3	<3	<7
06/05/90	<3	<3	<7	<3	<6	<3	<4	<4	<8
07/05/90	<3	<3	<7	<3	<6	<3	<3	<4	<6
07/31/90	<4	<3	<7	<3	<7	<3	<4	<4	<5
08/28/90	<3	<3	<7	<4	<6	<4	<3	<3	<8
09/25/90	<3	<4	<8	<3	<7	<4	<4	<4	<8
10/23/90	<2	<3	<6	<3	<6	<3	<3	<3	<7
11/19/90	<4	<4	<9	<5	<8	<4	<4	<5	<8
12/18/90	<3	<3	<7	<3	<6	<3	<3	<3	<7
Average ± 2 s.d.									

* All other gamma emitters were <LLD.

** Samples from Squaw Creek Reservoir (ESE-1.4 and N-1.5) are composites of weekly grab samples collected over a 4 week period. Samples from Lake Granbury (NE-7.4 and N-19.3) are grab samples collected on the date indicated.

TABLE 15

T U ELECTRIC

COMANCHE PEAK STEAM ELECTRIC STATION

CONCENTRATIONS OF TRITIUM IN SURFACE WATER

Results in pCi/l ± 2 s.d.

QUARTER	COLLECTION PERIOD	ESE-1.4	N-1.5	NE-7.4	N-19.3
1	12/26/90-03/13/90	<2000	<2000	<2000	<2000
2	03/20/90-06/05/90	<2000	<2000	--	--
2	04/10/90-06/05/90	--	--	<2000	<2000
3	06/12/90-09/25/90	<1000	<1000	--	--
3	07/05/90-09/25/90	--	--	<1000	<1000
4	10/03/90-12/18/90	<2000	<100	--	--
4	10/23/90-12/18/90	--	--	<100	<2000

TABLE 16

T U ELECTRIC

COMANCHE PEAK STEAM ELECTRIC STATION

CONCENTRATIONS OF GAMMA EMITTERS* IN FISH

Results in pCi/Kg (wet) ± 2 s.d.

COLLECTION DATE	STATION	DESCRIPTION	K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Cs-134	Cs-137
05/23/90	ENE-2.0	Sunfish	753±167	<20	<20	<50	<20	<40	<20	<20
05/23/90	ENE-2.0	Catfish	1370±180	<10	<10	<40	<10	<30	<10	<10
05/23/90	ENE-2.0	Hybrid Str	1070±260	<30	<40	<100	<40	<70	<30	<40
05/23/90	ENE-2.0	Walleye	1200±220	<20	<20	<50	<20	<40	<10	<20
10/08/90	ENE-2.0	Smalmt Bass	2990±300	<10	<10	<40	<10	<30	<10	<10
10/08/90	ENE-2.0	Largemt Bass	2700±270	<20	<20	<60	<20	<40	<20	<20
10/08/90	ENE-2.0	Sunfish	2390±240	<20	<20	<50	<20	<40	<20	22.0±12.8
05/23/90	NNE-8.0	Catfish	1110±220	<10	<20	<40	<20	<30	<20	<20
10/11/90	NNE-8.0	Crappie	2870±290	<10	<10	<40	<10	<30	<10	<10
10/11/90	NNE-8.0	Striped Bass	2800±280	<10	<10	<40	<10	<30	<10	<10

*All other gamma emitters were LLD.

TABLE 17

T U ELECTRIC

COMANCHE PEAK STEAM ELECTRIC STATION

CONCENTRATIONS OF GAMMA EMITTERS* IN SEDIMENT

Results in pCi/kg (dry) ± 2 s.d.

COLLECTION DATE	STATION	Be-7	K-40	Cs-134	Cs-137	Pb-212	Bi-214	Pb-214	Ra-226	Th-228
STATION N-9.9										
02/13/90		<300	2560±320	<20	<20	187±32	172±35	295±79	<300	181±31
08/13/90		<200	2950±290	<20	<20	118±19	152±35	178±39	<400	<40
STATION NE-7.4										
02/13/90		<200	2110±260	<20	<20	137±17	209±36	235±38	<300	133±16
08/13/90		<200	1830±250	<20	<20	140±17	229±31	272±36	476±212	138±16
STATION NNE-1.0										
02/13/90		<200	482±136	<20	<20	103±14	165±27	210±33	477±225	101±14
08/13/90		<100	1360±150	<10	19.2±11.1	138±14	216±22	234±25	433±159	136±14

*All other gamma emitters were LLD.

TABLE 18

(PAGE 1 OF 1)

T U ELECTRIC

COMANCHE PEAK STEAM ELECTRIC STATION

CONCENTRATIONS OF GAMMA EMITTERS* IN FOOD PRODUCTS

Results in Units of pCi/kg (wet) ± 2 s.d.

STATION	DESCRIPTION	COLLECTION DATE	Be-7	K-40	I-131	Cs-134	Cs-137
SW-13.5	FP-3 Cabbage	06/05/90	426± 88	4980±500	<60	<10	<10
	FP-3 Onions	06/05/90	<100	1890±190	<50	<10	<10
	FP-3 Cabbage	07/05/90	<100	5610±560	<20	<10	<10
		07/31/90 Samples not available.					
		08/28/90 Samples not available.					
		09/25/90 Samples not available.					
E-4.2	FP-2 Cucumber	06/05/90	<90	1720±170	<40	<9	<9
	FP-2 Cucumber	07/05/90	<70	2150±210	<10	<8	<8
	FP-2 Cantaloupe	07/31/90	<200	3440±340	<30	<20	<20
	FP-2 Cucumbers	07/31/90	<90	1630±160	<20	<9	<10
	FP-2 Cucumber	08/28/90	<80	1800±180	<30	<8	<9
	FP-2 Okra	08/28/90	<60	2870±290	<20	<6	<6
	FP2 Melon	09/25/90	<50	1660±170	<20	<5	<5
ENE-9.0	FP1 Pecans	11/19/90	<100	125±43	<50	<10	<10

* All other gamma emitters were <LLD.

TABLE 19
(PAGE 1 OF 2)
T U ELECTRIC
COMANCHE PEAK STEAM ELECTRIC STATION
CONCENTRATIONS OF GAMMA EMITTERS* IN BROADLEAF VEGETATION
Results in Units of pCi/kg (wet) ± 2 s.d.

