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Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: Clinton Power Station
Annual Radiological Environmental Operating Report

Dear Sir:

Illinois Power Company is submitting the 1993 Annual Radiological Environmental Operating Report for Clinton Power Station. This submittal is provided in accordance with the requirements of Section 6.9.1.6 of Clinton Power Station Technical Specifications.

Sincerely yours,

Richard F. Phares
Director, Licensing

SFB/csm

Attachment

cc: NRC Clinton Licensing Project Manager
NRC Resident Office, V-690
Regional Administrator, Region III, USNRC
Illinois Department of Nuclear Safety

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ILLINOIS POWER

Clinton Power Station 1993 Radiological Environmental Monitoring Report

1993

RADIOLOGICAL ENVIRONMENTAL MONITORING REPORT

FOR THE

CLINTON POWER STATION

Prepared by

Radiological Environmental Group

Radiation Protection Department

May 1, 1994

TABLE OF CONTENTS

ITEM	PAGE
LIST OF TABLES	iii
LIST OF FIGURES	iv
I. EXECUTIVE SUMMARY	1
II. INTRODUCTION	3
A. Characteristics of Radiation	3
B. Sources of Radiation Exposure	5
C. Description of the Clinton Power Station	12
D. Nuclear Reactor Operations	13
E. Containment of Radioactivity	17
F. Sources of Radioactive Effluents	18
G. Radioactive Waste Processing	19
III. RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM (REMP)	21
A. Program Description	21
B. Direct Radiation Monitoring	43
C. Atmospheric Monitoring	49
D. Aquatic Monitoring	57
° Fish	57
° Shoreline Sediments	58
° Bottom Sediments	59
° Aquatic Vegetation (Periphyton)	60
E. Terrestrial Monitoring	61
° Milk	62
° Grass	62
° Vegetables	65
° Meat	66
° Soil	66
F. Water Monitoring	66
° Drinking Water	67
° Surface Water	67
° Well Water	75
G. Quality Assurance Program	79
H. Changes to the REMP During 1993	79

TABLE OF CONTENTS (Cont'd)

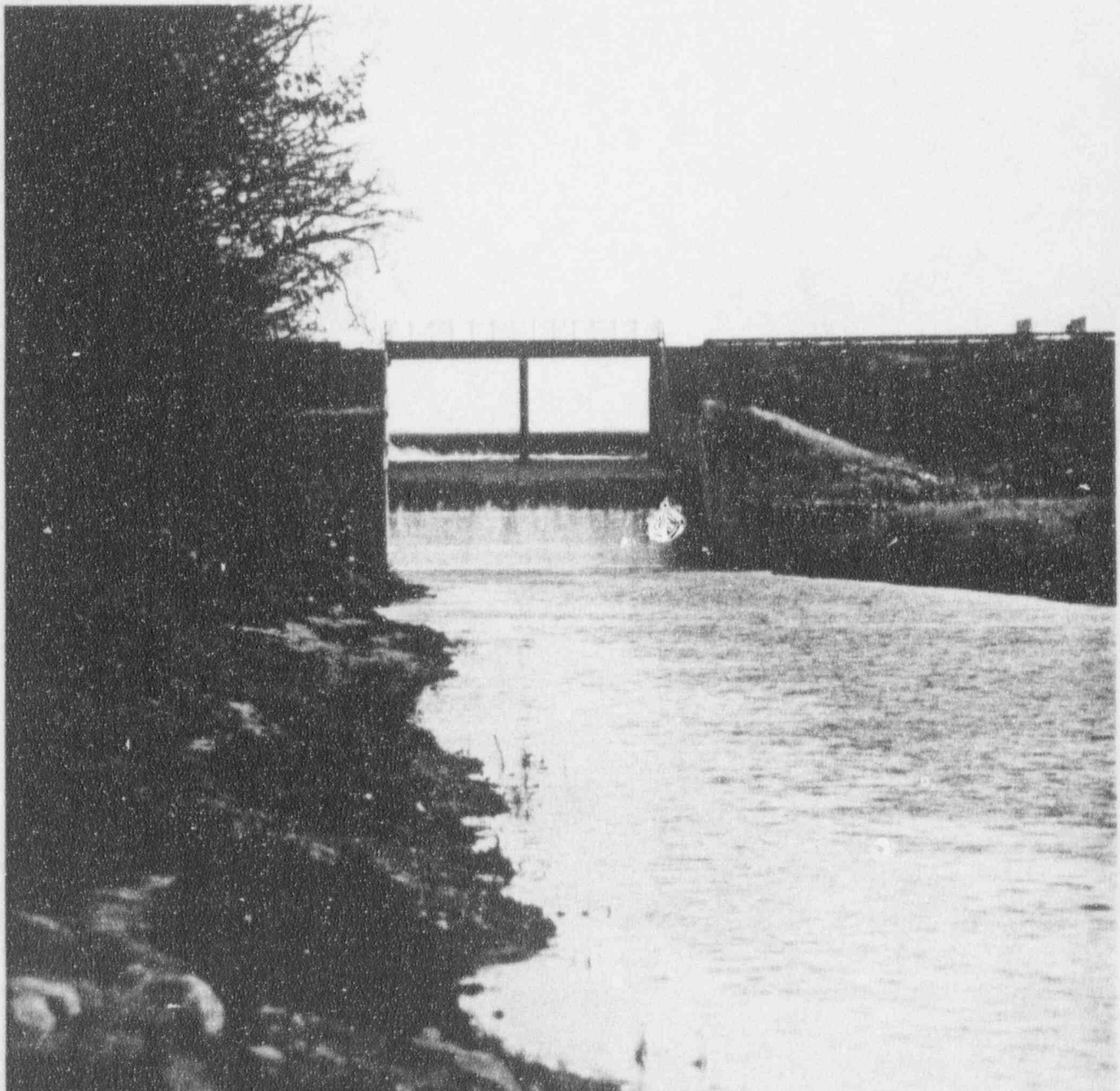
ITEM	PAGE
IV. ANNUAL LAND USE CENSUS	81
° Summary of Changes Identified in 1993 Annual Land Use Census	83
V. METEOROLOGICAL CHARACTERISTICS	85
A. Description	85
VI. NON-RADIOLOGICAL ENVIRONMENTAL PROGRAMS	99
VII. LIST OF REFERENCES	103
VIII. APPENDICES	107
A. Exceptions to the REMP During 1993	107
B. REMP Sample Collection and Analysis Methods	115
C. Glossary	143
D. CPS Radiological Environmental Monitoring Quality Control Check Results 1993	147
E. CPS Radiological Environmental Monitoring Results during 1993	159

LIST OF TABLES

TABLE	SUBJECT	PAGE
1	Common Sources of Radiation	9
2	1993 Radionuclide Composition of CPS Effluents	19
3	Clinton Power Station Sample Codes	35
4	REMP Sample Locations	37
5	Average Quarterly TLD Results	44
6	Quarterly Average TLD Results	49
7	Average Gross Beta Concentrations in Air Particulates	52
8	Average Monthly Gross Beta Concentrations in Air Particulates	53
9	Average Gross Beta Concentrations in Drinking, Surface and Well Water	76
10	1993 Annual Land Use Census	81
11	Classification of Atmospheric Stability	87
12	Joint Wind Frequency Distribution By Stability Class	88
13	Fish Stocking of Clinton Lake	100

LIST OF FIGURES

FIGURE	SUBJECT	PAGE
1	Dose Contributions to the U. S. Population from Principal Sources of Radiation Exposure	9
2	Clinton Power Station Basic Plant Schematic	15
3	Potential Exposure Pathways of Man Due to Releases of Radioactive Material to the Environment	23
4	REMP Sample Locations within 1 Mile	27
5	REMP Sample Locations from 1 - 2 Miles	29
6	REMP Sample Locations from 2 - 5 Miles	31
7	REMP Sample Locations Greater than 5 Miles	33
8	Direct Radiation Comparison	47
9	Air Particulate Gross Beta Activity Comparison	55
10	Strontium-90 Activity in Milk	63
11	Drinking Water Gross Beta Activity Comparison	69
12	Surface Water Gross Beta Activity Comparison	73
13	Well Water Gross Beta Activity Comparison	77
14	1993 Clinton Power Station 10 Meter Wind Rose	95
15	1993 Clinton Power Station 60 Meter Wind Rose	97



EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

This report describes the Annual Radiological Environmental Monitoring Program (REMP) conducted near the Clinton Power Station (CPS) during the 1993 calender year. The REMP was performed as required by the CPS Operating License issued by the United States Nuclear Regulatory Commission. The objective of the REMP is to assess any radiological impact upon the surrounding environment due to the operation of the Clinton Power Station.

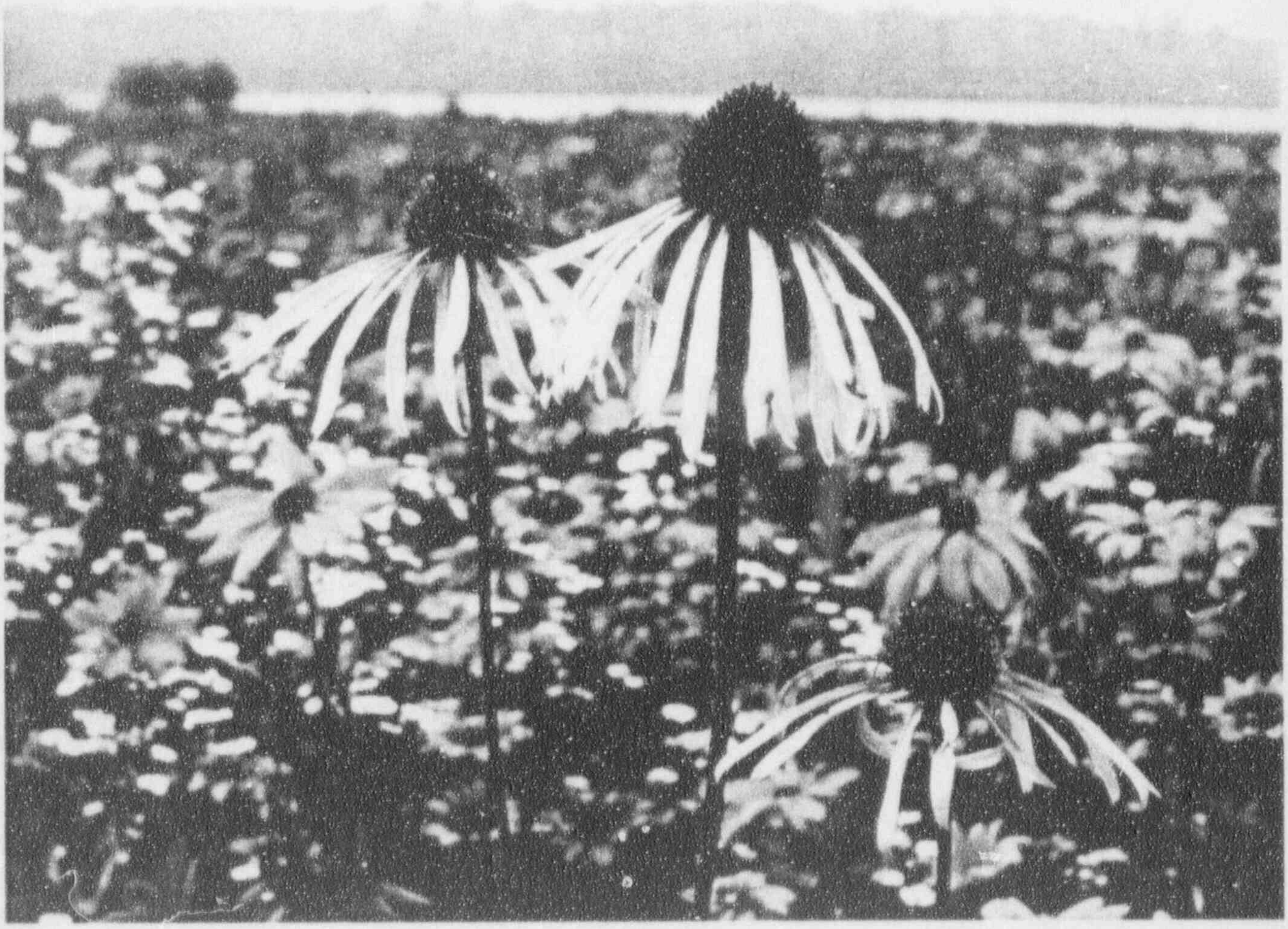
During 1993, over 1,700 environmental samples were collected. These samples represented direct radiation; atmospheric, terrestrial, and aquatic environments; and Clinton Lake surface water and public drinking water supplies. More than 2,300 analyses were performed on these environmental samples.

Results of the analyses showed natural radioactivity and radioactivity attributed to other historical nuclear events (i.e., fallout from nuclear weapons testing and the 1986 Russian reactor accident at Chernobyl). The radioactivity levels detected were similar to the preoperational results. The CPS Preoperational REMP Report documented natural background radionuclides and man-made radioactivity in the environment surrounding CPS prior to plant operations.

Radiological environmental measurements taken during 1993 demonstrated that operational and engineered controls on the radioactive effluents released from the plant functioned as designed. Any radioactivity that was detected in the environment at indicator locations was appropriately compared with both the measurements at control locations (sample locations not affected by station operations) and preoperational results.

Releases of gaseous radioactive materials were accurately measured in plant effluents. **There were no radioactive liquid releases during 1993.** Also, there were no gaseous releases that came close to approaching the limits specified in the CPS Offsite Dose Calculation Manual (ODCM). The highest calculated total body dose received by a member of the public due to the release of radioactive materials in gaseous effluents from Clinton Power Station was 0.00274 mRem.

All comparisons among operational data and preoperational data showed that the operation of Clinton Power Station had no measurable effect upon the environment in 1993.



INTRODUCTION

II. INTRODUCTION

The Radiological Environmental Monitoring Program (REMP) at Clinton Power Station (CPS) is designed to monitor the environment surrounding the plant for any radioactive material that may be released by CPS as a result of plant operations. The primary concern is what impact, if any, the radioactive materials released from CPS have on the general public. This report is prepared in a way that is useful to a specialized scientific community. However, this introduction, the explanations in later sections, and minimal use of technical terms are all designed to make this report understandable and useful to those with no background in environmental monitoring.

A. CHARACTERISTICS OF RADIATION

Atoms whose nuclei contain an excess of energy are called radioactive atoms. They release this excess energy by expelling electromagnetic or particulate radiation from their atomic centers to become stable (non-radioactive). This process is called "radioactive decay". X-rays and gamma rays are examples of electromagnetic radiation and are similar in many ways to visible light, microwaves and radio-waves. Particulate radiation may be either electrically charged such as alpha and beta particles, or has no charge, like neutrons.

The term "half-life" refers to the time required for half of a given amount of a radionuclide to decay. Some radionuclides have a half-life as short as a fraction of a second, while others have a half-life as long as a million years. Radionuclides may decay directly into stable elements or may undergo a series of decays which ultimately end up reaching a stable element.

Radionuclides are found in nature (e.g., radioactive uranium, thorium, carbon and potassium), and may also be produced artificially in accelerators and nuclear reactors (e.g., radioactive iodine, cesium and cobalt).

NATURALLY OCCURRING RADIONUCLIDES	MAN-MADE RADIONUCLIDES
Uranium	Iodine
Thorium	Cesium
Carbon	Cobalt
Potassium	Strontium
Lead	Barium

The activity of a radioactive source is the average number of nuclear disintegrations (decay) of the source per unit of time. The unit of activity is called the curie. A one curie radioactive source undergoes 2.2 trillion disintegrations per minute, but in the realm of nuclear power plant effluents and environmental radioactivity, this is a large unit. Therefore, two fractional units, the microcurie and the picocurie, are more commonly used.

1 curie (Ci)	= 2,220,000,000,000	disintegrations/minute
1 millicurie (mCi)	= 2,220,000,000	disintegrations/minute
1 *microcurie* (μCi)	= 2,220,000	disintegrations/minute
1 nanocurie (nCi)	= 2,220	disintegrations/minute
1 *picocurie* (pCi)	= 2.22	disintegrations/minute

The microcurie (uCi) is one millionth of a curie (Ci) and represents 2.2 million decays per minute. The picocurie (pCi) is one millionth of a microcurie and represents 2.2 decays per minute. Another way of comparing the pCi and the Ci is by analogy with distances. A picocurie would be the width of a pencil mark while a curie would be 100 trips around the earth.

Radioactivity is related to the half-life and the atomic mass of a radionuclide. For example, Uranium-235 (U-235) with a half-life of 704 million years requires about 462,400 grams to obtain an activity of one curie. But iodine-131 (I-131) with a half-life of 8.04 days only requires about 0.000008 grams to produce an activity of one curie.

Any mechanisms that can supply the energy necessary to ionize an atom, break a chemical bond, or alter the chemistry of a living cell is capable of producing biological damage. Electromagnetic and particulate radiation can produce cellular damage in any of these ways. In assessing the biological effects of radiation, the type, energy, and amount of radiation must be considered.

External total body radiation involves exposure of all organs. Most background exposures are of this form. When radioactive elements enter the body through inhalation or ingestion, their distribution may not be uniform.

TARGET TISSUE	*NUCLIDE*
Thyroid	Iodine-131
Muscle and Liver Tissue	Cesium-137
Bone	Strontium-90
Kidney	Uranium-235
Gastrointestinal Tract	Cobalt-60

For example, radioiodine selectively concentrates in the thyroid gland, whereas radiocesium collects in muscle and liver tissue, and radiostrontium collects in mineralized bone. The total dose to organs by a given radionuclide is also influenced by the quantity and the duration of time that the radionuclide remains in the body. Owing to radioactive decay and human metabolism factors, some radionuclides stay in the body for very short times while others remain for years.

The amount of radiation dose that an individual receives is expressed in rem. Since human exposure to radiation usually involves very small exposures, the millirem (mrem) is the unit most commonly used. One millirem is one thousandth of a rem.

1 millirem = 0.001 Rem

B. *SOURCES OF RADIATION EXPOSURE*

Many sources of radiation exposure exist. The most common and least controllable source is natural background radiation from cosmic rays and the earth which mankind has always lived with and always will. Every second of our lives, over seven thousand atoms undergo radioactive decay in the body of the average adult.

Radioactive elements have always been a part of our planet and everything that has come from the earth, including our own bodies is, therefore, naturally radioactive.

Natural Radionuclides In The Earth's Crust

Potassium-40 (K-40)	Radium-226 (Ra-226)
Uranium-238 (U-238)	Radon-222 (Rn-222)
Thorium-232 (Th-232)	Lead-204 (Pb-204)

Radioactive materials found in the Earth's crust today consists of radionuclides such as potassium-40, uranium-238, thorium-232, radium-226 and radon-222. These radionuclides are introduced into the water, soil and air by such natural processes as volcanic activity, weathering, erosion and radioactive decay.

Some of the naturally occurring radionuclides, such as radon, are a significant source of radiation exposure to the general public. Radioactive radon is a chemically inert gas produced naturally in the ground as a part of the uranium and thorium decay series. Radon continues to undergo radioactive decay, producing new naturally radioactive materials called "radon daughters". These new materials, which are solid particles, not gases, can stick to surfaces such as dust particles in the air.

Concentrations of radon in air are variable and are affected by concentrations of uranium and thorium in soil, as well as, altitude, soil porosity, temperature, pressure, soil moisture, rainfall, snow cover, atmospheric conditions, and season. Radon can move through cracks and openings into basements of buildings and become trapped in a small air volume indoors. Thus, indoor radon concentrations are usually higher than those found outdoors. Building materials such as cinder blocks and concrete are radon sources. Radon can also be dissolved in well water and contribute to airborne radon in houses when released through showers or washing.

Dust containing radon daughter particles can be inhaled and deposited on the surface of an individual's lung. Radon daughters emit high energy alpha radiation dose to the lung lining. Table 1 shows the average annual effective dose due to radon.

About three hundred cosmic rays originating from outer space pass through each person every second.

Cosmic-Ray-Activated Radionuclides

Beryllium-7 (Be-7)	Tritium (H-3)
Beryllium-10 (Be-10)	Sodium-22 (Na-22)
Carbon-14 (C-14)	Phosphorus-32 (P-32)

The interaction of cosmic rays with atoms in the earth's atmosphere produces radionuclides such as Beryllium-7, Beryllium-10, Carbon-14, tritium, and Sodium-22. Portions of these radionuclides become deposited on land or in water while the remainder stay suspended in the atmosphere.

Consequently, there are natural radioactive materials in the soil, water, air and building materials that contribute to radiation doses to the human body. Natural drinking water contains trace amounts of uranium and radium; milk contains measurable amounts of potassium-40. Sources of natural radiation and their average contributing radiation doses are summarized in Table 1. Figure 1 graphically shows the percentage contribution from principal sources of radiation exposure to the general population of the United States. Radiation exposure levels from natural radiation fluctuate with time and also can vary widely from location to location. The average individual in the United States receives approximately three hundred mrem per year from natural sources.

In some areas of the country, the dose from natural radiation is significantly higher. Residents of Colorado, five thousand feet above sea level, receive additional dose due to the increase in cosmic and terrestrial radiation levels. In fact, for every one thousand feet in elevation above sea level, an individual will receive an additional one mrem per year from cosmic radiation. In several areas of the world, high concentrations of mineral deposits result in natural background radiation levels of several thousand mrem per year.

In addition to natural background radiation, the average individual is exposed to radiation from a number of man-made sources. The largest of these sources come from medical diagnosis: X-rays, CAT-scans, fluoroscopic examinations and radio-pharmaceuticals. Approximately 160 million people in the United States are exposed to medical or dental X-rays in any given year. The annual dose to an individual from such irradiation averages 53 mrem.

TABLE 1

COMMON SOURCES OF RADIATION

A. Average Annual Effective Dose Equivalent to the U.S. Population

1. Natural Sources	mrem
a. Radon	200
b. Cosmic, Terrestrial, Internal	100
2. Man-Made Sources	**mrem**
a. Medical	
X-ray Diagnosis	39
Nuclear Medicine	14
b. Consumer Products	10
c. Occupational	1
d. Miscellaneous Environmental	<1
e. Nuclear Fuel Cycle	<1
Approximate Total	360

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PERCENTAGE OF CONTRIBUTION

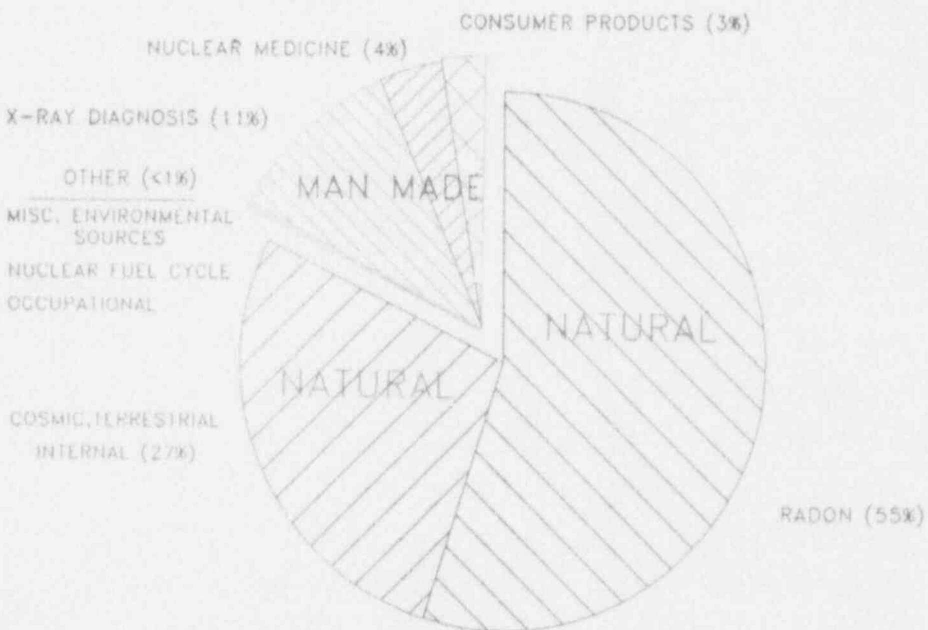


FIGURE 1: DOSE CONTRIBUTIONS TO THE U.S. POPULATION FROM PRINCIPAL SOURCES OF RADIATION EXPOSURE

Smaller doses from man-made sources come from consumer products (e.g., television, smoke detectors, fertilizers), fallout from prior nuclear weapons tests, and production of nuclear power and its associated fuel cycle.

"Fallout" commonly refers to the radioactive debris that settles to the surface of the earth following the detonation of nuclear weapons. Fallout is dispersed throughout the environment but can be washed down to the Earth's surface by rain or snow.

Radionuclides Found in Fallout

Iodine-131 (I-131)	Strontium-90 (Sr-90)
Strontium-89 (Sr-89)	Cesium-137 (Cs-137)

There are approximately two hundred radionuclides produced in the nuclear weapon detonation process; a number of these are detected in fallout. The radionuclides found in fallout that produce most of the fallout radiation exposures to man are iodine-131, strontium-89, strontium-90, and cesium-137.

C. *DESCRIPTION OF THE CLINTON POWER STATION*

The Clinton Power Station is located in Harp Township, DeWitt County, Illinois. It is approximately six miles east of Clinton, Illinois.

The station, its V-shaped cooling lake, and the surrounding Illinois Power Company-owned land encloses 14,182 acres. This includes the 4,895-acre, man-made cooling lake and about 90 acres of privately owned property. The plant is sited on approximately 150 acres on the northern arm of the lake. The cooling water discharge flume, which discharges to the eastern arm of the lake, occupies an additional 130 acres. Although the nuclear reactor, supporting equipment, and associated electrical generation and distribution equipment lie in Harp Township, portions of the 14,182 acres lie in Wilson, Rutledge, DeWitt, Creek, Nixon and Santa Anna Townships.

The cooling lake was formed by constructing an earthen dam near the confluence of Salt Creek and the North Fork of Salt Creek. The resulting lake has an average depth of 15.6 feet, and includes an ultimate heat sink of about 590 acre feet. The ultimate heat sink provides sufficient water volume and cooling capacity for approximately thirty days of operation without makeup water.

Through arrangements with the Illinois Department of Conservation, Clinton Lake and much of the area immediately adjacent to the lake are used for public recreation activities, including swimming, boating, water-skiing, hunting and fishing. Recreational facilities exist at Clinton Lake and accommodate up to 11,460 people per day during peak usage periods. The outflow from Clinton Lake falls into Salt Creek and flows in a westerly direction for about 56 miles before joining the Sangamon River. The Sangamon River drains into the Illinois River which enters the Mississippi River near Grafton, Illinois. The nearest use of downstream water for drinking purposes is 242 river miles downstream of Clinton Lake at Alton, Illinois, as verified from the Illinois Environmental Protection Agency Public Water Service. Although some farms in the Salt Creek drainage area downstream of Clinton Lake use irrigation, the irrigation water is drawn from wells, not from the waters of Salt Creek.

Approximately 810,000 individuals live within 50 miles of the Clinton Power Station. Over half are located in the major metropolitan centers of Bloomington-Normal (located about 23 miles north northwest), Champaign-Urbana (located about 31 miles east), Decatur (located about 22 miles south southwest) and Springfield (located about 48 miles west southwest). The nearest city is Clinton, the county seat of DeWitt County, located about 6 miles west of the station. The estimated population of Clinton is about 8,000 people. Outside of the urban areas, most of the land within 50 miles of the Clinton Power Station is used for farming. The principal crops grown are corn and soybeans.

D. *NUCLEAR REACTOR OPERATIONS*

The fuel of a nuclear reactor is made of the element uranium in the form of uranium oxide. The fuel produces power by the process called "fission". In fission, the uranium atom absorbs a neutron and splits to produce fission products, heat, radiation and free neutrons. The free neutrons travel in the reactor core and further absorption of neutrons by uranium permits the fission process to continue. As the fission process continues, more fission products, radiation, heat and neutrons are produced and a sustained reaction occurs. The heat produced is extracted from the fuel to produce steam that drives a turbine generator to produce electricity.

The fission products are predominantly radioactive. They are unstable elements that emit radiation as they change from unstable to stable elements. Neutrons that are not absorbed by the uranium fuel may be absorbed by stable atoms in the materials that make up the components and structures of the reactor. In such cases, stable atoms often become radioactive. This process is called "activation" and the radioactive atoms which result are called "activation products".

Fission Products	*Activation Products*
Cesium-134 (Cs-134)	Cobalt-60 (Co-60)
Cesium-137 (Cs-137)	Manganese-54 (Mn-54)
Ruthenium-106 (Ru-106)	Iron-55 (Fe-55)
Barium-140 (Ba-140)	Iron-59 (Fe-59)
Cerium-144 (Ce-144)	Zinc-65 (Zn-65)
Strontium-89 (Sr-90)	Tritium (H-3)

The reactor at the Clinton Power Station is a boiling water reactor (BWR). Figure 2 provides a basic plant schematic for the Clinton Power Station and shows the separation of the cooling water from plant systems. In this type of reactor the fuel is formed into small ceramic pellets that are loaded into sealed fuel rods.

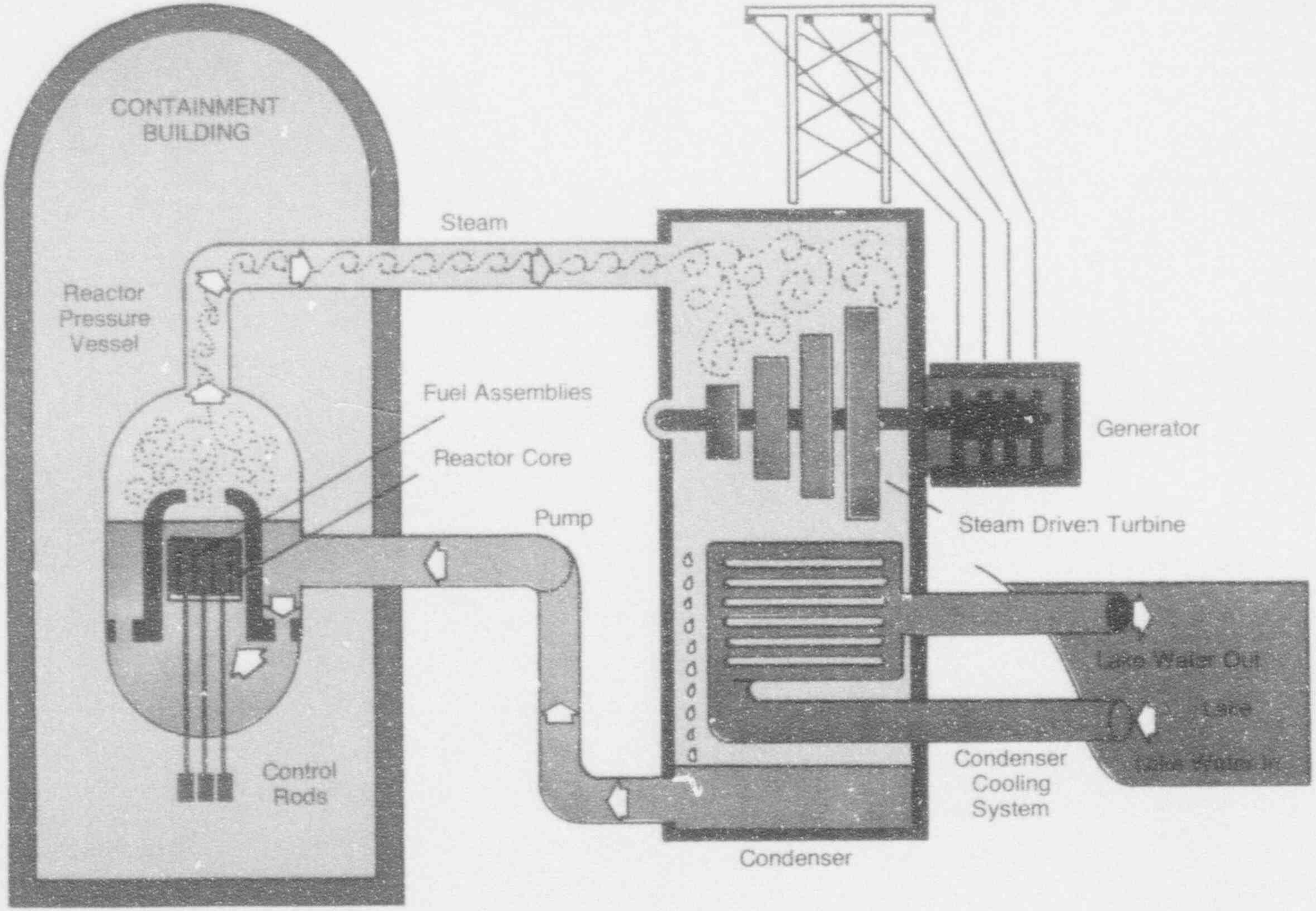


FIGURE 2: CLINTON POWER PLANT BASIC PLANT SCHEMATIC

The fuel rods are arranged in arrays called bundles that are supported within a massive steel reactor vessel.

The spaces between the fuel rods are filled with water. The heat released during the fission of fuel atoms is transferred to the water surrounding the fuel rods. A type of pump that contains no moving parts (a jet pump), and recirculation pumps are used to force the water to circulate through the fuel bundles to assure even cooling of the fuel rods. As the water absorbs heat from the fuel rods some of it is changed to steam. The steam is used to drive a turbine which is coupled to a generator, thereby completing the conversion of the energy released during fission to electricity.

After the steam passes through the turbine it is condensed back to water and returned to the reactor vessel to repeat the process. As the water circulates through the reactor pressure vessel, corrosion allows trace quantities of the component and structure surfaces to get into the water. The corroded material also contains radioactive substances known as activated corrosion products. Radioactive fission and activation products are normally confined to the primary system although small leaks from the primary system may occur.

E. *CONTAINMENT OF RADIOACTIVITY*

Under normal operating conditions, essentially all radioactivity is contained within the first of several barriers that collectively prevent escape of radioactivity to the environment.

The fuel cladding (metal tubes) provides the first barrier. The ceramic fuel pellets are sealed within zircaloy metal tubes. There is a small gap between the fuel and the cladding where the noble gases and volatile nuclides collect.

The reactor pressure vessel and the steel piping of the primary coolant system provide the second barrier. The reactor pressure vessel is a seventy-foot high vessel with steel walls ranging from four to seven inches thick which encase the reactor core. The reactor pressure vessel and the steel piping provide containment for all radionuclides in the primary coolant.

The Containment Building provides the third barrier. The Containment Building has steel-lined, four-foot-thick reinforced concrete walls which completely enclose the reactor pressure vessel and vital auxiliary equipment. This structure provides a third line of defense against the uncontrolled release of radioactive materials to the environment. The massive concrete walls also serve to absorb much of the radiation emitted during reactor operation or from radioactive materials created during reactor operations.

F. *SOURCES OF RADIOACTIVE EFFLUENTS*

In a normal operating nuclear power plant, most of the fission products are retained within the fuel and fuel cladding. However, the fuel manufacturing process leaves traces of uranium on the exterior of the fuel tubes. Fission products from the eventual fission of these traces may be released to the primary coolant. Other small amounts of radioactive fission products are able to diffuse or migrate through the fuel cladding and into the primary coolant. Trace quantities of the corrosion products from component and structural surfaces that have been activated, also get into the primary coolant.

Many soluble fission and activation products such as radioactive iodines, strontiums, cobalts and cesiums are removed by demineralizers in the purification systems. The noble gas fission products, activated atmospheric gases introduced with reactor feedwater, and some of the volatile fission products such as iodine and bromine, are carried from the reactor pressure vessel to the condenser with the steam.

The steam jet air ejectors or the condenser vacuum pump remove the gases from the condenser and transfer them to the off-gas treatment system. In the off-gas treatment system the gases are held up by adsorption on specially treated charcoal beds to allow the radioactive gases to decay before they are released through the main ventilation exhaust stack.

Small releases of radioactive liquids from valves, piping, or equipment associated with the primary coolant system may occur in the Containment, Auxiliary, Turbine, RadWaste and Fuel Buildings. The noble gases become part of the gaseous wastes while the remaining radioactive liquids are collected in sumps and processed for reuse. Processed primary coolant water that does not meet chemical specifications for reuse may also become waste water. These represent the principal sources of liquid effluents.

Table 2 summarizes the composition of radioactive gaseous effluents released from the Clinton Power Station during 1993. **There were no liquid radioactive effluents released during 1993.** The highest calculated total body dose received by a member of the public due to the release of these radioactive materials was 0.00274 mrem. This is compared to the 93 mrem per year received in Central Illinois due to natural background radiation.

TABLE 2

1993 RADIONUCLIDE COMPOSITION OF CPS EFFLUENTS[a]

Radionuclide	Half-life	Gaseous Effluents(Ci)
Gross Alpha	NA	0.000000279
Tritium (H-3)	12.3y	11.4
Argon-41	1.83h	3.78
Chromium-51	27.7d	0.0177
Manganese-54	312.7d	0.000186
Cobalt-58	70.8d	0.000111
Cobalt-60	5.3y	0.000338
Krypton-85	10.7y	2.47
Krypton-85m	4.48h	0.182
Krypton-87	76.3m	0.0106
Strontium-89	50.6d	0.0000616
Xenon-131m	11.8d	0.00146
Xenon-133	5.25d	0.146
Xenon-133m	2.19d	0.000147
Xenon-135	9.11h	0.757
Xenon-135m	15.36m	1.00
Iodine-131	8.0d	0.000127
Iodine-133	20.8h	0.000218
Total		19.8

a There were no liquid radioactive effluents released during 1993.

G. *RADIOACTIVE WASTE PROCESSING*

In a normal operating nuclear power plant, radioactive liquid and gaseous wastes are collected, stored and processed through treatment systems to remove or reduce most of the radioactivity (excluding tritium) prior to reuse within the plant or discharge to the environment. These processing systems are required by the Clinton Power Station Offsite Dose Calculation Manual to be installed and operable to help ensure all releases of radioactive liquid and gaseous effluents are As Low As Reasonably Achievable (ALARA).

The liquid waste treatment systems consist of filters, demineralizers and evaporators. Liquid wastes are routed through the waste evaporators to be degassed and distilled thereby reducing their volume and concentrating their radioactivity. The distillates are further treated through demineralizers and filters and transferred to the waste evaporator condensate storage tanks. Liquid wastes are processed through the appropriate portions of the liquid waste treatment system to provide assurance that the releases of radioactive materials in liquid effluents will be kept ALARA.

Liquid wastes are discharged into the plant cooling water stream which varies from approximately 5,000 gallons per minute, when the plant is in shutdown, to 567,000 gallons per minute, when the plant is at full power. The liquid effluents are thoroughly mixed with and diluted by the plant cooling water as it travels the 3.4 miles of the discharge canal before it enters Clinton Lake east of DeWitt County Road 14.

The Clinton Power Station Offsite Dose Calculation Manual requires that liquid effluents not contain a higher concentration of any radioisotope than that which is set for continuous exposure to the general public. This condition is satisfied at the point the liquid effluent is first introduced into the cooling water flow. The additional dilution that occurs in the cooling water canal reduces the concentrations of radioisotopes to between 1/73 (minimum flow) and 1/1890 of their original value before the water enters Clinton Lake.

The concentrated radioactive solids captured in the liquid waste treatment system are solidified and shipped off-site for disposal at licensed low-level waste disposal facilities.

The gaseous effluents from the main condenser are held up in the off-gas charcoal beds for at least 46 hours. This provides time for the decay of most of the radionuclides present since most have a half-life of less than 8 hours. If gaseous effluents in the ventilation exhaust system for the Containment Building and for the Secondary Containment structure exceed conservatively set levels, they are processed through charcoal beds and high efficiency particulate air filters in the Standby Gas Treatment System before being discharged to the environment. This combination of filters and charcoal beds is rated to be 95% efficient for removing iodines and greater than 99% efficient for removing particulate material larger than one micron (one millionth of an inch) in diameter.

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

III.

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

A. Program Description

The Clinton Power Station is required to maintain a radiological environmental monitoring program in accordance with the Code of Federal Regulations (CFR) Title 10, Section 20.1501 and Criterion 64 of CFR Title 10, Part 50, Appendix A. The program was developed using the following guidance published by the United States Nuclear Regulatory Commission (USNRC):

- Regulatory Guide 4.1, "Programs for Monitoring Radioactivity in the Environs of Nuclear Power Plants"
- USNRC Radiological Assessment Branch Technical Position on Radiological Environmental Monitoring (1979)

The Radiological Environmental Monitoring Program is an extensive program of sampling, measuring and analyzing that was instituted to monitor the radiological impact of reactor operation on the environment. Objectives of the program include:

- identification, measurement and evaluation of existing radionuclides in the environs of the Clinton Power Station and fluctuations in radioactivity levels which may occur
- evaluation of the measurements to determine the impact of Clinton Power Station operations on the local radiation environment
- collection of data needed to refine environmental radiation transport models used in offsite dose calculations
- verification that radioactive material containment systems are functioning to minimize environmental releases to levels that are ALARA
- demonstration of compliance with regulations and the Clinton Power Station Offsite Dose Calculat[illegible] Manual.

Implicit in these objectives are the requirements to trend and assess radiation exposure rates and radioactivity concentrations in the environment that may contribute to radiation exposure to the public. The program consists of two phases, preoperational (preop) and operational.

The preoperational portion of the program was initiated in May, 1980 and was completed on February 27, 1987 to establish the baseline for the local radiation environment. Assessment of the operational impact of the Clinton Power Station on the radiation environment is based on data collected since the beginning of reactor operation. The operational phase implements confirmatory measurements to verify that the in-station controls for the release of radioactive material are functioning as designed.

Illinois Power Company maintains a contract with Teledyne Brown Engineering Environmental Services Midwest Laboratory (TBEESML), formerly Teledyne Isotopes Midwest Laboratory (TIML), for analysis of all radiological environmental samples. TBEESML is located in Northbrook, Illinois. Samples are collected by Illinois Power Company personnel and shipped to TBEESML for analysis. After analysis, environmental samples are saved at TBEESML for a specified period of time in case additional analysis is required. Analytical results are reported monthly to the Clinton Power Station and reviewed by company radiation protection personnel.

Current regulatory guidance recommends evaluating direct pathways, or the highest trophic level in a dietary pathway, that contribute to an individual's dose. Figure 3 shows the basic pathways of gaseous and liquid radioactive effluents to man. The "important pathways" selected are based primarily on how radionuclides move through the environment and eventually expose individuals, as well as man's use of the environment. The scope of the program includes the monitoring of five environmental compartments:

- °direct radiation
- °atmospheric
- °aquatic
- °terrestrial environments
- °ground and surface water.

Each pathway is monitored at "indicator" and "control" locations. Indicator locations are generally within the 10-mile radius of the station. Control locations are located at least ten miles from the plant, far enough to be unaffected by plant operations. An increase in dose rate or radioactive material concentration at an indicator location may be due to plant operations.

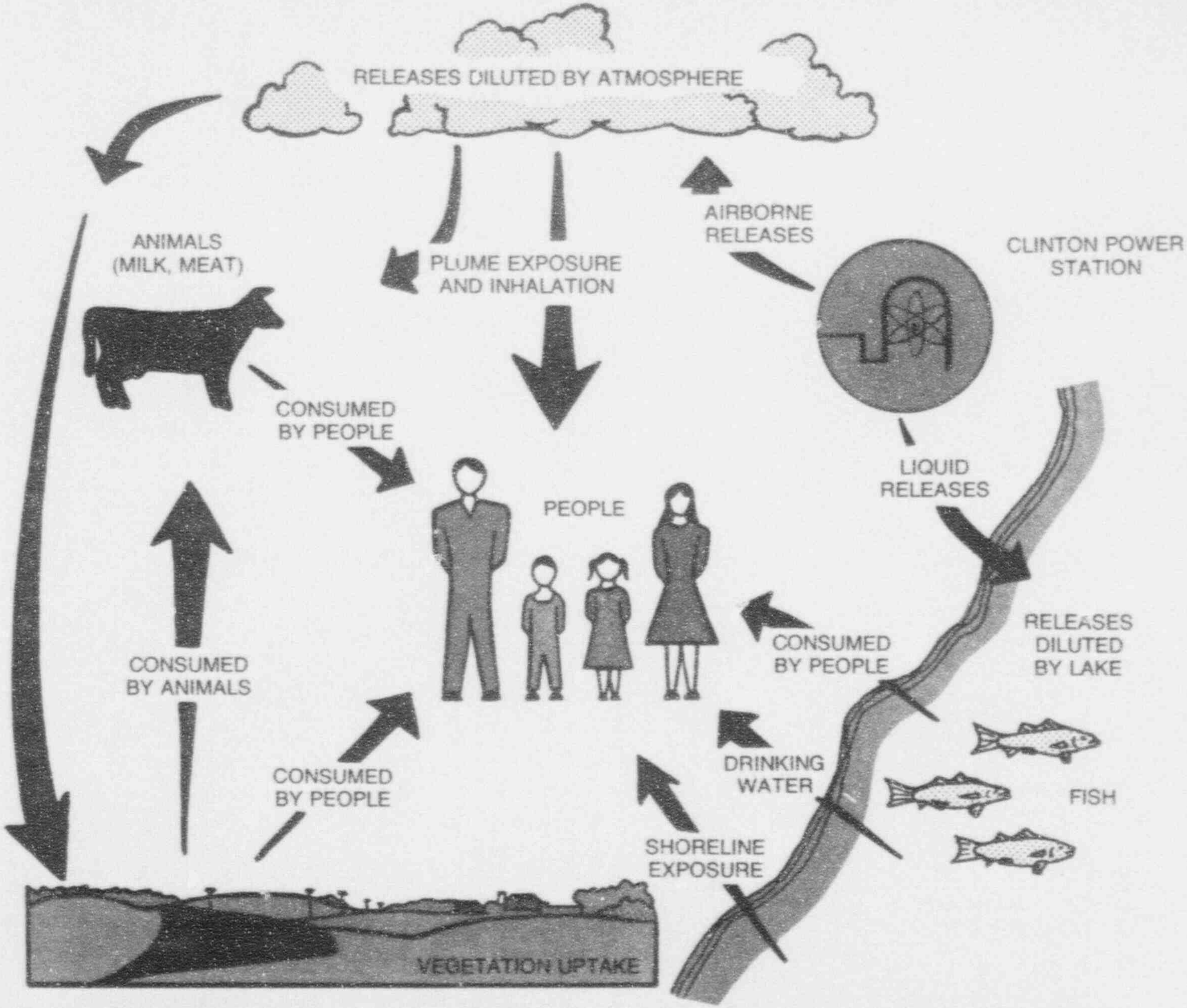


FIGURE 3: POTENTIAL EXPOSURE PATHWAYS OF MAN DUE TO RELEASE OF RADIOACTIVE MATERIAL TO THE ENVIRONMENT

Locations of sampling stations are shown on maps in Figures 4 through 7. Table 3 provides a list of the sample codes for each sample medium and Table 4 provides information on sample location, media sampled at each location, and a brief description of each location where samples are taken. The location is listed according to distance (in miles) and the compass sector relative to the Station Heating, Ventilation and Air Conditioning (HVAC) stack.

An on-site meteorological tower collects information such as wind speed, wind direction and air temperature at various levels. Meteorological monitoring is further discussed in Section V of this report.

