United States
Environmental Protection
Agency

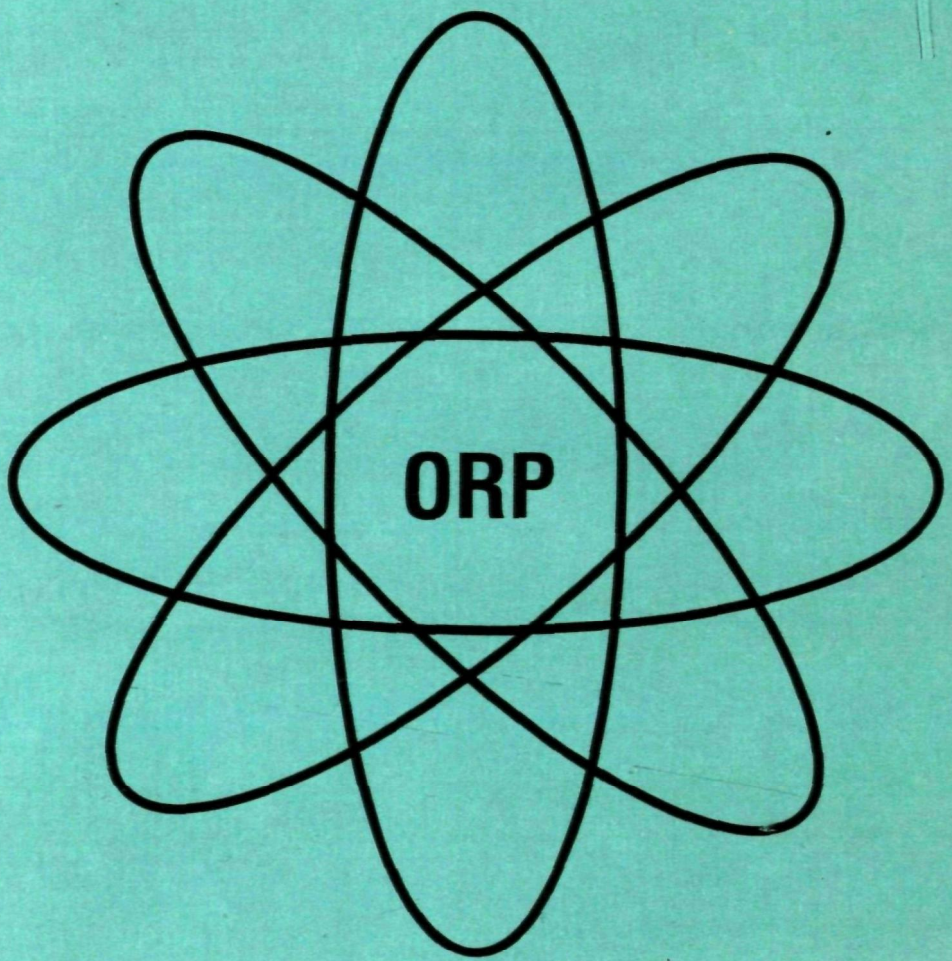
Air and Radiation
(ANR-459)

EPA 520/1-90-011
March 1990

EPA

Office Of Radiation Programs

Program Description



OFFICE OF RADIATION PROGRAMS
PROGRAM DESCRIPTION

March 1990

U.S. Environmental Protection Agency
401 M Street S.W.
Washington, DC 20460

This document was prepared by Irma McKnight and Miles Kahn of the Office of Radiation Programs Program Management Office. More specific information on any Office program may be obtained by writing to the following address or by contacting any of the persons listed in the Organization Chart on page 21 of this document:

United States Environmental Protection Agency
Office of Radiation Programs (ANR-459)
401 M Street S.W.
Washington, DC 20460

The **ORP Publications List** may be obtained from the same address.

CONTENTS

INTRODUCTION

The Office of Radiation Programs (the Office) carries out the Environmental Protection Agency's (EPA) radiation protection activities. The Office's goal is to protect public health and the environment from avoidable exposures to radiation. These activities include issuing standards and guidance to limit human radiation exposure, measuring environmental radiation levels; evaluating and assessing the impact of radiation on the public and the environment; analyzing data on radiation effects; distributing public information and working with State and local governments, industry and professional groups, and citizens to promote actions to reduce exposures to harmful levels of radiation; and responding to radiological emergencies.

SOURCES OF RADIATION

All Office programs deal with either ionizing radiation or radiation from electromagnetic fields. Basically, ionizing radiation is radiation that can remove electrons from atoms. Ionizing radiation, which is either natural or man made, constitutes the greatest source of radiation exposure to the public and to the environment. Natural background radiation includes cosmic rays; naturally occurring radioactive elements in the earth's crust, primarily those associated with uranium, thorium, and potassium; and radioactive decay products such as radon and its daughters.

Main sources of man-made ionizing radiation include medical facilities such as hospitals, pharmaceutical factories, and research and teaching institutions; nuclear reactors and their supporting facilities such as uranium mills and fuel preparation plants; and federal facilities that are involved in nuclear weapons production. All of these sources generate some radioactive wastes as a result of the many ways in which radiation is used.

The primary health effects of exposures to ionizing radiation are increases in the risk of cancer and deleterious genetic changes; e.g., growth impairment and mental retardation.

Radiation from electromagnetic fields consists of both a varying electric and magnetic field, operating at right angles to each other. The electric field is a direct function of voltage, while the magnetic field is a function of the current flowing.

Essentially everyone in the United States is exposed continuously to low levels of radiation from electromagnetic fields. People who live or work near powerful sources are exposed to higher sources. The principal sources of exposure are AM and FM radios and UHF and VHF television broadcast systems. Other sources include radars, microwaves, satellite earth terminals, and high-voltage transmission lines.

Radiation from electromagnetic fields does not change the structure of atoms, however, high levels of it can heat body tissue, which may produce harmful biological effects.

MAJOR PROGRAM AREAS

Office programs can be classified into five major areas: Radon, Nuclear Accident Response, Radioactive Waste Disposal, Radioactively Contaminated Sites, and Industrial Radiation Sources. The following sections describe these program areas as well as major accomplishments of the Office of Radiation Programs.

Radon Action Program

In response to growing concern about elevated indoor radon concentrations in houses situated on the Reading Prong in Pennsylvania and New Jersey and those located elsewhere, the EPA Administrator established the Radon Action Program in September 1985.

The goal of the Radon Action Program is to significantly reduce the health risks associated with radon through a partnership with other Federal agencies, the States, and the private sector. EPA estimates that about 20,000 lung cancer deaths each year in the United States may be attributable to indoor radon, and as many as 8 million houses may be affected. Program activities were expanded

in 1986 and 1987 in response to the growing scope and complexity of the radon problem.

