United States
Enrichment Corporation

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USEC

United States
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70-7002/7001

August 1, 1995

Ms. Merri Horn
U. S. Nuclear Regulatory Commission
Mail Stop T8A33
Washington, D. C. 20555

Dear Ms. Horn:

Enclosed you will find the most current Air Reports: 1) 1994 National Emission Standard for Hazardous Air Pollutant Annual Report for the Paducah Gaseous Diffusion Plant and 2) Portsmouth Gaseous Diffusion Plant National Emission Standards for Hazardous Air Pollutants Radionuclide Emissions Report for 1994. Also enclosed is a copy of the Paducah Gaseous Diffusion Plant Waste Minimization and Pollution Prevention Plan Update for 1995 and a copy of the Waste Minimization and Pollution Prevention Awareness Program Plan, as we discussed.

If you have any further questions, please call me at (301) 564-3412.

Sincerely,

Patrick H. Gorman
Environmental Compliance Representative

Enclosures 4

NF04

file - NESHAPS/PGDP

USEC

United States
Enrichment Corporation
95-0861
Paducah Site Office
P.O. Box 1410
Paducah, KY 42001

Tel: 502 441-5803
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June 7, 1995

Mr. Jimmie Hodges, Site Manager
Paducah Site Office
Department of Energy
Post Office Box 1410
Paducah, Kentucky 42002-1410

1994 National Emission Standard for Hazardous Air Pollutant (NESHAP) Annual Report for the Paducah Gaseous Diffusion Plant (PGDP)

Attached is the annual NESHAP report required by 40 CFR 61, Subpart H, which summarizes the airborne radionuclide emissions from PGDP during CY 1994. This report is required to be submitted to the Environmental Protection Agency by June 30, 1995. The appropriate Department of Energy official should sign the certification located after the compliance assessment on page 17 of the report.

If you have any questions, please contact Ron Dierolf at (502) 441-5956.

Sincerely,

Patrick T. Taimi

T. Michael Taimi
Environmental Assurance & Policy Manager

TMT:RKD:mjw

Attachment

cc: Dane Bartlett - MMUS/PGDP
John Dietrich - MMUS/HQ
David Hutcheson
Wayne Kachel - LMC
Howard Pulley - MMUS/PGDP
Ken Tomko - MMUS/PORTS

cc/att: Linda Beach - MMUS/HQ
Ron Dierolf - MMUS/PGDP
Weldon Dillow - DOE/OR
Gail Giltner/Jimmie Hankins - MMUS/PGDP
Rodney Kingrea - MMES/OAK RIDGE
EC File - RC

United States Department of Energy
Air Emissions Annual Report
(Under Subpart H, 40 CFR 61.94)
Calendar Year 1994

Site Name: Paducah Gaseous Diffusion Plant

OPERATIONS OFFICE INFORMATION

Office: Paducah Site Office
P. O. Box 1410
Paducah, Kentucky 42002-1410

Contact: W. David Tidwell *Phone*: (502) 441-6[illegible]

SITE INFORMATION

Operating Contractor:

United States Enrichment Corporation/Martin Marietta Utility Services, Inc.

Address: P. O. Box 1410
Paducah, Kentucky 42002-1410

Contact: Ronald K. Dierolf Jr. *Phone*: (502) 441-5956

SECTION I--FACILITY INFORMATION

SITE DESCRIPTION

The Department of Energy (DOE) Paducah Gaseous Diffusion Plant (PGDP) is an active uranium enrichment facility consisting of a diffusion cascade and extensive support facilities. The cascade, including product and tails withdrawal, is housed in 6 process buildings covering a total of approximately 80 acres. The plant is located on a reservation consisting of approximately 1350 acres in western McCracken County about 10 miles west of Paducah, Kentucky, and approximately 3 miles south of the Ohio River. Roughly 740 acres of the reservation are enclosed within a fenced security area. The raw water treatment plant, residential landfill, and inert landfill are the only operating areas outside of the security area. An uninhabited buffer zone of at least 400 yards surrounds the entire fenced area. Beyond the DOE-owned buffer zone is an extensive wildlife management area consisting of approximately 2100 acres either deeded or leased to the Commonwealth of Kentucky. During World War II, the Kentucky Ordnance Works (KOW), a trinitrotoluene production facility, was operated in an area southwest of the plant on what is now the wildlife management area. The water treatment plant used by PGDP was originally a KOW facility.