STATION	DESCRIPTION	COLLECTION DATE	Be-7	K-40	I-131	Cs-134	Cs-137
SW-13.5	Forage Grass	01/16/90	1440±240	1210±290	<6**	<20	<20
	Vegetation	02/13/90	2310±230	7360±740	<50	<10	<10
	Vegetation	03/13/90	597± 60	5600±560	<6**	<6	<6
	Vegetation	04/10/90	900±104	6230±620	<20	<10	<10
	Weed Lvs	05/08/90	2100±210	8510±850	<20**	<10	<10
	Weed Lvs	06/05/90	1490±150	8230±820	<7**	<8	<7
	Weed Lvs	07/05/90	346± 70	4900±490	<10**	<9	<9
	Weed Lvs	07/31/90	986± 99	5990±600	<20**	<8	<8
	Weed Lvs	08/28/90	797±109	8500±850	<10**	<10	<10
	Weed Lvs	09/25/90	1260±130	6520±650	<10**	<8	<7
	Bloodweed	10/23/90	1590±160	5810±580	<20**	<8	<7
	Johnson Grass	11/19/90	4280±430	2080±270	<20**	<20	<20
	Rye Grass	12/18/90	1830±180	7740±770	<8**	<10	21.9±10.1
N-1.45 (BL1)	Forage Grass	01/16/90	933±103	440±88	<9**	<9	<10
	Vegetation	02/13/90	8900±890	2340±370	<200***	<30	197±38
	Vegetation	03/13/90	10700±1100	3020±400	<7**	<30	<30
	Vegetation	04/10/90	1000±110	5700±570	<20	<10	<10
	Sumac Lvs	05/08/90	1300±210	5560±560	<10**	<20	<20
	Sumac Lvs	06/05/90	1450±260	8.43±0.84	<7	<0.02	<0.02
	Sumac Lvs	07/05/90	1100±200	6610±660	<8**	<20	<20
	Sumac Lvs	07/31/90	1790±270	5180±520	<40**	<30	<30
	Sumac Lvs	08/28/90	1790±240	5580±560	<20**	<20	<20
	Weed Lvs	09/25/90	1550±240	5590±560	<10**	<20	<20
	Sumac Lvs	10/23/90	1510±160	6400±640	<7**	<20	<20
	Cttn Wd Lvs	11/19/90	1250±130	2830±280	<30**	<10	<10
	Cottonwd	12/18/90	2680±270	2840±280	<10**	<10	<10

* All other gamma emitters were <LLD.
** Iodine-131 by radiochemical method.
***Iodine-131 analysis failed; See Appendix C for explanation.

TABLE 19
(PAGE 2 OF 2)
T U ELECTRIC
COMANCHE PEAK STEAM ELECTRIC STATION
CONCENTRATIONS OF GAMMA EMITTERS* IN BROADLEAF VEGETATION
Results in Units of pCi/kg (wet) ± 2 s.d.

STATION	DESCRIPTION	COLLECTION DATE	Be-7	K-40	I-131	Cs-134	Cs-137
SW-1.0	Forage Grass	01/16/90	1600±180	609±163	<10**	<20	<20
(BL2)	Vegetation	02/13/90	8520± 850	2130±460	<30**	<60	<50
	Vegetation	03/13/90	12200±1200	2300±330	<10**	<30	<30
	Vegetation	04/10/90	835± 115	5920±590	<30	<10	<10
	Weed Lvs	05/08/90	1760±180	8550±850	<20**	<10	<10
	Wed Lvs	06/05/90	1250±120	7970±800	<7	<10	<10
	Weed Lvs	07/05/90	572±70	8500±850	<10**	<8	<8
	Weed Lvs	07/31/90	387±56	7640±760	<20**	<6	<6
	Weed Lvs	08/28/90	759±91	11900±1200	<10**	<10	<10
	Weed Lvs	09/25/90	1480±150	8740±870	<20**	<10	<9
	Cttn Wd Lvs	10/23/90	876±1[illegible]	1670±170	<20**	<10	<10
	Sumac Lvs	11/19/90	4530±450	2210±270	<20**	<30	<30
	Cstlbrmda	12/18/90	4940±490	5670±570	<8	<30	<10

* All other gamma emitters were <LLD.
** Iodine-131 by radiochemical method.
***Iodine-131 analysis failed. See Appendix C for explanation.

TABLE 20

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RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

T U ELECTRIC - COMANCHE PEAK STEAM ELECTRIC STATION

JANUARY 1 TO DECEMBER 31, 1990

Medium of Pathway Sampled (Unit of Measurement)	Analysis and Total Number of Analysis Performed	Lower Limit of Detection (LLD) (1)	All Indicator Locations Mean Range	Location with Highest Mean Name Distance and Direction	Mean (f)(2) Range	Control Locations Mean (f)(2) Range	Number of Nonroutine Reported Measurements
TLDs (mR/day)	Gamma (212)		0.12(202/202) (0.05-0.19)	E-3.5	0.15(5/5) (0.12-0.19)	0.13(10/10) (0.10-0.16)	0
Air Iodine-131 (10^{-3} pci/m^3)	I-131(410)	70	-(0/358) --	NA	NA	-(0/52) --	0
Air Particulate (10^{-3} pci/m^3)	Gross (408) Beta	10	22(356/356) (7.7-62)	SW-12.3	23(52/52) (11-52)	23(52/52) (11-52)	0
	Gamma (32)						
	Be-7	-	68(28/28) (12-111)	SW/WSW-0.95	83(4/4) (68-108)	74(4/4) (68-80)	0
	K-40	-	13(13/28) (7.9-21)	SW/WSW-0.95	15(4/4) (8.3-21)	14(2/4) (12-15)	0
	Ru-103	-	-(0/28)	N/A	N/A	-(0/4)	0
	Cs-134	-	-(0/28)	N/A	N/A	-(0/4)	0
	Cs-137	-	-(0/28)	N/A	N/A	-(0/4)	0

(1) LLD is lower limit of detection as defined and required in USNRC Branch Technical Position on an Acceptable Radiological Environmental Monitoring Program., Revision 1, November 1979.

(2) (f) is the ratio of positive results to the number of samples analyzed for the parameter of interest, means are of positive results only.

