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AmerGen
An Exelon/British Energy Company

Technical Specification 6.9.1.e

April 26, 2002
2130-02-20011

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555

Subject: Oyster Creek Generating Station
Docket No. 50-219
Radiological Environmental Monitoring Report (REMP) - 2001

Enclosed is a copy of the Oyster Creek Radiological Environmental Monitoring Report for the calendar year 2001. This submittal is made in accordance with Oyster Creek Generating Station Technical Specification 6.9.1.e.

If you should have any questions or require any further information, please contact Mr. John Rogers, of my staff, at 609-971-4893.

Very truly yours,

Ron J. DeGregorio,
Vice President, Oyster Creek

Enclosure

cc: Administrator, Region I
NRC Project Manager
NRC Sr. Resident Inspector

IE25

2001

RADIOLOGICAL ENVIRONMENTAL MONITORING REPORT

OYSTER CREEK GENERATING STATION

AMERGEN ENERGY COMPANY

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SUMMARY AND CONCLUSIONS

The results of the radiological environmental monitoring performed during 2001 by the AmerGen Chemistry/Radwaste Department at the Oyster Creek Generating Station (OCGS) are presented in this report. The operation of a nuclear power plant results in the release of small amounts of radioactive materials to the environment. A radiological environmental monitoring program (REMP) has been established to monitor radiation and radioactive materials in the environment around the OCGS. The program also evaluates the relationship between amounts of radioactive material released in effluents to the environment and resultant radiation doses to individuals. Summaries and interpretations of the data were published semiannually from 1969-1985 and annually since 1986 (Ref. 20 through 34). Additional information concerning releases of radioactive materials to the environment is contained in the Semi-Annual and Annual Effluent Release Reports submitted to the United States Nuclear Regulatory Commission (USNRC).

During 2001, as in previous years, the radioactive effluents associated with the OCGS were a small fraction of the applicable federal regulatory limits and did not have significant effects on the quality of the environment. The calculated maximum hypothetical radiation dose to the public attributable to 2001 operations at the OCGS was only 1.44 percent of the applicable regulatory limit and significantly less than doses received from other man-made sources and natural background sources of radiation.

Radioactive materials considered in this report are normally present in the environment, either naturally or as a result of non-OCGS activities such as prior atmospheric nuclear weapons testing, medical industry activities, and the 1986 Chernobyl accident. Consequently, measurements made in the vicinity of the site were compared to background measurements to determine any impact of OCGS operations. Samples of air, well water, surface water, clams, sediment, fish, crabs, and vegetables were collected. Samples were analyzed for radioactivity including tritium (H-3), gross beta, and gamma-emitting radionuclides. External penetrating radiation dose measurements also were made using thermoluminescent dosimeters (TLDs) in the vicinity of the OCGS.

The results of these radiological measurements were used to assess the environmental impact of OCGS operations, to demonstrate compliance with the Technical Specifications (Ref. 1), the Offsite Dose Calculation Manual Specifications (Ref. 2), and applicable federal regulations, and to verify the adequacy of containment and radioactive effluent control systems. The data collected by the REMP also provide a historical record of the levels of radionuclides and radiation attributable

to natural causes, worldwide fallout from prior nuclear weapons tests and the Chernobyl accident, as well as OCGS operations.

Radiological impacts in terms of radiation dose as a result of OCGS operations were calculated and also are discussed. The results provided in this report are summarized in the following highlights:

- During 2001, 639 samples were collected from the aquatic, atmospheric, and terrestrial environments around the OCGS. A total of 707 analyses were performed on these samples. TLDs were also utilized to provide 173 direct radiation dose measurements. Forty groundwater samples were collected from local municipal water supplies and on-site wells and eighty analyses were performed on those samples.

- No radionuclides ascribable to OCGS operations were detected in the offsite environment during 2001. This is the first year that cesium-137 (Cs-137) was not detected in sediment samples and the fifth consecutive annual reporting period during which cobalt-60 (Co-60) was not detected in any environmental media. This is a result of the minimization of liquid radioactive effluents and the natural radioactive decay process.

- The predominant radionuclide released in gaseous effluents during 2001 was xenon-135 (Xe-135). No liquid effluents were released during the reporting period. The maximum radiation dose to a member of the public, attributable to 2001 effluents, was only 1.44 percent of applicable regulatory limit.

- During 2001, the maximum total body dose potentially received by an individual from airborne effluents was conservatively estimated to be 0.00569 millirems. The total body dose to the surrounding population from airborne effluents was conservatively calculated to be 0.208 person-rem. This is approximately 6 million times lower than the dose that the total population within 50 miles of the OCGS receives from natural background sources.

INTRODUCTION

Characteristics of Radiation

Instability within the nucleus of radioactive atoms results in the release of energy in the form of radiation. Radiation is classified according to its nature - particulate and electromagnetic. Particulate radiation consists of energetic subatomic particles such as electrons (beta particles), protons, neutrons, and alpha particles. Because of its limited ability to penetrate the human body, particulate radiation in the environment contributes primarily to internal radiation exposure resulting from inhalation and ingestion of radioactivity.

Electromagnetic radiation in the form of x-rays and gamma rays has characteristics similar to visible light but is more energetic and, hence, more penetrating. Although x-rays and gamma rays are penetrating and can pass through varying thicknesses of materials, once they are absorbed, they produce energetic electrons which release their energy in a manner that is identical to beta particles. The principal concern for gamma radiation from radionuclides in the environment is their contribution to external radiation exposure.

The rate at which atoms undergo disintegration (radioactive decay) varies among radioactive elements, but is uniquely constant for each specific radionuclide. The term "half-life" defines the time it takes for half of any amount of an element to decay and can vary from a fraction of a second for some radionuclides to millions of years for others. In fact, the natural background radiation to which all mankind has been exposed is largely due to the radionuclides of uranium (U), thorium (Th), and potassium (K). These radioactive elements were formed with the creation of the universe and, owing to their long half-lives, will continue to be present for millions of years to come. For example, potassium-40 (K-40) has a half-life of 1.3 billion years and exists naturally within our bodies. As a result, approximately 4000 atoms of potassium emit radiation internally within each of us every second of our life.

In assessing the impact of radioactivity on the environment, it is important to know the quantity of radioactivity released and the resultant radiation doses. The common unit of radioactivity is the curie (Ci). It represents the radioactivity in one gram (g) of natural radium (Ra) which is also equal to a decay rate of 37 billion radiation emissions every second. Because the level of radioactive material in the environment is extremely small, it is more convenient to work with portions or

fractions of a curie. Subunits such as picocurie (pCi), (one trillionth of a curie), are frequently used to express the radioactivity present in environmental and biological samples.

The biological effects of a specific dose of radiation are the same whether the radiation source is external or internal to the body. The important factor is how much radiation energy or dose was deposited. The unit of radiation dose is the Roentgen Equivalent Man (rem), which also incorporates the variable effectiveness of different forms of radiation to produce biological change. For environmental radiation exposures, it is convenient to use the smaller unit of millirem (mrem) to express dose (1000 mrem equals 1 rem). When radiation exposure occurs over periods of time, it is appropriate to refer to the dose rate. Dose rates, therefore, define the total dose for a fixed interval of time, and for environmental exposures, are usually measured with reference to one year of time (mrem per year).

Sources of Radiation

Life on earth has evolved amid the constant exposure to natural radiation. In fact, the single major source of radiation to which the general population is exposed comes from natural sources. Although everyone on the planet is exposed to natural radiation, some people receive more than others. Radiation exposure from natural background has three components (i.e., cosmic, terrestrial, and internal) and varies with altitude and geographic location, as well as with living habits.

For example, cosmic radiation originating from deep interstellar space and the sun increases with altitude, because there is less air to act as a shield. Similarly, terrestrial radiation resulting from the presence of naturally occurring radionuclides in the soil varies and may be significantly higher in some areas of the country than in others. Even the use of particular building materials for houses, cooking with gas, and home insulation affect exposure to natural radiation.

The presence of radioactivity in the human body results from the inhalation and ingestion of air, food, and water containing naturally occurring radionuclides. For example, drinking water contains trace amounts of uranium and radium, and milk contains radioactive potassium. Table 1 summarizes the common sources of radiation and their average annual dose.

TABLE 1

(Adapted from Ref. 4)
Sources and Doses of Radiation*

Natural (82%)		**Man-made (18%)**	
Source	**Radiation Dose (mrem/year)**	**Source**	**Radiation Dose (mrem/year)**
Radon	200 (55%)	Medical X-ray	39 (11%)
Cosmic rays	27 (8%)	Nuclear Medicine	14 (4%)
Terrestrial	28 (8%)	Consumer products	10 (3%)
Internal	40 (11%)	Other (Releases from nat. gas, phosphate mining, burning of coal, weapons fallout, & nuclear fuel cycle)	<1 (<1%)
Approximate Total	295	Approximate Total	64

*Percentage contribution of the total dose is shown in parentheses.

The average person in the United States receives about 300 mrem/yr (0.3 rem/yr) from natural background radiation sources. This estimate was recently revised from (approximately) 100 to 300 mrem because of the inclusion of radon gas which has always been present but has not been previously included in the calculations. In some regions of the country, the amount of natural radiation is significantly higher. Residents of Colorado, for example, receive an additional 60 mrem/yr due to the increase in cosmic and terrestrial radiation levels. In fact, for every 100 feet above sea level, a person will receive an additional 1 mrem/yr from cosmic radiation. In several regions of the world, high concentrations of uranium and radium deposits result in doses of several thousand mrem/yr to their residents (Ref. 4).

Recently, public attention has focused on radon (Rn), a naturally occurring radioactive gas produced from uranium and radium decay. These elements are widely distributed in trace amounts in the earth's crust. Unusually high concentrations have been found in certain parts of eastern Pennsylvania and northern New Jersey. Radon levels in some homes in these areas are hundreds of times greater than levels found elsewhere in the United States. However, additional surveys are needed to determine the full extent of the problem nationwide. Radon is the largest component of natural background radiation and may be responsible for a substantial number of lung cancer deaths annually. The National Council on Radiation Protection and Measurements (NCRP) estimates that

the average individual in the United States receives an annual dose of about 2,400 mrem to the lung from natural radon gas (Ref. 4). This lung dose is considered to be equivalent to a whole body dose of 200 millirems. The NCRP has recommended actions to control indoor radon sources and reduce exposures.

When radioactive substances are inhaled or swallowed, they are distributed within the body in a non-uniform fashion. For example, radioactive iodine selectively concentrates in the thyroid gland, radioactive cesium is distributed throughout the body water and muscles, and radioactive strontium concentrates in the bones. The total dose to organs by a given radionuclide also is influenced by the quantity and the duration of time that the radionuclide remains in the body, including its physical, biological, and chemical characteristics. Depending on their rate of radioactive decay and biological elimination from the body, some radionuclides stay in the body for very short times while others remain for years.

In addition to natural radiation, we are exposed to radiation from a number of man-made sources. The single largest of these sources comes from diagnostic medical x-rays and nuclear medical procedures. Some 180 million Americans receive medical x-rays each year. The annual dose to an individual from such radiation averages about 53 millirems. Much smaller doses come from nuclear weapons fallout and consumer products such as televisions, smoke detectors, and fertilizers. Production of commercial nuclear power and its associated fuel cycle contributes less than 1 mrem to the annual dose of about 300 mrem for the average individual living in the United States.

Fallout commonly refers to the radioactive debris that settles to the surface of the earth following the detonation of nuclear weapons. It is dispersed throughout the environment either by dry deposition or washed down to the earth's surface by precipitation. There are approximately 200 radionuclides produced in the nuclear weapon detonation process; a number of these are detected in fallout. The radionuclides found in fallout which produce most of the fallout radiation exposures to humans are iodine-131 (I-131), strontium-89 (Sr-89), strontium-90 (Sr-90), and cesium-137 (Cs-137). There has been no atmospheric nuclear weapon testing since 1980 and many of the radionuclides, still present in our environment, have decayed significantly. Consequently, doses to the public from fallout have been decreasing.

As a result of the nuclear accident at Chernobyl, USSR, on April 26, 1986, radioactive material was dispersed throughout the global environment and detected in various media such as air, milk, and soil. Cesium-134, cesium-137, iodine-131, and other radionuclides released from Chernobyl were

detected at the OCGS in significant amounts following the accident. These radionuclides continue to decay toward a stable state in the environment.

Nuclear Reactor Operations

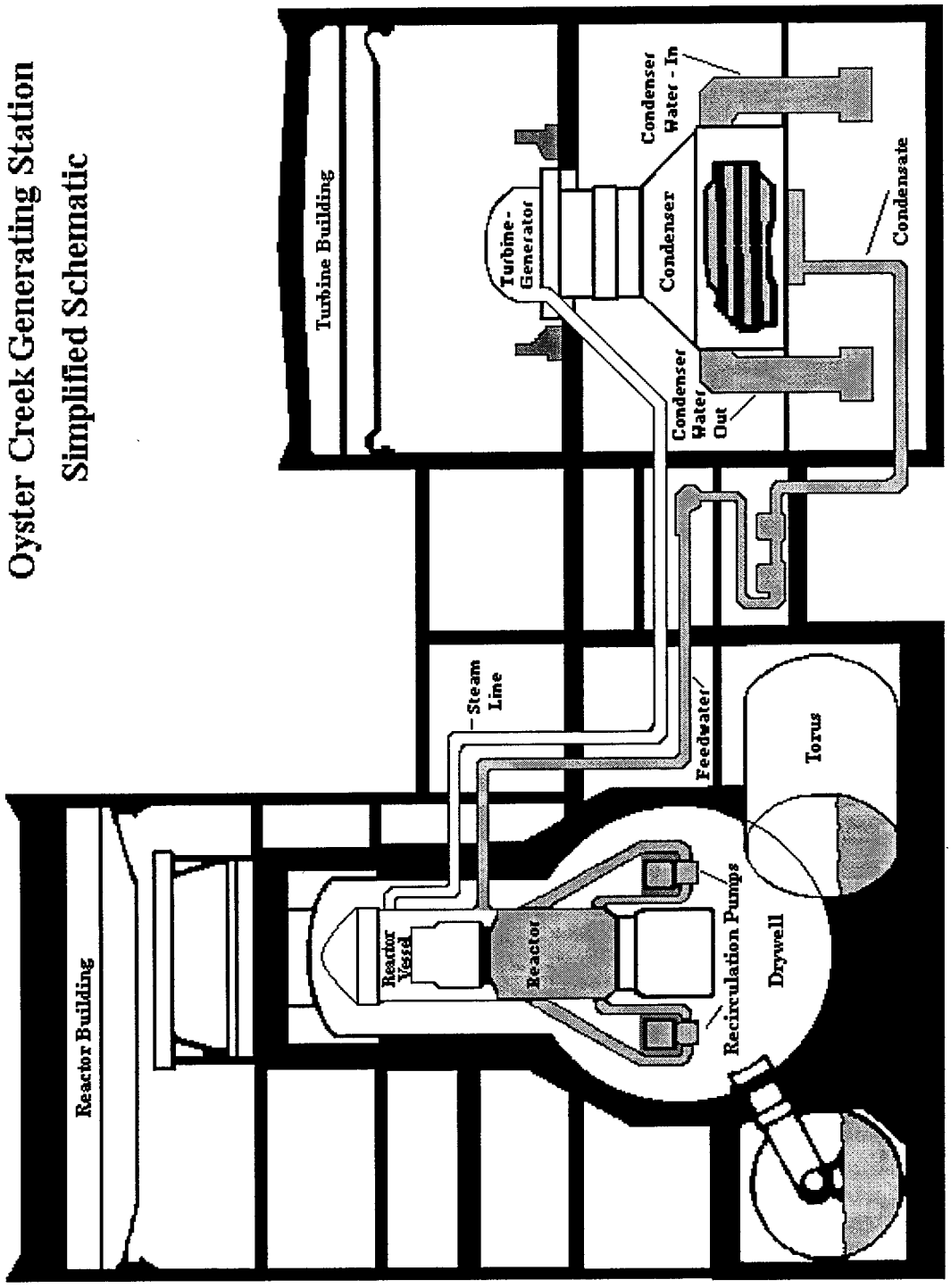
Common to the commercial production of electricity is the consumption of fuel which produces heat to make steam which turns the turbine-generator which generates electricity. Unlike the burning of coal, oil, or gas in fossil fuel powered plants to generate heat, the fuel of most nuclear reactors is comprised 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 (an atomic particle found in nature and also produced by the fissioning of uranium in the reactor) and splits to produce smaller atoms termed fission products, along with heat, radiation, and free neutrons. The free neutrons travel through the reactor and are similarly absorbed by the uranium, permitting the fission process to continue. As this process continues, more fission products, radiation, heat, and neutrons are produced and a sustained reaction occurs. The heat produced is transferred via reactor coolant (water) from the fuel to produce steam which drives a turbine-generator to produce electricity. The fission products are mostly radioactive; that is, they are unstable atoms which emit radiation as they decay to stable atoms. Neutrons which are not absorbed by the uranium fuel may be absorbed by stable atoms in the materials which 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.

The OCGS reactor is a Boiling Water Reactor (BWR). The nuclear fuel is designed to be contained within sealed fuel rods arranged in arrays called bundles which are located within a massive steel pressure vessel. As depicted in Figure 1, cooling water boils within the reactor vessel producing steam which drives the turbine. After the energy is extracted from the steam in the turbine, it is cooled and condensed back into water in the main condensers. This condensate is then pumped back into the reactor vessel and the cycle repeats.

Several hundred radionuclides of some 40 different elements are created in a nuclear reactor during the process of generating electricity. Because of reactor engineering designs, the short half-lives of many radionuclides, and their chemical and physical properties, nearly all radioactivity is contained.

The OCGS reactor has six independent barriers that confine radioactive materials produced in the

Figure 1


Oyster Creek Generating Station
Simplified Schematic
Reactor Building
Turbine Building
Turbine-Generator
Condenser
Condenser Water - In
Condenser Water Out
Condensate
Steam Line
Feedwater
Torus
Reactor Vessel
Reactor
Recirculation Pumps
Drywell

reactor as it heats the water. Under normal operating conditions, essentially all radioactivity is contained within the first two barriers.

The ceramic uranium fuel pellets provide the first barrier. Most of the fission products are either trapped or chemically bound in the fuel where they remain. However, a few fission products, which are volatile or gaseous at normal operating temperatures, may not be contained in the fuel.

The second barrier consists of zirconium (Zr) alloy tubes (termed "fuel cladding") that resist corrosion and degradation due to high temperatures. The fuel pellets are contained within these tubes. There is a small gap between the fuel and the cladding, in which the noble gases and other volatile radionuclides collect and are contained.

The primary coolant water is the third barrier. Many of the fission products, including radioactive iodine, strontium, and cesium are soluble and are retained in water in an ionic (electrically charged) form. These materials can be removed in the reactor coolant purification system. However, krypton (Kr) and xenon (Xe) do not readily dissolve in the coolant, particularly at high temperatures. Krypton and xenon collect as a gas above the condensate when the steam is condensed.

The fourth barrier consists of the reactor pressure vessel, turbine, condenser, and associated piping of the coolant system. The reactor pressure vessel is a 63-foot high tank with steel walls approximately eight inches thick. It encases the reactor core. The remainder of the coolant system, including the turbine and condenser and associated piping, provides containment for radioactivity in the primary coolant.

The drywell provides the fifth barrier. It is a steel-lined vessel, surrounded by concrete walls of variable thickness ranging from 4 1/2 to 7 1/4 feet. The drywell encloses the reactor pressure vessel and recirculating pumps and piping.

The reactor building provides the sixth barrier. It is a reinforced concrete and steel superstructure with walls approximately 5 feet thick that enclose the drywell and other plant components. The Reactor Building is always maintained at a negative pressure to prevent out-leakage.

Sources of Liquid and Airborne Effluents

Although the previously described barriers contain radioactivity with high efficiency, small amounts of radioactive fission products are nevertheless able to diffuse or migrate through minor flaws in the

fuel cladding and into the reactor coolant. Trace quantities of reactor system component and structural surfaces which have been activated also get into the reactor coolant water. Many of the soluble fission and activation products such as iodines, strontiums, cobalts, and cesiums are removed by demineralizers in the purification system of the reactor coolant. The physical and chemical properties of noble gas fission products in the primary coolant prevent their removal by the demineralizers.

Because the reactor system has many valves and fittings, an absolute seal cannot be achieved. Minute drainage of radioactive liquids from valves, piping, and/or equipment associated with the coolant system may occur in the Reactor and/or Turbine Buildings. Noble gases, produced during the fission process, are collected as gaseous waste which is processed in the multistage systems in the OCGS Augmented Off-Gas Building, while the remaining radioactive liquids are collected in floor and equipment drains and sumps and are pumped to and processed in the OCGS Radwaste Facility.

Reactor off-gas, consisting primarily of hydrogen and radioactive non-condensable gases, is withdrawn from the reactor primary system by steam jet air ejectors. These air ejectors drive the process stream through a 60 minute holdup pipe at approximately 110 cubic feet per minute and then into the Augmented Off-Gas (AOG) System. The holdup pipe allows radionuclides with short half-lives to decay. The Augmented Off-Gas System is a gaseous processing system which provides hydrogen conversion to water via a catalytic recombiner, removes the water (vapor) from the process stream, holds up the process stream to allow further decay of short-lived nuclides, and filters the off-gas using charcoal beds and High Efficiency Particulate (HEPA) filters prior to discharge to the base of the stack. Once the process stream enters the stack, it is diluted by building ventilation, which averages approximately 200,000 cubic feet per minute, is monitored and sampled, and then is discharged out the top of the 368-foot stack.

The liquid waste processing system receives water contaminated with radioactivity and processes it by filtration, demineralization, and distillation. Purified radwaste water is routinely recycled to the plant. Occasionally, it may be necessary to discharge this purified water, under the guidelines of applicable permits, to the environment. Contaminants removed during the purification process are stored in the radwaste building and are eventually disposed of via the radioactive solids disposal systems. Before purified water is discharged to the environment, it is first sampled, analyzed, assigned a release rate, and then released to the discharge canal which under operating conditions, has a flow rate of 460,000 to 960,000 gallons per minute.

DESCRIPTION OF THE OYSTER CREEK GENERATING STATION SITE

General Information

The Oyster Creek Generating Station is located in Lacey Township of Ocean County, New Jersey, about 60 miles south of Newark, 9 miles south of Toms River, and 35 miles north of Atlantic City. It lies approximately 2 miles inland from Barnegat Bay. The site, covering approximately 781 acres, is situated partly in Lacey Township and, to a lesser extent, in Ocean Township. The intake and discharge canals bound the site on the west. Access is provided by U. S. Route 9, passing through the site and separating a 637-acre eastern portion from the balance of the property west of the highway. The station is about 1/4 mile west of the highway and 1-1/4 miles east of the Parkway. The site property extends about 2-1/2 miles inland from the bay; the maximum width in the north-south direction is almost 1 mile. The site location is part of the New Jersey shore area with its relatively flat topography and extensive freshwater and saltwater marshlands. The South Branch of Forked River runs across the northern side of the site and Oyster Creek partly borders the southern side.

It is estimated that approximately 4.1 million people reside within a 50 mile radius of the OCGS (Ref. 3). The nearest population center is Ocean Township, which lies less than two miles south-southeast of the site. Based on 1994 population estimates, 5908 people reside in Ocean Township. Two miles to the north of the OCGS, 23,897 people reside in Lacey Township (estimated 1994 population). Dover Township, situated 9.5 miles to the north, is the nearest major population center with a population of 81,550 (estimated 1994 population). The region adjacent to Barnegat Bay is one of the State's most rapidly developing areas. In addition to the resident population, a sizable seasonal influx of people occurs during the summer. This influx occurs almost exclusively along the waterfront.

Climatological Summary

Meteorological data were obtained from an on-site weather station during 2001. These data are subject to extensive quality assurance reviews and categorized for further analysis, including historical comparisons with both on-site and off-site sources, as well as statistical processes to monitor instrument performance.

The weather highlights around the OCGS during 2001 were above average rainfall for the year, total snowfall of less than six inches, and very few Atlantic Ocean tropical storms and hurricanes.

Other than rainfall, all other meteorological data recorded at the OCGS were close to the historical average.

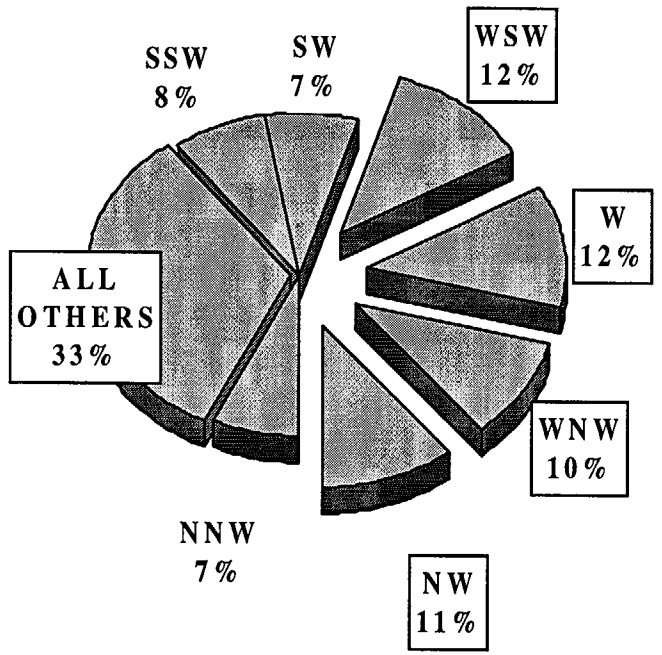
The frequency of occurrence of wind direction for the year was most pronounced from the west-southwest through the northwest sectors. This reflects the progression of weather systems from the west to the east. During 2001, the four compass sectors with the highest percentages of hourly occurrences, as measured at the 33-foot level, were from the west-southwest, west, west-northwest, and northwest (Fig 2.)

Temperatures recorded at the OCGS during 2001 were close to the historical average. The annual mean temperature recorded at the OCGS was 54.0 degrees Fahrenheit (F) while the annual Atlantic City historical average temperature is 53.9 degrees. Four months in 2001, January, March, July, and September experienced slightly below normal average temperatures and four months, February, August, November, and December, experienced slightly higher than average monthly temperatures (Fig. 3). The largest difference regarding average temperatures occurred in December where the 2001 average temperature was 6.45 degrees above the historical average. The largest difference regarding lower than average temperatures occurred in July where the average temperature was 4.48 degrees below the historical average.

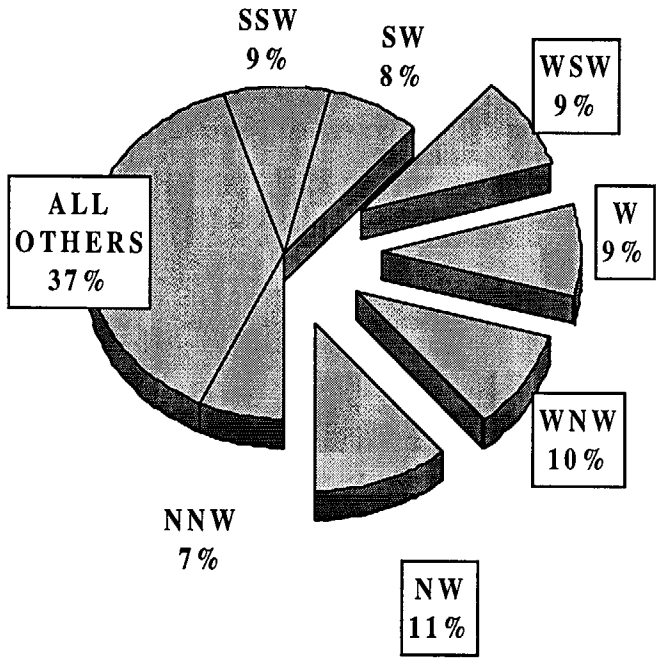
Precipitation totals for the year were above normal. For the calendar year, 48.80 inches of precipitation fell in the vicinity of the OCGS. This is 7.30 inches more than the historical average (1946-1981) of 41.50 inches as recorded by the National Weather Service in Atlantic City, NJ. Monthly precipitation totals recorded at the OCGS experienced a wide variation during the year. The first three months of the year 2001 experienced precipitation totals that were higher than average, with the highest difference (4.27 inches) occurring in March (Fig 4.). The second two months, April and May, experienced lower than average rainfall. The following four months, June, July, August, and September experienced higher than average rainfall while the final three months of 2001 had lower than normal precipitation. The bulk of the yearly precipitation was a result of low pressure systems that arrived via the jet stream.

For additional site-specific meteorological data, refer to the OCGS Annual Radioactive Effluent Release Report for 2001 (Ref. 35).