Construction of the PGDP facility began in 1951 and the plant was fully operational by 1955, supplying enriched uranium for commercial reactors and military defense reactors. Enriched uranium is defined as uranium in which the concentration of the fissionable uranium-235 (^{235}U) has been increased from its natural assay. Natural uranium is mostly ^{238}U with about 0.72 percent ^{235}U and 0.0051 percent ^{234}U. Uranium mills process the ores to produce concentrated uranium oxide (U_3O_8), which is then commercially converted to gaseous uranium hexafluoride (UF_6) for enrichment at a gaseous diffusion plant. The Paducah Plant serves as a first step in the uranium enrichment process in which the ^{235}U is increased to approximately 2 percent. Product from PGDP must be further enriched prior to its use as a nuclear fuel; thus the plant provides an enriched feed stream to the Portsmouth Gaseous Diffusion Plant in Portsmouth, Ohio, and provided a similar feed stream to the Oak Ridge Gaseous Diffusion Plant in Oak Ridge, Tennessee, prior to its shutdown. PGDP is in the process of upgrading its operations to be capable of 5 percent ^{235}U enrichment. The proposed date for this capability is 1995 or 1996. Hazardous, nonhazardous, and radioactive wastes are generated and disposed as a result of plant operations.

The Paducah Plant enriches the uranium isotope, ^{235}U, via a physical separation process. The separation is based on the faster rate at which ^{235}U diffuses through a barrier compared with the heavier ^{238}U isotope. During enriching operations from 1953 to 1975, feed material (called "reactor tails") from government reactors was also used intermittently in addition to the UF_6 typically used. Reactor tails are the fuel from nuclear

reactors that have had its ^{235}U content depleted, have been reprocessed to remove most of the fission products, and which must have its ^{235}U content replenished before it can be recycled. The reactor fuel rods were processed at other DOE facilities (where most of the fission products were removed) and the enriched uranium and the remaining fission products were fed into PGDP cascade system. Use of the reactor tails resulted in the introduction of technetium-99 (^{99}Tc), a fission by-product and transuranics, most notably neptunium 237 (^{237}Np) and plutonium-239 (^{239}Pu), into the cascade. ^{99}Tc is a man-made radioactive substance (radionuclide) having a half-life estimated at between 212,000 and 250,000 years. It decays by emitting beta radiation.

Extensive support facilities are required to maintain the diffusion process. Some of the major support facilities include a steam plant, four major electrical switchyards, four cooling tower complexes, a chemical cleaning and decontamination building, a water treatment plant, a cooling water blowdown treatment facility, maintenance facilities, laboratory facilities, and an active landfill. Several inactive facilities are also located on the plant site.

The West Kentucky Wildlife Management Area and lightly populated farmlands are in the immediate environs of PGDP. The population within the 50-mile radius is approximately 535,000 persons. Of these, approximately 36,500 live within 10 miles of the plant and approximately 104,000 within 20 miles. The unincorporated communities of Grahamville and Heath are 1.24 and 1.86 miles east of the plant, respectively. Portions of 28 counties, 11 of which are in Kentucky, 4 in Missouri, 10 in Illinois, and 3 in Tennessee, are included within the 50-mile radius of the plant. Larger cities in the region include Paducah, Kentucky, located approximately 10 air miles east of the plant; Cape Girardeau, Missouri, located approximately 40 air miles to the west; and Metropolis, Illinois, located approximately 6 air miles to the northeast.

Paducah is located in the humid continental zone. Summers are generally dry; precipitation occurs mainly in the spring and fall. Winters are characterized by moderately cold days; the average temperature during the coldest month, January, averages about 35°F. Summers are warm and humid; the average temperature in July is 79°F. Yearly precipitation averages about 44 inches. The prevailing wind direction is south to southwest.