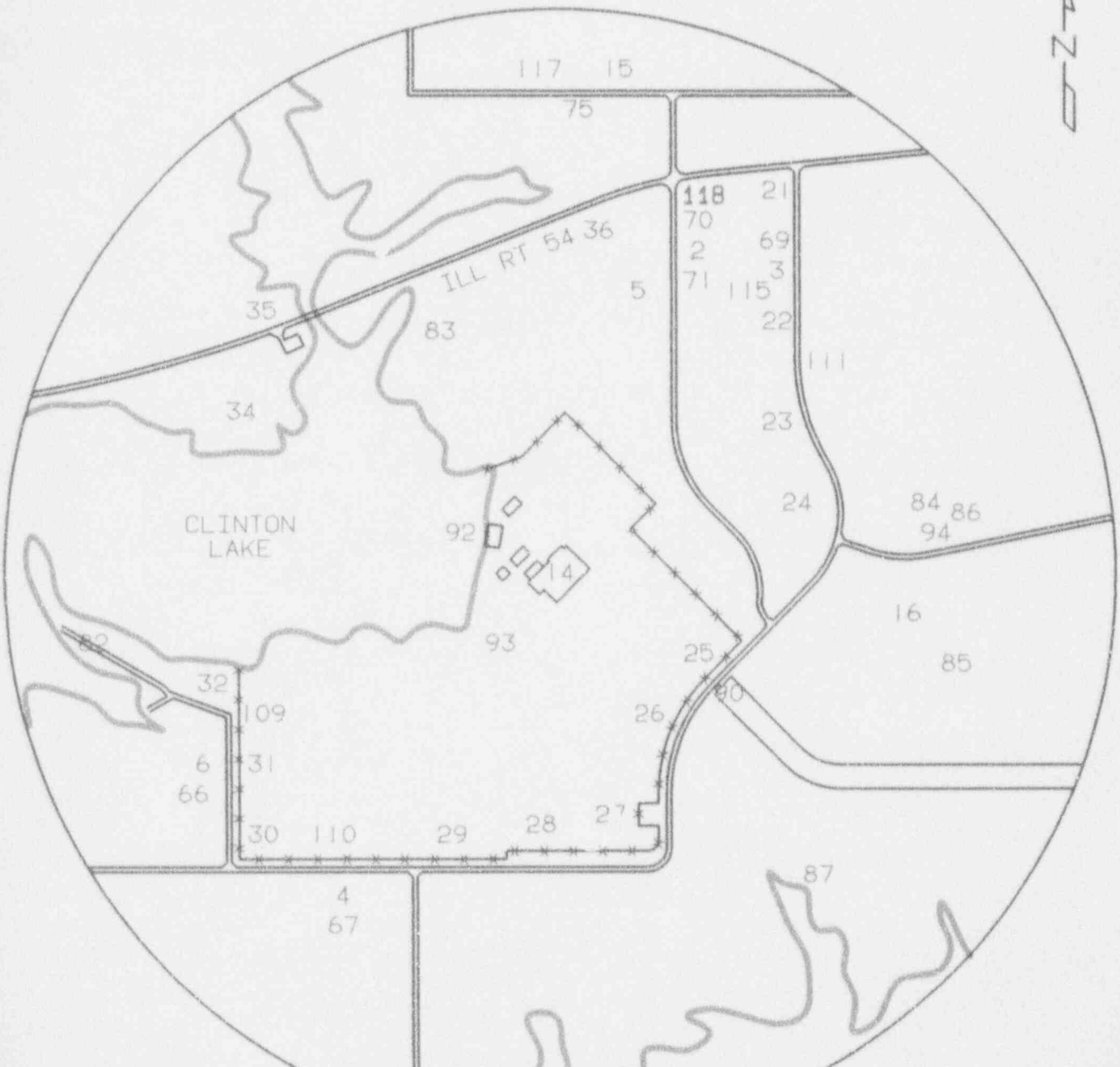


FIGURE 4: REMP SAMPLE LOCATIONS WITHIN 1 MILE

M,02349A
3-8-91

FIGURE 5: REMP SAMPLE LOCATIONS FROM 1 - 2 MILES

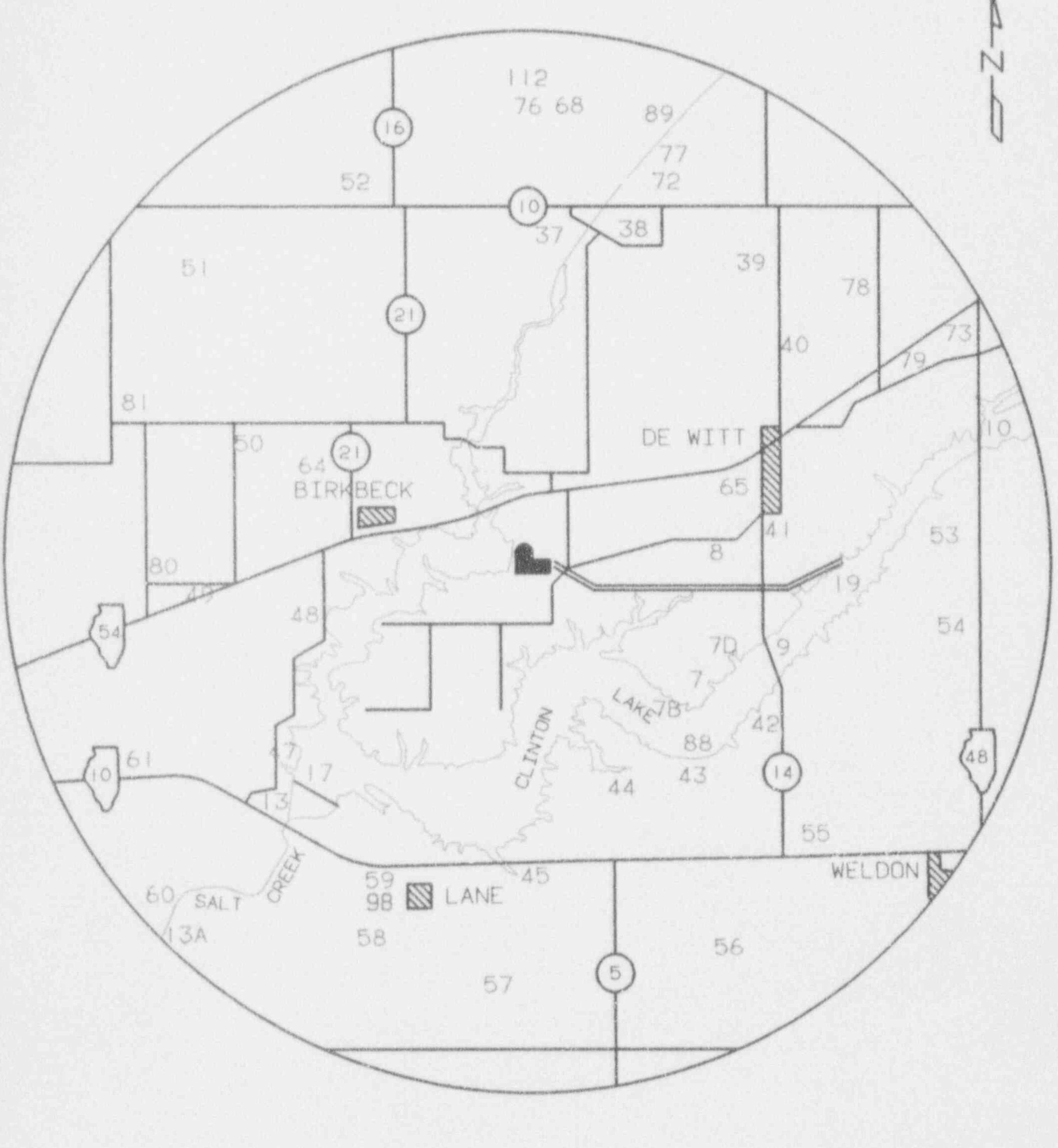


FIGURE 6: REMP SAMPLE LOCATIONS FROM 2 - 5 MILES

M.02349
3-8-9

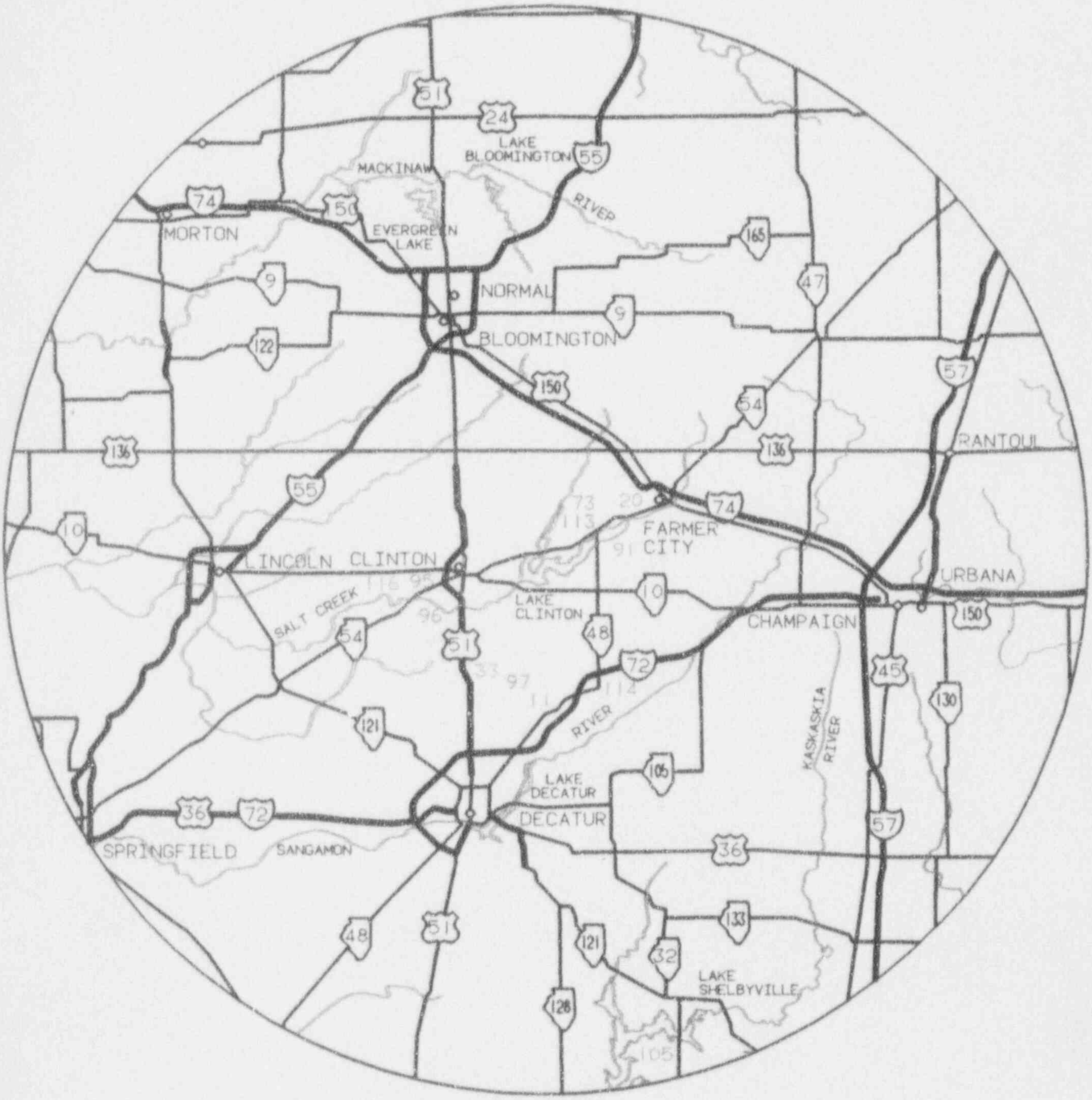


FIGURE 7: REMP SAMPLE LOCATIONS GREATER THAN 5 MILES

M,02349
1-27-92

TABLE 3
CLINTON POWER STATION SAMPLE CODES

CODE	SAMPLE MEDIUM
AP	Airborne Particulate
AI	Airborne Iodine
TLD	Direct Radiation
M	Milk
DW	Drinking Water
SW	Surface Water
WW	Well Water
VE	Green Leafy Vegetables
F	Fish
SL	Slime or Aquatic Vegetation
BS	Bottom Sediments
SS	Shoreline Sediments
SO	Soil
ME	Meat
G	Grass

TABLE 4

REMP SAMPLE LOCATIONS*

Station Code	Sample Medium	Location	Description
CL-1	AP,AI,TLD,SO,G	1.8 miles W	Near the gate to Camp Quest, S of Birkbeck
CL-2	AP,AI,TLD,SO,G	0.7 miles NNE	Located on site's main access road. Collocated with CL-70 and CL-71.
CL-3	AP,AI,TLD,SO	0.7 miles NE	Located on site's secondary access road. Collocated with CL-69.
CL-4	AP,AI,TLD,SO	0.8 miles SW	Located on farm SE of Illinois Power Recreation Area. Collocated with CL-67.
CL-5	TLD	0.7 miles NNE	Located on site's main access road
CL-6	AP,AI,TLD,SO	0.8 miles WSW	Located near the Illinois Power Recreation Area softball field. Collocated with CL-66.
CL-7	AP,AI,TLD,SO	2.3 miles SE	Located in the Mascoutin State Recreation Area
CL-7B	SS,SL	2.1 miles SE	SE of site on Clinton Lake
CL-7C	BS,SL,SS	1.3 miles SE	SE of site on Clinton Lake
CL-7D	WW	2.3 miles ESE	Located in Illinois Power Department of Conservation office at the Mascoutin State Recreation Area
CL-8	AP,AI,TLD,SO,G	2.2 miles E	Located at DeWitt Cemetery
CL-9	SW,SL	2.7 miles ESE	Located on NE side of DeWitt County Route 14 bridge
CL-10c	SW(1),BS,SS,SL	5.0 miles ENE	Located on SE side of Illinois Route 48 bridge
CL-11c	AP,AI,TLD,SO,G	16 miles S	Located SW of Argenta at the Illinois Power Substation
CL-12	WW	1.6 miles E	Located at the DeWitt pumphouse
CL-13	SW	3.6 miles SW	Located near the Salt Creek bridge on Illinois Route 10
CL-13A	BS	5.0 miles SW	Located on Salt Creek at the Route 1300E bridge
CL-14	DW	Plant Service Building	Located in the Plant Service Building

TABLE 4 (Cont'd)

Station Code	Sample Medium	Location	Description
CL-15	AP,AI,TLD	0.9 miles N	Located north of CPS on Route 900N
CL-16	SO	0.6 miles ESE	Located ESE of CPS just north of discharge flume
CL-17	BS	3.5 miles SW	Located on the lake side of Clinton Lake dam
CL-19	F,BS,SS,SL	3.4 miles E	Located E of site at the end of the discharge flume
CL-20	TLD	9.1 miles ENE	Located at the Campground Cemetery W of Farmer City
CL-21	TLD	0.9 miles NNE	Located at the intersection of Illinois Route 54 and the site's secondary access road
CL-22	TLD	0.6 miles NE	Located on the site's secondary access road
CL-23	TLD	0.5 miles ENE	Located on the site's secondary access road
CL-24	TLD	0.5 miles E	Located on the site's secondary access road
CL-25	TLD	0.4 miles ESE	Located on the Owner Controlled Area fence
CL-26	TLD	0.3 miles SE	Located on the Owner Controlled Area fence
CL-27	TLD	0.6 miles SSE	Located on the Owner Controlled Area fence near the Meteorological Tower
CL-28	TLD	0.5 miles S	Located on the Owner Controlled Area fence
CL-29	TLD	0.6 miles SSW	Located on the Owner Controlled Area fence
CL-30	TLD	0.7 miles SW	Located on the Owner Controlled Area fence at the entrance to Illinois Power Recreation Area
CL-31	TLD	0.8 miles WSW	Located on the Owner Controlled Area fence near the Illinois Power Recreation Area softball field
CL-32	TLD	0.7 miles WSW	Located on the Owner Controlled Area fence near Clinton Lake
CL-33c	TLD	11.7 miles SW	Located in Maroa at family residence

TABLE 4 (Cont'd)

Station Code	Sample Medium	Location	Description
CL-34	TLD	0.8 miles WNW	Located near CPS Visitors Center
CL-35	TLD	0.7 miles NW	Located near CPS Visitors Center near Illinois Route 54 bridge
CL-36	TLD	0.6 miles N	Located on Illinois Route 54 near intersection with site's main access road
CL-37	TLD	3.4 miles N	Located N of site
CL-38	TLD	3.6 miles NNE	Located near microwave tower N of site
CL-39	TLD	3.8 miles NE	Located 2 miles N of DeWitt
CL-40	TLD	3.5 miles NE	Located 0.6 miles N of DeWitt
CL-41	TLD	2.4 miles E	Located at S DeWitt city limit
CL-42	TLD	2.8 miles ESE	Located S of DeWitt County Route 14 bridge
CL-43	TLD	2.8 miles SE	Located on Clinton Marine access road
CL-44	TLD	2.3 miles SSE	Located near Clinton Marine Boat Sales
CL-45	TLD	2.8 miles S	Located at Lane Day Use Area
CL-46	TLD	2.8 miles SSW	Located at Peninsula Day Use Area
CL-47	TLD	3.3 miles SW	Located near Clinton Lake Dam Access Road
CL-48	TLD	2.3 miles WSW	Located at residence on West Side Access Road
CL-49	TLD	3.5 miles W	Located W of site along Illinois Route 54
CL-50	TLD	3.2 miles WNW	Located WNW of site
CL-51	TLD	4.4 miles NW	Located NW of site
CL-52	TLD	4.3 miles NNW	Located NNW of site
CL-53	TLD	4.3 miles E	Located E of site
CL-54	TLD	4.6 miles ESE	Located 2 miles N of Weldon
CL-55	TLD	4.1 miles SE	Located 1.5 miles W of Weldon
CL-56	TLD	4.1 miles SSE	Located SSE of site

TABLE 4 (Cont'd)

Station Code	Sample Medium	Location	Description
CL-57	TLD	4.6 miles S	Located S of site
CL-58	TLD	4.3 miles SSW	Located in rural Lane
CL-59	TLD	3.3 miles SSW	Located near Lane city limit
CL-60	TLD	4.5 miles SW	Located SW of Clinton Lake Dam near Salt Creek
CL-61	TLD	4.5 miles WSW	Located WSW of site
CL-62	TLD	1.9 miles NW	Located NW of site
CL-63	TLD	1.3 miles NNW	Located at North Fork Boat Access
CL-64	TLD	2.1 miles WNW	Located 0.5 miles N of Birkbeck
CL-65	TLD	2.6 miles ENE	Located at residence in DeWitt
CL-66	TLD	0.8 miles WSW	Located near the Illinois Power Recreation Area softball field. Collocated with CL-6.
CL-67	TLD	0.8 miles SW	Located on farm SE of Illinois Power Recreation Area. Collocated with CL-4.
CL-68	TLD	4.6 miles N	Located N of site. Collocated with CL-112.
CL-69	TLD	0.7 miles NE	Located on site's secondary access road. Collocated with CL-3.
CL-70	TLD	0.7 miles NNE	Located on site's secondary access road. Collocated with CL-2 and CL-71.
CL-71	TLD	0.7 miles NNE	Located on site's secondary access road. Collocated with CL-2 and CL-70.
CL-72	TLD	4.5 miles NNE	Located NNE of site. Collocated with CL-77
CL-73	TLD	5.1 miles ENE	Located near the MidAmerica Commodities plant on Illinois Route 48. Collocated with CL-113.
CL-74	TLD	1.9 miles W	Located at Camp Quest
CL-75	TLD	0.9 miles N	Located N of site
CL-76	TLD	4.6 miles N	Located N of site
CL-77	TLD	4.5 miles NNE	Located NNE of site. Collocated with CL-72.

TABLE 4 (Cont'd)

Station Code	Sample Medium	Location	Description
CL-78	TLD	4.8 miles NE	Located NE of site
CL-79	TLD	4.5 miles ENE	Located ENE of site
CL-80	TLD	4.1 miles W	Located W of site
CL-81	TLD	4.5 miles WNW	Located WNW of site
CL-82	TLD	0.9 miles W	Located at Illinois Power Recreation Area
CL-83	TLD	0.5 miles NNW	Located near Illinois Route 54 E of the bridge
CL-84	TLD	0.6 miles E	Located on Old Clinton Road between DeWitt and site. Collocated with CL-94 and CL-86.
CL-85	TLD	0.6 miles ESE	Located ESE of site
CL-86	TLD	0.6 miles E	Located on Old Clinton Road between DeWitt and site. Collocated with CL-84 and CL-94.
CL-87	TLD	0.6 miles SE	Located near discharge flume road
CL-88	SS	2.4 miles SE	Located SE of site
CL-89	BS,SS	3.6 miles NNE	Located NNE of site
CL-90	SW	0.4 miles SE	Located at start of discharge flume
CL-91	SW	6.1 miles ENE	Located at Parnell Boat Access
CL-92	SW	0.1 miles NW	Located at CPS Intake Screenhouse
CL-93	SW,SS	0.4 miles SW	Located at CPS Settling Pond
CL-94	AP,AI,SO	0.6 miles E	Located on Old Clinton Road between DeWitt and site. Collocated with CL-84 and CL-86.
CL-95c	TLD	10.5 miles W	Located at a family residence west of Clinton
CL-96c	TLD	10.9 miles WSW	Located at a family residence SW of Clinton
CL-97c	TLD	10.3 miles SSW	Located on Macon County Road 1400E SE of Maroa
CL-98	M	3.7 miles SSW	Located at a family residence SSW of site
CL-105c	F,SS,BS,SL	50 miles S	Located at Lake Shelbyville
CL-106	ME	2.0 miles NNE	Located NNE of site

TABLE 4 (Cont'd)

Station Code	Sample Medium	Location	Description
CL-109	TLD	0.7 miles WSW	Located on the Owner Controlled Area fence near Shooting Range
CL-110	TLD	0.8 miles SW	Located on the Owner Controlled Area fence
CL-111	TLD	0.6 miles NE	Located near site's secondary access road
CL-112	TLD	4.6 miles N	Located N of site. Collocated with CL-68.
CL-113	TLD	5.1 miles ENE	Located near the MidAmerica Commodities plant on Illinois Route 48. Collocated with CL-73.
CL-114c	VE	12.5 miles SSE	Located S of Cisco
CL-115	VE	0.7 miles NE	Located on site's secondary access road
CL-116c	M,G	14 miles WSW	Located in rural Kenney
CL-117	VE	0.9 miles N	Located N of site
CL-118	VE	0.7 miles NNE	Located on Illinois Rt.54 near intersection with main access road

* Sample location is listed by station code, location and number. Station Code is Clinton (CL) - Number (site's number designator). Location is listed by distance in miles and directional sector from the Station HVAC stack.

c Control location; all other locations are indicators.

(1) Control location for surface water only.

B. Direct Radiation Monitoring

Radionuclides present in the air, and those deposited in or on the ground cause human exposure by immersion in the atmosphere or by deposition on the ground. TLDs (thermoluminescent dosimeters) are used to measure the ambient gamma radiation field at many locations around the Clinton Power Station. TLDs are crystalline devices that store energy when they are exposed to radiation. They can be processed months after exposure with minimal loss of information. This makes them well suited for quarterly environmental radiation measurements. During processing, the stored energy is released as light and measured by a TLD reader. The light intensity is proportional to the radiation dose the TLD received. The TLDs used in monitoring around the Clinton Power Station are easily capable of measuring environmental levels of radiation, approximately 20 mrem per quarter.

Monitoring stations are placed near the site boundary and approximately five miles from the reactor, in locations representing the sixteen compass sectors. Other locations are chosen to measure the radiation field at places of special interest such as nearby residences, meeting places and population centers. Control sites are located further than ten miles from the site, in areas that should not be affected by plant operations.

TLD measurements register the gamma ray exposure in milliRoentgen (mR). For reporting purposes mR is numerically equivalent to mrem. Consequently the terms are used interchangeably.

Results of the annualized TLD dose measurements are summarized by location in Table 5. Figure 8 compares operational program control and indicator location average quarterly gamma dose rates to preoperational program measurements. A total of 341 TLD measurements were made in 1993. The average quarterly dose at indicator locations was 18.4 ± 3.2 mrem. The quarterly measurements ranged from 13.6 to 21.7 mrem. At control locations the average quarterly dose was 18.1 ± 2.9 mrem. The quarterly control measurements ranged from 16.0 to 20.5 mrem.

TABLE 5

AVERAGE QUARTERLY TLD RESULTS

Station Code[a]	1992 Average ±2σ	1993 Average ±2σ	Preop Range Average ±2σ
CL-1	19.0 ± 1.5	18.5 ± 1.3	16.8 - 22.3
CL-2	19.4 ± 1.5	19.0 ± 1.0	17.9 - 23.7
CL-3	19.3 ± 2.5	18.1 ± 0.3	17.9 - 21.9
CL-4	19.5 ± 2.5	17.9 ± 1.1	14.5 - 20.1
CL-5	19.9 ± 4.2	19.5 ± 1.5	16.7 - 22.1
CL-6	16.9 ± 4.1	15.9 ± 0.5	16.0 - 21.2
CL-7	19.2 ± 2.6	16.9 ± 1.3	15.9 - 19.9
CL-8	19.6 ± 1.6	18.1 ± 2.1	17.4 - 19.6
CL-11(c)	17.5 ± 0.7	16.5 ± 1.5	16.7 - 18.8
CL-15	15.3 ± 3.7	15.7 ± 0.9	(d)
CL-20	20.0 ± 2.0	19.5 ± 1.9	16.8 - 19.0
CL-21	20.5 ± 2.1	19.6 ± 0.5	17.7 - 21.0
CL-22	20.5 ± 1.9	18.6 ± 1.3	16.5 - 19.6
CL-23	14.9 ± 0.7	14.7 ± 0.7	14.5 - 19.4
CL-24	20.1 ± 2.7	18.2 ± 1.6	14.9 - 20.0
CL-25	14.6 ± 1.8	14.4 ± 1.3	11.4 - 16.0
CL-26	16.9 ± 1.8	16.0 ± 1.7	14.1 - 18.4
CL-27	18.8 ± 2.7	17.1 ± 0.6	14.4 - 19.6
CL-28	20.3 ± 1.6	18.5 ± 1.1	15.8 - 22.2
CL-29	20.3 ± 1.6	19.4 ± 1.6	15.8 - 23.2
CL-30	21.9 ± 3.2	18.7 ± 0.7	16.4 - 20.4
CL-31	18.7 ± 2.4	16.3 ± 1.1	12.7 - 18.0
CL-32	19.8 ± 2.1	17.3 ± 0.5	14.0 - 20.3
CL-33(c)	21.8 ± 1.8	19.1 ± 1.1	16.7 - 20.1
CL-34	23.6 ± 2.6	20.4 ± 1.5	15.8 - 23.5
CL-35	19.6 ± 2.2	18.0 ± 1.2	14.1 - 21.0
CL-36	19.6 ± 2.6	18.1 ± 2.4	17.3 - 22.0
CL-37	19.5 ± 2.3	18.1 ± 2.0	14.4 - 22.0
CL-38	20.5 ± 1.6	19.2 ± 1.7	15.0 - 21.9
CL-39	17.3 ± 1.5	17.3 ± 2.6	13.4 - 19.6
CL-40	18.1 ± 1.7	17.7 ± 2.1	15.1 - 21.9
CL-41	19.6 ± 1.9	18.5 ± 2.9	15.2 - 22.1
CL-42	18.3 ± 2.3	17.4 ± 0.9	13.8 - 22.7
CL-43	20.2 ± 2.7	19.3 ± 1.0	16.2 - 21.8
CL-44	21.6 ± 3.2	19.7 ± 0.5	13.8 - 21.1
CL-45	21.4 ± 1.8	19.6 ± 2.4	19.0 - 23.3
CL-46	19.8 ± 2.4	17.9 ± 0.9	14.9 - 21.1
CL-47	20.9 ± 1.2	19.4 ± 1.7	15.3 - 23.6
CL-48	18.3 ± 5.3	18.1 ± 2.8	15.8 - 24.6
CL-49	21.2 ± 1.3	19.5 ± 0.8	15.7 - 21.6
CL-50	21.2 ± 2.6	20.0 ± 2.8	16.8 - 20.8
CL-51	22.0 ± 2.8	19.6 ± 1.2	17.1 - 21.0
CL-52	22.0 ± 3.2	19.5 ± 0.4	17.5 - 19.6
CL-53	18.7 ± 3.0	17.2 ± 2.4	16.3 - 19.8
CL-54	20.0 ± 3.2	18.5 ± 1.5	16.6 - 20.1
CL-55	19.6 ± 3.0	18.9 ± 3.7	17.2 - 21.2

TABLE 5 (Cont'd)

AVERAGE QUARTERLY TLD RESULTS

Station Code[a]	1992 Average ±2σ	1993 Average ±2σ	Preop Range Average ±2σ
CL-56	20.0 ± 2.5	19.8 ± 2.9	17.0 - 22.8
CL-57	20.0 ± 3.5	17.6 ± 2.2	16.5 - 21.1
CL-58	19.2 ± 3.3	18.7 ± 3.2	17.8 - 21.9
CL-59	19.8 ± 3.2	19.2 ± 1.9	16.4 - 21.3
CL-60	20.8 ± 2.4	19.2 ± 1.6	15.9 - 21.9
CL-61	21.2 ± 4.2	19.5 ± 0.7	15.6 - 22.1
CL-62	20.8 ± 2.5	19.3 ± 0.4	11.5 - 21.7
CL-63	22.5 ± 3.3	19.9 ± 1.4	15.3 - 22.0
CL-64	21.5 ± 2.1	20.6 ± 1.4	15.5 - 21.6
CL-65	21.8 ± 3.0	20.1 ± 1.0	14.8 - 22.7
CL-66	17.3 ± 3.0	16.1 ± 1.1	14.0 - 20.7
CL-67	19.0 ± 3.2	18.5 ± 2.9	16.1 - 21.7
CL-68	18.6 ± 4.0	17.8 ± 2.9	13.8 - 19.7
CL-69	19.8 ± 2.4	17.8 ± 1.4	16.1 - 23.7
CL-70	17.5 ± 4.4	17.2 ± 4.5	15.4 - 24.2
CL-71	19.6 ± 2.3	18.3 ± 2.0	17.4 - 23.6
CL-72	18.0 ± 1.2	17.1 ± 4.0	18.7 - 22.5
CL-73	21.3 ± 3.4	19.5 ± 2.6	16.3 - 23.4
CL-74	18.7 ± 2.3	18.5 ± 2.8	16.5 - 23.9
CL-75	20.9 ± 2.2	19.7 ± 2.4	15.9 - 23.0
CL-76	18.9 ± 2.7	18.7 ± 4.7	16.5 - 22.4
CL-77	18.7 ± 1.1	17.0 ± 4.8	18.3 - 20.6
CL-78	19.9 ± 2.8	18.5 ± 2.6	15.8 - 21.3
CL-79	20.7 ± 2.2	19.2 ± 2.4	15.0 - 20.2
CL-80	20.5 ± 2.2	18.9 ± 3.9	15.5 - 20.2
CL-81	21.4 ± 2.4	20.1 ± 2.1	16.0 - 19.6
CL-82	20.1 ± 3.4	17.8 ± 2.9	14.8 - 18.3
CL-83	21.0 ± 1.7	20.1 ± 3.0	18.8 - 22.2
CL-84	19.7 ± 2.4	18.0 ± 2.1	(b)
CL-85	20.7 ± 1.8	19.1 ± 3.8	16.4 - 21.2
CL-86	20.2 ± 2.2	18.4 ± 3.7	14.7 - 20.5
CL-87	21.4 ± 3.5	19.3 ± 2.7	17.3 - 22.5
CL-95(c)	19.1 ± 2.6	19.2 ± 2.2	(d)
CL-96(c)	17.1 ± 3.3	17.5 ± 2.4	(d)
CL-97(c)	14.8 ± 9.2	18.1 ± 3.4	(d)
CL-109	17.5 ± 2.9	16.6 ± 1.4	15.2 - 20.8
CL-110	19.3 ± 3.6	18.7 ± 3.0	16.1 - 22.2
CL-111	16.5 ± 8.9	20.1 ± 1.8	14.1 - 20.4
CL-112	19.0 ± 3.9	18.0 ± 2.6	15.3 - 19.5
CL-113	20.6 ± 2.8	19.1 ± 3.6	16.1 - 21.6

(a) For station location description refer to Table 4
(b) Only one quarter result available; 12.7±0.8
(c) Control Station
(d) Data not available, locations established after preoperational phase of program

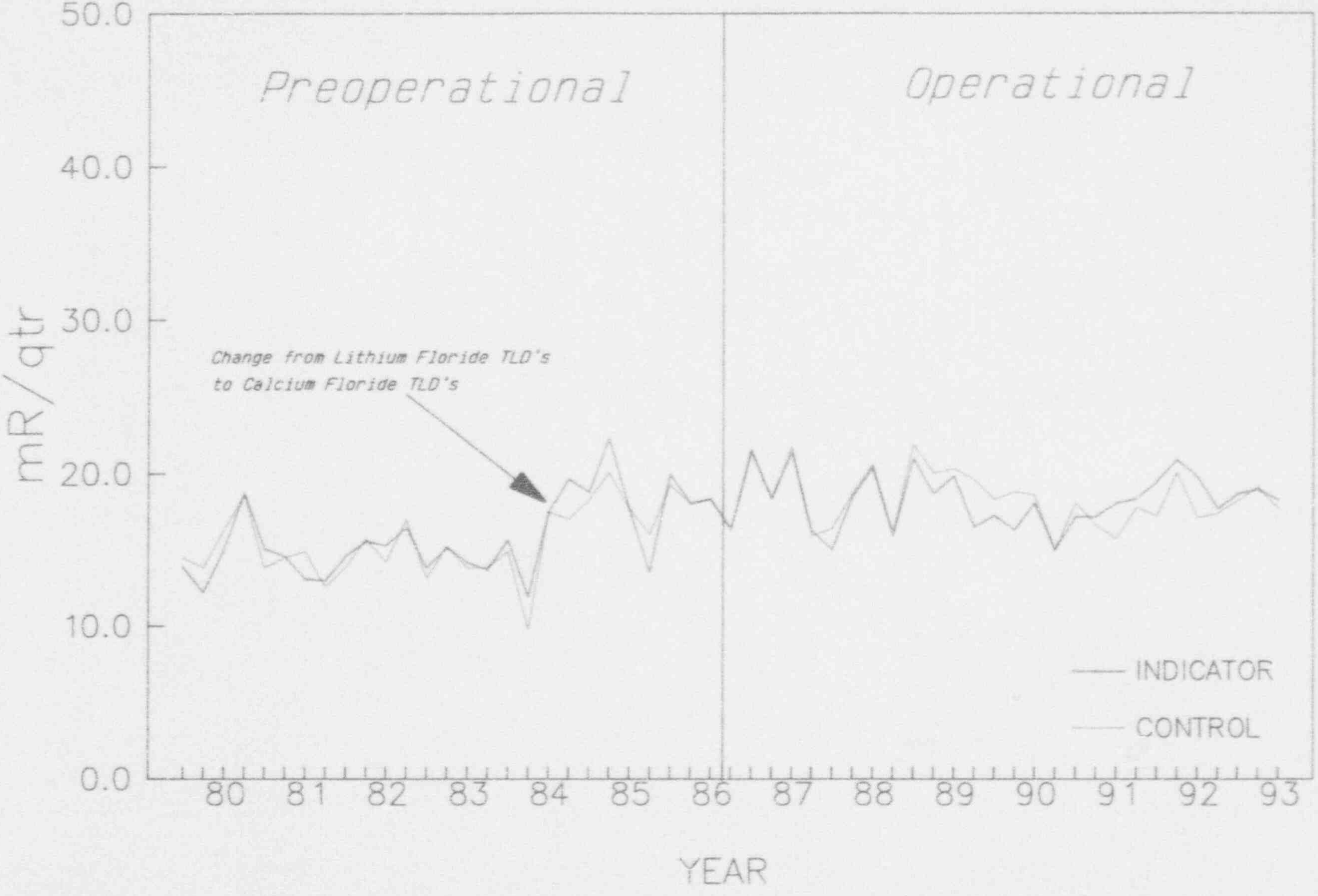


FIGURE 8: DIRECT RADIATION COMPARISON

Average doses (±2 standard deviations (σ)), bı en down by calendar quarter, are shown in Table 6 for both indicator and control locations.

TABLE 6

AVERAGE QUARTERLY TLD RESULTS

QUARTER	1993 INDICATOR	1992 INDICATOR	PREOP ALL SITES
1st	17.7 ±3.3	18.4 ±3.5	16.4 ±2.9
2nd	18.7 ±2.8	19.5 ±3.8	18.8 ±3.2
3rd	19.0 ±2.9	20.9 ±3.8	19.1 ±4.7
4th	18.3 ±3.2	19.8 ±3.8	17.8 ±2.2

QUARTER	1993 CONTROL	1992 CONTROL	PREOP ALL SITES
1st	17.4 ±2.3	17.8 ±3.2	16.4 ±2.9
2nd	18.2 ±2.8	17.2 ±8.1	18.8 ±3.2
3rd	19.1 ±3.6	20.1 ±3.3	19.1 ±4.7
4th	17.7 ±2.2	17.1 ±8.5	17.8 ±2.2

Site CL-64, located 2.1 miles WNW of the station, registered the highest annualized dose: 82.3 mrem during 1993.

From these observations, no increase in environmental gamma radiation levels resulted from operation of the Clinton Power Station during 1993.

C. Atmospheric Monitoring

The inhalation and ingestion of radionuclides in the air is a direct exposure pathway to man. A network of ten active air samplers around the Clinton Power Station monitors this pathway. There are nine indicator air sampling stations strategically located in areas which are most likely to indicate effects due to the release of radioactive effluents from the Clinton Power Station. The control location is located approximately 16 miles south of the plant in an area which is likely to be independent of the effects of station operations. Historical meteorological data indicates this control location is normally upwind from the plant.

No contribution to the general level of airborne particulate radioactivity could be identified as a result of station operations during 1993. The radioactivity that was detected is normally found in the environment and is consistent with expected concentrations of natural radioactivity and fallout from prior atmospheric nuclear weapons testing.

Mechanical air samplers are used to draw a continuous volume of air through a filter and charcoal cartridge to collect particulates and radioiodines present in the atmosphere. The samplers are equipped with a pressure-sensing flow regulator to maintain a constant sampling flow rate of about one cubic foot per minute. The total volume is calculated based on the amount of time the air sampler ran and its flow rate. The air sampling equipment is maintained and calibrated by the Clinton Power Station personnel using reference standards traceable to the National Institute of Standards and Technology.

Air samples are collected weekly and analyzed for gross beta and I-131 activities. Quarterly, all air particulate filters collected during that period are combined and counted for gamma isotopic activity. Since the intent of particulate sampling is to measure airborne radioactivity released from the plant, the counting of short-lived daughters produced by the decay of natural radon and thoron may mask plant contributions. Therefore, the filters are not analyzed for at least five days after their collection to allow for the decay of the short-lived daughters, thereby reducing their contribution to gross beta activity.

Results of the gross beta airborne particulate analyses provided comparisons between indicator and control locations for the year, as well as comparisons between locations in relation to spatial and temporal differences. The calculated annual average was 0.020 pCi/m^3 for all indicator locations and 0.021 pCi/m^3 for the control location. These results are consistent with the preoperational averages for both indicator and control locations which were 0.027 pCi/m^3. The location with the highest calculated annual average was control station CL-3 located 0.7 miles northeast of the Clinton Power Station. This location had an average concentration of 0.022 pCi/m^3. Individual location averages for the year are presented in Table 7.

Minor fluctuations in the gross beta concentrations were noted throughout the year. The general trend for average weekly gross beta concentrations in the indicator locations correlated to the trend for control locations throughout the monitoring period. This correlation is evidenced by the similarity of the trends in the average monthly gross beta concentrations displayed in Figure 9. No significant difference was indicated between individual locations. Monthly averages for indicator and control locations for the year are presented in Table 8.

All gross beta concentrations for 1993 were within normal background levels and no increases were noted as a result of the operation of the Clinton Power Station.

Naturally occurring Be-7 was the only gamma-emitting radionuclide detected in analyses of particulate filters.

TABLE 7

AVERAGE GROSS BETA CONCENTRATIONS

IN AIR PARTICULATES

Station	Description	1992 Average ± 2σ (pCi/m^3)	1993 Average ± 2σ (pCi/m^3)
CL-1	Camp Quest (Birkbeck)	0.020 ± 0.014	0.019 ± 0.012
CL-2	CPS Main Access Road	0.021 ± 0.014	0.020 ± 0.014
CL-3	CPS Secondary Access Road	0.022 ± 0.014	0.022 ± 0.014
CL-4	0.8 Miles SW	0.021 ± 0.012	0.020 ± 0.014
CL-6	IP Recreation Area	0.020 ± 0.015	0.021 ± 0.015
CL-7	Mascoutin State Recreation Area	0.019 ± 0.015	0.019 ± 0.014
CL-8	DeWitt Cemetery	0.022 ± 0.014	0.021 ± 0.015
CL-11[a]	IP Substation (Argenta)	0.022 ± 0.015	0.021 ± 0.014
CL-15	0.9 Miles N	0.020 ± 0.012	0.020 ± 0.015
CL-94	Old Clinton Road (0.6 miles E)	0.021 ± 0.012	0.019 ± 0.014

(a) Control Station

TABLE 8

AVERAGE MONTHLY GROSS BETA

CONCENTRATIONS IN AIR PARTICULATES

Month	1993 Indicator, pCi/m^3 (Average ± 2 σ)	1992 Indicator, pCi/m^3 (Average ± 2 σ)	1993 Control, pCi/m^3 (Average ± 2 σ)	1992 Control, pCi/m^3 (Average ± 2 σ)
January	0.030 ± 0.003	0.025 ± 0.005	0.029 ± 0.018	0.026 ± 0.012
February	0.026 ± 0.003	0.019 ± 0.003	0.029 ± 0.005	0.021 ± 0.005
March	0.018 ± 0.002	0.017 ± 0.003	0.018 ± 0.011	0.016 ± 0.002
April	0.014 ± 0.001	0.016 ± 0.003	0.014 ± 0.007	0.017 ± 0.004
May	0.015 ± 0.002	0.018 ± 0.002	0.016 ± 0.007	0.021 ± 0.003
June	0.015 ± 0.002	0.019 ± 0.003	0.017 ± 0.003	0.021 ± 0.004
July	0.017 ± 0.003	0.017 ± 0.002	0.018 ± 0.004	0.020 ± 0.004
August	0.018 ± 0.004	0.018 ± 0.002	0.021 ± 0.010	0.020 ± 0.003
September	0.015 ± 0.003	0.020 ± 0.002	0.018 ± 0.002	0.022 ± 0.002
October	0.021 ± 0.003	0.032 ± 0.004	0.024 ± 0.007	0.034 ± 0.010
November	0.026 ± 0.003	0.020 ± 0.001	0.025 ± 0.006	0.022 ± 0.003
December	0.024 ± 0.004	0.028 ± 0.002	0.025 ± 0.005	0.032 ± 0.010

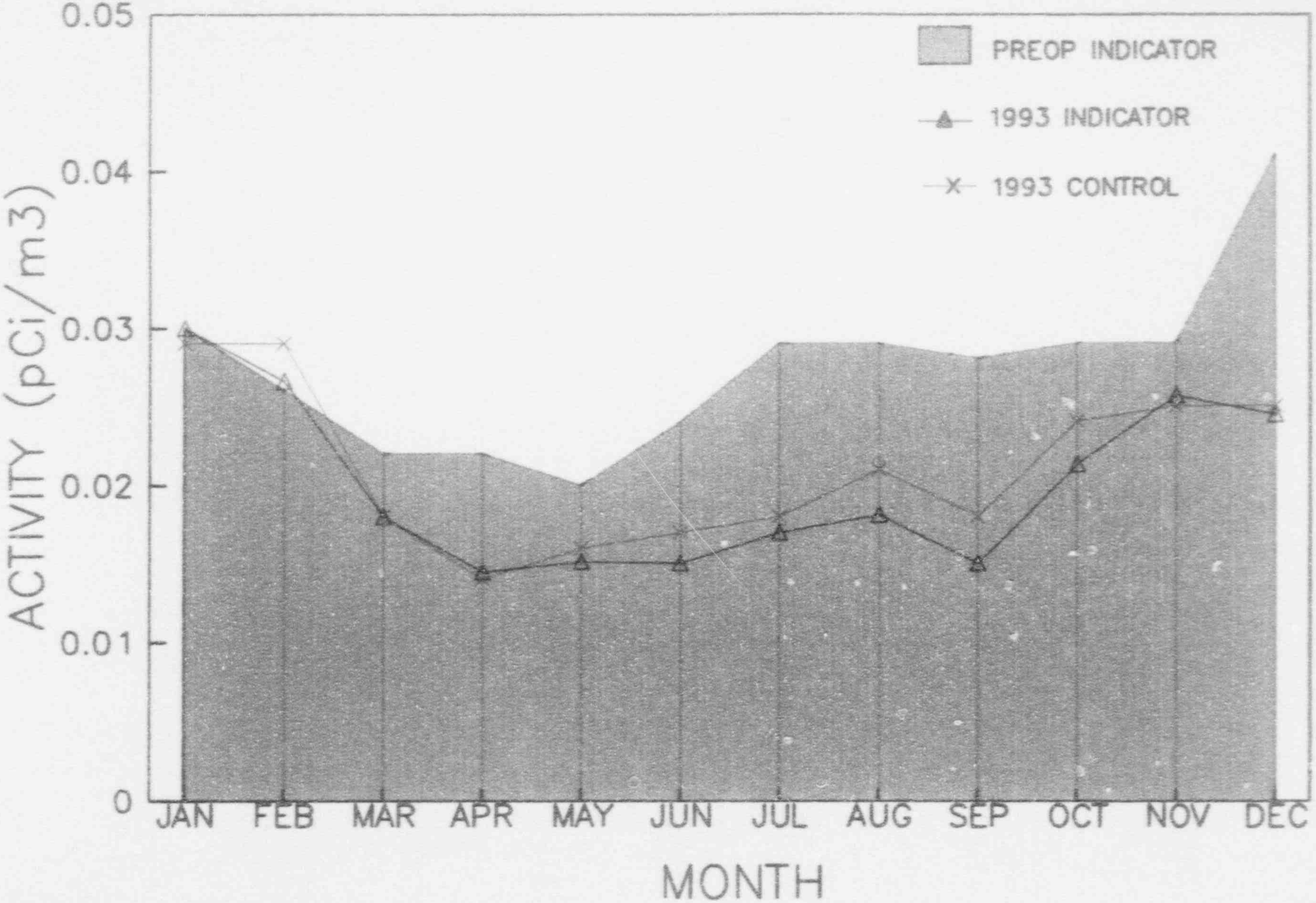


FIGURE 9: AIR PARTICULATE GROSS BETA ACTIVITY COMPARISON

D. Aquatic Monitoring

The Clinton Power Station utilizes a man-made lake as the source of cooling water and returns the used cooling water to the same lake while most nuclear power stations use once-through flow from a river, the ocean or a body of water much larger than Clinton Lake. When radioactive liquid effluents are discharged from the Clinton Power Station into the cooling water outfall, radioisotopes with long half-lives could build up as the same water is reused on successive trips through the plant. This water travels from the plant, into the eastern arm of the lake, then into the northern arm of the lake and back into the plant. Although the only user of Clinton Lake as a source of drinking water is the Clinton Power Station, the lake is a major recreational facility, used for fishing, swimming, water skiing, boating and hunting.

Clinton Lake constitutes the primary environmental exposure pathway for radioactive materials in liquid effluents. Aquatic monitoring provides for the collection of fish, shoreline and bottom sediments, and periphyton samples to detect the presence of any radioisotopes related to operation of the Clinton Power Station. These samples are analyzed for naturally occurring and man-made radioactive materials. Both indicator and control locations were sampled during 1993. Indicator samples were taken from various locations on Clinton Lake and the control samples were taken at Lake Shelbyville which is approximately 50 miles south of Clinton Power Station.

Aquatic monitoring samples are collected by the personnel from the Field Biology Laboratory of the Environmental Affairs Department of Illinois Power Company.

Fish

Samples of fish are collected from Clinton Lake and Lake Shelbyville. In both lakes the samples include largemouth bass, crappie, carp and bluegill. These species are the fish most commonly harvested from the lakes by sport fishermen. Fish ingest sediments during bottom feeding, or prey on other organisms which ingest sediments or otherwise retain radionuclides. Radiological analyses of these fish samples provide information on the potential ingestion of radionuclides by humans via the aquatic pathway. These samples are collected semiannually and analyzed by gamma spectroscopy.

The results of gamma isotopic analysis on the fish samples showed the presence of naturally occurring K-40 in all 1993 samples ranging from 2.17 to 3.46 pCi/g (wet). Preoperational K-40 concentrations ranged from 1.71 to 4.61 pCi/g (wet). All other analytical results were less than the lower limit of detection (LLD) for each radionuclide.

Shoreline Sediments

Samples of shoreline sediments are collected at six locations from Clinton Lake, at one location from the Clinton Power Station lower settling pond and at one location from Lake Shelbyville. Radiological analyses of shoreline sediments provide information on the potential shoreline exposure to humans and for determining long-term trends and accumulation of long-lived radionuclides in the environment. Samples are collected semiannually and analyzed for gross beta, gross alpha, Sr-90 and gamma isotopic activities.

Shoreline sediment samples are dried prior to analysis and the results are reported in pCi/g dry weight. Naturally occurring radioisotopes, such as K-40, Ra-226 and Pb-212, were present in samples taken at both indicator and control locations. There were two fission products, Cs-137 and Sr-90, detected from both control and indicator locations. The activity detected was not substantially different from that measured during the preoperational program with the exception of one Cs-137 result. This sample was taken at CL-7C and the activity measured was 0.62 pCi/g.

Shoreline sediment samples are taken as close to the waterline as possible, and due to the increase in rainfall during the summer and fall, the area considered as the lake's shoreline was pushed back several hundred feet at the time the sample was taken. As a result, the area sampled at CL-7C was more representative of a soil sample. Therefore, the sample result is more comparable to the Cs-137 results reported for soil samples during the preoperational period which ranged from 0.14 to 0.40 pCi/g.

The presence of these fission products is attributed to previous nuclear weapons testing and atmospheric fallout from the accident at Chernobyl.

One activation product, Co-60, was detected in one sample at an indicator site which is located on-site. The presence of this activation product is attributed to CPS operations.

	Preop Range (pCi/g dry)	1993 Range (pCi/g dry)	1992 Range (pCi/g dry)
Sr-90	0.009 to 0.087	0.013 to 0.172	0.005
Cs-137	0.016 to 0.045	0.060 to 0.62	0.044 to 0.12
Co-60	*	0.11	0.044 to 0.12

* No Preop data available

Gross alpha activity in samples of shoreline sediments collected from all locations ranged from 3.3 to 13.48 pCi/g (dry) during 1993. This activity was attributed to naturally occurring radioisotopes and decay products present in soil. These values compare closely with the activity detected in the preoperational program which ranged from 3.8 to 8.0 pCi/g (dry).

Gross beta activity in samples of shoreline sediments collected from all locations ranged from 6.51 to 28.68 pCi/g (dry) during 1993. The majority of this activity was attributed to naturally occurring K-40. These values are comparable with the gross beta activity detected in the preoperational program which ranged from 7.0 to 17.2 pCi/g (dry).

Bottom Sediments

Samples of bottom sediments are collected from Clinton Lake at six locations and Lake Shelbyville at one location. Radiological analyses of bottom sediments primarily provide information about the amount of radionuclides available to predators who feed on the organisms found in bottom sediments. Samples are collected semiannually and analyzed for gross beta, gross alpha, Sr-90 and gamma isotopic activities.

Bottom sediment samples are dried prior to analysis and the results are reported in pCi/g dry weight. Naturally occurring radioisotopes, such as K-40 and Pb-212, were present in all 1993 control and indicator sample locations.

Fission products, Cs-137 and Sr-90 were detected in samples from indicator and control locations.

	Preop Range (pCi/g dry)	1993 Range (pCi/g dry)	1992 Range (pCi/g dry)
Sr-90	0.011 to 0.056	0.015 to 0.05	0.009 to 0.065
Cs-137	0.008 to 1.39	0.013 to 0.560	0.017 to 0.60

The presence of these fission products is attributed to previous nuclear weapons testing and atmospheric fallout from the accident at Chernobyl.

Gross alpha activity in samples of bottom sediments collected from both lakes ranged from 4.0 to 19.0 pCi/g (dry) during 1993. This activity was attributed to naturally occurring radium isotopes and decay products present in soil. The preoperational gross alpha activity ranged from 4.4 to 14.7 pCi/g (dry).

Gross beta activity in samples of bottom sediments collected from both lakes ranged from 7.82 to 33.80 pCi/g (dry) during 1993. The majority of this activity was attributed to naturally occurring K-40. The preoperational gross beta activity ranged from 8.3 to 27.7 pCi/g (dry).

Aquatic Vegetation (Periphyton)

Samples of periphyton are collected from five locations in Clinton Lake and one location in Lake Shelbyville. Periphyton (attached algae) are collected from the submerged surface of the permanently anchored buoys or natural substrate. Periphyton absorb trace elements and radionuclides directly from water, often concentrating them to levels much higher than the dilute concentrations that occur in the aquatic environment. This is because most algae are coated with a carbohydrate jelly and have a large surface-to-volume ratio. Cell division usually occurs once every one or two days and, as a result, half of the cell wall is a new surface for sorption. Periphyton represent one of the earliest links in the food chain and provide information about the amounts of radionuclides available to predators further up the food chain. Samples of periphyton are collected every two months between April and October (during the colder months growth is limited) at the indicator locations and semiannually at the control location and analyzed by gamma spectroscopy.

The results of the gamma isotopic analyses on periphyton samples showed the following concentrations of naturally occurring radioisotopes:

	Preop Range (pCi/g dry)	1993 Range (pCi/g dry)	1992 Range (pCi/g dry)
Be-7	0.38 to 1.07	0.51 to 2.71	0.21 to 1.40
K-40	0.74 to 6.82	0.81 to 6.1	0.08 to 2.92
Cs-137	0.042 to 0.15	0.023 to 0.082	0.025 to 0.076

One fission product, Cs-137, was detected in several periphyton samples. Concentrations for Cs-137 in 1993 ranged from 0.023 to 0.082 pCi/g (wet). Preoperational results for Cs-137 showed concentrations ranging from 0.042 to 0.15 pCi/g (wet). The presence of Cs-137 is attributed to previous nuclear weapons testing and atmospheric fallout from the accident at Chernobyl.