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(PAGE 2 OF 5)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

T U ELECTRIC - COMANCHE PEAK STEAM ELECTRIC STATION

JANUARY 1 TO DECEMBER 31, 1990

Medium of Pathway Sampled (Unit of Measurement)	Analysis and Total Number of Analysis Performed	Lower Limit of Detection (LLD) (1)	All Indicator Locations Mean Range	Location with Highest Mean Name Distance and Direction	Mean (f)(2) Range	Control Location Mean (f)(2) Range	Number of Nonroutine Reported Measurements
Milk (pCi/l)	I-131 (38) (BY RADIOCHEMISTRY)	-	-(0/19) --	NA	NA	-(0/19) --	0
	Gamma (38)						
	K-40	-	1233(19/19) (1090-1360)	SW-13.5	1305(19/19) (1100-1520)	1305(19/19) (1100-1520)	0
	Cs-137	-	-(0/19) --	NA	NA	-(0/19) --	0
Surface Water (pCi/l)	Gamma (52)		-(0/39) --	NA	NA	-(0/13) --	0
	Tritium (16)	-	-(0/12) --	NA	NA	-(0/4) --	0
Ground Drinking Water (pCi/l)	Gamma (20)	-	-(0/16) --	NA	NA	-(0/4) --	0
	Tritium (20)	-	-(0/16) --	NA	NA	-(0/4) --	0

(1) LLD is lower limit of detection as defined and required in USNRC Branch Technical Position on an Acceptable Radiological Environmental Monitoring Program., Revision 1, November 1979.

(2) (f) is the ratio of positive results to the number of samples analyzed for the parameter of interest. means are of positive results only.

TABLE 20

(PAGE 3 OF 5)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

T U ELECTRIC - COMANCHE PEAK STEAM ELECTRIC STATION

JANUARY 1 TO DECEMBER 31, 1990

Medium of Pathway Sampled (Unit of Measurement)	Analysis and Total Number of Analysis Performed	Lower Limit of Detection (LLD) (1)	All Indicator Locations Mean Range	Location with Highest Mean Name Distance and Direction	Mean (f)(2) Range	Control Location Mean (f)(2) Range	Number of Nonroutine Reported Measurements
Water-Surface Drinking (pCi/l)	Gamma (30)	-	-(0/15) --	NA	NA	-(0/15) --	
	Tritium (8)	-	-(0/4)	NA	NA	-(0/4)	0
	Gross Beta (30)	-	15(15/15) (12-18)	NNW-1.1	15(15/15) (12-18)	11(15/15) (5.4-17)	0
	I-131 (52) (BY RADIOCHEMISTRY)	-	-(0/26) --	NA	NA	-(0/26) --	0
Fish (pCi/kg/dry)	Gamma (10)						
	K-40	-	1782(7/7) (753-2990)	NNE-8.0	2260(3/3) (1110-2870)	2260(3/3) (1110-2870)	0
	CS-137		22(1/7) --	ENE-2.0	22(1/7) --	-(0/3) --	0
Shoreline Sediments (pCi/kg dry)	Gamma (6)						
	K-40	-	1446(4/4) (482-2110)	N-9.9	2755(2/2) (2560-2950)	2755(2/2) (2560-2950)	0
	Cs-137	-	19(1/4) --	NNE-1.0	19(1/4) --	-(0/2) --	0
	Pb-212	-	130(4/4) (103-140)	N-9.9	153(2/2 (118-187)	153(2/2) (118-187)	0

(1) LLD is lower limit of detection as defined and required in USNRC Branch Technical Position on an Acceptable Radiological Environmental Monitoring Program, Revision 1, November 1979.

(2) (f) is the ratio of positive results to the number of samples analyzed for the parameter of interest. means are of positive results only.

TABLE 20

(PAGE 4 OF 5)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

T U ELECTRIC - COMANCHE PEAK STEAM ELECTRIC STATION

JANUARY 1 TO DECEMBER 31, 1990

Medium of Pathway Sampled (Unit of Measurement)	Analysis and Total Number of Analysis Performed	Lower Limit of Detection (LLD) (1)	All Indicator Locations Mean Range	Location with Highest Mean Name Distance and Direction	Mean (f)(2) Range	Control Location Mean (f)(2) Range	Number of Nonroutine Reported Measurements
Shoreline Sediments (pCi/kg dry)	Gamma (6)						
	Bi-214	-	205(4/4) (165-229)	NE-7.4	219(2/2) (209-229)	162(2/2) (152-172)	0
	Pb-214	-	238(4/4) (210-272)	NE-7.4	254(2/2) (235-272)	237(2/2) (178-295)	0
	Ra-226	-	462(3/4) (433-477)	NE-7.4	476(1/2) --	-(0/2) --	0
	Th-228	-	127(4/4) (101-138)	N-9.9	181(1/2) --	181(1/2) --	0
Broadleaf Vegetation (pCi/kg wet)	Gamma (39)						
	Be-7	-	2910(26/26) (387-12200)	SW-1.0	3055(13/13) (387-12200)	1533(13/13) (346-4280)	0
	K-40	-	4843(26/26) (8.4-11900)	SW-13.5	6052(13/13) (1210-8510)	6052(13/13) (1210-8510)	0
	I-131	-	-(0/26) --	NA	-(0/13) --	-(0/13) --	0
	Cs-134	-	-(0/26) --	NA	-(0/13) --	-(0/13) --	0
	Cs-137	-	197(1/26) --	N-1.45	197(1/13) --	22(1/13) --	0

(1) LLD is lower limit of detection as defined and required in USNRC Branch Technical Position on an Acceptable Radiological Environmental Monitoring Program., Revision 1, November 1979.

(2) (f) is the ratio of positive results to the number of samples analyzed for the parameter of interest, means are of positive results only.

TABLE 20

(PAGE 5 OF 5)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

T U ELECTRIC - COMANCHE PEAK STEAM ELECTRIC STATION

JANUARY 1 TO DECEMBER 31, 1990

Medium of Pathway Sampled (Unit of Measurement)	Analysis and Total Number of Analysis Performed	Lower Limit of Detection (LLD) (1)	All Indicator Locations Mean Range	Location with Highest Mean Name Distance and Direction	Mean (f)(2) Range	Control Location Mean (f)(2) Range	Number of Nonroutine Reported Measurements
Food Products (pCi/kg wet)	Gamma (11)						
	Be-7	-	-(0/8) --	SW-13.5	426(1/3) --	426(1/3) --	0
	K-40	-	1924(8/8) (125-3440)	SW-13.5	4160(3/3) (1890-5610)	4160(3/3) (1890-5610)	0
	I-131	-	-(0/8) --	NA	-(0/8) --	-(0/3) --	0
	Cs-134	-	-(0/8) --	NA	-(0/8) --	-(0/3) --	0
	Cs-137	-	-(0/8) --	NA	-(0/8) --	-(0/3) --	0

(1) LLD is lower limit of detection as defined and required in USNRC Branch Technical Position on an Acceptable Radiological Environmental Monitoring Program., Revision 1, November 1979.

(2) (f) is the ratio of positive results to the number of samples analyzed for the parameter of interest, means are of positive results only.