In October 1988, the Indoor Radon Abatement Act (IRAA) was signed into law. The long-term national goal of the Act is to reduce indoor levels of radon to levels comparable to ambient outdoor levels.

The IRAA directs EPA to undertake a variety of activities to address the growing public concern over dangers posed by exposure to radon. These activities include State grants, technical assistance, the study of schools, proficiency programs, regional training centers, model construction standards, an updated Citizens Guide, and a Federal building study. A number of activities described in the law have already been initiated.

The Radon Action Program is organized into four key elements: problem assessment, mitigation and prevention, capability development, and public information.

Problem Assessment

The objectives of problem assessment are to identify and then survey areas with high radon levels in houses, schools, and the workplace and to determine the national distribution of radon levels and associated health risks. One of the next logical steps will then be the establishment of a national data base from which various further analyses may be performed.

The Office has issued standardized measurement protocols for 11 measurement methods to help ensure that radon and radon-decay product measurements are comparable and accurate.

Since 1987 the Office has assisted 25 States and numerous Indian Tribal Lands in designing and conducting surveys to identify areas where indoor radon may be a problem. The Office is continuing efforts to identify those geological factors and characteristics which are most useful as indicators of high radon levels. In addition, work has begun on the use of soil gas measurements to predict the radon potential for individual parcels of land.

The Office has initiated the National Residential Radon Survey. Questionnaires have been completed and measurement devices have been placed in 7,500 homes throughout the United States. Recently guidance was released offering valuable assistance to schools in their measurement and mitigation of radon levels. The Office is currently working with 7 States to survey and mitigate radon in 21 schools. The Office conducted workshops in 6 Regional locations on radon in schools and developed an interim technical guidance report to assist school officials in making informal choices in selecting radon reduction strategies.

Mitigation and Prevention

The Mitigation and Prevention Program includes demonstrations and evaluations of cost-effective methods to reduce radon levels in existing homes and identification and evaluation of ways to prevent elevated radon levels in new construction.

The Development and Demonstration Program (DDP) is an ongoing program to research, develop, and demonstrate cost-effective radon mitigation and prevention techniques for all types of houses. The Agency's Office of Research and Development researched and demonstrated selected mitigation techniques in 64 houses in the Reading Prong. The program has been expanded into Maryland, Tennessee, Alabama, and Florida.

The House Evaluation Program, established in 1986, provides "hands-on" training in radon diagnosis and mitigation at field projects currently located in 11 States. Approximately 10 States are selected annually to participate in this program. EPA established the New House Evaluation Program in 1988 to evaluate the effectiveness of radon resistant new construction features.

The Office cooperated with the National Association of Home Builders and private homebuilders to develop, demonstrate, and release interim guidance for preventing radon in new construction. Currently, the Office is working with model building codes organizations to incorporate radon prevention techniques into

national building codes. The Office is also beginning research and operational programs to expand mitigation and prevention activities into schools and workplaces.

Capability Development

The Office's Washington staff and EPA Regional components are developing technical information and providing policy direction to stimulate the development of State and private sector capabilities to assess radon problems in homes and to help homeowners mitigate such problems.

The Office developed a technical training course on radon diagnostics and mitigation techniques for States and private contractors. Thirty-eight courses have been conducted, and 2,800 participants from 45 States have been trained. To meet growing demand, the Office produced a videotape of the course and distributed it to Regional offices for use by all 50 States.

"Reducing Radon in Structures," EPA's radon diagnosis and mitigation training course, was revised extensively and updated in 1988. The focus in Fiscal Year 1989 was on facilitating Regional and State sponsored courses. Two "Train the Instructors" courses were held to prepare teachers to deliver the EPA course. Five regular courses were held in States which had not previously hosted an EPA radon training course.

A major training activity in 1989 was the selection and implementation of three Regional Training Centers (RTCs): (1) Colorado State University to serve the western States; (2) University of Minnesota/Michigan to serve the central States; and (3) Rutgers University to serve the eastern States. These university-based centers, authorized under the IRAA, offer training in radon principles, measurements, diagnostics, and mitigation on a regular basis at locations across the country. The centers are coordinated through Regional offices.

The Office established the Radon Measurement Proficiency Program to allow private firms and other organizations to demonstrate on a voluntary basis their proficiency in measuring radon and its decay products. When the program began in 1986, 35 companies participated. By the end of 1989, the list of participants had grown to over 5,000, approximately 670 primary companies and 5,100 secondary companies. Primary companies provide measurement services to the public and have analysis capability. Secondary companies assist consumers by providing technical advice or distributing test results, but they depend on primary companies to analyze measurement devices.

A Radon Contractor Proficiency (RCP) Program was developed in 1989 to test the abilities on a voluntary basis of radon mitigation contractors to diagnose and mitigate radon problems. The RCP Program, which is required by the Indoor Radon Abatement Act, is for contractors who actually perform mitigation services. The program consists of training as well as a standardized examination. It serves as a core around which States could develop certification programs for the contractors. The Contractor Proficiency Program is administered by the Regional Training Centers.

Public Information

The timely transfer of information to the States, the private sector, and the public is a critical element of the Radon Action Program. This information is disseminated through brochures and technical reports, presentations at national meetings, and training programs.

The Agency has developed an array of public information material and conducted numerous public information activities since the Radon Action Program started in 1985. More recent activities include a radon advertising campaign in cooperation with the Advertising Council, the award of State Grants, projects with the American Medical Association, and publication of a reporter's guide.

In October 1989 EPA and the Advertising Council began a national media campaign to inform the public about radon. The campaign includes television and radio public service announcements, print and outdoor advertising, a toll-free hotline and brochures. The material was developed by TBWA Advertising Agency and the Direct Marketing Group in cooperation with EPA.

The Indoor Radon Abatement Act authorized EPA to administer grants to help States establish radon programs, conduct radon surveys, develop public information on radon, and conduct demonstration and mitigation projects. A total of 49 States, Puerto Rico, the Virgin Islands, Guam, and the District of Columbia submitted notices of intent to participate in the State Indoor Radon (SIRG) program. Region 10 awarded the first SIRG to the State of Idaho in January 1990. The $50,000 grant will allow Idaho to begin its State Radon Survey. In addition, $755,000 in grants were awarded to eight States for innovative radon projects, which are administered through a special fund as part of the SIRG program.

EPA and the American Medical Association (AMA) held 12 Regional conferences in 1988-89 to inform health care professionals of the risks associated with indoor radon so that they can better explain the health effects of radon to their patients. AMA also produced a brochure and will continue to conduct regional conferences.

In 1989 the Agency published "Reporting on Radon: A Journalist's Guide to Covering the Nations's Second Leading Cause of Lung Cancer." The guide provides information on what radon is and tells reporters how to communicate effectively with the public. The guide was prepared by the National Safety Council's Environmental Health Center with a grant from EPA.