OYSTER CREEK GENERATING STATION
WIND DIRECTION FREQUENCY OF OCCURRENCE - 2001
WIND DIRECTION FROM EACH COMPASS SECTOR
VALUES IN PERCENT OF HOURLY OCCURRENCE



33-FOOT WIND DIRECTION



380-FOOT WIND DIRECTION

NOTE: THE FOUR (4) HIGHEST FREQUENCY OF OCCURRENCE SECTORS ARE HIGHLIGHTED

FIGURE 2

OYSTER CREEK GENERATING STATION
MONTHLY MEAN AMBIENT AIR TEMPERATURE - 2001
COMPARED WITH HISTORICAL (1946-1981) ATLANTIC CITY
NATIONAL WEATHER SERVICE AVERAGE TEMPERATURE DATA

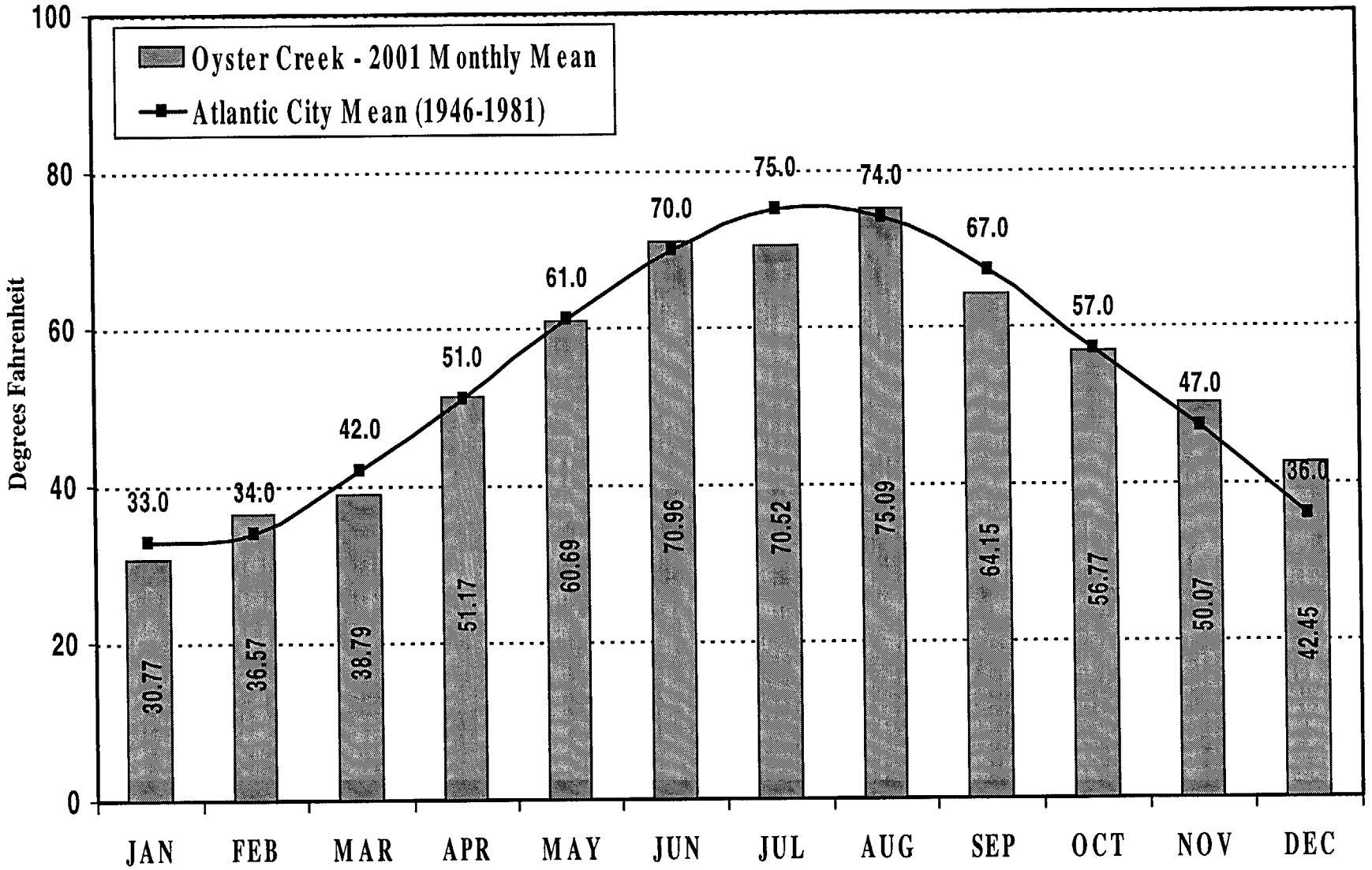


FIGURE 3

OYSTER CREEK GENERATING STATION
MONTHLY PRECIPITATION - 2001
COMPARED WITH HISTORICAL (1946-1981) ATLANTIC CITY
NATIONAL WEATHER SERVICE AVERAGE PRECIPITATION DATA

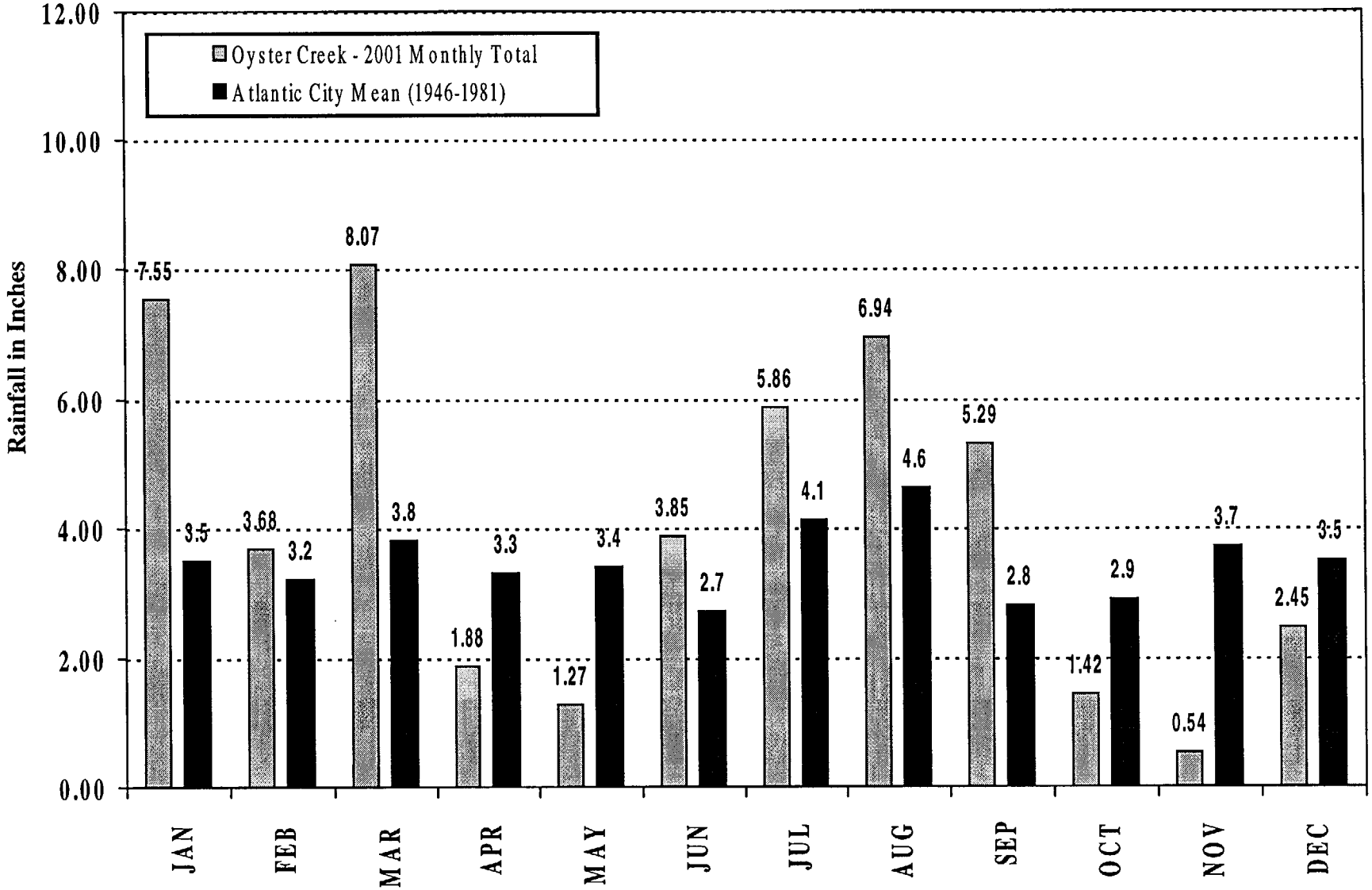


FIGURE 4

EFFLUENTS

Historical Background

Almost from the outset of the discovery of x-rays in 1895 by Wilhelm Roentgen, the potential hazard of ionizing radiation was recognized and efforts were made to establish radiation protection standards. The International Commission on Radiological Protection (ICRP) and the National Council on Radiation Protection and Measurements (NCRP) were established in 1928 and 1929, respectively. These organizations have the longest continuous experience in the review of radiation health effects and with making recommendations on guidelines for radiological protection and radiation exposure limits. In 1955, the United Nations created a Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) to summarize reports received on radiation levels and the effects on man and his environment. The National Academy of Sciences (NAS) formed a committee in 1956 to review the biological effects of atomic radiation (BEAR). A series of reports have been issued by this and succeeding NAS committees on the biological effects of ionizing radiation (BEIR), the most recent during 1990 (known as BEIR V).

These committees and commissions of nationally and internationally recognized scientific experts have been dedicated to the understanding of the health effects of radiation by investigating all sources of relevant knowledge and scientific data and by providing guidance for radiological protection. Their members are selected from universities, scientific research centers, and other national and international research organizations. The committee reports contain scientific data obtained from physical, biological, and epidemiological studies on radiation health effects and serve as scientific references for information presented in this report.

Since its inception, the USNRC has depended upon the recommendations of the ICRP, the NCRP, and the Federal Radiation Council (FRC) (incorporated in the United States Environmental Protection Agency (USEPA) in 1970) for basic radiation protection standards and guidance in establishing regulations for the nuclear industry (Ref. 6 through 9).

Effluent Release Limits

As part of routine plant operations, limited quantities of radioactivity are released to the environment in liquid and airborne effluents. An effluent control program is implemented by AmerGen Energy Company to ensure radioactivity released to the environment is minimal and does not exceed release limits. The Federal government establishes limits on radioactive materials released to the

environment. These limits are set at low levels to protect the health and safety of the public and are specified in the OCGS Technical Specifications and Offsite Dose Calculation Manual (ODCM) (Ref. 1 and 2). AmerGen Energy Company conducts operations in a manner that limits radioactive effluents to small percentages of the federal limits.

A recommendation of the ICRP, NCRP, and FRC is that radiation exposures should be maintained at levels which are "as low as reasonably achievable" (ALARA) and commensurate with the societal benefit derived from the activities resulting in such exposures. For this reason, dose limit guidelines were established by the USNRC for releases of radioactive effluents from nuclear power plants. These guidelines were then used as the basis for the development of the ODCM and Technical Specifications. In keeping with the ALARA principle, the OCGS operates in a manner that results in radioactive releases that are a small fraction of these limits.

Applicable OCGS Offsite Dose Calculation Manual limits are as follows:

- ODCM Specification 4.6.1.1.3.A

  Radioactivity Concentration in Liquid Effluent

  The concentration of radioactive material, other than noble gases, in liquid effluent in the discharge canal at the U.S. Route 9 bridge shall not exceed 10 times the liquid effluent concentrations specified in 10CFR Part 20.1001-20.2401, Appendix B, Table II, Column 2.

- ODCM Specification 4.6.1.1.3.B

  Radioactivity Concentration in Liquid Effluent

  The concentration of noble gases dissolved or entrained in liquid effluent in the discharge canal at the U.S. Route 9 bridge shall not exceed 2.0 E-4 uCi/ml.

- ODCM Specification 4.6.1.1.4.A

  Limit on Dose Due to Liquid Effluent

  The dose to a MEMBER OF THE PUBLIC due to radioactive material in liquid effluent in the UNRESTRICTED AREA shall not exceed:
  1.5 mrem to the Total Body during any calendar quarter

5.0 mrem to any body organ during any calendar quarter

3.0 mrem to the Total Body during any calendar year
or
10.0 mrem to any body organ during any calendar year.

- ODCM Specification 4.6.1.1.5.A

Dose Rate Due to Gaseous Effluent

The dose equivalent rate in the UNRESTRICTED AREA due to radioactive noble gas in gaseous effluent shall not exceed 500 mrem/year to the total body or 3000 mrem/year to the skin.

- ODCM Specification 4.6.1.1.5.B

Dose Rate Due to Gaseous Effluent

The dose equivalent rate in the UNRESTRICTED AREA due to tritium (H-3), I-131, I-133, and to radioactive material in particulate form having half-lives of 8 days or more in gaseous effluents shall not exceed 1500 mrem/year to any body organ when the dose rate due to H-3, Sr-89, Sr-90, and alpha-emitting radionuclides is averaged over no more than 3 months and the dose rate due to other radionuclides is averaged over no more than 31 days.

- ODCM Specification 4.6.1.1.6.A

Air Dose Due to Noble Gas in Gaseous Effluent

The air dose in the UNRESTRICTED AREA due to noble gas released in gaseous effluent shall not exceed:
5 mRad/calendar quarter due to gamma radiation

10 mRad/calendar quarter due to beta radiation

10 mRad/calendar year due to gamma radiation

20 mRad/calendar year due to beta radiation

- ODCM Specification 4.6.1.1.7.A

  Dose Due to Radioiodine and Particulates in Gaseous Effluent

  The dose to a MEMBER OF THE PUBLIC from I-131, I-133, and from radiodines in particulate form having half-lives of 8 days or more in gaseous effluent, in the UNRESTRICTED AREA shall not exceed 7.5 mrem to any body organ per calendar quarter or 15 mrem to any body organ per calendar year.

- ODCM Specification 4.6.1.1.8.A

  Annual Total Dose Due to Radioactive Effluent

  The annual dose to a MEMBER OF THE PUBLIC due to radioactive material in effluent from the OCNGS in the UNRESTRICTED AREA shall not exceed 75 mrem to his/her thyroid or 25 mrem to his/her total body or to any other organ.

Effluent Control Program

Effluent control includes plant components such as the ventilation system and filters, off-gas holdup components, demineralizers, and an evaporator system. In addition to minimizing the release of radioactivity, the effluent control program includes all aspects of effluent and environmental monitoring. This includes the operation of a complex radiation monitoring system, collection and analysis of effluent samples, environmental sampling and monitoring, and a comprehensive quality assurance program. Over the years, the program has evolved in response to changing regulatory requirements and plant conditions. For example, additional instruments and samplers have been installed to ensure that measurements of effluents remain onscale in the event of any accidental release of radioactivity.

Effluent Instrumentation: Liquid and airborne effluent measuring instrumentation is designed to monitor the presence and the amount of radioactivity in effluents. Many of these instruments provide continuous surveillance of radioactivity releases. Calibrations of effluent instruments are performed using reference standards certified by the National Institute of Standards and Technology (NIST). Instrument alarm setpoints are pre-set to ensure that effluent release limits will not be exceeded. If radiation monitor alarm setpoints are reached, releases are immediately terminated.

Where continuous surveillance is not practicable or possible, contingencies are specified in the Offsite Dose Calculation Manual and/or the Technical Specifications.

Effluent Sampling and Analysis: In addition to continuous radiation monitoring instruments, samples of effluents are taken and subjected to laboratory analysis to identify the specific radionuclide quantities being released. A sample must be representative of the effluent from which it is taken. Sampling and analysis provide a sensitive and precise method of determining effluent composition. Samples are analyzed using state-of-the-art laboratory counting equipment. Radiation instrument readings and sample results are compared to ensure correct correlation.

Effluent Data

As part of routine plant operations, limited quantities of radioactivity are released to the environment in effluents. The amounts of radioactivity released vary and are dependent upon operating conditions, power levels, fuel conditions, efficiency of liquid and gas processing systems, and proper functioning of plant equipment. The largest variations occur in the airborne effluents of fission and activation gases, which are proportional to the integrity of the fuel cladding and the operation of the OCGS Augmented Off Gas system. In general, effluents have been decreasing with time due to improved fuel integrity and increased efficiency of processing systems.

With respect to activity released during 2001, the predominant radionuclide was xenon-135 (Xe-135) in gases (Table 2). There were no radioactive liquid releases from the OCGS during the year 2001. Estimated doses to the public, attributable to these effluents, were a small fraction of the applicable regulatory limits (Tables 8 and 9). A summary of the 2001 OCGS effluents can be found in Table 2 and in the 2001 Annual Radioactive Effluent Release Report, which is submitted to the USNRC (Ref. 35). Radioactive constituents of these effluents are discussed in the following sections:

Noble Gases: The predominant radioactive materials released in OCGS airborne effluents are typically the noble gases krypton (Kr) and xenon (Xe). Small amounts of noble gases can also be released in liquid effluents. The total amounts of krypton and xenon released into the atmosphere in 2001 were 173.6 curies, 219.0 curies, respectively. Noble gases are inert, which means they do not react chemically or biologically. Xenon-135, with a half-life of 9.1 hours, was the most abundant noble gas released. These noble gases were readily dispersed into the atmosphere when released and because of their short half-lives, quickly decayed into stable, nonradioactive forms.

TABLE 2

RADIONUCLIDE COMPOSITION OF OCGS EFFLUENTS FOR 2001

Radionuclide	Half-Life	Liquid Effluents (Ci)	Airborne Effluents (Ci)
H-3	1.23 E+01 Years	No Releases	2.79 E+01
Mn-54	3.12 E+02 Days	No Releases	2.51 E-05
Co-60	5.27 E+00 Years	No Releases	4.16 E-05
Kr-85m	4.48 E+00 Hours	No Releases	1.21 E+01
Kr-87	1.27 E+00 Hours	No Releases	1.10 E+02
Kr-88	2.84 E+00 Hours	No Releases	5.15 E+01
Sr-89	5.05 E+01 Days	No Releases	3.84 E-02
Sr-90	2.91 E+01 Years	No Releases	4.69 E-04
I-129	1.70 E+07 Years	No Releases	4.64 E-06
I-131	8.05 E+00 Days	No Releases	3.82 E-02
I-132	2.28 E+00 Hours	No Releases	1.19 E-01
I-133	2.08 E+01 Hours	No Releases	1.96 E-01
Xe-133	5.24 E+00 Days	No Releases	4.12 E-03
I-134	2.07 E+00 Years	No Releases	1.02 E-01
I-135	6.57 E+00 Hours	No Releases	2.51 E-01
Xe-135	9.10 E+00 Hours	No Releases	2.19 E+02
Xe-135m	1.56 E+01 Hours	No Releases	4.43 E-02
Cs-137	3.02 E+01 Years	No Releases	1.44 E-04
Ba-140	1.28 E+01 Days	No Releases	1.65 E-02
Gross Alpha	-	No Releases	6.00 E-06

NOTE: All effluents are expressed in scientific notation. No other nuclides were detected.

Iodines and Particulates: The discharge of iodines and particulates to the environment is minimized by factors such as their high chemical reactivity, solubility in water, and the high removal efficiency of airborne and liquid processing systems.

Of the gaseous radioiodines, iodine-131 is of particular interest because of its relatively long half-life of 8.05 days. Particulates of interest are the radiocesiums (Cs-134 and Cs-137), radiostrontiums (Sr-89 and Sr-90), and activation products, manganese-54 (Mn-54) and cobalt-60 (Co-60). The total amount of iodines and particulates released from the OCGS in 2001 was 0.762 curies in airborne effluents.

Tritium: Tritium (H-3) is typically the predominant radionuclide released in liquid effluents and is also released in airborne effluents. Tritium is a radioactive isotope of hydrogen. It is produced in the reactor fuel and components and in reactor coolant as a result of neutron interaction with the naturally-occurring deuterium (also a hydrogen isotope) present in water. There were 27.9 curies of Tritium released in airborne effluents in 2001, which was the lowest annual total released since 15.1 curies was released in 1996. To put these amounts of H-3 into perspective, the world inventory of natural cosmic ray-produced tritium is approximately 70 million curies, which corresponds to a production rate of 4 million curies per year (Ref. 10). Tritium contributions to the environment from OCGS effluents are too small to have any measurable effect on the existing concentrations in the offsite environment.

Transuranics: Transuranics are produced by neutron capture in the fuel, and typically emit alpha and beta particles as they decay. Important transuranic isotopes produced in reactors are uranium-239 (U-239), plutonium-238 (Pu-238), plutonium-239 (Pu-239), plutonium-240 (Pu-240), plutonium-241 (Pu-241), americium-241 (Am-241), plutonium-243 (Pu-243), plus other isotopes of americium and curium. They have half-lives ranging from hundreds of days to millions of years. Greater than 99% of all transuranics are contained within the nuclear fuel.

These nuclides are insoluble and non-volatile and are not readily transported from in-plant pathways to the environment. Gaseous and liquid processing systems remove greater than 90% of transuranics that may be found in the reactor coolant. Because retention and removal efficiencies are so high, isotopic analyses for transuranics are not routinely performed. However, most transuranics are alpha emitters and are monitored by performing routine gross alpha analyses.

Carbon-14: Production of carbon-14 (C-14) in reactors is small. It is produced in the reactor coolant as a result of neutron interactions with oxygen (O) and nitrogen (N). Estimates for all nuclear power production worldwide show that 235,000 curies were released from 1970 through 1990 (Ref. 11). Carbon-14 also is produced naturally by the interactions of cosmic radiation with oxygen and nitrogen in the upper atmosphere. The worldwide inventory of natural C-14 is estimated at 241 million curies (Ref. 11). Since the inventory of natural carbon-14 is so large, releases from nuclear power plants do not result in a measurable change in the background concentration of carbon-14. Consequently, carbon-14 is not routinely monitored in plant effluents.

RADIOLOGICAL ENVIRONMENTAL MONITORING

AmerGen Energy Company conducts a comprehensive radiological environmental monitoring program (REMP) to monitor radiation and radioactive materials in the environment around the OCGS. The information obtained from the REMP is then used to determine the effect of OCGS operations, if any, on the environment and the public.

The USNRC has established regulatory guides, which contain acceptable monitoring practices (Ref. 12). The OCGS REMP was designed on the basis of these regulatory guides along with the USNRC Radiological Assessment Branch Technical Position on Environmental Monitoring (Ref. 13). The OCGS REMP meets or exceeds all of these guidelines.

The objectives of the REMP are:

- to assess dose impacts to the public from OCGS operations
- to verify in-plant controls for the containment of radioactive materials
- to monitor any buildup of long-lived radionuclides in the environment and changes in background radiation levels
- to provide reassurance to the public that the program is capable of adequately assessing impacts and identifying noteworthy changes in the radiological status of the environment
- to fulfill the requirements of the OCGS Offsite Dose Calculation Manual (ODCM) and Technical Specifications

Environmental Exposure Pathways to Humans from Airborne and Liquid Effluents

As previously discussed in the "Effluents" section, small amounts of radioactive material are released to the environment as a result of operating a nuclear generating station. Once released, these materials move through the environment in a variety of ways and may eventually reach humans via breathing, drinking, eating, and direct exposure. These routes of exposure are referred to as environmental exposure pathways. Figure 14 illustrates the important exposure routes.

While some pathways are relatively simple, such as inhalation of airborne radioactive materials, others may be complex. For example, radioactive airborne particulates may deposit onto forage, which when eaten by cows, may be transferred into milk, which is subsequently consumed by man. This route of exposure is known as the air-grass-cow-milk-human pathway.

Although radionuclides can reach humans by a number of pathways, some are more important than others. The critical pathway for a given radionuclide is the one that produces the greatest dose to a population or to a specific segment of the population. This segment of the population is known as the critical group and may be defined by age, diet, or other cultural factors. The dose may be delivered to the whole body or confined to a specific organ; the organ receiving the greatest fraction of the dose is known as the critical organ. This information was used to develop the OCGS REMP.

Sampling

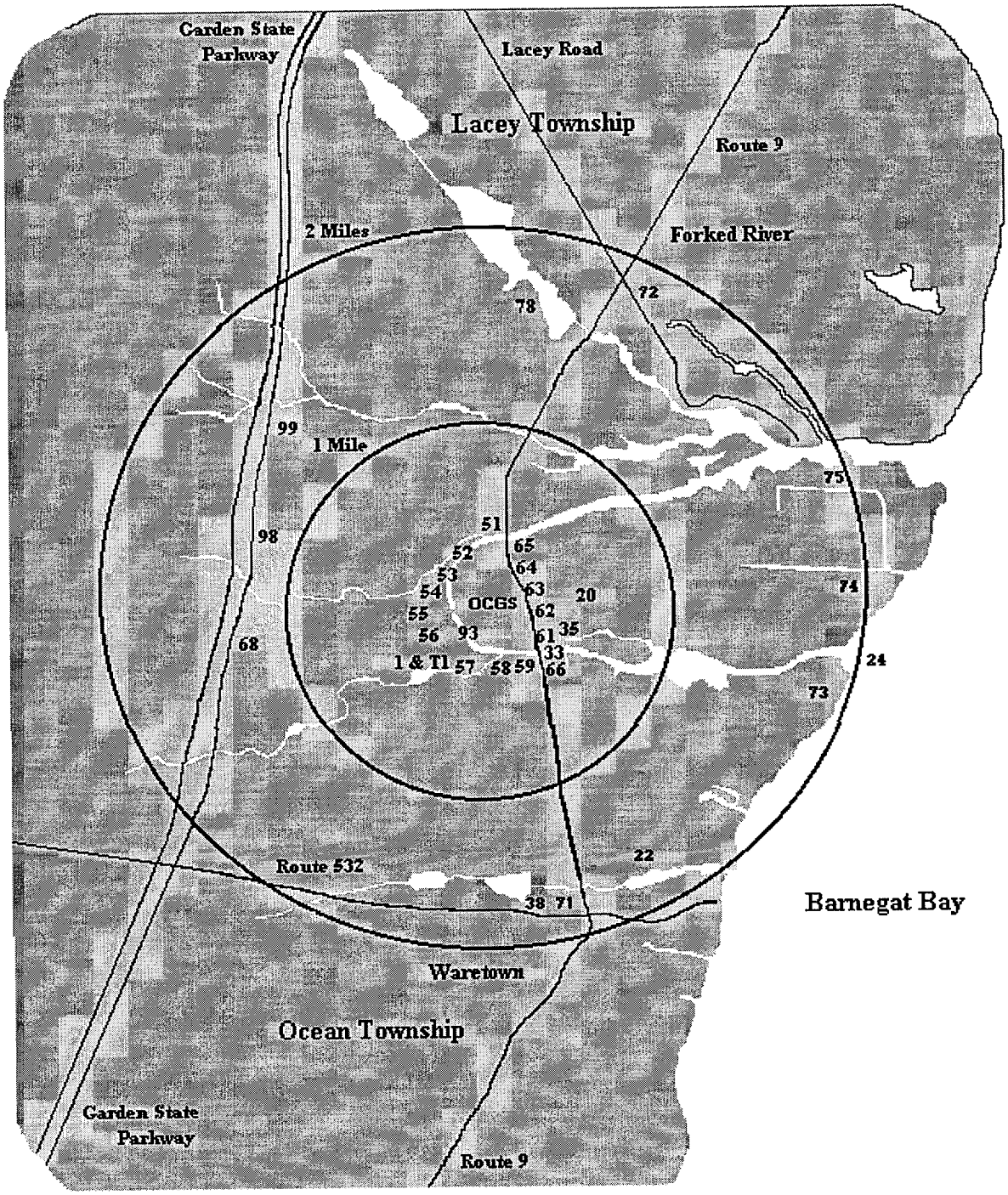
The OCGS radiological environmental monitoring program consists of two phases - the preoperational and the operational. Data gathered in the preoperational phase were used as a basis for evaluating radiation levels and radioactivity in the vicinity of the plant after the plant became operational. The operational phase began in 1969 when the OCGS attained initial criticality.

The program consists of taking radiation measurements and collecting samples from the environment, analyzing them for radioactive content, and interpreting the results. Emphasis is on the critical exposure pathways to humans with samples taken from the aquatic, atmospheric, and terrestrial environments. These samples include air, well water, surface water, clams, sediment, fish, crabs, and vegetables. Thermoluminescent dosimeters (TLDs) are placed in the environment to measure gamma radiation levels. The ODCM Specifications, along with recommendations from OCGS staff, specify the sample types to be collected and analyses to be performed.

Sampling locations were established by considering meteorology, population distribution, hydrology, and land use characteristics of the local area. The sampling locations are divided into two classes: indicator and background. Indicator locations are those which are expected to show effects from OCGS operations, if any exist. These locations were primarily selected on the basis of where the highest predicted environmental concentrations would occur. While the indicator locations are typically within a few miles of the plant, the background stations are generally at

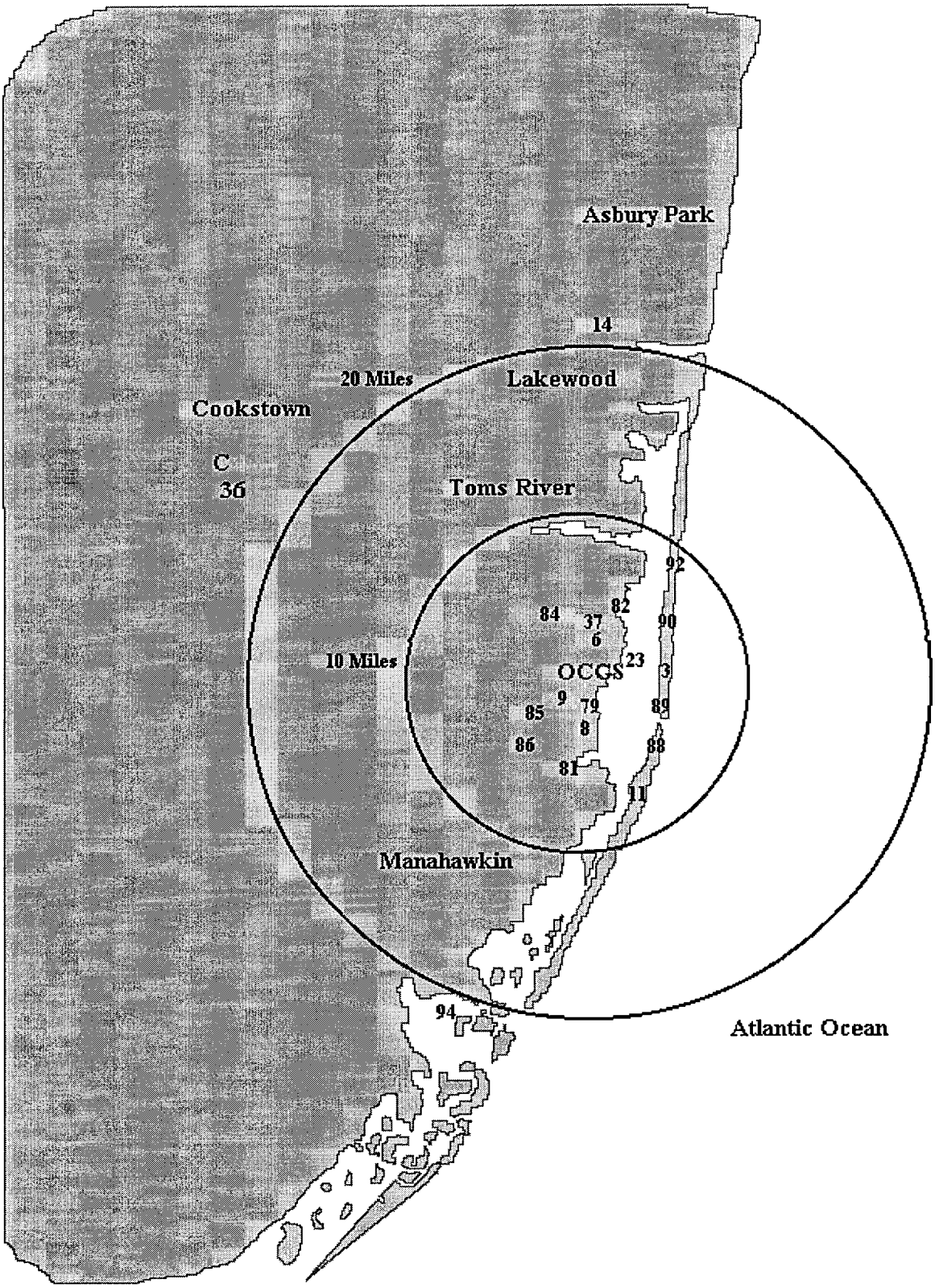
distances greater than 10 miles from the OCGS. Therefore, background samples are collected at locations which are expected to be unaffected by station operations. They provide a basis for evaluating fluctuations at indicator locations relative to natural background radioactivity and fallout from prior nuclear weapon tests. Figures 5 and 6 show the current sampling locations around the OCGS. Table A-1 in Appendix A describes the sampling locations by distance and azimuth (compass direction) from the OCGS, along with type(s) of samples collected at each sampling location.