In 1993, the United States Enrichment Corporation (USEC) was formed. Although all the facilities at PGDP are still owned by DOE, the uranium enrichment enterprise is now the responsibility of USEC. According to the Regulatory Oversite Agreement between DOE and USEC, USEC retained responsibility for quantification of airborne radionuclide emissions and preparation of the annual report required by 40 CFR 61, Subpart H.

SOURCE DESCRIPTION

The following are the potential airborne radionuclide sources at the Paducah Plant. Although not all of them were used in 1994, they are included in this report due to their potential for future restart.

C-310 Stack

The primary source of potential radionuclide air emissions is the vent stack which serves the "top end" of the cascade process and the cylinder burping facility. This 200-foot stack, known as the C-310 stack, is located at the southwest corner of the C-310 product withdrawal building. Low molecular weight gas compounds such as fluorides and chlorides, and contaminants which have traveled up the cascade, are vented to the atmosphere via the C-310 purge vent stack. Small quantities of ^{234}U, ^{235}U, ^{238}U, ^{99}Tc, ^{237}Np, ^{239}Pu, and thorium-230 (^{230}Th) are also emitted. The cascade effluent is routed through alumina traps prior to being emitted via the C-310 stack. The alumina traps were upgraded in 1990 to provide greater criticality safety. The improved system consists of an on-line bank of 13 traps and a stand-by bank of 13 traps. Each traps contains approximately 200 pounds of alumina.

The cylinder burp facility, located on the east side of C-310, is used to vent the low molecular weight gases from product cylinders. This facility is also a potential source of uranium, ^{99}Tc, minute quantities of transuranics, and ^{230}Th. The effluent from the burp facility is routed through a bank of sodium fluoride (NaF) traps prior to being emitted from the C-310 stack. There are 2 banks of chemical traps associated with this system. The north bank has 3 sets of traps (primary, secondary, and standby). Each trap contains approximately 300 pounds of NaF. The south bank has 7 traps, the first 5 of which are operated in series with the last 2 operated in parallel with each other. These traps contain approximately 100 pounds of NaF each. The smaller size of the traps is due to criticality safety concerns. Uranium is recovered from the NaF traps back to the enrichment cascade. Emissions from the C-310 stack were estimated based on results of the continuous potassium hydroxide bubbler stack sampling system which was approved by the Environmental Protection Agency (EPA) in 1992.

Seal Exhausts

Seals on the UF_6 compressors are supplied with an intricate array of air pressures to reduce any UF_6 release which may occur in the unlikely event of a seal failure. The seal exhaust flow is removed by large, oil-filled vacuum pumps and is routed from the seals through alumina traps, the pump, and to a common exhaust vent. There is one seal exhaust vent per cascade building, one on the C-310 product withdrawal building and one

on the C-315 tails withdrawal building. Under normal operations, only trace amounts of UF_6 are present in the seal exhaust system. Occasionally, a seal or seal control system malfunction will allow greater quantities of UF_6 to enter the exhaust system. If UF_6 is allowed to enter the pump by virtue of trap breakthrough, it reacts with the pump oil creating a thick, gummy sludge which overloads the pump in a short time. Due to the reaction between UF_6 and pump oil, the oil also serves as an excellent uranium emission control device. No credit is taken for the oil as a pollution abatement system, however, because the oil is an integral part of the pumping system and in no way is included for emission control. The list below indicates locations of the seal exhausts at PGDP:

C-331 Process Building
C-333 Process Building
C-335 Process Building
C-337 Process Building
C-310 Product Withdrawal Building
C-315 Tails Withdrawal Building

Emissions from the seal exhaust grouped source were estimated based on results of Method 5 stack sampling performed in 1992. The seal exhausts are scheduled to be resampled in 1997.

A discussion of the potential to emit from the seal exhausts and wet air exhausts, and the conclusion that the alumina traps which protect the pump oil are not pollution control devices under 40 CFR 61, Subpart H, was forwarded to EPA on January 28, 1994.