Nuclear Accident Response

EPA plays a major role in nuclear accident response. As a major participant in any Federal response, the Agency is responsible for monitoring and assessing the effects of radiation exposures to the general population from accidents that involve radioactive materials, for providing guidance to appropriate officials concerning the radiation levels at which protective actions are warranted, and for advising those officials of which protective actions should be taken.

The Office, through its Washington headquarters and the mobile monitoring and assessment teams from the National Air and Radiation Environmental Laboratory (NAREL) in Montgomery, Alabama, and the Las Vegas Facility, is able to assess potential doses from and the environmental consequences of accidental radioactivity releases. In addition, the nationwide Environmental Radiation Ambient Monitoring System may be put on an emergency sampling schedule, depending on the situation. The Office can then make recommendations on protective actions and emergency responses. The Montgomery and Las Vegas Laboratories supplement their response capabilities by using sophisticated mobile radiation monitoring and communications equipment.

In 1986, the Agency led and coordinated the federal response to the nuclear accident at Chernobyl. In 1988, the Agency participated in emergency preparedness activities related to the reentry of the nuclear-powered Russian satellite, Cosmos 1900. In 1989, the Agency participated in the launch of the Galileo satellite which carried a large quantity of plutonium-238, a radioactive material used to produce heat and electrical power for scientific equipment.

Specific activities undertaken by the Agency in response to nuclear accidents are described below.

Environmental Radiation Ambient Monitoring System

The Environmental Radiation Ambient Monitoring System (ERAMS), was established in 1973. It comprises 268 nationwide sampling stations that collect air, precipitation, surface and drinking water, and milk samples from which environmental radiation levels are derived. Many stations are located in the near-environment of major potential environmental release points. The stations were selected to effectively measure the wide-scale impact from global events and to provide optimal population coverage while monitoring fallout from any atmospheric testing of nuclear devices and other possible forms of environmental radioactive contamination. Data generated from ERAMS are used to assess any actions necessary to protect public health and to identify trends in environmental radioactivity levels.

ERAMS, which is operated with the cooperation of State radiation program personnel, collects 65 composite pasteurized milk samples, which are

representative of a significant fraction of the U.S. milk consumption.

Air filter and precipitation samples are obtained twice weekly from locations in all 50 States, drinking water samples quarterly from 78 locations, and river water samples quarterly from 58 locations. These samples are then analyzed to determine their level of radioactivity. In all, the sampling stations submit a monthly total of about 2,000 samples for 6,000 analyses. Results of this monitoring are published in a publication titled Environmental Radiation Data, which is distributed quarterly to State agencies and interested private organizations.

Though there have been no atmospheric tests since the Chinese test of October 1980, ERAMS continues to assess levels of long-lived radionuclides in the environment. The system is also employed in certain emergency situations.

For example, the network's sampling frequency was increased in early 1983 as part of the Federal emergency preparedness activity related to reentry of the nuclear-powered Russian satellite, Cosmos 1402. In 1986, following the Chernobyl accident, ERAMS' air sampling frequency was increased to provide daily measurements. The milk network sampling frequency was increased to two per week.

Radiological Emergency Preparedness and Response

EPA performs several essential functions in assisting the Federal Emergency Management Agency (FEMA) in coordinating Federal efforts to aid States and localities in preparing radiological emergency response plans. The Office also assists FEMA in its role of coordinating Federal responses to significant radiological emergencies such as nuclear power plant incidents and other unplanned releases of radioactivity to the environment.

The Agency participates in tabletop and full-field exercises for simulated accidents. In June 1987, the Agency participated in the second triennial federal response to a simulated nuclear accident near the Commonwealth Edison nuclear power plant in Zion, IL. In addition, the Agency has developed the EPA emergency response plan. Although States and localities are responsible for developing their own emergency response plans, the EPA regional staff, with help from the Office's field facilities, assists them in developing, reviewing, and testing their plans.

Protective Action Guides

One of the major Office planning responsibilities is the specification of projected radiation doses (Protective Action Guides) to individuals from nuclear incidents severe enough to warrant actions to reduce or avoid those doses. The Agency is also responsible for recommending emergency actions to take to reduce or avoid excessive radiation doses (Implementation Guidance).

The Office has issued Protective Action Guides (PAGs) and Implementation Guidance for use by States relating to exposure of the whole body and the thyroid gland to airborne radioactivity from accidents at nuclear power plants. This guidance is being revised to make it applicable to a wide range of nuclear accidents and to incorporate lessons learned from response to the accident at Chernobyl. PAGs have also been developed for chronic exposure of the public to deposited and resuspended radioactive materials from accidental releases. These PAGs will be issued in 1989 and incorporated in the Manual of Protective Actions and Protective Actions for Nuclear Incidents for use by Federal, State, and local governments in developing emergency preparedness plans for radiation incidents. In addition the Office is working with the Food and Drug Administration to revise PAGS for contaminated food.

Radioactive Waste Disposal

The basic authority for EPA under the Atomic Energy Act (AEA) is to establish "generally applicable environmental standards for the protection of the general environment from radioactive material." Since its inception, EPA has participated in many efforts to resolve radioactive waste management and disposal problems under legislative responsibilities to protect public health and the environment.

Typically any activity making use of radioactive material inevitably brings about radioactive waste as a by product of their operations. This waste contains varying levels or intensities of radioactivity and are produced both in the commercial sector and by Federal government defense programs. As such, radioactive waste is usually classified into several categories including: (1) low-level radioactive waste from various activities; (2) spent fuel and high-level radioactive waste from nuclear reactor operations; (3) transuranic waste from the defense programs; and (4) waste from mining and milling of uranium and thorium ores.

Land Disposal of Low-Level Radioactive Waste

Typically, low-level radioactive waste (LLW) is ordinary industrial or research waste such as paper, rags, plastic bags, protective clothes, cardboard, packing materials, organic fluids, or water treatment residues which are contaminated with radioactive materials. This waste is a by product from a variety of both government and commercial activities: research, fuel-cycle activities for electric power generation (refining, enrichment, fabrication and reactor operations), diagnostic and therapy medicine manufacturing (pharmaceuticals, tools, and instruments), and defense programs (submarines, ships, and research).

It is estimated that for the 1985-2004 timeframe, there will be about 3 million cubic meters of LLW generated by commercial activities (about 150,000 cubic meters per year) and 1.5 million cubic meters generated by Department of Energy (DOE) activities (about 75,000 cubic meters per year).

In 1974 the Agency, with the U.S. Geological Survey, published hydrogeologic and hydrochemical data to help evaluate suitability of LLW disposal sites. The Office is developing standards for management and land disposal of low-level radioactive waste. They are expected to be promulgated in 1991. The standards will include natural and accelerator-produced waste and will establish criteria for designating levels of radioactivity in waste as below regulatory concern.