Periphyton analyses are included in the Clinton Power Station Environmental Monitoring Program because of their sensitivity to the presence of radionuclides in the aquatic environment due to bio-magnification. Using periphyton as biomonitors for radionuclides in aquatic systems can be a highly sensitive and qualitatively effective means of environmental monitoring around nuclear power plants that release radioactive effluents to aquatic systems. It enables the Radiological Environmental Monitoring Program to determine the relative presence of radioactivity before it becomes a problem.

E. Terrestrial Monitoring

In addition to the direct radiation, radionuclides present in the atmosphere expose individuals when deposited on surfaces (e.g., plants and soil) and are subsequently ingested directly by man or indirectly by consumption of animal products (e.g., meat and milk). To monitor this food pathway, samples of green leafy vegetables, grass, milk and meat are analyzed.

Surface soil samples are collected and analyzed annually at the sewage sludge application site to ensure radionuclides attributed to the operation of Clinton Power Station are not being land applied with the processed sewage sludge. Every three years, samples are taken at nine other locations to monitor the potential buildup of atmospherically deposited radionuclides.

Surface vegetation samples are collected from a number of locations for the purpose of monitoring the potential buildup of atmospherically deposited radionuclides. Because the radionuclides of interest, with respect to the Clinton Power Station operations, are also present in the environment as a result of several decades of worldwide fallout or because they are naturally occurring, the presence of these radionuclides is expected in all of the samples collected.

The possible contributions of radionuclides from the operation of the Clinton Power Station are assessed by comparing the results of samples collected in prevalent downwind locations (north to north north-east of the plant) with control samples and samples collected in locations generally upwind of the plant. In addition, the results of samples collected during 1993 were compared with the results of samples collected during the preoperational program.

In addition to naturally occurring radioisotopes, Sr-90 and Cs-137 were found in a number of 1993 samples. However, the concentrations of radionuclides in samples collected near the Clinton Power Station were comparable to the concentrations in samples collected at locations remote from the station. The presence of these fission products is attributable to previous nuclear weapons testing and fallout from the accident at Chernobyl. The operation of Clinton Power Station had no measurable contribution to the radioactive concentration of the terrestrial environment.

Milk

There is no known commercial production of milk for human consumption within a five-mile radius of the Clinton Power Station. Milk samples are collected from a dairy located about 14 miles west southwest of the station and goat milk is collected from a family residence 3.5 miles south southwest of the station (twice a month during May through October and once a month during November through April). These samples are analyzed for I-131, Sr-90 and gamma isotopic activities.

The results of the analyses showed positive concentrations of K-40 and Sr-90 in all 1993 samples with a range of 1140 to 1920 pCi/l for K-40 and 0.9 to 3.6 pCi/l for Sr-90. Preoperational activity of K-40 in milk ranged from 706 to 1375 pCi/l. Strontium-90 analysis in milk was added to the REMP during the operational phase of the program, therefore there were no preoperational data for this isotope. I-131 was not detected in any milk sample obtained during 1993. Figure 10 presents the Sr-90 results graphically.

Grass

In addition to milk samples, grass samples are collected at three indicator locations and at two control locations. These samples are collected twice a month during May through October and once a month during November through April. These samples are analyzed for gamma isotopic activity including I-131.

The results of the analyses showed naturally occurring Be-7 and K-40 in all 1993 samples. Cs-137 was detected in several samples from both the indicator and control locations. I-131 was not detected in any grass sample obtained during 1993.

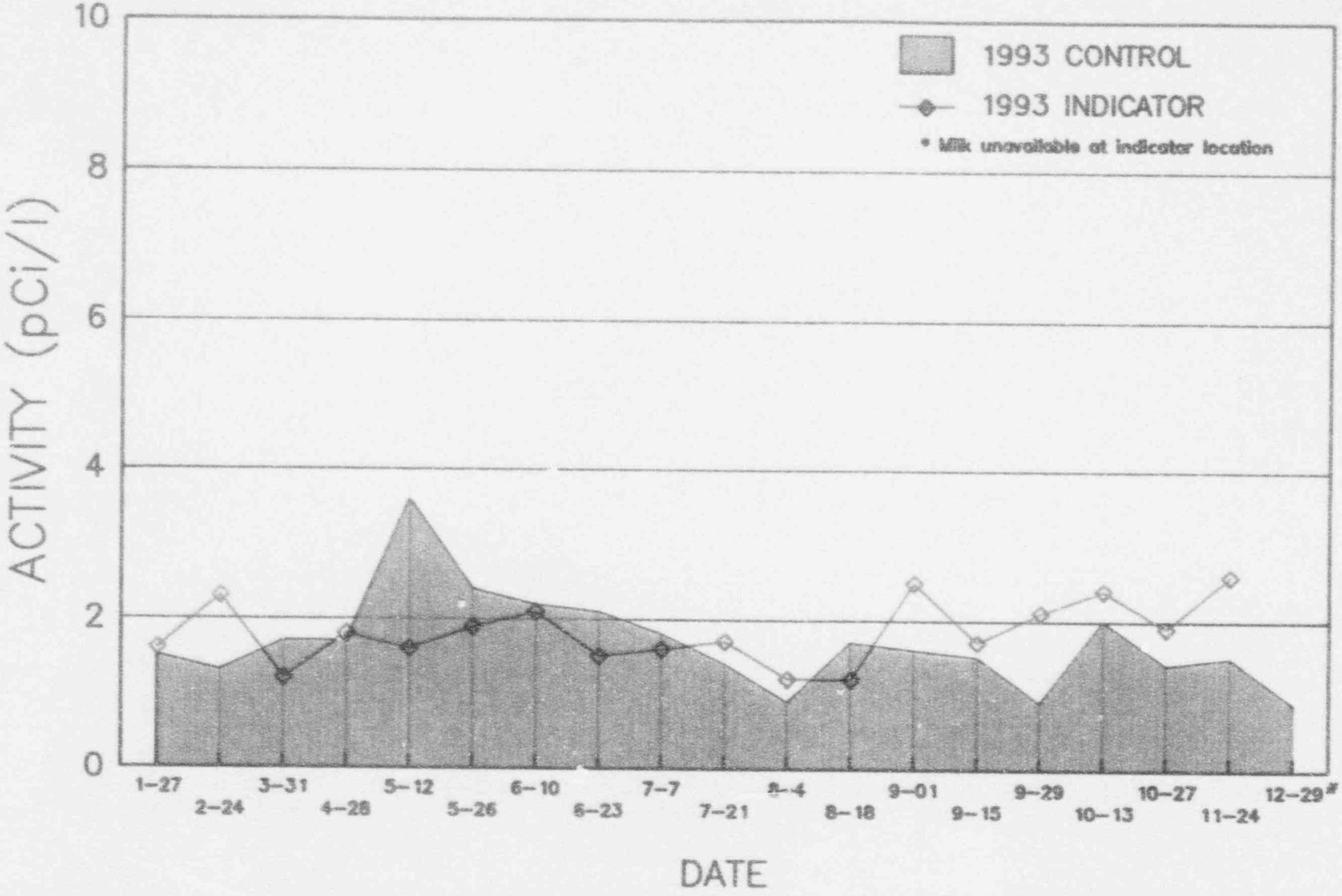


FIGURE 10: STRONTIUM-90 ACTIVITY IN MILK

	Preop Range (pCi/g wet)	1993 Range (pCi/g wet)	1992 Range (pCi/g wet)
Be-7	0.022 to 14.0	0.06 to 12.04	0.09 to 11.7
K-40	0.22 to 14.5	0.47 to 9.37	0.63 to 8.882
Cs-137	0.017 to 0.085	0.006 to 0.032	0.022 to 0.023

The presence of fission product Cs-137 is attributed to fallout from nuclear weapons testing and the Chernobyl accident.

Vegetables

The Clinton Power Station obtains samples of cabbage, lettuce and Swiss chard from three indicator locations and at one control location. The indicator locations are located in the sectors with the highest potential for surface deposition and the control location is in a sector and at a distance which is considered to be unaffected by plant operations. Samples are collected once a month during the growing season (June through September) and analyzed for gross beta and gamma isotopic activities including I-131.

The results of the gamma isotopic analysis showed naturally occurring K-40 and Be-7. Three indicator samples showed the presence of Cs-137 in 1993.

The presence of fission product Cs-137 is attributed to fallout from nuclear weapons testing and the Chernobyl accident.

	Preop Range (pCi/g wet)	1993 Range (pCi/g wet)	1992 Range (pCi/g wet)
Be-7	0.082 to 0.69	0.04 to 0.55	0.018 to 0.63
K-40	1.45 to 7.00	1.44 to 6.34	1.34 to 8.85
Gross Beta	0.87 to 8.80	1.52 to 6.89	1.22 to 8.27
C-137	0.006*	0.011 to 0.015	0.007 to 0.014

* Cs-137 was detected in only one preoperational sample.

I-131 was not detected in any vegetation sample during 1993.

Meat

As an additional check on the presence of radioactive materials in terrestrial exposure pathways, annual samples of beef liver, beef thyroid and ground beef are collected from an animal raised near the Clinton Power Station. These samples are analyzed for gamma isotopic activity including I-131.

The results of the gamma isotopic analysis showed only naturally occurring K-40 in the ground beef, liver and thyroid at 2.21, 1.43 and 2.36 pCi/g (wet) respectively. Preoperational activity ranged from 1.95 to 2.78 pCi/g (wet). I-131 was not detected in the meat samples during 1993.

Soil

One soil sample is collected and analyzed annually from the area where Clinton Power Station land applies processed sewage sludge from the Clinton Power Station Sewage Treatment Plant. All soil samples are analyzed for gross beta, gross alpha and gamma isotopic activities.

Soil samples are sifted to remove any stones or debris and then dried. The result of the gross beta activity was 22.78 pCi/g (dry). Gross alpha activity was 10.72 pCi/g (dry). Gamma isotopic activity indicated several naturally occurring isotopes, such as K-40, Bi-214, Pb-212 and one fission product, Cs-137. Cs-137 was detected at a concentration of 0.041 pCi/g (dry).

	Preop Range (pCi/g dry)	1993 Results (pCi/g dry)	1992 Results (pCi/g dry)
Gross Beta	17.7 to 24.7	22.78	20.99
Gross Alpha	6.2 to 10.4	10.72	9.48
Cs-137	0.14 to 0.40	0.041	0.120

The presence of Cs-137 is attributed to previous nuclear weapons testing and atmospheric fallout from the accident at Chernobyl.

F. Water Monitoring

Water monitoring provides for the collection of drinking water, surface water and ground water (well water) samples to detect the presence of any radioisotopes related to the operation of the Clinton Power Station. The only identified user of water from

Clinton Lake for domestic purposes is the Clinton Power Station; all others potentially exposed to any radioisotopes released into surface or ground water would not be affected for several years.

Samples taken were analyzed for naturally occurring and man-made radioactive isotopes. Average gross beta concentrations in surface, drinking and well water are presented in Table 9.

Drinking Water

The Clinton Power Station domestic water system is the only known direct user of water from Clinton Lake for human consumption. A composite water sampler located in the Service Building collects a small, fixed volume sample at hourly intervals. The sampler discharges each sample into a common sample collection bottle. Therefore, the monthly sample analyzed by the contracted laboratory service is a composite of the individual samples

collected throughout the month. The monthly composite sample is analyzed for gross alpha, gross beta and gamma isotopic activities. A portion of each monthly sample is mixed with the other monthly samples collected during each calendar quarter. The quarterly composite sample is analyzed for tritium.

Gross beta activity ranged from 1.1 to 3.4 pCi/l. These levels are attributed to very fine particles of sediment containing K-40 which are not removed during the chlorinating and filtration process. Monthly drinking water gross beta concentrations are presented in Figure 11.

Specific gamma-emitting radioisotopes were all below the lower limits of detection. Specific searches were made for activated corrosion products (Mn-54, Fe-59, Co-58, Co-60 and Zn-65) and fission products (Nb-95, Zr-95, Ce-134, Cs-137, Ba-140 and La-140).

The results of all analyses for tritium and gross alpha activity were all less than the lower limit of detection.

These results show no measurable effects on drinking water resulting from operation of the Clinton Power Station during 1993.

Surface Water

Composite water samplers are installed in three locations to sample surface water from Clinton Lake.

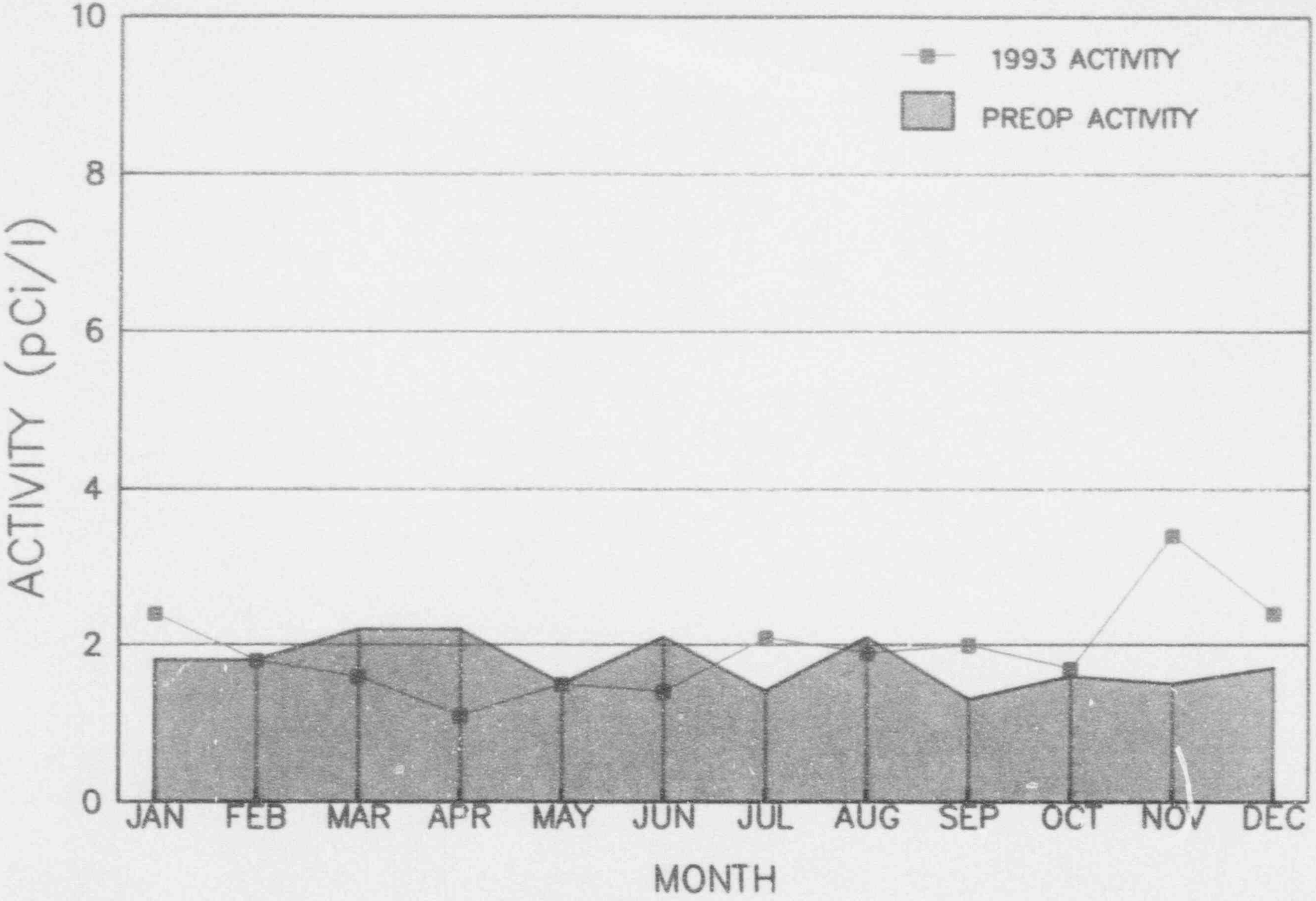


FIGURE 11: DRINKING WATER GROSS BETA ACTIVITY COMPARISON

These samplers collect a small volume of water at regular intervals and discharge it to a large sample collection bottle. These bottles are collected monthly. One of the composite samplers is located upstream from Clinton Power Station and is unaffected by plant liquid releases downstream. The two other composite samplers are positioned at the locations most likely to be affected by plant operations (one samples the intake water to the Circulating Water Intake Structure and the other samples the water at the start of the plant discharge flume). Monthly grab samples are collected from two indicator locations and one control location on Clinton Lake. One additional indicator sample is obtained from the Clinton Power Station lower settling pond.

Surface water samples are analyzed for gross beta, gamma isotopic and tritium activities. Additional analyses for gross alpha activity are performed on the upstream water samples. Additional analyses for gross alpha activity and I-131 activity are performed on water samples taken from the discharge flume. Tritium analyses are performed monthly on samples from the lower settling pond, the intake structure water samples and the upstream composite water samples, and quarterly from composites of monthly samples at the other locations.

The 1993 results of the gross beta analyses ranged from 1.2 to 4.8 pCi/l at the indicator locations and 1.4 to 6.1 pCi/l at the control location. Preoperational gross beta activity ranged from 1.1 to 7.6 pCi/l. These results are attributed to naturally occurring K-40 suspended as fine sediment particles in water. Other types of samples have confirmed the presence of K-40 in Clinton Lake shoreline and bottom sediments. Monthly surface water gross beta activity for the control and indicator locations are presented graphically in Figure 12.

Tritium analyses performed on samples were all less than the lower limit of detection. The preoperational tritium concentrations ranged from 220 to 330 pCi/l.

Specific gamma-emitting radioisotopes were all below the lower limits of detection. Specific searches were made for activated corrosion products (manganese-54, iron-59, cobalt-58, cobalt-60 and zinc-65) and fission products (niobium-95, zirconium-95, cesium-134, cesium-137, barium-140 and lanthanum-140). There was no Iodine-131 detected in any surface water sample during 1993.

Gross alpha activity was detected in several of the surface water samples analyzed for gross alpha. These results ranged from 0.5 to 1.5 pCi/l. Preoperational gross alpha activity ranged from 1.3 to 1.9 pCi/l. These results were attributed to naturally occurring radioisotopes, such as U-238 and Ra-226, suspended as fine sediment particles in water.

These results show no measurable change in radioactive material concentration in surface water due to operation of the Clinton Power Station during 1993.

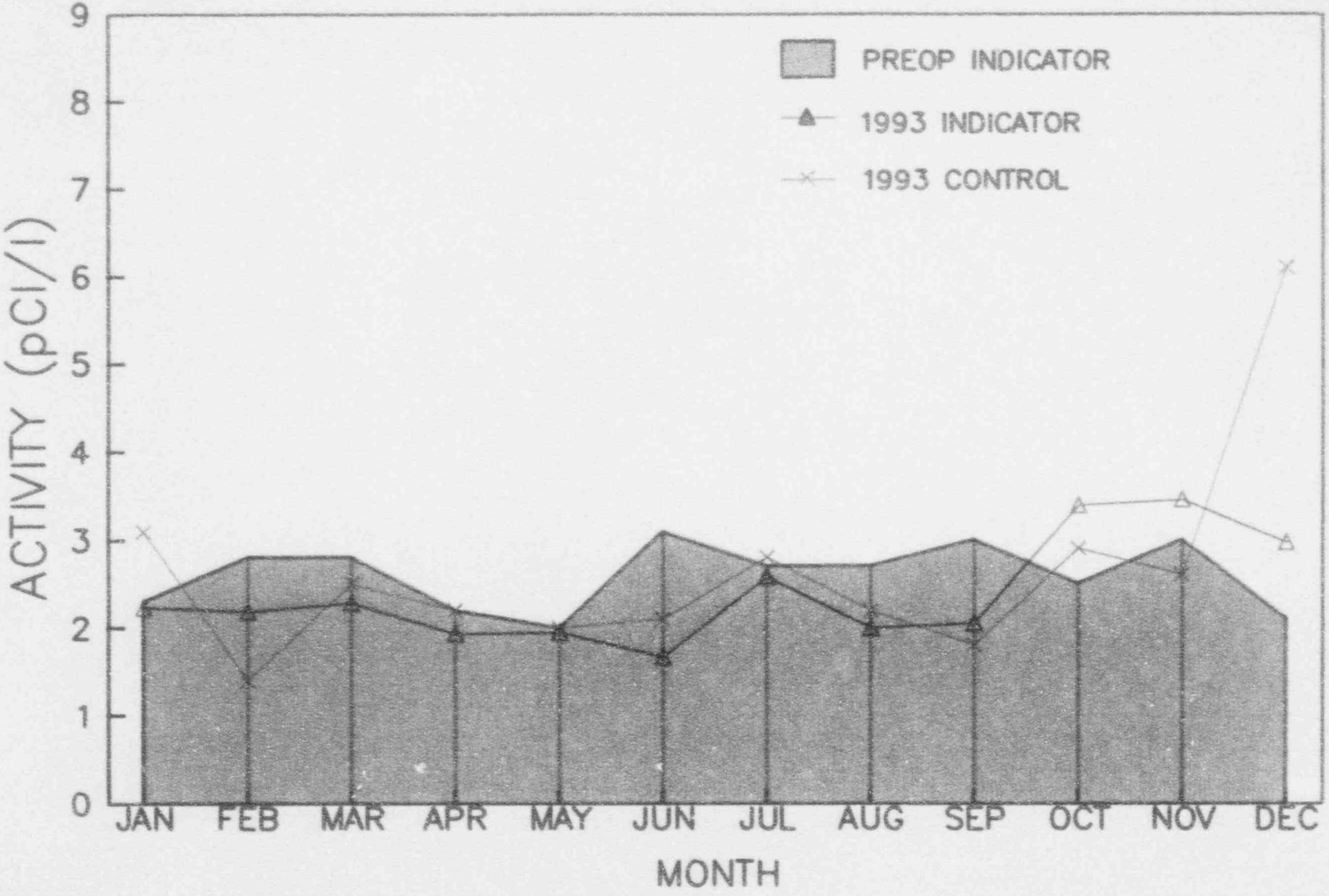


FIGURE 12: SURFACE WATER GROSS BETA ACTIVITY COMPARISON

Well Water

Every two weeks samples are collected from the well serving the Village of DeWitt (both treated and untreated samples are obtained) and from a well serving the Illinois Department of Conservation at the Mascoutin State Recreational Area. Each sample is analyzed for I-131. All samples drawn from the same well during a particular month are combined and analyzed for gross alpha, gross beta and gamma isotopic activities. In addition, a portion of each monthly composite is added to the quarterly composite sample and is analyzed for tritium.

The 1993 results of the gross beta analyses ranged from 0.8 to 3.7 pCi/l. Preoperational gross beta activity ranged from 1.1 to 5.1 pCi/l. The gross beta activity was attributed to naturally occurring K-40 suspended as fine sediment particles in water. Monthly well water gross beta activity is presented graphically in Figure 13.

Gross alpha results were all less than the lower limit of detection in 1993. Preoperational gross alpha activity ranged from 0.9 to 1.8 pCi/l. Gross alpha activity can be attributed to naturally occurring radioisotopes, such as, U-238 and Ra-226, suspended as fine sediment particles in water.

Specific gamma-emitting radioisotopes were all below the lower limits of detection. Specific searches were made for activated corrosion products (manganese-54, iron-59, cobalt-58, cobalt-60 and zinc-65) and fission products (niobium-95, zirconium-95, cesium-134, cesium-137, barium-140 and lanthanum-140). Tritium and I-131 were not detected in any well water samples taken during 1993.

These results show no measurable change in radioactive material concentration in well water resulting from operation of the Clinton Power Station during 1993.

TABLE 9

AVERAGE GROSS BETA CONCENTRATIONS IN DRINKING, SURFACE AND WELL WATER

Station	Description	1992 Average ±2σ (pCi/1)*	1993 Average ±2σ (pCi/1)*
	Drinking Water		
CL-14	CPS (Service Building)	1.9 ± 0.5	2.0 ± 1.2
	Surface Water		
CL-9	DeWitt Road Bridge	2.2 ± 1.2	2.4 ± 1.7
CL-10 (c)	Ill. 48 Bridge	2.1 ± 1.2	2.6 ± 2.3
CL-13	Salt Creek (below dam)	2.2 ± 0.9	2.7 ± 2.1
CL-90	CPS Discharge Flume	2.3 ± 1.6	2.5 ± 1.3
CL-91	Parnell Boat Access	1.8 ± 0.9	1.9 ± 0.7
CL-92	CPS Intake Screenhouse	2.3 ± 1.1	2.4 ± 1.3
CL-93	CPS Settling Ponds	2.8 ± 1.8	2.5 ± 2.3
	Well Water		
CL-7D	Mascoutin State Recreation Area	1.3 ± 0.7	1.3 ± 0.6
CL-12 Treated	DeWitt Pump Station	2.5 ± 1.0	2.0 ± 1.3
CL-12 Untreated	DeWitt Pump Station	2.6 ± 1.7	2.5 ± 1.1

(c) Control location; all others are indicators

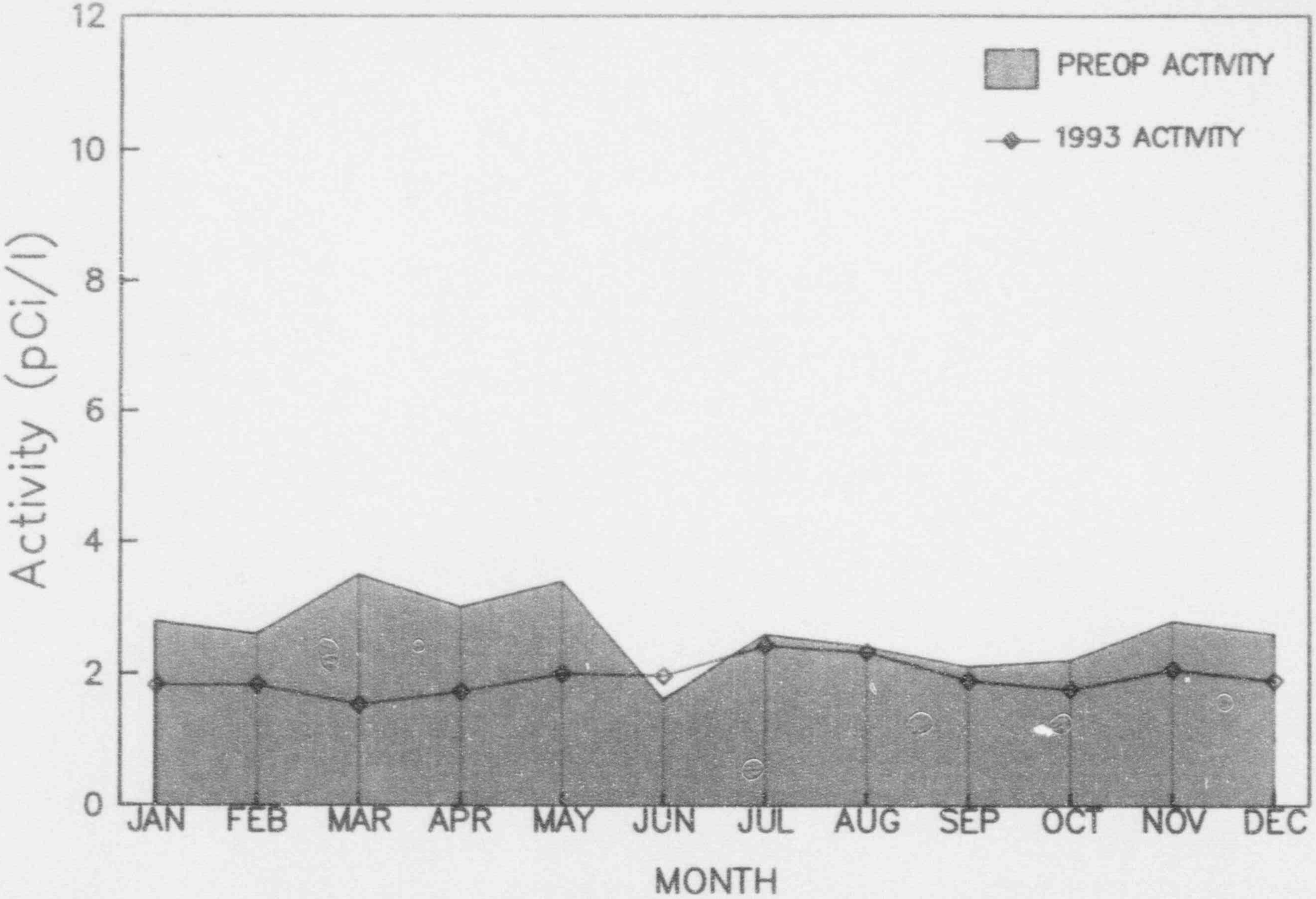


FIGURE 13: WELL WATER GROSS BETA ACTIVITY COMPARISON

G. Quality Assurance Program

To establish confidence that data developed and reported are accurate and precise, all REMP activities are incorporated into the Illinois Power Company Quality Assurance (QA) program of audits and surveillances. The Quality Assurance program requires:

- Participation in intercomparison programs, such as the EPA cross-check program.
- An annual audit of the analysis laboratory functions and facilities.
- Periodic review of the Clinton Power Station procedures specifying sampling techniques.
- Duplicate analysis of every tenth sample assayed (not including TLDs). This requirement is to check laboratory precision.
- The routine counting of quality control samples. Approximately ten percent of the total number of counts performed are to be quality control counts.

The analytical results provided by the laboratory were routinely reviewed by the Radiological Environmental Group of the Radiation Protection Department to ensure the required minimum sensitivities have been achieved and the proper analyses have been performed.

Teledyne Brown Engineering Environmental Services Midwest Laboratory (TBEESML) participates in the Environmental Protection Agency cross-check program. The TBEESML participant code in the cross-check program is CA. Participation in this program provides assurance that the laboratory is capable of meeting widely-accepted criteria for radioactivity analysis.

Results of the 1993 cross-check program and other in-house quality programs are shown in Appendix D.

H. Changes to the REMP During 1993

Occasionally changes to the Radiological Environmental Monitoring Program are necessary to improve the monitoring of the environmental exposure pathways. These changes may result from items identified during the performance of the Annual Land Use Census, revised or new regulatory requirements, Quality Assurance audits or supplemental periodic and long-term sampling and analyses.

During 1993, there were no changes necessary due to the Annual Land Use Census, Quality Assurance audits, any other audits, or regulatory requirements.

ANNUAL LAND USE CENSUS

IV. ANNUAL LAND USE CENSUS

A land use census is performed to ensure that changes in the use of areas at and beyond the site boundary are identified and that any necessary modifications to the REMP are made.

The land use census is performed to identify within a distance of 5 miles, the locations in each of the 16 meteorological sectors of the nearest milk animals, the nearest residence and the nearest garden of greater than 500 square feet producing broadleaf vegetation. Also, the census shall identify within a distance of 3 miles, the location in each of the 16 meteorological sectors of all milk animals and all gardens of greater than 500 square feet producing broadleaf vegetation.

TABLE 10

1993 ANNUAL LAND USE CENSUS

SECTOR	NEAREST RESIDENCE (in miles)	NEAREST GARDEN (in miles)	NEAREST BEEF OR MILK ANIMAL (in miles)
N	0.9	0.9	0.9
NNE	0.9	0.9	2.0
NE	1.2	3.5	3.5
ENE	2.5	2.5	4.6
E	1.1	2.4	a
ESE	3.2	3.2*	a
SE	2.9	3.1*	a
SSE	1.7	2.6	2.8
S	3.0	3.8*	3.0
SSW	3.0	3.0	3.2
SW	0.8	4.0	3.2
WSW	1.5	2.1	3.4
W	1.5	2.3	2.1
WNW	1.5	0.8	a
NW	1.4	1.8	a
NNW	2.5	2.5	3.9

* Gardens less than 50 square meters.

a None identified within 5 miles of CPS in this meteorological sector.

The 1993 Land Use Census was conducted during the growing season from July 17, 1993, through October 11, 1993, satisfying the CPS Offsite Dose Calculation Manual requirements. Over 260 residences were surveyed by either direct contact, telephone follow-up, or drive by observation. Data for this report was obtained using the following means:

- Performed door-to-door solicitation of residences within a 5-mile radius.
- Performed telephone solicitation when people were unavailable during the door-to-door survey.
- Direct observation of land when the aforementioned methods were unsuccessful.
- Contacting several state and local agencies.

The 1993 Land Use Census results were examined to ensure that the REMP will provide representative measurements of radiation and radioactive materials in those exposure pathways and for those radionuclides that lead to the highest potential radiation exposures to the general public resulting from Clinton Power Station operations.

On the basis of the examination of the 1993 Annual Land Use Census results, no changes to the REMP were required.

Summary of Changes Identified in 1993 Annual Land Use Census

Nearest Residence

Two changes were identified for the nearest residence. These changes were attributed to new residence and ownership change. Changes in nearest residence are shown below:

NNW Sector - Change in residence ownership at 2.5 miles.

ESE Sector - Replace resident at 3.2 miles with two residents at 3.2 miles.

Nearest Garden

A total of 150 gardens were identified in the 16 sectors within a 5-mile radius of Clinton Power Station of which 85 produced broad leaf vegetation (e.g., lettuce and cabbage) and were greater than 50 m^2. In most cases, tomatoes, sweet corn and beans were grown in gardens identified.

Changes in census locations for the nearest garden were identified in 8 of the 16 sectors and are shown below:

1992 Census Location	1993 Census Location
2.4 miles NE	3.5 miles NE
4.8 miles ESE	3.2 miles ESE
None identified SE	3.1 miles SE
4.0 miles S	3.8 miles S
3.2 miles SSW	3.0 miles SSW
2.2 miles WSW	2.1 miles WSW
2.9 miles W	2.3 miles W
2.3 miles NNW	2.5 miles NNW

Nearest Livestock/Dairy

Over 500 heads of cattle were counted in the 16 sectors within a 5-mile radius of Clinton Power Station. The cattle were used for nursing of calves and meat production. No cattle producing milk for human consumption were identified.

Seven goats were identified during the land use census. Of these, 3 are being milked for human consumption.

Over 31,000 other farm animals in addition to the cattle identified were counted. Of these the predominant species were turkeys, chickens, hogs and sheep.

Changes in the census locations for the nearest livestock/dairy were identified in 4 of the 16 sectors and are shown below:

1992 Census Location	1993 Census Location
3.5 miles SSW	3.2 miles SSW
3.5 miles SW	3.2 miles SW
4.8 miles W	2.1 miles W
None identified NNW	3.9 miles NNW

METEOROLOGICAL MONITORING

V. METEOROLOGICAL CHARACTERISTICS

A. Description

The climate of central Illinois is typical of the Midwest, with cold winters, warm summers and frequent short-period fluctuations in temperature, humidity, cloudiness and wind direction. The variability in central Illinois climate is due to its location in a confluence zone (particularly during the cooler months) between different air masses. The specific air masses which affect central Illinois include maritime tropical air which originates in the Gulf of Mexico; continental tropical air which originates in Mexico and the southern Rockies; Pacific air which originates in the eastern North Pacific Ocean; and continental polar and continental Arctic air which originates in Canada.

Monthly streamline analyses of resultant surface winds suggest that air reaching central Illinois most frequently originates over the Gulf of Mexico from April through August, over the southeastern United States from September through November, and over both the Pacific Ocean and the Gulf of Mexico from December through March.

The major factors controlling the frequency and variation of weather types are determined by the movement of storm systems which commonly follow paths along a major confluence zone between air masses. The confluence zone is usually oriented from southwest to northeast through the region and normally shifts in latitude during this period, ranging in position from the central states to the United States - Canadian border. The average frequency of passage of storm systems along this zone is about once every 5 to 8 days. These storm systems are most frequent during the winter and spring months, causing a maximum of cloudiness during these seasons. Winter is characterized by alternating periods of steady precipitation and periods of clear, crisp and cold weather. Springtime precipitation is primarily showery in nature. The frequent passage of storm systems, presence of high winds, and frequent occurrence of unstable conditions caused by the close proximity between warm, moist air masses and cold, dry air masses, result in this season's thunderstorms and on occasion, are the source of hail, damaging winds and tornadoes. Although storm systems also occur during the fall months, the frequency of occurrence during these months is less than that of the winter or spring months. Periods of dry weather characterize the fall season which ends rather abruptly with increasing storminess that usually begins in November.

In contrast, weather during the summer months is characterized by weaker storm systems which tend to pass to the north of Illinois. A major confluence zone is not present in this region, and the region's weather is characterized by much sunshine interspersed with thunderstorms. Showers and thunderstorms are usually of the air mass type, although occasional outbreaks of cold air bring precipitation and weather typical of that associated with the fronts and storm systems of the spring months.

When southeasterly and easterly winds are present in central Illinois, they usually bring mild and wet weather. Southerly winds are warm and showery, westerly winds are dry with moderate temperatures, and winds from the northwest and north are cool and dry.

The prevailing wind is southerly at the Clinton Power Station. The frequency of winds from other directions is relatively well distributed. The monthly average wind speed is lowest during late summer and highest during late winter and early spring.

The meteorological monitoring program began at Clinton Power Station on April 13, 1972. The meteorological system consists of a tower 199-feet high with two levels of instrumentation, at the 10-meter and 60-meter levels. Wind direction and speed at the two levels are measured by a combined cup and vane sensor. The temperatures at these levels are sensed by an aspirated dual temperature sensor. One-half of the dual sensor at each elevation is used for ambient temperature while the other half is used to provide a differential temperature of the two levels. Dew-point is measured at the 10-meter level using an aspirated dew-point sensor. Precipitation is measured at ground level by a tipping bucket rain gage.

Meteorological monitoring instruments have been placed on the Clinton Power Station microwave tower at the 10-meter level to act as a backup to the existing tower.

Clinton Power Station meteorological data is transmitted to the Main Control Room via a dedicated telephone line. There the signals are received and converted to a 4 to 20 milliamp signal and fed individually to a microprocessor and chart recorders. The microprocessor is part of the Clinton Power Station Radiation Monitoring System. Meteorological data is available via the microprocessors in the Main Control

Room, Technical Support Center and the Radiation Protection office.

The on-site meteorological tower obtains information that is valuable in determining plume dispersion by providing differential temperature, wind speed and direction. Table 11 summarizes the seven stability classes, with unstable conditions dispersing a plume more than stable conditions. Table 12 compiles the total hours for different wind speeds for each stability class during 1993, at 10 meters and 60 meters. Figures 14 and 15 are wind rose graphs which show predominant wind direction at 10 and 60 meters for the Clinton Power Station.

TABLE 11

CLASSIFICATION OF ATMOSPHERIC STABILITY

Stability Classification	Pasquill Categories	Defining Conditions
Extremely unstable	A	$-0.900<\Delta T\leq-0.019$
Moderately unstable	B	$-0.019<\Delta T\leq-0.017$
Slightly unstable	C	$-0.017<\Delta T\leq-0.015$
Neutral	D	$-0.015<\Delta T\leq-0.005$
Slightly stable	E	$-0.005<\Delta T\leq 0.015$
Moderately stable	F	$0.015<\Delta T\leq 0.040$
Extremely stable	G	$0.040<\Delta T\leq 0.900$
Invalid		$\Delta T\leq -0.900$ or $\Delta T> 0.900$

ΔT = temperature difference in Celsius degrees per meter

TABLE 12

JOINT WIND FREQUENCY DISTRIBUTION BY STABILITY CLASS

Data Period: January 1, 1993 - December 31, 1993

STABILITY CLASS A

WIND SPEED (MPH) AT 10 METER LEVEL

DIRECTION	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	1.00E 00	1.30E 01	1.10E 01	2.30E 01	0.00E-01	1.00E 00	4.90E 01
NNE	0.00E-01	4.00E 00	1.40E 01	8.00E 00	0.00E-01	0.00E-01	2.60E 01
NE	0.00E-01	4.00E 00	1.40E 01	4.00E 00	0.00E-01	0.00E-01	2.20E 01
ENE	0.00E-01	6.00E 00	4.00E 00	0.00E-01	0.00E-01	0.00E-01	1.00E 01
E	1.00E 00	9.00E 00	6.00E 00	0.00E-01	0.00E-01	0.00E-01	1.60E 01
ESE	0.00E-01	5.00E 00	6.00E 00	0.00E-01	0.00E-01	0.00E-01	1.10E 01
SE	0.00E-01	9.00E 00	7.00E 00	2.00E 00	0.00E-01	9.00E 00	2.70E 01
SSE	1.00E 00	3.00E 00	1.30E 01	1.30E 01	0.00E-01	0.00E-01	3.00E 01
S	1.00E 00	0.00E-01	1.70E 01	1.60E 01	1.00E 00	0.00E-01	3.50E 01
SSW	0.00E-01	8.00E 00	1.90E 01	1.90E 01	3.00E 00	0.00E-01	4.90E 01
SW	0.00E-01	1.30E 01	1.40E 01	2.00E 01	0.00E-01	0.00E-01	4.70E 01
WSW	1.00E 00	1.00E 00	2.70E 01	1.40E 01	0.00E-01	0.00E-01	4.30E 01
W	1.00E 00	3.00E 00	2.50E 01	1.80E 01	6.00E 00	0.00E-01	5.30E 01
WNW	2.00E 00	2.00E 01	3.70E 01	2.60E 01	4.00E 00	1.00E 00	9.00E 01
NW	2.00E 00	1.70E 01	3.10E 01	2.10E 01	0.00E-01	0.00E-01	7.10E 01
NNW	1.00E 00	9.00E 00	2.70E 01	1.80E 01	0.00E-01	1.00E 00	5.60E 01
TOTAL	1.10E 01	1.24E 02	2.72E 02	2.02E 02	1.40E 01	1.20E 01	6.35E 02

PERIODS OF CALM (HOURS): 0.00E-01

HOURS OF INVALID DATA: 2.30E 01

WIND SPEED (MPH) AT 60 METER LEVEL

DIRECTION	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	1.00E 00	4.00E 00	5.00E 00	9.00E 00	3.00E 00	1.00E 00	2.30E 01
NNE	0.00E-01	2.00E 00	7.00E 00	1.40E 01	1.00E 00	0.00E-01	2.40E 01
NE	0.00E-01	1.00E 00	7.00E 00	1.00E 01	1.00E 00	0.00E-01	1.90E 01
ENE	0.00E-01	3.00E 00	9.00E 00	3.00E 00	0.00E-01	0.00E-01	1.50E 01
E	0.00E-01	7.00E 00	5.00E 00	4.00E 00	1.00E 00	0.00E-01	1.70E 01
ESE	0.00E-01	6.00E 00	5.00E 00	0.00E-01	0.00E-01	0.00E-01	1.10E 01
SE	3.00E 00	5.00E 00	7.00E 00	3.00E 00	1.00E 00	9.00E 00	2.80E 01
SSE	0.00E-01	2.00E 00	5.00E 00	9.00E 00	8.00E 00	0.00E-01	2.40E 01
S	0.00E-01	0.00E-01	9.00E 00	1.20E 01	1.40E 01	3.00E 00	3.80E 01
SSW	0.00E-01	4.00E 00	1.30E 01	1.90E 01	5.00E 00	5.00E 00	4.60E 01
SW	0.00E-01	8.00E 00	1.90E 01	2.10E 01	1.10E 01	0.00E-01	5.90E 01
WSW	1.00E 00	5.00E 00	9.00E 00	2.00E 01	4.00E 00	2.00E 00	4.10E 01
W	0.00E-01	6.00E 00	2.30E 01	1.90E 01	7.00E 00	2.00E 00	5.70E 01
WNW	2.00E 00	1.70E 01	2.90E 01	2.20E 01	9.00E 00	5.00E 00	8.40E 01
NW	1.00E 00	1.00E 01	3.30E 01	2.40E 01	4.00E 00	1.00E 00	7.30E 01
NNW	2.00E 00	1.00E 01	1.80E 01	2.40E 01	0.00E-01	1.00E 00	5.50E 01
TOTAL	1.00E 01	9.00E 01	2.03E 02	2.13E 02	6.90E 01	2.90E 01	6.14E 02

PERIODS OF CALM (HOURS): 1.00E 00

HOURS OF INVALID DATA: 4.30E 01

TABLE 12 (cont'd)

JOINT WIND FREQUENCY DISTRIBUTION BY STABILITY CLASS

Data Period: January 1, 1993 - December 31, 1993

STABILITY CLASS B

WIND SPEED (MPH) AT 10 METER LEVEL

DIRECTION	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0.00E-01	5.00E 00	5.00E 00	2.00E 00	0.00E-01	0.00E-01	1.20E 01
NNE	2.00E 00	6.00E 00	9.00E 00	9.00E 00	0.00E-01	0.00E-01	2.60E 01
NE	2.00E 00	2.00E 00	1.30E 01	6.00E 00	0.00E-01	0.00E-01	2.30E 01
ENE	1.00E 00	5.00E 00	2.00E 00	0.00E-01	0.00E-01	0.00E-01	8.00E 00
E	0.00E-01	0.00E-01	1.00E 00	0.00E-01	1.00E 00	0.00E-01	2.00E 00
ESE	2.00E 00	6.00E 00	3.00E 00	0.00E-01	0.00E-01	0.00E-01	1.10E 01
SE	2.00E 00	9.00E 00	8.00E 00	2.00E 00	0.00E-01	0.00E-01	2.10E 01
SSE	4.00E 00	5.00E 00	9.00E 00	9.00E 00	0.00E-01	0.00E-01	2.70E 01
S	3.00E 00	6.00E 00	1.20E 01	7.00E 00	1.00E 00	0.00E-01	2.90E 01
SSW	2.00E 00	2.00E 00	1.50E 01	7.00E 00	2.00E 00	0.00E-01	2.80E 01
SW	0.00E-01	1.30E 01	1.20E 01	7.00E 00	0.00E-01	0.00E-01	3.20E 01
WSW	2.00E 00	3.00E 00	7.00E 00	5.00E 00	0.00E-01	0.00E-01	1.70E 01
W	3.00E 00	5.00E 00	1.80E 01	5.00E 00	3.00E 00	0.00E-01	3.40E 01
WNW	3.00E 00	1.50E 01	1.10E 01	1.70E 01	3.00E 00	2.00E 00	5.10E 01
NW	2.00E 00	1.50E 01	1.60E 01	4.00E 00	1.00E 00	0.00E-01	3.80E 01
NNW	1.00E 00	9.00E 00	7.00E 00	4.00E 00	4.00E 00	0.00E-01	2.50E 01
TOTAL	2.90E 01	1.06E 02	1.48E 02	8.40E 01	1.50E 01	2.00E 00	3.84E 02

PERIODS OF CALM (HOURS): 0.00E-01

HOURS OF INVALID DATA: 0.00E-01

WIND SPEED (MPH) AT 60 METER LEVEL

DIRECTION	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0.00E-01	2.00E 00	3.00E 00	1.00E 00	0.00E-01	0.00E-01	6.00E 00
NNE	2.00E 00	0.00E-01	6.00E 00	1.10E 01	4.00E 00	0.00E-01	2.30E 01
NE	1.00E 00	2.00E 00	4.00E 00	8.00E 00	1.00E 00	0.00E-01	1.60E 01
ENE	2.00E 00	5.00E 00	1.00E 00	1.00E 00	0.00E-01	0.00E-01	9.00E 00
E	2.00E 00	3.00E 00	2.00E 00	2.00E 00	1.00E 00	0.00E-01	1.00E 01
ESE	2.00E 00	3.00E 00	1.00E 00	0.00E-01	0.00E-01	0.00E-01	6.00E 00
SE	2.00E 00	8.00E 00	7.00E 00	4.00E 00	4.00E 00	0.00E-01	2.50E 01
SSE	4.00E 00	1.00E 00	7.00E 00	5.00E 00	7.00E 00	1.00E 00	2.50E 01
S	2.00E 00	4.00E 00	8.00E 00	4.00E 00	8.00E 00	3.00E 00	2.90E 01
SSW	1.00E 00	1.00E 00	9.00E 00	1.00E 01	3.00E 00	1.00E 00	2.50E 01
SW	0.00E-01	5.00E 00	1.70E 01	7.00E 00	6.00E 00	0.00E-01	3.50E 01
WSW	2.00E 00	7.00E 00	4.00E 00	7.00E 00	0.00E-01	0.00E-01	2.00E 01
W	3.00E 00	1.00E 00	1.10E 01	4.00E 00	3.00E 00	2.00E 00	2.40E 01
WNW	3.00E 00	1.50E 01	8.00E 00	1.10E 01	5.00E 00	3.00E 00	4.50E 01
NW	6.00E 00	1.70E 01	1.70E 01	7.00E 00	5.00E 00	0.00E-01	5.20E 01
NNW	0.00E-01	5.00E 00	4.00E 00	9.00E 00	0.00E-01	4.00E 00	2.20E 01
TOTAL	3.20E 01	7.90E 01	1.09E 02	9.10E 01	4.70E 01	1.40E 01	3.72E 02

PERIODS OF CALM (HOURS): 0.00E-01

HOURS OF INVALID DATA: 1.20E 01

TABLE 12 (cont'd)

JOINT WIND FREQUENCY DISTRIBUTION BY STABILITY CLASS

Data Period: January 1, 1993- December 31, 1993

STABILITY CLASS C

WIND SPEED (MPH) AT 10 METER LEVEL

DIRECTION	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0.00E-01	7.00E 00	7.00E 00	5.00E 00	1.00E 00	0.00E-01	2.00E 01
NNE	3.00E 00	1.10E 01	1.10E 01	1.00E 01	0.00E-01	0.00E-01	3.50E 01
NE	3.00E 00	1.20E 01	1.50E 01	3.00E 00	0.00E-01	0.00E-01	3.30E 01
ENE	0.00E-01	8.00E 00	7.00E 00	2.00E 00	0.00E-01	0.00E-01	1.70E 01
E	5.00E 00	6.00E 00	3.00E 00	1.00E 00	0.00E-01	0.00E-01	1.50E 01
ESE	1.00E 00	1.20E 01	5.00E 00	0.00E-01	0.00E-01	0.00E-01	1.80E 01
SE	3.00E 00	6.00E 00	1.10E 01	1.00E 00	0.00E-01	0.00E-01	2.10E 01
SSE	2.00E 00	5.00E 00	1.50E 01	7.00E 00	0.00E-01	0.00E-01	2.90E 01
S	4.00E 00	8.00E 00	1.60E 01	8.00E 00	0.00E-01	0.00E-01	3.60E 01
SSW	1.00E 00	5.00E 00	1.90E 01	1.10E 01	3.00E 00	3.00E 00	4.20E 01
SW	1.00E 00	1.40E 01	2.30E 01	7.00E 00	2.00E 00	0.00E-01	4.70E 01
WSW	0.00E-01	8.00E 00	1.90E 01	3.00E 00	0.00E-01	0.00E-01	3.00E 01
W	1.00E 00	4.00E 00	2.00E 01	6.00E 00	1.30E 01	0.00E-01	4.40E 01
WNW	9.00E 00	9.00E 00	1.40E 01	2.00E 01	1.00E 00	0.00E-01	5.30E 01
NW	1.00E 00	4.00E 00	1.60E 01	1.00E 00	2.00E 00	0.00E-01	2.40E 01
NNW	3.00E 00	6.00E 00	1.40E 01	1.00E 01	1.00E 00	0.00E-01	3.40E 01
TOTAL	3.70E 01	1.25E 02	2.15E 02	9.50E 01	2.30E 01	3.00E 00	4.98E 02