APPENDIX A

EPA CROSS-CHECK PROGRAM

US EPA INTERLABORATORY COMPARISON PROGRAM 1990
(ENVIRONMENTAL)

Collection Date	Media	Nuclide	EPA Result(a)		Teledyne Isotopes Result(b)		
10/31/89	Lab Perf.	Gr-Alpha	49.00 ±	12.00	42.33 ±	5.77	
	Water	Ra-226	8.40 ±	1.30	9.20 ±	0.46	
	Sample A	Ra-228	4.10 ±	0.60	4.00 ±	0.50	
	Sample B	Gr-Beta	32.00 ±	5.00	30.33 ±	0.58	
		Sr-89	15.00 ±	5.00	15.00 ±	3.46	
		Sr-90	7.00 ±	1.50	7.00 ±	0.00	
		Cs-134	5.00 ±	5.00	5.33 ±	1.15	
		Cs-137	5.00 ±	5.00	7.00 ±	0.00	
11/10/89	Water	Ra-226	8.70 ±	1.30	8.47 ±	0.49	
		Ra-228	8.57 ±	1.40	8.57 ±	1.46	
01/12/90	Water	Sr-89	25.00 ±	5.00	24.00 ±	1.73	
		Sr-90	20.00 ±	1.50	19.67 ±	2.52	
01/26/90	Water	Gr-Alpha	12.0 ±	5.0	10.00 ±	1.73	
		Gr-Beta	12.0 ±	5.0	12.33 ±	1.53	
02/09/90	Water	Co-60	15.00 ±	5.00	15.00 ±	3.46	
		Zn-65	139.00 ±	14.00	131.33 ±	9.07	
		Ru-106	139.00 ±	14.00	113.67 ±	4.04	(c)
		Cs-134	18.00 ±	5.00	15.33 ±	2.31	
		Cs-137	18.00 ±	5.00	19.33 ±	3.21	
		Ba-133	74.00 ±	7.00	66.00 ±	3.46	
02/23/90	Water	H-3	4976.00 ±	498.00	4900.00 ±	100.00	
03/09/90	Water	Ra-226	4.9 ±	0.7	4.73 ±	0.47	
		Ra-228	12.7 ±	1.9	13.00 ±	1.00	
03/30/90	Air Filter	Gr-Alpha	5.0 ±	5.0	6.33 ±	0.58	
		Gr-Beta	31.0 ±	5.0	31.67 ±	0.58	
		Sr-90	10.0 ±	1.5	9.33 ±	0.58	
		Cs-137	10.0 ±	5.0	10.67 ±	1.15	
04/17/90	Water	Gr-Alpha	90.0 ±	23.0	79.33 ±	2.89	
	(Lab Perf)	Ra-226	5.0 ±	0.8	5.67 ±	0.15	
	Sample A	Ra-228	10.2 ±	1.5	9.37 ±	1.44	
	Sample B	Gr-Beta	52.0 ±	5.0	53.33 ±	1.53	
		Sr-89	10.0 ±	5.0	10.67 ±	1.15	
		Sr-90	10.0 ±	1.5	9.67 ±	0.58	
		Cs-134	15.0 ±	5.0	12.67 ±	1.53	
		Cs-137	15.0 ±	5.0	16.33 ±	1.15	

Footnotes at end of table.

US EPA INTERLABORATORY COMPARISON PROGRAM 1990 (Cont.)
(ENVIRONMENTAL)

Collection Date	Media	Nuclide	EPA Result(a)		Teledyne Isotopes Result(b)		
04/27/90	Milk	Sr-89	23.0 ±	5.0	24.67 ±	1.53	
		Sr-90	23.0 ±	5.0	24.00 ±	0.00	
		I-131	99.0 ±	10.0	89.67 ±	3.21	
		Cs-137	24.0 ±	5.0	27.33 ±	2.52	
		K	1550.0 ±	78.0	1483.33 ±	75.06	
05/04/90	Water	Sr-89	7.0 ±	5.0	6.67 ±	0.58	
		Sr-90	7.0 ±	5.0	6.67 ±	0.58	
05/11/90	Water	Gr-Alpha	22.0 ±	6.0	16.00 ±	1.00	
		Gr-Beta	15.0 ±	5.0	17.00 ±	1.00	
06/08/90	Water	Co-60	24.0 ±	5.0	25.33 ±	2.52	
		Zn-65	148.0 ±	15.0	148.67 ±	3.06	
		Ru-106	210.0 ±	21.0	196.00 ±	20.66	
		Cs-134	24.0 ±	5.0	23.67 ±	2.89	
		Cs-137	25.0 ±	5.0	24.67 ±	2.08	
		Ba-133	99.0 ±	10.0	93.00 ±	6.08	
06/22/90	Water	H-3	2933.0 ±	358.0	2900 ±	100.00	
07/13/90	Water	Ra-226	12.1 ±	1.8	11.37 ±	0.60	
		Ra-228	5.1 ±	1.3	4.20 ±	0.75	
08/10/90	Water	I-131	39.0 ±	6.0	36.00 ±	3.00	
08/31/90	Air Filter	Gr-Alpha	10.0 ±	5.0	16.00 ±	1.00	(d)
		Gr-Beta	62.0 ±	5.0	63.33 ±	1.53	
		Sr-90	20.0 ±	5.0	18.00 ±	1.00	
		Cs-137	20.0 ±	5.0	18.33 ±	3.21	
09/14/90	Water	Sr-89	10.0 ±	5.0	8.67 ±	0.58	
		Sr-90	9.0 ±	5.0	9.0 ±	1.00	
09/21/90	Water	Gr-Alpha	10.0 ±	5.0	11.00 ±	1.00	
		Gr-Beta	10.0 ±	5.0	11.00 ±	1.00	

Footnotes at end of table.