For commercial sites, the EPA standards will eventually be implemented and enforced by the Nuclear Regulatory Commission (NRC) through its licensing requirements or by those States having regulatory agreements with the Commission. DOE will implement the EPA standards for Federal Government management and disposal facilities.

There are currently three operational commercial sites: Barnwell, SC; Beatty, NV; and Richland, WA. Commercial sites have been closed at Maxey Flats, KY; West Valley, NY; and Sheffield, IL. There are 16 Federal Government storage sites widely distributed around the country.

Under the Low-level Radioactive Waste Policy Act of 1980 and the Amendments of 1985, each State by 1993 would be responsible for providing disposal capacity for all commercial low-level radioactive waste generated within its borders. Regional cooperation through compacts was encouraged by this law, and is presently the method by which many States are carrying out their responsibility. As a result, it is anticipated that 8 to 10 new disposal sites will be operating by the mid 1990's.

Naturally Occurring and Accelerator-Produced Radioactive Materials

Two broad categories of radionuclides not covered under the Atomic Energy Act are naturally occurring radionuclides of insufficient concentration to be considered source materials and accelerator-produced radionuclides. Materials containing these nuclides are commonly referred to as naturally occurring and accelerator-produced radioactive materials (NARM).

Naturally occurring radioactive materials consist principally of uranium, thorium, and radium. There are two very different types of this waste: (a) discrete sources or waste streams of higher radioactive concentration, such as radium needles used in medical practice or radium-contaminated drinking water cleanup resins, and (b) lower activity diffuse sources such as residuals from mining and extraction industries. Most

accelerator-produced radionuclides are used in medicine or for research and have very short half-lives. A few are longer lived.

Because NARM radionuclides are indistinguishable from those that are produced at AEA-licensed facilities, they are usually disposed of with AEA LLW. EPA is proposing standards for disposal of NARM waste in conjunction with the standard proposed for low-level radioactive waste. NARM waste proposed for regulation includes any NARM waste whose radioactivity concentration exceeds 2 nanocuries per gram, but does not include certain named consumer items.

Disposal of Spent Nuclear Fuel, Transuranic and High-Level Radioactive Wastes

High-level radioactive waste (HLW) is the waste from reprocessing spent reactor fuel. Commercial HLW is now stored at individual reactor sites or at storage sites in West Valley, NY; Aiken, SC; and Morris, IL. Defense HLW is stored at special sites in Richland, WA; Aiken, SC; and Idaho Falls, ID. Spent nuclear fuel is being stored temporarily in pools of water at individual reactor sites and at three specifically designated sites in the United States.

In 1987, there were about 16,000 metric tons of commercial spent nuclear fuel and 382,000 cubic meters of high-level liquid waste being stored (both commercial and defense). The total in 2000 is expected to reach 40,000 metric tons of spent fuel and 330,000 cubic meters of liquid and solidified waste.

Transuranic (TRU) waste is generated by DOE in its defense programs, and is currently either burned or stored at several DOE sites. In 1987 some 3,000 cubic meters of transuranic waste were stored awaiting disposal in a geologic repository. DOE has constructed a geologic repository in New Mexico for the disposal of TRU wastes and is in the characterization phase of developing one in Nevada for spent nuclear fuel and solidified high-level radioactive waste.

On August 15, 1985, the Office issued environmental standards for the management and disposal of spent nuclear fuel, high-level, and transuranic radioactive wastes. Under court order, the Agency is reevaluating some of the technical aspects of the regulations. Shortly after the rule was promulgated, several States and environmental groups challenged it. In 1987, the U.S. Court of Appeals for the First Circuit agreed with the plaintiffs' objections to two sections of the standards. The Court remanded Subpart B of 40 CFR Part 191 to EPA for further action. As a result of the Court ruling, the Office is developing new standards for spent fuel, high-level, and transuranic radioactive waste.

Disposal of Radioactive Materials at Active Uranium and Thorium Processing Sites

On September 30, 1983, the Agency issued final standards for the control of effluents and emissions from uranium and thorium mill tailings during milling operations and for the final disposal of tailings. (Mill tailings are radioactive, sand-like materials that remain after uranium has been extracted from ore.) The standards require stabilization of tailings so that health hazards will be controlled and limited for at least 1,000 years. NRC or States having regulatory agreements with the Commission are directly responsible for implementing and enforcing these standards. There are 27 active (i.e., licensed) milling sites distributed among the States of Colorado, New Mexico, Texas, Utah, Wyoming, South Dakota, and Washington.

Ground-Water Protection at Inactive Uranium Mill Tailings Sites

On January 5, 1983, the Agency issued final standards for the cleanup and disposal of uranium mill tailings at 24 inactive mill sites that quality for remedial action under Uranium Mill Tailings Radiation Control Act of 1978. Inactive sites are located in Arizona, Colorado, Idaho, New Mexico, North Dakota, Oregon, Pennsylvania, Texas, Utah, and Wyoming.

The standards included qualitative standards for ground-water protection which allowed DOE and NRC to determine what actions were needed on a site-by-site basis for the cleanup and disposal of

uranium mill tailings at the inactive sites. As a result of a Court order, quantitative standards are now being developed.

Ocean Disposal of Radioactive Waste

The Marine Protection, Research, and Sanctuaries Act of 1972 specifies that all ocean disposal of wastes can be conducted only at EPA-designated sites and only in accordance with strict conditions set forth in a disposal permit issued by EPA. Further, only low-level radioactive waste may be considered for ocean disposal.

In conjunction with a comprehensive review of ocean disposal regulations being conducted by the Office of Water, the Office of Radiation Programs is developing criteria and supporting background information for additional regulatory changes concerning disposal of low-level radioactive waste. The Agency has not received any applications for permits for ocean disposal of radioactive waste.

Radioactively Contaminated Sites

The handling and processing of radioactive materials have resulted in numerous sites where radiation contamination exists, creating risks for the population who live on or near the sites. Water supplies may be contaminated by runoff or leaching from the site in aquifers, and homes may be constructed on fill or with materials reprocessed from these sites.

Sites contaminated with radioactive substances require different procedures and protocols for investigation and sampling than do chemically contaminated sites. Different instrumentation and measurement techniques must be used, additional pathways of exposure must be evaluated, and new safety and decontamination procedures must be developed for the investigation process.

The following sections describe the Office's regulatory efforts for alleviating or mitigating problems caused by radioactively contaminated sites.

Support to Superfund Program

The Office's goals in supporting Superfund are to ensure that Superfund site cleanup activities do not result in radiation hazards and that appropriate cleanup technology and methods are adopted to effectively and efficiently reduce the hazards associated with radiation problems encountered at the sites.