Figure 5



Oyster Creek Generating Station (OCGS)
Locations of Radiological Environmental Monitoring Program (REMP)
Stations within two miles of the OCGS

Figure 6



Oyster Creek Generating Station (OCGS)
Locations of Radiological Environmental Monitoring Program (REMP)
Stations greater than 2 miles from the OCGS

Analysis

In addition to specifying the minimum media to be collected and the minimum number of sampling locations, the ODCM Specifications stipulate the frequency of sample collection and the types and frequency of analyses to be performed. Also specified are analytical sensitivities (detection limits) and reporting levels. Table A-2 in Appendix A provides a synopsis of the sample types, number of sampling locations, collection frequencies, number of samples collected, types and frequencies of analyses, and number of samples analyzed. Table A-3 in Appendix A lists samples which were not collected or analyzed in accordance with the requirements of the ODCM Specifications. Sample analyses which did not meet the required analytical sensitivities are presented in Appendix B. Changes in sample collection and analysis are described in Appendix C.

The analytical results are routinely reviewed by OCGS staff to assure that established sensitivities have been achieved and that the proper analyses have been performed. All analytical results are subjected to an automated review process which ensures that ODCM-required lower limits of detection are met and that reporting levels are not exceeded. Investigations are conducted when reporting levels are approached, reached, or when anomalous values are discovered.

REMP sample analysis results are presented in Appendix D in this report. Table D-1 in Appendix D provides a tabular reporting of analytical results for samples collected in 2001. Table D-1 summarizes the data in a format that closely resembles the suggested format presented in the USNRC Branch Technical Position (Ref. 13). Quality Assurance (QA) sample results for split and/or duplicate samples were used to verify the primary sample results. The QA program is described below.

Measurement of low radionuclide concentrations in environmental media requires special analysis techniques. Analytical laboratories use state-of-the-art laboratory equipment designed to detect beta and gamma radiation. This equipment must meet the required analytical sensitivities. Examples of the specialized laboratory equipment used are germanium detectors with multichannel analyzers for identifying specific gamma emitting radionuclides, liquid scintillation detectors for detecting tritium, low level proportional counters for detecting gross beta radioactivity, and coincidence counters for low level I-131 detection. Computer hardware

and software used in conjunction with the counting equipment perform calculations and provide data management. Analysis methods are described in Appendix J.

Quality Assurance Program

A Quality Assurance (QA) program is conducted in accordance with guidelines provided in Regulatory Guide 4.15, "Quality Assurance for Radiological Monitoring Programs" (Ref. 16) and as required by the ODCM Specifications (Ref. 2) and Technical Specifications (Ref. 1). The QA program is documented by OCGS written policies, procedures, and records. These documents encompass all aspects of the REMP including sample collection, equipment calibration, laboratory analysis, and data review.

The QA program is designed to identify possible deficiencies so that corrective action can be taken if warranted. It also provides a measure of confidence in the results of the monitoring program in order to assure the regulatory agencies and the public that the results are valid. The Quality Assurance program for the measurement of radioactivity in environmental samples is implemented by:

- Auditing all REMP-related activities including analytical laboratories.
- Requiring analytical laboratories to participate in an NRC approved Environmental Radioactivity Intercomparison Program.
- Requiring analytical laboratories to split samples for separate analysis (recounts are performed when samples can not be split).
- Splitting samples, having the samples analyzed by independent laboratories, and then comparing the results for agreement.
- Reviewing QA results of the analytical laboratories including spike and blank sample results and duplicate analysis results.

The Quality Assurance program and the results of the Environmental Radioactivity Intercomparison Program are outlined in Appendices E and F, respectively.

Panasonic TLD readers are calibrated monthly against standard TLDs to within five percent of the standard TLD values. Harshaw TLD readers are calibrated annually, or more frequently when necessary, to within ten percent of standard TLD values. Prior to any use, Harshaw readers are also checked with QC TLDs. The Harshaw reader is then checked every 50 TLDs with a QC badge to assure reader accuracy to within +/- 10 percent of a known value. Each group of TLDs processed by a reader contains control TLDs that are used to correct for minor variations in the reader. The accuracy and variability of the results for the control TLDs are examined for each group of TLDs to assure the reader is functioning properly.

Other cross-checks, calibrations, and certifications are in place to assure the accuracy of the TLD program:

- On a semiannual basis for Panasonic TLDs and on a quarterly basis for Harshaw TLDs, randomly selected badges are sent to an independent laboratory where they are irradiated to set doses not known to the laboratory. Results are then compared against established limits.

- Groups of Harshaw TLDs are annually checked for response to within 7.5 percent of a known value. Every two years, each Panasonic TLD is checked for response within 10 percent of a known value.

- Every two years, each dosimetry program is examined and recertified by the National Institute of Standards and Technology (NIST) National Voluntary Laboratory Accreditation Program (NVLAP).

- Four OCGS REMP TLD stations have collocated quality assurance badges which are processed by an independent laboratory (Teledyne Brown Engineering/Proxtronics). The results are compared against Panasonic or Harshaw TLD results.

The environmental dosimeters were tested and qualified to the specifications in the American National Standard Institute's (ANSI) Publication N545-1975 and USNRC Regulatory Guide 4.13 (Ref. 14 and 15).

DIRECT RADIATION MONITORING

Dose rates from external radiation sources were measured at a number of locations in the vicinity of the OCGS using thermoluminescent dosimeters (TLDs). Naturally occurring sources, including radiation of cosmic origin and natural radioactive materials in the air and ground, as well as fallout from prior nuclear weapons testing, resulted in a certain amount of penetrating radiation being recorded at all monitoring locations. Indicator TLDs were placed systematically, with at least one station in each of 16 meteorological compass sectors (in a ring), typically within 0.25 miles of the OCGS, or as close as reasonable highway access would permit. TLDs were also placed in each of the 16 sectors within a five mile radius of the OCGS, located in areas where the potential for deposition of radioactivity was determined to be high, in areas of public interest, and population centers. Background locations were located greater than twenty miles distant from the OCGS and generally in an upwind direction.

Sample Collection and Analysis

A state-of-the-art thermoluminescent dosimeter is used. Thermoluminescence is a process in which ionizing radiation, upon interacting with the sensitive material of the TLD (the phosphor or "element") causes some of the energy deposited in the phosphor to be stored in stable "traps" in the TLD material. These TLD traps are so stable that they do not decay appreciably over the course of years. This provides an excellent method of integrating the exposure received over a period of time. The energy stored in the TLDs as a result of interactions with radiation is removed and measured by a controlled heating process in a calibrated reading system. As the TLD is heated, the phosphor releases the stored energy as light. The amount of light given off is directly proportional to the radiation dose the TLD received. The reading process also "zeros" the TLD and prepares it for reuse.

The TLDs in use for environmental monitoring at the OCGS are capable of accurately measuring exposures between 1 mrem (well below normal environmental levels for the quarterly monitoring periods) and 1000 rem.

TLDs were exposed quarterly at 44 monitoring locations ranging from less than 0.2 miles to 24.7 miles from the OCGS. Two Harshaw Model 110 TLDs were exposed at each location for the first quarter of 2001 and two Panasonic Model 814 TLDs were exposed at each location during the second, third, and fourth quarters. One of these locations, Station T1, was designated as a quality

control station where two additional badges were collocated. Four Proxtronics TLDs were exposed at designated quality control stations during the reporting period.

The scheduled exposure periods for 2001 were:

Table 3	
TLD EXPOSURE PERIODS DURING 2001	
Start Date	**Collection Date**
08 Jan 2001	**09 Apr 2001**
09 Apr 2001	**09 Jul 2001**
09 Jul 2001	**08 Oct 2001**
08 Oct 2001	**14 Jan 2002**

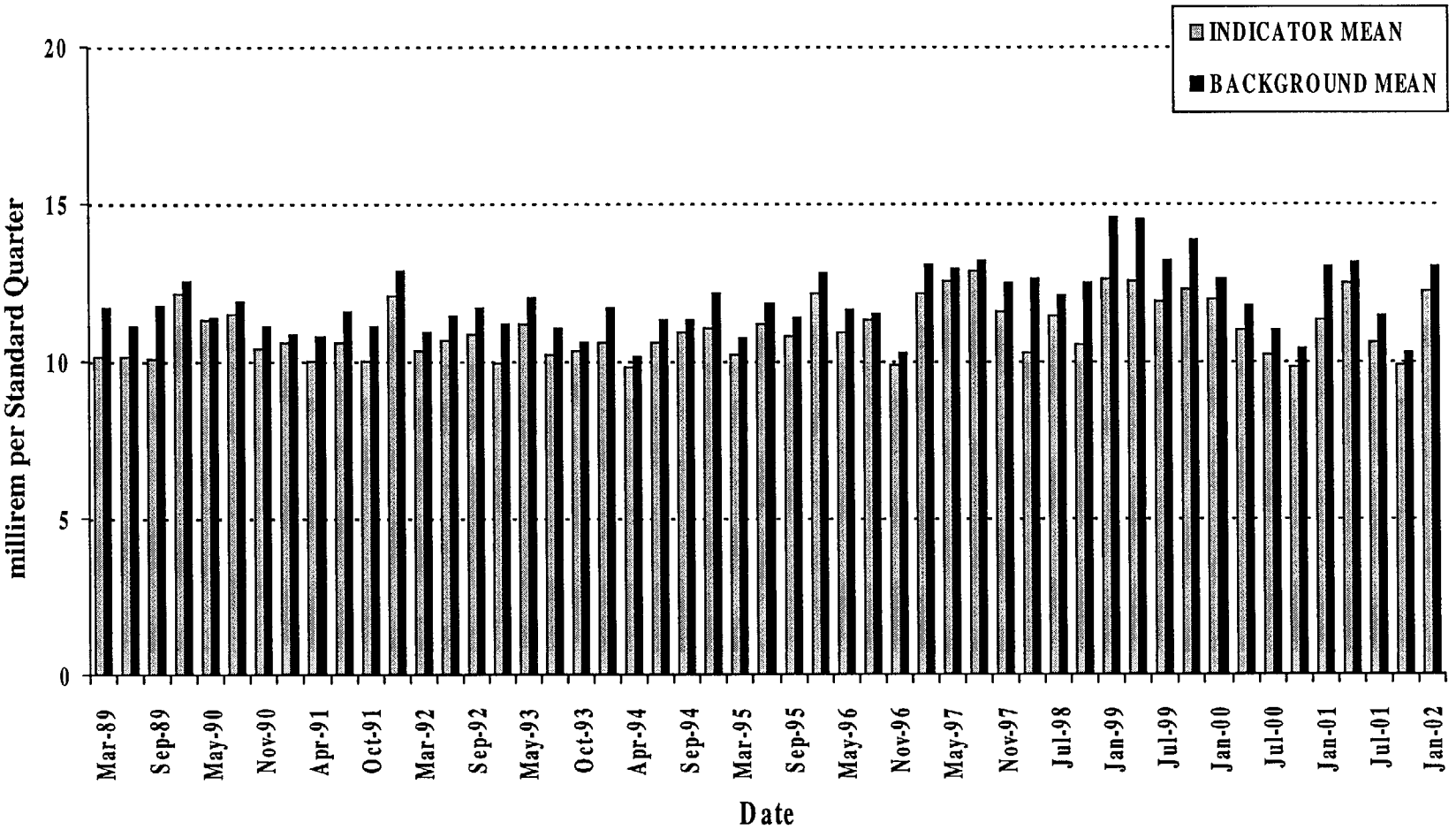
All TLD dose rate data presented in this report have been normalized to eliminate differences caused by slightly differing exposure periods. All results were normalized to a standard quarter (90 days). TLD dose rate data are presented in Tables K-1 and K-2 in Appendix K.

Results

The mean background dose slightly exceeded the mean indicator dose during 2001 suggesting that the OCGS had little if any affect on off-site exposure. The mean dose rate from indicator stations using Panasonic and Harshaw TLDs was 11.25 mrem/standard quarter with a range from 7.31 to 20.17 mrem/standard quarter (Table K-1). The mean background dose was 11.93 mrem/standard quarter with doses ranging from 9.50 to 14.01 mrem/standard quarter. Mean doses at background stations have historically exceeded mean doses at indicator stations, most probably due to differences in local geology. These results are consistent with the results of measurements from previous years (Fig. 7).

Dose rates were slightly higher at some locations within 0.2 miles of the OCGS when compared to background doses (Table K-1 and Fig 8). However, these slightly higher doses were recorded at stations that were all located in the Owner Controlled Area where public access is restricted or completely denied. In contrast, doses recorded at stations located at approximately the same distance from the OCGS where the public has unrestricted access (US Route 9) were less than those recorded at the background stations. Specifically, the mean dose recorded at locations along US Route 9

OYSTER CREEK GENERATING STATION
MEAN TLD GAMMA DOSE - 1989 THROUGH 2001*
millirem per Standard Quarter



* Harshaw Model 110 TLDs were used during the first quarter of 2001. Panasonic Model 814 TLDs were used in the second, third, and fourth quarters of 2001.

FIGURE 7

OYSTER CREEK GENERATING STATION
MEAN TLD GAMMA DOSE FOR 2001 *
BASED ON DISTANCE FROM OCGS
millirem per Standard Quarter

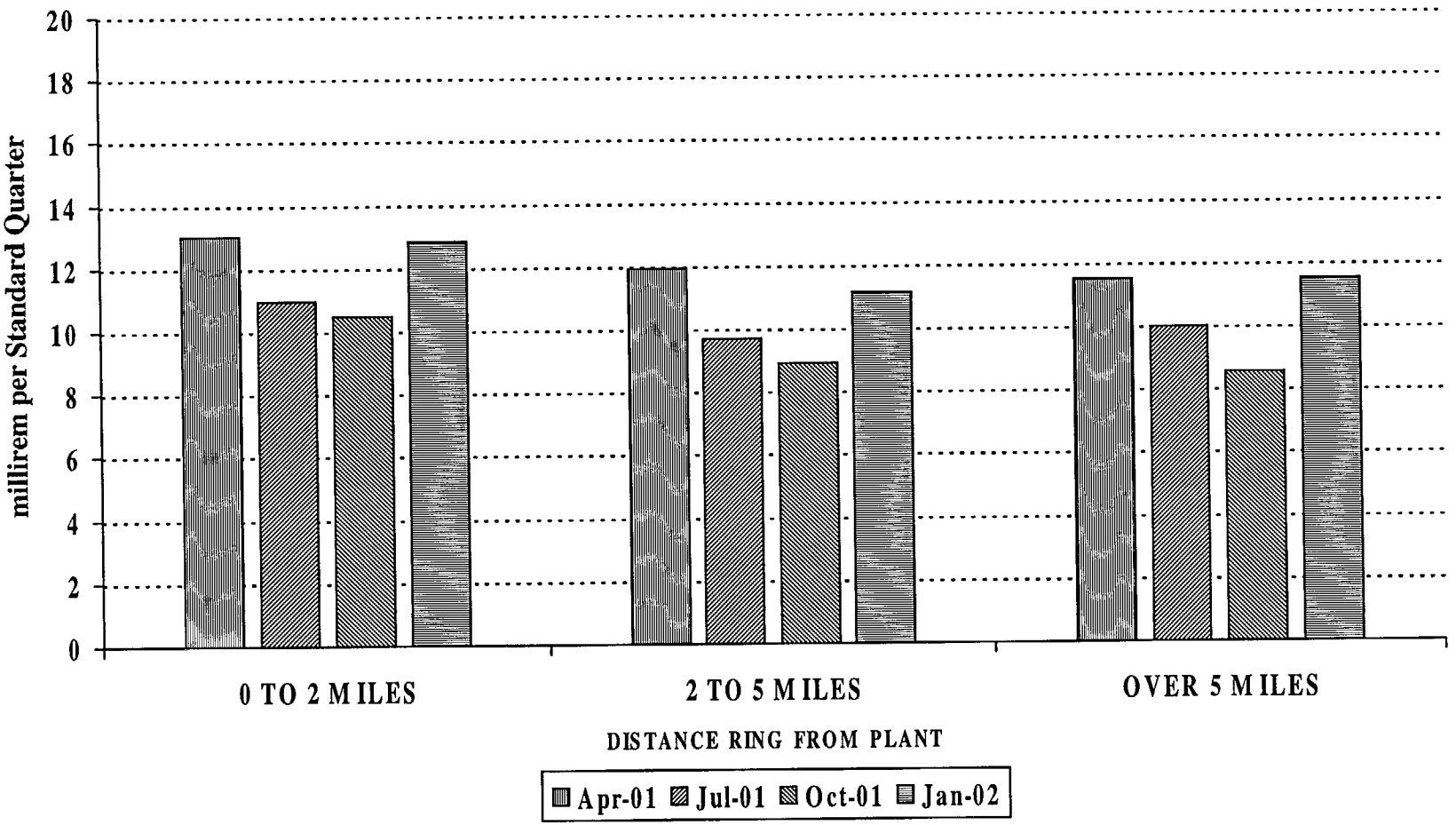


FIGURE 8

* First quarterly result utilized Harshaw TLD's. Second, Third, and Fourth quarter results utilized Panasonic TLDs

(Stations 61, 62, 63, 64, 65, and 66) was 10.85 mrem/standard quarter compared to a mean dose of 11.93 mrem/standard quarter recorded at the background stations. In addition, the maximum dose recorded at these indicator stations was 12.67 mrem/standard quarter while the highest recorded background dose was 14.01 mrem/standard quarter. These results suggest that OCGS operation contributed little if any to off-site exposure.

Regarding Proxtronics TLD data, the dose rate measured at indicator stations averaged 6.82 mrem/standard quarter and ranged from 4.60 to 9.00 mrem/standard quarter (Table K-2). The dose at background TLD stations averaged 9.43 mrem/standard quarter and ranged from 7.60 to 13.00 mrem/standard quarter. The mean dose rate from the background stations was higher than the mean dose rate from the indicator stations, again suggesting that OCGS operation contributed little if any to off-site exposure.

ATMOSPHERIC MONITORING

A potential exposure pathway to man is the inhalation and ingestion of airborne radioactive materials. Air was sampled by a network of seven continuously operating air samplers and then analyzed for radioactivity content.

Indicator air sampling stations are located in prevailing downwind directions, local population centers, and areas of public and special interest. All indicator stations are located within 6.0 miles of the OCGS. A background air sampling station is located 24.7 miles northwest of the OCGS in Cookstown, NJ.

Sample Collection and Analysis

Mechanical air samplers are used to continuously draw a recorded volume of air first through a glass fiber (particulate) filter and then through a charcoal cartridge. A dry gas meter, which is temperature compensated, is used in line with the filters to record the volume of air sampled. Internal vacuums are also measured in order to pressure correct the indicated volume. All air samplers are maintained and calibrated by the OCGS Maintenance Department.

The particulate filters were collected every two weeks and were analyzed for gross beta radioactivity. The filters were then combined quarterly by individual stations and analyzed for gamma-emitting radionuclides.

Charcoal cartridges, used to collect gaseous radioiodines, contain activated charcoal. Charcoal cartridges were collected weekly and analyzed for iodine-131 (I-131) activity.

Results

The results of the atmospheric monitoring during 2001 demonstrated that, as in previous years, the radioactive airborne effluents associated with the OCGS did not have any measurable effects on the environment.

During 2001, 182 gross beta analyses were performed on air particulate filters (Table D-1). The background mean gross beta activity (0.0194 pCi/m3) was slightly higher than the indicator mean (0.0183 pCi/m3) and all gross beta analysis results were within two standard deviations of the historical mean.

Comparison of the 2001 mean air particulate gross beta concentrations per collection period from indicator and background stations shows that indicator and background concentrations were essentially identical (Fig. 9). In sixteen of the twenty-six comparisons, the background concentration exceeded the mean indicator concentration. In eight of the comparisons, the indicator mean was slightly higher that the concentration detected at the background station. Of these eight comparisons, the largest difference occurred in filters collected on April 16, 2001 in which the indicator mean was 0.014 +/- 0.001 pCi/cubic meter and the background concentration was 0.013 +/- 0.001 pCi/ cubic meter. Factoring in the standard deviation, there is no statistically significant difference between the gross beta concentration detected at indicator stations versus the background station. These results are consistent with the results of gross beta analyses of air samples from previous years (Fig. 10). These air particulate gross beta analysis results indicate that effluent containing gross beta radioactivity from OCGS operation did not have any measurable impact on the local environment.

Gamma isotopic analyses were performed on 28 air particulate filter composites (Table D-1). The only radionuclide identified was naturally occurring beryllium-7. This nuclide is naturally occurring and not attributable to effluents from the OCGS.

Air charcoal cartridges (364) were analyzed for iodine-131 (I-131) and no radioiodine was detected in any of the samples (Table D-1). This is consistent with results from past years.

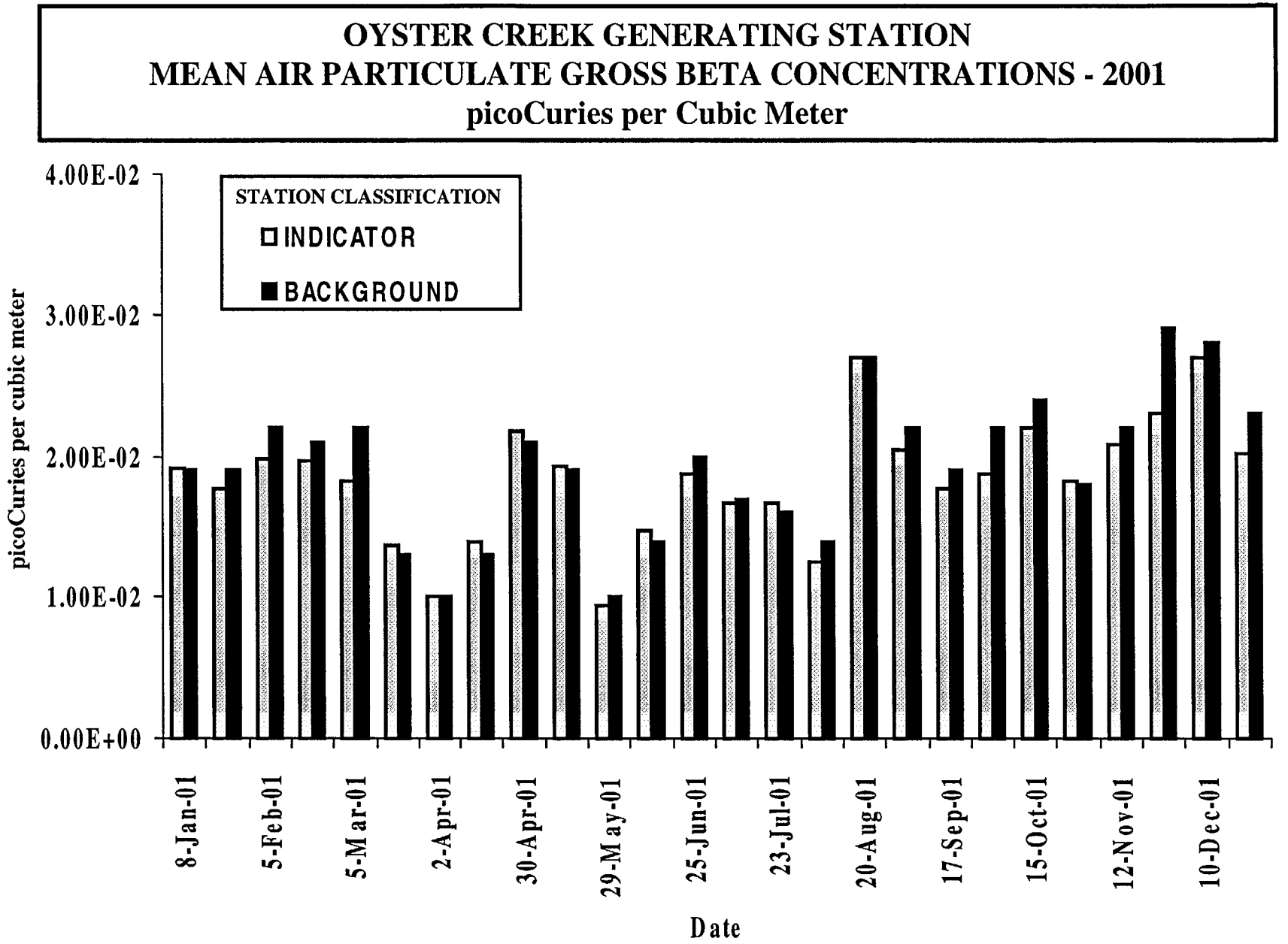
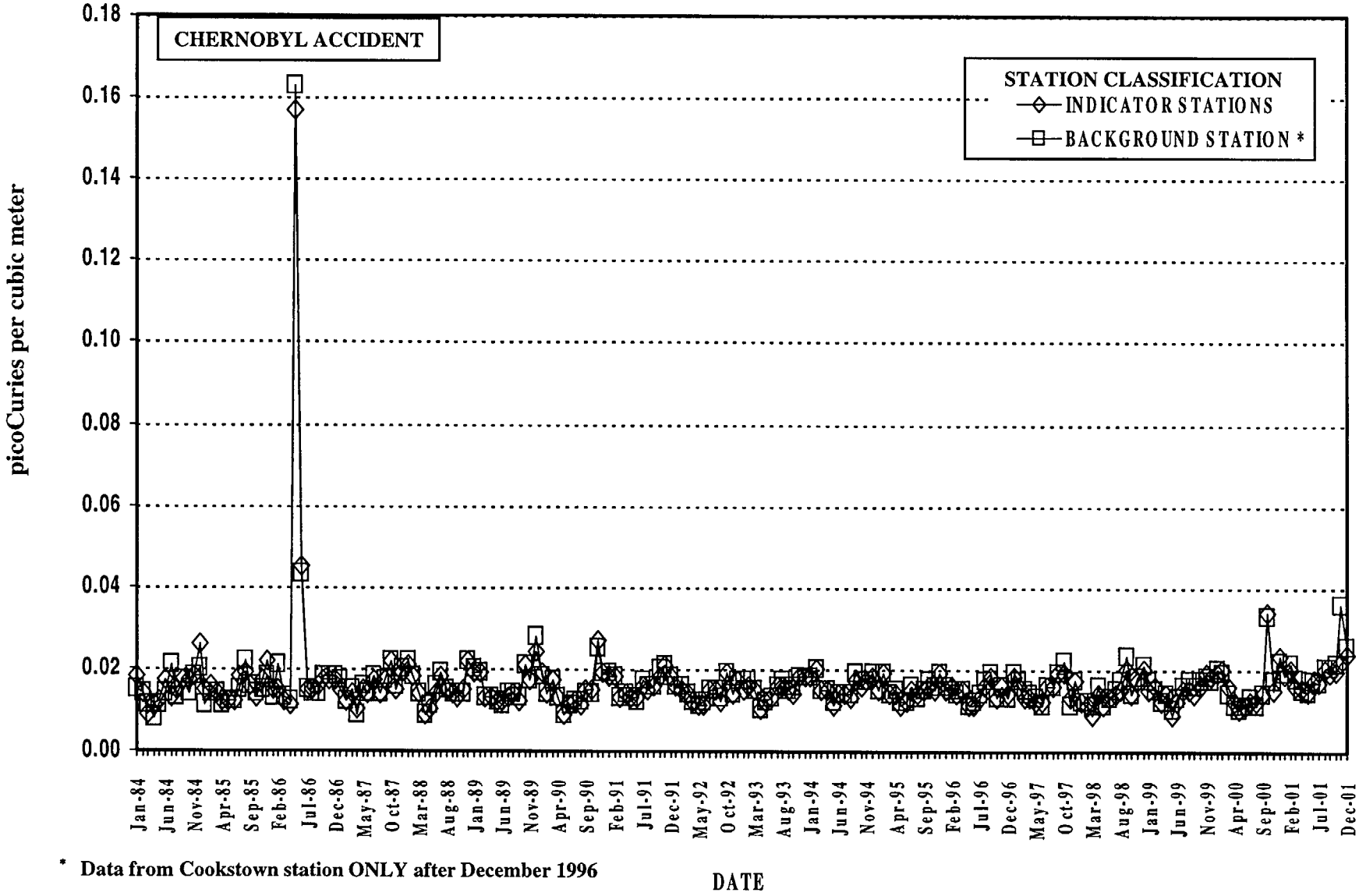

OYSTER CREEK GENERATING STATION
MEAN AIR PARTICULATE GROSS BETA CONCENTRATIONS - 2001
picoCuries per Cubic Meter
STATION CLASSIFICATION
INDICATOR
BACKGROUND
4.00E-02
3.00E-02
2.00E-02
1.00E-02
0.00E+00
picoCuries per cubic meter
8-Jan-01
5-Feb-01
5-Mar-01
2-Apr-01
30-Apr-01
29-May-01
25-Jun-01
23-Jul-01
20-Aug-01
17-Sep-01
15-Oct-01
12-Nov-01
10-Dec-01
Date

FIGURE 9

OYSTER CREEK GENERATING STATION
MONTHLY MEAN AIR PARTICULATE GROSS BETA CONCENTRATIONS
1984 THROUGH 2001
INDICATOR STATIONS VERSUS BACKGROUND STATION
picoCuries per Cubic Meter



* Data from Cookstown station ONLY after December 1996

FIGURE 10

AQUATIC MONITORING

Brackish water from Barnegat Bay is drawn in through the South Branch of Forked River, pumped into the OCGS cooling systems, and then discharged to Barnegat Bay via Oyster Creek. Normally, no radioactive material is introduced to this non-contact cooling water. On occasion, radioactive liquids may be released to the discharge canal in accordance with the limits established in the OCGS Offsite Dose Calculation Manual (ODCM) Specifications, Technical Specifications, and 10CFR20. Highly purified water, containing traces of radioactivity, may be discharged into the OCGS discharge canal, which routinely has a minimum flow rate of slightly under one-half million gallons per minute. There were no radioactive liquid releases made from the OCGS during 2001.