US EPA INTERLABORATORY COMPARISON PROGRAM 1990 (Cont.)
(ENVIRONMENTAL)

Collection Date	Media	Nuclide	EPA Result(a)		Teledyne Isotopes Result(b)	
09/28/90	Milk	Sr-89	16.0 ±	5.0	9.0 ±	2.65 (e)
		Sr-90	20.0 ±	5.0	15.33 ±	0.58
		I-131	58.0 ±	6.0	54.67 ±	1.53
		Cs-137	20.0 ±	5.0	23.00 ±	1.73
		K	1700.0 ±	85.0	1710.00 ±	65.51
10/15/90	Water	Co-60	20.0 ±	5.0	21.00 ±	1.00
		Zn-65	115.0 ±	12.0	115.00 ±	11.53
		Ru-106	151.0 ±	15.0	142.00 ±	8.66
		Cs-134	12.0 ±	5.0	11.00 ±	0.00
		Cs-137	12.0 ±	5.0	16.33 ±	2.52
		Ba-133	110.0 ±	11.0	94.67 ±	5.13 (f)
10/30/90	Lab Perf. Water Sample A	Gr-Alpha	62.00 ±	16.00	57.00 ±	1.00
		Ra-226	13.6 ±	2.0	12.67 ±	1.27
		Ra-228	5.0 ±	1.3	4.87 ±	0.23
	Sample B	Gr-Beta	53.0 ±	5.0	51.00 ±	2.31
		Sr-89	20.0 ±	5.0	19.00 ±	3.61
		Sr-90	15.0 ±	5.0	14.33 ±	0.58
		Cs-134	7.0 ±	5.0	9.00 ±	0.00
		Cs-137	5.0 ±	5.0	7.67 ±	1.15
10/19/90	Water	H-3	7203.0 ±	720.0	7133.33 ±	251.66
11/09/90	Water	Ra-226	7.4 ±	1.1	7.27 ±	0.38
		Ra-228	7.7 ±	1.9	7.57 ±	0.32

Footnotes at end of table.

US EPA INTERLABORATORY COMPARISON PROGRAM 1990 (Cont.)
(ENVIRONMENTAL)

Footnotes:

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

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

(c) No apparent cause for the low results were found. Three aliquots of the sample were counted on three separate detectors. The results of all three were similar. The calibration curve fit is good (0.997). Ruthenium-106 was obtained from the EPA. Results of spikes were acceptable. Subsequent cross-checks from the EPA did not exceed two normalized standard deviations. No additional follow-up is necessary, but we will continue to monitor the results. New calibrations were completed in March, 1991.

(d) The EPA deposit occupies a smaller area than our calibration planchet and hence has a higher counting efficiency. No further corrective action is required, since our calibration standard better represents an air particulate filter.

(e) Incomplete removal of calcium, lead to erroneously high strontium yields. More care is being taken in the strontium nitrate and strontium sulfate precipitation steps to ensure a final volume of at least 20 ml in the strontium sulfate step. Reanalysis of internal QC samples produced good results after implementing the corrective action.

(f) There is no apparent reason for the deviation between the EPA and Teledyne Isotopes values. Other isotopes in the sample were measured accurately. The calculations were reviewed and activities calculated from other Ba-133 gamma rays. Results were reproduced as reported.

4/9/91

APPENDIX B

SYNOPSIS OF ANALYTICAL PROCEDURES

APPENDIX B

APPLICABLE PROCEDURES

NUMBER	TITLE	DATE	PAGE
PRO-032-10	Determination of Gross Beta in Air Particulate Filters	03/01/87	B-3
PRO-032-35	Determination of Tritium in Water by Liquid Scintillation	12/30/87	B-4
PRO-032-11	Determination of Radioiodine in Milk and Water Samples	08/01/88	B-5
PRO-342-17	Environmental Thermoluminescent Dosimetry (TLD)	09/04/87	B-6
PRO-042-5	Determination of Gamma Emitting Radioisotopes	10/26/84	B-7
PRO-032-1	Determination of Gross Alpha and/or Gross Beta in Water Samples	03/21/86	B-9
PRO-032-12	Determination of Radioiodine in Vegetation Samples	11/15/82	B-11

GROSS BETA ANALYSIS OF SAMPLES

Air Particulates

After a delay of five or more days, allowing for the radon-222 and radon-220 (thoron) daughter products to decay, the filers are counted in a gas-flow proportional counter. An unused air particulate filter, supplied by TU Electric, is counted as the blank.

Calculations of the results, the two sigma error and the lower limit of detection (LLD), are performed as follows:

$$\text{RESULT } (pCi/m^3) = ((S/T) - (B/t))/(2.22\ V\ E)$$

$$\text{TWO SIGMA ERROR } (pCi/m^3) = 2((S/T^2) + (B/t^2))^{1/2}/(2.22\ V\ E)$$

$$\text{LLD } (pCi/m^3) = 4.66\ (B^{1/2})/(2.22\ V\ E\ t)$$

where:

S = Gross counts of sample including blank
B = Counts of blank
E = Counting efficiency
T = Number of minutes sample was counted
t = Number of minutes blank was counted
V = Sample aliquot size (cubic meters)
2.22 = dpm/pCi

ANALYSIS OF WATER SAMPLES FOR TRITIUM

One milliliter of water is added to 20 ml of liquid scintillation solution in a 25 ml vial. The sample is inserted into a Liquid Scintillator and counted for 100 minutes.

Calculations of the results, the two sigma error and the lower limit of detection (LLD), are performed as follows:

RESULT (pCi/ℓ) = $((S/T) - (B/t))/(2.22\ V\ E)$

TWO SIGMA ERROR (pCi/ℓ) = $2((S/T^2 + (B/t^2))^{1/2}/(2.22\ V\ E)$

LLD (pCi/ℓ) = $4.66\ (B^{1/2})/(2.22\ V\ E\ t)$

where
- S = Gross counts of sample
- B = Counts of blank
- E = Counting efficiency
- T = Number of minutes sample was counted
- t = Number of minutes blank was counted
- V = Sample aliquot size (ℓ)
- 2.22 = dpm/pCi

ANALYSIS OF SAMPLES FOR IODINE-131

Milk or Water

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

Calculations of results, two sigma error and the lower limit of detection (LLD) in pCi/ℓ, are performed as follows:

RESULT = $(N/\Delta t - B)/(2.22\ E\ V\ Y\ DF)$

TWO SIGMA ERROR = $2((N/\Delta t + B)/\Delta t)^{1/2}(2.22\ E\ V\ Y\ DF)$

LLD = $4.66(B/\Delta t)^{1/2}/(2.22\ E\ V\ Y\ DF)$

where:

- N = total counts from sample (counts)
- Δt = counting time for sample (min)
- B = background rate of counter (cpm)
- 2.22 = dpm/pCi
- V = volume or weight of sample analyzed
- Y = chemical yield of the mount or sample counted
- DF = decay factor from the collection to the counting date
- E = efficiency of the counter for I-131, corrected for self absorption effects by the formula
- $E = E_s(\exp -0.0061M)/(\exp -0.0061M_s)$
- E_s = efficiency of the counter determined from an I-131 standard mount
- M_s = mass of PdI_2 on the standard mount, mg
- M = mass of PdI_2 on the sample mount, mg

ENVIRONMENTAL DOSIMETRY

Teledyne Isotopes uses a $CaSO_4$:Dy thermoluminescent dosimeter (TLD) which the company manufactures. This material has a high light output, negligible thermally induced signal loss (fading), and negligible self dosing. The energy response curve (as well as all other features) satisfies NRC Reg. Guide 4.13. Transit doses are accounted for by use of separate TLDs.