Thirty-three sites on the National Priority List (NPL) are contaminated with radioactive materials. More are likely to be added in the next few months. Over 1,000 additional hazardous waste sites contain nuclear materials. For those sites on the NPL or other sites managed by the EPA Superfund program, the Office must provide assistance and ensure that protocols are consistent with the Superfund program requirements. The Office is actively involved in site-specific assistance and development of alternative technology for site cleanup.

Decommissioning or managing cleanup of facilities, waste sites, or defunct businesses with radioactive waste problems requires coordination between agencies, collection of information, and establishment of guidelines for cleanup. Thus the Office is responsible for establishing safety protocols, data quality objectives (DQO), investigative procedures, and cleanup levels. A two-volume document, "Development and Implementation of Data Quality Objectives for Radiologically Contaminated Sites," was completed in 1988 for Superfund site investigations and DQO development.

During the summer of 1989, the Office assisted in the cleanup of radium from an abandoned building in Woodside, Queens, New York. This was one of the first Superfund removal actions directed at radioactive contamination. The abandoned building, which belonged to the Radium Chemical Company, contained what may have been the world's largest concentration of radium. The working area of the building contained enough

radium for a person to exceed the yearly occupational radiation exposure limit after only 1 hour in the worst parts of the building.

The Office is currently involved in investigations in the residential areas of Montclair, Glen Ridge, and West Orange, New Jersey. These areas contain radium-contaminated soils with high levels of gamma radiation and radon gas. They are on EPA's National Priority List. The contaminated soils occur in former landfills which are now residential areas. Approximately 50 acres of contaminated soil in Glen Ridge and 45 acres in Montclair and West Orange are included in the contaminated areas. Over 300,000 cubic yards of radium-contaminated soils are estimated at these sites.

The Office, in concert with Superfund requirements, is evaluating the use of physical volume reduction and chemical extraction (VORCE) to remediate the radium-contaminated soils at these Superfund sites. The VORCE investigation consists of (1) soil characterization, (2) treatment studies, and (3) technology implementation. The soil characterization phase provides important data that paves the way for the treatment and implementation phases that follow.

Technical Assistance

The Office provides technical assistance upon request to other parts of the Agency, to other Federal agencies, and to State and local governments. Technical assistance is provided mainly through radiation personnel in each of the 10 EPA Regions and the Montgomery and Las Vegas Laboratories.

Assistance is provided in three principal forms: conducting radiochemical analyses of environmental samples for selected radionuclides; performing site surveys of areas with known or suspected unusual conditions; and making measurement equipment available to other organizations. The Montgomery and Las Vegas Laboratories also advise other laboratories on conducting analyses and provide training in radiation monitoring and laboratory procedures.

Internationally, the Office provides technical support for the United States' participation in meetings of the Contracting Parties to the London Dumping Convention and in activities of other organizations that guide the conduct of ocean dumping, such as the International Atomic Energy Agency and the Organization for Economic Cooperation and Development's Nuclear Energy Agency.

Residual Radioactivity

EPA is developing criteria for cleanup of sites and buildings that are contaminated with radioactivity. There are thousands of facilities, such as laboratories and power plants, now in operation around the country that use radioactive materials. When these facilities cease operation, the sites must be cleaned up before they can be made available for other uses. To safely accomplish that, facilities may need to reduce the levels of residual radiation at these sites and any remaining equipment must be decontaminated. Information on the health risks from residual radioactivity and on decontamination methods is being compiled to assess the costs and benefits associated with the criteria being developed. The criteria may be developed as generic Federal Guidance applicable to all Federal agencies or they may be supplemented by standards for specific types of contamination or sites.

Industrial Sources

National Emission Standards for Hazardous Air Pollutants (NESHAPS); Standards for Radionuclides

EPA has listed radionuclides as hazardous air pollutants under Section 112 of the Clean Air Act. This listing was based on a finding that radionuclides are carcinogens and are emitted in significant amounts into the air from thousands of sources across the nation.

On February 6, 1985, EPA published standards for DOE facilities, NRC licensees, and non-DOE Federal facilities, and elemental phosphorus plants. Before these standards can be fully implemented, however, sections of the final rule including

reporting and record-keeping requirements must be completed.

The final standard for radon-222 emissions from underground uranium mines was published in the Federal Register on April 17, 1985. The standard requires bulkheading as a work practice for limiting radon emissions. The Agency found that the emission rate of radon from underground mines may be highly variable, depending on mine ventilation rates, ore grade, exposed surface areas, mining practices, and geologic formations.

Final standards for radon-222 emissions from licensed uranium mill tailings were published on September 24, 1986. The standards require the use of improved technology for the management of all future uranium tailings piles. Existing tailings piles may continue in use for 6 to 15 years, depending on the status of the piles.

The radionuclide NESHAPS have been re-evaluated in compliance with Court order. On October 31, 1989, EPA published final rules controlling radionuclide emissions from industrial sources. The rule covers an estimated 6,300 facilities in nine source categories including NRC and non-DOE federal facilities; nuclear power reactors and their support facilities; disposal of uranium-mill tailings piles; DOE facilities; phosphogypsum piles; licensed uranium-mill tailings piles; elemental phosphorous plants; DOE radon sources; and underground uranium mines.

In 1990 EPA will initiate a program that promotes delegating NESHAPS implementation authority to the States. EPA will prepare and provide guidance to the States so they can develop programs that will enable them to qualify for such authority. In the interim, requests from States for delegation will be reviewed as received. Also in 1990, pilot Regional and State training programs will be conducted.

Guidance for Occupational Exposure

The types of employment and associated activities that involve worker exposure to radiation vary greatly. EPA estimates that approximately 1.3 million workers were employed in occupations in which they were potentially exposed to radiation in 1980, the latest year for which there are comprehensive assessments. Most of these workers receive very low exposures and the average worker is believed to incur a relatively small risk of harm.

On January 27, 1987, President Ronald Reagan issued revised guidance to Federal agencies significantly reducing the level of radiation to which workers may be exposed occupationally. The guidance, developed by EPA, updates that issued by President Dwight Eisenhower in 1960. Because there is no definitive evidence that radiation exhibits any "threshold" level, below which no health effects occur, EPA's occupational guidance is predicated on the tenet of achieving exposures "as low as reasonably achievable" (ALARA). It contains new provisions to protect the unborn. The new guidance applies to radiation workers employed by the Federal Government and by institutions or companies subject to Federal regulation.

Other Radiation Activities

Diagnostic X Rays

In 1976, based on recommendations developed by the Office in cooperation with other Federal agencies, including the then Department of Health, Education, and Welfare, President Gerald Ford issued Federal Guidance for radiation protection in the use of diagnostic x rays. The guidance is designed to eliminate unnecessary use of x rays and to ensure that x-ray personnel, equipment, and techniques are of the highest quality, resulting in lower radiation doses. Among its more significant provisions, the guidance recommends that mass screening by using x-ray examinations be eliminated unless specifically justified; that use of medical diagnostic x rays be limited only to obtaining diagnostic information; that certain numerical guides for common x-ray examinations not be exceeded; and that routine dental x-ray examinations not be performed.