Fish, clams, and crabs are harvested from the bay on a recreational and commercial basis. The ingestion pathway is addressed because of fish, clam, and crab consumption by man. Samples of surface water, sediment, fish, blue crab, and hard clams were routinely collected from locations in the OCGS discharge canal, Barnegat Bay, and Great Bay/Little Egg Harbor in order to monitor any environmental impact that may be associated with liquid effluents from the OCGS.

Sample Collection and Analysis

Surface water samples were collected from one indicator station (Station 33) and one background station (Station 94) on a monthly basis. On a semiannual basis, surface water samples were also collected at indicator Stations 23 and 24. Sediment and clam samples were collected semiannually. Grab samples of sediment were collected from three indicator stations (Stations 23, 24, & 33) and one background station (Station 94). Grab samples of clams were collected from two indicator stations (Stations 23 & 24) and one background station (Station 94). One indicator station (Station 33) is located in the OCGS discharge canal where surface water and sediment are collected, but no clams are available for collection. Two additional indicator stations for surface water, sediment, and clams are located in Barnegat Bay in close proximity to the mouth of Oyster Creek. The background station is located approximately 20 miles south-southwest of the OCGS in Great Bay/Little Egg Harbor (Table A-1 & Figs. 5 & 6).

Fish samples were collected semiannually (when available) from two indicator stations (Stations 33 & 93) and one background station (Station 94). One crab sample was collected from an indicator station (Station 93). Indicator stations for fish and crabs are located in the OCGS discharge canal and the background station for fish is located in Great Bay/Little Egg Harbor. Crab pots were used to catch blue crab. Traps, as well as the hook and line technique, were used to catch fish.

Sediment, clam, fish, and crab samples were analyzed for gamma-emitting nuclides and surface water was analyzed for tritium as well as gamma-emitting nuclides.

Results

Operation of the OCGS had no detectable effect upon the local surface water, which was sampled 28 times at four different locations during 2001. No radionuclides were detected in any surface water sample (Table D-1).

One gamma-emitting nuclide was detected in the eight sediment samples collected during 2001 (Table D-1). Potassium-40 (K-40) was detected in six of six indicator station samples and in two of two background samples. This naturally occurring radionuclide is routinely found in salt water and is not attributable to OCGS operations. Cesium-137 (Cs-137), which is a fission product, was not detected in any of the six sediment samples collected from indicator stations or from the two samples collected from the background station (Table D-1). This is of particular interest because this is the first year since August 1973, when isotopic analysis of sediment samples began, that Cs-137 was not detected in any sediment sample Fig. 11). Cesium-137 was widely distributed and detected in considerable abundance as a result of fallout following atmospheric weapons testing and the 1986 Chernobyl accident. Cs-137 is also a byproduct of OCGS operation and was released in liquid effluents in past years. Historical results of the sediment sampling program suggested that the presence of cesium-137 in the sediments of the OCGS discharge canal and nearby portions of Barnegat Bay probably were attributable in part to past liquid discharges from the facility (Table 4). A review of sediment sample analysis results for 1994 through 2001 (Table 4) shows cesium-137 was detected in higher levels at the two indicator stations (Stations 33 and 93), which are

FIGURE 11

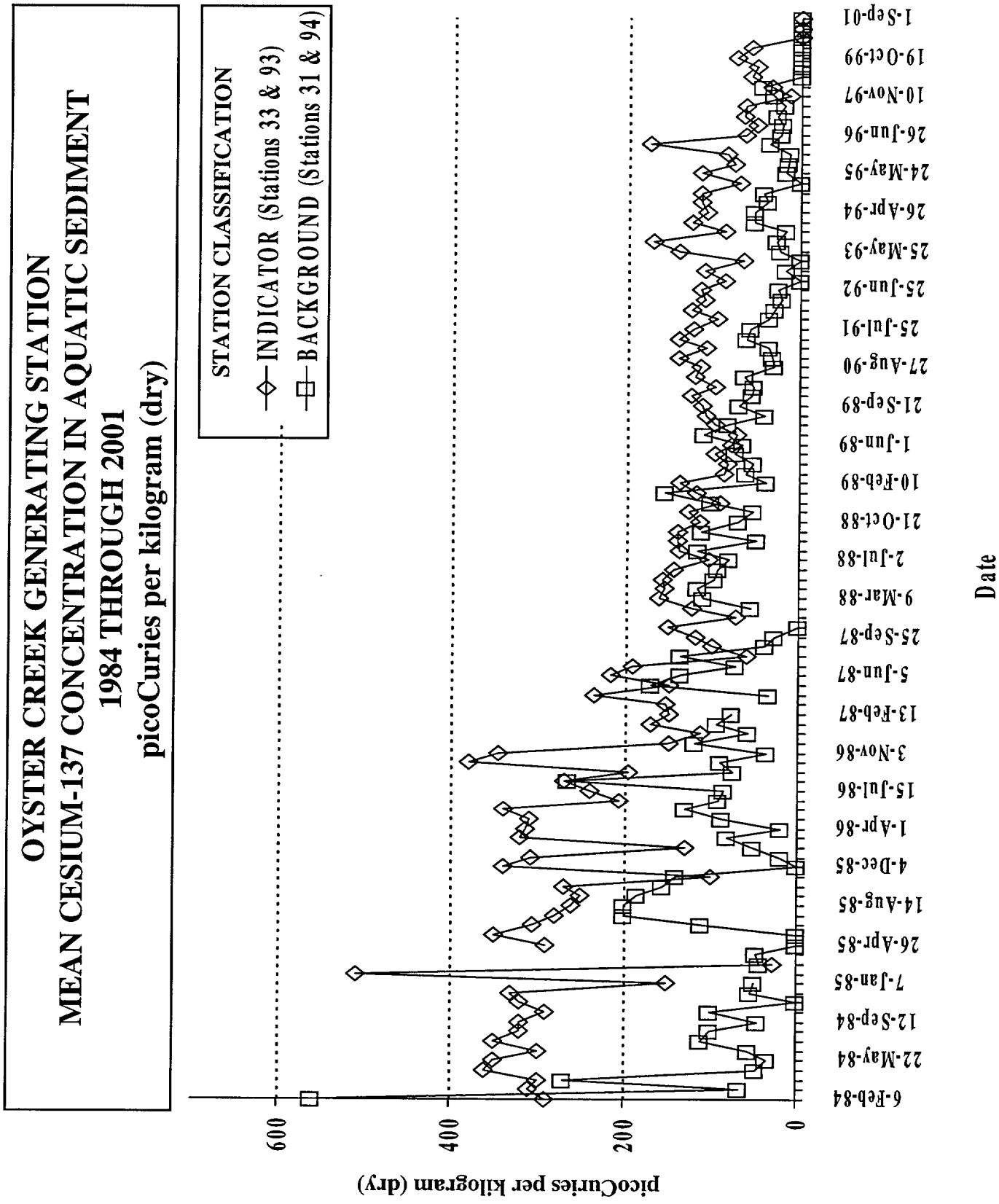

OYSTER CREEK GENERATING STATION
MEAN CESIUM-137 CONCENTRATION IN AQUATIC SEDIMENT
1984 THROUGH 2001
picoCuries per kilogram (dry)
STATION CLASSIFICATION
INDICATOR (Stations 33 & 93)
BACKGROUND (Stations 31 & 94)
picoCuries per kilogram (dry)
600
400
200
0
6-Feb-84
22-May-84
12-Sep-84
7-Jan-85
26-Apr-85
14-Aug-85
4-Dec-85
1-Apr-86
15-Jul-86
3-Nov-86
13-Feb-87
5-Jun-87
25-Sep-87
9-Mar-88
2-Jul-88
21-Oct-88
10-Feb-89
1-Jun-89
21-Sep-89
27-Aug-90
25-Jul-91
25-Jun-92
25-May-93
26-Apr-94
24-May-95
26-Jun-96
10-Nov-97
19-Oct-99
1-Sep-01
Date

Table 4

Cesium-137 Concentration in Aquatic Sediment (pCi/kg-dry)

1994 - 2001

Date	Station 23	Station 24	Station 25	Station 31	Station 32	Station 33	Station 93	Station 94
Jan 94	26	22	< LLD	40	54	140	110	67
Apr 94	< LLD	21	< LLD	49	45	150	67	48
Jul 94	< LLD	< LLD	< LLD	24	29	160	70	46
Nov 94	24	37	< LLD	22	44	140	95	61
Mar 95	< LLD	< LLD	< LLD	< LLD	72	46	94	< LLD
May 95	56	< LLD	< LLD	< LLD	< LLD	130	100	32
Aug 95	< LLD	< LLD	9	13	32	60	91	15
Oct 95	47	31	< LLD	< LLD	< LLD	51	120	27
Mar 96	< LLD	< LLD	< LLD	37	20	240	110	26
Jun 96	32	21	11	23	< LLD	56	71	22
Aug 96	16	< LLD	< LLD	17	< LLD	< LLD	100	24
Sep 96	< LLD	< LLD	15	39	23	33	100	17
May 97	45	< LLD				64		20
Oct 97	< LLD	< LLD				12		31
Jun 98	< LLD	< LLD				34		45
Nov 98	< LLD	< LLD				58		< LLD
Mar 99	< LLD	< LLD				50		< LLD
Oct 99	< LLD	< LLD				75		< LLD
May 00	< LLD	< LLD				57		< LLD
Nov 00	< LLD	< LLD				< LLD		< LLD
May 01	< LLD	< LLD				< LLD		< LLD
Sep 01	< LLD	< LLD				< LLD		< LLD
Maximum	56	37	15	49	72	240	120	67
Average	35	26	12	29	40	86	94	34
Minimum	16	21	9	13	20	12	67	15

- Shaded areas indicate no samples taken
- Stations 23, 24, 25, 32, 33, and 93 are indicator stations
- Stations 31 and 94 are background stations

closest to the OCGS liquid discharge point. Over the years, the level of cesium-137 has decreased to the point that it was not detected in sediments since May 2000.

As was the case with cesium-137, the presence of cobalt-60 in sediment samples in previous years was in part attributed to past OCGS liquid effluents. Cobalt-60 was not detected in sediment samples collected in 2001 (Table D-1) and has not been detected in sediment samples since August 1996 (Fig. 12 & Table 5). The last detectable concentration of Co-60 in clams occurred during the third quarter of 1987 (Figure13).

Over the years, there has been a dramatic reduction in liquid discharges from the OCGS and there have been no routine discharges of liquid radioactive wastes since 1989. As a result of this reduction of liquid effluents, as well as the ongoing natural radioactive decay process, the concentrations of both cesium-137 and cobalt-60 in sediments and clams have reached non-detectable levels.

No radionuclides attributable to effluents from the OCGS were found in samples of clams, fish, or crabs collected during 2001 (Table D-1).

Six clam samples were collected from three different locations in 2001. Gamma isotopic analyses indicated that the only gamma-emitting nuclide detected was potassium-40, which is naturally occurring and commonly found in salt water (Table D-1).

Fourteen fish samples were collected from two indicator stations and one background station in 2001 (Table D-1). The only radionuclide detected in fish samples was naturally occurring potassium-40, which was detected in each of the fourteen samples. Table 6 lists the species of fish and number of samples collected in 2001.

One blue crab sample was collected from the OCGS discharge canal during 2001. A gamma isotopic analysis was performed on this sample and no radioactivity was identified except for naturally occurring potassium-40 (Table D-1). The close association of this species with sediments could make it susceptible to cesium-137 and cobalt-60 uptake. However, no detectable Cs-137 or Co-60 activity has been observed in blue crab samples since routine collection began in 1985.

Table 5

Cobalt-60 Concentration in Aquatic Sediment (pCi/Kg-dry)

1994 - 2001

Date	Station 23	Station 24	Station 25	Station 31	Station 32	Station 33	Station 93	Station 94
Jan 94	< LLD	< LLD	< LLD	< LLD	< LLD	26	37	< LLD
Apr 94	< LLD	< LLD	< LLD	< LLD	< LLD	38	26	< LLD
Jul 94	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD	22	< LLD
Nov 94	< LLD	< LLD	< LLD	< LLD	< LLD	44	27	< LLD
Mar 95	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD	18	< LLD
May 95	< LLD	< LLD	< LLD	< LLD	< LLD	41	< LLD	< LLD
Aug 95	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD
Oct 95	< LLD	< LLD	< LLD	< LLD	< LLD	14	20	< LLD
Mar 96	< LLD	< LLD	< LLD	< LLD	< LLD	180	< LLD	< LLD
Jun 96	< LLD	< LLD	< LLD	< LLD	< LLD	15	< LLD	< LLD
Aug 96	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD	33	< LLD
Sep 96	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD	< LLD
May 97	< LLD	< LLD				< LLD		< LLD
Oct 97	< LLD	< LLD				< LLD		< LLD
Jun 98	< LLD	< LLD				< LLD		< LLD
Nov 98	< LLD	< LLD				< LLD		< LLD
Mar 99	< LLD	< LLD				< LLD		< LLD
Oct 99	< LLD	< LLD				< LLD		< LLD
May 00	< LLD	< LLD				< LLD		< LLD
Nov 00	< LLD	< LLD				< LLD		< LLD
May 01	< LLD	< LLD				< LLD		< LLD
Sep 01	< LLD	< LLD				< LLD		< LLD
Maximum	< LLD	< LLD	< LLD	< LLD	< LLD	180	37	< LLD
Average	< LLD	< LLD	< LLD	< LLD	< LLD	51	26	< LLD
Minimum	< LLD	< LLD	< LLD	< LLD	< LLD	14	18	< LLD

- Shaded areas indicate no samples taken
- Stations 23, 24, 25, 32, 33, and 93 are indicator stations
- Stations 31 and 94 are background stations

OYSTER CREEK GENERATING STATION
MEAN COBALT-60 CONCENTRATION IN AQUATIC SEDIMENT
1984 THROUGH 2001
picoCuries per kilogram (dry)

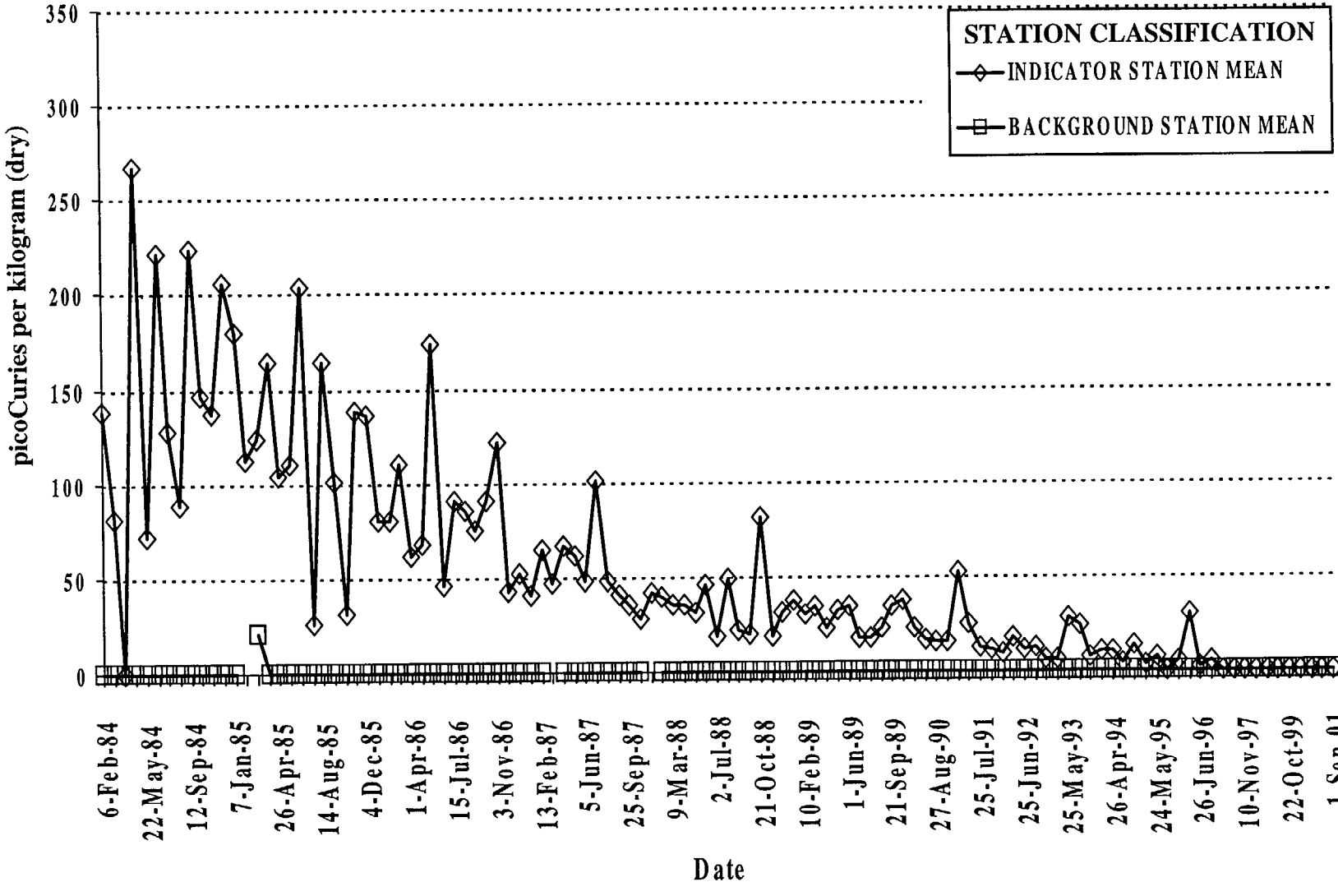


FIGURE 12

OYSTER CREEK GENERATING STATION
MEAN COBALT-60 CONCENTRATION IN CLAMS - 1983 THROUGH 2001
picoCuries per kilogram (wet)

FIGURE 13

TABLE 6	
SPECIES OF FISH CAUGHT AS PART OF THE OCGS REMP IN 2001	
Fish	**Number of Samples**
bluefish	3
striped bass	2
tautog	2
American eel	1
blowfish	1
sea bass	1
summer flounder	1
weakfish	1
white perch	1
winter flounder	1

TERRESTRIAL MONITORING

Radionuclides released to the atmosphere may be deposited on soil and vegetation and may be incorporated into milk, vegetation, vegetables, and other food products. To assess the impact of dose to humans from this ingestion pathway, samples of green leafy vegetables were collected and analyzed during 2001.

The contribution of radionuclides from OCGS effluents to this ingestion pathway was assessed by comparing the results of samples collected at indicator stations in prevalent downwind locations, primarily to the southeast of the site, with background samples collected from distant and generally upwind directions. Indicator samples are collected at the two locations with the highest D/Q (deposition factor). These locations were identified using site-specific meteorological data. This technique is utilized in lieu of performing any garden census, because it ensures that representative measurements of radioactivity in the highest potential exposure pathways are obtained as required by Technical Specification 6.8.4.b.

In addition, a dairy census was conducted to determine the locations of commercial dairy operations and milk producing animals in each of the 16 meteorological sectors out to a distance of five miles from the OCGS. The census showed that there were no commercial dairy operations and no dairy animals producing milk for human consumption within a 5 mile radius of the plant (Appendix G).

Two gardens were maintained near the site boundary of the OCGS in the two sectors with the highest potential for radioactive deposition in accordance with the Offsite Dose Calculation Manual (Ref. 2). Both of these indicator gardens were greater than 50 square meters (500 square feet) in size and produced green leafy vegetables. A commercial farm located approximately 23.1 miles northwest of the site was used as a background station.

Sample Collection and Analysis

Cabbage and collards were scheduled to be collected on a monthly basis when available in 2001. Samples were collected beginning in August and ending in November during the reporting period. Six vegetable samples, scheduled for collection in September, were collected beyond the monthly time tolerance of 37.5 days (Appendix A, Table A-3). All samples collected after that date were collected in accordance with the sampling frequency. A gamma isotopic analysis was performed on each sample.

Results

The results of the terrestrial monitoring during 2001 demonstrated that radionuclides in effluents from the OCGS are not accumulating in vegetation.

A gamma isotopic analysis was performed on eleven cabbage samples and twelve collard samples (Table D-1). Naturally occurring potassium-40 (K-40) was detected in all of the samples collected from both indicator and background stations. Cesium-137 (Cs-137) activity was detected in 1 of 7 indicator station samples of cabbage and detected in 2 of 8 collard samples taken from indicator stations. No cesium-137 was detected in any samples collected at the background stations. The detected concentrations of Cs-137, 50 pCi/kg(wet) in Cabbage and 23.3 and 13.6 pCi/kg(wet) in Collards, were only 2.5, 1.2, and 0.7 percent, respectively, of the reporting level (2000 pCi/kg(wet)) as specified in the OCGS Offsite Dose Calculation Manual (Ref. 2).

Although cesium-137 activity was released as a gaseous effluent of the OCGS in 2001, it accounted for only 0.26 percent of the total gaseous particulate effluent released (Table 2). Prior to 2001, cesium-137 had been detected in only one vegetable sample (Ref. 33) since 1993 even though Cs-137 was released in gaseous effluents from the OCGS during this period. The historical database shows that cesium-137 activity has been detected in vegetables on a more frequent basis, and in similar concentrations, during years in which the radionuclide was not released with OCGS effluents. For example, Cs-137 activity was detected in 50 percent of indicator station vegetable samples collected in 1988 and 1989 although no cesium was released in gaseous effluents during these years. The concentrations of cesium-137 in vegetables during these years ranged from 17.1 to 44.5 pCi/kg (wet). These results indicate that the minute concentrations of cesium-137 detected in the three vegetable samples were attributable to fallout from previous weapons testing and the Chernobyl nuclear accident and not a result of deposition of effluents from the OCGS.

GROUNDWATER MONITORING

The Oyster Creek Generating Station is located on the Atlantic Coastal Plain Physiographic Province. This Province extends southeastward from the Fall Zone, a topographic break that marks the boundary between the Atlantic Coastal Plain and the more rugged topography of the Piedmont Province. The Fall Zone is also where the crystalline and sedimentary rocks of the Piedmont and the unconsolidated Coastal Plain sediments meet.

At least five distinct aquifers exist in the vicinity of the OCGS. From the surface downward, they are:

1. Recent and Upper Cape May Formation
2. Lower Cape May Formation
3. Cohansey Sand
4. Upper Zone in the Kirkwood Formation
5. Lower Zone in the Kirkwood Formation

The Recent and Cape May Formations are replenished directly by local precipitation. The recharge to the underlying aquifers occurs primarily from direct rainfall penetration on the outcrop areas, which are generally to the west of the site at higher elevations.

Sample Collection and Analysis

As part of the routine REMP, three groundwater wells, drawing water from the Kirkwood aquifer, were sampled on a quarterly basis. Grab samples were obtained from two local Municipal Utility Authority wells and an on-site drinking water well. The Lacey Municipal Utility Authority combines water from three wells, which were drilled to depths of 239', 248', and 267'. This sampling location is 2.2 miles north-northeast of the OCGS. A second sampling location is the Ocean Township Municipal Utility Authority well, which is approximately 360' deep and located 1.6 miles from the OCGS in a south-southwest direction. The third sampling location is either of the two on-site wells that supply potable water to the OCGS. The northern and southern on-site wells are 162' and 300' deep, respectively. Each sample was subjected to a tritium and gamma isotopic analysis.

In addition, a groundwater monitoring network installed around the OCGS in 1983 to serve as an

early detection and monitoring system for spills, was sampled in April and October 2001. This network is comprised of fifteen wells which are located in the Cape May, Cohansey, and Kirkwood Aquifers. Grab samples were collected and analyzed for tritium and gamma emitting nuclides.

Results

The results of the REMP groundwater monitoring during 2001 demonstrated that, as in previous years, the radioactive effluents associated with the OCGS did not have any measurable effects on offsite drinking water.

Twelve routine REMP well water samples were collected during 2001. No radioactivity was detected in any of these samples (Table D-1).

The results of the analyses of 28 samples collected from the onsite groundwater monitoring well network showed no gamma emitting nuclides and a continuing downward trend in the levels of tritium detected when compared to previous years (Tables I-1 & I-2). Tritium was the only nuclide detected in these wells and is naturally occurring. Tritium, however, is also produced as a byproduct in the OCGS reactor and was detected in these monitoring wells in 7 of 28 samples collected in 2001 (Table 7). Tritium was detected in 14 of 29 samples in 2000, in 13 of 30 samples in 1999, and in 15 of the 28 samples collected in 1998. Tritium concentrations in 2001 ranged from 122 to 297 pCi/liter with an average concentration of 194 pCi/liter. The tritium concentrations in the year 2000 ranged from 120 to 470 pCi/liter with an average concentration of 214 pCi/liter (Table I-2). In 1999, the tritium concentrations in the well samples ranged from 140 to 580 pCi/liter with and average concentration of 275 pCi/liter and in 1998, concentrations ranged from 150 to 840 pCi/liter, with an average concentration of 299 pCi/liter (Table I-2). Prior to 1998, the highest frequency of occurrence was seven positive tritium results out of 25 samples in 1991 (Ref. 25). Only two positive tritium results, 170 pCi/liter in each, were observed during 1997, and only one positive result (180 pCi/liter) was observed during 1996 (Table I-2).

The increase in the frequency of occurrence and concentration of tritium in the onsite groundwater monitoring wells was attributed to the increase in the amount of tritium in airborne effluents from the OCGS during 1997 and 1998. Increases in reactor coolant tritium concentrations, thought to be related to control rod blade leakage, resulted in an increase in the amount of tritium released in gaseous effluents. Remedial efforts during the 17R outage in the

autumn of 1998, including the replacement and shuffling of control rods, were implemented in order to reduce or eliminate this source of tritium. The success of this effort is indicated by the results of the onsite groundwater monitoring during from 1998 through 2001.

The maximum and average concentrations of tritium during 1998 were 840 and 301 pCi/liter, respectively. The maximum and average concentrations dropped to 580 and 275 pCi/liter, respectively, in 1999 and again dropped to 470 and 214 pCi/liter, respectively, in the year 2000. In 2001, the maximum and average concentrations again dropped to 297 and 194 pCi/liter, respectively. The maximum concentration in 2001 dropped to 35 percent of the level detected in 1998, while the average concentration in 2001 dropped to 64 percent of the average concentration calculated in 1998.

The highest tritium concentration detected in onsite monitoring wells during 2001 (297 pCi/liter) was only 15 percent of the analytical Lower Limit of Detection of 2,000 pCi/liter specified by the Nuclear Regulatory Commission (Ref. 13) and only 1.5 percent of the USEPA drinking water limit of 20,000 pCi/liter. In addition, as discussed above, no tritium was detected in samples collected from onsite or offsite drinking water wells.

TABLE 7

FREQUENCY OF OCCURRENCE OF TRITIUM
IN THE ONSITE GROUNDWATER MONITORING NETWORK
(1989 through 2001)

Year	Number of Samples Collected	Number of Samples in Which Tritium was Detected
2001	28	7
2000	29	14
1999	30	13
1998	28	15
1997	30	2
1996	15	1
1995	30	3
1994	29	1
1993	30	1
1992	25	2
1991	25	7
1990	30	5
1989	28	2

RADIOLOGICAL IMPACT OF OCGS OPERATIONS

An assessment of potential radiological impact indicated that radiation doses to the public from 2001 operations at the OCGS were well below all applicable regulatory limits and were significantly less than doses received from common sources of radiation. The 2001 total body dose, potentially received by a hypothetical maximum exposed individual, from OCGS liquid and airborne effluents, was conservatively calculated to be 5.69E-03 millirem or only 2.28E-02 percent of the regulatory limit. The 2001 total body dose to the surrounding population from OCGS liquid and airborne effluents was calculated to be 2.08E-01 person-rem. This is approximately 6 million times lower than the doses to the total population within a 50-mile radius of the OCGS resulting from natural background sources.

Determination of Radiation Doses to the Public

To the extent possible, doses to the public are based on direct measurement of dose rates from external sources and measurements of radionuclide concentrations in the environment which may contribute to an internal dose of radiation. Thermoluminescent dosimeters (TLDs) positioned in the environment around the OCGS provide measurements to determine external radiation doses to humans. Samples of air, water, food products, etc. can be used to determine internal doses.

During normal plant operations, the quantities of radionuclides released are typically too small to be measured once released to the offsite environment. As a result, the potential offsite doses are calculated using a computerized model that predicts concentrations of radioactive materials in the environment and subsequent radiation doses on the basis of radionuclides released to the environment. OCGS doses were calculated using a computer program called SEEDS (Simplified Effluent Environmental Dosimetry System). This program is based upon the OCGS Offsite Dose Calculation Manual (ODCM) and incorporates the guidelines and methodologies set forth by the USNRC in Regulatory Guide 1.109 (Ref. 17). Due to the conservative assumptions that are used in SEEDS, the calculated doses are considerably higher than the actual doses to people.

The type and amount of radioactivity released from the OCGS is calculated using measurements from effluent radiation monitoring instruments and effluent sample analysis. Once released, the dispersion of radionuclides in the environment is readily estimated by computer modeling. Airborne releases are diluted and carried away from the site by atmospheric diffusion which continuously acts to disperse radioactivity. Variables which affect atmospheric dispersion include wind speed and direction, atmospheric stability, and terrain. A meteorological

monitoring station northwest of the OCGS permanently records and telemeters all necessary meteorological data. A computer program is also used to predict the downstream dilution and travel times for liquid releases into the Barnegat Bay estuary and Atlantic Ocean.