Wet Air Exhaust

When maintenance is required on cascade piping and equipment, the process gas (UF_6) is evacuated to other sections of the cascade or surge drums. The subject equipment and piping are swept in a series of purges with "dry" plant air. After maintenance, the system is closed and the ambient (wet) air is pumped from the system by the wet air pumps. In both the dry air purges and the wet air withdrawal, the air is routed through alumina traps for uranium trapping to protect the wet air pump oil, and then to an exhaust vent. In process buildings C-310, C-333, C-335, and C-337, the exhaust vent is the same one which services the seal exhaust system for those buildings. The list below indicates locations of wet air exhausts at PGDP:

C-310 Product Withdrawal Building (same as seal exhaust)
C-331 Process Building
C-333 Process Building (same as seal exhaust)
C-335 Process Building (same as seal exhaust)
C-337 Process Building (same as seal exhaust)

Emissions from the wet air exhausts were estimated based on results of Method 5 stack sampling performed in 1992. The wet air exhausts are scheduled to be resampled in 1997.

Cylinder Valve Connection Activities

Activities involving the connection and disconnection to UF_6 cylinders include cold pressure checks; sampling of feed, product, and tails cylinders; and product withdrawal, tails withdrawal, and cylinder burping. The cylinder valves are connected to the associated process via a "pigtail." Cylinder pigtails consist of a single length of copper tubing and threaded couplings. Pigtail disconnection procedures require a series of doubling purges to ensure that no UF_6 remains in the pigtail prior to disconnection. Although adherence to these procedures minimizes UF_6 emissions, occasionally a "puff" of UF_6 is observed during disconnection of the pigtails. As an additional measure to control radionuclide emissions, personnel performing the pigtail disconnects employ the use of a glove box containment device and/or portable high efficiency particulate air (HEPA) filters. The HEPA vacuums (vacs) are placed so that any minute "whiff or puff" of UF_6 which is emitted from the pigtail disconnect process is captured by the HEPA vac. Furthermore, some of the pigtail connect/disconnect areas are serviced by large HEPA filter-equipped exhaust hood systems which exhaust any "puffs" not contained by the HEPA vacs from the area to a vent stack. Cylinder valve connection activities are divided into two major categories: activities which are serviced by a permanent exhaust system and stack, and activities which are not serviced by a permanent exhaust system. For those activities serviced by a permanent exhaust system and stack, the emissions were determined by EPA Method 5 stack sampling in 1992. For those activities not serviced by a permanent exhaust system, the emissions were determined by Appendix D emission factors. There was one recorded UF_6 "whiff or puff" which occurred in the category "not serviced by a permanent exhaust system" in 1994 at the C-315 Building. The quantity of UF_6 released was estimated at 0.1 grams. This release is included in the seal/wet air exhausts source. Any "whiffs or puffs" which occurred inside a building are included in the discussion on building ventilation. The list below indicates locations of the pigtail exhaust systems:

C-310	Burp Station (located outside--no exhaust system, portable HEPA vacs used).
C-310	Product Withdrawal Building (HEPA filters failed test--exhaust system not used in 1994, HEPA vacs used).
C-315	Tails Withdrawal Building (controlled by permanent HEPA-filtered stack and portable HEPA vacs).
C-333-A	Feed Facility (UF_6 Vaporizer) (No exhaust system--HEPA vacs used).
C-337-A	Feed Facility (UF_6 Vaporizer) (No exhaust system--HEPA vacs used).
C-360	Toll Transfer and Sampling Facility (controlled by permanent HEPA-filtered stack and portable HEPA vacs).

Laboratory Hoods

The C-710 laboratory is operated by the Technical Services Division, and is the main facility for sample analysis and research at PGDP. There are a total of 111 laboratory hoods and canopies in the C-710 building. All of the hoods and canopies were not used in 1994. Thirty-six of the hoods were used for exhaust of analyses and research involving radionuclides. This number does not include 11 hoods which contain closed systems with no potential for radionuclide emissions under normal conditions. The radionuclides involved in analyses consist primarily of uranium, with a slight potential for emissions of ^{99}Tc, ^{237}Np, ^{239}Pu, and the daughters of uranium (^{230}Th ^{234}Th, and protactinium-234). In some cases, the hood exhausts combine with other hood exhausts, creating a discrepancy between the number of hoods and actual emission points. There are 3 HEPA filters in the C-710 laboratory. Two of the HEPA filters serve as controls only in accidental release situations, and the third is used when samples are being taken or transferred. There are also 8 laboratory hoods in the C-409 stabilization facility. Analysis and research in only one of these hoods involved radionuclides in 1994. The estimated emissions were so insignificant that for modeling purposes they were included in emissions from the C-710 laboratory. Three laboratory hoods in the C-410 feed plant are permanently shut down. Although only 36 of the C-710 hoods dealt with exhaust of activities involving radionuclides in 1994, it can be assumed that many of the hoods plantwide have historically dealt with radionuclide exhaust at some time. To estimate emissions from the laboratory hoods, supervisors of the hoods used process knowledge to determine the number of curies of uranium "used" in each hood. Emissions factors from Appendix D were then applied to the curies "used" to determine the emissions. The list below indicates the laboratory exhaust systems at PGDP:

Building	Hoods/Canopies	Hoods/Canopies used for Radionuclide Analyses in 1994
C-710 Laboratory	111	36
C-409	8	1
C-410	3	0

Chlorofluorocarbon-114 (CFC-114) UF_6 Separator

The CFC-114/UF_6 separator is located in C-335 and can be used to separate relatively large amounts of CFC-114 coolant which has entered the cascade system and mixed with UF_6. The separator was installed in 1978, and pilot tests were conducted in 1979. When in use, the separator air effluent is passed through a cold trap at O°F which condenses approximately 98.5 percent of the gaseous UF_6. The residual UF_6 in the effluent is trapped by two NaF traps containing 900 pounds of NaF each. Uranium trapped by the NaF traps is recovered back to the gaseous diffusion cascade. The outlet of the

NaF traps is monitored by a flow-through ionization chamber. The effluent passes from the NaF traps through alumina traps and a header to the C-335 wet air/seal exhaust system. This facility was operated in January and February 1994 due to an incident in the C-337 building in December 1993 during which a UF_6 compressor motor failed due to excessive vibration and was extensively damaged. The vibration caused a breach in the associated CFC-114/UF_6 systems and an in-leakage of CFC-114 into the UF_6 cascade. The CFC-114/UF_6 separator was used to separate the CFC-114 from the UF_6. The UF_6 was recovered back to the cascade. Six samples from a system similar to the one on the C-310 stack, downstream of the alumina traps, indicated total "emissions" over the 3-day operating period of less than 0.07 grams (1.03E-7 curies of 2 percent uranium). These "emissions" also have to pass through the wet air/seal exhaust pump oil, which is an excellent scrubber of UF_6. Since this facility is used only when large amounts of CFC-114 leak into the cascade and it is equipped with a two-stage control process, use of this facility is not expected to increase the emissions from the wet air/seal exhaust system. (Emissions from the wet air/seal exhaust were determined by EPA Method 5 stack sampling in 1992[1].) Under normal operations, this facility is not used.

C-400 Decontamination Spray Booth

This facility is used to decontaminate equipment. It consists of a large booth equipped with an ultra high-pressure sprayer which sprays a water solution on the contaminated machinery. The potential of radionuclide emissions arises from entrainment of radionuclides in the spray solution during the decontamination process. The booth is equipped with a mist eliminator as an emission control device. The mist eliminator is not listed as a pollution control device in 40 CFR 61, Appendix D, and no credit is taken for it. Emissions were estimated by Appendix D. The concentration of radionuclides in the spray booth water multiplied by the total volume of water was considered as the curies "used."

C-400 No. 5 Dissolver/Rotary Vacuum Filter

This facility is used to dissolve and precipitate the uranium in the solutions from the C-400 cylinder wash and decontamination spray booth. It is also used to treat uranium salvaged from C-710. The solution is chemically treated to precipitate the uranium, which forms a slurry. The slurry is then passed through a rotary vacuum filter which collects the precipitate (filter cake) for future disposal. After sampling, the filtrate is then discharged via permitted Kentucky Pollutant Discharge Elimination System outfalls. The possibility for radionuclide emissions arises from the vent on the pump which pulls the slurry through the rotary vacuum filter. Emissions from this vent should be minimal because the pump

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[1]See correspondence from Hutcheson to Smith, January 28, 1994.

and its vent are downstream of the rotary vacuum filter, which should trap the uranium as filter cake. Emissions were estimated by Appendix D. The concentrations of radionuclides in the filtrate multiplied by the filtrate volume were considered as the curies "used."