Electromagnetic Fields

The existing concern over exposure to electromagnetic field sources such as microwave

emitters, broadcast towers, and radars has been extended to the electric and magnetic fields from power lines. The Office maintains a small program to keep abreast of new developments in the electromagnetic field areas. This program focuses on assessing risks and disseminating information.

The Office responds to numerous other requests for assistance from Regional offices, State and local officials, as well as industries and broadcasters. The Office, at the request of the Federal Communications Commission (FCC), made measurements around broadcast facilities in Portland, OR; Seattle, WA; and Denver, CO, to determine the environmental exposure levels to which the public could be exposed. Upon request from the State of New Jersey, measurements were made at a group of satellite communications earth stations in Vernon, NJ. In 1989, at the request of the State of California, the Office made measurements around Voice of America facilities in McFarland, CA. This study was done to assist the State in its investigation of a cancer cluster in McFarland.

RADIATION STANDARDS AND GUIDANCE

No amount of exposure to radiation is without some risk. To protect the public and the environment from radiation exposure, the Office develops environmental standards and recommendations for Federal guidance, a unique authority that applies only to activities of Federal agencies. In setting standards and recommending Federal guidance, the Agency considers technological, social, and, in some cases, economic factors in seeking to reduce exposure risks to acceptable levels.

The Office develops radiation standards in response to several pieces of legislation and set limits on human radiation exposure levels or on quantities or concentrations of radioactive materials that may be released to the environment. Once issued, EPA standards apply directly to all commercial or governmental organizations involved in the regulated activity. For instance, the Nuclear Regulatory Commission must incorporate the EPA environmental standards into its regulations governing their licensees.

Under Federal Guidance authority, the Agency may make recommendations to the President on guidance to Federal agencies for radiation protection. If the President issues the EPA recommendations as Federal Guidance, affected agencies must take them into account in carrying out their responsibilities. The basic philosophy behind EPA standards and guidance on radiation is that any exposure to radiation carries some risk with the risk increasing as the exposure increases.

Following are lists of the radiation standards and recommendations for Federal guidance developed and being developed by the Office of Radiation Programs.

Radiation Standards

1. Land Disposal of Low-Level Radioactive Waste
    - o To Be Proposed

2. Disposal of Spent Nuclear Fuel, Transuranic and High-Level Radioactive Waste
    - o Issued 1985
    - o Remanded 1987
    - o To Be Reproposed

3. Disposal of Radioactive Materials at Active Uranium and Thorium Processing Sites
    - o Issued 1983

4. Ground-Water Protection at Inactive Uranium Processing Sites
    - o Issued 1983
    - o Remanded 1987
    - o To Be Reproposed

5. Remedial Actions at Inactive Uranium Processing Sites
    - o Issued 1983

6. Drinking Water
    - o Interim Regulation 1976
    - o Advance Notice of Proposed Rulemaking 1986

7. National Emission Standards for Hazardous Air Pollutants: Radionuclides
    - o Issued 1985
    - o Remanded 1987
    - o Republished 1989

8. Nuclear Power Operations
    - o Promulgated 1977

Radiation Guidance

1. Exposure of Underground Uranium Miners
    - o Final 1971

2. Occupational Exposure
    - o Final 1960
    - o Revised 1987

3. Dose Limits from Transuranium Elements
    - o Proposed 1977

4. Diagnostic X Rays
    - o Final 1976

5. Residual Radioactivity
    - o To Be Proposed

6. Public Exposure to Radiofrequency Radiation
    - o Advance Notice of Proposed Rulemaking 1986

Authorities for EPA's Radiation Programs

Authority	Subject
1. Atomic Energy Act of 1954, as amended 42 USC 2011 et seq. (1970), and Reorganization Plan #3 of 1970	All Federal radiation guidance functions and generally applicable environmental radiation standards
2. Public Health Service Act 42 USC 201 et seq (1970)	Radiation monitoring, research, training, and technical assistance to States
3. National Environmental Policy Act of 1969 33 USC 4321 et seq (1970)	*Evaluation of Federal actions involving radiation
4. Toxic Substances Control Act 15 USC 2601 et seq (1970)	*Commodities containing carcinogenic (e.g., naturally occuring radionuclides) materials
5. Marine Protection, Research and Sanctuaries Act of 1972, 42 USC 1401 et seq (1972)	Ocean disposal of radioactive waste
6. Federal Water Pollution Control Act as amended 33 USC 1251 (1973) and 7. Safe Drinking Water Act, 42 USC 300f et seq (1974)	Radionuclides in drinking and surface water
8. Resources Conservation and Recovery Act 42 USC 6901 et seq (1976)	*Naturally occurring radionuclides in wastes of all types
9. Clean Air Act as amended, 42 USC 7401 et seq (1977)	Airborne emissions of radionuclides
10. Uranium Mill Tailings Radiation Control Act of 1978 (an amendment to the Atomic Energy Act) 42 USC 7901 et seq (1978)	Uranium mill tailing
11. Comprehensive Emergency Response, Compensation and Liability Act of 1980; Superfund Amendments and Reauthorization Act of 1986, 42 USC 9601 et seq	Radioactive waste cleanup, radon surveys and demonstration projects
12. Nuclear Waste Policy Act of 1982 P.L. 97-425	Generally applicable environmental standards for high-level radioactive waste

*The Office of Radiation Programs is not the lead office in these areas.

13. Low-Level Radioactive Waste Policy Amendment Act of 1985, 42 USC 2012(b)-2021	Low-level radioactive waste disposal sites
14. Indoor Radon Abatement Act of 1988 15 USC 2661-2671	Radon surveys, mitigation proficiency programs, training centers, assistance to States, public information
15. Administrative Procedures Act, 5 USC 551-559, 701-706	Rulemaking procedures
16. Executive Order 10831, "Federal Compliance with Pollution Control Standards (1959)	Federal guidance on radiation
17. Executive Order 12088, "Federal Compliance with Pollution Control Standards" (1978)	Extension of EPA standards to Federal activities
18. Executive Order 12148, "Federal Emergency Preparedness Management" (1979)	Radiological emergencies

OFFICE ORGANIZATION AND FUNCTIONS

The Office of Radiation Programs, under the supervision of a Director, is responsible to the Assistant Administrator for Air and Radiation for the radiation activities of the Agency including development or radiation protection criteria, standards, and policies; measurement and control of radiation exposure; and research requirements for radiation programs.