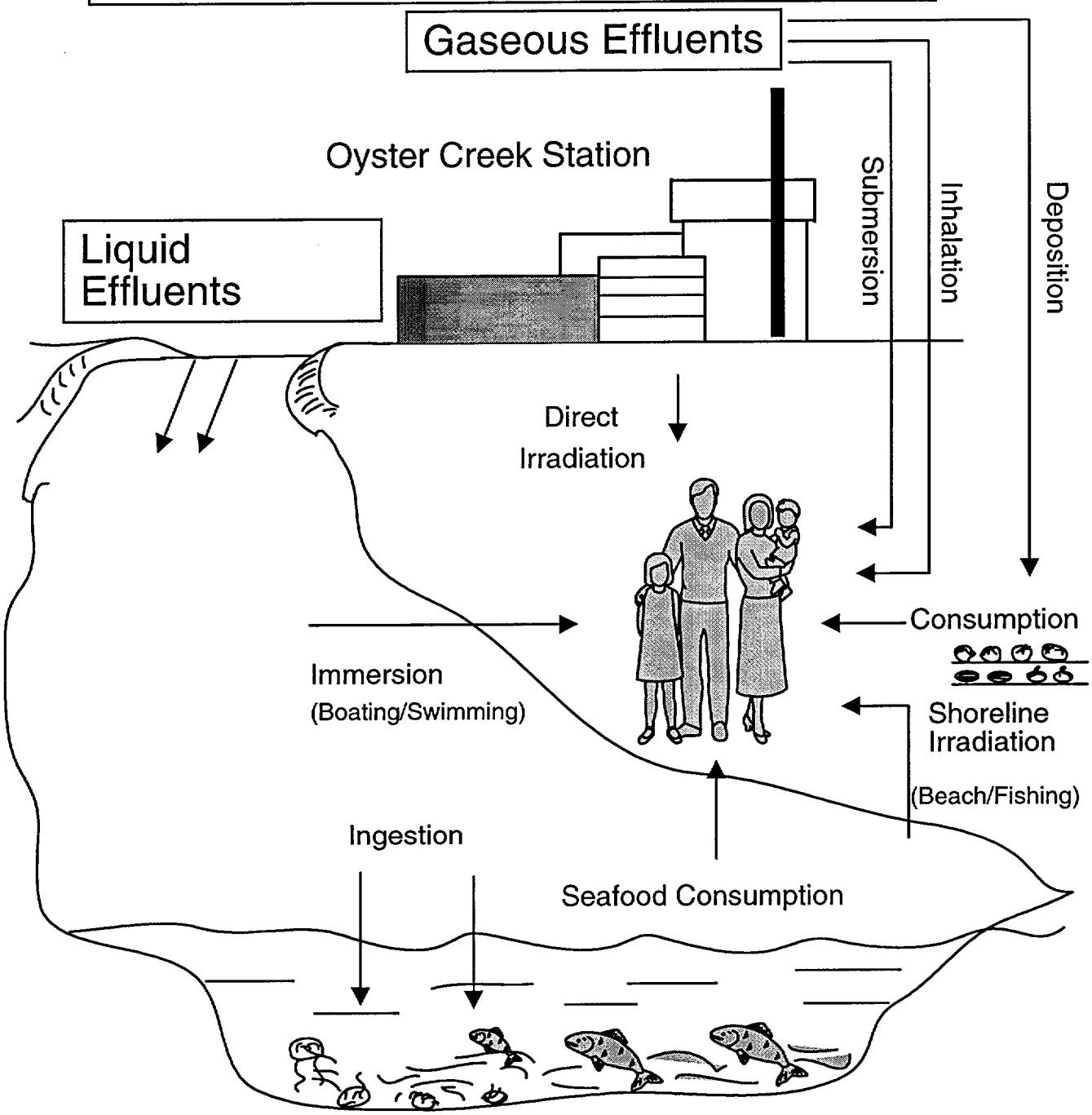
The pathways to human exposure are also included in the model. These pathways are depicted in Figure 14. The exposure pathways considered for the discharge of the station's liquid effluent are fish and shellfish consumption and shoreline exposure. The exposure pathways considered for airborne effluents include plume exposure, inhalation, vegetable consumption (during growing season), and land deposition.

SEEDS employs numerous data files which describe the area around the OCGS in terms of demography and foodstuffs production. Data files include such information as the distance from the plant stack to the site boundary in each of the sixteen compass sectors, the population groupings, meat animals, and crop yields.

When determining the dose to humans, it is necessary to consider all pathways and all exposed tissues (summing the dose from each) to provide the total dose for each organ as well as the total body from a given radionuclide in the environment. Dose calculations involve determining the energy absorbed per unit mass in the various tissues. Thus, for radionuclides taken into the body, the metabolism of the radionuclide in the body must be known along with the physical characteristics of the nuclide such as energies, types of radiation(s) emitted, and half-life. SEEDS also contains dose conversion factors for over 75 radionuclides for each of four age groups (adult, teen, child, and infant) and eight organs (total body, thyroid, liver, skin, kidney, lung, bone, and gastro-intestinal tract).

Doses are calculated for what is termed the "maximum hypothetical individual". This individual is assumed to be affected by the combined maximum environmental concentrations wherever they occur. For liquid releases at the OCGS, the maximum hypothetical individual would be one who stands at the U.S. Route 9-discharge canal shoreline for 67 hours per year while eating 43 pounds of fish and shellfish. For airborne releases, the maximum hypothetical individual would live at the location of highest radionuclide concentration for inhalation and direct plume exposure while eating 1,389 pounds of vegetables per year. The usage factors and other assumptions used in the model result in a conservative overestimation of dose. Doses are calculated for the population within 50 miles of the OCGS for airborne effluents and the entire population using the

FIGURE 14
EXPOSURE PATHWAYS FOR RADIONUCLIDES POTENTIALLY RELEASED FROM THE OCGS



PREDOMINANT RADIONUCLIDES

NOBLE GASES (Xe, Kr)
Plume Exposure

RADIOIODINES (I-131,I-133)
Inhalation and Consumption of Vegetables

ACTIVATION PRODUCTS (Co-60, Mn-54)
Shoreline Exposure and Consumption of Seafood

RADIOCESIUMS (Cs-134, Cs-137)
Shoreline Exposure and Consumption of Seafood and Vegetables

TRITIUM (H-3)
Inhalation and Consumption of Vegetables

Barnegat Bay estuary and Atlantic Ocean for liquid effluents. Appendix H contains a more detailed discussion of the dose calculation methodology.

Results of Dose Calculations

Doses from natural background radiation provide a baseline for assessing the potential public health significance of radioactive effluents. The average person in the United States receives about 300 millirem (mrem) per year from natural background radiation sources. Natural background radiation from cosmic, terrestrial, and natural radionuclides in the human body (not including radon), averages about 100 mrem/yr. The natural background radiation from cosmic and terrestrial sources varies with geographic location, ranging from a low of about 65 mrem/yr on the Atlantic and Gulf coastal plains to as much as 350 mrem/yr on the Colorado plateau (Ref. 5). The National Council on Radiation Protection and Measurements (NCRP) now estimates that the average individual in the United States receives an annual dose of about 2,400 millirems to the lung from natural radon gas. This lung dose is considered to be equivalent to a whole body dose of 200 millirems (Ref. 4). Effluent releases from the OCGS and other nuclear power plants contribute a very small percentage to the natural radioactivity, which has always been present in the air, water, soil, and even in our bodies.

In general, the annual population doses from natural background radiation (excluding radon) are 1,000 to 1,000,000 times larger than the doses to the same population resulting from nuclear power plant operations (Ref. 18).

Results of the dose calculations are summarized in Tables 8 and 9. Table 8 compares the calculated maximum dose to an individual of the public with the OCGS ODCM Specifications, Technical Specifications, 10CFR20.1301, and 10CFR50 Appendix I dose limits. Table 9 presents the maximum total body radiation doses to the population within 50 miles of the plant from airborne releases, and to the entire population using Barnegat Bay and the Atlantic Ocean, for liquid releases.

These conservative calculations of the doses to members of the public from the OCGS resulted in a maximum dose of only 1.44 percent of the applicable regulatory limits. They are also considerably lower than the doses from natural background and fallout from prior nuclear weapon tests.

TABLE 8

CALCULATED MAXIMUM HYPOTHETICAL DOSES TO AN INDIVIDUAL FROM LIQUID AND AIRBORNE EFFLUENT RELEASES FROM THE OCGS FOR 2001

EFFLUENT RELEASED	REGULATORY LIMITS mrem/YEAR	SOURCE	CALCULATED DOSE mrem/YEAR	PERCENT OF REGULATORY LIMIT
LIQUID	3 - TOTAL BODY	ODCM SPEC 4.6.1.1.4	*	*
LIQUID	10 - ANY ORGAN	ODCM SPEC 4.6.1.1.4	*	*
AIRBORNE (NOBLE GAS)	100 - TOTAL BODY	10CFR20.1301	5.69E-03	5.69E-03
AIRBORNE (NOBLE GAS)	3000 - SKIN	ODCM SPEC 4.6.1.1.5	9.15E-03	3.05E-04
AIRBORNE (IODINE AND PARTICULATE)	15 - ANY ORGAN	ODCM SPEC 4.6.1.1.7	2.16E-01	1.44E+00
TOTAL-LIQUID AND AIRBORNE	25 - TOTAL BODY	ODCM SPEC 4.6.1.1.8	5.69E-03	2.28E-02
TOTAL - LIQUID AND AIRBORNE	75 - THYROID	ODCM SPEC 4.6.1.1.8	1.23E-01	1.64E-01
TOTAL - LIQUID AND AIRBORNE	25 - ANY OTHER ORGAN (Bone)	ODCM SPEC 4.6.1.1.8	2.21E-01	8.84E-01

* There were no liquid effluents released during 2001

TABLE 9

CALCULATED MAXIMUM TOTAL RADIATION DOSES TO THE POPULATION[1] FROM LIQUID AND AIRBORNE EFFLUENT RELEASES FROM THE OCGS FOR 2001

	Calculated Population Total Body Dose Person-rem/Year
From Radionuclides in Liquid Releases (Barnegat Bay and Atlantic Ocean Users)	*
From Radionuclides in Airborne Releases (Within 50-Mile Radius of OCGS)	2.08E-01

DOSE DUE TO NATURAL BACKGROUND RADIATION

Approximately 1,230,000 Person-rem Per Year

[1] Based upon 1990 Census Data

* There were no liquid effluents released in 2001

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APPENDIX A

2001 REMP Sampling Locations and Descriptions, Synopsis of REMP, and Sampling and Analysis Exceptions

TABLE A-1

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SAMPLING LOCATIONS

Sample Medium	Station Code	Distance (miles)	Azimuth (degrees)	Description
TLD	1	0.4	219	SW of site at OCGS Fire Pond, Forked River, NJ
WWA	1	0.1	209	On-site southern domestic well at OCGS, Forked River, NJ
		0.2	349	On-site northern domestic well at OCGS, Forked River, NJ
APT, AIO, TLD	3	6.0	97	East of site, near old Coast Guard Station, Island Beach State Park
TLD	6	2.1	13	NNE of site, Lane Place, behind St. Pius Church, Forked River, NJ
TLD	8	2.3	177	South of site, Route 9 at the Waretown Substation, Waretown, NJ
TLD	9	2.0	230	SW of site, where Route 532 and the Garden State Parkway meet, Waretown, NJ
APT, AIO, TLD	C	24.7	313	NW of site, GPU Energy office in rear parking lot, Cookstown, NJ
TLD	11	8.2	152	SSE of site, 80th and Anchor Streets, Harvey Cedars, NJ
TLD	14	20.8	2	North of site, Larrabee Substation on Randolph Road, Lakewood, NJ
APT, AIO	20	0.7	95	East of site, on Finninger Farm on south side of access road, Forked River, NJ
TLD	22	1.6	145	SE of site, on Long Silver Way, Skippers Cove, Waretown, NJ
SWA, CLAM, AQS	23	3.6	64	ENE of site, Barnegat Bay off Stouts Creek, approximately 400 yards SE of "Flashing Light 1"
SWA, CLAM, AQS	24	2.1	101	East of site, Barnegat Bay, approximately 250 yards SE of "Flashing Light 3"
SWA, AQS, FISH	33	0.4	123	ESE of site, east of Route 9 Bridge in OCGS Discharge Canal
VEG	35	0.4	111	ESE of site, east of Route 9 and north of the OCGS Discharge Canal, Forked River, NJ
VEG	36	23.1	319	NW of site, at "U-Pick" Farm, New Egypt, NJ

TABLE A-1(Cont.)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SAMPLING LOCATIONS

Sample Medium	Station Code	Distance (miles)	Azimuth (degrees)	Description
WWA	37	2.2	18	NNE of Site, off Boox Road at Lacey MUA Pumping Station, Forked River, NJ
WWA	38	1.6	197	SSW of Site, on Route 532, at Ocean Township MUA Pumping Station, Waretown, NJ
TLD	51	0.4	358	North of site, on the access road to Forked River site, Forked River, NJ
TLD	52	0.3	333	NNW of site, on the access road to Forked River site, Forked River, NJ
TLD	53	0.3	309	NW of site, at sewage lift station on the access road to the Forked River site, Forked River, NJ
TLD	54	0.3	288	WNW of site, on the access road to Forked River site, Forked River, NJ
TLD	55	0.3	263	West of site, on Southern Area Stores security fence, west of OCGS Switchyard, Forked River, NJ
TLD	56	0.3	249	WSW of site, on utility pole east of Southern Area Stores, west of the OCGS Switchyard, Forked River, NJ
TLD	57	0.2	206	SSW of site, on Southern Area Stores access road, Forked River, NJ
TLD	58	0.2	188	South of site, on Southern Area Stores access road, Forked River, NJ
TLD	59	0.3	166	SSE of site, on Southern Area Stores access road, Waretown, NJ
TLD	61	0.3	104	ESE of site, on Route 9 south of OCGS Main Entrance, Forked River, NJ
TLD	62	0.2	83	East of site, on Route 9 at access road to OCGS Main Gate, Forked River, NJ
TLD	63	0.2	70	ENE of site, on Route 9, between main gate and OCGS North Gate access road, Forked River, NJ
TLD	64	0.3	48	NE of site, on Route 9 at entrance to Finninger Farm, Forked River, NJ
TLD	65	0.4	19	NNE of site, on Route 9 at Intake Canal Bridge, Forked River, NJ
APT, AIO, TLD, VEG	66	0.4	133	SE of site, east of Route 9 and south of the OCGS Discharge Canal, inside fence, Waretown, NJ

TABLE A-1(Cont.)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SAMPLING LOCATIONS

Sample Medium	Station Code	Distance (miles)	Azimuth (degrees)	Description
TLD	68	1.3	265	West of site, on Garden State Parkway at mile marker 71.7, Lacey Township, NJ
APT, AIO, TLD	71	1.6	164	SSE of site, on Route 532 at the Waretown Municipal Building, Waretown, NJ
APT, AIO, TLD	72	1.9	25	NNE of site, on Lacey Road at Knights of Columbus Hall, Forked River, NJ
APT, AIO, TLD	73	1.8	108	ESE of site, on Bay Parkway, Sands Point Harbor, Waretown, NJ
TLD	74	1.8	88	East of site, Orlando Drive and Penguin Court, Forked River, NJ
TLD	75	2.0	71	ENE of site, Beach Blvd. and Maui Drive, Forked River, NJ
TLD	78	1.8	2	North of site, 1514 Arient Road, Forked River, NJ
TLD	79	2.9	160	SSE of site, Hightide Drive and Bonita Drive, Waretown, NJ
TLD	81	3.5	201	SSW of site, on rose Hill Road at intersection with Barnegat Boulevard, Barnegat, NJ
TLD	82	4.4	36	NE of site, Bay Way and Clairmore Avenue, Lanoka Harbor, NJ
TLD	84	4.4	332	NNW of site, on Lacey Road, 1.3 miles west of the Garden State Parkway on siren pole, Lacey Township, NJ
TLD	85	3.9	250	WSW of site, on Route 532, just east of Wells Mills Park, Waretown, NJ
TLD	86	5.0	224	SW of site, on Route 554, 1 mile west of the Garden State Parkway, Barnegat, NJ
TLD	88	6.6	125	SE of site, eastern end of 3rd Street, Barnegat Light, NJ
TLD	89	6.1	108	ESE of site, Job Francis residence, Island Beach State Park
TLD	90	6.3	75	ENE of site, parking lot A-5, Island Beach State Park
TLD	92	9.0	46	NE of site, at Guard Shack/Toll Booth, Island Beach State Park
FISH, CRAB	93	0.1	242	WSW of site, OCGS Discharge Canal between Pump Discharges and Route 9, Forked River, NJ

TABLE A-1(Cont.)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SAMPLING LOCATIONS

Sample Medium	Station Code	Distance (miles)	Azimuth (degrees)	Description
SWA, AQS, CLAM, FISH	94	20.0	198	SSW of site, in Great Bay/Little Egg Harbor
TLD	98	1.3	292	WNW of site, on Garden State Parkway at mile marker 72.3, Lacey Township, NJ
TLD	99	1.5	310	NW of site, on Garden State Parkway at mile marker 72.8, Lacey Township, NJ
TLD	T1	0.4	219	SW of site, at OCGS Fire Pond, Forked River, NJ

SAMPLE MEDIUM IDENTIFICATION KEY

APT	= Air Particulate	SWA	= Surface Water	TLD	= Thermoluminescent Dosimeter
AIO	= Air Iodine	AQS	= Aquatic Sediment	FISH	= Fish
WWA	= Well Water	CLAM	= Clams	CRAB	= Crab
VEG	= Vegetables				

TABLE A-2

SYNOPSIS OF THE OPERATIONAL RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM FOR THE OYSTER CREEK GENERATING STATION 2001(1)

SAMPLE TYPE	NUMBER OF SAMPLING LOCATIONS	COLLECTION FREQUENCY	NUMBER OF SAMPLES COLLECTED	TYPE OF ANALYSIS	ANALYSIS FREQUENCY	NUMBER OF SAMPLES ANALYZED (2)
Air Particulate	7	Bi-weekly	182	Gross Beta Gamma	Bi-weekly Quarterly composite	182 28
Air Iodine	7	Weekly	364	I-131	Weekly	364
Well Water	3	Quarterly	12	Gamma H-3	Quarterly Quarterly	12 12
Surface Water	4	2 locations-Monthly 4 locations – Semi-Annually	28	Gamma H-3	Monthly (2 Stations) Semiannually (4 Stations)	28 28
Clam	3	Semiannually	6	Gamma	Semiannually	6
Sediment	4	Semiannually	8	Gamma	Semiannually	8
Vegetables	3	Monthly(3)	23	Gamma	Monthly(3)	23
Fish	3	Semiannually	14	Gamma	Semiannually	14
Crab	1	Annually	1	Gamma	Annually	1
TLD-Proxtronics	4	Quarterly	12	Immersion Dose	Quarterly	12
TLD-Harshaw 110 & Panasonic 814	44	Quarterly	173	Immersion Dose	Quarterly	173

(1) This table does not include Quality Assurance (QA) samples.

(2) The number of samples analyzed does not include duplicate analyses, recounts, or reanalyses.

(3) Collected during harvest season only.

TABLE A-3

2001 SAMPLING AND ANALYSIS EXCEPTIONS

During 2001, 639 samples were collected from aquatic, atmospheric, and terrestrial environments around the OCGS. This is far more than the minimum number of samples required by the Offsite Dose Calculation Manual (ODCM) Specifications. There were sampling and analysis exceptions that occurred in 2001 that resulted in minor deviations from the requirements of the ODCM. These deviations did not compromise AmerGen Energy Company's ability to assess the impact of the OCGS on public health or the environment because the scope of the monitoring program exceeds the ODCM requirements. The circumstances surrounding these events are described below.

Attachment 2000-ADM-4532.04-9 of the ODCM (Ref. 2) provides the sampling and collection frequencies that apply to the collection of REMP samples. Technical Specification Section 1.24 (Ref. 1) requires collection of REMP samples be performed within the specified time interval with a maximum allowable extension not to exceed 25% of the surveillance interval. As an example, Air Charcoal cartridges are required to be collected weekly. When the 25% factor is applied, all cartridges must be collected within 8.75 days of the prior collection. The following samples were collected beyond the specified time interval plus twenty-five percent:

Medium	Station	Scheduled Collection Date	Amount Of Time REMP Sample Was Collected Beyond the Maximum Interval
Surface Water	33	05 Feb 02	3.0 Days
Surface Water	94	05 Feb 02	3.0 Days
Surface Water	33	01 Oct 02	0.2 Days
Surface Water	94	01 Oct 02	0.3 Days
Cabbage	35	10 Sep 02	8.8 Days
Cabbage	36	10 Sep 02	5.6 Days
Cabbage	66	10 Sep 02	9.5 Days
Collards	35	10 Sep 02	8.8 Days
Collards	36	10 Sep 02	5.7 Days
Collards	66	10 Sep 02	9.6 Days

Upon recognition that ten REMP samples were not collected within the maximum required time interval, CAP (Corrective Action Process) # 02002-0247 was written, dated 15 Feb 02, to investigate the causes and take measures to prevent recurrence.

Of the 639 REMP samples collected in 2001, only 10 of these samples, (1.6 percent) were collected beyond the specified timeframe. None of these ten REMP samples when analyzed showed radionuclide levels that exceeded license limits.

APPENDIX B

2001 Lower Limits of Detection (LLD) Exceptions

2001 LOWER LIMITS OF DETECTION (LLD) EXCEPTIONS

During 2001, there were no Lower Limit of Detection (LLD) violations on any analyzed REMP sample.

APPENDIX C

Changes to the REMP During 2001

Table C-1

Changes to the REMP during 2001

April 2001	Harshaw Model # 110 TLDs were replaced by Panasonic Model # 814 TLDs.

APPENDIX D

Radionuclide Concentrations in 2001 Environmental Samples

TABLE D-1
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
OYSTER CREEK GENERATING STATION
RADIONUCLIDE CONCENTRATIONS IN 2001 ENVIRONMENTAL SAMPLES
JANUARY 2001 THROUGH DECEMBER 2001

THE FOLLOWING PAGES ARE A SUMMARY OF REMP DATA FOR THE SCHEDULED COLLECTION PERIOD JANUARY 2001 THROUGH DECEMBER 2001. DATA ARE SUMMARIZED ON AN ANNUAL BASIS, WHERE:

SAMPLE MEDIUM: Sample type being analyzed

ANALYSIS: Type of analysis being performed on the particular media

OF ANALYSES PERFORMED: The total number of analyses performed for a particular sample type

LLD: The mean lower limit of detection. Note that this value is based on samples whose results showed no detectable activity

INDICATOR STATIONS: The mean, minimum, and maximum radioactive concentration detected at all indicator stations

HIGHEST ANNUAL MEAN: The mean, minimum, and maximum radioactive concentration detected at the station with the highest annual mean concentration

STATION: The station designation with the highest annual mean concentration

BACKGROUND STATION: The mean, minimum, and maximum radioactive concentrations detected at all background stations

(N/TOT): The fraction of detectable concentration versus the total number of analyses performed

BACKGROUND STATIONS USED AT OCGS

SAMPLE MEDIUM	AIR PARTICULATE AIR IODINE	SURFACE WATER CLAMS SEDIMENT FISH	WELL WATER	VEGETABLES
STATION	C	94	37	36

TABLE D-1 (cont.)
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
OYSTER CREEK NUCLEAR STATION
RADIONUCLIDE CONCENTRATIONS IN 2001 ENVIRONMENTAL SAMPLES
JANUARY 2001 THROUGH DECEMBER 2001

SAMPLE MEDIUM	ANALYSIS	NUCLIDE	# OF ANAL. PERF.	LLD	INDICATOR STATIONS				STATION WITH HIGHEST ANNUAL MEAN				BACKGROUND STATION			
					MIN	MEAN	MAX	(N/TOT)	MIN	MEAN Station #	MAX	(N/TOT)	MIN	MEAN Station #	MAX	(N/TOT)
AIR IODINE (pCi/m³)	Iodine-131	I-131	364	3.00E-02	< LLD	< LLD	< LLD	(0/312)	< LLD	< LLD	< LLD	(0/52)	< LLD	< LLD Station C	< LLD	(0/52)
AIR PARTICULATE (pCi/m³)	Gross Beta	-	182	-	7.00E-03	1.83E-02	2.90E-02	(156/156)	9.00E-03	2.00E-02 Station 20	2.90E-02	(26/26)	1.00E-02	1.94E-02 Station C	2.90E-02	(26/26)
AIR PARTICULATE (pCi/m³)	Gamma Scan	Be-7	28	-	4.50E-02	7.03E-02	1.00E-01	(24/24)	5.90E-02	7.65E-02 Station 20	9.50E-02	(4/4)	5.10E-02	6.88E-02 Station C	9.30E-02	(4/4)
AIR PARTICULATE (pCi/m³)	Gamma Scan	Mn-54	28	3.04E-04	< LLD	< LLD	< LLD	(0/24)	< LLD	< LLD	< LLD	(0/4)	< LLD	< LLD Station C	< LLD	(0/4)
AIR PARTICULATE (pCi/m³)	Gamma Scan	Co-58	28	2.68E-04	< LLD	< LLD	< LLD	(0/24)	< LLD	< LLD	< LLD	(0/4)	< LLD	< LLD Station C	< LLD	(0/4)
AIR PARTICULATE (pCi/m³)	Gamma Scan	Co-60	28	3.25E-04	< LLD	< LLD	< LLD	(0/24)	< LLD	< LLD	< LLD	(0/4)	< LLD	< LLD Station C	< LLD	(0/4)
AIR PARTICULATE (pCi/m³)	Gamma Scan	Cs-134	28	2.71E-04	< LLD	< LLD	< LLD	(0/24)	< LLD	< LLD	< LLD	(0/4)	< LLD	< LLD Station C	< LLD	(0/4)
AIR PARTICULATE (pCi/m³)	Gamma Scan	Cs-137	28	2.50E-04	< LLD	< LLD	< LLD	(0/24)	< LLD	< LLD	< LLD	(0/4)	< LLD	< LLD Station C	< LLD	(0/4)
WELL WATER (pCi/L)	Tritium	H-3	12	1.09E+02	< LLD	< LLD	< LLD	(0/8)	< LLD	< LLD	< LLD	(0/4)	< LLD	< LLD Station 37	< LLD	(0/4)
WELL WATER (pCi/L)	Gamma Scan	Mn-54	12	3.48E+00	< LLD	< LLD	< LLD	(0/8)	< LLD	< LLD	< LLD	(0/4)	< LLD	< LLD Station 37	< LLD	(0/4)
WELL WATER (pCi/L)	Gamma Scan	Co-58	12	3.08E+00	< LLD	< LLD	< LLD	(0/8)	< LLD	< LLD	< LLD	(0/4)	< LLD	< LLD Station 37	< LLD	(0/4)
WELL WATER (pCi/L)	Gamma Scan	Fe-59	12	5.17E+01	< LLD	< LLD	< LLD	(0/8)	< LLD	< LLD	< LLD	(0/4)	< LLD	< LLD Station 37	< LLD	(0/4)
WELL WATER (pCi/L)	Gamma Scan	Co-60	12	3.29E+00	< LLD	< LLD	< LLD	(0/8)	< LLD	< LLD	< LLD	(0/4)	< LLD	< LLD Station 37	< LLD	(0/4)
WELL WATER (pCi/L)	Gamma Scan	Zn-65	12	4.88E+00	< LLD	< LLD	< LLD	(0/8)	< LLD	< LLD	< LLD	(0/4)	< LLD	< LLD Station 37	< LLD	(0/4)

TABLE D-1 (cont.)
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
OYSTER CREEK GENERATING STATION
RADIONUCLIDE CONCENTRATIONS IN 2001 ENVIRONMENTAL SAMPLES
JANUARY 2001 THROUGH DECEMBER 2001

SAMPLE MEDIUM	ANALYSIS	NUCLIDE	# OF ANAL. PERF.	LLD	INDICATOR STATIONS				STATION WITH HIGHEST ANNUAL MEAN				BACKGROUND STATION			
					MIN	MEAN	MAX	(N/TOT)	MIN	MEAN Station #	MAX	(N/TOT)	MIN	MEAN Station #	MAX	(N/TOT)
WELL WATER (pCi/L)	Gamma Scan	Zr-95	12	7.42E+00	< LLD	< LLD	< LLD	(0/8)	< LLD	< LLD	< LLD	(0/4)	< LLD	< LLD Station 37	< LLD	(0/4)
WELL WATER (pCi/L)	Gamma Scan	Nb-95	12	3.54E+00	< LLD	< LLD	< LLD	(0/8)	< LLD	< LLD	< LLD	(0/4)	< LLD	< LLD Station 37	< LLD	(0/4)
WELL WATER (pCi/L)	Gamma Scan	I-131	12	1.29E+01	< LLD	< LLD	< LLD	(0/8)	< LLD	< LLD	< LLD	(0/4)	< LLD	< LLD Station 37	< LLD	(0/4)
WELL WATER (pCi/L)	Gamma Scan	Cs-134	12	3.61E+00	< LLD	< LLD	< LLD	(0/8)	< LLD	< LLD	< LLD	(0/4)	< LLD	< LLD Station 37	< LLD	(0/4)
WELL WATER (pCi/L)	Gamma Scan	Cs-137	12	3.48E+00	< LLD	< LLD	< LLD	(0/8)	< LLD	< LLD	< LLD	(0/4)	< LLD	< LLD Station 37	< LLD	(0/4)
WELL WATER (pCi/L)	Gamma Scan	Ba-140	12	2.51E+01	< LLD	< LLD	< LLD	(0/8)	< LLD	< LLD	< LLD	(0/4)	< LLD	< LLD Station 37	< LLD	(0/4)
WELL WATER (pCi/L)	Gamma Scan	La-140	12	5.91E+00	< LLD	< LLD	< LLD	(0/8)	< LLD	< LLD	< LLD	(0/4)	< LLD	< LLD Station 37	< LLD	(0/4)
SURFACE WATER (pCi/L)	Tritium	H-3	28	1.08E+02	< LLD	< LLD	< LLD	(0/16)	< LLD	< LLD	< LLD	(0/2 or 0/12)	< LLD	< LLD Station 94	< LLD	(0/12)
SURFACE WATER (pCi/L)	Gamma Scan	Mn-54	28	3.11E+00	< LLD	< LLD	< LLD	(0/16)	< LLD	< LLD	< LLD	(0/2 or 0/12)	< LLD	< LLD Station 94	< LLD	(0/12)
SURFACE WATER (pCi/L)	Gamma Scan	Co-58	28	3.04E+00	< LLD	< LLD	< LLD	(0/16)	< LLD	< LLD	< LLD	(0/2 or 0/12)	< LLD	< LLD Station 94	< LLD	(0/12)
SURFACE WATER (pCi/L)	Gamma Scan	Fe-59	28	4.79E+00	< LLD	< LLD	< LLD	(0/16)	< LLD	< LLD	< LLD	(0/2 or 0/12)	< LLD	< LLD Station 94	< LLD	(0/12)
SURFACE WATER (pCi/L)	Gamma Scan	Co-60	28	2.81E+00	< LLD	< LLD	< LLD	(0/16)	< LLD	< LLD	< LLD	(0/2 or 0/12)	< LLD	< LLD Station 94	< LLD	(0/12)
SURFACE WATER (pCi/L)	Gamma Scan	Zn-65	28	5.38E+00	< LLD	< LLD	< LLD	(0/16)	< LLD	< LLD	< LLD	(0/2 or 0/12)	< LLD	< LLD Station 94	< LLD	(0/12)
SURFACE WATER (pCi/L)	Gamma Scan	Zr-95	28	6.01E+00	< LLD	< LLD	< LLD	(0/16)	< LLD	< LLD	< LLD	(0/2) or (0/12)	< LLD	< LLD Station 94	< LLD	(0/12)
SURFACE WATER (pCi/L)	Gamma Scan	Nb-95	28	3.41E+00	< LLD	< LLD	< LLD	(0/16)	< LLD	< LLD	< LLD	(0/2) or (0/12)	< LLD	< LLD Station 94	< LLD	(0/12)
SURFACE WATER (pCi/L)	Gamma Scan	I-131	28	8.81E+00	< LLD	< LLD	< LLD	(0/16)	< LLD	< LLD	< LLD	(0/2) or (0/12)	< LLD	< LLD Station 94	< LLD	(0/12)