Following the field exposure period the TLDs are placed in a Teledyne Isotopes Model 8300. One fourth of the rectangular TLD is heated at a time and the measured light emission (luminescence) is recorded. The TLD is then annealed and exposed to a known Cs-137 dose; each area is then read again. This provides a calibration of each area of each TLD after every field use. The transit controls are read in the same manner.

Calculations of results and the two sigma error in net milliRoetgen (mR), are performed as follows:

$$\text{RESULT} = D = (D_1+D_2+D_3+D_4)/4$$

$$\text{TWO SIGMA ERROR} = 2((D_1-D)^2+(D_2-D)^2+(D_3-D)^2+(D_4-D)^2)/3)^{1/2}$$

where D_1 = the net mR of area 1 of the TLD, and similarly for D_2, D_3, and D_4

$D_1 = I_1 K/R_1 - A$

I_1 = the instrument reading of the field dose in area 1

K = the known exposure by the Cs-137 source

R_1 = the instrument reading due to the Cs-137 dose on area 1

A = average dose in mR, calculated in similar manner as above, of the transit control TLDs

GAMMA SPECTROMETRY OF SAMPLES

Milk and Water

A 1.0 liter Marinelli beaker is filled with a representative aliquot of the sample. The sample is then counted for at least 1000 minutes with a shielded Ge(Li) detector coupled to a mini-computer-based data acquisition system which performs pulse height analysis.

Dried Solids Other Than Soils and Sediments

A large quantity of the sample is dried at a low temperature, less than 100°C. As much as possible (up to the total sample) is loaded into a tared 1-liter Marinelli and weighed. The sample is then counted for at least 1000 minutes with a shielded Ge(Li) detector coupled to a mini-computer-based data acquisition system which performs pulse height analysis.

Fish

As much as possible (up to the total sample) of the edible portion of the sample is loaded into a tared Marinelli and weighed. The sample is then counted for at least 1000 minutes with a shielded Ge(Li) detector coupled to a mini-computer-based data acquisition system which performs pulse height analysis.

Soils and Sediments

Soils and sediments are dried to a low temperature, less than 100°C. The soil or sediment is loaded fully into a tared, standard 300 cc container and weighed. The sample is then counted for at least six hours with a shielded Ge(Li) detector coupled to a mini-computer-based data acquisition system which performs pulse height analysis.

Charcoal Cartridges (Air Iodine)

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

Air Particulate

The four or five (depending on the calendar month) air particulate filters for a monthly composite for each field station are aligned one in front of another and then counted for at least six hours with a shielded Ge(Li) detector coupled to a mini-computer-based data acquisition system which performs pulse height analysis.

A mini-computer software program defines peaks by certain changes in the slope of the spectrum. The program also compares the energy of each peak with a library of peaks for isotope identification and then performs the radioactivity calculation using the appropriate fractional gamma ray abundance, half life, detector efficiency, and net counts in the peak region. The calculation of results, two sigma error and the lower limit of detection (LLD) in pCi/volume or pCi/mass:

RESULT = $(S-B)/(2.22\ t\ E\ V\ F\ DF)$

TWO SIGMA ERROR = $2(S+B)^{1/2}/(2.22\ t\ E\ V\ F\ DF)$

LLD = $4.66(B)^{1/2}/(2.22\ t\ E\ V\ F\ DF)$

where:

S = Area, in counts, of sample peak and background (region of spectrum of interest)

B = Background area, in counts, under sample peak, determined by a linear interpolation of the representative backgrounds on either side of the peak

t = length of time in minutes the sample was counted

2.22 = dpm/pCi

E = detector efficiency for energy of interest and geometry of sample

V = sample aliquot size (liters, cubic meters, kilograms, or grams)

F = fractional gamma abundance (specific for each emitted gamma)

DF = decay factor from the collection to the counting date

DETERMINATION OF GROSS ALPHA AND/OR GROSS BETA ACTIVITY IN WATER SAMPLES

1.0 INTRODUCTION

The procedures described in this section are used to measure the overall radioactivity of water samples without identifying the radioactive species present. No chemical separation techniques are involved.

One liter of the sample is evaporated on a hot plate. Different volumes may be used if the sample has a significant salt content as measured by a conductivity meter, or if unusual sensitivity is desired. If requested by the customer, the sample is filtered through No. 54 filter paper before evaporation, removing particles greater than 30 microns in size.

After evaporating to a small volume in a beaker, the sample is rinsed into a 2-inch diameter stainless steel planchet which is stamped with a concentric ring pattern to distribute residue evenly. Final evaporation to dryness takes place under heat lamps. Samples which appear to be hygroscopic are dried again under heat lamps just prior to counting.

Residue mass is determined by weighing the planchet before and after mounting the sample. The planchet is counted for alpha and/or beta activity on an automatic proportional counter. Results are calculated using empirical self-absorption curves which allow for the change in effective counting efficiency caused by the residue mass.

2.0 DETECTION CAPABILITY

Detection capability depends upon the sample volume actually represented on the planchet, the background and the efficiency of the counting instrument, and upon self-absorption of alpha and beta particles by the mounted sample. Because the radioactive species are not identified, no decay corrections are made and the reported activity refers to the counting time.

The minimum detectable level (MDL) for water samples is nominally 1.6 picocuries per liter for gross beta at the 4.66 sigma level (1.0 pCi/ℓ at the 2.83 sigma level), assuming that 1 liter of sample is used and that 1/2 gram of sample residue is mounted on the planchet. These figures are based upon a nominal counting time of 50 minutes and upon representative values of counting efficiency and background of 0.2 and 1.2 cpm, respectively. The MDL for gross alpha activity is nominally 2.3 picocuries per liter at the 4.66 sigma level (1.4 pCi/ℓ at the 2.83 sigma level) also assuming that 1 liter of sample is used and that 1/2 gram of sample residue is mounted on the planchet. These figures are based upon a nominal 200 minute counting time and upon a representative efficiency of 0.02 and a background of 0.1 cpm.

The MDL becomes significantly lower as the mount weight decreases because of reduced self-absorption. At a zero mount weight, the 4.66 sigma MDL for gross beta is 0.9 picrocuries per liter and the MDL for gross alpha is 0.3 picocuries per liter. These values reflect a beta counting efficiency of 0.38 and an alpha counting efficiency of 0.18.