C-400 Cylinder Drying Station

This facility is used to dry UF_6 cylinders after the "heel" has been removed in the C-400 cylinder wash stand. Dry "plant air" is passed through the cylinder to evaporate any moisture from the washing and hydrostatic testing processes. Emissions were estimated by Appendix D. The concentrations of radionuclides in water used to hydrostatically test the cylinders prior to drying, multiplied by the total volume of water used in the hydrostatic test, were considered as the curies "used."

C-746-A Low Level Waste Compactor

This facility is used to compact bagged, low-level radiological waste. The facility consists of a telescoping compacting arm which very slowly compacts bags of low-level contaminated material into a storage drum. It is equipped with HEPA filters. This facility was not used in 1994.

RADIOLOGICAL AREAS

Radiological areas are established under specific criteria listed in various worker protection procedures and standards. There are a number of minor radiological areas at PGDP which are monitored by Health Physics (HP) air samplers. The sampling systems consist of a low-volume pump (20 to 40 liters per minute) drawing the ambient building air through a Whatman No. 41 cellulose filter. The samplers run 24 hours per day and the filters are changed on 2-, 3-, 4-, or 5-day basis, depending upon weekend and holiday schedules. A minimum of 2 days of sample air is collected on each filter. After sample collection, the filters are counted for gross alpha concentrations.

For the 1994 NESHAP report, PGDP estimated the building ventilation grouped source according to the method stated in Section 3.1 of the revised PGDP NESHAP Compliance Plan submitted to EPA in January 1992.

According to PGDP's compliance plan, building emissions from non-radiological areas are not estimated due to their lack of potential for airborne radiological emissions. One of the criteria for establishing a radiological area is airborne concentrations of radionuclides in that area which are greater than 10 percent of a derived air concentration (DAC). DACs are established in 10 CFR 835 and represent the airborne radionuclide

concentrations which would cause a maximum internal radiation dose of 5000 millirem (mrem)/year (50 millisieverts/year). According to the compliance plan, if an area does not have airborne radionuclide concentrations greater than 10 percent of a DAC, it is not required to be classified a radiological area and will therefore not be evaluated for radionuclide emissions. (It could be classified a radiological area due to other HP criteria, however).

Over 17,000 air samples were taken by HP air samplers in radiological areas in 1994. Less than 2 percent of these samples indicated alpha concentrations greater than the most stringent transuranic DAC. Furthermore, isotopic analysis of the samples indicated that the alpha activity on the filter was primarily due to uranium and not transuranics. Although a few of the uranium concentrations were above the uranium DAC, the average, and by far the vast majority, of the samples were much less than 10 percent of DAC.

Although the compliance plan states that non-radiological areas will not be evaluated as an airborne radiological source due to average concentrations of radionuclides less than 10 percent of the most stringent DAC, HP sample results indicate the average radionuclide air concentrations, even in radiological areas, are less than 10 percent of the most stringent DAC. Therefore, building ventilation emissions, even from radiological areas, will not be considered an airborne radionuclide source and emissions will not be evaluated.

Finally, the dilution factor due to dispersion at PGDP based on 1992 meteorological data is 7.9E-7. Therefore, even if the average concentration of airborne nuclides was 10 percent of the most stringent DAC, the resulting off-site dose due to the public due to dispersion would not exceed 0.0004 mrem/year (0.000004 millisieverts/year).

The following is a list of PGDP's radiological areas from which emissions were evaluated using HP data:

C-310 Product Withdrawal Building
C-315 Tails Withdrawal Building
C-331 Uranium Enrichment Process Building
C-333 Uranium Enrichment Process Building
C-335 Uranium Enrichment Process Building
C-337 Uranium Enrichment Process Building
C-360 Toll Transfer/Sampling Building
C-400 Decontamination Building
C-409 Stabilization Building--The stabilization process is shut down. This building now houses some laboratory hoods (discussed under the laboratory hood section) and decontamination equipment to be used after the proposed increase to 5 percent enrichment assay.