TABLE D-1 (cont.)
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
OYSTER CREEK GENERATING STATION
RADIONUCLIDE CONCENTRATIONS IN 2001 ENVIRONMENTAL SAMPLES
JANUARY 2001 THROUGH DECEMBER 2001

SAMPLE MEDIUM	ANALYSIS	NUCLIDE	# OF ANAL. PERF.	LLD	INDICATOR STATIONS				STATION WITH HIGHEST ANNUAL MEAN				BACKGROUND STATION			
					MIN	MEAN	MAX	(N/TOT)	MIN	MEAN Station #	MAX	(N/TOT)	MIN	MEAN Station #	MAX	(N/TOT)
SURFACE WATER (pCi/L)	Gamma Scan	Cs-134	28	3.23E+00	< LLD	< LLD	< LLD	(0/16)	< LLD	< LLD	< LLD	(0/2) or (0/12)	< LLD	< LLD Station 94	< LLD	(0/12)
SURFACE WATER (pCi/L)	Gamma Scan	Cs-137	28	3.20E+00	< LLD	< LLD	< LLD	(0/16)	< LLD	< LLD	< LLD	(0/2) or (0/12)	< LLD	< LLD Station 94	< LLD	(0/12)
SURFACE WATER (pCi/L)	Gamma Scan	Ba-140	28	1.88E+01	< LLD	< LLD	< LLD	(0/16)	< LLD	< LLD	< LLD	(0/2) or (0/12)	< LLD	< LLD Station 94	< LLD	(0/12)
SURFACE WATER (pCi/L)	Gamma Scan	La-140	28	3.39E+00	< LLD	< LLD	< LLD	(0/16)	< LLD	< LLD	< LLD	(0/2) or (0/12)	< LLD	< LLD Station 94	< LLD	(0/12)
CLAMS (pCi/kg(wet))	Gamma Scan	K-40	6	6.33E+02	9.02E+02	1.06E+03	1.16E+03	(3/4)	1.12E+03	1.12E+03 Station 23	1.12E+03	(1/2)	7.35E+02	8.99E+02 Station 94	1.06E+03	(2/2)
CLAMS (pCi/kg(wet))	Gamma Scan	Mn-54	6	1.73E+01	< LLD	< LLD	< LLD	(0/4)	< LLD	< LLD	< LLD	(0/2)	< LLD	< LLD Station 94	< LLD	(0/2)
CLAMS (pCi/kg(wet))	Gamma Scan	Co-58	6	1.68E+01	< LLD	< LLD	< LLD	(0/4)	< LLD	< LLD	< LLD	(0/2)	< LLD	< LLD Station 94	< LLD	(0/2)
CLAMS (pCi/kg(wet))	Gamma Scan	Fe-59	6	4.13E+01	< LLD	< LLD	< LLD	(0/4)	< LLD	< LLD	< LLD	(0/2)	< LLD	< LLD Station 94	< LLD	(0/2)
CLAMS (pCi/kg(wet))	Gamma Scan	Co-60	6	1.68E+01	< LLD	< LLD	< LLD	(0/4)	< LLD	< LLD	< LLD	(0/2)	< LLD	< LLD Station 94	< LLD	(0/2)
CLAMS (pCi/kg(wet))	Gamma Scan	Zn-65	6	2.94E+01	< LLD	< LLD	< LLD	(0/4)	< LLD	< LLD	< LLD	(0/2)	< LLD	< LLD Station 94	< LLD	(0/2)
CLAMS (pCi/kg(wet))	Gamma Scan	Cs-134	6	1.87E+01	< LLD	< LLD	< LLD	(0/4)	< LLD	< LLD	< LLD	(0/2)	< LLD	< LLD Station 94	< LLD	(0/2)
CLAMS (pCi/kg(wet))	Gamma Scan	Cs-137	6	1.70E+01	< LLD	< LLD	< LLD	(0/4)	< LLD	< LLD	< LLD	(0/2)	< LLD	< LLD Station 94	< LLD	(0/2)
AQUATIC SEDIMENT (pCi/kg(dry))	Gamma Scan	K-40	8	-	9.48E+02	2.56E+03	6.48E+03	(6/6)	1.16E+03	3.82E+03 Station 24	6.48E+03	(2/2)	1.16E+04	1.22E+04 Station 94	1.28E+04	(2/2)
AQUATIC SEDIMENT (pCi/kg(dry))	Gamma Scan	Mn-54	8	1.14E+01	< LLD	< LLD	< LLD	(0/6)	< LLD	< LLD	< LLD	(0/2)	< LLD	< LLD Station 94	< LLD	(0/2)
AQUATIC SEDIMENT (pCi/kg(dry))	Gamma Scan	Co-58	8	1.31E+01	< LLD	< LLD	< LLD	(0/6)	< LLD	< LLD	< LLD	(0/2)	< LLD	< LLD Station 94	< LLD	(0/2)

TABLE D-1 (cont.)
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
OYSTER CREEK GENERATING STATION
RADIONUCLIDE CONCENTRATIONS IN 2001 ENVIRONMENTAL SAMPLES
JANUARY 2001 THROUGH DECEMBER 2001

SAMPLE MEDIUM	ANALYSIS	NUCLIDE	# OF ANAL. PERF.	LLD	INDICATOR STATIONS				STATION WITH HIGHEST ANNUAL MEAN				BACKGROUND STATION			
					MIN	MEAN	MAX	(N/TOT)	MIN	MEAN Station #	MAX	(N/TOT)	MIN	MEAN Station #	MAX	(N/TOT)
AQUATIC SEDIMENT (pCi/kg(dry))	Gamma Scan	Co-60	8	9.51E+00	< LLD	< LLD	< LLD	(0/6)	< LLD	< LLD	< LLD	(0/2)	< LLD	< LLD Station 94	< LLD	(0/2)
AQUATIC SEDIMENT (pCi/kg(dry))	Gamma Scan	Cs-134	8	1.40E+01	< LLD	< LLD	< LLD	(0/6)	< LLD	< LLD	< LLD	(0/2)	< LLD	< LLD Station 94	< LLD	(0/2)
AQUATIC SEDIMENT (pCi/kg(dry))	Gamma Scan	Cs-137	8	1.08E+01	< LLD	< LLD	< LLD	(0/6)	< LLD	< LLD	< LLD	(0/2)	2.62E+01	2.62E+01 Station 94	2.62E+01	(1/2)
CABBAGE (pCi/kg(wet))	Gamma Scan	K-40	11	-	2.37E+03	3.00E+03	3.57E+03	(7/7)	2.78E+03	3.20E+03 Station 66	3.57E+03	(4/4)	1.94E+03	2.38E+03 Station 36	3.04E+03	(4/4)
CABBAGE (pCi/kg(wet))	Gamma Scan	Mn-54	11	1.33E+01	< LLD	< LLD	< LLD	(0/7)	< LLD	< LLD	< LLD	(0/3) or (0/4)	< LLD	< LLD Station 36	< LLD	(0/4)
CABBAGE (pCi/kg(wet))	Gamma Scan	Co-58	11	1.03E+01	< LLD	< LLD	< LLD	(0/7)	< LLD	< LLD	< LLD	(0/3) or (0/4)	< LLD	< LLD Station 36	< LLD	(0/4)
CABBAGE (pCi/kg(wet))	Gamma Scan	Fe-59	11	2.62E+01	< LLD	< LLD	< LLD	(0/7)	< LLD	< LLD	< LLD	(0/3) or (0/4)	< LLD	< LLD Station 36	< LLD	(0/4)
CABBAGE (pCi/kg(wet))	Gamma Scan	Co-60	11	9.38E+00	< LLD	< LLD	< LLD	(0/7)	< LLD	< LLD	< LLD	(0/3) or (0/4)	< LLD	< LLD Station 36	< LLD	(0/4)
CABBAGE (pCi/kg(wet))	Gamma Scan	Zn-65	11	2.23E+01	< LLD	< LLD	< LLD	(0/7)	< LLD	< LLD	< LLD	(0/3) or (0/4)	< LLD	< LLD Station 36	< LLD	(0/4)
CABBAGE (pCi/kg(wet))	Gamma Scan	I-131	11	2.09E+01	< LLD	< LLD	< LLD	(0/7)	< LLD	< LLD	< LLD	(0/3) or (0/4)	< LLD	< LLD Station 36	< LLD	(0/4)
CABBAGE (pCi/kg(wet))	Gamma Scan	Cs-134	11	1.39E+01	< LLD	< LLD	< LLD	(0/7)	< LLD	< LLD	< LLD	(0/3) or (0/4)	< LLD	< LLD Station 36	< LLD	(0/4)
CABBAGE (pCi/kg(wet))	Gamma Scan	Cs-137	11	1.48E+01	5.00E+01	5.00E+01	5.00E+01	(1/7)	5.00E+01	5.00E+01 Station 35	5.00E+01	(1/3)	< LLD	< LLD Station 36	< LLD	(0/4)
COLLARDS (pCi/kg(wet))	Gamma Scan	K-40	12	-	1.51E+03	2.70E+03	3.85E+03	(8/8)	2.29E+03	3.14E+03 Station 66	3.85E+03	(4/4)	3.59E+03	4.19E+03 Station 36	4.72E+03	(4/4)
COLLARDS (pCi/kg(wet))	Gamma Scan	Mn-54	12	1.04E+01	< LLD	< LLD	< LLD	(0/8)	< LLD	< LLD	< LLD	(0/4)	< LLD	< LLD Station 36	< LLD	(0/4)
COLLARDS (pCi/kg(wet))	Gamma Scan	Co-58	12	8.68E+00	< LLD	< LLD	< LLD	(0/8)	< LLD	< LLD	< LLD	(0/4)	< LLD	< LLD Station 36	< LLD	(0/4)
COLLARDS (pCi/kg(wet))	Gamma Scan	Fe-59	12	2.63E+01	< LLD	< LLD	< LLD	(0/8)	< LLD	< LLD	< LLD	(0/4)	< LLD	< LLD Station 36	< LLD	(0/4)

TABLE D-1 (cont.)
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
OYSTER CREEK GENERATING STATION
RADIONUCLIDE CONCENTRATIONS IN 2001 ENVIRONMENTAL SAMPLES
JANUARY 2001 THROUGH DECEMBER 2001

SAMPLE MEDIUM	ANALYSIS	NUCLIDE	# OF ANAL. PERF.	LLD	INDICATOR STATIONS				STATION WITH HIGHEST ANNUAL MEAN				BACKGROUND STATION			
					MIN	MEAN	MAX	(N/TOT)	MIN	MEAN Station #	MAX	(N/TOT)	MIN	MEAN Station #	MAX	(N/TOT)
COLLARDS (pCi/kg(wet))	Gamma Scan	Co-60	12	1.20E+01	< LLD	< LLD	< LLD	(0/8)	< LLD	< LLD	< LLD	(0/4)	< LLD	< LLD Station 36	< LLD	(0/4)
COLLARDS (pCi/kg(wet))	Gamma Scan	Zn-65	12	2.38E+01	< LLD	< LLD	< LLD	(0/8)	< LLD	< LLD	< LLD	(0/4)	< LLD	< LLD Station 36	< LLD	(0/4)
COLLARDS (pCi/kg(wet))	Gamma Scan	I-131	12	2.03E+01	< LLD	< LLD	< LLD	(0/8)	< LLD	< LLD	< LLD	(0/4)	< LLD	< LLD Station 36	< LLD	(0/4)
COLLARDS (pCi/kg(wet))	Gamma Scan	Cs-134	12	1.32E+01	< LLD	< LLD	< LLD	(0/8)	< LLD	< LLD	< LLD	(0/4)	< LLD	< LLD Station 36	< LLD	(0/4)
COLLARDS (pCi/kg(wet))	Gamma Scan	Cs-137	12	1.51E+01	1.36E+01	1.85E+01	2.33E+01	(2/8)	1.36E+01	1.85E+01 Station 35	2.33E+01	(2/4)	< LLD	< LLD Station 36	< LLD	(0/4)
AMERICAN EEL (pCi/kg(wet))	Gamma Scan	K-40	1	-	1.89E+03	1.89E+03	1.89E+03	(1/1)	1.89E+03	1.89E+03 Station 33	1.89E+03	(1/1)	No Background Sample Collected			(0/0)
AMERICAN EEL (pCi/kg(wet))	Gamma Scan	Mn-54	1	1.60E+01	< LLD	< LLD	< LLD	(0/1)	< LLD	< LLD	< LLD	(0/1)	No Background Sample Collected			(0/0)
AMERICAN EEL (pCi/kg(wet))	Gamma Scan	Co-58	1	2.10E+01	< LLD	< LLD	< LLD	(0/1)	< LLD	< LLD	< LLD	(0/1)	No Background Sample Collected			(0/0)
AMERICAN EEL (pCi/kg(wet))	Gamma Scan	Fe-59	1	4.60E+01	< LLD	< LLD	< LLD	(0/1)	< LLD	< LLD	< LLD	(0/1)	No Background Sample Collected			(0/0)
AMERICAN EEL (pCi/kg(wet))	Gamma Scan	Co-60	1	8.00E+00	< LLD	< LLD	< LLD	(0/1)	< LLD	< LLD	< LLD	(0/1)	No Background Sample Collected			(0/0)
AMERICAN EEL (pCi/kg(wet))	Gamma Scan	Zn-65	1	2.30E+01	< LLD	< LLD	< LLD	(0/1)	< LLD	< LLD	< LLD	(0/1)	No Background Sample Collected			(0/0)
AMERICAN EEL (pCi/kg(wet))	Gamma Scan	Cs-134	1	8.00E+00	< LLD	< LLD	< LLD	(0/1)	< LLD	< LLD	< LLD	(0/1)	No Background Sample Collected			(0/0)
AMERICAN EEL (pCi/kg(wet))	Gamma Scan	Cs-137	1	1.50E+01	< LLD	< LLD	< LLD	(0/1)	< LLD	< LLD	< LLD	(0/1)	No Background Sample Collected			(0/0)
BLOWFISH (pCi/kg(wet))	Gamma Scan	K-40	1	-	1.84E+03	1.84E+03	1.84E+03	(1/1)	1.84E+03	1.84E+03 Station 93	1.84E+03	(1/1)	No Background Sample Collected			(0/0)
BLOWFISH (pCi/kg(wet))	Gamma Scan	Mn-54	1	4.40E+01	< LLD	< LLD	< LLD	(0/1)	< LLD	< LLD	< LLD	(0/1)	No Background Sample Collected			(0/0)
BLOWFISH (pCi/kg(wet))	Gamma Scan	Co-58	1	6.20E+01	< LLD	< LLD	< LLD	(0/1)	< LLD	< LLD	< LLD	(0/1)	No Background Sample Collected			(0/0)
BLOWFISH (pCi/kg(wet))	Gamma Scan	Fe-59	1	1.47E+02	< LLD	< LLD	< LLD	(0/1)	< LLD	< LLD	< LLD	(0/1)	No Background Sample Collected			(0/0)

TABLE D-1 (cont.)
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
OYSTER CREEK GENERATING STATION
RADIONUCLIDE CONCENTRATIONS IN 2001 ENVIRONMENTAL SAMPLES
JANUARY 2001 THROUGH DECEMBER 2001

SAMPLE MEDIUM	ANALYSIS	NUCLIDE	# OF ANAL. PERF.	LLD	INDICATOR STATIONS				STATION WITH HIGHEST ANNUAL MEAN				BACKGROUND STATION			
					MIN	MEAN	MAX	(N/TOT)	MIN	MEAN Station #	MAX	(N/TOT)	MIN	MEAN Station #	MAX	(N/TOT)
BLOWFISH (pCi/kg(wet))	Gamma Scan	Co-60	1	3.40E+01	< LLD	< LLD	< LLD	(0/1)	< LLD	< LLD	< LLD	(0/1)	No Background Sample Collected			(0/0)
BLOWFISH (pCi/kg(wet))	Gamma Scan	Zn-65	1	7.70E+01	< LLD	< LLD	< LLD	(0/1)	< LLD	< LLD	< LLD	(0/1)	No Background Sample Collected			(0/0)
BLOWFISH (pCi/kg(wet))	Gamma Scan	Cs-134	1	4.20E+01	< LLD	< LLD	< LLD	(0/1)	< LLD	< LLD	< LLD	(0/1)	No Background Sample Collected			(0/0)
BLOWFISH (pCi/kg(wet))	Gamma Scan	Cs-137	1	4.90E+01	< LLD	< LLD	< LLD	(0/1)	< LLD	< LLD	< LLD	(0/1)	No Background Sample Collected			(0/0)
BLUEFISH (pCi/kg(wet))	Gamma Scan	K-40	3	-	2.69E+03	2.97E+03	3.23E+03	(3/3)	3.23E+03	3.23E+03 Station 33	3.23E+03	(1/1)	No Background Sample Collected			(0/0)
BLUEFISH (pCi/kg(wet))	Gamma Scan	Mn-54	3	1.43E+01	< LLD	< LLD	< LLD	(0/3)	< LLD	< LLD	< LLD	(0/1) or (0/2)	No Background Sample Collected			(0/0)
BLUEFISH (pCi/kg(wet))	Gamma Scan	Co-58	3	1.93E+01	< LLD	< LLD	< LLD	(0/3)	< LLD	< LLD	< LLD	(0/1) or (0/2)	No Background Sample Collected			(0/0)
BLUEFISH (pCi/kg(wet))	Gamma Scan	Fe-59	3	5.93E+01	< LLD	< LLD	< LLD	(0/3)	< LLD	< LLD	< LLD	(0/1) or (0/2)	No Background Sample Collected			(0/0)
BLUEFISH (pCi/kg(wet))	Gamma Scan	Co-60	3	1.43E+01	< LLD	< LLD	< LLD	(0/3)	< LLD	< LLD	< LLD	(0/1) or (0/2)	No Background Sample Collected			(0/0)
BLUEFISH (pCi/kg(wet))	Gamma Scan	Zn-65	3	3.17E+01	< LLD	< LLD	< LLD	(0/3)	< LLD	< LLD	< LLD	(0/1) or (0/2)	No Background Sample Collected			(0/0)
BLUEFISH (pCi/kg(wet))	Gamma Scan	Cs-134	3	1.23E+01	< LLD	< LLD	< LLD	(0/3)	< LLD	< LLD	< LLD	(0/1) or (0/2)	No Background Sample Collected			(0/0)
BLUEFISH (pCi/kg(wet))	Gamma Scan	Cs-137	1	1.40E+01	< LLD	< LLD	< LLD	(0/3)	< LLD	< LLD	< LLD	(0/1) or (0/2)	No Background Sample Collected			(0/0)
SEA BASS (pCi/kg(wet))	Gamma Scan	K-40	1		No Indicator Sample Collected			(0/0)	No Indicator Sample Collected			(0/0)	2.84E+03	2.84E+03 Station 94	2.84E+03	(0/1)
SEA BASS (pCi/kg(wet))	Gamma Scan	Mn-54	1	3.00E+01	No Indicator Sample Collected			(0/0)	No Indicator Sample Collected			(0/0)	< LLD	< LLD Station 94	< LLD	(0/1)
SEA BASS (pCi/kg(wet))	Gamma Scan	Co-58	1	2.40E+01	No Indicator Sample Collected			(0/0)	No Indicator Sample Collected			(0/0)	< LLD	< LLD Station 94	< LLD	(0/1)
SEA BASS (pCi/kg(wet))	Gamma Scan	Fe-59	1	8.00E+01	No Indicator Sample Collected			(0/0)	No Indicator Sample Collected			(0/0)	< LLD	< LLD Station 94	< LLD	(0/1)

TABLE D-1 (cont.)
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
OYSTER CREEK GENERATING STATION
RADIONUCLIDE CONCENTRATIONS IN 2001 ENVIRONMENTAL SAMPLES
JANUARY 2001 THROUGH DECEMBER 2001

SAMPLE MEDIUM	ANALYSIS	NUCLIDE	# OF ANAL. PERF.	LLD	INDICATOR STATIONS				STATION WITH HIGHEST ANNUAL MEAN				BACKGROUND STATION			
					MIN	MEAN	MAX	(N/TOT)	MIN	MEAN Station #	MAX	(N/TOT)	MIN	MEAN Station #	MAX	(N/TOT)
SEA BASS (pCi/kg(wet))	Gamma Scan	Co-60	1	9.00E+00	No Indicator Sample Collected			(0/0)	No Indicator Sample Collected			(0/0)	< LLD	< LLD Station 94	< LLD	(0/1)
SEA BASS (pCi/kg(wet))	Gamma Scan	Zn-65	1	5.00E+00	No Indicator Sample Collected			(0/0)	No Indicator Sample Collected			(0/0)	< LLD	< LLD Station 94	< LLD	(0/1)
SEA BASS (pCi/kg(wet))	Gamma Scan	Cs-134	1	2.00E+01	No Indicator Sample Collected			(0/0)	No Indicator Sample Collected			(0/0)	< LLD	< LLD Station 94	< LLD	(0/1)
SEA BASS (pCi/kg(wet))	Gamma Scan	Cs-137	1	2.10E+01	No Indicator Sample Collected			(0/0)	No Indicator Sample Collected			(0/0)	< LLD	< LLD Station 94	< LLD	(0/1)
STRIPED BASS (pCi/kg(wet))	Gamma Scan	K-40	2	-	3.12E+03	3.23E+03	3.34E+03	(2/2)	3.12E+03	3.23E+03	3.34E+03	(2/2)	No Background Sample Collected			(0/0)
STRIPED BASS (pCi/kg(wet))	Gamma Scan	Mn-54	2	9.00E+00	< LLD	< LLD	< LLD	(0/2)	< LLD	< LLD	< LLD	(0/2)	No Background Sample Collected			(0/0)
STRIPED BASS (pCi/kg(wet))	Gamma Scan	Co-58	2	1.80E+01	< LLD	< LLD	< LLD	(0/2)	< LLD	< LLD	< LLD	(0/2)	No Background Sample Collected			(0/0)
STRIPED BASS (pCi/kg(wet))	Gamma Scan	Fe-59	2	5.55E+00	< LLD	< LLD	< LLD	(0/2)	< LLD	< LLD	< LLD	(0/2)	No Background Sample Collected			(0/0)
STRIPED BASS (pCi/kg(wet))	Gamma Scan	Co-60	2	1.30E+01	< LLD	< LLD	< LLD	(0/2)	< LLD	< LLD	< LLD	(0/2)	No Background Sample Collected			(0/0)
STRIPED BASS (pCi/kg(wet))	Gamma Scan	Zn-65	2	1.60E+01	< LLD	< LLD	< LLD	(0/2)	< LLD	< LLD	< LLD	(0/2)	No Background Sample Collected			(0/0)
STRIPED BASS (pCi/kg(wet))	Gamma Scan	Cs-134	2	1.30E+01	< LLD	< LLD	< LLD	(0/2)	< LLD	< LLD	< LLD	(0/2)	No Background Sample Collected			(0/0)
STRIPED BASS (pCi/kg(wet))	Gamma Scan	Cs-137	2	1.15E+01	< LLD	< LLD	< LLD	(0/2)	< LLD	< LLD	< LLD	(0/2)	No Background Sample Collected			(0/0)
SUMMER FLOUNDER (pCi/kg(wet))	Gamma Scan	K-40	1	-	No Indicator Sample Collected			(0/0)	No Indicator Sample Collected			(0/0)	3.07E+03	3.07E+03	3.07E+03	(1/1)
SUMMER FLOUNDER (pCi/kg(wet))	Gamma Scan	Mn-54	1	1.80E+01	No Indicator Sample Collected			(0/0)	No Indicator Sample Collected			(0/0)	< LLD	< LLD	< LLD	(0/1)
SUMMER FLOUNDER (pCi/kg(wet))	Gamma Scan	Co-58	1	3.30E+01	No Indicator Sample Collected			(0/0)	No Indicator Sample Collected			(0/0)	< LLD	< LLD	< LLD	(0/1)

TABLE D-1 (cont.)
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
OYSTER CREEK GENERATING STATION
RADIONUCLIDE CONCENTRATIONS IN 2001 ENVIRONMENTAL SAMPLES
JANUARY 2001 THROUGH DECEMBER 2001

SAMPLE MEDIUM	ANALYSIS	NUCLIDE	# OF ANAL. PERF.	LLD	INDICATOR STATIONS				STATION WITH HIGHEST ANNUAL MEAN				BACKGROUND STATION			
					MIN	MEAN	MAX	(N/TOT)	MIN	MEAN Station #	MAX	(N/TOT)	MIN	MEAN Station #	MAX	(N/TOT)
SUMMER FLOUNDER (pCi/kg(wet))	Gamma Scan	Fe-59	1	8.10E+01	No Indicator Sample Collected			(0/0)	No Indicator Sample Collected			(0/0)	< LLD	< LLD	< LLD	(0/1)
SUMMER FLOUNDER (pCi/kg(wet))	Gamma Scan	Co-60	1	1.80E+01	No Indicator Sample Collected			(0/0)	No Indicator Sample Collected			(0/0)	< LLD	< LLD	< LLD	(0/1)
SUMMER FLOUNDER (pCi/kg(wet))	Gamma Scan	Zn-65	1	2.90E+01	No Indicator Sample Collected			(0/0)	No Indicator Sample Collected			(0/0)	< LLD	< LLD	< LLD	(0/1)
SUMMER FLOUNDER (pCi/kg(wet))	Gamma Scan	Cs-134	1	1.40E+01	No Indicator Sample Collected			(0/0)	No Indicator Sample Collected			(0/0)	< LLD	< LLD	< LLD	(0/1)
SUMMER FLOUNDER (pCi/kg(wet))	Gamma Scan	Cs-137	1	1.60E+01	No Indicator Sample Collected			(0/0)	No Indicator Sample Collected			(0/0)	< LLD	< LLD	< LLD	(0/1)
TAUTOG (pCi/kg(wet))	Gamma Scan	K-40	2	-	3.04E+03	3.56E+03	4.08E+03	(2/2)	3.04E+03	3.56E+03 Station 93	4.08E+03	(2/2)	No Background Sample Collected			(0/0)
TAUTOG (pCi/kg(wet))	Gamma Scan	Mn-54	2	2.90E+01	< LLD	< LLD	< LLD	(0/2)	< LLD	< LLD	< LLD	(0/2)	No Background Sample Collected			(0/0)
TAUTOG (pCi/kg(wet))	Gamma Scan	Co-58	2	3.80E+01	< LLD	< LLD	< LLD	(0/2)	< LLD	< LLD	< LLD	(0/2)	No Background Sample Collected			(0/0)
TAUTOG (pCi/kg(wet))	Gamma Scan	Fe-59	2	1.44E+02	< LLD	< LLD	< LLD	(0/2)	< LLD	< LLD	< LLD	(0/2)	No Background Sample Collected			(0/0)
TAUTOG (pCi/kg(wet))	Gamma Scan	Co-60	2	1.85E+01	< LLD	< LLD	< LLD	(0/2)	< LLD	< LLD	< LLD	(0/2)	No Background Sample Collected			(0/0)
TAUTOG (pCi/kg(wet))	Gamma Scan	Zn-65	2	6.45E+01	< LLD	< LLD	< LLD	(0/2)	< LLD	< LLD	< LLD	(0/2)	No Background Sample Collected			(0/0)
TAUTOG (pCi/kg(wet))	Gamma Scan	Cs-134	2	2.45E+01	< LLD	< LLD	< LLD	(0/2)	< LLD	< LLD	< LLD	(0/2)	No Background Sample Collected			(0/0)
TAUTOG (pCi/kg(wet))	Gamma Scan	Cs-137	2	2.75E+01	< LLD	< LLD	< LLD	(0/2)	< LLD	< LLD	< LLD	(0/2)	No Background Sample Collected			(0/0)
WEAKFISH (pCi/kg(wet))	Gamma Scan	K-40	2	-	2.14E+03	2.14E+03	2.14E+03	(1/1)	2.14E+03	2.14E+03 Station 33	2.14E+03	(1/1)	3.64E+03	3.64E+03 Station 94	3.64E+03	(1/1)
WEAKFISH (pCi/kg(wet))	Gamma Scan	Mn-54	2	2.90E+01	< LLD	< LLD	< LLD	(0/1)	< LLD	< LLD	< LLD	(0/1)	< LLD	< LLD Station 94	< LLD	(0/1)