ANALYSIS OF SAMPLES FOR IODINE-131

Broadleaf Vegetation

This procedure presents radiochemical methods for determining the I-131 activity in vegetation samples. Stable iodide carrier is first added to 25-100 grams of the chopped sample. The sample is then leached with sodium hydroxide solution, evaporated to dryness and fused in a muffle furnace. The melt is dissolved in water, filtered and treated with sodium hypochlorite. The iodine is then reduced with hydroxylamine hydrochloride and is extracted into chloroform. It is then back-extracted as iodide into sodium bisulfite solution and is precipitated as palladium iodide. The precipitate is weighed for chemical yield and is mounted on a nylon planchet for low level beta counting.

Calculations of results, two sigma error and the lower limit of detection (LLD) in pCi/ℓ, are performed as follows:

RESULT = $(N/\Delta t - B)/(2.22\ E\ V\ Y\ DF)$

TWO SIGMA ERROR = $2((N/\Delta t + B)/\Delta t)^{1/2}(2.22\ E\ V\ Y\ DF)$

LLD = $4.66(B/\Delta t)^{1/2}/(2.22\ E\ V\ Y\ DF)$

where:

- N = total counts from sample (counts)
- Δt = counting time for sample (min)
- B = background rate of counter (cpm)
- 2.22 = dpm/pCi
- V = volume or weight of sample analyzed
- Y = chemical yield of the mount or sample counted
- DF = decay factor from the collection to the counting date
- E = efficiency of the counter for I-131, corrected for self absorption effects by the formula
- $E = E_s(\exp -0.0061M)/(\exp -0.0061M_s)$
- E_s = efficiency of the counter determined from an I-131 standard mount
- M_s = mass of PdI_2 on the standard mount, mg
- M = mass of PdI_2 on the sample mount, mg

APPENDIX C

EXCEPTIONS TO THE 1990 REMP

APPENDIX C

REMP PROGRAM EXCEPTIONS FOR SCHEDULED
SAMPLING AND ANALYSIS DURING 1990

Location	Description	Date of Sampling	Reasons for Loss/ Exception
Sta-NW-1.0	Air Filter	02/13/90-02/20/90	Sample not collected due to mispositioned filter.
Sta-SW/WSW-0.95	Air Filter	02/13/90-02/20/90	Pump out of service vane broken
Sta-E-3.5	Air Filter	10/23/90-10/30/90	Pump out of service electrical failure
Sta-N-1.45	Air Filter	10/23/90-10/30/90	Pump out of service sample not collected
Sta-S/SSW-1.2	Air Filter	11/13/90-11/19/90	Pump out of service sample collection timer failure
Sta-S/SSW-1.2	Air Filter	11/19/90-11/27/90	Pump out of service sample collection timer failure
N-9.4	Air Filter	11/19/90-11/27/90	Pump out of service electrical failure
Sta-SW/WSW-0.95	Air Filter	11/27/90-12/04/90	Sample not collected due to mispositioned filter
Sta-SW/WSW-0.95	Air charcoal	02/13/90-02/20/90	Pump out of service vane broken
Sta-NW-1.0	Air charcoal	05/08/90-05/15/90	The LLD was not achieved due to low sample volume resulting from a power failure
Sta-E-3.5	Air charcoal	10/23/90-10/30/90	Pump out of service electrical failure
Sta-N-1.45	Air charcoal	10/23/90-10/30/90	Pump out of service pump broken
Sta-S/SSW-1.2	Air charcoal	11/13/90-11/19/90	Pump out of service bad timer
Sta-S/SSW-1.2	Air charcoal	11/19/90-11/27/90	Pump out of service bad timer

APPENDIX C

REMP PROGRAM EXCEPTIONS FOR SCHEDULED
SAMPLING AND ANALYSIS DURING 1990

Location	Description	Date of Sampling	Reasons for Loss/ Exception
Sta-N-9.4	Air charcoal	11/19/90-11/27/90	Sample not collected power out
Sta-N-1.45	Vegetation	02/13/90	Sample not analyzed** two unsuccessful attempts made to analyze sample by radiochemical method. Analysis by gamma spectroscopy gave LLD of <200 pCi/kg.
Sta-SW-13.5	Food/garden	07/31/90	Sample from control location unavailable due to drought
Sta-SW-13.5	Food/Garden	08/28/90	" " "
Sta-SW-13.5	Food/Garden	09/25/90	" " "
Sta-NNW-0.1	Surface/Drinking Water	10/23/90	LLD for Ba/La-140 was not achieved. CPSES originally failed to request a gamma spec analysis of this sample. The analysis was subsequently requested and performed on 01/16/91. This delay in counting resulted in the failure to achieve the required LLD.
Sta-N-9.9	Surface Drinking Water	10/23/90	" " "
Sta-NE-7.4	Surface Water	02/13/90	Required LLD for I-131 of 15 pCi/l was not achieved (the MDA was 16 pCi/l)
Sta-SE-1.3	TLD	10/05/90-01/09/91	TLD vandalized
Sta-SE-1.3	TLD	01/04/90-01/09/91	TLD vandalized
Sta-S-1.5	TLD	04/03/90-07/03/90	TLD vandalized

**See attached letter dated 04/02/90 providing additional explanation.

APPENDIX C

REMP PROGRAM EXCEPTIONS FOR SCHEDULED
SAMPLING AND ANALYSIS DURING 1990

Location	Description	Date of Sampling	Reasons for Loss/ Exception
Sta-S-1.5	TLD	01/04/90-01/09/91	TLD in field from 07/03/90-01/09/91

TELEDYNE ISOTOPES

50 VAN BUREN AVENUE

WESTWOOD, NEW JERSEY 07675

(201) 664-7070

April 2, 1990

Mr. Chuck Curry
TU Electric
PO Box 2300
Glen Rose, TX 76043

Dear Mr. Curry:

I am writing in response to your request for more information concerning the note on Report of Analysis, WO 3-1542. For each of the two attempts to analyze TI #94040 for I-131, each step of PRO-032-12 progressed as usual until step 5.4 (e). At that step, nothing passed through the filter. What should have remained was palladium iodide. However, upon weighing the filter, the apparent yield was several hundred percent. A copy of the procedure is enclosed.

Sincerely,

J. David Martin

J. David Martin, Ph.D.
Vice President - Technical

JDM:cm

Enc.