PERIODS OF CALM (HOURS): 0.00E-01

HOURS OF INVALID DATA: 0.00E-01

WIND SPEED (MPH) AT 60 METER LEVEL

DIRECTION	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	1.00E 00	1.40E 01	3.00E 00	2.00E 00	3.00E 00	1.00E 00	2.40E 01
NNE	3.00E 00	5.00E 00	8.00E 00	1.00E 01	4.00E 00	0.00E-01	3.00E 01
NE	2.00E 00	6.00E 00	1.60E 01	5.00E 00	0.00E-01	0.00E-01	2.90E 01
ENE	1.00E 00	7.00E 00	7.00E 00	7.00E 00	1.00E 00	0.00E-01	2.30E 01
E	1.00E 00	8.00E 00	1.00E 00	4.00E 00	1.00E 00	0.00E-01	1.50E 01
ESE	2.00E 00	1.00E 01	4.00E 00	0.00E-01	0.00E-01	0.00E-01	1.60E 01
SE	1.00E 00	7.00E 00	8.00E 00	2.00E 00	1.00E 00	0.00E-01	1.90E 01
SSE	4.00E 00	5.00E 00	9.00E 00	9.00E 00	6.00E 00	1.00E 00	3.40E 01
S	2.00E 00	5.00E 00	1.20E 01	1.20E 01	9.00E 00	2.00E 00	4.20E 01
SSW	0.00E-01	3.00E 00	9.00E 00	8.00E 00	7.00E 00	6.00E 00	3.30E 01
SW	1.00E 00	1.00E 01	1.80E 01	1.00E 01	4.00E 00	2.00E 00	4.50E 01
WSW	0.00E-01	5.00E 00	1.10E 01	8.00E 00	0.00E-01	1.00E 00	2.50E 01
W	1.00E 00	9.00E 00	9.00E 00	7.00E 00	6.00E 00	8.00E 00	4.00E 01
WNW	5.00E 00	9.00E 00	8.00E 00	1.40E 01	5.00E 00	1.00E 00	4.20E 01
NW	6.00E 00	4.00E 00	9.00E 00	5.00E 00	5.00E 00	1.00E 00	3.00E 01
NNW	3.00E 00	9.00E 00	1.00E 01	1.00E 01	1.00E 00	0.00E-01	3.30E 01
TOTAL	3.30E 01	1.16E 02	1.42E 02	1.13E 02	5.30E 01	2.30E 01	4.80E 02

PERIODS OF CALM (HOURS): 0.00E-01

HOURS OF INVALID DATA: 1.80E 01

TABLE (cont'd)

JOINT WIND FREQUENCY DISTRIBUTION BY STABILITY CLASS

Data Period: January 1, 1993 December 31, 1993

STABILITY CLASS D

WIND SPEED (MPH) AT 10 METER LEVEL

DIRECTION	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	8.00E 00	4.20E 01	4.00E 01	5.70E 01	9.00E 00	0.00E-01	1.56E 02
NNE	1.40E 01	5.20E 01	1.06E 02	5.50E 01	1.30E 01	0.00E-01	2.40E 02
NE	2.90E 01	9.30E 01	1.28E 02	4.60E 01	1.00E 00	0.00E-01	2.97E 02
ENE	2.40E 01	7.70E 01	4.80E 01	3.80E 01	1.00E 00	0.00E-01	1.88E 02
E	2.90E 01	5.40E 01	5.50E 01	6.00E 00	0.00E-01	0.00E-01	1.44E 02
ESE	3.20E 01	9.20E 01	6.00E 01	0.00E-01	0.00E-01	0.00E-01	1.84E 02
SE	1.70E 01	1.00E 02	7.50E 01	9.00E 00	0.00E-01	0.00E-01	2.01E 02
SSE	2.90E 01	9.20E 01	1.05E 02	3.50E 01	1.00E 00	0.00E-01	2.62E 02
S	5.00E 00	6.40E 01	1.37E 02	7.10E 01	5.00E 00	0.00E-01	2.82E 02
SSW	1.00E 01	6.60E 01	1.14E 02	7.40E 01	1.90E 01	1.00E 00	2.84E 02
SW	1.80E 01	8.00E 01	7.70E 01	3.70E 01	0.00E-01	0.00E-01	2.12E 02
WSW	8.00E 00	6.70E 01	8.30E 01	4.60E 01	7.00E 00	0.00E-01	2.11E 02
W	1.30E 01	4.80E 01	9.00E 01	6.80E 01	3.50E 01	1.00E 00	2.55E 02
WNW	1.40E 01	3.20E 01	1.20E 02	1.29E 02	1.90E 01	3.00E 00	3.17E 02
NW	8.00E 00	4.40E 01	8.20E 01	4.30E 01	4.00E 00	0.00E-01	1.81E 02
NNW	9.00E 00	3.50E 01	8.10E 01	6.00E 01	5.00E 00	0.00E-01	1.90E 02
TOTAL	2.67E 02	1.04E 03	1.40E 03	7.74E 02	1.19E 02	5.00E 00	3.60E 03

PERIODS OF CALM (HOURS): 1.00E 01

HOURS OF INVALID DATA: 0.00E-01

WIND SPEED (MPH) AT 60 METER LEVEL

DIRECTION	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	8.00E 00	1.90E 01	4.50E 01	3.00E 01	5.10E 01	6.00E 00	1.59E 02
NNE	6.00E 00	2.50E 01	6.60E 01	8.00E 01	3.80E 01	1.70E 01	2.32E 02
NE	1.70E 01	3.60E 01	1.01E 02	9.50E 01	5.30E 01	3.30E 01	3.35E 02
ENE	7.00E 00	3.50E 01	5.60E 01	4.30E 01	1.00E 01	8.00E 00	1.59E 02
E	1.40E 01	3.20E 01	5.50E 01	5.50E 01	1.10E 01	3.00E 00	1.70E 02
ESE	1.90E 01	5.90E 01	6.90E 01	1.20E 01	0.00E-01	0.00E-01	1.59E 02
SE	1.70E 01	3.70E 01	6.80E 01	4.10E 01	6.00E 00	0.00E-01	1.69E 02
SSE	2.00E 01	3.70E 01	7.60E 01	6.00E 01	4.20E 01	1.10E 01	2.46E 02
S	7.00E 00	2.90E 01	8.20E 01	1.27E 02	7.30E 01	3.10E 01	3.49E 02
SSW	7.00E 00	2.10E 01	7.90E 01	7.80E 01	4.60E 01	1.90E 01	2.50E 02
SW	1.20E 01	2.90E 01	7.40E 01	6.80E 01	2.10E 01	0.00E-01	2.04E 02
WSW	1.10E 01	2.40E 01	5.20E 01	7.10E 01	1.90E 01	1.30E 01	1.90E 02
W	1.60E 01	2.90E 01	5.30E 01	5.70E 01	3.10E 01	2.60E 01	2.12E 02
WNW	1.10E 01	2.20E 01	6.50E 01	9.50E 01	5.90E 01	1.60E 01	2.68E 02
NW	1.30E 01	3.60E 01	6.00E 01	6.40E 01	3.00E 01	7.00E 00	2.10E 02
NNW	1.20E 01	2.60E 01	5.20E 01	7.60E 01	2.20E 01	3.00E 00	1.91E 02
TOTAL	1.97E 02	4.96E 02	1.05E 03	1.05E 03	5.12E 02	1.93E 02	3.50E 03

PERIODS OF CALM (HOURS): 1.00E 01

HOURS OF INVALID DATA: 1.01E 02

TABLE 12 (cont'd)

JOINT WIND FREQUENCY DISTRIBUTION BY STABILITY CLASS

Data Period: January 1, 1993 - December 31, 1993

STABILITY CLASS E

WIND SPEED (MPH) AT 10 METER LEVEL

DIRECTION	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	1.60E 01	3.30E 01	1.20E 01	1.00E 00	0.00E-01	0.00E-01	6.20E 01
NNE	1.50E 01	3.90E 01	1.20E 01	1.00E 00	0.00E-01	0.00E-01	6.70E 01
NE	2.60E 01	5.10E 01	1.00E 01	1.00E 00	0.00E-01	0.00E-01	8.80E 01
ENE	2.50E 01	5.10E 01	1.20E 01	0.00E-01	0.00E-01	0.00E-01	8.80E 01
E	3.10E 01	5.90E 01	1.80E 01	0.00E-01	0.00E-01	0.00E-01	1.08E 02
ESE	3.10E 01	6.80E 01	7.00E 00	0.00E-01	0.00E-01	0.00E-01	1.06E 02
SE	2.50E 01	9.80E 01	2.30E 01	2.00E 00	1.00E 00	0.00E-01	1.49E 02
SSE	1.80E 01	1.03E 02	3.60E 01	7.00E 00	0.00E-01	0.00E-01	1.64E 02
S	8.00E 00	8.10E 01	6.30E 01	2.70E 01	1.00E 00	0.00E-01	1.80E 02
SSW	1.20E 01	8.90E 01	9.90E 01	1.50E 01	1.00E 00	0.00E-01	2.16E 02
SW	1.30E 01	6.80E 01	5.20E 01	9.00E 00	0.00E-01	0.00E-01	1.42E 02
WSW	2.30E 01	3.10E 01	4.20E 01	1.20E 01	3.00E 00	0.00E-01	1.11E 02
W	1.50E 01	3.30E 01	3.20E 01	2.60E 01	0.00E-01	0.00E-01	1.06E 02
WNW	9.00E 00	6.10E 01	5.50E 01	1.20E 01	0.00E-01	0.00E-01	1.37E 02
NW	9.00E 00	3.00E 01	1.10E 01	0.00E-01	0.00E-01	0.00E-01	5.00E 01
NNW	1.10E 01	2.70E 01	1.30E 01	1.00E 00	0.00E-01	0.00E-01	5.20E 01
TOTAL	2.87E 02	9.22E 02	4.97E 02	1.14E 02	6.00E 00	0.00E-01	1.83E 03

PERIODS OF CALM (HOURS): 9.00E 00

HOURS OF INVALID DATA: 0.00E-01

WIND SPEED (MPH) AT 60 METER LEVEL

DIRECTION	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	5.00E 00	1.00E 01	2.40E 01	1.20E 01	1.00E 00	0.00E-01	5.20E 01
NNE	1.00E 00	1.10E 01	2.90E 01	1.50E 01	3.00E 00	0.00E-01	5.90E 01
NE	5.00E 00	8.00E 00	3.90E 01	2.00E 01	5.00E 00	0.00E-01	7.70E 01
ENE	0.00E 01	1.50E 01	4.40E 01	3.70E 01	0.00E-01	0.00E-01	9.60E 01
E	1.00E 00	1.40E 01	4.10E 01	3.60E 01	1.00E 01	1.00E 00	1.03E 02
ESE	8.00E 00	3.90E 01	4.20E 01	1.10E 01	0.00E-01	0.00E-01	1.00E 02
SE	7.00E 00	3.60E 01	3.60E 01	3.70E 01	3.00E 00	2.00E 00	1.21E 02
SSE	1.40E 01	1.60E 01	5.40E 01	6.90E 01	1.70E 01	3.00E 00	1.73E 02
S	4.00E 00	8.00E 00	6.30E 01	8.10E 01	3.70E 01	1.20E 01	2.05E 02
SSW	6.00E 00	1.10E 01	4.30E 01	1.03E 02	2.80E 01	0.00E-01	1.91E 02
SW	3.00E 00	1.60E 01	4.60E 01	9.50E 01	1.30E 01	0.00E-01	1.73E 02
WSW	7.00E 00	1.40E 01	2.40E 01	3.60E 01	9.00E 00	8.00E 00	9.80E 01
W	4.00E 00	1.70E 01	2.60E 01	3.20E 01	2.20E 01	0.00E-01	1.01E 02
WNW	3.00E 00	1.20E 01	2.90E 01	4.60E 01	7.00E 00	2.00E 00	9.90E 01
NW	2.00E 00	1.20E 01	6.20E 01	2.30E 01	1.00E 00	0.00E-01	1.00E 02
NNW	7.00E 00	4.00E 00	2.40E 01	6.00E 00	1.00E 00	0.00E-01	4.20E 01
TOTAL	7.70E 01	2.43E 02	6.26E 02	6.59E 02	1.57E 02	2.80E 01	1.79E 03

PERIODS OF CALM (HOURS): 3.00E 00

HOURS OF INVALID DATA: 4.20E 01

TABLE 12 (cont'd)

JOINT WIND FREQUENCY DISTRIBUTION BY STABILITY CLASS

Data Period: January 1, 1993 - December 31, 1993

STABILITY CLASS F

WIND SPEED (MPH) AT 10 METER LEVEL

DIRECTION	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	4.00E 00	1.10E 01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	1.50E 01
NNE	1.00E 01	1.90E 01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	2.90E 01
NE	2.20E 01	2.00E 01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	4.20E 01
ENE	1.00E 01	1.40E 01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	2.40E 01
E	1.50E 01	7.00E 00	0.00E-01	0.00E-01	0.00E-01	0.00E-01	2.20E 01
ESE	1.30E 01	8.00E 00	0.00E-01	0.00E-01	0.00E-01	0.00E-01	2.10E 01
SE	1.10E 01	2.10E 01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	3.20E 01
SSE	1.50E 01	2.00E 01	1.00E 00	1.00E 00	0.00E-01	0.00E-01	3.70E 01
S	4.00E 00	2.20E 01	8.00E 00	0.00E-01	0.00E-01	0.00E-01	3.40E 01
SSW	9.00E 00	3.00E 01	1.00E 01	1.00E 00	0.00E-01	0.00E-01	5.00E 01
SW	1.00E 01	2.50E 01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	3.50E 01
WSW	1.20E 01	1.40E 01	1.00E 00	0.00E-01	0.00E-01	0.00E-01	2.70E 01
W	1.30E 01	2.00E 01	3.00E 00	0.00E-01	0.00E-01	0.00E-01	3.60E 01
WNW	1.00E 01	1.80E 01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	2.80E 01
NW	1.00E 01	3.10E 01	1.00E 00	0.00E-01	0.00E-01	0.00E-01	4.20E 01
NNW	5.00E 00	1.10E 01	1.00E 00	0.00E-01	0.00E-01	0.00E-01	1.70E 01
TOTAL	1.73E 02	2.91E 02	2.50E 01	2.00E 00	0.00E-01	0.00E-01	4.91E 02

PERIODS OF CALM (HOURS): 5.00E 00

HOURS OF INVALID DATA: 0.00E 00

WIND SPEED (MPH) AT 60 METER LEVEL

DIRECTION	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0.00E-01	1.00E 01	1.00E 00	3.00E 00	0.00E-01	0.00E-01	1.40E 01
NNE	2.00E 00	1.00E 00	4.00E 00	9.00E 00	0.00E-01	0.00E-01	1.60E 01
NE	1.00E 00	6.00E 00	1.20E 01	1.30E 01	1.00E 00	0.00E-01	3.30E 01
ENE	2.00E 00	8.00E 00	8.00E 00	7.00E 00	0.00E-01	0.00E-01	2.50E 01
E	3.00E 00	6.00E 00	1.10E 01	4.00E 00	0.00E-01	0.00E-01	2.40E 01
ESE	5.00E 00	1.30E 01	8.00E 00	0.00E-01	0.00E-01	0.00E-01	2.60E 01
SE	7.00E 00	1.40E 01	7.00E 00	3.00E 00	3.00E 00	0.00E-01	3.40E 01
SSE	1.00E 00	6.00E 00	9.00E 00	9.00E 00	0.00E-01	0.00E-01	2.50E 01
S	2.00E 00	8.00E 00	1.10E 01	2.60E 01	1.00E 00	0.00E-01	4.80E 01
SSW	2.00E 00	6.00E 00	1.60E 01	3.20E 01	1.00E 00	0.00E-01	5.70E 01
SW	1.00E 00	3.00E 00	1.60E 01	1.20E 01	0.00E-01	0.00E-01	3.20E 01
WSW	1.00E 00	1.00E 00	1.60E 01	7.00E 00	0.00E-01	0.00E-01	2.50E 01
W	2.00E 00	6.00E 00	1.70E 01	2.00E 00	0.00E-01	0.00E-01	2.70E 01
WNW	2.00E 00	9.00E 00	6.00E 00	5.00E 00	0.00E-01	0.00E-01	2.20E 01
NW	0.00E-01	1.40E 01	1.90E 01	5.00E 00	0.00E-01	0.00E-01	3.80E 01
NNW	1.00E 00	1.20E 01	1.90E 01	2.00E 00	0.00E-01	0.00E-01	3.40E 01
TOTAL	3.20E 01	1.23E 02	1.80E 02	1.39E 02	6.00E 00	0.00E-01	4.80E 02

PERIODS OF CALM (HOURS): 1.00E 00

HOURS OF INVALID DATA: 1.50E 01

TABLE 12 (cont'd)

JOINT WIND FREQUENCY DISTRIBUTION BY STABILITY CLASS

Data Period: January 1, 1993 - December 31, 1993

STABILITY CLASS G

WIND SPEED (MPH) AT 10 METER LEVEL

DIRECTION	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	7.00E 00	4.00E 00	0.00E-01	0.00E-01	0.00E-01	0.00E-01	1.10E 01
NNE	1.60E 01	7.00E 00	0.00E-01	0.00E-01	0.00E-01	0.00E-01	2.30E 01
NE	1.10E 01	2.70E 01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	3.80E 01
ENE	7.00E 00	5.00E 00	0.00E-01	0.00E-01	0.00E-01	0.00E-01	1.20E 01
E	5.00E 00	2.00E 00	0.00E-01	0.00E-01	0.00E-01	0.00E-01	7.00E 00
ESE	1.00E 00	0.00E-00	0.00E-01	0.00E-01	0.00E-01	0.00E-01	1.00E 00
SE	8.00E 00	3.00E 00	0.00E-01	0.00E-01	0.00E-01	0.00E-01	1.10E 01
SSE	9.00E 00	1.00E 01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	1.90E 01
S	3.00E 00	3.00E 00	0.00E-01	0.00E-01	0.00E-01	0.00E-01	6.00E 00
SSW	1.00E 00	8.00E 00	0.00E-01	1.00E 00	1.00E 00	0.00E-01	1.10E 01
SW	8.00E 00	6.00E 00	0.00E-01	0.00E-01	0.00E-01	0.00E-01	1.40E 01
WSW	9.00E 00	5.00E 00	1.00E 00	1.00E 00	0.00E-01	0.00E-01	1.60E 01
W	6.00E 00	9.00E 00	0.00E-01	0.00E-01	0.00E-01	0.00E-01	1.50E 01
WNW	6.00E 00	3.00E 00	0.00E-01	0.00E-01	0.00E-01	0.00E-01	9.00E 00
NW	0.00E-01	1.30E 01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	1.30E 01
NNW	6.00E 00	1.00E 00	0.00E-01	0.00E-01	0.00E-01	0.00E-01	7.00E 00
TOTAL	1.03E 02	1.06E 02	1.00E 00	2.00E 00	1.00E 00	0.00E-01	2.13E 02

PERIODS OF CALM (HOURS): 1.00E 00

HOURS OF INVALID DATA: 0.00E-01

HOURS OF GOOD DATA: 7.68E 03 = 87.6% OF TOTAL HOURS

WIND SPEED (MPH) AT 60 METER LEVEL

DIRECTION	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	1.00E 00	1.00E 00	4.00E 00	0.00E-01	0.00E-01	0.00E-01	6.00E 00
NNE	0.00E-01	1.00E 00	3.00E 00	6.00E 00	0.00E-01	0.00E-01	1.00E 01
NE	1.00E 00	1.00E 00	1.10E 01	1.10E 01	0.00E-01	0.00E-01	2.40E 01
ENE	0.00E-01	1.00E 00	7.00E 00	7.00E 00	0.00E-01	0.00E-01	1.50E 01
E	1.00E 00	3.00E 00	1.30E 01	4.00E 00	0.00E-01	0.00E-01	2.10E 01
ESE	2.00E 00	5.00E 00	1.00E 00	1.00E 00	0.00E-01	0.00E-01	9.00E 00
SE	1.00E 00	4.00E 00	0.00E-01	0.00E-01	0.00E-01	0.00E-01	5.00E 00
SSE	0.00E-01	6.00E 00	3.00E 00	1.00E 00	0.00E-01	0.00E-01	1.00E 01
S	1.00E 00	1.00E 00	4.00E 00	6.00E 00	0.00E-01	1.00E 00	1.30E 01
SSW	0.00E-01	5.00E 00	1.30E 01	1.00E 01	2.00E 00	0.00E-01	3.00E 01
SW	1.00E 00	4.00E 00	8.00E 00	2.00E 00	0.00E-01	0.00E-01	1.50E 01
WSW	1.00E 00	4.00E 00	7.00E 00	4.00E 00	0.00E-01	0.00E-01	1.60E 01
W	0.00E-01	2.00E 00	6.00E 00	3.00E 00	0.00E-01	0.00E-01	1.10E 01
WNW	1.00E 00	2.00E 00	1.00E 00	0.00E-01	0.00E-01	0.00E-01	4.00E 00
NW	0.00E-01	3.00E 00	5.00E 00	0.00E-01	0.00E-01	0.00E-01	8.00E 00
NNW	3.00E 00	2.00E 00	7.00E 00	0.00E-01	0.00E-01	0.00E-01	1.20E 01
TOTAL	1.30E 01	4.50E 01	9.30E 01	5.50E 01	2.00E 00	1.00E 00	2.09E 02

PERIODS OF CALM (HOURS): 0.00E-01

HOURS OF INVALID DATA: 5.00E 00

HOURS OF GOOD DATA: 7.46E 03 = 85.2% OF TOTAL HOURS

Figure 14

CPS Wind Rose: 10 Meter

Data Period: January 1, 1993 - December 31, 1993

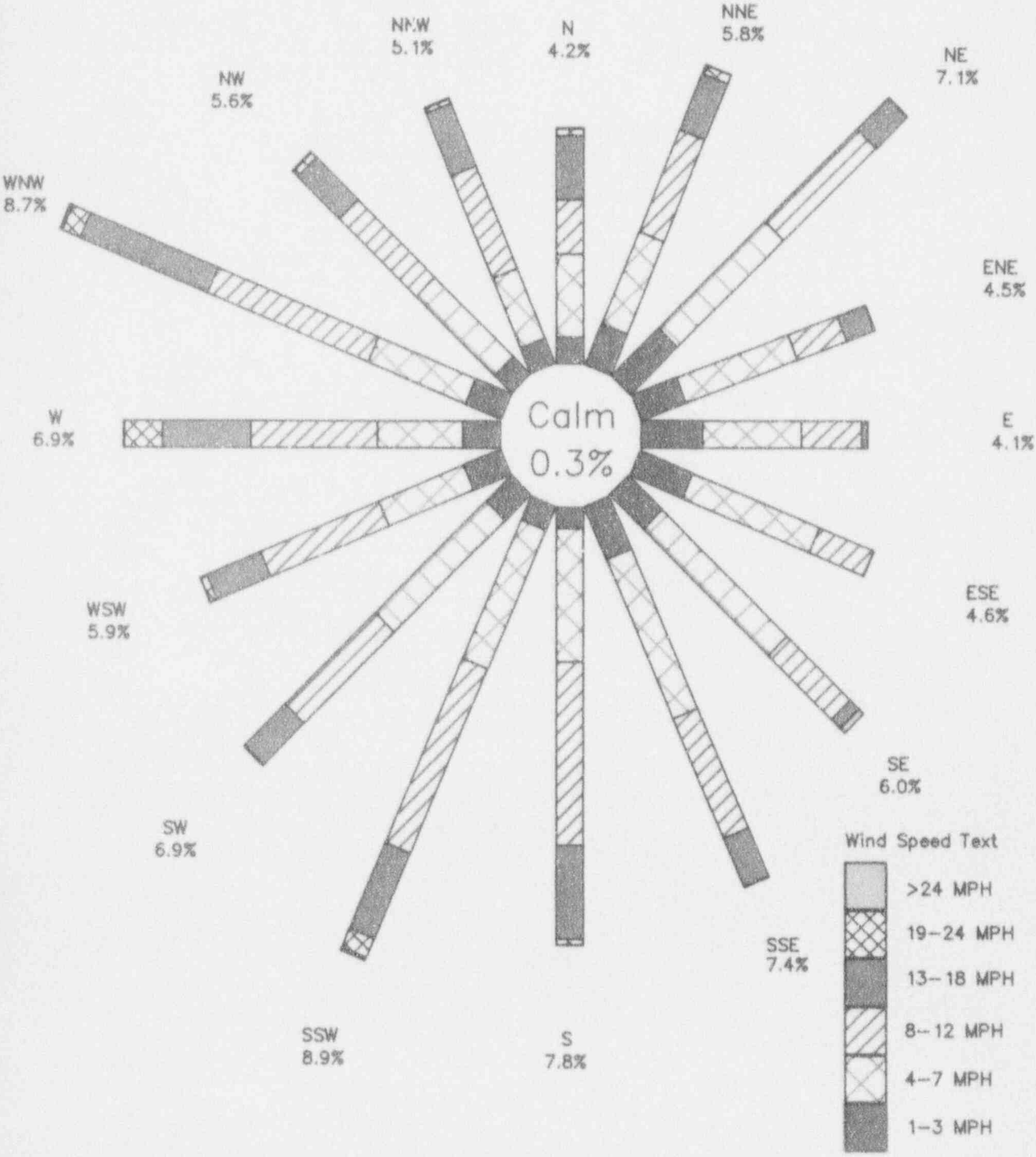
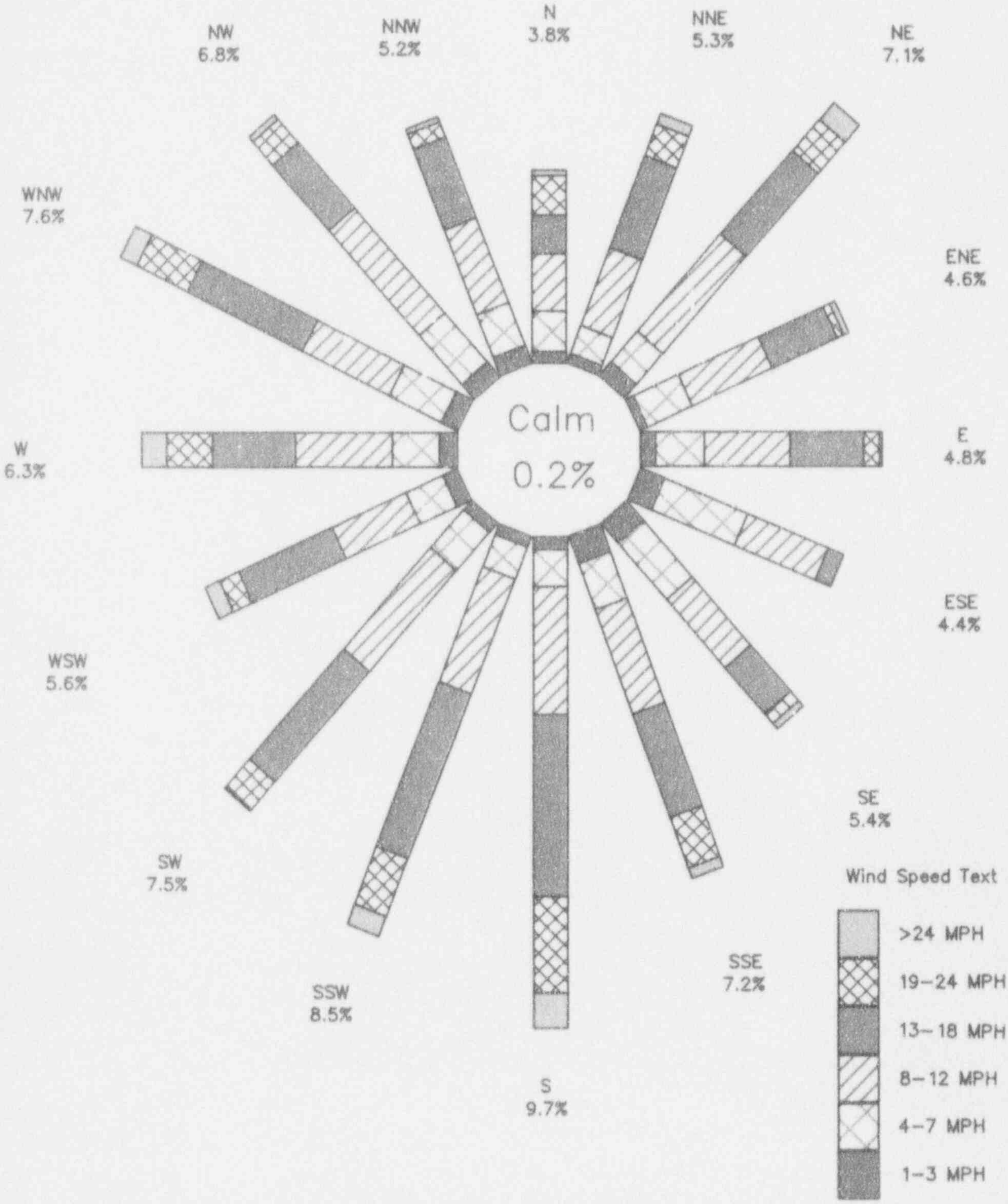


Figure 15

CPS Wind Rose: 60 Meter

Data Period: January 1, 1993 – December 31, 1993



NON-RADIOLOGICAL ENVIRONMENTAL PROGRAMS

VI. NON-RADIOLOGICAL ENVIRONMENTAL PROGRAMS

ENVIRONMENTAL MONITORING PROGRAM

The Biological Programs Section (BPS) of Environmental Affairs is in charge of the non-radiological Environmental Monitoring Program. Through this program, the biological aspects of Clinton Lake are monitored on a routine basis. This is done in an effort to evaluate any changes which might take place within the lake due to the construction and operation of CPS. A number of parameter areas are monitored, including phytoplankton (microscopic free-floating plants - algae), periphyton (microscopic attached algae), zooplankton (microscopic free-floating animals), benthos (larval insects which live in the mud at the bottom of the lake), and fish. The results of several years of monitoring indicate no detrimental effects from the operation of CPS. Several biological organisms, including fish, are attracted to, and benefit from extended growing seasons in the warm water areas of Clinton Lake.

TURKEY STOCKING PROGRAM

Illinois Power contacted IDOC during the fall of 1990 regarding the possible stocking of wild turkeys on the inner peninsula. In the winter of 1991, the IDOC successfully trapped and relocated several wild turkeys to the inner peninsula. Sixteen more were stocked in 1992. These turkeys, along with a stocking at an adjacent state park (Weldon Springs) should help establish a resident population of birds in DeWitt County.

PRAIRIE RESTORATION

One environmental project which began while CPS was being constructed involved the restoration of a natural prairie. An 80-acre natural prairie was planted and fertilized to help establish a prairie that has a wide variety and diversity of plants. This area had been severely degraded due to over-grazing by cattle before Illinois Power's successful prairie restoration project. It now looks and ecologically functions as a real prairie. The prairie is located on the North Fork of Clinton Lake. In 1992 an additional 20 acres of Illinois Power property was set aside and seeded as a natural prairie.

FISH REARING PONDS

BPS is also involved in several other environmental projects around the site. In addition to the fish stocking which the Illinois Department Of Conservation (IDOC) does each year in Clinton Lake, BPS conducts supplemental fish stocking by using fish rearing ponds and the purchase of fish. There are seven rearing ponds near Clinton Lake which are annually stocked with fish fry (approximately 1/4-inch long). These fish eat insect larva and are fed minnows from May through October each year, and the resultant large size fingerlings (8-10 inches in length) are released into Clinton Lake. Stocking larger sized fish helps ensure their survival. Table 13 provides data on the numbers and species of fish released to Clinton Lake.

TABLE 13

FISH STOCKING OF CLINTON LAKE

Year	Species	Number	Size	Pond Raised	IP Power Purchased
1988	Hybrid striped bass	75,000	3"		X
	Largemouth bass	1,000	8"	X	
	Walleye	5,000	7"	X	
1989	Largemouth bass	8,000	7"	X	
	Walleye	8,200	7"	X	
1990	Hybrid striped bass	50,000	3"		X
	Walleye	2,300	7"	X	
	Largemouth bass	5,900	5"	X	
1991	Striped bass	25,000	3"	X	
	Striped bass	45,000	2"		X
	Striped bass	1,400	8"	X	
	Walleye	400	8"	X	
	Largemouth bass	300	7"	X	
1992	Walleye	3,800	9"	X	
	Largemouth bass	1,550	10"	X	
	Largemouth bass	500	8"	X	
	Largemouth bass	500	6"	X	
	Largemouth bass	500	4"	X	
1993	Smallmouth bass	3,000	8"	X	

Total 1988-1993	Striped bass	71,400
	Hybrid striped bass	125,000
	Largemouth bass	18,250
	Walleye	19,700
	Smallmouth bass	3,000
Total of all fish released		237,350

MANAGEMENT IMPROVEMENTS

Within the last four years, Illinois Power has become involved in several wildlife management projects at CPS. One project involves management of a pond used for settling silt when the basin near the plant intake was dredged (summer and fall 1990). This pond has been put into a secondary use for fish rearing and for waterfowl management. Numerous goose nesting structures have been placed within the pond to provide proper goose nesting habitat. Thousands of ducks also frequent the pond, and some have also nested there. In addition, Illinois Power constructed raptor nesting, perching sites at Clinton Lake on Illinois Power property. Another project involved a partnership with the local chapter of Pheasants Unlimited. Over 100 acres of high quality pheasant cover was planted on Illinois Power land surrounding CPS.

DEER MANAGEMENT

Illinois Power has also been involved in a deer management program on the inner peninsula and in the Mascoutin State park. Data was collected concerning forest and vegetation damage, and agricultural crop damage in the area. This data, along with population estimates, verified that there was an over population of deer in the area. In an effort to reduce the number of deer in the area, a special archery-only deer hunt was conducted over an eight-week period beginning in October, 1993. Hunters were successful in reducing the herd by approximately 70%. Successive hunts will be conducted until the herd is reduced to the desired level. As part of this hunt, about 40 deer have been donated to the local food pantry Angel Tree Project. Funding for the deer processing was provided by Illinois Power, Whitetails Unlimited, Clinton Rotary Club and Clinton Packing. The venison was distributed around the Christmas holiday season.

WATER CHEMISTRY

The Central Laboratory of the Power Generation Department monitors the water quality of Clinton Lake. This involves a quarterly assessment of various nutrients and chemical parameters which affect the biological community of Clinton Lake. Results of water quality measurements indicate that the water quality of Clinton Lake is similar to several other Central Illinois reservoirs. Influences of CPS operations are primarily associated with increased water temperatures and concomitant decreased dissolved oxygen concentrations. These effects are predominantly restricted to the area near the CPS cooling water discharge flume. Several areas around the lake are continually monitored for changes in water temperature. The warm water plume from the discharge canal usually only extends about halfway around the cooling loop (the area between the warm water discharge and the CPS intake). Thermal discharges (warm water) to the lake are typically 18° F higher than intake temperatures. Lake temperatures are typically influenced more by meteorological conditions than by plant operations at all sites, except in the area of the discharge canal.

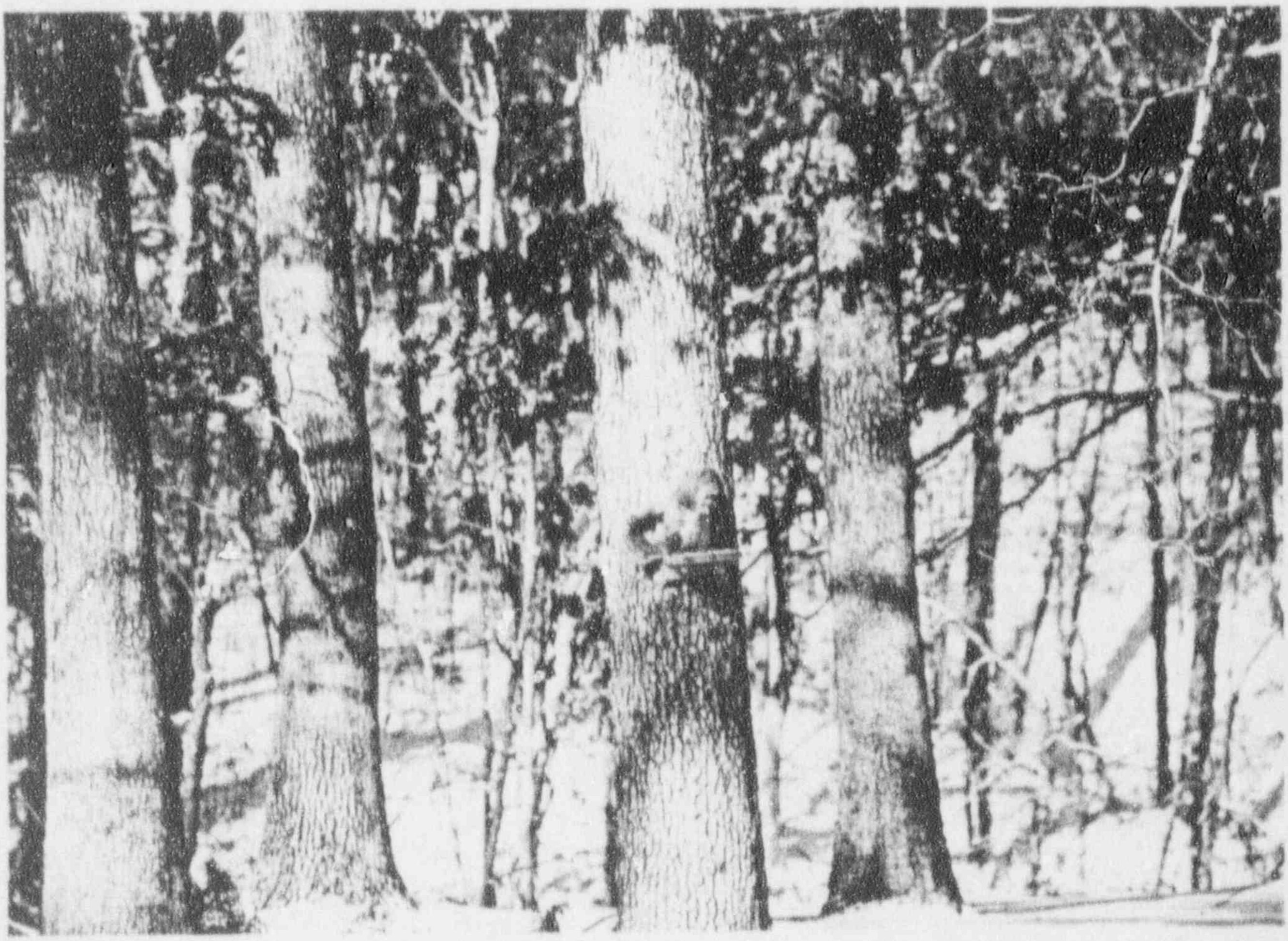
OUTREACH PROGRAMS

One other area in which Environmental Affairs is involved relates to an Environmental Outreach section. To increase public environmental awareness, several of the above mentioned programs and some new programs are currently being publicized.

Illinois Power's Energy and Environmental Center is located approximately five miles east of Clinton on Route 54. This facility is used to promote environmental awareness when the Biological Programs and Environmental Outreach sections staff make public presentations to students from grade school to college level. Partnerships have also been developed with Millikin University to provide summer workshops in lake ecology for high school students. Another environmental education program involves field trips for grade school children to one of the fish-rearing pond sites. This has become very popular with local teachers and is an excellent "hands on" type of field trip, during which the children are taught some basic biological principles.

As an extension of this outreach philosophy, CPS maintains a wildlife viewing platform adjacent to the settling pond. This platform is very popular for the viewing of wildlife, including raptors, waterfowl, migratory birds, and deer.

Environmental programs such as these are in keeping with our goal of becoming a corporate leader on environmental issues. These programs demonstrate our commitment to this goal and encourage a partnership with our customers and employees to improve the environment.



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VII. LIST OF REFERENCES

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APPENDICES

APPENDIX A

Exceptions to the REMP During 1993

Data from the radiological analysis of environmental samples are routinely reviewed and evaluated by the Clinton Power Station Radiological Environmental Group. This data is checked for LLD compliance, anomalous values, quality control sample agreement, and any positive results which are inconsistent with expected results or which exceed any Offsite Dose Calculation Manual reporting levels. Reporting levels for radioactivity concentrations in environmental samples required by the Clinton Power Station Offsite Dose Calculation Manual are listed in Table A-1.

If an inconsistent result occurs, an investigation is initiated which may consist of some of the following actions:

- Examine the collection data sheets for any indication of collection or delivery errors, tampering, vandalism and equipment calibration or malfunctions due to electrical power failure, weather conditions, etc.
- Perform statistical tests
- Examine previous data for trends
- Review other results from same sample media and different sample media
- Review control station data
- Review quality control or duplicate sample data
- Review CPS effluent reports
- Recount and/or reanalyze the sample
- Collect additional samples as necessary

During 1993, no investigations were performed as a result of reaching any Offsite Dose Calculation Manual (ODCM) reporting levels. All sample analysis required by the ODCM achieved the LLDs specified by ODCM Table 5.1-3. Sampling and analysis exceptions are listed in Table A-2 of this appendix.

TABLE A-1

CPS REMP REPORTING LEVELS FOR RADIOACTIVITY CONCENTRATIONS IN ENVIRONMENTAL SAMPLES[d]

Analysis	Water (pCi/l)	Airborne Particulate or Gases (pCi/m^3)	Fish (pCi/kg, wet)	Milk (pCi/l)	Food Products (pCi/kg, wet)
H-3	20,000[a]	---	---	---	---
Mn-54	1,000	---	30,000	---	---
Fe-59	400	---	10,000	---	---
Co-58	1,000	---	30,000	---	---
Co-60	300	---	10,000	---	---
Zn-65	300	---	20,000	---	---
Zr/Nb-95	400[c]	---	---	---	---
I-131	2[b]	0.9	---	3	100
Cs-134	30	10	1,000	60	1,000
Cs-137	50	20	2,000	70	2,000
Ba/La-140	200[c]	---	---	300	---

a For drinking water samples. This is the 40 CFR Part 141 value. If no drinking water pathway exists, a value of 30,000 pCi/l may be used.

b If no drinking water pathway exists, a value of 20 pCi/l may be used.

c Total for parent and daughter.

d This list does not mean these nuclides are the only ones considered. Other nuclides identified are also analyzed and reported when applicable.

TABLE A-2

SAMPLING AND ANALYSIS EXCEPTIONS FOR 1993

1. **January 27, 1993 and April 1, 1993**

   Grass at all sample locations brown and dried out.*

2. **February 24, 1993**

   CL-3 lost power due to expanding ice in electrical conduit causing a break in the supply voltage. Power was restored on 2/26/93. Th indicated elapsed time was used for sample volume calculation.

   CL-94 air sample result was evaluated and determined to be unreliable and considered invalid. The exact cause for the low sample result is unknown.

   Grass at all sample locations not collected due to snow cover.

3. **March 3, 1993**

   CL-94 filter head found disconnected. The reason for this is unknown; therefore the sample was considered invalid and discarded.

4. **May 19, 1993**

   CL-94 was found with the particulate filter paper damaged causing it to be effectively bypassed. The sample was considered invalid for analysis and discarded.

5. **June 9, 1993**

   Air sampler at CL-2 was found de-energized due to thunderstorm activity during the sample period. Power was restored on June 10, 1993. Air sampler at CL-1 found with elapsed timer off by 2.3 hours due to thunderstorm activity during the sample period. The indicated elapsed time was used for sample volume calculations.

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* Grass samples are normally analyzed wet. During winter months and drought conditions, the grass will dry up and die. Dry, dead grass has a moisture content much lower than that of fresh green grass. Analysis of dry dead grass may be biased.

TABLE A-2 (Cont'd)

Elapsed timers off at CL-4 by 0.6 hours and CL-6 by 0.7 hours. Differential in times attributed to loss of electrical power due to thunderstorm activity during the sample period. The indicated elapsed time was used for sample volume determinations.

6. **June 29, 1993**

   TLD holders at CL-50 and CL-80 found knocked down. Evaluation of CL-50 and CL-80 data indicated the data was reliable and consistent with previous data.

7. **June 30, 1993**

   Unable to obtain vegetation samples at CL-117 due to plants being consumed by wildlife. Electric fencing installed at sample location and garden replanted.

8. **July 7, 1993**

   CL-3 air sampler found inoperable because the shaft between the pump and motor sheared; therefore, the minimum required sample volume was not achieved. The air sample pump was replaced. The indicated elapsed time was used for sample volume determinations. The sample was determined invalid for analysis and discarded.

9. **July 14, 1993**

   CL-8 air sampler timer off by 5.4 hours, CL-7 air sampler timer off by 1.5 hours. The reason is suspected to be a loss of power due to thunderstorm activity during the sample period. The indicated elapsed time was used for sample volume determinations.

10. **July 28, 1993**

    Air sampler elapsed timers off at CL-2 by 6.3 hours and CL-3 by 6.5 hours. The reason is due to loss of electrical power while maintenance was performed on the 12 KV loop. The indicated elapsed time was used for sample volume determinations.

    Lettuce unavailable at CL-114, CL-115, CL-118 due to hot weather.

    Swiss Chard unavailable at CL-117 due to earlier consumption by wildlife. Garden was replanted and protected by an electric fence. Plants were not mature enough for sample collection.

TABLE A-2 (Cont'd)

11. **August 11, 1993**

Air sample at CL-4 failed after 166.2 hours of operation. Failure was determined to be recent due to pump temperature and filter loading. The total volume was calculated using the "as left" sample flow rate as the "as found" sample flow rate and the indicated elapsed time. The air sample pump was replaced.

12. **August 25, 1993**

Lettuce was unavailable at CL-114, CL-115, CL-117 and CL-118 due to being the end of the growing season and hot weather. There were no Swiss Chard available at CL-117. Plants that were replanted were consumed by wildlife. The installed electric fencing was ineffective.

Air sampler elapsed timers off at CL-15 by 3.9 hours, CL-94 and CL-1 by 4.0 hours. Timers off due to power outage caused by thunderstorms during the sample period. The indicated elapsed time was used for sample volume determinations.

13. **September 15, 1993**

Air sampler elapsed timers off at CL-15 and CL-94 by 1.6 hours each due to power outage caused by thunderstorms during the sample period. The indicated elapsed time was used for sample volume determinations.

14. **September 22, 1993**

Air sampler elapsed timers off at CL-4 and CL-6 by 2.3 hours due to power outages caused by thunderstorms during the sample period. The indicated elapsed time was used for sample volume determinations.

15. **September 29, 1993**

Lettuce unavailable at locations CL-114, CL-115, CL-117 and CL-118 due to hot weather and being the end of the growing season.

Swiss Chard unavailable at CL-117 due to earlier consumption by wildlife.

<u>TABLE A-2 (Cont'd)</u>

16. **October 6, 1993**

Air sampler at CL-94 found with pump seized. There was an insufficient volume for analysis and the filter was discarded as an invalid sample. The air sample pump was replaced.

17. **October 13, 1993**

Elapse timers off at CL-4 and CL-6 by 3.2 hours due to thunderstorms during the sample period. The indicated elapsed time was used for sample volume determinations.

18. **October 29, 1993 and November 10, 1993**

Surface water grab sample obtained in lieu of composite sample at CL-90 due to a low water level in the discharge flume caused by low flow during reactor shutdown.

19. **December 15, 1993**

Air sample pump at CL-1 found discharging through the filter head. Discarded the sample and replaced the air sample pump.

20. **December 28, 1993**

The TLD holder for CL-72 and CL-77 was vandalized and both TLDs stolen. TLDs and the holder were replaced at this location.

21. **December 29, 1993**

Milk not available at CL-98 due to goats "drying up" during the winter months.

Grass not collected at any sample location due to snow cover.