The Office provides technical assistance to States through EPA Regional Offices and other agencies having radiation protection programs; establishes and directs a national surveillance and investigation program for measuring radiation levels in the environment; evaluates and assesses the impact of radiation on the general public and the environment; and maintains liaison with other public and private organizations involved in environmental radiation protection activities. The Office also coordinates with and assists the Office of Enforcement and Compliance Monitoring in enforcement activities where EPA has jurisdiction.

To carry out its activities, the Office relies on a staff with diverse capabilities including radiobiology, radiochemistry, epidemiology, health physics, physical sciences, oceanography, economics, and engineering. Staff are located in the Office's headquarters in Washington, DC, and in two field laboratories.

Washington Office

In addition to the immediate office, the Office of Radiation Program's Washington, DC, office is composed of three divisions: Criteria and Standards; Analysis and Support; and Radon.

Criteria and Standards Division

The Criteria and Standards Division (CSD) is responsible for formulating and recommending policies, criteria, and standards designed to protect the environment and the public from both ionizing and nonionizing radiation. Specific activities carried out by CSD includes:

- Developing guidance designed to protect those occupationally exposed to ionizing radiation
- Identifying and evaluating new radiation sources to determine the public health significance of all sources of radiation exposures
- Assuming lead responsibility for those sections of all EPA standards and guidelines dealing with radioactive materials, including those for which proposal and promulgation responsibility is located outside of the Office of Air and Radiation.

Analysis and Support Division

The Analysis and Support Division (ASD) is responsible for providing support to the development of standards and regulations. Support takes the form of evaluating human health and environmental risks and radiation exposure and providing basic understanding of the biological effects of radiation. In support of standards and guidance development, ASD conducts economic studies of alternative choices of controls and evaluates technology and processes to reduce exposure to ionizing and nonionizing radiation in the environment. Other ASD activities include:

- Providing statistical and applied mathematical support to the standards setting function
- Developing mathematical models of the environmental transport of radionuclides
- Determining and reporting findings on the radiological quality of the environment
- Determining if environmental levels are within EPA established radiological guidelines and standards and recommending changes to existing control programs
- Developing general guidance for design and implementation of surveillance programs
- Developing emergency planning criteria and coordinating Agency support to other Federal agencies and to the States.

Radon Division

The Radon Division has been designated as the lead organization in developing, coordinating, and implementing the Agency's Radon Action Program. Under this program, the Agency addresses national and regional problems of indoor radon through an integrated effort to mitigate elevated radon levels in structures and to disseminate information to the public about radon. Radon Division activities include:

- o Identifying areas with high levels of radon in homes, schools, and workplaces; and determining the national distribution of radon levels and associated risks
- o Developing mitigation and prevention technologies to reduce radon concentrations significantly in existing and new buildings
- o Stimulating the development of State and private sector capabilities to assess radon problems in homes, and helping people to mitigate such problems
- o Working with States and the private sector to provide information to the public on radon, its risks, and what can be done to reduce those risks.

Laboratories

The Office operates two laboratories, the National Air and Radiation Environmental Laboratory and the Las Vegas Facility.

National Air and Radiation Environmental Laboratory

The National Air and Radiation and Environmental Laboratory (NAREL), located in Montgomery, AL, conducts activities in support of the Office's Headquarters components. NAREL provides technical support to headquarters and technical assistance to States, EPA Regional Offices, and other EPA Programs in their radiation-related activities, and special laboratory support to other Government agencies as required. The Laboratory performs the following functions:

- o Radon Program. Provide measurement and calibration for the Radon Action Program. NAREL operates two radon calibration chambers to evaluate instruments and methods for radon measurements, to assist States in preparing for their radon programs, and to provide known exposures for the Office's radon quality assurance program. NAREL also analyzes charcoal canister monitors for the Office's State survey program.
- o Measurement Programs. Conduct field and laboratory measurement programs that help the Office set appropriate environmental radioactivity standards and provide a basis for evaluating environmental radiation sources
- o Radioactivity Monitoring. Assess ambient radiation levels and levels and levels resulting from nuclear accidents by operating the Environmental Radiation Ambient Monitoring System
- o Emergency Response. Assume lead responsibility within EPA for providing capability for field measurements in emergency situations involving releases of radioactivity to the general environment. NAREL maintains two well-equipped vehicles, a mobile analytical laboratory and a communications unit, in a state of readiness to respond to accidental releases of radioactivity that pose potential danger to the population and the environment. NAREL's role in a typical response is to help States assess the environmental impact of an accident and to ensure public health.
- o Assessments. Evaluate and assess environmental radiation sources through the development and validation of computer dose models
- o Superfund Support. Conduct special studies and programs in support of Superfund. NAREL has provided radioanalytical analyses for two Superfund sites and has been involved in evaluating innovative technologies for site remediation.

A new state-of-the art building to house NAREL under one roof has been constructed on

approximately 12 acres of land on Gunter Air Force Base in Montgomery.

Las Vegas Facility

The Las Vegas Facility (LVF) provides the following technical support for radiation control activities:

- o Field Studies. Conduct studies in radiation problem areas such as Superfund sites, waste disposal, mill tailings, construction materials, uranium and plutonium operations, and other areas as required. The LVF staff recently evaluated human exposure to natural and man-made radiation sources around two elemental phosphorus plants in Idaho.

- o Radon Program. Operate a radon chamber in support of the Radon Measurement Proficiency Program and other ongoing radon programs, such as the national school survey. The chamber is used to evaluate new measurement technologies and benchmark measurement proficiency for approved measurement devices.

- o Electromagnetic Fields. Conduct measurements and analyze electrical and magnetic fields; evaluate and calibrate measurement instruments; and provide assistance to States and other Government agencies.

- o Assessments. Estimate dose and risk from radionuclides with the use of computer models such as the Clean Air Act Assessment Package-1988 and REPRISK, in support of rulemaking activities for the Clean Air Act and High-level Nuclear Waste Programs.

- o Emergency Response. Provide an emergency response capability for radiation incidents. This response includes the ability to deliver measurement capabilities to the site on short notice, make measurements and assessments, and report results to Washington, DC, quickly. LVF maintains a Mobile Emergency Response Laboratory (MERL) to support federal, State, and local efforts in a radiological emergency.