TELEX 134474 TDYISOT WTWD • • • EasyLink 62871[illegible] • • • FAX (201) 664-5586

APPENDIX D

EXCEEDED REPORTING LEVELS

APPENDIX D

EXCEEDED REPORTING LEVELS

1990	None of the analytical measurements exceeded any notification level.

APPENDIX E

LAND USE CENSUS

TU ELECTRIC

OFFICE MEMORANDUM

CPSES-9028426
December 07, 1990

No Response Required

TO: D. M. Bozeman 003

SUBJECT: COMANCHE PEAK STEAM ELECTRIC STATION
LAND USE CENSUS

SUPERSEDES: CPSES-9019888

The Land Use Census identifies receptors within a five (5) mile radius of the plant in each of the sixteen (16) meteorological sectors. The Land Use Census includes the following items:

1. Population by Sector and Distance
2. Nearest Resident by Sector and Distance
3. Nearest Garden by Sector and Distance
4. Nearest Milk Animal by Sector and Distance
5. A Map with an Accompanying Map Legend
6. Environmental Sampling Locations

Listed below are public use areas within the five (5) mile radius and the approximate attendance for the areas in 1989:

1. Camp Arrowhead- 3,600
2. Dinosaur State Park- 226,956
3. Glen Lake Camp- 8,000
4. Cedar Brake Girl Scout Camp- 830
5. Squaw Creek Park- 38,485
6. Kellers Camp- 7,000 March to November
7. Tres Rios Camp- 40,000
8. Oakdale Camp & Fish- 4,500
9. Oakdale Park- 69,000
10. Creation Science Museum- 12,000
11. Texas Amphitheater- Glen Rose- 10,000

G. J. Brown

G. J. Brown E02
Environmental Technician

GJB:ejp

ATTACHMENT

cc: CCS E06

Population* By Sector and Distance

Sector	Distance (Miles)					
	0-1	1-2	2-3	3-4	4-5	Total
N	-	-	3	26	71	100
NNE	-	-	8	71	21	100
NE	-	-	50	82	184	316
ENE	-	-	39	5	24	68
E	-	-	26	124	23	173
ESE	-	-	11	92	100	203
SE	-	-	47	21	26	94
SSE	-	18	32	26	2534	2610
S	-	21	8	21	103	153
SSW	-	3	3	3	50	59
SW	-	79	8	34	21	142
WSW	-	82	3	5	-	90
W	-	53	5	26	8	92
WNW	-	-	5	26	60	91
NW	-	-	5	-	-	5
NNW	-	-	3	26	11	40
TOTAL	-	256	256	588	3236	4336

* Based on an average of 2.4 residents per house. (Obtained from North Central Texas Council of Governments, 1989 based on an average from 2.6 for single family, 1.8 for mobile home residences, 2.66 for multi-family.

(1) Includes permanent residents at Happy Hills Children's Home.

(2) Includes permanent residents at Camp Arrowhead.

Nearest Resident by Sector and Distance

Sector	Distance (Miles)
N	2.2
NNE	2.3
NE	2.3
ENE	2.4
E	2.4
ESE	2.3*
SE	2.0*
SSE	1.6
S	1.6
SSW	1.9
SW	1.0
WSW	1.0
W	1.5
WNW	2.0
NW	2.7*
NNW	2.7

* Denote change from previous year

Nearest Garden by Sector and Distance

Sector	Distance (Miles)
N	None
NNE	2.4
NE	2.7
ENE	2.6*
E	None*
ESE	2.3
SE	2.5
SSE	4.8*
S	4.3*
SSW	None
SW	2.1*
WSW	1.1*
W	1.5
WNW	3.0
NW	None
NNW	4.9*

* Denotes change from previous year

Nearest Milk Animal by Sector and Distance

Sector	Distance (Miles)
SSE	2.2
S	4.2*
SW	4.7*
NNW	4.5
NE	4.2*
All other Sectors	None

* Denotes change from previous year, additional milk animals identified in 1989 at locations WNW 4.0 and NNE 4.5 were not identified in 1990.

EVALUATION OF 1990 LAND USE CENSUS

The results of the 1990 Land Use Census were reviewed for impact on the Radiological Environmental Monitoring Program (REMP). The sampling program requirements that could be affected by changes in land use are:

(1) Milk -

ODCM Table 3.12-1 requires that samples be obtained from milking animals in three locations within 5 km having the highest potential dose. If none are available, samples are acceptable from milking animals in locations 5 to 8 km distant where doses are calculated to be greater than 1 mrem per year. A sample is also required at a control location.

Currently, milk samples are collected at one indicator location (SSE-2.2) and at a control location.

(2) Food Products -

ODCM Table 3.12-1 requires that one sample of each principal class of food product be collected from any area that is irrigated with water in which liquid plant wastes have been discharged.

Currently, food products are sampled from two indicator locations (ENE-9.0, Pecans; E-4.2, vegetables) and one control location.

(3) Broadleaf Vegetation -

ODCM Table 3.12-1 requires a sample of broadleaf vegetation from each of two offsite locations of highest predicted annual average D/Q if milk sampling is not performed at all required locations.

Currently, broadleaf vegetation samples are collected at two indicator locations (N-1.45 and SW-1.0) and one control location. These locations are near the site boundary in sectors where broadleaf is available and D/Q is greatest.

Based on these requirements, the milk animals identified at locations S-4.2, SW-4.7, NE-4.2 and WNW-4.5 were evaluated for possible inclusion in the REMP. Chemistry and Environmental Personnel have determined that these milk animals are not milked and are not available for sampling. Therefore, no changes to the milk sampling locations of the REMP are required.

Of the gardens that were identified, no new gardens were identified that are irrigated with water in which liquid plant wastes are discharged. Therefore, no change to the REMP is required.

Finally, since broadleaf vegetation is currently collected at the site boundary, no changes to broadleaf sampling locations are required. There are no identified locations closer to the plant.

In summary, the 1990 Land Use Census did not identify any new locations that are available for sampling and would yield a calculated dose greater than at a location from which samples are currently obtained. Therefore, changes to the REMP sampling locations described in ODCM, Part II, Section 3.1, are not required.

Although no required changes to the REMP sampling locations were identified, changes to the controlling receptor locations and pathways, and associated atmospheric dispersion parameters were given in ODCM, Part II, Tables 2.4 and 2.5 were identified. These parameters are used in dose calculations required by Radiological Effluent Control 4.11.2.3. Tables 2.4 and 2.5 will be revised to reflect the 1990 Land Use Census data.

Evaluation Performed By: Douglas C. Kuy Date: 12-14-90
Health Physicist