APPENDIX B

REMP Sample Collection and Analysis Methods

TABLE B-1

CLINTON POWER STATION

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

SUMMARY OF SAMPLE COLLECTION AND ANALYSIS METHODS

Analysis	Sample Medium	Sampling Method	Approximate Sample Size Collected	Teledyne Procedure Number	Procedure Abstract
Gross Beta	AP	Continuous air sampling through filter media	280m^3	TIML-AP-02	Sample counted in a low level gas flow proportional counter
	WW	Grab	7.6l	TIML-W(DS)-01	Sample evaporated on a stainless steel planchette for low-level gas flow proportional counting
	SW	Grab	3.8l	TIML-W(DS)-01	Sample evaporated on a stainless steel planchette for low-level gas flow proportional counting
	SW	Composite	3.8l	TIML-W(DS)-01	Sample evaporated on a stainless steel planchette for low-level gas flow proportional counting
	VE	Grab	2.5kg	TIML-AB-01	Sample ashed for low-level gas flow proportional counting
	BS	Grab	1.5-2.0kg	TIML-AB-01	Sample pulverized and dried for low-level gas flow proportional counting

TABLE B-1 (Cont'd)

Analysis	Sample Medium	Sampling Method	Approximate Sample Size Collected	Teledyne Procedure Number	Procedure Abstract
Gross Beta (cont'd)	SS	Grab	1.5-2.0kg	TIML-AB-01	Sample pulverized and dried for low-level gas flow proportional counting
	DW	Composite	3.8l	TIML-W(DS)-01	Sample evaporated on a stainless steel planchette for low-level gas flow proportional counting
	SO	Grab	1.0kg	TIML-AB-01	Sample pulverized and dried for low-level gas flow proportional counting
Gamma Spectroscopy	AP	Composite	$3640m^3$	TIML-GS-01	Germanium gamma isotopic analysis
	G	Grab	1.0kg	TIML-GS-01	Germanium gamma isotopic analysis
	WW	Grab	7.6l	TIML-GS-01	Germanium gamma isotopic analysis
	SW	Composite	3.8l	TIML-GS-01	Germanium gamma isotopic analysis
	VE	Grab	2.5kg	TIML-GS-01	Germanium gamma isotopic analysis
	BS	Grab	1.5-2.0kg	TIML-GS-01	Germanium gamma isotopic analysis
	SS	Grab	1.5-2.0kg	TIML-GS-01	Germanium gamma isotopic analysis

TABLE B-1 (Cont'd)

Analysis	Sample Medium	Sampling Method	Approximate Sample Size Collected	Teledyne Procedure Number	Procedure Abstract
Gamma Spectroscopy (cont'd)	SL	Grab	0.3 - 6.0kg	TIML-GS-01	Germanium gamma isotopic analysis
	F	Grab	2.5kg	TIML-GS-01	Germanium gamma isotopic analysis
	ME	Grab	3.0kg	TIML-GS-01	Germanium gamma isotopic analysis
	DW	Composite	3.8l	TIML-GS-01	Germanium gamma isotopic analysis
	SW	Grab	3.8l	TIML-GS-01	Germanium gamma isotopic analysis
	SO	Grab	1.0kg	TIML-GS-01	Germanium gamma isotopic analysis
	M	Grab	3.8l	TIML-GS-01	Germanium gamma isotopic analysis
Direct Radiation	TLD	Continuous Exposure	NA	TIML-TLD-01	Integration of thermally stimulated visible photons
Gross Alpha	SW	Composite	3.8l	TIML-W(DS)-01	Sample evaporated on a stainless steel planchette for low-level gas flow proportional counting
	WW	Grab	7.6l	TIML-W(DS)-01	Sample evaporated on a stainless steel planchette for low-level gas flow proportional counting

TABLE B-1 (Cont'd)

Analysis	Sample Medium	Sampling Method	Approximate Sample Size Collected	Teledyne Procedure Number	Procedure Abstract
Gross Alpha (cont'd)	BS	Grab	1.5-2.0kg	TIML-AB-01	Sample pulverized and dried for low-level gas flow proportional counting
	DW	Composite	3.8l	TIML-W(DS)-01	Sample evaporated on stainless steel planchette for low-level gas flow proportional counting
	SO	Grab	1.0kg	TIML-AB-01	Sample pulverized and dried for low-level gas flow proportional counting
	SS	Grab	1.5-2.0kg	TIML-AB-01	Sample pulverized and dried for low-level gas flow proportional counting
Sr-90	BS	Grab	1.5-2.0kg	TIML-SR-06	Hydrochloric acid leach and low-level gas flow proportional counting
	SS	Grab	1.5-2.0kg	TIML-SR-06	Hydrochloric acid leach and low-level gas flow proportional counting
	M	Grab	3.8l	TIML-SR-07	Sample chemically separated and dried for low-level gas flow proportional counting
Tritium	SW	Composite	3.8l	TIML-T-02	Distillation followed by counting in a liquid scintillation counter

TABLE B-1 (Cont'd)

Analysis	Sample Medium	Sampling Method	Approximate Sample Size Collected	Teledyne Procedure Number	Procedure Abstract
Tritium (cont'd)	DW	Composite	3.8l	TIML-T-02	Distillation followed by counting in a liquid scintillation counter
	SW	Grab	11.4l	TIML-T-02	Distillation followed by counting in a liquid scintillation counter
	WW	Grab	22.8l	TIML-[illegible]-02	Distillation followed by counting in a liquid scintillation counter
	SW	Grab	3.8l	TIML-T-02	Distillation followed by counting in a liquid scintillation counter
I-131	ME	Grab	1.4kg	TIML-GS-01	Germanium gamma isotopic analysis
	AI	Continuous air sampling through filter media	$280m^3$	TIML-I-131-02	Germanium gamma isotopic analysis
	SW	Grab	3.8l	TIML-I-131-03	Ion exchange and proportional beta counting
	WW	Grab	7.6l	TIML-I-131-03	Ion exchange and proportional beta counting
	G	Grab	1.0kg	TIML-GS-01	Germanium gamma isotopic analysis
	M	Grab	3.8l	TIML-I-131-01	Ion exchange and proportional beta counting

TABLE B-2

1992 REMP SAMPLING AND ANALYSIS FREQUENCY SUMMARY

Sample Type	Number of Sampling Locations	Collection Frequency	Number of Samples Collected	Type of Analysis	Analysis Frequency	Number of Samples Analyzed*
Air Particulate	10	Weekly	512	Gross Beta	Weekly	512
				Gamma Isotopic	Quarterly Composite	40
Air Iodine	10	Weekly	512	Iodine-131	Weekly	512
Direct Radiation (TLD)	86	Quarterly (continuous)	341	Gamma Exposure	Quarterly	341
Surface Water (Grab)	4	Monthly	48	Gamma Isotopic	Monthly	48
				Tritium[a]	Quarterly Composite[a]	12
				Gross Beta	Monthly	48
				Tritium[a]	Monthly[a]	12
Surface Water (Intake Composite)	1	Monthly	12	Gamma Isotopic	Monthly	12
				Tritium	Monthly	12
				Gross Beta	Monthly	12
Surface Water (Effluent Composite)	1	Monthly	12	Gamma Isotopic	Monthly	12
				Gross Beta	Monthly	12
				Gross Alpha	Monthly	12
				Tritium	Quarterly Composite	4
				Iodine-131	Monthly	12
Surface Water (Upstream Composite)	1	Monthly	12	Gamma Isotopic	Monthly	12
				Gross Beta	Monthly	12
				Gross Alpha	Monthly	12
				Tritium	Quarterly Composite	4

TABLE B-2 (Cont'd)

Sample Type	Number of Sampling Locations	Collection Frequency	Number of Samples Collected	Type of Analysis	Analysis Frequency	Number of Samples Analyzed*
Well Water	2[b]	Semimonthly	78	Iodine-131	Semimonthly	78
				Gross Alpha	Monthly Composite	36
				Gross Beta	Monthly Composite	36
				Gamma Isotopic	Monthly Composite	36
				Tritium	Quarterly Composite	12
Drinking Water	1	Monthly	12	Gross Alpha	Monthly	12
				Gross Beta	Monthly	12
				Gamma Isotopic	Monthly	12
				Tritium	Quarterly Composite	4
Bottom Sediments	7	Semiannually	14	Gross Alpha	Semiannually	14
				Gross Beta	Semiannually	14
				Gamma Isotopic	Semiannually	14
				Sr-90	Semiannually	14
Shoreline Sediments	8	Semiannually	16	Gross Alpha	Semiannually	16
				Gross Beta	Semiannually	16
				Gamma Isotopic	Semiannually	16
				Sr-90	Semiannually	16
Aquatic Vegetation	6	Semiannually/Bimonthly[c]	22	Gamma Isotopic	Semiannually/Bimonthly	22
Grass	5	Monthly/Semimonthly[d]	85	Gamma Isotopic (including I-131)	Monthly/Semimonthly	85
Vegetables	4	Monthly (during growing season)	32	Gross Beta	Monthly	32
				Gamma Isotopic (including I-131)	Monthly	32
Fish	2	Semiannually	16	Gamma Isotopic	Semiannually	16

TABLE B-2 (Cont'd)

Sample Type	Number of Sampling Locations	Collection Frequency	Number of Samples Collected	Type of Analysis	Analysis Frequency	Number of Samples Analyzed*
Milk	2	Monthly/Semimonthly[d]	37	Gamma Isotopic	Monthly/Semimonthly	37
				Iodine-131	Monthly/Semimonthly	37
				Sr-90	Monthly/Semimonthly	37
Meat	1	Annually (when available)	3	Gamma Isotopic (including I-131)	Annually	3
Soil	10	Triannually/Annually[e]	1	Gross Alpha	Triannually/Annually	1
				Gross Beta		1
				Gamma Isotopic		1

* Number of samples analyzed does not include duplicate analysis, recounts or reanalysis.

a Samples taken at CL-93 are analyzed monthly for tritium, all other surface water grab samples are composited for quarterly analysis.

b Samples collected at CL-12 are taken prior to water treatment and after water treatment.

c Samples are collected semiannually at CL-105 and bimonthly at all other locations from April through October.

d Samples are collected monthly from November through April and semimonthly May through October.

e Samples are collected annually at CL-16, triennially at all other locations.

TABLE B-3

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY

Name of Facility: Clinton Power Station Docket No. 50-461

Location of Facility: DeWitt, Illinois Reporting Period January 1 - December 31, 1993
(county, state)

Medium or Pathway Sampled (Unit of Measurement)	Type of Analysis Total Number Performed	Lower Limit of Detection (LLD)	All Indicator Locations: Mean(f) (Range)	Location with Highest Annual Mean: Name Distance and Direction	Location with Highest Annual Mean: Mean(f) (Range)	Control Locations: Mean(f) (Range)	Number of Nonroutine Reported Measurements
Direct Radiation (mR/Qtr)	TLD 341	NA	18.4(321/321) (13.6 - 21.7)	CL-64 2.1 miles WNW	20.6(4/4)[a] (20.1 - 21.6)	18.1(20/20) (16.0 - 20.5)	0
Air Particulates (pCi/m^3)	Gross Beta 512	N/A	0.020(460/460)[b] (0.009 - 0.048)	CL-3 0.7 miles NE	0.022(50/50) (0.012 - 0.046)	0.021(52/52) (0.010 - 0.045)	0
	Gamma Spec 40						
	Be-7	N/A	0.060(36/36) (0.037 - 0.083)	CL-4 0.8 miles SW	0.066(4/4) (0.054 - 0.074)	0.062(4/4) (0.051 - 0.067)	0
	K-40	0.058	LLD	-	LLD	LLD	0
	Co-60	0.0014	LLD	-	LLD	LLD	0
	Nb-95	0.0026	LLD	-	LLD	LLD	0
	Zr-95	0.0085	LLD	-	LLD	LLD	0
	Ru-103	0.0019	LLD	-	LLD	LLD	0
	Ru-106	0.010	LLD	-	LLD	LLD	0
	Cs-134	0.0015	LLD	-	LLD	LLD	0
	Cs-137	0.0013	LLD	-	LLD	LLD	0
	Ce-141	0.0024	LLD	-	LLD	LLD	0
	Ce-144	0.0074	LLD	-	LLD	LLD	0

Note: Column explanations at the end of Table B-3.

TABLE B-3 (Cont'd)

Medium or Pathway Sampled (Unit of Measurement)	Type of Analysis Total Number Performed	Lower Limit of Detection (LLD)	All Indicator Locations: Mean(f) (Range)	Location with Highest Annual Mean Name Distance and Direction	Mean(f) (Range)	Control Locations: Mean(f) (Range)	Number of Nonroutine Reported Measurements
Air Iodines (pCi/m^3)	I-131 512	0.07	LLD	-	LLD	LLD	0
Surface Water (pCi/l)	Gross Beta 84	NA	2.4(72/72) (1.2 - 4.8)	CL-13 3.6 miles SW	2.7(12/12) (1.5 - 4.8)	2.6(12/12) (1.4 - 6.1)	0
	Gross Alpha 24	1.1	0.8(9/24) (0.5 - 1.5)	CL-90 0.4 miles SE	0.8(5/12) (0.5 - 1.5)	NA	0
	Tritium 44	200	LLD	-	LLD	LLD	0
	I-131 12	0.5	LLD	-	LLD	NA	0
	Gamma Spec 84						
	Be-7	35.1	LLD	-	LLD	LLD	0
	K-40	51.9	LLD	-	LLD	LLD	0
	Mn-54	3.7	LLD	-	LLD	LLD	0
	Fe-59	7.8	LLD	-	LLD	LLD	0
	Co-58	3.6	LLD	-	LLD	LLD	0
	Co-60	4.2	LLD	-	LLD	LLD	0
	Zn-65	8.0	LLD	-	LLD	LLD	0
	Nb-95	3.6	LLD	-	LLD	LLD	0
	Zr-95	6.3	LLD	-	LLD	LLD	0

<u>TABLE B-3 (Cont'd)</u>

Medium or Pathway Sampled (Unit of Measurement)	Type of Analysis Total Number Performed	Lower Limit of Detection (LLD)	All Indicator Locations: Mean(f) (Range)	Location with Highest Annual Mean Name Distance and Direction	Location with Highest Annual Mean Mean(f) (Range)	Control Locations: Mean(f) (Range)	Number of Nonroutine Reported Measurements
Surface Water (cont'd)	Cs-134	5.5	LLD	-	LLD	LLD	0
	Cs-137	4.1	LLD	-	LLD	LLD	0
	Ba-140	13.8	LLD	-	LLD	LLD	0
	La-140	4.6	LLD	-	LLD	LLD	0
	Ce-144	33.1	LLD	-	LLD	LLD	0
Drinking Water (pCi/l)	Gross Beta 12	N/A	2.0(12/12) (1.1 - 3.4)	CL-14 0 miles	2.0(12/12) (1.1 - 3.4)	NA	0
	Gross Alpha 12	0.4	LLD	-	LLD	NA	0
	Tritium 4	187	LLD	-	LLD	NA	0
	Gamma Spec 12						
	Be-7	24.2	LLD	-	LLD	NA	0
	K-40	50.2	LLD	-	LLD	NA	0
	Mn-54	2.2	LLD	-	LLD	NA	0
	Fe-59	4.9	LLD	-	LLD	NA	0
	Co-58	2.2	LLD	-	LLD	NA	0
	Co-60	2.8	LLD	-	LLD	NA	0
	Zn-65	5.1	LLD	-	LLD	NA	0
	Nb-95	3.0	LLD	-	LLD	NA	0
	Zr-95	5.4	LLD	-	LLD	NA	0

TABLE B-3 (Cont'd)

Medium or Pathway Sampled (Unit of Measurement)	Type of Analysis Total Number Performed	Lower Limit of Detection (LLD)	All Indicator Locations: Mean(f) (Range)	Location with Highest Annual Mean Name Distance and Direction	Location with Highest Annual Mean Mean(f) (Range)	Control Locations: Mean(f) (Range)	Number of Nonroutine Reported Measurements
Drinking Water (cont'd)	Cs-134	2.2	LLD	-	LLD	NA	0
	Cs-137	2.6	LLD	-	LLD	NA	0
	Ba-140	8.8	LLD	-	LLD	NA	0
	La-140	3.2	LLD	-	LLD	NA	0
	Ce-144	27.6	LLD	-	LLD	NA	0
Well Water (pCi/l)	Gross Beta 36	NA	1.9(36/36) (0.8 - 3.7)	CL-12T[c] 1.6 miles E	2.5(12/12) (1.6 - 3.7)	NA	0
	Gross Alpha 36	2.2	LLD	-	LLD	NA	0
	I-131 78	0.5	LLD	-	LLD	NA	0
	Tritium 12	195	LLD	-	LLD	NA	0
	Gamma Spec 36						
	Be-7	22.8	LLD	-	LLD	NA	0
	K-40	49.8	LLD	-	LLD	NA	0
	Mn-54	3.0	LLD	-	LLD	NA	0
	Fe-59	5.5	LLD	-	LLD	NA	0
	Co-58	3.1	LLD	-	LLD	NA	0
	Co-60	2.6	LLD	-	LLD	NA	0
	Zn-65	6.6	LLD	-	LLD	NA	0

TABLE B-3 (Cont'd)

Medium or Pathway Sampled (Unit of Measurement)	Type of Analysis Total Number Performed	Lower Limit of Detection (LLD)	All Indicator Locations: Mean(f) (Range)	Location with Highest Annual Mean Name Distance and Direction	Mean(f) (Range)	Control Locations: Mean(f) (Range)	Number of Nonroutine Reported Measurements
Well Water (cont'd)	Nb-95	3.0	LLD	-	LLD	NA	0
	Zr-95	6.2	LLD	-	LLD	NA	0
	Cs-134	3.2	LLD	-	LLD	NA	0
	Cs-137	2.4	LLD	-	LLD	NA	0
	Ba-140	9.6	LLD	-	LLD	NA	0
	La-140	2.9	LLD	-	LLD	NA	0
	Ce-144	34.4	LLD	-	LLD	NA	0
Milk (pCi/l)	I-131 37	0.5	LLD	-	LLD	LLD	0
	Sr-90 37	N/A	1.8(18/18) (1.2 - 2.6)	CL-98 3.7 miles SSW	1.8(18/18) (1.2 - 2.6)	1.7(19/19) (0.9 - 3.6)	0
	Gamma Spec 37						
	Be-7	21.3	LLD	-	LLD	LLD	0
	K-40	-	1784(18/18) (1620 -1920)	CL-98 3.7 miles SSW	1784(18/18) (1620-1920)	1288(19/19) (1140-1440)	0
	Mn-54	2.5	LLD	-	NA	LLD	0
	Fe-59	7.4	LLD	-	NA	LLD	0
	Co-58	2.6	LLD	-	NA	LLD	0
	Co-60	3.5	LLD	-	NA	LLD	0
	Zn-65	6.9	LLD	-	NA	LLD	0
	Nb-95	3.2	LLD	-	NA	LLD	0
	Zr-95	4.4	LLD	-	NA	LLD	0

TABLE B-3 (Cont'd)

Medium or Pathway Sampled (Unit of Measurement)	Type of Analysis Total Number Performed	Lower Limit of Detection (LLD)	All Indicator Locations: Mean(f) (Range)	Location with Highest Annual Mean: Name Distance and Direction	Location with Highest Annual Mean: Mean(f) (Range)	Control Locations: Mean(f) (Range)	Number of Nonroutine Reported Measurements
Milk (cont'd)	Cs-134	3.3	LLD	-	LLD	LLD	0
	Cs-137	2.8	LLD	-	LLD	LLD	0
	Ba-140	11.1	LLD	-	LLD	LLD	0
	La-140	2.4	LLD	-	LLD	LLD	0
	Ce-144	32.2	LLD	-	LLD	LLD	0
Fish (pCi/g wet)	Gamma Spec 16						
	Be-7	0.153	LLD	-	LLD	LLD	0
	K-40	-	2.91(8/8) (2.17 - 3.46)	CL-19 3.4 miles E	2.91(8/8) (2.17 - 3.46)	2.74(8/8) (2.42 - 3.10)	0
	Mn-54	0.016	LLD	-	LLD	LLD	0
	Fe-59	0.066	LLD	-	LLD	LLD	0
	Co-58	0.017	LLD	-	LLD	LLD	0
	Co-60	0.016	LLD	-	LLD	LLD	0
	Zn-65	0.034	LLD	-	LLD	LLD	0
	Nb-95	0.032	LLD	-	LLD	LLD	0
	Zr-95	0.043	LLD	-	LLD	LLD	0
	Ru-103	0.019	LLD	-	LLD	LLD	0
	Ru-106	0.18	LLD	-	LLD	LLD	0
	Cs-134	0.016	LLD	-	LLD	LLD	0
	Cs-137	0.017	LLD	-	LLD	LLD	0
	Ba-140	0.063	LLD	-	LLD	LLD	0
	La-140	0.017	LLD	-	LLD	LLD	0
	Ce-141	0.045	LLD	-	LLD	LLD	0
	Ce-144	0.102	LLD	-	LLD	LLD	0

TABLE B-3 (Cont'd)

Medium or Pathway Sampled (Unit of Measurement)	Type of Analysis Total Number Performed	Lower Limit of Detection (LLD)	All Indicator Locations: Mean(f) (Range)	Location with Highest Annual Mean Name Distance and Direction	Mean(f) (Range)	Control Locations: Mean(f) (Range)	Number of Nonroutine Reported Measurements
Bottom Sediments (pCi/g dry)	Gross Beta 14	-	19.46(12/12) (7.82 - 33.80)	CL-7C 1.3 miles SE	30.94(2/2) (28.08 - 33.80)	29.51(2/2) (28.82 - 30.2)	0
	Gross Alpha 14	6.1	11.7(8/12) (4.0 - 19.0)	CL-10 5.0 miles ENE	17.47(2/2) (16.3 - 18.63)	17.47(2/2) (16.5 - 17.64)	0
	Sr-90 14	0.025	0.033(3/12) (0.015 - 0.050)	CL-13A 5.0 miles SW	0.05(1/2) -	0.018(2/2) (0.017 - 0.019)	0
	Gamma Spec 14						
	Be-7	0.760	0.38(3/12) (0.22 - 0.52)	CL-13A 5.0 miles SW	0.52(1/2) -	LLD -	0
	K-40	-	14.86(12/12) (7.63 - 20.50)	CL-105 50 miles S	22.46(2/2) (19.60 - 25.31)	22.46(2/2) (19.60 - 25.31)	0
	Mn-54	0.063	LLD	-	LLD	LLD	0
	Fe-59	0.140	LLD	-	LLD	LLD	0
	Co-58	0.059	LLD	-	LLD	LLD	0
	Co-60	0.049	LLD	-	LLD	LLD	0
	Zn-65	0.210	LLD	-	LLD	LLD	0
	Nb-95	0.100	LLD	-	LLD	LLD	0
	Zr-95	0.140	LLD	-	LLD	LLD	0
	Cs-134	0.089	LLD	-	LLD	LLD	0
	Cs-137	0.029	0.139(9/12) (0.013 - 0.459)	CL-105 50 miles S	0.49(2/2) (0.422 - 0.56)	0.49(2/2) (0.422 - 0.56)	0
	Ba-140	0.151	LLD	-	LLD	LLD	0
	La-140	0.060	LLD	-	LLD	LLD	0
	Ce-144	0.320	LLD	-	LLD	LLD	0
	Ac-228	0.112	0.84(7/12) (0.22 - 1.49)	CL-105 50 miles S	1.55(2/2) (1.22 - 1.88)	1.55(2/2) (1.22 - 1.88)	0

TABLE B-3 (Cont'd)

Medium or Pathway Sampled (Unit of Measurement)	Type of Analysis Total Number Performed	Lower Limit of Detection (LLD)	All Indicator Locations: Mean(f) (Range)	Location with Highest Annual Mean Name Distance and Direction	Mean(f) (Range)	Control Locations: Mean(f) (Range)	Number of Nonroutine Reported Measurements
Bottom Sediments (cont'd)	Bi-212	0.486	1.04(8/12) (0.393 - 1.70)	CL-105 50 miles S	2.73(1/2) -	2.73(1/2) -	0
	Bi-214	0.09	0.62(7/12) (0.21 - 1.10)	CL-105 50 miles S	1.31(1/2) -	1.31(1/2) -	0
	Pb-212	-	0.74(12/12) (0.226 - 1.54)	CL-105 50 miles S	1.70(2/2) (1.470 - 1.92)	1.70(2/2) (1.470 - 1.92)	0
	Pb-214	-	0.56(12/12) (0.147 - 1.20)	CL-105 5.0 miles ENE	1.12(2/2) (1.042 - 1.20)	1.10(2/2) (0.761 - 1.44)	0
	Ra-226	0.22	0.961(11/12) (0.175 - 2.62)	CL-105 50 miles S	2.99(2/2) (2.05 - 3.93)	2.99(2/2) (2.05 - 3.93)	0
	Tl-208	0.094	0.36(12/12) (0.045 - 1.284)	CL-10 5.0 miles ENE	0.89(2/2) (0.49 - 1.284)	0.87(2/2) (0.49 - 1.25)	0
Shoreline Sediments (pCi/g dry)	Gross Beta 16	-	14.96(14/14) (6.51 - 28.68)	CL-89 3.6 miles NNE	23.4(2/2) (19.1 - 27.61)	13.1(2/2) (8.3 - 17.95)	0
	Gross Alpha 16	4.54	8.7(10/14) (3.3 - 13.48)	CL-10 5.0 miles ENE	12.24(1/2) -	9.5(1/2) -	0
	Sr-90 16	0.02	0.066(3/14) (0.013 - 0.172)	CL-7C 1.3 miles SE	0.17[illegible](1/2) -	0.017(2/2) (0.015 - 0.018)	0

TABLE B-3 (Cont'd)

Medium or Pathway Sampled (Unit of Measurement)	Type of Analysis Total Number Performed	Lower Limit of Detection (LLD)	All Indicator Locations: Mean(f) (Range)	Location with Highest Annual Mean Name Distance and Direction	Mean(f) (Range)	Control Locations: Mean(f) (Range)	Number of Nonroutine Reported Measurements
Shoreline Sediments (cont'd)	Gamma Spec 16						
	Be-7	0.36	0.66(4/14) (0.34 - 1.47)	CL-93 0.4 miles SW	1.47(1/2) -	0.057(1/2) -	0
	K-40	-	11.30(14/14) (5.83 - 18.49)	CL-89 3.6 miles NNE	16.5(2/2) (15.9 - 17.04)	11.6(2/2) (8.07 - 15.14)	0
	Mn-54	0.032	LLD	-	LLD	LLD	0
	Fe-59	0.12	LLD	-	LLD	LLD	0
	Co-58	0.048	LLD	-	LLD	LLD	0
	Co-60	0.04	0.11(1/14) -	CL-93 0.4 miles SW	0.11(1/2) -	LLD -	0
	Zn-65	0.14	LLD	-	LLD	LLD	0
	Nb-95	0.073	LLD	-	LLD	LLD	0
	Zr-95	0.081	LLD	-	LLD	LLD	0
	Cs-134	0.06	LLD	-	LLD	LLD	0
	Cs-137	0.026	0.25(3/14) (0.06 - 0.62)	CL-7C 1.3 miles SE	0.62(1/2) -	0.16(1/2) -	0
	Ba-140	0.076	LLD	-	LLD	LLD	0
	La-140	0.025	LLD	-	LLD	LLD	0
	Ce-144	0.21	LLD	-	LLD	LLD	0
	Ac-228	0.06	0.74(8/14) (0.19 - 1.32)	CL-10 5.0 miles ENE	1.32(1/2) -	0.50(2/2) (0.179 - 0.83)	0
	Bi-212	0.70	0.67(8/14) (0.032 - 1.78)	CL-10 5.0 miles ENE	1.78(1/2) -	0.89(1/2) -	0
	Bi-214	0.039	0.56(8/14) (0.15 - 1.00)	CL-10 5.0 miles ENE	1.00(1/2) -	0.27(2/2) (0.138 - 0.41)	0

TABLE B-3 (Cont'd)

Medium or Pathway Sampled (Unit of Measurement)	Type of Analysis Total Number Performed	Lower Limit of Detection (LLD)	All Indicator Locations: Mean(f) (Range)	Location with Highest Annual Mean Name Distance and Direction	Mean(f) (Range)	Control Locations: Mean(f) (Range)	Number of Nonroutine Reported Measurements
Shoreline Sediments (cont'd)	Pb-212	-	0.45(14/14) (0.026 - 1.25)	CL-89 3.6 miles NNE	0.84(2/2) (0.711 - 0.96)	0.43(2/2) (0.181 - 0.68)	0
	Pb-214	0.033	0.46(12/14) (0.03 - 1.13)	CL-7C 1.3 miles SE	1.06(1/2) -	0.20(2/2) (0.03 - 0.36)	0
	Ra-226	0.44	0.95(9/14) (0.08 - 1.61)	CL-10 5.0 miles ENE	2.15(1/2) -	0.80(2/2) (0.32 - 1.28)	0
	Tl-208	0.053	0.26(9/14) (0.024 - 0.63)	CL-89 3.6 miles NNE	0.48(2/2) (0.32 - 0.63)	0.168(2/2) (0.166 - 0.17)	0
Aquatic Vegetation (pCi/g wet)	Gamma Spec 22						
	Be-7	-	1.46(20/20) (0.78 - 2.71)	CL-9 2.7 miles ESE	1.9(4/4) (1.08 - 2.53)	1.09(2/2) (0.51 - 1.66)	0
	K-40	-	2.7(20/20) (0.81 - 6.1)	CL-19 3.4 miles E	4.1(4/4) (2.33 - 6.1)	3.12(2/2) (2.28 - 3.96)	0
	Mn-54	0.053	LLD	-	LLD	LLD	0
	Fe-59	0.083	LLD	-	LLD	LLD	0
	Co-58	0.04	LLD	-	LLD	LLD	0
	Co-60	0.034	LLD	-	LLD	LLD	0

TABLE B-3 (Cont'd)

Medium or Pathway Sampled (Unit of Measurement)	Type of Analysis Total Number Performed	Lower Limit of Detection (LLD)	All Indicator Locations: Mean(f) (Range)	Location with Highest Annual Mean: Name Distance and Direction	Location with Highest Annual Mean: Mean(f) (Range)	Control Locations: Mean(f) (Range)	Number of Nonroutine Reported Measurements
Aquatic Vegetation (cont'd)	Zn-65	0.098	LLD	-	LLD	LLD	0
	Nb-95	0.048	LLD	-	LLD	LLD	0
	Zr-95	0.054	LLD	-	LLD	LLD	0
	Cs-134	0.030	LLD	-	LLD	LLD	0
	Cs-137	0.035	0.053(12/20)	CL-19	0.069(3/4)	0.060(2/2)	0
			(0.023 - 0.082)	3.4 miles E	(0.054 - 0.082)	(0.052 - 0.068)	
	Ba-140	0.11	LLD	-	LLD	LLD	0
	La-140	0.032	LLD	-	LLD	LLD	0
	Ce-144	0.16	LLD	-	LLD	LLD	0
Vegetables (pCi/g wet)	Gross Beta 32		3.65(23/23)	CL-118	3.91(9/9)	3.13(9/9)	0
			(1.86 - 6.89)	0.7 miles NNE	(2.14 - 6.89)	(1.52 - 5.00)	
	Gamma Spec 32						
	Be-7	0.058	0.25(16/23)	CL-117	0.32(4/5)	0.16(4/9)	0
			(0.04 - 0.55)	0.9 miles N	(0.04 - 0.55)	(0.10 - 0.32)	
	K-40	-	3.50(23/23)	CL-118	3.69(9/9)	2.90(9/9)	0
			(1.68 - 6.34)	0.7 miles NNE	(1.68 - 5.87)	(1.44 - 4.92)	
	Mn-54	0.010	LLD	-	LLD	LLD	0
	Fe-59	0.030	LLD	-	LLD	LLD	0
	Co-58	0.011	LLD	-	LLD	LLD	0
	Co-60	0.012	LLD	-	LLD	LLD	0
	Zn-65	0.024	LLD	-	LLD	LLD	0
	Nb-95	0.011	LLD	-	LLD	LLD	0
	Zr-95	0.018	LLD	-	LLD	LLD	0

TABLE B-3 (Cont'd)

Medium or Pathway Sampled (Unit of Measurement)	Type of Analysis Total Number Performed	Lower Limit of Detection (LLD)	All Indicator Locations: Mean(f) (Range)	Location with Highest Annual Mean: Name Distance and Direction	Location with Highest Annual Mean: Mean(f) (Range)	Control Locations: Mean(f) (Range)	Number of Nonroutine Reported Measurements
Vegetables (cont'd)	I-131	0.014	LLD	-	LLD	LLD	0
	Cs-134	0.011	LLD	-	LLD	LLD	0
	Cs-137	0.009	0.013(3/23) (0.011 - 0.015)	CL-117 0.9 miles N	0.013(2/5) (0.011 - 0.015)	LLD	0
	Ba-140	0.052	LLD	-	LLD	LLD	0
	La-140	0.011	LLD	-	LLD	LLD	0
	Ce-144	0.088	LLD	-	LLD	LLD	0
Grass (pCi/g wet)	Gamma Spec 85						
	Be-7	-	2.77(51/51) (0.06 - 11.9)	CL-1 1.8 miles W	3.28(17/17) (0.41 - 11.90)	2.69(34/34) (0.23 - 12.04)	0
	K-40	-	5.15(51/51) (1.31 - 7.79)	CL-8 2.2 miles E	5.57(17/17) (1.58 - 7.44)	5.10(34/34) (0.47 - 9.37)	0
	Mn-54	0.019	LLD	-	LLD	LLD	0
	Fe-59	0.053	LLD	-	LLD	LLD	0
	Co-58	0.016	LLD	-	LLD	LLD	0
	Co-60	0.018	LLD	-	LLD	LLD	0
	Zn-65	0.043	LLD	-	LLD	LLD	0
	Nb-95	0.036	LLD	-	LLD	LLD	0
	Zr-95	0.025	LLD	-	LLD	LLD	0
	I-131	0.022	LLD	-	LLD	LLD	0
	Cs-134	0.016	LLD	-	LLD	LLD	0
	Cs-137	0.020	0.013(5/51) (0.006 - 0.032)	CL-1 1.8 miles W	0.021(2/17) (0.010 - 0.032)	0.013(1/34) -	0
	Ba-140	0.086	LLD	-	LLD	LLD	0
	La-140	0.017	LLD	-	LLD	LLD	0
	Ce-144	0.13	LLD	-	LLD	LLD	0

TABLE B-3 (Cont'd)

Medium or Pathway Sampled (Unit of Measurement)	Type of Analysis Total Number Performed	Lower Limit of Detection (LLD)	All Indicator Locations: Mean(f) (Range)	Location with Highest Annual Mean Name Distance and Direction	Mean(f) (Range)	Control Locations: Mean(f) (Range)	Number of Nonroutine Reported Measurements
Meat[d] (pCi/g wet)	Gamma Spec 3						
	Be-7	0.160	LLD	-	LLD	-	0
	K-40	-	2.00(3/3) (1.43 - 2.36)	CL-106 2.0 miles NNE	2.0(3/3) (1.43 - 2.36)	NA	0
	Mn-54	0.016	LLD	-	LLD	NA	0
	Fe-59	0.045	LLD	-	LLD	NA	0
	Co-58	0.016	LLD	-	LLD	NA	0
	Co-60	0.018	LLD	-	LLD	NA	0
	Zn-65	0.035	LLD	-	LLD	NA	0
	Nb-95	0.019	LLD	-	LLD	NA	0
	Zr-95	0.031	LLD	-	LLD	NA	0
	Ru-103	0.021	LLD	-	LLD	NA	0
	Ru-106	0.150	LLD	-	LLD	NA	0
	I-131	0.064	LLD	-	LLD	NA	0
	Cs-134	0.015	LLD	-	LLD	NA	0
	Cs-137	0.016	LLD	-	LLD	NA	0
	Ba-140	0.059	LLD	-	LLD	NA	0
	La-140	0.015	LLD	-	LLD	NA	0
	Ce-141	0.030	LLD	-	LLD	NA	0
	Ce-144	0.096	LLD	-	LLD	NA	0

TABLE B-3 (Cont'd)

Medium or Pathway Sampled (Unit of Measurement)	Type of Analysis Total Number Performed	Lower Limit of Detection (LLD)	All Indicator Locations: Mean(f) (Range)	Location with Highest Annual Mean Name Distance and Direction	Mean(f) (Range)	Control Locations: Mean(f) (Range)	Number of Nonroutine Reported Measurements
Soil (pCi/g dry)	Gross Beta 1	-	22.78(1/1) -	CL-16B 0.6 miles ESE	22.78(1/1) -	NA	0
	Gross Alpha 1		10.72(1/1) -	CL-16B 0.6 miles ESE	10.72(1/1) -	NA	0
	Gamma spec 1						
	Be-7	0.26	LLD	-	LLD	NA	0
	K-40	-	16.04(1/1) -	CL-16B 0.6 miles ESE	16.04(1/1) -	NA	0
	Mn-54	0.021	LLD	-	LLD	NA	0
	Fe-59	0.069	LLD	-	LLD	NA	0
	Co-58	0.030	LLD	-	LLD	NA	0
	Co-60	0.025	LLD	-	LLD	NA	0
	Zn-65	0.093	LLD	-	LLD	NA	0
	Nb-95	0.054	LLD	-	LLD	NA	0
	Zr-95	0.053	LLD	-	LLD	NA	0
	Cs-134	0.046	LLD	-	LLD	NA	0
	Cs-137	-	0.041(1/1) -	CL-16B 0.6 miles ESE	0.041(1/1) -	NA	0
	Ba-140	0.060	LLD	-	LLD	NA	0
	La-140	0.014	LLD	-	LLD	NA	0
	Ce-144	0.140	LLD	-	LLD	NA	0
	Ac-228	-	0.98(1/1)	CL-16B 0.6 miles ESE	0.98(1/1) -	NA	0

TABLE B-3 (Cont'd)

Medium or Pathway Sampled (Unit of Measurement)	Type of Analysis Total Number Performed	Lower Limit of Detection (LLD)	All Indicator Locations: Mean(f) (Range)	Location with Highest Annual Mean: Name Distance and Direction	Location with Highest Annual Mean: Mean(f) (Range)	Control Locations: Mean(f) (Range)	Number of Nonroutine Reported Measurements
Soil (cont'd)	Bi-212	-	0.96(1/1) -	CL-16B 0.6 miles ESE	0.96(1/1) -	NA	0
	Bi-214	-	0.67(1/1) -	CL-16B 0.6 miles ESE	0.67(1/1) -	NA	0
	Pb-212	-	0.95(1/1) -	CL-16B 0.6 miles ESE	0.95(1/1) -	NA	0
	Pb-214	-	0.74(1/1) -	CL-16B 0.6 miles ESE	0.74(1/1) -	NA	0
	Ra-226	1.51	LLD	LLD		NA	0
	TL-208	-	0.28(1/1) -	CL-16B 0.6 miles ESE	0.28(1/1) -	NA	0

a Highest quarterly mean

b Values excluded due to insufficient sample volume collected

c (T) Treated well water sample or (U) Untreated well water sample

TABLE B-3 (Cont'd)

Medium or Pathway Sampled (Unit of Measurement)	Type of Analysis Total Number Performed	Lower Limit of Detection (LLD)	All Indicator Locations: Mean(f) (Range)	Location with Highest Annual Mean Name Mean(f) Distance and Direction (Range)	Control Locations: Mean(f) (Range)	Number of Nonroutine Reported Measurements
Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7

TABLE EXPLANATIONS:

Column 1: The Unit of Measurement describes all the numerical values for LLD, Mean and Range reported for a particular sample medium. For example: the Gross Beta LLD in AIR PARTICULATES is 0.010 pCi/m^3. Abbreviations used are: pCi/m^3 = picocurie per cubic meter of sampled air; mR/quarter = exposure measured for calendar quarter period; pCi/l = picocurie per liter of sample; pCi/g = picocurie per gram of sample.

Column 2: The Types of Analyses are described as follows: Gamma Spec = measurement of each radioisotope in a sample using Gamma Spectroscopy; Gross Betas and Gross Alphas = measurement of the radioactivity in a sample by measurement of emitted betas and alphas - no determination of individual radioisotopes is possible; Tritium = measurement of tritium (H-3) in sample by liquid scintillation counting method; TLD = direct measurement of gamma exposure using thermoluminescent dosimeters.

Column 3: LLD reported is the highest of those reported for each type of analysis during the year; if all analyses reported positive values, no LLD is reported.

Column 4: Samples taken at Indicator Locations during an operational radiological environmental monitoring program (REMP) reliably measure the quantities of any radioisotopes cycling through the pathways to man from the nuclear station. The reported values are the mean or average for the year of all samples of that type which had values greater than the LLD. "f" is the fraction of all the samples taken at all indicator locations for the medium which reported values greater than the LLD. Example: 7 results greater than LLD out of 15 samples taken would be reported 7/15. The Range is the values of the lowest to highest sample results greater than LLD reported at all the indicator locations for that medium.

Column 5: The Mean, f-fraction and Range along with the name of the location, distance from the CPS gaseous effluent stack in miles, and the letter(s) name of the compass sector in the direction of the sample location from the CPS gaseous effluent stack. The location with the highest annual mean is compared to both indicator and control locations of the medium samples.

TABLE 8-3 (Cont'd)

TABLE EXPLANATIONS (Cont'd):

Column 6: Control locations are sited in areas with low relative deposition and/or dispersion factors. Sample results are used as reference for the control location.

Column 7: NRC Regulations (Branch Technical Position, Rev. 1, November 1979) include a table of radioisotope concentrations that, if exceeded by confirmed sample measurements, indicate that a Nonroutine Reported Measurement exists. Such measurements require further investigation to validate the source.

APPENDIX C

Glossary

GLOSSARY

activation - the process in which stable atoms become radioactive atoms by absorbing neutrons.

ALARA - acronym for "As Low As Reasonably Achievable" which applies to many facets of nuclear power, i.e., radiation exposure for personnel kept low, minimizes number/activity of effluent discharges.

alpha particle - a charged particle emitted from the nucleus of an atom having a mass and charge equal in magnitude to a helium nucleus which has two protons and two neutrons.

atom - the smallest component of an element having all the properties of that element. Comprised of protons, neutrons and electrons such that the number of protons determines the element.

background radiation - source of radiation that mankind has no control over, such as cosmic (from the sun) and terrestrial (naturally occurring radioactive elements).

beta particle - a charged particle equivalent to an electron if negative or a positron if positive, originating near the nucleus of an atom during radioactive decay or fission.

control location - a sample collection location considered to be far enough away from Clinton Power Station so as not to be affected by station operations.

cosmic radiation - penetrating ionizing radiation originating in outer space.

curie (Ci) - the unit of radioactivity equal to 2.2 trillion disintegrations per minute.

dead water - water that contains no tritium.

dose - a quantity (total or accumulated) of ionizing radiation received.

dose equivalent - a quantity used in radiation protection which expresses all radiations on a common scale for calculating the effective absorbed dose (the unit of dose equivalent is the rem).

ecology - a branch of biology dealing with the relations between organisms and their environment.

electromagnetic radiation - a traveling wave motion resulting from changing electric or magnetic fields. Familiar sources of electromagnetic radiation range from x-rays (and gamma rays) of short wavelength, through the ultraviolet, visible and infrared regions, to radar and radiowaves of relatively long wavelength. All electromagnetic radiation travels in a vacuum at the speed of light.

element - one of 103 known chemical substances that cannot be broken down further without changing its chemical properties.

environment - the aggregate of surrounding things, conditions, or influences.

exposure - a measure of the ionization produced in air by x-ray or gamma radiation. Acute exposure is generally accepted to be large exposure received over a short period of time. Chronic exposure is exposure received over a long period of time.

fission - process by which an atomic nucleus splits into two smaller nuclei and releases neutrons and energy.

fission products - the nuclei formed as part of the fissioning of an atomic nucleus.

gamma rays - high energy, short wavelength electromagnetic radiation emitted from the nucleus.

half-life - the time required for half of a given amount of a radionuclide to decay.

indicator location - a sample collection strategically placed to monitor dose rate or radioactive material that may be the result of Clinton Power Station operations.

ionization - the process by which a neutral atom or molecule acquires a positive or negative charge.

irradiation - exposure to radiation.

Lower Limit of Detection (LLD) - the smallest amount of sample activity that will give a net count for which there is a confidence at a predetermined level that the activity is present.

microcurie - one millionth of a curie and represents 2.2 million decays per minute.

neutron - one of the three basic parts of an atom which has no charge and is normally found in the nucleus (center) of an atom.

nucleus - the center of an atom containing protons and neutrons; determines the atomic weight and contributes to the net positive charge of an atom. nuclei (plural)

nuclides - atoms which all have the same atomic number and mass number.

periphyton - water plant life (i.e., algae).

radiation - the process by which energy is emitted from a nucleus as particles (alpha, beta, neutron) or waves (gamma).

radionuclide - a radioactive species of an atom characterized by the constitution of its nucleus. The nuclear constitution is specified by the number of protons, number of neutrons, and energy content.

rem - the unit of dose of any ionizing radiation that produces the same biological effects as a unit of absorbed dose of ordinary x-rays. Acronym for Roentgen Equivalent Man.

roentgen - a measure of ionization produced in air by x-ray or gamma radiation

statistics - the science that deals with the collection, classification, analysis and interpretation of numerical data by use of mathematical theories of probabilities.

target tissue - any tissue or organ of the body in which radiation is absorbed.

terrestrial radiation - source of radiation pertaining to the ground (Earth's crust).

wind rose - a graphic representation indicating from which direction and speed the wind blew.

x-rays - high energy, short wavelength electromagnetic radiation, emitted from the electron shells of an atom.

APPENDIX D

Clinton Power Station Radiological Environmental Monitoring
Quality Control Check Results
1993

TABLE D-1

U. S. EPA CROSSCHECK PROGRAM[a]

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/l[b] TBEESML Result ±2 s.d.[c]	EPA Result[d] ±1 s.d., N=1	Control Limits
STW-680	Water	Jan 1993	Sr-89	15.0±2.0	15.0±5.0	6.3-23.7
			Sr-90	10.3±1.2	10.0±5.0	1.3-18.7
STW-681	Water	Jan 1993	Pu-239	17.5±1.6	20.0±2.0	16.5-23.5
STW-682	Water	Jan 1993	Gr. alpha	*17.1±1.2	34.0±9.0	18.4-49.6
			Gr. beta	46.7±3.2	44.0±5.0	35.3-52.7

* Gross Alpha analysis was repeated with similar results. An investigation of possible causes for the deviation from the EPA was conducted with no cause discovered. The sample was spiked with Th-230; so Alpha Spec Analysis for Th-230 was performed in triplicate with results of 15.5±2.1, 13.4±1.4, and 14.8±2.0. It should be noted that 66% of all participants failed this analysis with a grand average of 17.1. This coupled with the support of the Alpha Spec results leaves TBEESML cause to believe that there may have been a dilution error at the EPA. It should be noted that on the next Gross Alpha EPA check, TBEESML reported results that where exactly the known value. Since no apparent cause can be found, and TBEESML had outstanding results on the following sample, it is felt that no further investigation is needed.

Lab Code	Sample Type	Date Collected	Analysis	TBEESML Result ±2 s.d.	EPA Result ±1 s.d., N=1	Control Limits
STW-683	Water	Feb 1993	I-131	106.0±10.0	100.0±10.0	82.7-117.3
STW-684	Water	Feb 1993	Uranium	7.2±0.5	7.6±3.0	2.4-12.8
STW-685	Water	Mar 1993	Ra-226	9.3±1.3	9.8±1.5	7.2-12.4
			Ra-228	20.8±2.2	18.5±4.6	10.5-26.5
STW-686	Water	Apr 1993	Gr. alpha	88.3±8.1	95.0±24.0	53.4-136.6
			Ra-226	25.4±1.4	24.9±3.7	18.5-31.3
			Ra-228	17.4±1.2	19.0±4.8	10.7-27.3
			Uranium	27.8±2.2	28.9±3.0	23.3-34.1
STW-687	Water	Apr 1993	Gr. beta	161.7±9.0	177.0±27.0	130.2-223.8
			Sr-89	*28.7±9.4	41.0±5.0	32.3-49.7
			Sr-90	28.0±3.5	29.0±5.0	20.3-37.7
			Co-60	41.3±1.2	39.0±5.0	30.3-47.7
			Cs-134	24.7±1.2	27.0±5.0	18.3-35.7
			Cs-137	30.0±0.0	32.0±5.0	23.3-40.7

* The EPA report was received 08-16-93. No cause for the low result for Sr-89 was found. The analyst has been observed performing this procedure with no noted discrepancies. Teledyne will continue to monitor this procedure in the future. No further action is anticipated unless conditions warrant.

TABLE D-1 (cont'd)

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/l[b] TBEESML Result ±2 s.d.[c]	EPA Result[d] ±1 s.d., N=1	Control Limits
STW-688	Water	Jun 1993	H-3	9613.3±46.2	9844.0±984.0	8136.8-11551.2
STW-689	Water	Jun 1993	Co-60	17.3±4.6	15.0±5.0	6.3-23.7
			Zn-65	114.0±13.2	103.0±10.0	85.7-120.3
			Ru-106	108.0±8.0	119.0±12.0	98.2-139.8
			Cs-134	5.7±1.2	5.0±5.0	0.0-13.7
			Cs-137	6.0±2.0	5.0±5.0	0.0-13.7
			Ba-133	101.7±10.3	99.0±10.0	81.7-116.3
STW-690	Water	Jul 1993	Sr-89	28.3±2.3	34.0±5.0	25.3-42.7
			Sr-90	25.0±1.0	25.0±5.0	16.3-33.7
STW-691	Water	Jul 1993	Alpha	15.0±2.7	15.0±5.0	6.3-23.7
			Beta	41.3±4.9	43.0±6.9	31.0-55.0
STW-692	Water	Aug 1993	Uranium	24.9±1.4	25.3±3.0	20.1-30.5
STAF-693	Air Fltr	Aug 1993	Alpha	17.0±1.0	19.0±5.0	10.3-27.7
			Beta	47.3±0.6	47.0±5.0	38.3-55.7
			Sr-90	19.3±0.6	19.0±5.0	10.3-27.7
			Cs-137	10.0±1.0	9.0±5.0	0.3-17.7
STW-694	Water	Sep 1993	Ra-226	15.9±0.7	14.9±2.2	11.1-18.7
			Ra-228	21.0±1.6	20.4±5.1	11.6-29.2
STM-695	Milk	Sep 1993	I-131	125.3±4.5	120.0±12.0	99.2-140.8
			Sr-89	*19.3±1.5	30.0±5.0	21.3-38.7
			Sr-90	22.0±0.0	25.0±5.0	16.3-33.7
			Cs-137	49.0±3.0	49.0±5.0	40.3-57.7
			K	1616.7±37.9	1679.0±84.0	1533.3-1824.7
STW-696	Water	Oct 1993	I-131	116.7±2.3	117.0±12.0	96.2-137.8

*Report was received 01-18-94; an investigation is underway as to the cause of the low Sr-89 results. In house spikes have been prepared and the analysis are in progress (see SPM-4848 and SPM-4849 in future reports). There is no apparent cause of the low Sr-89 result. In-house spikes have been prepared and the analyses are in progress. The analyst has been observed performing this procedure with no discrepancies noted. No further action is planned unless the results of the In-House spikes show a problem.

TABLE D-1 (cont'd)

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/l[b] TBEESML Result ±2 s.d.[c]	EPA Result[d] ±1 s.d., N=1	Control Limits
STW-697	Water	Oct 1993	Gr. Alpha	39.7±1.5	40.0±10.0	22.7-57.3
			Ra-226	10.6±0.5	9.9±1.5	7.3-12.5
			Ra-228	13.2±1.5	12.5±3.1	7.1-17.9
			Uranium	15.3±0.6	15.1±3.0	9.9-20.3
STW-698	Water	Oct 1993	Beta	52.0±1.0	58.0±10.0	40.7-75.3
			Sr-89	11.3±0.6	15.0±5.0	6.3-23.7
			Sr-90	11.0±0.0	10.0±5.0	1.3-18.7
			Co-60	10.7±0.6	10.0±5.0	1.3-18.7
			Cs-134	10.0±1.0	12.0±5.0	3.3-20.7
			Cs-137	12.3±1.2	10.0±5.0	1.3-18.7
STW-699	Water	Oct 1993	Alpha	18.3±2.5	20.0±5.0	11.3-28.7
			Beta	13.7±0.6	15.0±5.0	6.3-23.7
STW-700	Water	Nov 1993	H-3	7310.0±175.2	7398.0±740.0	6114.1-8681.9
STW-701	Water	Nov 1993	Ba-133	75.7±7.6	79.0±8.0	65.1-92.9
			Co-60	30.7±2.1	30.0±5.0	21.3-38.7
			Cs-134	51.3±5.9	59.0±5.0	50.3-67.7
			Cs-137	41.7±1.2	40.0±5.0	31.3-48.7
			*Ru-106	163.3±3.2	201.0±20.0	166.3-235.7
			Zn-65	157.0±8.7	150.0±15.0	124.0-176.0

*The report was received on 02-14-94; the cause of the low Ru-106 is under investigation. It should be noted that the grand average of all participants in this analysis was 175.2 pCi/L, with 54% of the participants outside of limits.

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a Results obtained by TBEESML as a participant in the environmental sample crosscheck program operated by the Intercomparison and Calibration Section, Quality Assurance Branch, Environmental Monitoring and Support Laboratory, U.S. Environmental Protection Agency (EPA), Las Vegas, Nevada.

b All results are in the pCi/l, except for elemental potassium (K) data in milk, which are in mg/l; air filter samples, which are in pCi/filter; and food products, which are in mg/kg.

c Unless otherwise indicated, the TBEESML results are given as the mean ±2 standard deviations for three determinations.

d USEPA results are presented as the known values and expected laboratory precision (1 s.d., 1 determination) and control limits as defined by the EPA.