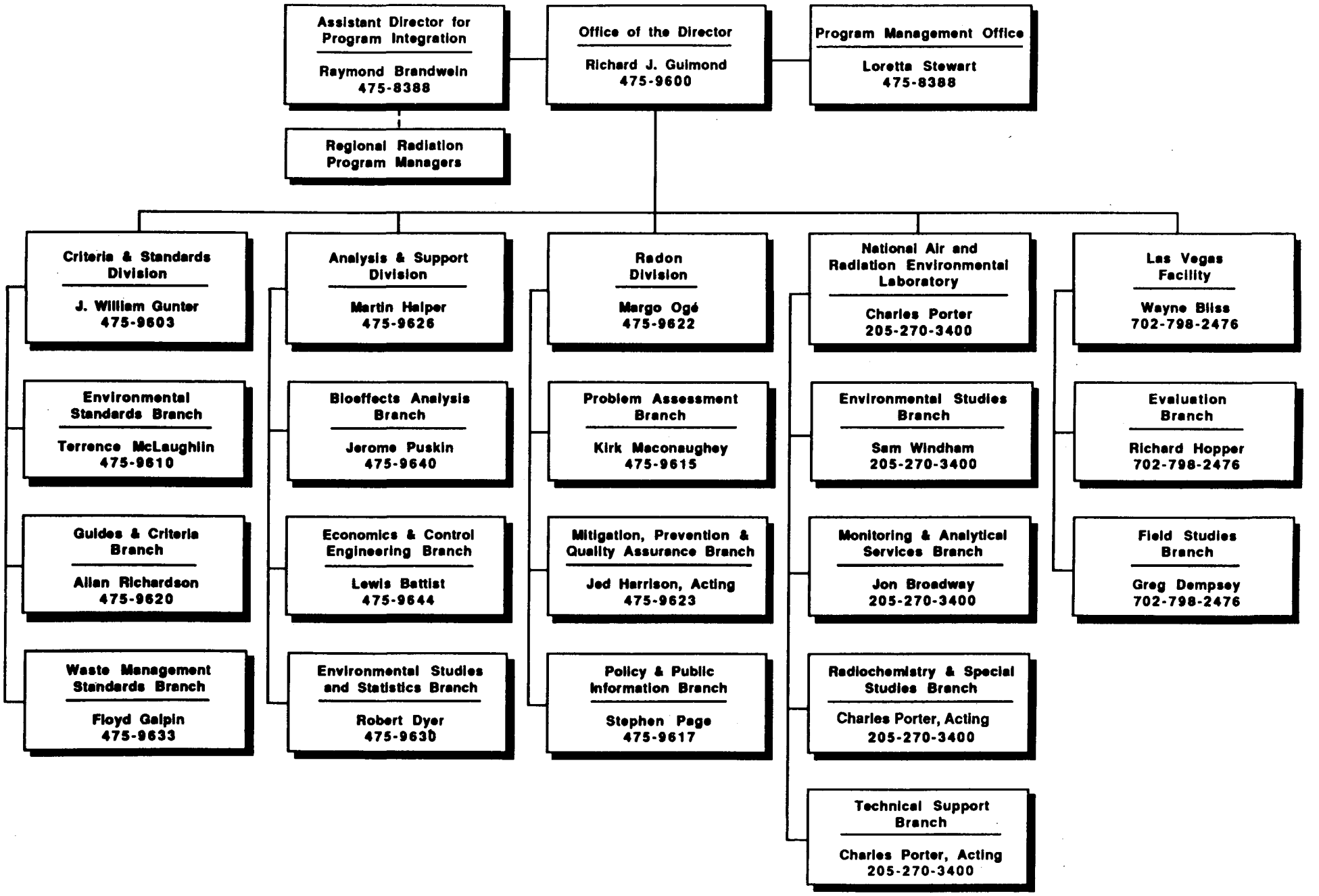
- o Technology Transfer. Advise EPA Regions, and State and city government officials on measurements of both ionizing and electromagnetic radiation. Provide information to the private sector on radon measurement devices. Provide assistance and advice on radiochemical analyses, site assessments for Superfund and for Indian Tribes for reclaiming abandoned uranium mining lands; loan radiation measurement equipment to States; and train State health personnel in laboratory procedures.

Regional Complement

The Office also supports a Regional complement, with staff located in each of the Agency's 10 Regional offices. The Regional staff bear principal responsibility for outreach activities with State and local programs in their respective areas, particularly for such subjects as indoor radon, where there is strong public interest. In addition, the Regional offices have a major role in the implementation program for the National Emission Standards for Hazardous Air Pollutants for radionuclides.

Radiation Program Managers and/or Radiation Representatives frequently serve on the Regional Advisory Committee (RAC) for radiation accidents, and are directly involved in the review and testing of nuclear response plans developed for nuclear facilities. The Regional staff also participates in Headquarters work groups, and serves as the advisor to the Agency's Regional managers on radiation matters which are of interest or concern within the Regions.

Office of Radiation Programs Organization Chart



EPA Regional Radiation Program Managers

	Telephone No.
Tom D'Avanzo Radiation Program Manager, Region 1 U.S. Environmental Protection Agency Room 2311 Boston, MA 02203	FTS: 835-4502 COMM: (617) 565-4502
Paul A. Giardina Radiation Program Manager, Region 2 U.S. Environmental Protection Agency 26 Federal Plaza Room 1137L New York, NY 10278	FTS: 264-4110 COMM: (212) 264-4110
Lewis Felleisen Radiation Program Manager, Region 3 U.S. Environmental Program Manager Special Program Section (3AM12) 841 Chestnut Street Philadelphia, PA 19107	FTS: 597-8326 COMM: (215) 597-8326
Chuck Wakamo Radiation Program Manager, Region 4 U.S. Environmental Protection Agency 345 Courtland Stree, N.E. Atlanta, GA 30365	FTS: 257-3907 COMM: (404) 347-3907
Gary V. Gulezian Radiation Program Manager, Region 5 (5AR26) U.S. Environmental Protection Agency 230 S. Dearborn Street Chicago, IL 60604	FTS: 886-6258 COMM: (312) 353-2206

Donna M. Ascenzi
Radiation Program Manager, Region 6
U.S. Environmental Protection Agency
Air Enforcement Branch (6T-E)
Air, Pesticides and Toxics Division
1445 Ross Avenue
Dallas, TX 75202-2733

FTS: 255-7223
COMM: (214) 655-7223

Carl Walter
Radiation Program Manager, Region 7
U.S. Environmental Protection Agency
726 Minnesota Avenue
Kansas City, KS 66101

FTS: 276-7600
COMM: (913) 551-7600

Milton W. Lammering
Radiation Program Manager, Region 8
(8HWM-RP)
U.S. Environmental Protection Agency
Suite 500
999 18th Street
Denver, CO 80202-2405

FTS: 330-1709
COMM: (303) 293-1713

Michael S. Bandrowski
Radiation Program Manager, Region 9
(A1-1)
U.S. Environmental Protection Agency
1235 Mission Street
San Francisco, CA 94103

FTS: 556-5285
COMM: (415) 556-5285

Jerry Leitch
Radiation Program Manager, Region 10
(AT-082)
U.S. Environmental Protection Agency
1200 Sixth Avenue, Mail Stop 533
Seattle, WA 98101

FTS: 399-7660
COMM: (206) 442-7660