TABLE D-1 (cont.)
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
OYSTER CREEK GENERATING STATION
RADIONUCLIDE CONCENTRATIONS IN 2001 ENVIRONMENTAL SAMPLES
JANUARY 2001 THROUGH DECEMBER 2001

SAMPLE MEDIUM	ANALYSIS	NUCLIDE	# OF ANAL. PERF.	LLD	INDICATOR STATIONS				STATION WITH HIGHEST ANNUAL MEAN				BACKGROUND STATION			
					MIN	MEAN	MAX	(N/TOT)	MIN	MEAN Station #	MAX	(N/TOT)	MIN	MEAN Station #	MAX	(N/TOT)
WEAKFISH (pCi/kg(wet))	Gamma Scan	Co-58	2	3.00E+01	< LLD	< LLD	< LLD	(0/1)	< LLD	< LLD	< LLD	(0/1)	< LLD	< LLD	< LLD	(0/1)
WEAKFISH (pCi/kg(wet))	Gamma Scan	Fe-59	2	6.50E+01	< LLD	< LLD	< LLD	(0/1)	< LLD	< LLD	< LLD	(0/1)	< LLD	< LLD	< LLD	(0/1)
WEAKFISH (pCi/kg(wet))	Gamma Scan	Co-60	2	1.95E+01	< LLD	< LLD	< LLD	(0/1)	< LLD	< LLD	< LLD	(0/1)	< LLD	< LLD	< LLD	(0/1)
WEAKFISH (pCi/kg(wet))	Gamma Scan	Zn-65	2	6.60E+01	< LLD	< LLD	< LLD	(0/1)	< LLD	< LLD	< LLD	(0/1)	< LLD	< LLD	< LLD	(0/1)
WEAKFISH (pCi/kg(wet))	Gamma Scan	Cs-134	2	2.85E+01	< LLD	< LLD	< LLD	(0/1)	< LLD	< LLD	< LLD	(0/1)	< LLD	< LLD	< LLD	(0/1)
WEAKFISH (pCi/kg(wet))	Gamma Scan	Cs-137	1	2.60E+01	< LLD	< LLD	< LLD	(0/1)	< LLD	< LLD	< LLD	(0/1)	< LLD	< LLD	< LLD	(0/1)
WHITE PERCH (pCi/kg(wet))	Gamma Scan	K-40	1	-	No Indicator Sample Collected			(0/0)	No Indicator Sample Collected			(0/0)	2.58E+03	2.58E+03 Station 94	2.58E+03	(1/1)
WHITE PERCH (pCi/kg(wet))	Gamma Scan	Mn-54	1	3.20E+01	No Indicator Sample Collected			(0/0)	No Indicator Sample Collected			(0/0)	< LLD	< LLD Station 94	< LLD	(0/1)
WHITE PERCH (pCi/kg(wet))	Gamma Scan	Co-58	1	3.30E+01	No Indicator Sample Collected			(0/0)	No Indicator Sample Collected			(0/0)	< LLD	< LLD Station 94	< LLD	(0/1)
WHITE PERCH (pCi/kg(wet))	Gamma Scan	Fe-59	1	6.30E+01	No Indicator Sample Collected			(0/0)	No Indicator Sample Collected			(0/0)	< LLD	< LLD Station 94	< LLD	(0/1)
WHITE PERCH (pCi/kg(wet))	Gamma Scan	Co-60	1	2.80E+01	No Indicator Sample Collected			(0/0)	No Indicator Sample Collected			(0/0)	< LLD	< LLD Station 94	< LLD	(0/1)
WHITE PERCH (pCi/kg(wet))	Gamma Scan	Zn-65	1	6.20E+01	No Indicator Sample Collected			(0/0)	No Indicator Sample Collected			(0/0)	< LLD	< LLD Station 94	< LLD	(0/1)
WHITE PERCH (pCi/kg(wet))	Gamma Scan	Cs-134	1	3.40E+00	No Indicator Sample Collected			(0/0)	No Indicator Sample Collected			(0/0)	< LLD	< LLD Station 94	< LLD	(0/1)
WHITE PERCH (pCi/kg(wet))	Gamma Scan	Cs-137	1	3.00E+01	No Indicator Sample Collected			(0/0)	No Indicator Sample Collected			(0/0)	< LLD	< LLD Station 94	< LLD	(0/1)
WINTER FLOUNDER (pCi/kg(wet))	Gamma Scan	K-40	1	-	2.76E+03	2.76E+03	2.76E+03	(1/1)	2.76E+03	2.76E+03 Station 33	2.76E+03	(1/1)	No Background Sample Collected			(0/0)

TABLE D-1 (cont.)
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
OYSTER CREEK GENERATING STATION
RADIONUCLIDE CONCENTRATIONS IN 2001 ENVIRONMENTAL SAMPLES
JANUARY 2001 THROUGH DECEMBER 2001

SAMPLE MEDIUM	ANALYSIS	NUCLIDE	# OF ANAL. PERF.	LLD	INDICATOR STATIONS				STATION WITH HIGHEST ANNUAL MEAN				BACKGROUND STATION			
					MIN	MEAN	MAX	(N/TOT)	MIN	MEAN Station #	MAX	(N/TOT)	MIN	MEAN Station #	MAX	(N/TOT)
WINTER FLOUNDER (pCi/kg(wet))	Gamma Scan	Mn-54	1	7.00E+00	< LLD	< LLD	< LLD	(0/1)	< LLD	< LLD	< LLD	(0/1)	No Background Sample Collected			(0/0)
WINTER FLOUNDER (pCi/kg(wet))	Gamma Scan	Co-58	1	1.90E+01	< LLD	< LLD	< LLD	(0/1)	< LLD	< LLD	< LLD	(0/1)	No Background Sample Collected			(0/0)
WINTER FLOUNDER (pCi/kg(wet))	Gamma Scan	Fe-59	1	1.60E+02	< LLD	< LLD	< LLD	(0/1)	< LLD	< LLD	< LLD	(0/1)	No Background Sample Collected			(0/0)
WINTER FLOUNDER (pCi/kg(wet))	Gamma Scan	Co-60	1	6.00E+00	< LLD	< LLD	< LLD	(0/1)	< LLD	< LLD	< LLD	(0/1)	No Background Sample Collected			(0/0)
WINTER FLOUNDER (pCi/kg(wet))	Gamma Scan	Zn-65	1	1.80E+01	< LLD	< LLD	< LLD	(0/1)	< LLD	< LLD	< LLD	(0/1)	No Background Sample Collected			(0/0)
WINTER FLOUNDER (pCi/kg(wet))	Gamma Scan	Cs-134	1	8.00E+00	< LLD	< LLD	< LLD	(0/1)	< LLD	< LLD	< LLD	(0/1)	No Background Sample Collected			(0/0)
WINTER FLOUNDER (pCi/kg(wet))	Gamma Scan	Cs-137	1	7.00E+00	< LLD	< LLD	< LLD	(0/1)	< LLD	< LLD	< LLD	(0/1)	No Background Sample Collected			(0/0)
BLUE CRAB (pCi/kg(wet))	Gamma Scan	K-40	1	*	1.24E+03	1.24E+03	1.24E+03	(1/1)	1.24E+03	1.24E+03 Station 33	1.24E+03	(1/1)	No Background Sample Collected			(0/0)
BLUE CRAB (pCi/kg(wet))	Gamma Scan	Mn-54		1.04E+01	< LLD	< LLD	< LLD	(0/1)	< LLD	< LLD	< LLD	(0/1)	No Background Sample Collected			(0/0)
BLUE CRAB (pCi/kg(wet))	Gamma Scan	Co-58		9.90E+00	< LLD	< LLD	< LLD	(0/1)	< LLD	< LLD	< LLD	(0/1)	No Background Sample Collected			(0/0)
BLUE CRAB (pCi/kg(wet))	Gamma Scan	Fe-59		3.79E+01	< LLD	< LLD	< LLD	(0/1)	< LLD	< LLD	< LLD	(0/1)	No Background Sample Collected			(0/0)
BLUE CRAB (pCi/kg(wet))	Gamma Scan	Co-60		7.30E+00	< LLD	< LLD	< LLD	(0/1)	< LLD	< LLD	< LLD	(0/1)	No Background Sample Collected			(0/0)
BLUE CRAB (pCi/kg(wet))	Gamma Scan	Zn-65		2.07E+01	< LLD	< LLD	< LLD	(0/1)	< LLD	< LLD	< LLD	(0/1)	No Background Sample Collected			(0/0)
BLUE CRAB (pCi/kg(wet))	Gamma Scan	Cs-134		1.12E+01	< LLD	< LLD	< LLD	(0/1)	< LLD	< LLD	< LLD	(0/1)	No Background Sample Collected			(0/0)
BLUE CRAB (pCi/kg(wet))	Gamma Scan	Cs-137		1.05E+01	< LLD	< LLD	< LLD	(0/1)	< LLD	< LLD	< LLD	(0/1)	No Background Sample Collected			(0/0)

APPENDIX E

2001 Quality Assurance Results

The OCGS REMP Quality Assurance (QA) Program is comprised of three phases. Phase I requires samples collected at designated stations be split and analyzed by separate (independent) laboratories. Analysis results from the quality assurance (QA) laboratory are compared to those from the primary laboratory as set forth in OCGS procedure 2120-ADM-4500.07. Statistical agreement criteria are established in this procedure. If non-agreement of the data occurs, an investigation begins which may include recounting or reanalyzing the sample(s) in question.

Phase II requires laboratories analyzing REMP samples for the OCGS to participate in a program involving analysis of single-blind radiological samples, such as the Department of Energy Environmental Measurements Laboratory (DOE EML) Cross-Check Program. This serves as independent verification of each laboratory's ability to correctly perform analyses on various kinds of samples containing unknown quantities of specific radionuclides. The Phase II program during 2001 included participation in cross-check programs with the DOE EML, as well as other independent contractors. The results of these interlaboratory comparison programs are presented in the tables in Appendix F.

Phase III requires that the REMP analytical laboratories perform duplicate analyses on every twentieth sample. Results of the duplicate analyses were reviewed in accordance with criteria specified in OCGS procedure 2120-ADM-4500.07.

APPENDIX F

2001 Environmental Radioactivity Interlaboratory Comparison Results

TABLE F-1

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

OYSTER CREEK GENERATING STATION

2001 ENVIRONMENTAL, INC. / DOE ENVIRONMENTAL MEASUREMENTS LABORATORY CROSS-CHECK PROGRAM RESULTS (A)

JANUARY 2001 THROUGH DECEMBER 2001

SAMPLE TYPE	COLLECTION DATE	NUCLIDE	ENVIRONMENTAL, INC MIDWEST LABORATORY Value (B & E)		Uncertainty (C & E)	DOE ENVIRONMENTAL MEASUREMENTS LABORATORY Value (D & E)	RATIO	MINIMUM RATIO	MAXIMUM RATIO	AGREEMENT (F)
AIR FILTER (Total Becquerel)	March 2001	Gr Beta	2.300	+/-	0.020	2.580	0.891	0.76	1.52	Yes
		Mn-54	7.250	+/-	0.220	6.520	1.112	0.80	1.36	Yes
		Co-60	20.110	+/-	0.160	19.440	1.034	0.79	1.30	Yes
		Sr-90	7.410	+/-	0.150	7.100	1.044	0.55	2.05	Yes
		Cs-134	2.710	+/-	0.150	2.830	0.958	0.74	1.21	Yes
		Cs-137	9.860	+/-	0.230	8.760	1.126	0.78	1.35	Yes
SOIL (Becquerel/ kg (dry))	March 2001	K-40	583.800	+/-	52.600	468.000	1.247	0.80	1.37	Yes
		Sr-90	55.600	+/-	2.200	69.000	0.806	0.61	3.91	Yes
		Cs-137	1772.600	+/-	79.800	1740.000	1.019	0.80	1.29	Yes
		Pb-212	46.600	+/-	8.500	41.500	1.123	0.74	1.36	Yes
		Bi-212	53.200	+/-	3.100	42.000	1.267	0.45	1.23	No (G)
		Pb-214	45.300	+/-	8.600	34.300	1.321	0.76	1.53	Yes
		Bi-214	42.100	+/-	7.700	32.600	1.291	0.78	1.50	Yes
		Ac-228	45.600	+/-	4.000	42.700	1.068	0.80	1.50	Yes
VEGETATION (Becquerel/ kg (wet))	March 2001	K-40	592.600	+/-	42.500	603.000	0.983	0.78	1.43	Yes
		Co-60	28.500	+/-	2.100	30.400	0.938	0.75	1.51	Yes
		Sr-90	1239.600	+/-	130.000	1330.000	0.932	0.52	1.23	Yes
		Cs-137	795.500	+/-	76.400	842.000	0.945	0.80	1.37	Yes
WATER (Becquerel/ liter)	March 2001	Gr Beta	1246.400	+/-	31.100	1297.000	0.961	0.56	1.50	Yes
		H-3	76.500	+/-	5.500	79.300	0.965	0.74	2.29	Yes
		Co-60	97.000	+/-	0.800	98.200	0.988	0.80	1.20	Yes
		Sr-90	3.850	+/-	0.130	4.400	0.875	0.64	1.50	Yes
		Cs-137	70.100	+/-	4.000	73.000	0.960	0.80	1.24	Yes
SOIL (Becquerel/ kg (dry))	September 2001	K-40	737.700	+/-	16.600	623.330	1.183	0.80	1.37	Yes
		Sr-90	27.400	+/-	6.300	30.596	0.896	0.61	3.91	Yes
		Cs-137	659.200	+/-	10.800	612.330	1.077	0.80	1.29	Yes
		Pb-212	64.700	+/-	3.800	58.330	1.109	0.74	1.36	Yes
		Bi-212	65.100	+/-	1.600	62.067	1.049	0.45	1.23	Yes
		Pb-214	53.700	+/-	7.700	39.670	1.354	0.76	1.53	Yes
		Bi-214	47.300	+/-	4.700	36.900	1.282	0.78	1.50	Yes
		Ac-228	68.100	+/-	1.400	59.570	1.143	0.80	1.50	Yes

TABLE F-1 (cont.)
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
OYSTER CREEK GENERATING STATION
2001 ENVIRONMENTAL, INC. / DOE ENVIRONMENTAL MEASUREMENTS LABORATORY CROSS-CHECK PROGRAM RESULTS (A)
JANUARY 2001 THROUGH DECEMBER 2001

SAMPLE TYPE	COLLECTION DATE	NUCLIDE	ENVIRONMENTAL, INC MIDWEST LABORATORY Value (B & E)		Uncertainty (C & E)	DOE ENVIRONMENTAL MEASUREMENTS LABORATORY Value (D & E)	RATIO	MINIMUM RATIO	MAXIMUM RATIO	AGREEMENT (F)
WATER (Becquerel/L)	September 2001	Gr Beta	8461.000	+/-	206.000	7970.000	1.062	0.56	1.50	Yes
		H-3	254.100	+/-	3.600	207.000	1.228	0.74	2.29	Yes
		Co-60	206.700	+/-	4.700	209.000	0.989	0.80	1.20	Yes
		Sr-90	4.100	+/-	0.300	3.729	1.099	0.64	1.50	Yes
		Cs-137	46.600	+/-	0.800	45.133	1.033	0.80	1.24	Yes
AIR FILTER (Total Becquerel)	September 2001	Gr Beta	13.800	+/-	0.100	12.770	1.081	0.76	1.52	Yes
		Mn-54	85.400	+/-	1.300	81.150	1.052	0.80	1.36	Yes
		Co-60	16.900	+/-	0.300	17.500	0.966	0.79	1.30	Yes
		Sr-90	3.110	+/-	0.060	3.481	0.893	0.55	2.05	Yes
		Cs-134	11.800	+/-	0.200	12.950	0.911	0.74	1.21	Yes
		Cs-137	18.300	+/-	0.300	17.100	1.070	0.78	1.35	Yes
VEGETATION (Becquerel/ kg (wet))	September 2001	K-40	1023.000	+/-	44.100	898.670	1.138	0.78	1.43	Yes
		Co-60	40.200	+/-	0.900	35.300	1.139	0.75	1.51	Yes
		Sr-90	1364.000	+/-	18.400	1612.800	0.846	0.52	1.23	Yes
		Cs-137	1184.000	+/-	2.800	1030.000	1.150	0.80	1.37	Yes

A. Only analyses performed routinely for the REMP are included on this table.
B. The Environmental, Inc. value is the mean of 1 or 3 measurements/determinations.
C. The Environmental, Inc. uncertainty is the 2-sigma counting uncertainty for one determination and one standard deviation for three determinations.
D. The DOE EML value is the mean of replicate determinations for each radionuclide.
E. Reporting units are Bq/L for water, Bq/kg (dry) for soil, Bq/kg (wet) for vegetation and total Bq for air filters.
F. The control limits (min ratio and max ratio) are established by DOE EML. Acceptable agreement is achieved if the ratio of the Environmental, Inc. value divided by the DOE EML value falls within the control limits.
G. This naturally-occurrring radionuclide is present in the shield background. No follow-up actions were performed because all of the other gamma scan results were acceptable were acceptable and the subject result was just outside of the upper control limit.

TABLE F-2
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
OYSTER CREEK GENERATING STATION
2001 TELEDYNE BROWN ENGINEERING / ANALYTICS CROSS-CHECK PROGRAM RESULTS
JANUARY 2001 THROUGH DECEMBER 2001

SAMPLE TYPE	COLLECTION DATE	NUCLIDE	TELEDYNE BROWN ENGINEERING LABORATORY Value	ANALYTICS, INC LABORATORY Value	RATIO	AGREEMENT	COMMENTS
MILK	March 2001	Cr-51	433	418	1.04	Yes	
(pCi/L)		Mn-54	172	175	0.98	Yes	
		Co-58	81	82	0.99	Yes	
		Fe-59	151	146	1.03	Yes	
		Co-60	254	254	1.00	Yes	
		Zn-65	314	322	0.98	Yes	
		I-131	75	77	0.97	Yes	
		Cs-134	212	223	0.95	Yes	
		Cs-137	165	176	0.94	Yes	
		Ce-141	166	162	1.02	Yes	
CHARCOAL	June 2001	I-131	104.5	81	1.29	Warning	
FILTERS		I-131	84.8	72	1.18	Yes	
(pCi)		I-131	99.6	92	1.08	Yes	
AIR FILTERS	August 2001	Cr-51	100	90	1.11	Yes	
(pCi)		Mn-54	161	134	1.20	Yes	
		Fe-55	71	83	0.86	Yes	
		Co-58	72	66	1.09	Yes	
		Fe-59	64	49	1.31	Yes	
		Co-60	148	128	1.16	Yes	
		Zn-65	200	158	1.27	Warning	
		Cs-134	109	125	0.87	Yes	
		Cs-137	140	116	1.21	Yes	
		Ce-141	79	74	1.07	Yes	
MILK	August 2001	Mn-54	131	124	1.06	Yes	
(pCi/L)		Co-58	68	68	1.00	Yes	
		Fe-59	53	50	1.06	Yes	
		Co-60	134	132	1.02	Yes	
		Zn-65	172	162	1.06	Yes	
		I-131	76	86	0.88	Yes	
		Cs-134	141	128	1.10	Yes	
		Cs-137	126	120	1.05	Yes	
		Ce-141	72	76	0.95	Yes	
LIQUID	September 2001	Sr-89	0.0013	0.00155	0.84	Yes	
(uCi)		Sr-90	0.0001	0.000112	0.89	Yes	

TABLE F-2 (cont.)
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
OYSTER CREEK GENERATING STATION
2001 TELEDYNE BROWN ENGINEERING / ANALYTICS CROSS-CHECK PROGRAM RESULTS
JANUARY 2001 THROUGH DECEMBER 2001

SAMPLE TYPE	COLLECTION DATE	NUCLIDE	TELEDYNE BROWN ENGINEERING LABORATORY Value	ANALYTICS, INC LABORATORY Value	RATIO	AGREEMENT	COMMENTS
GAS	September 2001	Kr-85	8.53	8.42	1.01	Yes	
(uCi)		Xe-133	0.606	0.585	1.04	Yes	
CHARCOAL FILTER	September	I-131	0.483	0.495	0.98	Yes	
(uCi)							
AIR FILTERS	September 2001	Cr-51	0.168	0.185	0.91	Yes	
(uCi)		Mn-54	0.0396	0.0402	0.99	Yes	
		Co-58	0.046	0.0475	0.97	Yes	
		Fe-59	0.0299	0.0292	1.02	Yes	
		Co-60	0.0471	0.0483	0.98	Yes	
		Zn-65	0.0522	0.0512	1.02	Yes	
		Cs-134	0.0247	0.0297	0.83	Yes	
		Cs-137	0.0518	0.0573	0.90	Yes	
		Ce-141	0.0499	0.0525	0.95	Yes	
LIQUID	September 2001	Gr Alpha	0.00058	0.000467	1.24	Yes	
(uCi)							
LIQUID	September 2001	Gr Alpha	0.00017	0.000145	1.17	Yes	
(uCi/cc)		H-3	0.00292	0.00177	1.65	Yes	
MILK	September 2001	Cr-51	349	366	0.95	Yes	
(pCi/L)		Mn-54	205	205	1.00	Yes	
		Co-58	190	177	1.07	Yes	
		Fe-59	85	86	0.99	Yes	
		Co-60	261	266	0.98	Yes	
		Zn-65	246	254	0.97	Yes	
		I-131	100	91	1.10	Yes	
		Cs-134	147	160	0.92	Yes	
		Cs-137	321	319	1.01	Yes	
		Ce-141	126	121	1.04	Yes	

TABLE F-3
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
OYSTER CREEK GENERATING STATION
2001 TELEDYNE BROWN ENGINEERING / DOE/EML ENVIRONMENTAL RADIOACTIVITY CROSS-CHECK PROGRAM RESULTS
JANUARY 2001 THROUGH DECEMBER 2001

SAMPLE TYPE	COLLECTION DATE	NUCLIDE	TELEDYNE BROWN ENGINEERING LABORATORY Value	DOE ENVIRONMENTAL MEASUREMENTS LABORATORY Value	RATIO	AGREEMENT	COMMENTS
AIR FILTERS	March 2001	Gr Alpha	3.33	3.97	0.84	Yes	
(Bq/filter)		Gr Beta	2.26	2.58	0.88	Warning	
		Mn-54	6.96	6.52	1.07	Yes	
		Co-60	19.4	19.44	1.00	Yes	
		Sr-90	7.46	7.1	1.05	Yes	
		Cs-134	2.59	2.83	0.92	Yes	
		Cs-137	9.52	8.76	1.09	Yes	
		Pu-238	0.23	0.215	1.07	Yes	
		Pu-239	0.17	0.136	1.25	Warning	
		Am-241	0.93	0.486	1.91	Warning	
		Uranium	0.127	3.7	0.03	No (a)	
SOIL	March 2001	K-40	464.8	468	0.99	Yes	
(Bq/kg)		Sr-90	80.8	69	1.17	Yes	
		Cs-137	1696	1740	0.97	Yes	
		Pu-239/40	24.32	25.6	0.95	Yes	
VEGETATION	March 2001	K-40	728	603	1.21	Yes	
(Bk/kg)		Co-60	34	30.4	1.12	Yes	
		Sr-90	1283	1330	0.96	Yes	
		Cs-137	1005	842	1.19	Yes	
		Pu-239	10.54	9.58	1.10	Yes	
		Am-241	7.03	6.17	1.14	Yes	
		Cm-244	2.26	3.69	0.61	Warning	
WATER	March 2001	Gr Alpha	1600	1900	0.84	Yes	
(pCi/L)		Gr Beta	1200	1297	0.93	Yes	
		Co-60	100.3	98.2	1.02	Yes	
		Cs-137	75.8	73	1.04	Yes	
		Pu-238	1.78	1.58	1.13	Warning	
		Pu-239	1.99	1.64	1.21	Warning	
		Am-241	2.2	1.67	1.32	Warning	
WATER	May 2001	H-3	61	79.3	0.77	Warning	
(Bq/L)		Sr-90	4.57	4.4	1.04	Yes	
		Uranium	1.46	0.08	18.25	No (b)	

TABLE F-3 (cont.)
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
OYSTER CREEK GENERATING STATION
2001 TELEDYNE BROWN ENGINEERING / DOE/EML ENVIRONMENTAL RADIOACTIVITY CROSS-CHECK PROGRAM RESULTS
JANUARY 2001 THROUGH DECEMBER 2001

SAMPLE TYPE	COLLECTION DATE	NUCLIDE	TELEDYNE BROWN ENGINEERING LABORATORY Value	DOE ENVIRONMENTAL MEASUREMENTS LABORATORY Value	RATIO	AGREEMENT	COMMENTS
AIR FILTERS (Bq/filter)	June 2001	Gr Alpha	2.31	2.35	0.98	Yes	
		Gr Beta	1.79	1.52	1.18	Yes	
		Mn-54	49.5	43.2	1.15	Yes	
		Co-57	15.2	14.5	1.05	Yes	
		Co-60	8.79	8.43	1.04	Yes	
		Cs-137	8.26	7.41	1.11	Yes	
SOIL (Bq/kg)	June 2001	K-40	839.2	713	1.18	Yes	
		Cs-137	1164	1020	1.14	Yes	
		Pb-212	95.5	79.3	1.20	Yes	
		Pb-214	92.9	86.3	1.08	Yes	
		Bi-214	84.0	83.3	1.01	Yes	
		Ac-228	84.8	80.2	1.06	Yes	
		U-234	117	157	0.75	Warning	
		U-238	122	163	0.75	Warning	
		Uranium	4.41	13.2	0.33	No (b)	
VEGETATION (Bq/kg)	June 2001	K-40	827.4	639	1.29	Warning	
		Co-60	34.4	32.8	1.05	Yes	
		Cs-137	949.4	867	1.10	Yes	
WATER (Bq/L)	June 2001	Co-60	75.7	73.7	1.03	Yes	
		Cs-137	69.3	67.0	1.03	Yes	
		U-234	0.39	0.481	0.81	Yes	
		U-238	0.32	0.368	0.87	Yes	
		Uranium	0.014	0.0304	0.46	No (b)	
AIR FILTERS (Bq/filter)	September 2001	Gr Alpha	5.42	5.362	1.01	Yes	
		Gr Beta	12.0	12.77	0.94	Yes	
		Mn-54	97.1	81.15	1.20	Yes	
		Co-60	18.8	17.5	1.07	Yes	
		Sr-90	2.56	3.481	0.74	Warning	
		Cs-134	12.7	12.95	0.98	Yes	
		Cs-137	20.8	17.1	1.22	Warning	
		Pu-238	0.0595	0.071	0.84	Warning	
		Pu-239	0.287	0.2291	1.25	Warning	
		Am-241	0.089	0.088	1.01	Yes	

TABLE F-3 (cont.)
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
OYSTER CREEK GENERATING STATION
2001 TELEDYNE BROWN ENGINEERING / DOE/EML ENVIRONMENTAL RADIOACTIVITY CROSS-CHECK PROGRAM RESULTS
JANUARY 2001 THROUGH DECEMBER 2001

SAMPLE TYPE	COLLECTION DATE	NUCLIDE	TELEDYNE BROWN ENGINEERING LABORATORY Value	DOE ENVIRONMENTAL MEASUREMENTS LABORATORY Value	RATIO	AGREEMENT	COMMENTS
SOIL (Bq/kg)	September 2001	K-40	673.0	623.33	1.08	Yes	
		Sr-90	29.6	30.596	0.97	Yes	
		Cs-137	680.5	612.33	1.11	Yes	
		Pu-239	7.42	8.948	0.83	Warning	
VEGETATION (Bq/kg)	September 2001	K-40	1090.0	898.67	1.21	Yes	
		Co-60	39.8	35.3	1.13	Yes	
		Sr-90	1,253.0	1612.8	0.78	Yes	
		Cs-137	1235.0	1030.0	1.20	Yes	
		Pu-239	11.6	11.022	1.05	Yes	
WATER (Bq/L)	September 2001	Gr Alpha	1333.0	1150.0	1.16	Warning	
		Gr Beta	8533.0	7970.0	1.07	Yes	
		H-3	212.3	207.0	1.03	Yes	
		Co-60	207.3	209.0	0.99	Yes	
		Ni-63	50.7	45.25	1.12	Yes	
		Sr-90	4.76	3.729	1.28	Warning	
		Cs-137	47.7	45.133	1.06	Yes	
		Pu-238	1.21	1.0882	1.11	Warning	
		Pu-239	1.86	1.628	1.14	Warning	
		Am-241	0.763	0.7597	1.00	Yes	

a. Reported in Bq/filter. Converted to ug/filter, the results of 3.4 would be acceptable
b. Reported in incorrect units. Converted to correct units, the results would be acceptable

TABLE F-4
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
OYSTER CREEK GENERATING STATION
2001 TELEDYNE BROWN ENGINEERING / ERA ENVIRONMENTAL RADIOACTIVITY CROSS-CHECK PROGRAM RESULTS
JANUARY 2001 THROUGH DECEMBER 2001

SAMPLE TYPE	COLLECTION DATE	NUCLIDE	TELEDYNE BROWN ENGINEERING LABORATORY Value	ENVIRONMENTAL RESEARCH ASSOCIATES Value	RATIO	AGREEMENT	COMMENTS
LIQUID (pCi/L)	February 2001	Co-60	95.5	91.1	1.05	Yes	
		Cs-134	60.5	59.8	1.01	Yes	
		Cs-137	48	45	1.07	Yes	
LIQUID (pCi/L)	August 2001	Ra-226	14.7	15.4	0.95	Yes	
		Uranium	60.3	52.9	1.14	Yes	
LIQUID (pCi/L)	August 2001	Gr Alpha	15.2	17.8	0.85	Yes	
		Gr Beta	52.0	53.0	0.98	Yes	
LIQUID (pCi/L)	September 2001	Co-60	47.6	46.8	1.02	Yes	
		Zn-65	35.4	36.2	0.98	Yes	
		Ba-133	35.5	36	0.99	Yes	
		Cs-134	15.5	15.9	0.97	Yes	
		Cs-137	206	197	1.05	Yes	
LIQUID (pCi/L)	September 2001	Sr-89	26.4	31.2	0.85	Yes	
		Sr-90	28.2	25.9	1.09	Yes	
LIQUID (pCi/L)	September 2001	H-3	2370	2730	0.87	Yes	
LIQUID (pCi/L)	December 2001	I-131	3.77	4.38	0.86	Yes	

TABLE F-5
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
OYSTER CREEK GENERATING STATION
2001 TELEDYNE BROWN ENGINEERING / MAPEP ENVIRONMENTAL RADIOACTIVITY CROSS-CHECK PROGRAM RESULTS
JANUARY 2001 THROUGH DECEMBER 2001

SAMPLE TYPE	COLLECTION DATE	NUCLIDE	TELEDYNE BROWN ENGINEERING LABORATORY Value	MAPEP LABORATORY Value	RATIO	AGREEMENT	COMMENTS
LIQUID (Bq/L)	March 2001	Mn-54	3.04	2.87	1.06	Yes	
		Co-57	92.4	95.5	0.97	Yes	
		Co-60	2.20	2.19	1.00	Yes	
		Zn-65	4.65	4.59	1.01	Yes	
		Cs-134	260	283	0.92	Yes	
		Cs-137	91.5	94.4	0.97	Yes	

TABLE F-6
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
OYSTER CREEK GENERATING STATION
2001 TELEDYNE BROWN ENGINEERING / NYELAP ENVIRONMENTAL RADIOACTIVITY CROSS-CHECK PROGRAM RESULTS
JANUARY 2001 THROUGH DECEMBER 2001

SAMPLE TYPE	COLLECTION DATE	NUCLIDE	TELEDYNE BROWN ENGINEERING LABORATORY Value	NYELAP LABORATORY Value	RATIO	AGREEMENT	COMMENTS
WATER (Bq/L)	May 2001	Gr Alpha	33.8	41	0.82	Yes	
		Gr Beta	73.9	68	1.09	Yes	
WATER (Bk/L)	May 2001	Ra-226	26.1	43.3	0.60	Warning	

APPENDIX G

2001 Annual Dairy Census

Annual Dairy Census - 2001

An annual dairy census was conducted to determine the number of commercial dairy operations and/or lactating dairy animals providing milk for human consumption which were located within a five mile radius of the OCGS. The results of the census demonstrated that no commercial dairy operations were located within 5 miles of the OCGS.