TABLE D-2

IN-HOUSE SPIKED SAMPLES

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/l[a] TBEESML Result ±2 s.d., n=1[b]	Known Activity	Control Limits[c]
SPM-3341	Milk	Jan 93	Sr-89	6.7±3.1	8.7	0.0-18.7
			Sr-90	20.0±1.2	19.2	9.2-29.2
			Cs-134	17.1±2.0	21.3	11.3-31.3
			Cs-137	21.4±2.0	23.8	13.8-33.8
SPM-3387	Milk	Feb 93	I-131	72.5±8.4	71.5	57.2-85.8
SPVE-3401	Vegetation (Saw dust)	Feb 93	I-131	994.5±53.2	953.7	763.0-1144.4
SPCH-3402	Charcoal	Feb 93	I-131	95.2±12.8	95.4	76.3-114.5
SPW-3434	Water	Apr 93	Gr. alpha	10.4±1.8	10.4	0.4-20.4
			Gr. beta	22.0±2.0	20.6	10.6-30.6
SPW-3556	Water	Apr 93	Sr-89	18.2±5.0	22.2	12.2-32.2
			Sr-90	20.1±1.8	17.0	7.0-27.0
SPW-3597	Water	Apr 93	H-3	5464±219.0	5428.0	4342.4-6513.6
SPW-3599	Water	Apr 93	I-131	149.8±1.9	145.0	116.0-174.0
SPW-3606	Water	Apr 93	Co-60	24.8±2.3	21.5	11.5-31.5
			Cs-134	26.4±1.9	26.4	16.4-36.4
			Cs-137	33.9±2.6	31.7	21.7-41.7
SPM-3631	Milk	Apr 93	I-131	139.8±1.6	145.0	116.0-174.0
			Cs-134	48.8±2.9	52.8	42.8-62.8
			Cs-137	65.2±2.9	63.4	53.4-73.4
SPF-3681	Fish* (Jello)	May 93	Cs-137	68.2±7.7	67.6	57.6-77.6
	*Concentrations are in pCi/Total Volume (550g).					
SPW-3842	Water	Jun 93	Th-230	4.2±0.5	4.5	2.7-6.3
SPW-4160	Water	Jun 1993	Gr. alpha	8.9±1.4	12.9	7.7-18.1
			Gr. beta	22.0±1.9	31.9	19.1-44.7
SPW-4232	Water	Aug 1993	Fe-55	1684.0±415.0	1420.0	1136.0-1704.0
SPW-4246	Water	Aug 93	Sr-90	32.2±2.6	30.4	24.3-36.5

TABLE D-2 (Cont'd)

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/l[a] TBEESML Result ±2 s.d., n=1[b]	Known Activity	Control Limits[c]
SPM-4247	Milk	Aug 93	Sr-89	29.1±4.9	35.4	25.4-45.4
			Sr-90	18.3±1.3	19.2	9.2-29.2
SPW-4248	Water	Aug 93	H-3	9910.0±300.0	10430.0	8344.0-12516.0
SPW-4250	Water	Aug 93	Co-60	247.0±23.1	247.7	222.9-272.5
			Cs-134	141.6±15.9	141.1	127.0-155.2
			*Cs-137	283.5±27.8	247.2	222.5-271.9

*The cause of the high Cs-137 data is unknown. All data was reviewed, no errors where found in the calculations. The employee was observed performing this analysis and no deviations from the procedure where observed. The employee's results have been good in the past; no further action is planned.

Lab Code	Sample Type	Date Collected	Analysis	TBEESML Result ±2 s.d., n=1	Known Activity	Control Limits
SPF-4251	Fish (Jello)	Aug 93	Cs-134	68.8±3.3	75.3	65.3-85.3
			Cs-137	203.6±8.2	198.1	178.3-217.9
SPS-4262	Bottom Sediment	Aug 93	Cs-134	74.1±9.9	71.0	61.0-81.0
			Cs-137	212.4±14.8	197.8	178.0-217.6
SPW-4377	Water	Sep 93	I-131	39.0±10.0	42.1	30.1-54.1
SPM-4378	Milk	Sep 93	I-131	44.5±5.5	42.1	30.1-54.1
SPCH-4379	Charcoal	Sep 93	I-131	90.3±13.5	84.3	67.4-101.2
SPVE-4380	Vegetation (Saw dust)	Sep 93	I-131	193.2±20.0	170.2	136.2-204.2
SPW-4381	Water	Sep 93	Sr-89	21.9±4.0	28.8	18.8-38.8
			Sr-90	19.5±1.8	19.0	9.0-29.0
SPW-4382	Water	Sep 93	I-129	18.1±1.0	18.6	6.6-30.6
SPW-4421	Water	Oct 1993	H-3	16900.0±368.0	17380.0	13904.0-20856.0
SPW-4428	Water	Oct 1993	Co-60	19.3±3.1	18.3	8.3-28.3
			Cs-134	31.5±3.3	33.5	23.5-43.5
			Cs-137	44.4±3.6	43.2	33.2-53.2
SPM-4426	Milk	Oct 93	I-131	49.7±8.6	44.5	32.5-56.5
			Cs-134	30.8±4.5	33.0	23.0-43.0
			Cs-137	43.4±6.0	43.2	33.2-53.2

TABLE D-2 (Cont'd)

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/l[a]: TBEESML Result ±2 s.d., n=1[b]	Known Activity	Control Limits[c]
SPW-4427	Water	Oct 93	I-131	95.2±10.6	88.9	71.1-106.7

a All results are in pCi/L, except elemental potassium (K) data in milk, which are in mg/L; air filter samples, which are in pCi/Filter; charcoal which are in pCi charcoal; and food products which are in mg/kg.

b All determinations are sinç

c Control Limits are based on EPA publication; "Environmental Radioactive Laboratory Intercomparison Studies Program", Fiscal Year 1981-1982, EPA-600/4-81-004 (see Attachment A) or limits imposed by TBEESML.

TABLE D-3

IN-HOUSE BLANK SAMPLES

Lab Code	Sample Type	Sample Date	Analyses	Concentration in pCi/L[a] TBEESML (4.66 Sigma) LLD	Results Activity[b]	Acceptance Criteria (4.66 Sigma)
SPM-3342	Milk	Jan 1993	Sr-89	<0.7	-0.9±1.1	<5.0
			*Sr-90	NA	1.6±0.5	<1.0
			Cs-134	<4.1	-0.9±2.6	<10.0
			Cs-137	<3.9	0.8±2.2	<10.0
	*Low levels of Sr-90 concentration in milk (1-5 pCi/L) are not unusual.					
SPM-3386	Milk	Feb 1993	I-131	<0.2	0.1±0.1	<1.0
SPW-3557	Water	Mar 1993	Sr-89	<0.5	0.3±0.5	<5.0
			Sr-90	<0.5	0.1±0.2	<1.0
SPW-3598	Water	Apr 1993	H-3	<180.0	84.7±94.2	<300.0
SPW-3600	Water	Apr 1993	I-131	<0.2	0.1±0.2	<1.0
SPW-3601	Water*	Apr 1993	Co-60	<4.2		<10.0
			Cs-134	<4.4		<10.0
			Cs-137	<3.4		<10.0
			I-131	<0.4	0.3±0.9	<1.0
	*Activity results for the gamma-emitters are not available for this sample.					
SPM-3651	Milk**	May 1993	I-131	<0.2	0.1±0.1	<1.0
			Cs-134	<4.4		<10.0
			Cs-137	<6.3		<10.0
	**Activity results for the gamma-emitters are not available for this sample.					
SPFP-3680	Food	May 1993	Cs-137	<6.5	0.0±0.0	<10.0
SPW-3844	Water	Jun 1993	Th-228	<0.1	0.0±0.1	<1.0
			Th-230	<0.1	0.2±0.1	<1.0
			Th-232	<0.1	0.0±0.0	<1.0
SPW-4234	Water	Jun 1993	Gr. Alpha	<0.3	0.0±0.2	<1.0
			Gr. Beta	<0.8	0.2±0.3	<5.0
SPS-4059	Bottom Sediment	Jul 1993	Cs-134	<5.0	0.0±0.0	<10.0
			Cs-137	<7.2	0.0±0.0	<10.0
SPVE-4060	Vegetation (Saw dust)	Jul 1993	I-131	<13.5	0.0±0.0	<20.0
			Cs-134	<4.8	0.0±0.0	<10.0
			Cs-137	<6.4	0.0±0.0	<10.0

TABLE D-3 (con't)

Lab Code	Sample Type	Sample Date	Analyses	Concentration in pCi/l[a] TBEESML Results (4.66 Sigma) LLD	Activity[b]	Acceptance Criteria (4.66 Sigma)
SPM-4061	Milk	Jul 1993	Cs-134	<8.6	0.0±0.0	<10.0
			Cs-137	<5.8	0.0±0.0	<10.0
SPM-4062	Milk	Jul 1993	Cs-134	<3.8	1.5±1.5	<10.0
			Cs-137	<4.4	-1.6±3.3	<10.0
SPW-4063	Water	Jul 1993	Co-60	<4.0	1.2±2.3	<10.0
			Cs-134	<3.7	0.3±1.2	<10.0
			Cs-137	<3.2	0.4±3.2	<10.0
SPAP-4064	Air Filter (composite)	Jul 1993	Cs-134	<2.1	0.0±0.0	<10.0
			Cs-137	<2.8	0.0±0.0	<10.0
SPCH-4065	Charcoal	Jul 1993	I-131	<0.1	0.0±0.0	<1.0
	Based on a volume of 300 m^3					
SPW-4233	Water	Aug 1993	Fe-55	<500.0	0.0±0.3	<1000.0
SPM-4235	Milk	Aug 1993	I-131	<0.1	0.0±0.2	<1.0
			Cs-134	<8.1	1.6±1.8	<10.0
			Cs-137	<4.2	-1.7±3.4	<10.0
			Sr-89	<0.8	-1.0±1.1	<5.0
			Sr-90	N/A	1.8±0.5	<1.0
	Low level of Sr-90 concentration in milk (1-5 pCi/L) is not unusual.					
SPW-4241	Water	Aug 1993	H-3	<190	72.9±99.1	<300.0
SPW-4243	Water	Aug 1993	Sr-89	<1.1	-0.6±0.9	<5.0
			Sr-90	<0.7	0.4±0.4	<1.0
			I-131	<0.5	0.0±0.1	<1.0
			Co-60	<7.0	0.4±3.1	<10.0
			Cs-134	<7.6	0.8±15.6	<10.0
			Cs-137	<5.4	-0.7±4.2	<10.0
SPW-4244	Water	Aug 1993	U-233/234	<0.1	0.1±0.1	<1.0
			U-235	<0.1	0.0±0.1	<1.0
			U-238	<0.1	0.1±0.1	<1.0
			Th-228	<0.4	-0.1±0.3	<1.0
			Th-230	<0.1	0.0±0.1	<1.0
			Th-232	<0.1	0.0±0.0	<1.0
			Pu-238	<1.0	0.4±0.7	<1.0
			Pu-239/240	<0.3	0.1±0.2	<1.0

TABLE D-3 (con't)

Lab Code	Sample Type	Sample Date	Analyses	Concentration in pCi/l[a] TBEESML Results (4.66 Sigma) LLD	Activity[b]	Acceptance Criteria (4.66 Sigma)
SPW-4245	Water	Aug 1993	Ra-226	<0.1	0.0±0.0	<1.0
			Ra-228	<0.8	-0.2±0.5	<1.0
SPW-4422	Water	Oct 1993	H-3	<180	-27.5±88.9	<300.0

a All results are in pCi/L, except for air filter samples, which are in pCi/filter.

b Prior to 1993, results were reported as only a LLD, the activity reported is the net activity result.

TABLE D-4

CROSS CHECK PROGRAM RESULTS
THERMOLUMINESCENT DOSIMETERS (TLDs)

Lab Code	TLD Type	Measurement		mR: TBEESML Results ±2 Sigma	Known Value ±2 Sigma	Average ±2 Sigma (All Participants)
Teledyne Testing						
93-1	Teledyne LiF-100 Chips	Mar 1993	Lab	10.1±1.0	10.2	ND
				25.5±2.2	25.5	ND
				42.7±5.7	45.9	ND

ND = No data; Teledyne Testing was only performed by Teledyne Isotopes.

Cards and Chips were irradiated by Teledyne Isotopes, Inc., Westwood NJ. on March 10, 1993. Due to a potential error of 10-12% when cards where irradiated, results of the testing on the cards will not be published. Data is available upon request.

TABLE D-5

ACCEPTANCE CRITERIA FOR "SPIKED" SAMPLES

LABORATORY PRECISION: ONE STANDARD DEVIATION VALUES FOR VARIOUS ANALYSES[a]

Analysis	Level	One Standard Deviation for Single Determination
Gamma Emitters	5 to 100 pCi/liter or kg >100 pCi/liter or kg	5 pCi/liter 5% of known value
Strontium-89[b]	5 to 50 pCi/liter or kg >50 pCi/liter or kg	5 pCi/liter 10% of known value
Strontium-90[b]	2 to 30 pCi/liter or kg >30 pCi/liter of kg	5.0 pCi/liter 10% of known value
Potassium	>0.1 g/liter or kg	5% of known value
Gross Alpha	≤20 pCi/liter >20 pCi/liter	5 pCi/liter 25% of known value
Gross Beta	≤100 pCi/liter >100 pCi/liter	5 pCi/liter 5% of known value
Tritium	≤4,000 pCi/liter >4,000 pCi/liter	1 s.d. = (pCi/liter) = $169.85 \times (\text{known})^{.0933}$ 10% of known value
Radium-226 Radium-228	<0.1 pCi/liter	15% of known value
Plutonium	0.1 pCi/liter, gram or sample	10% of known value
Iodine-131, Iodine-129[b]	≤55 pCi/liter >55 pCi/liter	6 pCi/liter 10% of known value
Uranium-238, Nickel-64[b], Technetium-99[b]	≤35 pCi/liter >35 pCi/liter	6 pCi/liter 15% of known value
Iron-55[b]	50 to 100 pCi/liter >100 pCi/liter	10 pCi/liter 10% of known value
Others[b]	——	20% of known value

a From EPA publication, "Environmental Radioactivity Laboratory Intercomparison Studies Program", Fiscal Year 1981-1982, EPA-600/4-81-004.

b TBEESML Limit.

APPENDIX E

CPS Radiological Environmental Monitoring Results During 1993

TABLE E-1

GROSS BETA AND IODINE-131 ACTIVITY
IN AIR PARTICULATES FOR 1993[a]
($pCi/m^3 \pm 2$ s.d.)

Collection Period	CL-1	CL-2	CL-3	CL-4	CL-6
12/31/92-01/06/93	0.028±0.004	0.030±0.004	0.034±0.004	0.031±0.004	0.036±0.004
1/06-01/13	0.027±0.003	0.034±0.004	0.032±0.004	0.034±0.004	0.038±0.004
01/13-01/20	0.041±0.004	0.041±0.004	0.046±0.004	0.047±0.004	0.045±0.004
01/20-01/27	0.017±0.003	0.018±0.003	0.018±0.003	0.015±0.003	0.016±0.003
01/27-02/02	0.023±0.004	0.023±0.004	0.026±0.004	0.024±0.004	0.025±0.004
02/02-02/10	0.022±0.003	0.023±0.003	0.029±0.003	0.025±0.003	0.029±0.003
02/10-02/17	0.029±0.004	0.028±0.004	0.029±0.003	0.027±0.004	0.030±0.004
02/17-02/24	0.026±0.002	0.025±0.002	<0.009	0.026±0.002	0.025±0.002
02/24-03/03	0.021±0.003	0.023±0.003	0.027±0.004	0.024±0.003	0.028±0.004
03/03-03/10	0.021±0.003	0.023±0.004	0.025±0.004	0.029±0.004	0.028±0.004
03/10-03/17	0.016±0.003	0.018±0.003	0.020±0.003	0.017±0.003	0.019±0.003
03/17-03/24	0.019±0.003	0.016±0.003	0.019±0.003	0.013±0.003	0.018±0.003
03/24-04/31	0.012±0.003	0.012±0.003	0.016±0.003	0.012±0.003	0.015±0.003
04/31-04/07	0.012±0.003	0.013±0.003	0.016±0.003	0.013±0.003	0.013±0.003
04/07-04/14	0.011±0.003	0.013±0.003	0.012±0.003	0.015±0.003	0.014±0.003
04/14-04/21	0.012±0.003	0.012±0.003	0.012±0.003	0.010±0.003	0.012±0.003
04/21-04/28	0.020±0.003	0.018±0.003	0.021±0.003	0.018±0.003	0.020±0.003
04/28-05/05	0.016±0.003	0.014±0.003	0.017±0.003	0.018±0.003	0.016±0.003
05/05-05/12	0.021±0.003	0.022±0.003	0.023±0.003	0.020±0.003	0.022±0.003
05/12-05/19	0.012±0.003	0.013±0.003	0.012±0.003	0.013±0.003	0.012±0.003
05/19-05/26	0.015±0.003	0.014±0.003	0.014±0.003	0.015±0.003	0.015±0.003
05/26-06/02	0.011±0.003	0.012±0.003	0.012±0.003	0.012±0.003	0.009±0.003
06/02-06/09	0.014±0.003	0.019±0.003	0.016±0.003	0.016±0.003	0.015±0.003
06/09-06/16	0.013±0.003	0.012±0.003	0.015±0.003	0.015±0.003	0.014±0.003
06/16-06/23	0.012±0.003	0.014±0.003	0.021±0.003	0.013±0.003	0.014±0.003
06/23-06/30	0.015±0.003	0.017±0.003	0.016±0.003	0.015±0.003	0.014±0.003
06/30-07/07	0.020±0.003	0.020±0.003	ND	0.022±0.003	0.019±0.003
07/07-07/14	0.013±0.003	0.015±0.003	0.019±0.003	0.017±0.003	0.012±0.003
07/14-07/21	0.013±0.003	0.017±0.003	0.020±0.003	0.018±0.003	0.017±0.003
07/21-07/28	0.019±0.003	0.014±0.003	0.018±0.003	0.019±0.003	0.017±0.003
07/28-08/04	0.012±0.003	0.013±0.003	0.015±0.003	0.015±0.003	0.016±0.003
08/04-08/11	0.015±0.003	0.015±0.003	0.017±0.003	0.017±0.003	0.012±0.003
08/11-08/18	0.018±0.003	0.016±0.003	0.021±0.003	0.023±0.003	0.022±0.003
08/18-08/25	0.018±0.003	0.019±0.003	0.023±0.003	0.024±0.003	0.025±0.003
08/25-09/01	0.024±0.003	0.024±0.003	0.026±0.003	0.027±0.004	0.026±0.003
09/01-09/08	0.012±0.003	0.012±0.003	0.016±0.003	0.013±0.003	0.015±0.003
09/08-09/15	0.016±0.003	0.018±0.003	0.017±0.003	0.019±0.003	0.017±0.003
09/15-09/22	0.017±0.003	0.016±0.003	0.017±0.003	0.016±0.003	0.020±0.003
09/22-09/29	0.015±0.003	0.013±0.003	0.015±0.003	0.016±0.003	0.015±0.003
09/29-10/06	0.018±0.003	0.016±0.003	0.020±0.003	0.016±0.003	0.019±0.003

TABLE E-1 (Cont'd)

Collection Period	CL-7	CL-8	CL-11[b]	CL-15	CL-94
12/31/92-01/06/93	0.034±0.004	0.034±0.004	0.030±0.004	0.034±0.004	0.032±0.004
1/06-01/13	0.034±0.004	0.034±0.004	0.030±0.003	0.035±0.004	0.035±0.004
01/13-01/20	0.042±0.004	0.048±0.004	0.045±0.004	0.045±0.004	0.042±0.004
01/20-01/27	0.014±0.003	0.017±0.003	0.017±0.003	0.018±0.003	0.014±0.003
01/27-02/02	0.023±0.004	0.027±0.004	0.024±0.004	0.024±0.004	0.022±0.004
02/02-02/10	0.024±0.003	0.030±0.003	0.029±0.003	0.027±0.003	0.024±0.003
02/10-02/17	0.031±0.004	0.031±0.004	0.033±0.004	0.029±0.004	0.024±0.004
02/17-02/24	0.030±0.003	0.025±0.002	0.027±0.003	0.027±0.002	0.007±0.002
02/24-03/03	0.023±0.003	0.027±0.004	0.028±0.004	0.028±0.004	ND
03/03-03/10	0.024±0.004	0.025±0.004	0.025±0.004	0.022±0.003	0.025±0.003
03/10-03/17	0.018±0.003	0.016±0.004	0.016±0.003	0.016±0.003	0.010±0.003
03/17-03/24	0.014±0.003	0.016±0.003	0.016±0.003	0.018±0.003	0.018±0.003
03/24-04/31	0.013±0.003	0.014±0.003	0.014±0.003	0.018±0.003	0.012±0.003
04/31-04/07	0.014±0.003	0.017±0.003	0.013±0.003	0.013±0.003	0.011±0.003
04/07-04/14	0.012±0.003	0.012±0.003	0.013±0.003	0.014±0.003	0.012±0.003
04/14-04/21	0.014±0.003	0.013±0.003	0.010±0.003	0.014±0.003	0.014±0.003
04/21-04/28	0.017±0.003	0.019±0.003	0.020±0.003	0.018±0.003	0.017±0.003
04/28-05/05	0.014±0.003	0.017±0.003	0.015±0.003	0.017±0.003	0.014±0.003
05/05-05/12	0.017±0.003	0.027±0.003	0.023±0.003	0.019±0.003	0.021±0.003
05/12-05/19	0.012±0.003	0.011±0.003	0.015±0.003	0.012±0.003	ND
05/19-05/26	0.011±0.003	0.016±0.003	0.015±0.003	0.014±0.003	0.012±0.003
05/26-06/02	0.011±0.003	0.010±0.003	0.013±0.003	0.012±0.003	0.011±0.003
06/02-06/09	0.013±0.003	0.013±0.003	0.015±0.003	0.017±0.003	0.016±0.003
06/09-06/16	0.015±0.003	0.015±0.003	0.019±0.003	0.013±0.003	0.013±0.003
06/16-06/23	0.018±0.003	0.018±0.003	0.018±0.003	0.015±0.003	0.013±0.003
06/23-06/30	0.015±0.003	0.015±0.003	0.016±0.003	0.014±0.003	0.015±0.003
06/30-07/07	0.017±0.003	0.020±0.003	0.022±0.003	0.019±0.003	0.020±0.003
07/07-07/14	0.013±0.003	0.017±0.003	0.017±0.003	0.012±0.003	0.016±0.003
07/14-07/21	0.011±0.003	0.021±0.003	0.017±0.003	0.015±0.003	0.015±0.003
07/21-07/28	0.014±0.003	0.016±0.003	0.017±0.003	0.016±0.003	0.017±0.003
07/28-08/04	0.014±0.003	0.016±0.003	0.017±0.003	0.014±0.003	0.013±0.003
08/04-08/11	0.012±0.003	0.018±0.003	0.015±0.003	0.013±0.003	0.010±0.003
08/11-08/18	0.013±0.003	0.020±0.003	0.022±0.003	0.018±0.003	0.019±0.003
08/18-08/25	0.015±0.003	0.022±0.003	0.026±0.003	0.019±0.003	0.018±0.003
08/25-09/01	0.020±0.003	0.024±0.004	0.027±0.003	0.022±0.005	0.020±0.003
09/01-09/08	0.013±0.003	0.015±0.003	0.017±0.003	0.012±0.003	0.014±0.003
09/08-09/15	0.012±0.003	0.015±0.003	0.019±0.003	0.014±0.003	0.013±0.003
09/15-09/22	0.013±0.003	0.020±0.003	0.018±0.003	0.015±0.003	0.014±0.003
09/22-09/29	0.012±0.003	0.015±0.003	0.016±0.003	0.012±0.003	0.014±0.003
09/29-10/06	0.017±0.003	0.018±0.003	0.019±0.003	0.015±0.003	ND

TABLE E-1 (Cont'd)

Collection Period	CL-1	CL-2	CL-3	CL-4	CL-6
10/06-10/13	0.026±0.003	0.026±0.003	0.027±0.003	0.023±0.003	0.030±0.004
10/13-10/20	0.024±0.003	0.027±0.004	0.032±0.004	0.027±0.004	0.034±0.004
10/20-10/27	0.022±0.003	0.020±0.003	0.019±0.003	0.021±0.003	0.022±0.003
10/27-11/03	0.014±0.003	0.012±0.003	0.013±0.003	0.013±0.003	0.016±0.003
11/03-11/10	0.020±0.003	0.019±0.003	0.025±0.004	0.022±0.003	0.023±0.003
11/10-11/17	0.026±0.004	0.026±0.004	0.029±0.004	0.023±0.003	0.026±0.004
11/17-11/23	0.023±0.003	0.026±0.003	0.026±0.003	0.022±0.003	0.024±0.003
11/23-12/01	0.027±0.003	0.035±0.004	0.032±0.004	0.034±0.004	0.035±0.004
12/01-12/08	0.026±0.003	0.028±0.004	0.027±0.004	0.024±0.003	0.028±0.004
12/08-12/15	ND	0.030±0.004	0.032±0.004	0.026±0.003	0.031±0.004
12/15-12/21	0.018±0.003	0.021±0.004	0.022±0.004	0.016±0.003	0.021±0.004
12/21-12/29/93	0.025±0.004	0.009±0.003	0.027±0.004	0.022±0.004	0.023±0.004

Collection Period	CL-7	CL-8	CL-11	CL-15	CL-94
10/06-10/13	0.027±0.003	0.026±0.003	0.032±0.004	0.023±0.003	0.024±0.003
10/13-10/20	0.029±0.004	0.033±0.004	0.034±0.004	0.026±0.003	0.028±0.004
10/20-10/27	0.018±0.003	0.024±0.003	0.022±0.003	0.020±0.003	0.020±0.003
10/27-11/03	0.013±0.003	0.011±0.003	0.011±0.003	0.015±0.003	0.014±0.003
11/03-11/10	0.020±0.003	0.020±0.003	0.023±0.003	0.022±0.003	0.022±0.003
11/10-11/17	0.023±0.003	0.030±0.004	0.028±0.004	0.028±0.004	0.029±0.004
11/17-11/23	0.020±0.003	0.019±0.003	0.022±0.003	0.023±0.003	0.022±0.003
11/23-12/01	0.030±0.004	0.031±0.004	0.028±0.003	0.032±0.004	0.032±0.004
12/01-12/08	0.020±0.003	0.026±0.003	0.027±0.004	0.030±0.004	0.028±0.004
12/08-12/15	0.025±0.003	0.029±0.004	0.025±0.003	0.032±0.004	0.028±0.004
12/15-12/21	0.015±0.003	0.016±0.003	0.020±0.003	0.019±0.003	0.019±0.003
12/21-12/29/93	0.023±0.004	0.022±0.004	0.026±0.004	0.028±0.004	0.025±0.004

a all I-131 activity is <0.07 pCi/m^3

b control location, all other locations are indicators

ND No Data

TABLE E-2

GAMMA ISOTOPIC ACTIVITY IN AIR PARTICULATES FOR 1993
(pCi/m^3 ± 2 s.d.)

Site	Isotope	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr
CL-1	Be-7	0.043±0.008	0.074±0.015	0.058±0.025	0.061±0.016
	K-40	<0.016	<0.029	<0.057	<0.058
	Co-60	<0.0009	<0.0005	<0.0009	<0.0009
	Nb-95	<0.0013	<0.0010	<0.0018	<0.0006
	Zr-95	<0.0002	<0.0014	<0.0018	<0.0015
	Ru-103	<0.0010	<0.0006	<0.0012	<0.0009
	Ru-106	<0.0062	<0.0033	<0.0051	<0.0070
	Cs-134	<0.0007	<0.0004	<0.0007	<0.0008
	Cs-137	<0.0007	<0.0007	<0.0009	<0.0009
	Ce-141	<0.0012	<0.0010	<0.0023	<0.0019
	Ce-144	<0.0030	<0.0033	<0.0074	<0.0060
CL-2	Be-7	0.048±0.009	0.056±0.017	0.072±0.021	0.072±0.016
	K-40	<0.016	<0.029	<0.023	<0.038
	Co-60	<0.0011	<0.0005	<0.0008	<0.0006
	Nb-95	<0.0013	<0.0005	<0.0026	<0.0020
	Zr-95	<0.0018	<0.0008	<0.0043	<0.0045
	Ru-103	<0.0011	<0.0011	<0.0009	<0.0011
	Ru-106	<0.0075	<0.0077	<0.0048	<0.0076
	Cs-134	<0.0009	<0.0006	<0.0009	<0.0009
	Cs-137	<0.0007	<0.0003	<0.0011	<0.0006
	Ce-141	<0.0007	<0.0024	<0.0018	<0.0006
	Ce-144	<0.0027	<0.0061	<0.0030	<0.0034
CL-3	Be-7	0.045±0.008	0.083±0.016	0.070±0.020	0.062±0.018
	K-40	<0.018	<0.043	<0.053	<0.057
	Co-60	<0.0012	<0.0004	<0.0009	<0.0006
	Nb-95	<0.0014	<0.0009	<0.0020	<0.0008
	Zr-95	<0.0021	<0.0011	<0.0021	<0.0029
	Ru-103	<0.0013	<0.0010	<0.0008	<0.0011
	Ru-106	<0.0088	<0.0022	<0.0065	<0.0070
	Cs-134	<0.0008	<0.0004	<0.0006	<0.0015
	Cs-137	<0.0010	<0.0007	<0.0009	<0.0013
	Ce-141	<0.0019	<0.0020	<0.0014	<0.0021
	Ce-144	<0.0049	<0.0052	<0.0054	<0.0054

TABLE E-2 (Cont'd)

Site	Isotope	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr
CL-4	Be-7	0.054±0.009	0.074±0.015	0.067±0.017	0.069±0.015
	K-40	<0.016	<0.027	<0.058	<0.039
	Co-60	<0.0008	<0.0009	<0.0007	<0.0006
	Nb-95	<0.0013	<0.0012	<0.0007	<0.0018
	Zr-95	<0.0017	<0.0006	<0.0013	<0.0028
	Ru-103	<0.0009	<0.0007	<0.0010	<0.0005
	Ru-106	<0.0062	<0.0068	<0.0039	<0.010
	Cs-134	<0.0007	<0.0009	<0.0006	<0.0011
	Cs-137	<0.0007	<0.0007	<0.0006	<0.0006
	Ce-141	<0.0012	<0.0022	<0.0018	<0.0014
	Ce-144	<0.0028	<0.0042	<0.0036	<0.0020
CL-6	Be-7	0.054±0.009	0.079±0.014	0.066±0.018	0.062±0.015
	K-40	<0.017	<0.028	<0.029	<0.043
	Co-60	<0.0013	<0.0004	<0.0013	<0.0006
	Nb-95	<0.0012	<0.0009	<0.0017	<0.0023
	Zr-95	<0.0017	<0.0012	<0.0030	<0.0085
	Ru-103	<0.0011	<0.0018	<0.0019	<0.0008
	Ru-106	<0.0069	<0.0035	<0.0095	<0.0040
	Cs-134	<0.0008	<0.0008	<0.0009	<0.0008
	Cs-137	<0.0007	<0.0005	<0.0008	<0.0007
	Ce-141	<0.0010	<0.0022	<0.0019	<0.0013
	Ce-144	<0.0027	<0.0044	<0.0054	<0.0017
CL-7	Be-7	0.037±0.007	0.079±0.015	0.050±0.014	0.049±0.015
	K-40	<0.016	<0.036	<0.048	<0.044
	Co-60	<0.0010	<0.0004	<0.0008	<0.0007
	Nb-95	<0.0013	<0.0006	<0.0023	<0.0017
	Zr-95	<0.0019	<0.0010	<0.0015	<0.0025
	Ru-103	<0.0012	<0.0005	<0.0017	<0.0012
	Ru-106	<0.0070	<0.0057	<0.0062	<0.0085
	Cs-134	<0.0007	<0.0009	<0.0005	<0.0012
	Cs-137	<0.0008	<0.0006	<0.0009	<0.0004
	Ce-141	<0.0017	<0.0010	<0.0021	<0.0016
	Ce-144	<0.0044	<0.0053	<0.0025	<0.0022

TABLE E-2 (Cont'd)

Site	Isotope	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr
CL-8	Be-7	0.050±0.007	0.07±0.018	0.072±0.019	0.056±0.013
	K-40	<0.014	<0.027	<0.024	<0.040
	Co-60	<0.0010	<0.0004	<0.0009	<0.0005
	Nb-95	<0.0012	<0.0009	<0.0022	<0.0007
	Zr-95	<0.0014	<0.0008	<0.0047	<0.00[illegible]
	Ru-103	<0.0009	<0.0007	<0.0009	<0.0008
	Ru-106	<0.0057	<0.0021	<0.0044	<0.0041
	Cs-134	<0.0006	<0.0006	<0.0007	<0.0014
	Cs-137	<0.0006	<0.0002	<0.0006	<0.0012
	Ce-141	<0.0010	<0.0012	<0.0018	<0.0010
	Ce-144	<0.0024	<0.0023	<0.0041	<0.0019
CL-11	Be-7	0.051±0.008	0.065±0.016	0.067±0.025	0.065±0.013
	K-40	<0.013	<0.027	<0.016	<0.031
	Co-60	<0.0011	<0.0004	<0.0005	<0.0008
	Nb-95	<0.0009	<0.0005	<0.0008	<0.0017
	Zr-95	<0.0014	<0.0006	<0.0019	<0.0030
	Ru-103	<0.0008	<0.0004	<0.0008	<0.0005
	Ru-106	<0.0061	<0.0046	<0.0084	<0.0067
	Cs-134	<0.0006	<0.0002	<0.0007	<0.0008
	Cs-137	<0.0006	<0.0003	<0.0010	<0.0004
	Ce-141	<0.0009	<0.0017	<0.0020	<0.0005
	Ce-144	<0.0022	<0.0048	<0.0060	<0.0030
CL-15	Be-7	0.048±0.009	0.070±0.015	0.057±0.017	0.061±0.015
	K-40	<0.018	<0.030	<0.046	<0.035
	Co-60	<0.0013	<0.0004	<0.0007	<0.0004
	Nb-95	<0.0014	<0.0007	<0.0008	<0.0020
	Zr-95	<0.0023	<0.0011	<0.0012	<0.0012
	Ru-103	<0.0014	<0.0005	<0.0015	<0.0005
	Ru-106	<0.0081	<0.0040	<0.0038	<0.0057
	Cs-134	<0.0009	<0.0004	<0.0007	<0.0006
	Cs-137	<0.0010	<0.0004	<0.0010	<0.0010
	Ce-141	<0.0020	<0.0015	<0.0015	<0.0006
	Ce-144	<0.0052	<0.0033	<0.0029	<0.0042
CL-94	Be-7	0.037±0.009	0.071±0.015	0.055±0.014	0.046±0.016
	K-40	<0.016	<0.038	<0.050	<0.047
	Co-60	<0.0014	<0.0005	<0.0005	<0.0007
	Nb-95	<0.0016	<0.0005	<0.0016	<0.0018
	Zr-95	<0.0022	<0.0011	<0.0008	<0.0036
	Ru-103	<0.0012	<0.0006	<0.0010	<0.0008
	Ru-106	<0.0084	<0.0072	<0.0082	<0.0064
	Cs-134	<0.0010	<0.0005	<0.0003	<0.0006
	Cs-137	<0.0009	<0.0006	<0.0009	<0.0008
	Ce-141	<0.0012	<0.0018	<0.0011	<0.0013
	Ce-144	<0.0032	<0.0050	<0.0032	<0.0043

TABLE E-3

1993 CPS REMP QUARTERLY TLD RESULTS

Location	mR/91 Days (Net Exposure)			
	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr
CL-1	17.9±0.2	19.2±0.3	18.3±0.2	ND
CL-2	18.8±0.4	19.6±0.3	18.4±0.2	19.1±0.2
CL-3	18.0±0.4	17.9±0.3	18.3±0.3	18.1±0.2
CL-4	18.3±0.4	17.6±0.5	18.3±0.3	17.2±0.3
CL-5	20.5±0.7	19.5±0.3	19.2±0.3	18.8±0.2
CL-6	15.9±0.6	15.7±0.2	16.2±0.2	15.6±0.2
CL-7	17.8±0.3	16.5±0.3	16.9±0.2	16.4±0.2
CL-8	19.7±0.5	17.6±0.2	17.6±0.3	17.5±0.3
CL-11[a]	17.6±0.2	16.2±0.2	16.0±0.3	16.3±0.2
CL-15	15.9±0.2	16.1±0.2	15.1±0.2	15.6±0.2
CL-20	18.1±0.4	20.1±0.2	20.1±0.3	19.5±0.2
CL-21	19.5±0.6	19.3±0.3	19.9±0.3	19.5±0.2
CL-22	18.1±0.3	19.2±0.3	19.1±0.3	18.0±0.2
CL-23	14.2±0.3	14.9±0.3	14.9±0.2	14.8±0.2
CL-24	19.0±0.3	17.8±0.5	18.6±0.3	17.2±0.2
CL-25	13.6±0.3	14.9±0.3	14.9±0.2	14.0±0.2
CL-26	16.7±0.3	15.9±0.3	16.6±0.2	14.9±0.2
CL-27	17.0±0.2	17.4±0.4	17.3±0.3	16.8±0.3
CL-28	18.2±0.2	19.2±0.3	17.9±0.2	18.5±0.2
CL-29	18.8±0.4	20.5±0.2	19.0±0.2	19.1±0.2
CL-30	19.2±0.2	18.6±0.2	18.7±0.3	18.4±0.2
CL-31	16.5±0.3	16.9±0.2	15.6±0.2	16.0±0.2
CL-32	17.2±0.2	17.6±0.3	17.3±0.2	17.0±0.3
CL-33[a]	19.0±0.2	19.6±0.3	19.4±0.3	18.4±0.2
CL-34	21.1±0.6	20.9±0.2	20.3±0.3	19.4±0.2
CL-35	18.0±0.3	18.3±0.4	18.5±0.2	17.1±0.2
CL-36	16.4±0.4	18.1±0.3	19.1±0.2	18.7±0.2
CL-37	16.7±0.2	18.3±0.3	18.9±0.3	18.6±0.2
CL-38	18.7±0.4	18.3±0.2	20.2±0.4	19.5±0.2
CL-39	15.4±0.3	18.0±0.4	18.0±0.2	17.9±0.2
CL-40	16.1±0.4	18.1±0.3	18.3±0.3	18.2±0.2
CL-41	16.5±0.2	18.2±0.4	19.4±0.3	19.7±0.5
CL-42	16.7±0.4	17.5±0.6	17.7±0.2	17.5±0.2
CL-43	18.6±0.2	19.7±0.3	19.7±0.3	19.3±0.2
CL-44	19.8±0.4	19.3±0.3	19.8±0.3	19.9±0.2
CL-45	17.8±0.2	20.2±0.3	19.8±0.2	20.4±0.2
CL-46	18.2±0.3	18.1±0.3	18.1±0.2	17.2±0.2
CL-47	19.9±0.4	18.1±0.4	20.0±0.2	19.4±0.2
CL-48	16.0±0.3	18.9±0.2	18.7±0.2	18.8±0.2
CL-49	19.9±0.4	[illegible].2±0.3	19.8±0.2	19.1±0.2
CL-50	18.2±0.3	21.1±0.4	19.6±0.6	21.1±0.2
CL-51	19.3±0.3	20.4±0.3	19.0±0.3	19.8±0.2
CL-52	19.7±0.3	19.6±0.3	19.2±0.2	19.4±0.2
CL-53	15.5±0.4	18.2±0.2	17.2±0.3	17.8±0.2
CL-54	17.6±0.3	18.2±0.3	19.1±0.2	19.1±0.2
CL-55	16.1±0.6	19.9±0.3	19.8±0.3	19.7±0.2
CL-56	17.8±0.3	21.3±0.4	20.1±0.3	20.0±0.2

TABLE E-3 (Cont'd)

Location	mR/91 Days (Net Exposure) 1st Qtr	2nd Qtr	3rd Qtr	4th Qtr
CL-57	16.6±0.4	17.5±0.3	19.2±0.3	17.2±0.2
CL-58	16.3±0.4	19.7±0.3	19.7±0.3	18.9±0.2
CL-59	17.8±0.3	19.6±0.2	19.9±0.3	19.5±0.2
CL-60	18.1±0.2	20.0±0.3	19.4±0.2	19.2±0.2
CL-61	19.1±0.4	19.6±0.3	19.4±0.2	19.9±0.2
CL-62	19.1±0.3	19.5±0.4	19.4±0.2	19.2±0.2
CL-63	19.0±0.3	20.1±0.2	19.9±0.2	20.7±0.2
CL-64	20.3±0.6	20.3±0.4	20.1±0.3	21.6±0.2
CL-65	19.4±0.4	20.4±0.3	20.5±0.4	20.0±0.2
CL-66	15.3±0.3	16.6±0.2	16.2±0.3	16.2±0.2
CL-67	16.6±0.4	19.6±0.4	19.7±0.3	18.0±0.2
CL-68	15.8±0.5	19.3±0.3	18.0±0.2	18.1±0.2
CL-69	17.4±0.2	18.6±0.4	18.1±0.2	17.1±0.2
CL-70	14.0±0.4	18.2±0.2	19.1±0.2	17.5±0.2
CL-71	16.9±0.6	18.7±0.2	19.3±0.2	18.2±0.2
CL-72	14.9±0.4	17.8±0.3	18.7±0.3	ND
CL-73	17.6±0.2	20.2±0.2	20.5±0.4	19.5±0.2
CL-74	16.5±0.2	19.6±0.3	19.2±0.2	18.6±0.2
CL-75	18.3±0.3	20.6±0.3	19.1±0.3	20.8±0.2
CL-76	15.2±0.2	20.0±0.2	19.8±0.2	19.9±0.2
CL-77	14.3±0.3	18.1±0.3	18.7±0.3	ND
CL-78	16.6±0.2	19.1±0.3	18.8±0.2	19.5±0.2
CL-79	18.5±0.2	17.8±0.3	20.3±0.3	20.0±0.2
CL-80	18.5±0.2	17.9±0.3	21.7±0.2	17.3±0.2
CL-81	18.8±0.2	21.4±0.4	20.1±0.4	20.2±0.2
CL-82	16.6±0.3	17.7±0.3	19.8±0.4	16.9±0.2
CL-83	18.3±0.2	21.4±0.3	21.2±0.2	19.4±0.2
CL-84	18.2±0.2	18.1±0.3	19.0±0.2	16.5±0.2
CL-85	18.7±0.2	18.8±0.2	21.7±0.2	17.2±0.2
CL-86	19.2±0.3	17.8±0.5	20.5±0.2	16.2±0.2
CL-87	19.6±0.7	19.2±0.2	20.7±0.3	17.5±0.3
CL-95[a]	17.8±0.4	19.4±0.3	20.5±0.2	19.1±0.2
CL-96[a]	16.3±0.4	17.4±0.3	19.2±0.2	17.1±0.2
CL-97[a]	16.3±0.5	18.3±0.4	20.3±0.3	17.4±0.2
CL-109	16.2±0.5	16.5±0.3	17.6±0.3	16.0±0.2
CL-110	20.0±0.4	17.6±0.3	20.0±0.2	17.2±0.2
CL-111	19.5±0.4	19.6±0.3	21.4±0.2	19.8±0.2
CL-112	18.6±0.3	17.4±0.3	19.5±0.3	16.5±0.2
CL-113	19.8±1.0	18.6±0.3	21.0±0.3	16.8±0.3
Mean ± s.d.	17.7±1.6	18.6±1.4	19.0±1.5	18.3±1.6

ND = No data. TLD lost in field.

[a] control location

TABLE E-4

SURFACE WATER GROSS BETA AND GAMMA ISOTOPIC ACTIVITY
(pCi/l) - CL-9

Date Collected:	01-27-93	02-24-93	03-31-93	04-28-93	05-26-93	06-30-93
Gross Beta	2.8±0.6	2.4±0.6	1.2±0.5	1.6±0.5	2.0±0.6	1.5±0.5
Be-7	<20.4	<18.5	<13.7	<20.8	<18.7	<9.6
K-40	<50.8	<48.6	<30.3	<48.2	<47.4	<27.5
Mn-54	<2.4	<2.1	<1.4	<2.4	<2.3	<1.2
Fe-59	<5.0	<4.3	<3.3	<5.1	<5.2	<3.8
Co-58	<2.3	<2.0	<1.2	<2.4	<2.3	<2.1
Co-60	<2.6	<2.3	<1.5	<2.4	<2.6	<0.9
Zn-65	<4.9	<4.7	<2.8	<5.2	<5.0	<2.4
Nb-95	<2.5	<2.2	<1.5	<2.5	<2.3	<2.1
Zr-95	<4.2	<3.8	<2.5	<4.2	<3.8	<2.9
Cs-134	<2.3	<2.2	<1.3	<2.3	<2.1	<2.3
Cs-137	<2.4	<2.1	<1.5	<2.3	<2.2	<1.4
Ba-140[a]	<8.5	<8.2	<5.5	<8.5	<7.4	<5.8
La-140[a]	<2.8	<2.6	<1.4	<2.7	<3.6	<2.5
Ce-144	<21.1	<19.6	<13.2	<21.1	<12.4	<8.5
Date Collected:	07-28-93	08-25-93	09-29-93	10-27-93	11-24-93	12-29-93
Gross Beta	2.7±0.4	2.1±0.6	1.9±0.4	4.3±0.8	3.4±0.7	2.7±0.7
Be-7	<10.0	<14.3	<15.2	<18.6	<16.0	<11.6
K-40	<42.6	<42.4	<28.4	<49.1	<49.4	<40.6
Mn-54	<1.9	<1.0	<1.3	<2.0	<1.4	<1.5
Fe-59	<2.4	<3.0	<3.7	<2.9	<3.3	<3.0
Co-58	<1.8	<1.1	<1.5	<3.0	<1.4	<1.5
Co-60	<2.3	<1.8	<1.4	<1.4	<1.6	<1.8
Zn-65	<3.0	<5.6	<2.9	<2.0	<4.2	<5.2
Nb-95	<1.9	<1.1	<1.8	<2.1	<2.1	<1.1
Zr-95	<3.3	<2.2	<2.7	<2.2	<4.9	<1.7
Cs-134	<2.1	<2.8	<1.4	<1.7	<2.0	<1.9
Cs-137	<1.9	<1.9	<1.5	<2.1	<2.1	<2.0
Ba-140[a]	<10.7	<4.6	<5.3	<4.1	<6.4	<5.8
La-140[a]	<1.9	<2.4	<1.4	<1.0	<1.4	<1.4
Ce-144	<16.1	<14.1	<13.6	<12.4	<26.3	<9.7

a LLD at time of counting.

TABLE E-5

SURFACE WATER GROSS BETA AND GAMMA ISOTOPIC ACTIVITY
(pCi/l) - CL-10(control)

Date Collected:	01-27-93	02-24-93	03-31-93	04-28-93	05-26-93	6-30-93
Gross Beta	3.1±0.6	1.4±0.6	2.5±0.6	2.2±0.5	2.0±0.6	2.1±0.6
Be-7	<14.6	<17.0	<14.2	<16.1	<21.0	<8.3
K-40	<27.0	<46.4	<27.8	<30.6	<40.8	<36.3
Mn-54	<1.6	<1.8	<1.7	<1.6	<1.9	<1.5
Fe-59	<4.2	<3.8	<3.8	<4.4	<3.8	<4.0
Co-58	<1.7	<2.0	<1.6	<1.6	<1.9	<1.5
Co-60	<1.9	<2.2	<1.9	<1.8	<2.1	<1.8
Zn-65	<3.3	<4.2	<3.1	<3.3	<2.6	<3.7
Nb-95	<1.7	<2.0	<1.6	<1.7	<1.8	<1.7
Zr-95	<2.5	<3.4	<2.5	<3.0	<3.9	<2.8
Cs-134	<1.4	<2.1	<1.3	<1.4	<2.0	<1.4
Cs-137	<1.7	<1.9	<1.7	<1.7	<1.9	<1.7
Ba-140[a]	<6.2	<7.4	<5.5	<6.0	<7.9	<5.6
La-140[a]	<2.2	<2.5	<1.8	<2.3	<2.7	<1.7
Ce-144	<12.0	<14.0	<11.7	<12.0	<19.7	<11.5

Date Collected:	07-28-93	08-25-93	09-29-93	10-27-93	11-24-93	12-29-93
Gross Beta	2.8±0.3	2.2±0.4	1.8±0.6	2.9±0.7	2.6±0.7	6.1±0.9
Be-7	<18.9	<14.1	<14.6	<10.6	<16.4	<20.3
K-40	<40.2	<34.0	<33.4	<25.9	<51.7	<32.9
Mn-54	<1.8	<1.5	<1.5	<1.8	<1.7	<2.0
Fe-59	<4.8	<3.4	<3.9	<2.1	<3.5	<4.1
Co-58	<1.6	<1.5	<1.5	<2.4	<2.0	<2.1
Co-60	<1.8	<1.5	<1.6	<2.0	<1.5	<1.8
Zn-65	<2.8	<3.0	<3.1	<3.1	<4.6	<3.0
Nb-95	<2.2	<1.5	<1.8	<1.8	<2.3	<2.0
Zr-95	<3.8	<2.7	<2.8	<3.0	<5.4	<1.8
Cs-134	<1.6	<1.4	<1.3	<0.9	<1.7	<1.6
Cs-137	<1.3	<1.6	<1.5	<2.0	<1.8	<1.9
Ba-140[a]	<6.9	<5.2	<5.3	<4.9	<4.9	<5.3
La-140[a]	<2.2	<1.8	<1.8	<1.4	<1.5	<2.4
Ce-144	<22.9	<10.7	<11.0	<12.9	<25.8	<12.1

a LLD at time of counting.

TABLE E-6

SURFACE WATER GROSS BETA AND GAMMA ISOTOPIC ACTIVITY
(pCi/l) - CL-13

Data Collected:	01-27-93	02-24-93	03-31-93	04-28-93	05-26-93	06-30-93
Gross Beta	2.4±0.6	2.4±0.6	1.9±0.5	1.9±0.6	1.5±0.4	1.7±0.5
Be-7	<19.2	<14.6	<30.2	<19.1	<17.8	<9.0
K-40	<49.6	<24.4	<42.7	<47.5	<47.7	<45.4
Mn-54	<2.1	<1.7	<3.7	<2.2	<2.0	<2.9
Fe-59	<4.5	<3.9	<6.9	<5.3	<4.1	<7.0
Co-58	<2.2	<1.8	<3.6	<2.4	<2.1	<2.4
Co-60	<2.3	<1.6	<3.9	<2.9	<2.4	<4.2
Zn-65	<4.7	<3.1	<8.0	<5.3	<4.6	<4.1
Nb-95	<2.2	<1.4	<3.6	<2.4	<2.3	<1.3
Zr-95	<4.2	<2.4	<6.3	<3.8	<3.8	<5.4
Cs-134	<2.2	<1.4	<3.7	<2.1	<2.2	<2.7
Cs-137	<2.3	<1.6	<3.3	<2.2	<2.0	<3.2
Ba-140[a]	<7.9	<5.6	<13.0	<7.7	<7.8	<10.0
La-140[a]	<2.7	<2.1	<4.6	<3.6	<2.7	<3.4
Ce-144	<20.2	<11.7	<25.7	<12.8	<12.8	<33.1

Date Collected:	07-28-93	08-25-93	09-29-93	10-27-93	11-24-93	12-29-93
Gross Beta	3.7±0.4	2.0±0.3	2.4±0.4	4.4±0.7	3.2±0.7	4.8±0.8
Be-7	<21.9	<13.5	<11.4	<15.1	<16.4	<18.6
K-40	<43.6	<31.7	<43.8	<33.9	<25.6	<28.7
Mn-54	<2.2	<1.3	<1.6	<1.4	<1.3	<1.6
Fe-59	<3.5	<3.2	<3.9	<3.5	<3.2	<3.6
Co-58	<0.9	<1.3	<1.1	<1.4	<1.5	<1.4
Co-60	<1.8	<1.5	<1.7	<1.4	<2.1	<1.9
Zn-65	<1.7	<2.8	<3.1	<3.1	<1.7	<5.3
Nb-95	<1.0	<1.4	<1.8	<1.6	<1.9	<2.3
Zr-95	<3.8	<2.5	<2.6	<2.7	<1.9	<3.4
Cs-134	<1.0	<1.3	<1.1	<1.4	<1.6	<2.2
Cs-137	<1.9	<1.6	<1.5	<1.4	<1.9	<2.1
Ba-140[a]	<9.4	<5.6	<6.1	<5.7	<6.0	<3.9
La-140[a]	<0.8	<1.4	<1.7	<1.4	<1.3	<0.9
Ce-144	<10.7	<13.3	<11.7	<14.1	<11.4	<18.3

a LLD at time of counting

TABLE E-7

SURFACE WATER GROSS BETA, GROSS ALPHA, I-131
AND GAMMA ISOTOPIC ACTIVITY (pCi/l) - CL-90

Date Collected:	01-27-93	02-24-93	03-31-93	04-28-93	05-26-93	06-30-93
Gross Alpha	0.6±0.4	<0.3	<0.7	<1.1	<0.5	<0.6
Gross Beta	1.9±0.3	2.3±0.3	2.2±0.4	1.8±0.6	2.5±0.4	1.6±0.3
I-131	<0.4	<0.4	<0.5	<0.3	<0.3	<0.4
Be-7	<14.1	<19.1	<14.9	<19.4	<16.8	<35.1
K-40	<32.3	<50.2	<41.7	<47.2	<46.5	<48.1
Mn-54	<1.6	<2.2	<1.7	<2.2	<2.1	<1.7
Fe-59	<1.5	<4.3	<3.4	<4.5	<4.2	<7.8
Co-58	<3.1	<2.1	<1.7	<2.2	<2.2	<3.5
Co-60	<1.6	<2.4	<1.9	<2.5	<2.8	<3.3
Zn-65	<2.5	<4.9	<3.8	<4.9	<4.7	<6.0
Nb-95	<1.5	<2.1	<1.8	<2.2	<2.1	<2.9
Zr-95	<1.7	<3.7	<3.1	<4.0	<3.7	<5.7
Cs-134	<5.5	<2.2	<1.7	<2.2	<2.1	<2.4
Cs-137	<2.1	<2.2	<1.8	<2.3	<2.0	<4.1
Ba-140[a]	<11.2	<8.3	<6.5	<8.4	<7.4	<13.8
La-140[a]	<2.3	<2.9	<2.0	<2.8	<3.1	<2.8
Ce-144	<18.5	<19.7	<15.7	<20.2	<12.0	<12.2

Date Collected:	07-28-93	08-25-93	09-29-93	10-27-93	11-24-93	12-29-93
Gross Alpha	1.5±0.8	0.5±0.3	0.5±0.3	<0.6	1.0±0.5	<0.7
Gross Beta	3.1±0.6	2.4±0.4	2.4±0.4	2.8±0.4	4.1±0.4	2.4±0.4
I-131	<0.3	<0.3	<0.4	<0.3	<0.2	<0.3
Be-7	<17.7	<18.9	<20.4	<14.1	<11.5	<11.9
K-40	<42.0	<45.7	<51.9	<43.9	<50.6	<24.8
Mn-54	<1.6	<1.0	<2.1	<1.8	<1.6	<1.4
Fe-59	<3.2	<4.1	<5.2	<3.4	<2.7	<2.8
Co-58	<1.0	<2.6	<2.2	<2.2	<1.9	<0.8
Co-60	<2.0	<1.9	<2.6	<2.2	<1.9	<1.8
Zn-65	<2.4	<2.6	<5.0	<3.3	<4.6	<2.2
Nb-95	<2.3	<0.9	<2.5	<1.0	<2.2	<1.5
Zr-95	<2.6	<3.0	<3.9	<2.7	<4.8	<2.0
Cs-134	<2.1	<2.6	<1.9	<2.0	<1.6	<1.8
Cs-137	<1.9	<1.3	<2.0	<1.5	<1.8	<1.8
Ba-140[a]	<7.9	<9.4	<7.7	<4.0	<3.8	<5.4
La-140[a]	<1.6	<2.4	<2.2	<1.0	<1.6	<0.8
Ce-144	<20.2	<29.0	<14.4	<13.5	<25.9	<11.8

a LLD at time of counting.

TABLE E-8

SURFACE WATER GROSS BETA, GROSS ALPHA, AND GAMMA ISOTOPIC ACTIVITY (pCi/l) - CL-91

Date Collected:	01-27-93	02-24-93	03-31-93	04-28-93	05-26-93	06-30-93
Gross Alpha	<0.5	0.9±0.4	<0.7	<0.7	<0.3	0.6±0.4
Gross Beta	1.6±0.2	1.7±0.3	1.7±0.4	2.2±0.4	1.5±0.4	1.5±0.4
Be-7	<15.6	<17.9	<13.6	<15.6	<9.4	<15.2
K-40	<30.8	<45.5	<32.8	<29.1	<39.9	<32.6
Mn-54	<1.4	<1.9	<1.5	<1.7	<1.9	<1.6
Fe-59	<4.3	<4.2	<3.6	<4.6	<3.6	<4.4
Co-58	<1.7	<2.1	<1.5	<1.6	<1.2	<1.7
Co-60	<1.6	<2.2	<1.6	<1.7	<1.6	<1.5
Zn-65	<3.4	<4.4	<3.0	<3.0	<2.8	<3.2
Nb-95	<1.6	<2.0	<1.7	<1.6	<0.9	<1.7
Zr-95	<2.7	<3.5	<2.6	<2.4	<3.5	<2.8
Cs-134	<1.3	<2.0	<1.3	<1.6	<1.2	<1.4
Cs-137	<1.8	<2.0	<1.4	<1.7	<2.4	<1.6
Ba-140[a]	<6.1	<7.6	<5.5	<6.1	<4.6	<5.7
La-140[a]	<1.8	<2.4	<1.6	<1.8	<1.3	<1.5
Ce-144	<11.9	<14.6	<10.4	<11.8	<17.4	<12.6

Date Collected:	07-28-93	08-25-93	09-29-93	10-27-93	11-24-93	12-29-93
Gross Alpha	<0.5	0.7±0.4	0.9±0.5	<0.6	<0.7	<0.7
Gross Beta	2.5±0.4	2.2±0.4	2.1±0.4	2.5±0.4	1.7±0.4	1.6±0.4
Be-7	<19.4	<9.6	<15.0	<15.2	<14.4	<16.0
K-40	<32.8	<38.2	<25.3	<29.8	<50.6	<25.1
Mn-54	<0.8	<0.9	<1.5	<1.6	<1.6	<1.6
Fe-59	<3.8	<4.0	<4.4	<3.8	<2.8	<3.7
Co-58	<2.2	<2.7	<1.7	<1.6	<2.3	<1.3
Co-60	<1.8	<2.1	<1.9	<1.8	<1.4	<2.0
Zn-65	<2.9	<3.4	<3.1	<3.4	<1.4	<3.2
Nb-95	<1.5	<1.7	<1.7	<1.9	<1.9	<1.0
Zr-95	<3.9	<2.5	<2.9	<3.2	<4.3	<2.2
Cs-134	<1.7	<2.7	<1.5	<1.4	<0.8	<1.6
Cs-137	<1.6	<1.9	<1.5	<1.5	<2.1	<2.0
Ba-140[a]	<10.5	<8.7	<5.8	<5.6	<5.1	<4.9
La-140[a]	<1.3	<1.7	<1.9	<1.7	<1.7	<1.6
Ce-144	<12.6	<19.7	<11.5	<11.5	<25.9	<13.2

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a LLD at time of counting.

TABLE E-9

SURFACE WATER GROSS BETA, TRITIUM AND GAMMA ISOTOPIC ACTIVITY
(pCi/l) - CL-92

Date Collected:	01-27-93	02-24-93	03-31-93	04-28-93	05-26-93	06-30-93
Gross Beta	2.8±0.6	2.4±0.6	2.4±0.5	2.1±0.5	2.5±0.6	1.8±0.6
H-3	<168	<169	<179	<174	<196	<200
Be-7	<20.1	<14.5	<17.5	<17.4	<16.8	<29.6
K-40	<49.9	<30.8	<44.4	<50.1	<49.4	<41.5
Mn-54	<2.2	<1.3	<2.2	<1.9	<2.0	<2.4
Fe-59	<4.5	<3.2	<4.7	<4.2	<4.1	<5.8
Co-58	<2.2	<1.4	<2.3	<2.1	<2.0	<3.2
Co-60	<2.2	<1.4	<2.7	<2.2	<2.2	<2.0
Zn-65	<4.8	<2.7	<5.2	<4.5	<4.3	<1.7
Nb-95	<2.4	<1.5	<2.1	<3.1	<3.0	<3.0
Zr-95	<4.2	<2.5	<3.8	<3.6	<3.3	<3.5
Cs-134	<2.2	<1.4	<2.0	<2.0	<2.0	<2.7
Cs-137	<2.2	<1.5	<2.1	<2.0	<1.9	<2.7
Ba-140[a]	<8.2	<5.7	<7.4	<7.6	<7.1	<12.9
La-140[a]	<2.7	<1.4	<3.2	<2.4	<2.5	<1.8
Ce-144	<20.1	<13.6	<12.3	<14.3	<14.0	<30.5

Date Collected:	07-28-93	08-25-93	09-29-93	10-27-93	11-24-93	12-29-93
Gross Beta	1.7±0.3	1.9±0.4	2.0±0.6	3.6±0.5	3.7±0.7	2.0±0.6
H-3	<195	<194	<181	<182	<187	<193
Be-7	<13.0	<13.0	<10.0	<19.3	<14.6	<22.6
K-40	<41.0	<25.5	<31.0	<38.8	<35.2	<41.7
Mn-54	<2.1	<1.6	<1.6	<2.0	<1.5	<1.2
Fe-59	<4.5	<4.0	<3.6	<4.9	<1.8	<3.7
Co-58	<2.6	<1.5	<2.1	<2.4	<2.6	<1.8
Co-60	<1.9	<2.0	<1.7	<2.2	<1.5	<2.2
Zn-65	<1.8	<3.1	<3.8	<2.7	<1.6	<5.6
Nb-95	<2.4	<1.4	<1.0	<1.8	<2.3	<1.9
Zr-95	<3.1	<2.4	<2.0	<2.6	<4.0	<3.5
Cs-134	<1.7	<1.3	<1.5	<2.3	<2.0	<2.4
Cs-137	<1.0	<1.7	<2.0	<1.4	<2.2	<2.3
Ba-140[a]	<8.8	<5.8	<4.0	<6.7	<6.9	<8.1
La-140[a]	<2.3	<2.0	<2.3	<2.0	<1.4	<1.4
Ce-144	<13.8	<11.6	<10.2	<12.4	<11.8	<12.7

a LLD at time of counting.

TABLE E-10

SURFACE WATER GROSS BETA, TRITIUM AND GAMMA ISOTOPIC ACTIVITY
(pCi/l) - CL-93

Date Collected:	01-27-93	02-24-93	03-31-93	04-28-93	05-26-93	06-30-93
Gross Beta	1.9±1.0	1.9±1.0	4.3±1.0	2.0±1.1	1.7±1.0	1.9±0.9
H-3	<168	<169	<179	<174	<196	<195
Be-7	<14.6	<12.7	<19.2	<21.1	<19.4	<19.0
K-40	<29.9	<26.2	<46.1	<47.3	<49.2	<28.6
Mn-54	<1.3	<1.2	<2.2	<2.4	<2.3	<2.1
Fe-59	<3.5	<3.2	<4.7	<5.0	<5.3	<2.4
Co-58	<1.3	<1.2	<2.2	<2.4	<2.6	<1.7
Co-60	<1.3	<1.3	<2.6	<2.4	<2.9	<1.0
Zn-65	<2.9	<2.7	<4.6	<5.0	<6.2	<2.9
Nb-95	<1.6	<1.4	<2.3	<2.6	<2.3	<2.3
Zr-95	<2.6	<2.3	<4.0	<4.2	<3.9	<1.6
Cs-134	<1.3	<1.2	<2.2	<2.3	<2.3	<1.6
Cs-137	<1.5	<1.4	<2.3	<2.4	<2.3	<1.8
Ba-140[a]	<5.6	<5.2	<7.9	<8.7	<8.2	<8.0
La-140[a]	<1.3	<1.3	<2.5	<2.9	<3.3	<2.1
Ce-144	<13.7	<12.7	<19.7	<21.0	<13.5	<8.6

Date Collected:	07-28-93	08-25-93	09-29-93	10-27-93	11-24-93	12-29-93
Gross Beta	1.8±0.7	1.4±0.6	1.5±0.6	2.8±0.7	4.7±1.0	4.3±1.2
H-3	<195	<189	<181	<182	<187	<193
Be-7	<18.2	<13.7	<19.5	<22.9	<18.4	<19.9
K-40	<40.9	<33.5	<43.1	<40.6	<13.2	<41.1
Mn-54	<2.1	<1.4	<1.5	<1.8	<1.4	<1.7
Fe-59	<1.7	<3.1	<4.4	<2.6	<1.4	<3.1
Co-58	<1.5	<1.3	<2.4	<2.6	<1.0	<1.5
Co-60	<2.2	<1.5	<1.7	<1.7	<1.7	<0.8
Zn-65	<4.1	<2.9	<2.4	<3.8	<1.8	<3.8
Nb-95	<1.9	<1.4	<1.2	<1.7	<2.2	<2.1
Zr-95	<1.7	<2.4	<3.5	<3.5	<5.2	<1.7
Cs-134	<2.0	<1.3	<1.1	<2.0	<1.5	<2.2
Cs-137	<2.7	<1.5	<1.8	<2.3	<1.9	<2.1
Ba-140[a]	<9.6	<5.6	<7.0	<6.6	<6.2	<4.3
La-140[a]	<1.6	<1.4	<1.2	<2.6	<0.8	<1.7
Ce-144	<20.4	<13.4	<11.7	<12.4	<25.6	<11.5

a LLD at time of counting.

TABLE E-11

SURFACE WATER QUARTERLY TRITIUM COMPOSITE (pCi/l)

1993	CL-9	CL-10[a]	CL-13	CL-90	CL-91
1st Qtr	<172	<172	<172	<172	<172
2nd Qtr	<200	<178	<178	<178	<195
3rd Qtr	<186	<176	<186	<186	<176
4th Qtr	<187	<187	<187	<187	<187

a control location

TABLE E-12

WELL WATER QUARTERLY TRITIUM COMPOSITE (pCi/l)

1993	CL-7D	CL-12 Untreated	CL-12 Treated
1st Qtr	<173	<188	<173
2nd Qtr	<195	<178	<178
3rd Qtr	<176	<183	<183
4th Qtr	<187	<187	<187

TABLE E-13

WELL WATER SEMIMONTHLY IODINE ACTIVITY (pCi/l)

Date	CL-7D	CL-12 Untreated	CL-12 Treated
01/13/93	<0.1	<0.1	<0.2
01/27/93	<0.2	<0.2	<0.1
02/10/93	<0.2	<0.2	<0.2
02/24/93	<0.2	<0.5	<0.4
03/10/93	<0.2	<0.2	<0.2
03/24/93	<0.4	<0.2	<0.2
04/07/93	<0.5	<0.5	<0.5
04/21/93	<0.3	<0.4	<0.5
05/05/93	<0.3	<0.4	<0.5
05/19/93	<0.4	<0.3	<0.4
06/02/93	<0.3	<0.3	<0.4
06/16/93	<0.3	<0.5	<0.3
06/30/93	<0.4	<0.3	<0.3
07/14/93	<0.3	<0.5	<0.4
07/28/93	<0.3	<0.3	<0.3
08/11/93	<0.2	<0.2	<0.2
08/25/93	<0.2	<0.3	<0.3
09/08/93	<0.5	<0.4	<0.5
09/22/93	<0.4	<0.4	<0.3
10/06/93	<0.5	<0.5	<0.4
10/20/93	<0.4	<0.4	<0.3
11/04/93	<0.4	<0.2	<0.3
11/17/93	<0.3	<0.3	<0.2
12/01/93	<0.4	<0.3	<0.4
12/15/93	<0.2	<0.3	<0.3
12/29/93	<0.4	<0.4	<0.4

TABLE E-14

WELL WATER MONTHLY COMPOSITE ACTIVITY

CL-7D (pCi/l)

Collection Period:	January	February	March	April	May	June
Gross Alpha	<1.5	<0.8	<0.7	<1.4	<0.8	<0.7
Gross Beta	0.9±0.5	1.4±0.4	1.0±0.5	1.5±0.6	0.9±0.4	1.7±0.5
Be-7	<15.5	<14.9	<17.4	<16.8	<15.6	<18.5
K-40	<32.2	<29.5	<48.9	<34.8	<28.4	<40.3
Mn-54	<1.4	<1.5	<2.0	<1.6	<1.8	<1.7
Fe-59	<4.1	<4.7	<4.2	<3.7	<5.0	<2.2
Co-58	<1.5	<1.6	<2.0	<1.7	<1.9	<1.9
Co-60	<1.7	<1.8	<2.1	<1.8	<1.8	<2.3
Zn-65	<3.2	<3.1	<4.6	<3.2	<3.5	<4.3
Nb-95	<1.9	<1.7	<3.0	<2.0	<2.1	<2.4
Zr-95	<2.9	<2.6	<3.3	<3.1	<3.2	<3.1
Cs-134	<1.3	<1.5	<2.2	<1.4	<1.5	<1.1
Cs-137	<1.5	<1.6	<2.0	<1.5	<1.7	<2.2
Ba-140[a]	<5.5	<5.9	<7.6	<8.8	<5.8	<4.3
La-140[a]	<1.5	<1.5	<2.6	<1.9	<1.8	<0.8
Ce-144	<11.0	<11.3	<14.3	<11.5	<12.2	<10.5
Collection Period:	**July**	**August**	**September**	**October**	**November**	**December**
Gross Alpha	<0.6	<0.7	<0.8	<0.6	<0.4	<0.7
Gross Beta	1.4±0.4	1.5±0.5	0.8±0.5	1.6±0.6	1.3±0.4	1.3±0.5
Be-7	<15.5	<13.4	<15.3	<15.6	<22.8	<13.1
K-40	<30.4	<44.9	<29.8	<27.6	<49.8	<28.1
Mn-54	<1.6	<0.9	<1.6	<1.6	<1.7	<1.8
Fe-59	<4.6	<3.7	<4.6	<4.7	<3.8	<3.4
Co-58	<1.8	<3.1	<1.8	<2.5	<2.3	<2.4
Co-60	<0.8	<1.9	<2.1	<1.3	<1.7	<1.8
Zn-65	<2.4	<4.0	<3.5	<5.4	<2.1	<5.6
Nb-95	<2.4	<2.0	<1.8	<2.4	<2.9	<2.2
Zr-95	<2.5	<3.0	<2.9	<5.8	<5.6	<2.9
Cs-134	<1.7	<2.2	<1.4	<1.5	<1.6	<2.1
Cs-137	<1.8	<1.6	<1.9	<2.0	<1.8	<2.0
Ba-140[a]	<9.6	<5.7	<5.7	<6.5	<5.5	<5.0
La-140[a]	<1.0	<2.4	<1.8	<1.4	<1.1	<1.3
Ce-144	<14.2	<33.5	<12.5	<26.7	<28.0	<27.6

a LLD at time of counting.

TABLE E-15

WELL WATER MONTHLY COMPOSITE ACTIVITY
CL-12 UNTREATED (pCi/l)

Collection Period:	January	February	March	April	May	June
Gross Alpha	<1.8	<1.8	<1.6	<1.5	<1.7	<1.9
Gross Beta	1.9±0.9	1.2±0.6	2.0±0.9	1.8±0.9	2.5±0.9	1.4±0.9
Be-7	<14.5	<12.3	<20.0	<15.5	<19.6	<15.2
K-40	<42.3	<30.6	<46.1	<27.4	<42.2	<19.4
Mn-54	<1.4	<1.6	<2.4	<1.7	<1.9	<1.7
Fe-59	<3.5	<3.9	<4.8	<4.8	<5.5	<4.0
Co-58	<1.6	<1.6	<2.3	<1.8	<2.7	<1.7
Co-60	<1.5	<1.8	<2.6	<1.6	<2.0	<1.6
Zn-65	<3.1	<3.2	<4.9	<3.0	<4.1	<3.8
Nb-95	<1.8	<1.8	<2.5	<1.6	<1.9	<1.8
Zr-95	<2.7	<2.9	<4.1	<2.7	<3.8	<2.9
Cs-134	<1.4	<1.4	<2.2	<1.3	<1.8	<1.3
Cs-137	<1.4	1.7	<2.3	<1.6	<2.1	<1.5
Ba-140[a]	<5.3	<6.2	<8.6	<5.7	<4.6	<5.5
La-140[a]	<1.7	<1.9	<2.9	<1.9	<1.9	<2.2
Ce-144	<13.1	<11.9	<20.6	<11.3	<17.8	<12.0

Collection Period:	July	August	September	October	November	December
Gross Alpha	<2.1	<1.9	<1.6	<1.5	<1.8	<2.1
Gross Beta	3.4±1.0	2.6±0.9	1.2±0.9	1.6±0.9	2.2±0.9	2.7±0.9
Be-7	<20.3	<19.5	<20.2	<18.0	<14.8	<22.5
K-40	<41.7	<28.5	<40.5	<25.5	<47.5	<43.3
Mn-54	<1.7	<3.0	<1.7	<1.3	<1.4	<2.1
Fe-59	<5.0	<4.0	<2.3	<4.6	<4.1	<4.3
Co-58	<1.0	<1.8	<2.6	<1.7	<2.5	<2.4
Co-60	<1.9	<1.0	<1.4	<1.4	<1.7	<2.1
Zn-65	<4.5	<4.0	<4.5	<3.1	<2.6	<1.9
Nb-95	<1.1	<1.4	<2.2	<2.2	<2.0	<1.0
Zr-95	<1.8	<1.9	<3.2	<2.6	<6.2	<3.7
Cs-134	<1.0	<1.6	<3.0	<1.4	<1.6	<2.1
Cs-137	<1.9	<1.5	<2.3	<1.5	<2.0	<1.9
Ba-140[a]	<7.6	<8.2	<7.3	<5.6	<5.3	<7.0
La-140[a]	<1.2	<2.3	<2.0	<1.5	<1.1	<1.4
Ce-144	<22.1	<9.0	<20.6	<15.8	<28.4	<34.4

a LLD at time of counting.

TABLE E-16

WELL WATER MONTHLY COMPOSITE ACTIVITY
CL-12 TREATED (pCi/l)

Collection Period:	January	February	March	April	May	June
Gross Alpha	<1.4	<1.4	<1.7	<1.6	<1.7	<1.8
Gross Beta	2.7±0.9	2.9±0.9	1.6±0.8	1.9±0.9	2.6±0.9	2.8±0.9
Be-7	<16.0	<14.6	<16.7	<14.8	<16.0	<14.9
K-40	<30.3	<28.4	<33.5	<28.9	<37.5	<39.9
Mn-54	<1.7	<1.4	<2.1	<1.4	<1.6	<2.1
Fe-59	<4.5	<3.6	<5.0	<3.7	<4.2	<3.3
Co-58	<1.7	<1.3	<2.1	<1.4	<1.7	<2.2
Co-60	<2.0	<1.4	<2.1	<1.5	<1.6	<1.5
Zn-65	<3.5	<2.8	<3.6	<2.9	<3.5	<4.5
Nb-95	<1.8	<1.6	<1.7	<1.7	<2.0	<2.2
Zr-95	<2.7	<2.7	<3.5	<2.7	<3.0	<4.8
Cs-134	<1.4	<1.3	<1.7	<1.3	<1.4	<1.6
Cs-137	<1.8	<1.6	<2.0	<1.4	<1.6	<2.4
Ba-140[a]	<5.6	<5.6	<6.9	<5.4	<5.9	<4.9
La-140[a]	<1.6	<1.3	<2.1	<1.5	<1.8	<0.9
Ce-144	<11.9	<13.5	<13.5	<13.2	<11.5	<10.8

Collection Period:	July	August	September	October	November	December
Gross Alpha	<1.9	<1.7	<1.6	<2.2	<1.8	<1.6
Gross Beta	2.5±0.9	2.9±0.9	3.7±1.0	2.1±0.9	2.7±0.9	1.7±0.9
Be-7	<19.8	<12.7	<11.8	<17.8	<14.1	<15.8
K-40	<42.6	<40.7	<32.1	<29.4	<48.9	<28.2
Mn-54	<1.6	<1.1	<1.0	<1.4	<1.5	<1.5
Fe-59	<4.5	<4.3	<3.7	<4.3	<2.3	<3.3
Co-58	<2.1	<1.0	<1.8	<1.6	<2.1	<0.9
Co-60	<2.3	<1.4	<2.3	<1.5	<1.6	<2.1
Zn-65	<3.3	<6.6	<4.1	<3.2	<4.4	<1.7
Nb-95	<1.2	<2.2	<1.1	<2.1	<2.0	<1.6
Zr-95	<2.1	<4.3	<3.2	<2.9	<4.5	<3.2
Cs-134	<1.0	<1.9	<3.2	<1.4	<2.0	<1.2
Cs-137	<1.7	<1.9	<1.7	<1.5	<2.1	<1.8
Ba-140[a]	<6.1	<5.0	<3.8	<5.9	<5.8	<3.9
La-140[a]	<0.6	<1.7	<1.0	<1.4	<1.6	<1.3
Ce-144	<15.0	<12.5	<8.7	<14.5	<26.2	<13.0

a LLD at time of counting.

TABLE E-17

DRINKING WATER ACTIVITY - CL-14 (pCi/l)

Date Collected:	01-27-93	02-24-93	03-31-93	04-28-93	05-26-93	06-30-93
Gross Alpha	<0.2	<0.3	<0.4	<0.2	<0.4	<0.2
Gross Beta	2.4±0.2	1.8±0.2	1.6±0.2	1.1±0.1	1.5±0.2	1.4±0.2
Be-7	<19.5	<14.5	<17.3	<14.1	<17.6	<14.3
K-40	<48.8	<35.7	<49.8	<35.0	<25.0	<26.8
Mn-54	<2.2	<1.4	<1.9	<1.5	<2.2	<1.3
Fe-59	<4.8	<3.7	<4.4	<3.8	<4.9	<3.2
Co-58	<2.2	<1.6	<2.0	<1.4	<2.2	<1.4
Co-60	<2.2	<1.7	<2.1	<1.6	<2.8	<1.4
Zn-65	<4.9	<3.0	<4.6	<3.1	<5.1	<2.9
Nb-95	<2.3	<1.6	<3.0	<1.6	<2.2	<1.5
Zr-95	<4.0	<2.8	<3.4	<2.9	<3.9	<2.4
Cs-134	<2.1	<1.4	<2.0	<1.3	<2.2	<1.4
Cs-137	<2.1	<1.6	<2.0	<1.7	<2.2	<1.4
Ba-140[a]	<7.9	<5.6	<7.6	<5.4	<7.4	<5.5
La-140[a]	<2.6	<1.6	<2.7	<1.9	<3.2	<1.3
Ce-144	<19.8	<11.4	<14.4	<10.9	<12.3	<13.6
Date Collected:	07-28-93	08-25-93	09-29-93	10-27-93	11-24-93	12-29-93
Gross Alpha	<0.3	<0.2	<0.3	<0.4	<0.4	<0.4
Gross Beta	2.1±0.2	1.9±0.2	2.0±0.2	2.7±0.2	3.4±0.2	2.4±0.2
Be-7	<24.2	<14.2	<14.6	<17.6	<18.8	<12.8
K-40	<39.4	<30.2	<28.5	<30.1	<50.2	<25.9
Mn-54	<1.8	<1.8	<1.3	<1.5	<1.4	<1.7
Fe-59	<4.0	<3.8	<3.7	<4.2	<3.2	<1.6
Co-58	<1.2	<1.5	<1.4	<1.6	<1.1	<1.3
Co-60	<2.2	<2.0	<1.5	<1.5	<1.7	<2.1
Zn-65	<3.3	<3.2	<2.9	<3.0	<2.5	<1.6
Nb-95	<2.6	<1.5	<1.5	<2.0	<2.6	<1.5
Zr-95	<3.6	<2.5	<2.5	<3.0	<5.4	<1.5
Cs-134	<1.9	<1.3	<1.3	<1.4	<1.5	<1.1
Cs-137	<2.6	<1.6	<1.5	<1.6	<1.6	<1.9
Ba-140[a]	<8.8	<5.7	<5.7	<5.8	<4.7	<3.4
La-140[a]	<0.9	<1.8	<1.4	<1.4	<1.2	<0.8
Ce-144	<11.0	<11.5	<13.5	<14.5	<27.6	<12.5

a LLD at time of counting.

TABLE E-18

DRINKING WATER QUARTERLY TRITIUM COMPOSITE (pCi/l)

1993	CL-14
1st Qtr	<172
2nd Qtr	<178
3rd Qtr	<186
4th Qtr	<187

TABLE E-19

MILK ACTIVITY - CL-98 (pCi/l)

Date Collected:	01-27-93	02-24-93	03-31-93	04-28-93	05-12-93
Sr-90	1.6±0.5	2.3±0.7	1.2±0.4	1.8±0.5	1.6±0.5
I-131	<0.2	<0.3	<0.3	<0.3	<0.5
Be-7	<16.1	<14.8	<14.9	<14.4	<9.3
K-40	1740±70	1640±50	1700±60	1830±50	1850±40
Mn-54	<2.0	<1.5	<1.8	<1.6	<1.0
Fe-59	<5.8	<4.4	<4.6	<4.4	<2.9
Co-58	<2.0	<1.4	<1.8	<1.5	<1.0
Co-60	<2.3	<1.8	<2.1	<1.8	<1.1
Zn-65	<5.2	<3.8	<5.0	<4.0	<2.6
Nb-95	<2.0	<1.6	<2.8	<1.6	<1.0
Zr-95	<3.2	<2.7	<3.2	<2.9	<1.8
Cs-134	<1.6	<1.4	<1.8	<1.5	<0.9
Cs-137	<2.0	<1.7	<1.8	<1.6	<1.1
Ba-140[a]	<6.6	<5.8	<6.4	<6.2	<3.9
La-140[a]	<1.9	<1.3	<1.9	<1.4	<0.9
Ce-144	<13.1	<14.2	<12.1	<14.2	<9.1

Date Collected:	05-26-93	06-10-93	06-23-93	07-07-93	07-21-93
Sr-90	1.9±0.6	2.1±0.5	1.5±0.5	1.6±0.5	1.7±0.5
I-131	<0.3	<0.4	<0.3	<0.2	<0.4
Be-7	<18.7	<15.4	<16.7	<15.5	<15.0
K-40	1690±70	1820±50	1900±60	1840±50	1920±50
Mn-54	<2.4	<1.6	<1.7	<1.7	<1.6
Fe-59	<5.8	<4.5	<4.8	<4.6	<4.4
Co-58	<2.5	<1.7	<1.7	<1.7	<1.6
Co-60	<2.7	<1.9	<1.8	<1.7	<1.7
Zn-65	<6.5	<3.9	<4.4	<4.1	<4.1
Nb-95	<3.2	<1.7	<1.9	<1.7	<1.7
Zr-95	<4.0	<2.7	<2.8	<2.8	<2.8
Cs-134	<2.3	<1.4	<1.6	<1.5	<1.5
Cs-137	<2.3	<1.7	<1.8	<1.7	<1.7
Ba-140[a]	<8.8	<6.1	<6.2	<6.6	<6.2
La-140[a]	<2.4	<1.3	<1.4	<1.3	<1.3
Ce-144	<15.6	<14.4	<14.9	<14.4	<14.2

a LLD at time of counting

TABLE E-19 (Cont'd)

MILK ACTIVITY - CL-98 (pCi/l)

Date Collected:	08-04-93	08-18-93	09-01-93	09-15-93	09-29-93
Sr-90	1.2±0.3	1.2±0.4	2.5±0.6	1.7±0.5	2.1±0.5
I-131	<0.2	<0.3	<0.4	<0.3	<0.4
Be-7	<14.5	<16.9	<14.5	<12.7	<17.5
K-40	1910±60	1740±70	1850±50	1780±70	1750±70
Mn-54	<1.6	<2.2	<1.6	<2.5	<2.1
Fe-59	<4.5	<6.5	<4.4	<6.2	<6.2
Co-58	<1.6	<2.2	<1.5	<1.3	<2.2
Co-60	<1.8	<2.5	<1.8	<2.4	<2.2
Zn-65	<4.1	<5.4	<4.1	<6.0	<5.5
Nb-95	<1.6	<1.8	<1.6	<2.2	<1.9
Zr-95	<2.9	<3.3	<2.8	<4.4	<3.4
Cs-134	<1.5	<1.8	<1.5	<3.3	<1.6
Cs-137	<1.6	<2.2	<1.7	<2.5	<2.1
Ba-140[a]	<6.2	<7.2	<6.0	<8.1	<6.9
La-140[a]	<1.3	<1.9	<1.2	<1.9	<1.7
Ce-144	<14.4	<14.4	<14.4	<13.4	<13.7

Date Collected:	10-13-93	10-27-93	11-24-93	12-29-93
Sr-90	2.4±0.6	1.9±0.4	2.6±0.5	ND b
I-131	<0.4	<0.4	<0.4	
Be-7	<15.4	<14.5	<18.8	
K-40	1720±50	1620±50	1800±90	
Mn-54	<1.6	<1.6	<2.1	
Fe-59	<4.9	<4.3	<5.4	
Co-58	<1.7	<1.6	<1.6	
Co-60	<1.8	<1.7	<3.5	
Zn-65	<4.1	<3.8	<4.4	
Nb-95	<1.8	<1.6	<2.2	
Zr-95	<2.8	<2.8	<2.0	
Cs-134	<1.5	<1.5	<2.1	
Cs-137	<1.8	<1.7	<2.3	
Ba-140[a]	<11.1	<6.4	<6.9	
La-140[a]	<1.4	<1.5	<1.3	
Ce-144	<14.7	<19.8	<9.6	

a LLD at time of counting

b milk not available due to goats not producing.

TABLE E-20

MILK ACTIVITY - CL-116(control)(pCi/l)

Date Collected:	01-27-93	02-24-93	03-31-93	04-28-93	05-12-93
Sr-90	1.5±0.5	1.3±0.4	1.7±0.5	1.7±0.5	3.6±0.7
I-131	<0.3	<0.4	<0.3	<0.3	<0.5
Be-7	<21.3	<14.8	<13.0	<14.7	<16.1
K-40	1340±70	1350±60	1280±50	1340±60	1300±60
Mn-54	<2.4	<2.0	<1.7	<2.0	<1.9
Fe-59	<7.4	<4.9	<4.3	<5.3	<5.1
Co-58	<2.6	<2.2	<1.8	<2.0	<1.9
Co-60	<2.6	<2.2	<1.9	<2.0	<2.2
Zn-65	<5.9	<4.6	<3.8	<4.5	<4.5
Nb-95	<2.6	<1.6	<1.5	<1.8	<1.7
Zr-95	<4.1	<2.7	<2.6	<3.2	<3.0
Cs-134	<2.1	<1.6	<1.4	<1.6	<1.6
Cs-137	<2.4	<1.8	<1.7	<2.0	<2.0
Ba-140[a]	<8.5	<6.4	<5.6	<6.4	<6.7
La-140[a]	<2.2	<1.8	<1.5	<1.8	<1.9
Ce-144	<15.1	<12.7	<10.8	<12.7	<12.7

Date Collected:	05-26-93	06-10-93	06-23-93	07-07-93	07-21-93
Sr-90	2.4±0.6	2.2±0.5	2.1±0.5	1.8±0.6	1.4±0.4
I-131	<0.3	<0.2	<0.3	<0.2	<0.4
Be-7	<14.7	<12.8	<18.8	<15.8	<15.0
K-40	1140±50	1250±60	1280±60	1340±60	1240±60
Mn-54	<1.5	<2.4	<2.2	<2.2	<2.0
Fe-59	<4.0	<5.9	<5.2	<5.3	<5.4
Co-58	<1.5	<1.2	<2.4	<2.1	<1.9
Co-60	<1.8	<3.2	<2.3	<2.3	<2.2
Zn-65	<3.6	<3.6	<6.9	<4.9	<4.5
Nb-95	<1.5	<1.3	<1.3	<1.9	<1.9
Zr-95	<2.4	<4.1	<3.9	<3.2	<3.3
Cs-134	<1.4	<1.1	<2.3	<1.6	<1.5
Cs-137	<1.6	<2.0	<2.8	<1.9	<1.9
Ba-140[a]	<6.0	<4.5	<8.8	<6.8	<6.5
La-140[a]	<1.3	<1.6	<1.9	<1.8	<1.7
Ce-144	<14.0	<16.5	<10.2	<13.8	<13.0

a LLD at time of counting

TABLE E-20 (Cont'd)

Date Collected:	08-04-93	08-18-93	09-01-93	09-15-93	09-29-93
Sr-90	0.9±0.4	1.7±0.5	1.6±0.5	1.5±0.4	0.9±0.6
I-131	<0.2	<0.2	<0.4	<0.2	<0.4
Be-7	<15.2	<15.5	<15.0	<15.7	<16.6
K-40	1350±60	1230±60	1280±60	1200±50	1230±60
Mn-54	<2.0	<2.0	<2.1	<1.6	<1.4
Fe-59	<5.5	<5.3	<5.2	<4.6	<2.8
Co-58	<1.9	<1.9	<2.0	<1.6	<1.4
Co-60	<2.4	<2.1	<2.4	<1.8	<2.3
Zn-65	<4.3	<4.9	<4.8	<3.9	<5.1
Nb-95	<1.8	<1.9	<1.8	<1.7	<1.3
Zr-95	<3.1	<2.8	<3.0	<2.8	<4.2
Cs-134	<1.7	<1.7	<1.5	<1.5	<2.6
Cs-137	<2.0	<2.1	<2.0	<1.6	<2.4
Ba-140[a]	<6.6	<6.5	<5.8	<6.5	<8.2
La-140[a]	<2.0	<2.0	<1.8	<1.5	<0.9
Ce-144	<13.0	<13.0	<13.0	<14.7	<12.9

Date Collected:	10-13-93	10-27-93	11-24-93	12-29-93
Sr-90	2.0±0.4	1.4±0.4	1.5±0.4	0.9±0.3
I-131	<0.3	<0.4	<0.3	<0.4
Be-7	<15.7	<10.7	<20.5	<18.1
K-40	1260±50	1260±60	1360±50	1440±50
Mn-54	<1.5	<1.7	<1.1	<0.9
Fe-59	<4.3	<4.6	<4.4	<1.9
Co-58	<1.6	<2.6	<1.0	<1.3
Co-60	<1.8	<2.4	<1.4	<2.6
Zn-65	<4.0	<4.0	<6.4	<6.8
Nb-95	<1.7	<1.8	<2.3	<1.1
Zr-95	<2.9	<2.7	<2.0	<2.1
Cs-134	<1.5	<2.3	<2.4	<2.4
Cs-137	<1.7	<2.0	<1.9	<2.1
Ba-140[a]	<6.2	<5.2	<6.0	<5.6
La-140[a]	<1.5	<1.5	<1.0	<1.4
Ce-144	<14.8	<10.4	<32.2	<27.7

a LLD at time of counting

TABLE E-21

GRASS ACTIVITY - CL-1 (pCi/g wet)

Date Collected:	01-27-93	02-28-93	03-31-93	04-28-93	05-12-93
Be-7	11.90±0.34	NS b	5.07±0.14	4.04±0.14	0.41±0.06
K-40	2.69±0.29		1.31±0.13	7.79±0.26	4.61±0.25
Mn-54	<0.015		<0.006	<0.008	<0.010
Fe-59	<0.033		<0.012	<0.021	<0.026
Co-58	<0.015		<0.006	<0.008	<0.010
Co-60	<0.016		<0.006	<0.009	<0.012
Zn-65	<0.036		<0.015	<0.019	<0.027
Nb-95	<0.015		<0.009	<0.008	<0.009
Zr-95	<0.025		<0.01	<0.014	<0.016
I-131	<0.021		<0.008	<0.011	<0.011
Cs-134	<0.016		<0.007	<0.007	<0.009
Cs-137	<0.015		<0.006	<0.008	<0.009
Ba-140[a]	<0.057		<0.022	<0.031	<0.034
La-140[a]	<0.017		<0.007	<0.007	<0.012
Ce-144	<0.099		<0.042	<0.067	<0.045

Date Collected:	05-26-93	06-09-93	06-23-93	07-07-93	07-21-93
Be-7	0.62±0.07	1.08±0.01	1.21±0.19	2.01±0.20	2.08±0.12
K-40	6.82±0.31	5.16±0.21	4.74±0.29	5.02±0.29	4.43±0.21
Mn-54	<0.010	<0.007	<0.015	<0.019	<0.008
Fe-59	<0.028	<0.018	<0.037	<0.032	<0.021
Co-58	<0.011	<0.007	<0.011	<0.011	<0.008
Co-60	<0.013	<0.008	<0.016	<0.016	<0.009
Zn-65	<0.030	<0.016	<0.034	<0.037	<0.020
Nb-95	<0.010	<0.007	<0.010	<0.019	<0.008
Zr-95	<0.017	<0.013	<0.009	<0.022	<0.014
I-131	<0.010	<0.010	<0.018	<0.019	<0.009
Cs-134	<0.009	<0.007	<0.016	<0.012	<0.007
Cs-137	<0.010	<0.007	<0.015	<0.013	<0.008
Ba-140[a]	<0.033	<0.028	<0.086	<0.057	<0.029
La-140[a]	<0.011	<0.006	<0.010	<0.012	<0.008
Ce-144	<0.046	<0.057	<0.082	<0.13	<0.050

a LLD at time of counting

b NS=sample not available due to snow cover.

TABLE E-21 (Cont'd)

Date Collected:	08-04-93	08-18-93	09-01-93	9-15-93	09-29-93
Be-7	3.23±0.16	0.53±0.08	3.16±0.13	1.82±0.09	3.84±0.17
K-40	5.44±0.28	5.48±0.25	6.43±0.26	4.79±0.22	6.01±0.31
Mn-54	<0.011	<0.010	<0.008	<0.007	<0.012
Fe-59	<0.025	<0.016	<0.023	<0.019	<0.028
Co-58	<0.010	<0.006	<0.008	<0.007	<0.006
Co-60	<0.012	<0.009	<0.009	<0.008	<0.012
Zn-65	<0.023	<0.011	<0.020	<0.017	<0.021
Nb-95	<0.008	<0.009	<0.009	<0.007	<0.006
Zr-95	<0.016	<0.010	<0.014	<0.013	<0.021
I-131	<0.011	<0.012	<0.012	<0.010	<0.010
Cs-134	<0.009	<0.013	<0.008	<0.007	<0.014
Cs-137	0.032±0.009	<0.006	<0.009	0.010±0.006	<0.012
Ba-140[a]	<0.032	<0.033	<0.033	<0.027	<0.039
La-140[a]	<0.009	<0.003	<0.007	<0.006	<0.008
Ce-144	<0.062	<0.052	<0.071	<0.060	<0.058

Date Collected:	10-13-93	10-27-93	11-24-93	12-29-93
Be-7	3.02±0.16	5.13±0.16	6.56±0.22	NS b
K-40	5.54±0.29	6.28±0.26	3.73±0.26	
Mn-54	<0.011	<0.009	<0.012	
Fe-59	<0.031	<0.026	<0.026	
Co-58	<0.008	<0.010	<0.010	
Co-60	<0.012	<0.011	<0.014	
Zn-65	<0.020	<0.023	<0.022	
Nb-95	<0.012	<0.011	<0.013	
Zr-95	<0.012	<0.016	<0.019	
I-131	<0.011	<0.014	<0.013	
Cs-134	<0.012	<0.008	<0.016	
Cs-137	<0.012	<0.009	<0.012	
Ba-140[a]	<0.037	<0.034	<0.020	
La-140[a]	<0.004	<0.008	<0.003	
Ce-144	<0.053	<0.056	<0.052	

a LLD at time of counting

b NS=sample not available due to snow cover.

TABLE E-22

GRASS ACTIVITY - CL-2 (pCi/g wet)

Date Collected:	01-27-93	02-24-93	03-31-93	04-28-93	05-12-93
Be-7	8.36±0.27	NS b	4.90±0.11	2.60±0.08	0.20±0.05
K-40	3.53±0.28		1.39±0.11	5.58±0.17	5.95±0.27
Mn-54	<0.014		<0.005	<0.006	<0.009
Fe-59	<0.032		<0.012	<0.015	<0.022
Co-58	<0.014		<0.005	<0.005	<0.009
Co-60	<0.018		<0.006	<0.006	<0.011
Zn-65	<0.036		<0.011	<0.014	<0.024
Nb-95	<0.013		<0.005	<0.006	<0.012
Zr-95	<0.023		<0.008	<0.010	<0.015
I-131	<0.015		<0.006	<0.006	<0.011
Cs-134	<0.014		<0.004	<0.005	<0.009
Cs-137	<0.014		0.008±0.004	<0.005	<0.009
Ba-140[a]	<0.048		<0.018	<0.019	<0.034
La-140[a]	<0.017		<0.005	<0.006	<0.010
Ce-144	<0.072		<0.032	<0.035	<0.052

Date Collected:	05-26-93	06-09-93	06-23-93	07-07-93	07-21-93
Be-7	0.06±0.01	0.81±0.09	2.74±0.11	2.56±0.15	1.03±0.09
K-40	1.71±0.18	5.07±0.23	5.52±0.21	5.38±0.32	4.75±0.22
Mn-54	<0.006	<0.008	<0.008	<0.010	<0.006
Fe-59	<0.016	<0.017	<0.021	<0.022	<0.017
Co-58	<0.010	<0.004	<0.008	<0.012	<0.009
Co-60	<0.009	<0.013	<0.009	<0.013	<0.006
Zn-65	<0.016	<0.019	<0.019	<0.029	<0.013
Nb-95	<0.007	<0.011	<0.009	<0.011	<0.004
Zr-95	<0.017	<0.017	<0.014	<0.017	<0.010
I-131	<0.012	<0.008	<0.011	<0.015	<0.013
Cs-134	<0.010	<0.007	<0.006	<0.011	<0.007
Cs-137	<0.008	<0.008	<0.008	<0.009	<0.009
Ba-140[a]	<0.035	<0.026	<0.028	<0.024	<0.038
La-140[a]	<0.010	<0.004	<0.007	<0.006	<0.003
Ce-144	<0.042	<0.059	<0.048	<0.066	<0.053

a LLD at time of counting

b NS=sample not available due to snow cover.

TABLE E-22 (Cont'd)

Date Collected:	08-04-93	08-18-93	09-01-93	9-15-93	09-29-93
Be-7	3.01±0.13	2.71±0.12	1.97±0.12	1.57±0.10	1.10±0.12
K-40	6.21±0.24	4.69±0.23	6.75±0.29	4.11±0.25	5.22±0.30
Mn-54	<0.008	<0.008	<0.009	<0.007	<0.012
Fe-59	<0.021	<0.021	<0.013	<0.020	<0.027
Co-58	<0.008	<0.008	<0.014	<0.007	<0.009
Co-60	<0.009	<0.009	<0.011	<0.008	<0.013
Zn-65	<0.019	<0.018	<0.016	<0.019	<0.022
Nb-95	<0.008	<0.008	<0.009	<0.008	<0.010
Zr-95	<0.014	<0.014	<0.017	<0.013	<0.020
I-131	<0.013	<0.012	<0.010	<0.009	<0.008
Cs-134	<0.007	<0.008	<0.005	<0.007	<0.013
Cs-137	<0.008	<0.008	<0.008	<0.008	<0.012
Ba-140[a]	<0.030	<0.032	<0.043	<0.028	<0.030
La-140[a]	<0.007	<0.007	<0.004	<0.007	<0.007
Ce-144	<0.063	<0.067	<0.038	<0.045	<0.054

Date Collected:	10-13-93	10-27-93	11-24-93	12-29-93
Be-7	4.78±0.15	3.68±0.15	8.62±0.20	NS b
K-40	5.94±0.26	7.06±0.29	2.70±0.17	
Mn-54	<0.009	<0.009	<0.010	
Fe-59	<0.026	<0.020	<0.021	
Co-58	<0.009	<0.007	<0.014	
Co-60	<0.010	<0.013	<0.011	
Zn-65	<0.024	<0.035	<0.015	
Nb-95	<0.010	<0.008	<0.012	
Zr-95	<0.017	<0.012	<0.021	
I-131	<0.014	<0.016	<0.013	
Cs-134	<0.008	<0.005	<0.008	
Cs-137	0.010±0.006	<0.012	<0.012	
Ba-140[a]	<0.032	<0.019	<0.031	
La-140[a]	<0.008	<0.007	<0.006	
Ce-144	<0.058	<0.063	<0.098	

a LLD at time of counting

b NS=sample not available due to snow cover.