Ocean County Agricultural Extension Service Agent, Ms. Debra Fiola, was contacted regarding the occurrence of dairy animals within a five-mile radius of the OCGS. Ms. Fiola indicated that no commercial dairy operations were active in the study area and that the closest dairy cattle to the OCGS are located in Jackson Township, which is over fifteen miles from the OCGS. The closest known dairy animals whose milk was being used for human consumption were goats owned by six families located various distances and directions from the OCGS. All of the dairy goats identified were located over five miles from the OCGS.

APPENDIX H

Dose Calculation Methodology

To the extent possible, radiological impacts were evaluated based on the direct measurement of dose rates or of radionuclide concentrations in the environment. However, the effluents associated with 2001 OCGS routine operations were too small to be measured once dispersed in the offsite environment. As a result, the potential offsite doses could only be estimated using computerized models that predict concentrations of radioactive materials in the environment and subsequent radiation doses on the basis of radionuclides released to the environment. The OCGS calculates doses using an advanced class "A" dispersion model called SEEDS (Simplified Effluent Environmental Dosimetry System). This model incorporates the guidelines and methodology set forth in USNRC Regulatory Guide 1.109 (Ref. 17). SEEDS uses real-time hourly meteorological information matched to the time of release to assess the dispersion of effluents in the discharge canal/estuary system and the atmosphere. Combining this assessment of dispersion and dilution with effluent data, postulated maximum hypothetical doses to the public from the OCGS effluents are computed. The maximum individual dose is calculated as well as the dose to the total population within 50 miles of the OCGS for gaseous effluents and the entire population downstream of the OCGS around Barnegat Bay and the Atlantic Ocean for liquid effluents. Values of environmental parameters and radionuclide concentration factors have been chosen to provide conservative results. As a result, the doses calculated using this model are conservative estimates (i.e., overestimates) of the actual exposures.

The dose summary table, Table H-1, presents the maximum hypothetical doses to an individual, as well as the population dose, resulting from effluents from OCGS during the 2001 reporting period.

Individual Doses From Liquid Effluents

As recommended in USNRC Regulatory Guide 1.109 (Ref. 17), calculations of doses resulting from OCGS liquid effluents are performed on four age groups and eight organs. The pathways considered are consumption of fish, consumption of shellfish, and shoreline exposure. All pathways are considered to be primary recreational activities associated with Barnegat Bay and the Atlantic Ocean in the vicinity of the OCGS. The "receptor" would be that individual who eats fish and shellfish that reside in the OCGS discharge canal, and stands on the shoreline influenced by the station discharge. Table H-1 presents the maximum total body dose and critical organ dose for the age group most affected.

No liquid releases were made from the OCGS in 2001. As a result, there were no doses via liquid effluents to the public.

Individual Doses From Gaseous Effluents

There are seven major pathways considered in the dose calculation for gaseous effluents. These are: (1) plume exposure, (2) inhalation, (3) consumption of cow milk, (4) goat milk, (5) vegetables, (6) meat, and (7) standing on contaminated ground.

The maximum plume exposure reported in lines 3 and 4 of Table H-1 generally occurs at, or near, the site boundary. These "air doses" are not to an individual but are considered to be the maximum dose at a location. The location is not necessarily a receptor.

With respect to airborne noble gas releases for the 2001 reporting period, the maximum plume exposure (air dose) would have been 1.91E-02 and 1.81E-02 mRad for OCGS gamma and beta radiation, respectively. These doses are equal to only 1.91E-01 percent and 9.05E-02 percent of the OCGS ODCM annual dose limits, respectively.

Regarding total body dose, the calculated airborne dose to the closest individual in the maximally affected sector (SE) was at a distance of 966 meters. Regarding skin dose, the calculated airborne dose to the closest individual in the maximally affected sector (ESE) was at a distance of 1006 meters. These data are presented in lines 5 and 6 of Table H-1. Maximum calculated plume exposures to an individual from gaseous effluents during the 2001 reporting period were 5.69E-03 mrem to the total body and 9.15E-03 mrem to the skin. These doses are equivalent to only 5.69E-03 percent and 3.05E-04 percent of the applicable annual dose limits, respectively.

The dose to the maximum exposed organ due to radioactive airborne iodine and particulates is presented in line 7, Table H-1. This does not include the total body plume exposure, which was separated out on line 5. The dose presented in this section reflects the maximum exposure to an organ for the appropriate age group. During 2001, gaseous iodines and particulates from OCGS would have resulted in a maximum dose of 2.16E-01 mrem to any organ, which during 2001 was to the bone. This dose is only 1.44 percent of the OCGS ODCM specified annual dose limit.

Population Doses From Liquid and Gaseous Effluents

The population doses resulting from liquid and gaseous effluents are summed over all pathways and the affected population (Table H-1, lines 8-11). Liquid population dose is based upon the population located within the region from the OCGS outfall extending out to the Atlantic Ocean. The population dose due to gaseous effluents is based upon the 1990 census data and considers the population out to a distance of 50 miles around the OCGS as well as the much larger total population, which can be fed by foodstuffs grown in the 50-mile radius. Population doses are summed over all distances and sectors to give an aggregate dose. There were no liquids effluents released during 2001 and as a result, no dose. Gaseous effluents resulted in a population dose of 2.08E-01 mrem total body for the 2001 reporting period. This is approximately 6 million times lower than the doses to the same population resulting from natural background sources.

TABLE H-1

SUMMARY OF MAXIMUM HYPOTHETICAL INDIVIDUAL AND POPULATION DOSES FROM LIQUID AND AIRBORNE EFFLUENT RELEASES FROM THE OCGS FOR 2001

INDIVIDUAL DOSES

Effluent Released	ODCM Specification Limit	Calculated Dose	Age Group	Dist. (m)	Sector	Percent of Reg. Limit
LIQUID	3 mrem-Total Body	**	-	Receptor 1*		**
LIQUID	10 mrem-GI Tract	**	-	Receptor 1*		**
AIRBORNE	10 mRad-Gamma	1.91E-02 mRad	-	405	E	1.91E-01 %
AIRBORNE	20 mRad-Beta	1.81E-02 mRad	-	405	E	9.05E-02 %
AIRBORNE	100 mrem-Total Body[1]	5.69E-03 mrem	All	966	SE	5.69E-03 %
AIRBORNE	3000 mrem-Skin	9.15E-03 mrem	All	1006	ESE	3.05E-04 %
AIRBORNE	15 mrem-Any Organ[2]	2.16E-01 mrem	All	966	SE	1.44E+00 %

POPULATION DOSES

Effluent Released		Calculated Dose (Person-rem)	
LIQUID	Total Body	**	
LIQUID	All Organs	**	
GASEOUS	Total Body	2.08E-01	
GASEOUS	Thyroid	8.63E-01	

* Receptor 1 is the Discharge Canal at the U.S. Route 9 bridge.

** There were no liquid effluents released during 2001.

[1] This limit is from 10CFR20.1301. The ODCM limit is 500 mrem.

[2] During 2001, this dose was to the bone.

APPENDIX I

2001 Groundwater Monitoring Results

TABLE I-1
RADIONUCLIDE CONCENTRATIONS IN SAMPLES FROM THE ON-SITE GROUNDWATER MONITORING NETWORK

April 2001 Results

WELL	DEPTH (Ft.)	TRITIUM (pCi/liter)	GAMMA ISOTOPIC * (pCi/liter)
WW-1	50.0	< 110	All Nuclides < LLD
WW-2	55.0	< 110	All Nuclides < LLD
WW-3	24.0	132 +/- 65	All Nuclides < LLD
WW-4	52.0	< 110	All Nuclides < LLD
WW-5	22.5	< 115	All Nuclides < LLD
WW-6	52.5	243 +/- 72	All Nuclides < LLD
WW-7	20.0	197 +/- 67	All Nuclides < LLD
WW-9	20.0	122 +/- 69	All Nuclides < LLD
WW-10	57.0	< 108	All Nuclides < LLD
WW-12	20.0	297 +/- 70	All Nuclides < LLD
WW-13	50.0	< 115	All Nuclides < LLD
WW-14	53.0	220 +/- 67	All Nuclides < LLD
WW-15	20.0	< 115	All Nuclides < LLD
WW-16	20.0	< 115	All Nuclides < LLD
WW-17	150.0	< 108	All Nuclides < LLD

* Gamma Isotopic analysis includes: Mn-54, Co-58, Fe-59, Co-60, Zn-65, Zr-95, Nb-95, I-131, Cs-134, Cs-137, Ba-140, and La-140

October 2001 Results

WELL	DEPTH (Ft.)	TRITIUM (pCi/liter)	GAMMA ISOTOPIC * (pCi/liter)
WW-1	50.0	< 116	All Nuclides < LLD
WW-2	55.0	< 116	All Nuclides < LLD
WW-3	24.0	< 116	All Nuclides < LLD
WW-4	52.0	< 116	All Nuclides < LLD
WW-5	22.5	< 116	All Nuclides < LLD
WW-6	52.5	< 116	All Nuclides < LLD
WW-7	20.0	145 +/- 64	All Nuclides < LLD
WW-9	20.0	< 113	All Nuclides < LLD
WW-10	57.0	< 113	All Nuclides < LLD
WW-14	53.0	< 113	All Nuclides < LLD
WW-15	20.0	< 113	All Nuclides < LLD
WW-16	20.0	< 113	All Nuclides < LLD
WW-17	150.0	< 113	All Nuclides < LLD

* Gamma Isotopic analysis includes: Mn-54, Co-58, Fe-59, Co-60, Zn-65, Zr-95, Nb-95, I-131, Cs-134, Cs-137, Ba-140, and La-140

Figure I-1

Locations of On-Site Wells

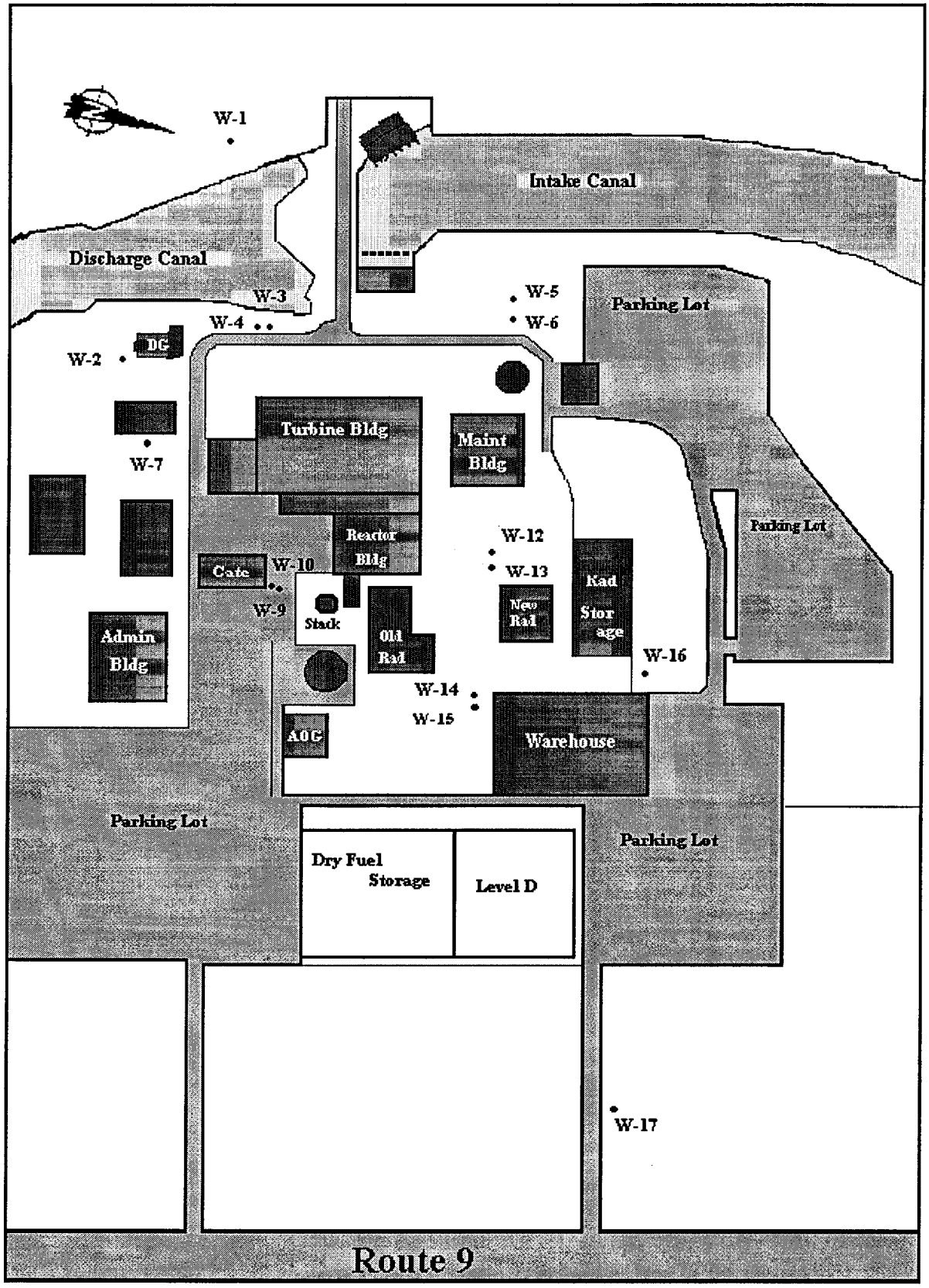

TABLE I-2
TRITIUM CONCENTRATIONS IN SAMPLES FROM THE ON-SITE GROUNDWATER MONITORING NETWORK
(1996 through 2001)

WELL	Depth (ft.)	Tritium Results (pCi/liter)					
		March 1996	March 1997	March 1998	March 1999	March 2000	April 2001
WW-1	50.0	< 170	< 150	< 100	< 130	< 120	< 110
WW-2	55.0	< 170	< 150	< 100	200 +/- 90	130 +/- 80	< 110
WW-3	24.0	< 170	< 150	No Sample	< 130	< 130	132 +/- 65
WW-4	52.0	< 170	< 150	No Sample	140 +/- 80	130 +/- 80	< 110
WW-5	22.5	< 170	< 150	180 +/- 70	380 +/- 100	140 +/- 80	< 115
WW-6	52.5	< 170	< 150	< 100	< 130	< 130	243 +/- 72
WW-7	20.0	< 180	< 150	390 +/- 70	580 +/- 100	470 +/- 100	197 +/- 67
WW-9	20.0	180 +/- 100	< 150	240 +/- 70	340 +/- 90	< 130	122 +/- 69
WW-10	57.0	< 180	< 150	< 100	< 130	< 120	< 108
WW-12	20.0	< 180	< 150	< 100	280 +/- 90	240 +/- 90	297 +/- 70
WW-13	50.0	< 180	< 150	< 100	< 130	< 120	< 115
WW-14	53.0	< 180	< 150	< 100	< 130	< 120	220 +/- 67
WW-15	20.0	< 180	< 150	840 +/- 90	320 +/- 90	160 +/- 80	< 115
WW-16	20.0	< 180	< 150	240 +/- 70	340 +/- 90	180 +/- 80	< 115
WW-17	150.0	< 180	< 150	< 100	< 130	< 120	< 108
Results Above LLD		1 of 15	0 of 15	5 of 13	8 of 15	7 of 15	6 of 15
Maximum		180	-	840	580	470	297
Average		180	-	378	323	207	202
Minimum		180	-	180	140	130	122

WELL	Depth (ft.)	Tritium Results (pCi/liter)					
			September 1997	October 1998	September 1999	September 2000	September 2001
WW-1	50.0	N	< 140	< 120	< 130	< 120	< 116
WW-2	55.0	O	< 140	150 +/- 80	< 130	No Sample	< 116
WW-3	24.0		170 +/- 90	220 +/- 80	160 +/- 90	120 +/- 80	< 116
WW-4	52.0	S	< 140	180 +/- 80	< 130	< 120	< 116
WW-5	22.5	A	< 140	280 +/- 90	230 +/- 90	170 +/- 80	< 115
WW-6	52.5	M	< 140	< 120	< 130	< 120	< 116
WW-7	20.0	P	170 +/- 90	670 +/- 90	190 +/- 90	270 +/- 90	145 +/- 64
WW-9	20.0	L	< 140	170 +/- 100	140 +/- 90	210 +/- 90	< 113
WW-10	57.0	I	< 150	< 110	< 130	< 120	< 113
WW-12	20.0	N	< 150	200 +/- 90	280 +/- 90	370 +/- 90	No Sample
WW-13	50.0	G	< 150	< 120	< 130	< 120	No Sample
WW-14	53.0		< 150	200 +/- 100	< 130	270 +/- 90	< 113
WW-15	20.0		< 150	240 +/- 80	< 130	130 +/- 80	< 113
WW-16	20.0		< 150	280 +/- 90	< 130	< 120	< 113
WW-17	150.0		< 150	< 120	< 130	< 120	< 113
Results Above LLD		1 of 15	2 of 15	10 of 15	5 of 15	7 of 14	1 of 13
Maximum		180	170	670	280	370	145
Average		180	170	259	200	220	145
Minimum		180	170	150	140	120	145

APPENDIX J

2001 REMP Sample Collection and Analysis Methods

TABLE J-1
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
SUMMARY OF SAMPLE COLLECTION AND ANALYSIS METHODS
2001

Analysis	Sample Medium	Sampling Method	Collection Procedure Number	Sample Size	Analysis Procedure Number	Procedure Abstract
Gross Beta	Air Particulate	Two week composite of continuous air sampling through filter paper	OCGS Procedure 2120-IMP-4522.05	1 filter (approximately 1200 cubic meters bi-weekly)	Midwest Lab Procedure TIML-AP-02	Low background gas flow proportional counting
Gamma Spectroscopy	Air Particulate	Quarterly composite of each station	OCGS Procedure 2120-IMP-4522.05	6 filters (approximately 7200 cubic meters)	Midwest Lab Procedure TIML-GS-01	Gamma Isotopic analysis
Gamma Spectroscopy	Air Iodine	Weekly composite of continuous air sampling through charcoal filter	OCGS Procedure 2120-IMP-4522.05	1 cartridge (approximately 600 cubic meters weekly)	Midwest Lab Procedure TIML-I-131-04	Gamma Isotopic analysis
Gamma Spectroscopy	Surface Water	Monthly grab sample at two stations and semiannual grab sample at an additional two stations	OCGS Procedure 2120-IMP-4522.06	3.78 liters	Midwest Lab Procedure TIML-GS-01 Teledyne Brown Engineering PRO-042-5	Gamma Isotopic analysis Gamma Isotopic analysis
Gamma Spectroscopy	Well Water	Quarterly grab sample	OCGS Procedure 2120-IMP-4522.10	3.78 liters	Midwest Lab Procedure TIML-GS-01 Teledyne Brown Engineering PRO-042-5	Gamma Isotopic analysis Gamma Isotopic analysis
Gamma Spectroscopy	Clams Fish Crabs	Semiannual grab sample Semiannual grab sample Annual grab sample	OCGS Procedures 2120-IMP-4522.14 and 2120-IMP-4522.16	Approximately 250g	Midwest Lab Procedure TIML-GS-01 Teledyne Brown Engineering PRO-042-5	Gamma Isotopic analysis Gamma Isotopic analysis

TABLE J-1
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
SUMMARY OF SAMPLE COLLECTION AND ANALYSIS METHODS
2001

Analysis	Sample Medium	Sampling Method	Collection Procedure Number	Sample Size	Analysis Procedure Number	Procedure Abstract
Gamma Spectroscopy	Sediment	Semiannual grab sample	OCGS Procedure 2120-IMP-4522.03	3.78 liters	Midwest Lab Procedure TIML-GS-01 Teledyne Brown Engineering PRO-042-5	Gamma Isotopic analysis Gamma Isotopic analysis
Gamma Spectroscopy	Vegetables and Broadleaf Vegetation	Monthly grab sample during the harvest season	OCGS Procedure 2120-IMP-4522.04	Approximately 1 kg	Midwest Lab Procedure TIML-GS-01 Teledyne Brown Engineering PRO-042-5	Gamma Isotopic analysis Gamma Isotopic analysis
Tritium	Well Water Surface Water	Quarterly grab sample Monthly grab sample from two stations and semiannual grab sample from two additional stations	OCGS Procedures 2120-IMP-4522.10 2120-IMP-4522.06	3.78 liters	Midwest Lab Procedure EIML-T-02 Teledyne Brown Engineering PRO-052-2 PRO-052-35	Sample is filtered and mixed with scintillation fluid for scintillation counting. Sample is filtered and mixed with scintillation fluid for scintillation counting.
TLD (Panasonic & Harshaw)	Immersion Dose	Dosimeters exchanged quarterly	OCGS Procedure 2120-IMP-4522.02	Two Badges	ICN SOPs	Thermoluminescent dosimetry
TLD (Teledyne Brown Engineering & Proxtronics)	Immersion Dose	Dosimeters exchanged quarterly	OCGS Procedure 2120-IMP-4522.02	One Badge	Proxtronics 240 and 250	Thermoluminescent dosimetry

APPENDIX K

2001 TLD

Quarterly Data

Table K-1

2001 TLD Ouarterly Data - Panasonic and Harshaw TLD Results

mrem per Standard Quarter +/- 2 Sigma

Station	First Quarter - 2001 *Harshaw Model 110*	Second Quarter - 2001 *Panasonic Model 814*	Third Quarter - 2001 *Panasonic Model 814*	Fourth Quarter - 2001 *Panasonic Model 814*
C	12.45 +/- 0.31	10.89 +/- 0.9	9.50 +/- 1.1	11.96 +/- 1.7
14	13.78 +/- 0.31	11.93 +/- 0.9	10.89 +/- 0.9	14.01 +/- 0.0
1	14.36 +/- 0.53	10.50 +/- 1.2	12.20 +/- 2.4	13.01 +/- 1.4
3	11.13 +/- 0.36	10.37 +/- 1.1	7.91 +/- 1.8	10.97 +/- 1.8
6	11.87 +/- 0.54	9.93 +/- 1.1	8.02 +/- 1.8	10.56 +/- 0.9
8	11.77 +/- 0.41	9.86 +/- 1.7	8.73 +/- 2.0	11.40 +/- 1.2
9	11.56 +/- 0.22	10.71 +/- 1.7	8.91 +/- 1.7	11.96 +/- 0.0
11	11.35 +/- 0.42	9.69 +/- 0.0	7.71 +/- 0.9	11.82 +/- 1.1
22	9.44 +/- 1.00	9.35 +/- 1.1	7.91 +/- 1.8	10.33 +/- 1.2
51	14.71 +/- 0.22	12.20 +/- 0.9	11.54 +/- 1.2	14.69 +/- 1.8
52	15.63 +/- 0.36	13.32 +/- 1.8	13.29 +/- 2.2	15.20 +/- 0.9
53	15.30 +/- 0.87	12.84 +/- 1.6	12.85 +/- 1.9	16.23 +/- 0.9
54	11.88 +/- 0.19	9.37 +/- 1.1	10.26 +/- 1.2	11.38 +/- 1.9
55	19.45 +/- 0.98	16.71 +/- 1.7	15.73 +/- 1.1	20.17 +/- 2.4
56	17.36 +/- 0.59	14.61 +/- 1.8	13.96 +/- 1.8	16.23 +/- 1.7
57	14.58 +/- 0.59	13.16 +/- 0.9	12.40 +/- 0.9	14.86 +/- 0.9
58	14.23 +/- 0.27	13.32 +/- 1.8	12.83 +/- 1.2	15.03 +/- 22.0
59	13.29 +/- 0.28	10.98 +/- 0.0	11.33 +/- 1.1	13.49 +/- 1.9
61	11.70 +/- 0.37	9.21 +/- 0.9	8.97 +/- 1.2	11.02 +/- 0.9
62	12.67 +/- 0.46	10.01 +/- 0.0	10.68 +/- 1.7	12.47 +/- 1.2
63	12.02 +/- 0.86	10.01 +/- 1.4	9.83 +/- 0.9	12.28 +/- 1.8
64	11.88 +/- 0.13	10.17 +/- 0.9	10.26 +/- 1.2	12.13 +/- 0.9
65	11.48 +/- 0.50	10.17 +/- 0.9	10.04 +/- 1.1	12.13 +/- 0.9
66	11.67 +/- 0.26	9.52 +/- 1.7	9.10 +/- 1.1	11.02 +/- 2.0
68	11.84 +/- 0.11	9.69 +/- 2.0	9.30 +/- 1.9	10.71 +/- 2.2
71	10.94 +/- 0.34	10.55 +/- 1.7	9.50 +/- 1.1	12.35 +/- 1.1
72	Dosimeter Lost	9.52 +/- 0.9	9.90 +/- 2.0	11.32 +/- 1.1
73	10.57 +/- 0.30	9.52 +/- 0.9	7.31 +/- 0.9	11.20 +/- 1.1
74	11.24 +/- 0.22	9.76 +/- 1.7	8.31 +/- 1.1	9.98 +/- 1.6
75	14.52 +/- 1.76	10.44 +/- 0.9	9.51 +/- 2.3	11.56 +/- 1.8
78	10.49 +/- 0.20	9.59 +/- 0.0	8.62 +/- 0.9	10.22 +/- 1.2

Table K-1 (cont.)

2001 TLD Quarterly Data - Panasonic and Harshaw TLD Results

mrem per Standard Quarter +/- 2 Sigma

Station	First Quarter - 2001 *Harshaw Model 110*	Second Quarter - 2001 *Panasonic Model 814*	Third Quarter - 2001 *Panasonic Model 814*	Fourth Quarter - 2001 *Panasonic Model 814*
79	10.82 +/- 0.33	8.83 +/- 0.9	8.51 +/- 0.9	12.58 +/- 13.5
81	11.67 +/- 0.42	10.03 +/- 1.1	9.11 +/- 1.1	11.04 +/- 1.7
82	12.28 +/- 0.88	9.93 +/- 1.1	9.43 +/- 1.2	11.55 +/- 5.0
84	12.34 +/- 0.54	10.61 +/- 2.0	10.45 +/- 3.0	11.05 +/- 2.7
85	11.44 +/- 0.10	9.69 +/- 0.0	8.31 +/- 1.1	9.98 +/- 0.9
86	12.26 +/- 0.42	10.88 +/- 0.9	8.91 +/- 0.9	10.85 +/- 1.4
88	10.64 +/- 0.66	8.49 +/- 0.9	7.31 +/- 0.9	9.83 +/- 1.2
89	9.97 +/- 0.18	8.66 +/- 1.4	7.71 +/- 0.9	11.54 +/- 1.7
90	10.73 +/- 0.36	9.35 +/- 1.1	7.51 +/- 0.0	10.25 +/- 1.8
92	11.76 +/- 0.20	10.37 +/- 1.8	9.92 +/- 3.4	11.52 +/- 0.9
98	12.12 +/- 0.39	10.20 +/- 1.2	9.10 +/- 1.1	Dosimeter Lost
99	12.41 +/- 0.39	9.69 +/- 0.0	8.90 +/- 1.7	Dosimeter Lost
T1	13.77 +/- 0.61	11.69 +/- 1.1	11.33 +/- 2.3	12.84 +/- 0.9

Table K-2

2001 TLD Quarterly Data - Teledyne Brown Engineering and Proxtronics TLD Results
mrem per Standard Quarter +/- 2 Sigma

Station	First Quarter - 2001	Second Quarter - 2001	Third Quarter - 2001	Fourth Quarter - 2001
	Proxtronics	*Proxtronics*	*Proxtronics*	*Proxtronics*
C	7.6 +/- 1.7	7.7 +/- 2.0	Dosimeter Lost	13.0 +/- 3.4
8	Dosimeter Lost	7.5 +/- 12.4	Dosimeter Lost	Dosimeter Lost
66	4.6 +/- 1.7	5.3 +/- 7.0	8.0 +/- 1.1	9.0 +/- 3.5
79	5.8 +/- 1.7	6.3 +/- 7.6	7.6 +/- 2.9	7.3 +/- 1.9