TABLE E-23

GRASS ACTIVITY - CL-8 (pCi/g wet)

Date Collected:	01-27-93	02-28-93	03-31-93	04-28-93	05-12-93
Be-7	5.79±0.18	NS b	3.46±0.11	0.79±0.07	0.40±0.10
K-40	4.77±0.27		1.58±0.13	6.20±0.26	5.66±0.24
Mn-54	<0.013		<0.004	<0.012	<0.009
Fe-59	<0.030		<0.011	<0.026	<0.053
Co-58	<0.012		<0.005	<0.010	<0.014
Co-60	<0.015		<0.005	<0.013	<0.009
Zn-65	<0.033		<0.010	<0.029	<0.026
Nb-95	<0.012		<0.005	<0.011	<0.036
Zr-95	<0.023		<0.008	<0.019	<0.025
I-131	<0.016		<0.006	<0.012	<0.020
Cs-134	<0.012		<0.004	<0.010	<0.008
Cs-137	<0.013		0.006±0.005	<0.011	<0.008
Ba-140[a]	<0.046		<0.018	<0.039	<0.027
La-140[a]	<0.014		<0.005	<0.011	<0.008
Ce-144	<0.10		<0.033	<0.086	<0.052

Date Collected:	05-26-93	06-09-93	06-23-93	07-07-93	07-21-93
Be-7	0.43±0.05	1.10±0.11	0.96±0.09	1.31±0.10	0.33±0.08
K-40	7.44±0.22	5.88±0.29	5.63±0.22	5.27±0.23	5.98±0.27
Mn-54	<0.007	<0.011	<0.007	<0.008	<0.009
Fe-59	<0.019	<0.024	<0.020	<0.017	<0.015
Co-58	<0.006	<0.011	<0.007	<0.004	<0.005
Co-60	<0.008	<0.014	<0.008	<0.007	<0.012
Zn-65	<0.020	<0.026	<0.017	<0.010	<0.011
Nb-95	<0.007	<0.008	<0.008	<0.006	<0.012
Zr-95	<0.012	<0.012	<0.013	<0.008	<0.017
I-131	<0.008	<0.009	<0.014	<0.006	<0.012
Cs-134	<0.006	<0.010	<0.007	<0.004	<0.005
Cs-137	<0.007	<0.006	<0.008	<0.011	<0.010
Ba-140[a]	<0.023	<0.020	<0.029	<0.041	<0.037
La-140[a]	<0.006	<0.004	<0.006	<0.004	<0.007
Ce-144	<0.040	<0.060	<0.062	<0.056	<0.048

a LLD at time of counting

b NS=sample not available due to snow cover.

TABLE E-23 (Cont'd)

Date Collected:	08-04-93	08-18-93	09-01-93	9-15-93	09-29-93
Be-7	0.57±0.06	0.63±0.07	0.92±0.09	1.70±0.11	2.16±0.12
K-40	6.60±0.19	4.90±0.22	5.86±0.27	5.73±0.27	6.48±0.27
Mn-54	<0.006	<0.008	<0.008	<0.010	<0.009
Fe-59	<0.015	<0.014	<0.011	<0.021	<0.023
Co-58	<0.005	<0.007	<0.012	<0.009	<0.009
Co-60	<0.006	<0.008	<0.005	<0.011	<0.009
Zn-65	<0.014	<0.028	<0.043	<0.022	<0.022
Nb-95	<0.006	<0.008	<0.011	<0.008	<0.008
Zr-95	<0.010	<0.008	<0.012	<0.015	<0.014
I-131	<0.009	<0.007	<0.011	<0.009	<0.009
Cs-134	<0.005	<0.012	<0.011	<0.008	<0.007
Cs-137	<0.006	<0.012	<0.011	<0.009	<0.009
Ba-140[a]	<0.021	<0.032	<0.031	<0.030	<0.030
La-140[a]	<0.004	<0.006	<0.010	<0.008	<0.007
Ce-144	<0.045	<0.036	<0.059	<0.056	<0.051

Date Collected:	10-13-93	10-27-93	11-24-93	12-29-93
Be-7	5.06±0.18	4.37±0.14	4.85±0.11	NS b
K-40	6.10±0.28	6.56±0.23	4.04±0.14	
Mn-54	<0.010	<0.008	<0.006	
Fe-59	<0.025	<0.021	<0.014	
Co-58	<0.009	<0.007	<0.005	
Co-60	<0.011	<0.008	<0.009	
Zn-65	<0.022	<0.018	<0.013	
Nb-95	<0.011	<0.008	<0.010	
Zr-95	<0.017	<0.013	<0.014	
I-131	<0.015	<0.014	<0.014	
Cs-134	<0.009	<0.007	<0.009	
Cs-137	<0.011	<0.007	<0.009	
Ba-140[a]	<0.038	<0.028	<0.021	
La-140[a]	<0.008	<0.006	<0.003	
Ce-144	<0.083	<0.060	<0.047	

a LLD at time of counting

b NS=sample not available due to snow cover

TABLE E-24

GRASS ACTIVITY - CL-11(control) (pCi/g wet)

Date Collected:	01-27-93	02-28-93	03-31-93	04-28-93	05-12-93
Be-7	12.04±0.29	NS b	4.07±0.10	1.89±0.10	0.23±0.05
K-40	1.85±0.27		0.47±0.08	5.97±0.21	6.60±0.31
Mn-54	<0.011		<0.006	<0.[illegible]08	<0.011
Fe-59	<0.026		<0.011	<0.[illegible]	<0.028
Co-58	<0.011		<0.005	<0.00[illegible]	<0.011
Co-60	<0.012		<0.006	<0.008	<0.014
Zn-65	<0.021		<0.013	<0.018	[illegible]030
Nb-95	<0.010		<0.006	<0.007	[illegible]
Zr-95	<0.017		<0.010	<0.013	<0.0[illegible]
I-131	<0.013		<0.008	<0.009	<0.01[illegible]
Cs-134	<0.009		<0.006	<0.006	<0.009
Cs-137	<0.013		<0.006	<0.007	<0.010
Ba-140[a]	<0.041		<0.021	<0.026	<0.035
La-140[a]	<0.011		<0.006	<0.007	<0.012
Ce-144	<0.080		<0.052	<0.044	<0.049

Date Collected:	05-26-93	06-09-93	06-23-93	07-07-93	07-21-93
Be-7	1.6±0.09	1.88±0.11	1.42±0.17	2.61±0.12	0.29±0.07
K-40	7.07±0.23	4.70±0.24	7.58±0.37	5.55±0.22	4.01±0.22
Mn-54	<0.007	<0.008	<0.011	<0.008	<0.007
Fe-59	<0.017	<0.019	<0.011	<0.019	<0.020
Co-58	<0.007	<0.008	<0.013	<0.007	<0.007
Co-60	<0.008	<0.009	<0.011	<0.008	<0.010
Zn-65	<0.018	<0.018	<0.028	<0.018	<0.013
Nb-95	<0.007	<0.007	<0.012	<0.007	<0.005
Zr-95	<0.013	<0.012	<0.020	<0.013	<0.007
I-131	<0.010	<0.008	<0.022	<0.011	<0.010
Cs-134	<0.007	<0.006	<0.016	<0.007	<0.004
Cs-137	<0.008	<0.007	<0.020	<0.008	<0.008
Ba-140[a]	<0.028	<0.027	<0.043	<0.030	<0.026
La-140[a]	<0.006	<0.007	<0.009	<0.009	<0.003
Ce-144	<0.058	<0.049	<0.049	<0.063	<0.049

a LLD at time of counting.

b NS=sample not available due to snow cover.

TABLE E-24 (Cont'd)

Date Collected:	08-04-93	08-18-93	09-01-93	9-15-93	09-29-93
Be-7	0.39±0.05	0.36±0.07	0.68±0.06	1.84±0.12	1.81±0.12
K-40	4.44±0.18	4.40±0.24	4.79±0.17	4.06±0.23	4.53±0.24
Mn-54	<0.006	<0.010	<0.005	<0.004	<0.008
Fe-59	<0.015	<0.014	<0.014	<0.022	<0.012
Co-58	<0.006	<0.011	<0.005	<0.009	<0.009
Co-60	<0.007	<0.010	<0.006	<0.004	<0.009
Zn-65	<0.016	<0.035	<0.014	<0.013	<0.016
Nb-95	<0.007	<0.008	<0.006	<0.008	<0.010
Zr-95	<0.011	<0.016	<0.010	<0.014	<0.015
I-131	<0.007	<0.012	<0.006	<0.008	<0.009
Cs-134	<0.006	<0.015	<0.005	<0.013	<0.010
Cs-137	<0.006	<0.010	<0.006	<0.010	<0.010
Ba-140[a]	<0.022	<0.046	<0.020	<0.020	<0.031
La-140[a]	<0.006	<0.010	<0.005	<0.005	<0.007
Ce-144	<0.037	<0.049	<0.030	<0.037	<0.034

Date Collected:	10-13-93	10-27-93	11-24-93	12-29-93
Be-7	5.14±0.20	6.62±0.23	4.51±0.19	NS b
K-40	6.10±0.31	6.37±0.23	5.82±0.31	
Mn-54	<0.011	<0.012	<0.012	
Fe-59	<0.029	<0.029	<0.021	
Co-58	<0.010	<0.016	<0.006	
Co-60	<0.012	<0.013	<0.009	
Zn-65	<0.024	<0.022	<0.021	
Nb-95	<0.009	<0.009	<0.007	
Zr-95	<0.017	<0.016	<0.021	
I-131	<0.012	<0.019	<0.014	
Cs-134	<0.009	<0.009	<0.007	
Cs-137	<0.011	<0.013	<0.011	
Ba-140[a]	<0.036	<0.040	<0.028	
La-140[a]	<0.010	<0.010	<0.011	
Ce-144	<0.064	<0.051	<0.063	

a LLD at time of counting.

b NS=sample not available due to snow cover.

TABLE E-25

GRASS ACTIVITY - CL-116 (pCi/g wet)

Date Collected:	01-27-93	02-28-93	03-31-93	04-28-93	05-12-93
Be-7	6.94±0.10	NS b	8.25±0.14	3.56±0.14	0.76±0.08
K-40	2.98±0.17		2.22±0.15	4.64±0.26	6.46±0.23
Mn-54	<0.009		<0.006	<0.010	<0.008
Fe-59	<0.023		<0.014	<0.021	<0.018
Co-58	<0.009		<0.005	<0.010	<0.007
Co-60	<0.011		<0.006	<0.011	<0.009
Zn-65	<0.022		<0.013	<0.025	<0.019
Nb-95	<0.010		<0.006	<0.013	<0.008
Zr-95	<0.017		<0.010	<0.016	<0.013
I-131	<0.019		<0.009	<0.012	<0.008
Cs-134	<0.009		<0.005	<0.009	<0.007
Cs-137	<0.010		0.013±0.006	<0.009	<0.007
Ba-140[a]	<0.034		<0.022	<0.034	<0.026
La-140[a]	<0.010		<0.008	<0.010	<0.007
Ce-144	<0.064		<0.052	<0.057	<0.044

Date Collected:	05-26-93	06-09-93	06-23-93	07-07-93	07-21-93
Be-7	0.48±0.09	1.14±0.08	1.28±0.11	2.33±0.13	0.47±0.06
K-40	6.07±0.25	4.77±0.18	5.00±0.26	4.61±0.26	4.44±0.20
Mn-54	<0.008	<0.010	<0.008	<0.009	<0.004
Fe-59	<0.019	<0.021	<0.020	<0.023	<0.007
Co-58	<0.008	<0.008	<0.009	<0.009	<0.007
Co-60	<0.009	<0.013	<0.013	<0.009	<0.009
Zn-65	<0.019	<0.017	<0.024	<0.020	<0.020
Nb-95	<0.007	<0.010	<0.006	<0.009	<0.006
Zr-95	<0.012	<0.017	<0.021	<0.014	<0.012
I-131	<0.008	<0.017	<0.011	<0.009	<0.010
Cs-134	<0.006	<0.009	<0.008	<0.008	<0.006
Cs-137	<0.007	<0.010	<0.012	<0.009	<0.009
Ba-140[a]	<0.026	<0.018	<0.046	<0.033	<0.031
La-140[a]	<0.007	<0.003	<0.009	<0.009	<0.008
Ce-144	<0.044	<0.046	<0.038	<0.052	<0.036

a LLD at time of counting.

b NS=sample not available due to snow cover.

TABLE E-25 (Cont'd)

Date Collected:	08-04-93	08-18-93	09-01-93	9-15-93	09-29-93
Be-7	1.47±0.10	0.75±0.07	1.14±0.08	1.17±0.07	3.34±0.11
K-40	4.94±0.23	4.07±0.17	5.14±0.22	3.90±0.17	9.24±0.24
Mn-54	<0.011	<0.006	<0.007	<0.006	<0.007
Fe-59	<0.016	<0.016	<0.020	<0.007	<0.020
Co-58	<0.006	<0.006	<0.007	<0.005	<0.007
Co-60	<0.006	<0.007	<0.009	<0.004	<0.008
Zn-65	<0.016	<0.016	<0.018	<0.009	<0.020
Nb-95	<0.006	<0.006	<0.006	<0.006	<0.007
Zr-95	<0.008	<0.009	<0.011	<0.009	<0.013
I-131	<0.010	<0.007	<0.007	<0.006	<0.008
Cs-134	<0.006	<0.005	<0.006	<0.009	<0.006
Cs-137	<0.009	<0.006	<0.007	<0.006	<0.007
Ba-140[a]	<0.026	<0.020	<0.021	<0.021	<0.024
La-140[a]	<0.003	<0.005	<0.009	<0.003	<0.006
Ce-144	<0.034	<0.036	<0.040	<0.038	<0.041

Date Collected:	10-13-93	10-27-93	11-24-93	12-31-93
Be-7	4.78±0.14	2.62±0.14	3.77±0.15	NS b
K-40	9.37±0.29	6.30±0.29	4.92±0.24	
Mn-54	<0.009	<0.011	<0.009	
Fe-59	<0.025	<0.020	<0.022	
Co-58	<0.009	<0.008	<0.006	
Co-60	<0.010	<0.011	<0.013	
Zn-65	<0.026	<0.025	<0.012	
Nb-95	<0.010	<0.008	<0.010	
Zr-95	<0.016	<0.019	<0.010	
I-131	<0.010	<0.012	<0.012	
Cs-134	<0.008	<0.007	<0.008	
Cs-137	<0.009	<0.011	<0.010	
Ba-140[a]	<0.030	<0.034	<0.021	
La-140[a]	<0.008	<0.008	<0.008	
Ce-144	<0.053	<0.049	<0.057	

a LLD at time of counting.

b NS=sample not available due to snow cover.

TABLE E-26

GREEN LEAFY VEGETABLE ACTIVITY - CL-114(control) (pCi/g wet)

Sample Type:	Chard	Lettuce	Cabbage	Chard	Cabbage
Date Collected:	06-30-93	06-30-93	06-30-93	07-28-93	07-28-93
Gross Beta	4.15±0.15	1.84±0.06	3.40±0.09	4.24±0.10	2.00±0.06
Be-7	0.10±0.04	<0.035	<0.058	0.12±0.02	<0.040
K-40	3.60±0.15	1.44±0.13	2.78±0.19	4.02±0.10	2.36±0.10
Mn-54	<0.005	<0.004	<0.009	<0.002	<0.003
Fe-59	<0.012	<0.014	<0.014	<0.008	<0.010
Co-58	<0.005	<0.004	<0.008	<0.003	<0.004
Co-60	<0.005	<0.005	<0.009	<0.006	<0.002
Zn-65	<0.011	<0.012	<0.020	<0.007	<0.006
Nb-95	<0.004	<0.005	<0.007	<0.003	<0.002
Zr-95	<0.007	<0.008	<0.016	<0.007	<0.004
I-131	<0.004	<0.004	<0.007	<0.005	<0.008
Cs-134	<0.004	<0.004	<0.009	<0.004	<0.002
Cs-137	<0.004	<0.005	<0.006	<0.003	<0.004
Ba-140[a]	<0.015	<0.014	<0.046	<0.017	<0.011
La-140[a]	<0.004	<0.005	<0.009	<0.002	<0.001
Ce-144	<0.024	<0.016	<0.088	<0.019	<0.021

Sample Type:	Chard	Cabbage	Chard	Cabbage
Date Collected:	08-25-93	08-25-93	09-29-93	09-29-93
Gross Beta	3.92±0.13	1.52±0.05	5.00±0.17	2.10±0.06
Be-7	0.11±0.02	<0.037	0.32±0.05	<0.040
K-40	3.83±0.10	1.56±0.10	4.92±0.17	1.62±0.10
Mn-54	<0.003	<0.004	<0.005	<0.002
Fe-59	<0.009	<0.010	<0.015	<0.010
Co-58	<0.003	<0.004	<0.005	<0.005
Co-60	<0.003	<0.004	<0.005	<0.005
Zn-65	<0.008	<0.009	<0.012	<0.006
Nb-95	<0.003	<0.004	<0.005	<0.005
Zr-95	<0.005	<0.007	<0.008	<0.009
I-131	<0.005	<0.006	<0.007	<0.005
Cs-134	<0.002	<0.003	<0.004	<0.006
Cs-137	<0.003	<0.004	<0.005	<0.004
Ba-140[a]	<0.010	<0.014	<0.017	<0.015
La-140[a]	<0.003	<0.004	<0.004	<0.003
Ce-144	<0.018	<0.025	<0.029	<0.021

a LLD at time of counting

TABLE E-27

GREEN LEAFY VEGETABLE ACTIVITY - CL-115 (pCi/g wet)

Sample Type:	Chard	Lettuce	Cabbage	Chard	Cabbage	Chard
Date Collected:	06-30-93	06-30-93	06-30-93	07-28-93	07-28-93	08-25-93
Gross Beta	4.17±0.13	2.59±0.10	3.19±0.11	2.85±0.06	2.13±0.07	3.70±0.11
Be-7	0.15±0.05	0.17±0.05	<0.047	0.13±0.05	<0.049	0.12±0.05
K-40	3.63±0.17	2.31±0.12	3.27±0.14	3.79±0.16	2.26±0.12	4.70±0.16
Mn-54	<0.005	<0.004	<0.005	<0.004	<0.005	<0.005
Fe-59	<0.014	<0.012	<0.013	<0.015	<0.010	<0.013
Co-58	<0.003	<0.004	<0.005	<0.006	<0.005	<0.005
Co-60	<0.006	<0.005	<0.005	<0.007	<0.006	<0.006
Zn-65	<0.013	<0.010	<0.011	<0.009	<0.015	<0.012
Nb-95	<0.006	<0.004	<0.005	<0.007	<0.006	<0.005
Zr-95	<0.008	<0.008	<0.009	<0.010	<0.006	<0.007
I-131	<0.004	<0.006	<0.006	<0.008	<0.011	<0.006
Cs-134	<0.003	<0.004	<0.004	<0.003	<0.003	<0.004
Cs-137	<0.008	<0.005	<0.005	<0.006	<0.004	<0.004
Ba-140[a]	<0.014	<0.016	<0.017	<0.022	<0.017	<0.016
La-140[a]	<0.005	<0.004	<0.005	<0.005	<0.005	<0.004
Ce-144	<0.026	<0.032	<0.031	<0.027	<0.033	<0.027

Sample Type:	Cabbage	Chard	Cabbage
Date Collected:	08-25-93	09-29-93	09-29-93
Gross Beta	1.86±0.04	5.47±0.17	3.86±0.09
Be-7	<0.027	0.38±0.05	0.11±0.04
K-40	2.40±0.07	6.34±0.15	2.67±0.16
Mn-54	<0.002	<0.004	<0.006
Fe-59	<0.007	<0.014	<0.008
Co-58	<0.002	<0.003	<0.006
Co-60	<0.003	<0.005	<0.007
Zn-65	<0.006	<0.012	<0.011
Nb-95	<0.003	<0.005	<0.006
Zr-95	<0.005	<0.008	<0.010
I-131	<0.005	<0.007	<0.011
Cs-134	<0.003	<0.004	<0.004
Cs-137	<0.003	<0.004	<0.004
Ba-140[a]	<0.011	<0.014	<0.012
La-140[a]	<0.002	<0.003	<0.002
Ce-144	<0.022	<0.025	<0.032

a LLD at time of counting

TABLE E-28

GREEN LEAFY VEGETABLE ACTIVITY - CL-117 (pCi/g wet)

Sample Type:	Lettuce	Cabbage	Cabbage	Cabbage
Date Collected:	07-28-93	07-28-93	08-25-93	09-29-93
Gross Beta	3.95±0.24	2.00±0.07	2.53±0.10	4.62±0.15
Be-7	0.55±0.08	<0.029	0.04±0.02	0.30±0.06
K-40	3.22±0.27	1.97±0.08	2.05±0.10	4.02±0.19
Mn-54	<0.010	<0.003	<0.003	<0.007
Fe-59	<0.030	<0.008	<0.010	<0.009
Co-58	<0.009	<0.003	<0.004	<0.006
Co-60	<0.012	<0.004	<0.004	<0.007
Zn-65	<0.024	<0.009	<0.008	<0.015
Nb-95	<0.011	<0.002	<0.004	<0.005
Zr-95	<0.018	<0.007	<0.006	<0.007
I-131	<0.014	<0.005	<0.006	<0.008
Cs-134	<0.009	<0.003	<0.003	<0.006
Cs-137	<0.011	<0.003	<0.003	<0.007
Ba-140[a]	<0.029	<0.007	<0.012	<0.013
La-140[a]	<0.011	<0.002	<0.003	<0.007
Ce-144	<0.032	<0.019	<0.022	<0.033

a LLD at time of counting

TABLE E-29

GREEN LEAFY VEGETABLE ACTIVITY - CL-118 (pCi/g wet)

Sample Type:	Cabbage	Chard	Lettuce	Chard	Cabbage
Date Collected:	06-30-93	06-30-93	06-30-93	07-28-93	07-28-93
Gross Beta	2.44±0.07	5.51±0.16	2.79±0.09	6.89±0.20	2.23±0.06
Be-7	<0.044	0.27±0.06	0.21±0.09	0.30±0.04	<0.040
K-40	1.93±0.12	4.82±0.22	2.39±0.21	5.87±0.15	2.19±0.10
Mn-54	<0.003	<0.006	<0.007	<0.004	<0.004
Fe-59	<0.010	<0.012	<0.015	<0.013	<0.010
Co-58	<0.003	<0.011	<0.009	<0.004	<0.004
Co-60	<0.003	<0.009	<0.012	<0.005	<0.004
Zn-65	<0.006	<0.023	<0.023	<0.011	<0.006
Nb-95	<0.003	<0.008	<0.010	<0.004	<0.003
Zr-95	<0.010	<0.012	<0.010	<0.007	<0.006
I-131	<0.003	<0.009	<0.010	<0.006	<0.007
Cs-134	<0.004	<0.003	<0.007	<0.003	<0.003
Cs-137	<0.006	<0.007	<0.009	<0.004	<0.004
Ba-140[a]	<0.020	<0.052	<0.037	<0.012	<0.010
La-140[a]	<0.003	<0.003	<0.007	<0.003	<0.002
Ce-144	<0.026	<0.059	<0.055	<0.021	<0.030

Sample Type:	Chard	Cabbage	Chard	Cabbage
Date Collected:	08-25-93	08-25-93	09-29-93	09-29-93
Gross Beta	3.86±0.11	2.14±0.07	5.72±0.17	3.64±0.11
Be-7	0.27±0.06	<0.034	0.38±0.05	0.31±0.05
K-40	5.79±0.22	1.68±0.10	4.69±0.15	3.88±0.13
Mn-54	<0.006	<0.003	<0.005	<0.004
Fe-59	<0.015	<0.009	<0.014	<0.010
Co-58	<0.007	<0.004	<0.005	<0.004
Co-60	<0.008	<0.003	<0.005	<0.004
Zn-65	<0.012	<0.008	<0.014	<0.010
Nb-95	<0.004	<0.004	<0.006	<0.004
Zr-95	<0.006	<0.006	<0.008	<0.007
I-131	<0.014	<0.008	<0.008	<0.008
Cs-134	<0.011	<0.003	<0.004	<0.004
Cs-137	<0.007	<0.004	0.013±0.004	<0.004
Ba-140[a]	<0.033	<0.013	<0.017	<0.015
La-140[a]	<0.003	<0.003	<0.004	<0.003
Ce-144	<0.038	<0.030	<0.029	<0.030

a LLD at time of counting

TABLE E-30

MEAT ACTIVITY - CL-106 (pCi/g wet)

Date Collected:	01-14-93	01-14-93	01-14-93
Type:	Ground Beef	Bovine Liver	Bovine Thyroid
Be-7	<0.042	<0.048	<0.16
K-40	2.21±0.18	1.43±0.24	2.36±0.39
Mn-54	<0.007	<0.008	<0.016
Fe-59	<0.023	<0.024	<0.045
Co-58	<0.008	<0.009	<0.016
Co-60	<0.007	<0.008	<0.018
Zn-65	<0.017	<0.021	<0.035
Nb-95	<0.009	<0.010	<0.019
Zr-95	<0.013	<0.016	<0.031
Ru-103	<0.007	<0.006	<0.021
Ru-106	<0.055	<0.060	<0.15
I-131	<0.017	<0.018	<0.064
Cs-134	<0.006	<0.006	<0.015
Cs-137	<0.007	<0.007	<0.016
Ba-140[a]	<0.019	<0.019	<0.059
La-140[a]	<0.007	<0.004	<0.015
Ce-141	<0.006	<0.011	<0.030
Ce-144	<0.021	<0.041	<0.096

a LLD at time of counting

TABLE E-31

FISH ACTIVITY - CL-19 (pCi/g wet)

Date Collected:	04-22-93	04-22-93	04-22-93	04-22-93
Type:	Largemouth Bass	Crappie	Bluegill	Carp
Be-7	<0.006	<0.005	<0.004	<0.004
K-40	3.30±0.16	3.08±0.16	2.33±0.15	2.86±0.15
Mn-54	<0.006	<0.006	<0.005	<0.005
Fe-59	<0.022	<0.017	<0.011	<0.015
Co-58	<0.008	<0.007	<0.005	<0.006
Co-60	<0.007	<0.008	<0.005	<0.007
Zn-65	<0.017	<0.018	<0.012	<0.014
Nb-95	<0.015	<0.006	<0.005	<0.009
Zr-95	<0.014	<0.011	<0.008	<0.010
Ru-103	<0.009	<0.005	<0.005	<0.006
Ru-106	<0.051	<0.049	<0.038	<0.047
Cs-134	<0.005	<0.005	<0.004	<0.005
Cs-137	<0.005	<0.006	<0.005	<0.005
Ba-140[a]	<0.019	<0.020	<0.016	<0.018
La-140[a]	<0.006	<0.007	<0.005	<0.006
Ce-141	<0.014	<0.006	<0.006	<0.008
Ce-144	<0.030	<0.024	<0.024	<0.028

Date Collected:	10-18-93	10-18-93	10-18-93	10-18-93
Type:	Bluegill	Largemouth Bass	Carp	Crappie
Be-7	<0.083	<0.10	<0.051	<0.082
K-40	2.17±0.15	3.46±0.28	2.83±0.27	3.26±0.19
Mn-54	<0.006	<0.007	<0.006	<0.008
Fe-59	<0.021	<0.021	<0.033	<0.034
Co-58	<0.010	<0.010	<0.009	<0.011
Co-60	<0.008	<0.009	<0.004	<0.011
Zn-65	<0.009	<0.011	<0.010	<0.010
Nb-95	<0.014	<0.007	<0.011	<0.013
Zr-95	<0.010	<0.011	<0.015	<0.014
Ru-103	<0.010	<0.008	<0.011	<0.010
Ru-106	<0.060	<0.075	<0.059	<0.061
Cs-134	<0.008	<0.007	<0.003	<0.007
Cs-137	<0.006	<0.005	<0.007	<0.008
Ba-140[a]	<0.016	<0.025	<0.029	<0.022
La-140[a]	<0.006	<0.004	<0.003	<0.004
Ce-141	<0.011	<0.032	<0.014	<0.013
Ce-144	<0.030	<0.062	<0.053	<0.023

a LLD at time of counting

TABLE E-32

FISH ACTIVITY - CL-105(CONTROL) (pCi/g wet)

Date Collected:	04-23-93	04-23-93	04-23-93	04-23-93
Type:	Crappie	Bluegill	Largemouth Bass	Carp
Be-7	<0.153	<0.041	<0.024	<0.047
K-40	2.47±0.37	2.52±0.13	2.59±0.12	3.09±0.19
Mn-54	<0.016	<0.005	<0.005	<0.006
Fe-59	<0.043	<0.014	<0.013	<0.021
Co-58	<0.017	<0.005	<0.005	<0.007
Co-60	<0.016	<0.006	<0.006	<0.008
Zn-65	<0.034	<0.012	<0.014	<0.018
Nb-95	<0.017	<0.006	<0.005	<0.007
Zr-95	<0.028	<0.009	<0.009	<0.012
Ru-103	<0.019	<0.005	<0.005	<0.005
Ru-106	<0.145	<0.038	<0.044	<0.057
Cs-134	<0.015	<0.004	<0.005	<0.006
Cs-137	<0.017	<0.004	<0.005	<0.006
Ba-140[a]	<0.063	<0.016	<0.017	<0.019
La-140[a]	<0.017	<0.005	<0.006	<0.007
Ce-141	<0.026	<0.006	<0.008	<0.005
Ce-144	<0.102	<0.025	<0.034	<0.021

Date Collected:	10-18-93	10-18-93	10-18-93	10-18-93
Type:	Bluegill	Carp	Largemouth Bass	Crappie
Be-7	<0.14	<0.12	<0.15	<0.12
K-40	2.91±0.30	3.10±0.25	2.42±0.29	2.83±0.35
Mn-54	<0.013	<0.007	<0.012	<0.015
Fe-59	<0.036	<0.024	<0.018	<0.066
Co-58	<0.009	<0.011	<0.016	<0.014
Co-60	<0.016	<0.010	<0.013	<0.015
Zn-65	<0.024	<0.009	<0.022	<0.026
Nb-95	<0.027	<0.010	<0.023	<0.032
Zr-95	<0.030	<0.013	<0.025	<0.043
Ru-103	<0.007	<0.015	<0.015	<0.014
Ru-106	<0.099	<0.066	<0.078	<0.18
Cs-134	<0.006	<0.004	<0.009	<0.016
Cs-137	<0.007	<0.006	<0.011	<0.016
Ba-140[a]	<0.047	<0.023	<0.041	<0.034
La-140[a]	<0.009	<0.003	<0.003	<0.006
Ce-141	<0.026	<0.024	<0.040	<0.045
Ce-144	<0.10	<0.057	<0.075	<0.083

a LLD at time of counting

TABLE E-33

AQUATIC VEGETATION ACTIVITY - (pCi/g wet)

Location:	CL-7B	CL-7C	CL-9	CL-10	CL-19
Date Collected:	04-22-93	04-22-93	04-22-93	04-22-93	04-22-93
Be-7	0.83±0.11	0.80±0.12	1.08±0.21	1.25±0.20	0.78±0.16
K-40	2.59±0.32	2.08±0.31	3.32±0.48	2.38±0.38	3.37±0.42
Mn-54	<0.017	<0.019	<0.023	<0.019	<0.021
Fe-59	<0.039	<0.048	<0.054	<0.046	<0.062
Co-58	<0.018	<0.020	<0.020	<0.019	<0.022
Co-60	<0.019	<0.026	<0.025	<0.020	<0.026
Zn-65	<0.041	<0.050	<0.046	<0.035	<0.051
Nb-95	<0.026	<0.021	<0.023	<0.021	<0.027
Zr-95	<0.031	<0.033	<0.038	<0.028	<0.041
Cs-134	<0.019	<0.020	<0.019	<0.014	<0.018
Cs-137	<0.016	<0.018	0.062±0.021	<0.024	0.054±0.016
Ba-140[a]	<0.059	<0.064	<0.080	<0.060	<0.057
La-140[a]	<0.022	<0.029	<0.020	<0.019	<0.019
Ce-144	<0.076	<0.070	<0.133	<0.078	<0.067

Location:	CL-105	CL-7B	CL-7C	CL-9	CL-10	CL-19
Date Collected:	04-23-93	06-21-93	06-21-93	06-21-93	06-21-93	06-21-93
Be-7	0.51±0.17	1.45±0.29	1.49±0.20	2.30±0.31	1.14±0.19	2.27±0.26
K-40	2.28±0.38	2.99±0.38	2.69±0.29	3.29±0.57	2.69±0.33	6.10±0.44
Mn-54	<0.018	<0.014	<0.016	<0.030	<0.016	<0.019
Fe-59	<0.048	<0.040	<0.017	<0.074	<0.048	<0.053
Co-58	<0.018	<0.022	<0.015	<0.028	<0.016	<0.020
Co-60	<0.019	<0.022	<0.011	<0.033	<0.018	<0.023
Zn-65	<0.040	<0.026	<0.029	<0.060	<0.036	<0.045
Nb-95	<0.023	<0.028	<0.017	<0.030	<0.021	<0.025
Zr-95	<0.033	<0.043	<0.017	<0.050	<0.030	<0.038
Cs-134	<0.016	<0.009	<0.016	<0.023	<0.014	<0.016
Cs-137	0.052±0.014	<0.023	0.030±0.020	0.080±0.034	0.047±0.018	0.070±0.017
Ba-140[a]	<0.062	<0.070	<0.031	<0.090	<0.058	<0.065
La-140[a]	<0.020	<0.007	<0.011	<0.032	<0.002	<0.020
Ce-144	<0.085	<0.10	<0.055	<0.14	<0.098	<0.096

a LLD at time of counting

TABLE E-33 (Cont'd)

Location:	CL-7B	CL-7C	CL-9	CL-10	CL-19
Date Collected:	08-17-93	08-17-93	08-17-93	08-17-93	08-17-93
Be-7	1.22±0.20	0.96±0.17	2.53±0.25	2.71±0.30	2.07±0.31
K-40	1.50±0.33	0.91±0.32	3.11±0.48	2.37±0.44	4.88±0.37
Mn-54	<0.019	<0.015	<0.020	<0.024	<0.013
Fe-59	<0.039	<0.037	<0.056	<0.048	<0.030
Co-58	<0.019	<0.015	<0.021	<0.026	<0.021
Co-60	<0.021	<0.015	<0.023	<0.022	<0.018
Zn-65	<0.034	<0.030	<0.047	<0.043	<0.069
Nb-95	<0.018	<0.017	<0.022	<0.028	<0.021
Zr-95	<0.028	<0.025	<0.038	<0.041	<0.047
Cs-134	<0.013	<0.013	<0.019	<0.015	<0.029
Cs-137	0.034±0.018	0.023±0.011	<0.057±0.020	<0.028	<0.082±0.026
Ba-140[a]	<0.056	<0.052	<0.078	<0.097	<0.048
La-140[a]	<0.023	<0.015	<0.020	<0.018	<0.016
Ce-144	<0.083	<0.092	<0.13	<0.076	<0.093

Location:	CL-7B	CL-7C	CL-9	CL-10	CL-19	CL-105[b]
Date Collected:	10-18-93	10-18-93	10-18-93	10-18-93	10-18-93	10-21-93
Be-7	0.83±0.20	1.08±0.26	1.70±0.35	1.39±0.32	1.32±0.28	1.66±0.30
K-40	1.82±0.25	2.27±0.38	2.26±0.52	0.81±0.48	2.33±0.29	3.96±0.52
Mn-54	<0.018	<0.053	<0.026	<0.019	<0.015	<0.024
Fe-59	<0.036	<0.020	<0.083	<0.077	<0.028	<0.074
Co-58	<0.010	<0.020	<0.028	<0.040	<0.028	<0.025
Co-60	<0.024	<0.020	<0.029	<0.034	<0.014	<0.027
Zn-65	<0.063	<0.041	<0.061	<0.098	<0.067	<0.055
Nb-95	<0.034	<0.027	<0.038	<0.048	<0.034	<0.033
Zr-95	<0.038	<0.037	<0.054	<0.024	<0.048	<0.048
Cs-134	<0.020	<0.017	<0.022	<0.030	<0.020	<0.020
Cs-137	<0.021	0.036±0.015	0.055±0.021	<0.035	<0.016	0.068±0.026
Ba-140[a]	<0.050	<0.063	<0.094	<0.11	<0.053	<0.086
La-140[a]	<0.014	<0.019	<0.024	<0.024	<0.016	<0.022
Ce-144	<0.096	<0.088	<0.16	<0.011	<0.051	<0.15

a LLD at time of counting

b control location

TABLE E-34

SHORELINE SEDIMENT ACTIVITY (pCi/g dry)

Location:	CL-7B	CL-7C	CL-10	CL-19
Date Collected:	04-22-93	04-22-93	04-22-93	04-22-93
Gross Alpha	<1.5	5.7±1.8	<1.6	5.6±1.5
Gross Beta	7.4±1.9	7.9±1.9	9.2±2.2	8.5±1.9
Sr-90	<0.008	<0.008	<0.010	<0.007
Be-7	<0.055	<0.056	<0.095	<0.111
K-40	6.19±0.20	5.83±0.27	10.30±0.33	7.86±0.33
Mn-54	<0.006	<0.011	<0.011	<0.013
Fe-59	<0.013	<0.030	<0.031	<0.035
Co-58	<0.002	<0.012	<0.012	<0.011
Co-60	<0.006	<0.015	<0.016	<0.014
Zn-65	<0.021	<0.029	<0.030	<0.038
Nb-95	<0.005	<0.013	<0.014	<0.016
Zr-95	<0.012	<0.022	<0.023	<0.025
Cs-134	<0.011	<0.011	<0.012	<0.014
Cs-137	<0.005	<0.010	<0.010	<0.012
Ba-140[a]	<0.012	<0.042	<0.044	<0.053
La-140[a]	<0.004	<0.018	<0.018	<0.022
Ce-144	<0.031	<0.062	<0.067	<0.076
Ac-228	<0.035	<0.039	<0.043	<0.048
Bi-212	0.185±0.049	<0.146	<0.148	<0.167
Bi-214	<0.021	<0.030	<0.032	<0.034
Pb-212	0.129±0.011	0.129±0.015	0.323±0.021	0.147±0.018
Pb-214	0.135±0.013	<0.028	0.165±0.023	<0.033
Ra-226	0.080±0.011	<0.018	<0.185	<0.212
Tl-208	<0.031	<0.038	0.201±0.028	<0.045

a LLD at time of counting

TABLE E-34 (Cont'd)

Location:	CL-88	CL-89	CL-93	CL-105[b]
Date Collected:	04-22-93	04-22-93	04-22-93	04-23-93
Gross Alpha	<1.6	7.6±3.4	3.3±2.1	<2.0
Gross Beta	6.8±1.2	19.1±2.5	10.3±1.8	8.3±2.0
Sr-90	<0.009	0.013±0.006	<0.020	0.015±0.007
Be-7	<0.100	0.442±0.072	<0.082	0.057±0.038
K-40	7.43±0.29	15.90±0.35	6.68±0.29	8.07±0.18
Mn-54	<0.012	<0.014	<0.007	<0.006
Fe-59	<0.030	<0.036	<0.012	<0.015
Co-58	<0.013	<0.014	<0.009	<0.006
Co-60	<0.017	<0.019	<0.010	<0.007
Zn-65	<0.033	<0.040	<0.038	<0.014
Nb-95	<0.014	<0.016	<0.016	<0.007
Zr-95	<0.022	<0.025	<0.010	<0.011
Cs-134	<0.013	<0.016	<0.020	<0.005
Cs-137	<0.011	0.060±0.009	<0.010	<0.006
Ba-140[a]	<0.046	<0.053	<0.021	<0.022
La-140[a]	<0.020	<0.022	<0.003	<0.004
Ce-144	<0.070	<0.023	<0.054	<0.035
Ac-228	<0.043	0.677±0.042	<0.060	0.179±0.027
Bi-212	<0.160	<0.173	0.032±0.011	<0.092
Bi-214	<0.032	0.455±0.025	<0.039	0.138±0.016
Pb-212	0.128±0.011	0.711±0.024	0.026±0.002	0.181±0.012
Pb-214	0.093±0.014	0.476±0.025	0.030±0.002	0.138±0.018
Ra-226	<0.197	1.29±0.18	0.019±0.002	0.32±0.13
Tl-208	<0.043	0.630±0.035	<0.053	0.166±0.022

a LLD at time of counting

b control location

TABLE E-34 (Cont'd)

Location:	CL-7B	CL-7C	CL-10	CL-19
Date Collected:	10-18-93	10-18-93	10-18-93	10-18-93
Gross Alpha	<4.54	11.16±3.91	12.24±5.52	13.48±5.55
Gross Beta	6.51±2.35	28.68±3.23	25.98±4.65	25.14±4.27
Sr-90	<0.006	0.172±0.019	0.018±0.007	<0.015
Be-7	0.34±0.11	<0.30	0.38±0.22	<0.36
K-40	7.93±0.36	16.41±0.68	18.39±0.71	18.49±0.91
Mn-54	<0.010	<0.020	<0.024	<0.032
Fe-59	<0.038	<0.024	<0.048	<0.11
Co-58	<0.012	<0.026	<0.032	<0.039
Co-60	<0.018	<0.029	<0.036	<0.033
Zn-65	<0.051	<0.012	<0.12	<0.14
Nb-95	<0.014	<0.028	<0.028	<0.073
Zr-95	<0.023	<0.035	<0.038	<0.081
Cs-134	<0.004	<0.016	<0.017	<0.060
Cs-137	<0.009	0.62±0.04	0.068+0.024	<0.023
Ba-140a	<0.023	<0.068	<0.073	<0.072
La-140a	<0.021	<0.008	<0.008	<0.016
Ce-144	<0.076	<0.16	<0.097	<0.21
Ac-228	0.19±0.04	0.98±0.10	1.32±0.11	0.90±0.11
Bi-212	0.19±0.11	1.15±0.28	1.78±0.42	0.70±0.32
Bi-214	0.15±0.03	0.95±0.07	1.00±0.07	0.53±0.06
Pb-212	0.13±0.02	1.01±0.06	1.25±0.06	0.84±0.06
Pb-214	0.14±0.02	1.06±0.07	1.13±0.07	0.61±0.07
Ra-226	0.36±0.16	1.61±0.37	2.15±0.37	1.41±0.38
Tl-208	0.024±0.014	0.29±0.03	0.40±0.07	0.28±0.04

a LLD at time of counting

TABLE E-34 (Cont'd)

Location:	CL-88	CL-89	CL-93	CL-105[b]
Date Collected:	10-18-93	10-18-93	10-18-93	10-21-93
Gross Alpha	7.14±4.86	12.16±3.92	8.49±3.57	9.50±5.31
Gross Beta	14.44±3.80	27.61±3.41	11.86±2.67	17.95±3.98
Sr-90	<0.010	0.014±0.007	<0.017	0.018±0.006
Be-7	<0.28	<0.35	1.47±0.30	<0.023
K-40	13.44±0.79	17.04±0.57	6.24±0.52	15.14±0.72
Mn-54	<0.025	<0.029	<0.024	<0.019
Fe-59	<0.12	<0.077	<0.023	<0.060
Co-58	<0.048	<0.039	<0.019	<0.013
Co-60	<0.011	<0.021	0.11±0.02	<0.011
Zn-65	<0.14	<0.11	<0.097	<0.094
Nb-95	<0.048	<0.073	<0.045	<0.036
Zr-95	<0.054	<0.052	<0.036	<0.051
Cs-134	<0.052	<0.050	<0.008	<0.018
Cs-137	<0.026	<0.022	<0.022	0.16±0.03
Ba-140[a]	<0.076	<0.036	<0.031	<0.070
La-140[a]	<0.012	<0.025	<0.005	<0.007
Ce-144	<0.14	<0.21	<0.14	<0.11
Ac-228	0.54±0.10	0.94±0.09	0.34±0.08	0.83±0.11
Bi-212	0.45±0.10	1.06±0.31	0.53±0.21	0.89±0.34
Bi-214	0.45±0.26	0.60±0.05	0.36±0.05	0.41±0.05
Pb-212	0.27±0.05	0.96±0.05	0.27±0.04	0.68±0.05
Pb-214	0.43±0.05	0.87±0.06	0.36±0.06	0.42±0.06
Ra-226	<0.44	1.60±0.37	1.36±0.36	1.28±0.33
Tl-208	0.18±0.03	0.32±0.03	0.055±0.027	0.17±0.03

a LLD at time of counting

b control location

TABLE E-35

BOTTOM SEDIMENT ACTIVITY (pCi/g dry)

Location:	CL-7C	CL-10	CL-13A	CL-17	CL-19	CL-89	CL-105[b]
Date Collected:	04-22-93	04-22-93	04-22-93	04-22-93	04-22-93	04-22-93	04-23-93
Gross Alpha	19.0±2.8	16.3±2.6	4.0±2.2	9.8±2.2	4.4±1.8	<2.1	16.5±2.8
Gross Beta	33.8±2.2	29.6±2.0	15.1±1.8	20.4±1.8	15.6±1.7	8.4±1.5	30.2±2.0
Sr-90	<0.013	<0.025	<0.008	<0.008	<0.006	<0.007	0.019±0.011
Be-7	<0.014	0.22±0.11	<0.082	<0.168	<0.078	<0.114	<0.309
K-40	18.72±0.38	20.50±0.440	12.78±0.24	14.80±0.71	11.70±0.31	7.63±0.32	19.60±0.76
Mn-54	<0.012	<0.016	<0.010	<0.019	<0.011	<0.013	<0.037
Fe-59	<0.022	<0.016	<0.009	<0.052	<0.031	<0.034	<0.090
Co-58	<0.019	<0.014	<0.008	<0.020	<0.011	<0.014	<0.038
Co-60	<0.018	<0.019	<0.008	<0.028	<0.017	<0.020	<0.047
Zn-65	<0.060	<0.035	<0.030	<0.051	<0.034	<0.035	<0.098
Nb-95	<0.028	<0.019	<0.015	<0.024	<0.012	<0.016	<0.044
Zr-95	<0.024	<0.028	<0.010	<0.039	<0.019	<0.026	<0.069
Cs-134	<0.034	<0.013	<0.015	<0.023	<0.012	<0.015	<0.044
Cs-137	<0.029	0.459±0.020	0.017±0.006	<0.019	<0.010	<0.012	0.422±0.031
Ba-140[a]	<0.028	<0.062	<0.021	<0.077	<0.038	<0.054	<0.151
La-140[a]	<0.010	<0.012	<0.005	<0.034	<0.015	<0.022	<0.060
Ce-144	<0.134	<0.091	<0.036	<0.119	<0.037	<0.078	<0.210
Ac-228	<0.112	1.419±0.088	<0.051	<0.070	<0.039	<0.048	1.22±0.11
Bi-212	1.322±0.200	1.54±0.22	0.393±0.081	<0.257	<0.140	<0.178	<0.486
Bi-214	<0.064	0.873±0.048	<0.028	<0.047	<0.027	<0.035	<0.090
Pb-212	1.233±0.033	1.499±0.036	0.391±0.016	0.778±0.040	0.340±0.016	0.226±0.020	1.470±0.067
Pb-214	0.963±0.030	1.042±0.053	0.279±0.018	0.469±0.036	0.162±0.017	0.147±0.023	0.761±0.067
Ra-226	0.623±0.031	2.62±0.38	0.175±0.014	1.13±0.23	0.479±0.099	<0.22	2.05±0.52
Tl-208	<0.094	1.284±0.068	<0.047	0.630±0.051	0.241±0.022	0.218±0.032	1.250±0.098

a LLD at time of counting

b control location

TABLE E-35 (Cont'd)

Location:	CL-7C	CL-10	CL-13A	CL-17	CL-19	CL-89	CL-105
Date Collected:	10-18-93	10-18-93	10-18-93	10-18-93	10-18-93	10-18-93	10-21-93
Gross Alpha	12.58±4.18	18.63±6.56	<6.1	8.54±5.00	<5.3	<3.6	17.64±6.59
Gross Beta	28.08±3.26	26.21±4.52	18.03±3.87	21.31±4.31	9.11±3.41	7.82±2.29	28.82±4.41
Sr-90	0.035±0.010	<0.009	0.050±0.011	0.015±0.007	<0.011	<0.008	0.017±0.006
Be-7	<0.38	<0.54	0.52±0.16	0.41±0.23	<0.18	<0.15	<0.76
K-40	19.06±0.84	19.26±0.97	15.12±0.57	17.50±0.63	11.03±0.43	10.16±0.42	25.31±1.18
Mn-54	<0.026	<0.040	<0.009	<0.020	<0.007	<0.013	<0.063
Fe-59	<0.086	<0.13	<0.036	<0.071	<0.023	<0.018	<0.14
Co-58	<0.036	<0.054	<0.018	<0.015	<0.015	<0.013	<0.059
Co-60	<0.042	<0.042	<0.028	<0.030	<0.015	<0.014	<0.049
Zn-65	<0.026	<0.16	<0.083	<0.10	<0.059	<0.056	<0.21
Nb-95	<0.048	<0.10	<0.012	<0.016	<0.018	<0.023	<0.051
Zr-95	<0.075	<0.090	<0.041	<0.017	<0.033	<0.029	<0.14
Cs-134	<0.018	<0.089	<0.012	<0.020	<0.010	<0.005	<0.050
Cs-137	0.23±0.04	0.36±0.05	0.050±0.015	0.087±0.022	<0.013	<0.013	0.56±0.06
Ba-140[a]	<0.039	<0.15	<0.044	<0.050	<0.041	<0.036	<0.12
La-140[a]	<0.011	<0.048	<0.009	<0.005	<0.009	<0.004	<0.012
Ce-144	<0.15	<0.24	<0.097	<0.15	<0.076	<0.084	<0.32
Ac-228	1.20±0.14	1.49±0.17	0.48±0.07	0.79±0.09	0.25±0.06	0.22±0.04	1.88±0.22
Bi-212	1.64±0.42	1.70±0.48	0.55±0.24	0.75±0.26	0.41±0.21	<0.21	2.73±0.67
Bi-214	0.91±0.09	1.10±0.09	0.42±0.05	0.58±0.06	0.21±0.04	0.21±0.03	1.31±0.14
Pb-212	1.19±0.08	1.54±0.08	0.47±0.04	0.75±0.05	0.24±0.03	0.23±0.03	1.92±0.11
Pb-214	1.05±0.09	1.20±0.10	0.44±0.04	0.65±0.06	0.19±0.03	0.18±0.03	1.44±0.14
Ra-226	2.30±0.48	2.61±0.56	1.12±0.27	1.25±0.29	0.41±0.18	0.38±0.18	3.93±0.79
Tl-208	0.34±0.05	0.49±0.06	0.12±0.02	0.18±0.03	0.045±0.015	0.053±0.015	0.49±0.07

a LLD at time of counting

b control location

TABLE E-36

SOIL ACTIVITY (pCi/g dry)

Location:	CL-16B
Date Collected:	10-25-93
Gross Alpha	10.72±3.67
Gross Beta	22.78±3.13
Be-7	<0.26
K-40	16.04±0.58
Mn-54	<0.021
Fe-59	<0.069
Co-58	<0.030
Co-60	<0.025
Zn-65	<0.093
Nb-95	<0.054
Zr-95	<0.053
Cs-134	<0.046
Cs-137	0.041±0.018
Ba-140[a]	<0.060
La-140[a]	<0.014
Ce-144	<0.14
Ac-228	0.98±0.08
Bi-212	0.96±0.22
Bi-212	0.67±0.04
Pb-212	0.95±0.04
Pb-214	0.74±0.05
Ra-226	1.51±0.28
Tl-208	0.28±0.27

a LLD at time of counting

FOR MORE INFORMATION, CALL OR WRITE

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Clinton Power Station
R.R. 3, P.O. Box 678
Clinton, Illinois 61727
(217) 935-8881