C-720 Maintenance Building--This building is the primary maintenance building at PGDP. Maintenance on contaminated and uncontaminated machinery is performed here. Transferrable contamination has been removed prior to maintenance; however, there is a potential for airborne radionuclide emissions from fixed contamination during maintenance procedures. Portable negative air machines which are equipped with HEPA filters are utilized whenever there is a potential for airborne radionuclide emissions.

Buildings C-340, C-410, C-420, and C-746-Q are also categorized as radiological areas. However, the ventilation systems in buildings C-340, C-410 and C-420 are shut down and building C-746-Q has no ventilation system. Any emissions from these buildings would be fugitive or diffuse in nature. Fugitive and diffuse emissions are discussed later in this report.

In addition to the general emissions from radiological areas, PGDP also has a number of minor sources which do not have direct exhausts into the ambient air. These minor sources are located in radiological areas and contribute to the emissions from the radiological areas as calculated by the HP samplers. A list of these minor sources with no direct exhaust to the ambient air, and which are located in radiological areas, is as follows: (This list also contains sources which did not operate in 1994.)

C-310 Burp Station, C-333-A and C-337-A Feed Cylinder Connection Activity Emissions

These pigtail systems, unlike those in the C-360 Toll Transfer Building, the C-310 Product Withdrawal Building, and the C-315 Tails Withdrawal Building, have no specific ventilation system. Furthermore, the C-333-A and C-337-A feed cylinder vaporizers are not located in completely enclosed buildings. The C-310 Burp Station is outside with no enclosure. As stated previously, HEPA vacs are used to control any potential radionuclide emissions during the disconnection of the pigtails. The vaporizer buildings are enclosed on three sides only. Since the vaporizers and the C-310 Burp Station are not located in an enclosed structure, building ventilation data could not be used to estimate emissions. Emissions from the vaporizers and the C-310 Burp Station cylinder connection activities were estimated as described previously in the "cylinder valve connection activities" section. There were no documented "whiffs and puffs" from these systems in 1994.

C-400 Compressor Pit

This area was used for maintenance on UF_6 compressors and has not been used since 1989. PGDP intends to use this facility in 1995 and methods to estimate emissions will be developed.

C-400 Cylinder Wash

This facility is used to remove the solid UF_6 "heel" from cylinders. The cylinder heel is dissolved in a boric acid solution and the solution is transferred to the C-400 No. 5 Dissolver for uranium recovery. The only potential for radionuclide emissions are "whiffs and puffs" when the cylinder valve is opened for introduction of the sodium carbonate solution. The facility does not have a dedicated exhaust system. Any potential emissions will be included in the estimates from the C-400 HP air samplers.

Nonpoint Sources

Guidance from EPA which stated that provisions of 40 CFR 61, Subpart H, applied to fugitive and diffuse emissions, was contained in correspondence dated March 24, 1992. EPA also forwarded to PGDP on September 21, 1992, questions pertaining to 1992 ambient air sampling results and their use as indications that fugitive and diffuse emissions from PGDP operations were insignificant. PGDP's reply satisfied all of EPA's questions except the one pertaining to resuspension of contaminated soil which could result from such activities as well drilling activities or vehicular traffic upon contaminated earth. The question as to whether such activities actually constitute fugitive or diffuse sources was forwarded to EPA headquarters for resolution. PGDP has not, as of this submittal, received guidance on this question. It is not expected that any activity which would result in fugitive or diffuse emissions would result in emissions which would be distinguishable from background at off-site locations.

PGDP intends to upgrade its ambient air monitoring system to be capable of isotopic analysis of the samples collected. The present ambient air network is incapable of producing isotopic results and thus incapable of producing data from which off-site dose can be estimated. PGDP intends to use the new ambient air monitoring data to confirm that off-site dose due to fugitive and diffuse emissions is insignificant.

Another potential fugitive or diffuse source of radionuclides, albeit a minor one, results from the decontamination of machinery and equipment used in remediation activities such as well drilling. The equipment is washed with high-powered sprayers to remove any contaminants (radiological or non-radiological). The contaminants originate from the soil and groundwater. The concentrations of contaminants on the equipment are so small that employees who operate the sprayers are not required by HP to wear any radiological protection.

SECTION II--AIR EMISSIONS DATA

MAJOR POINT SOURCE

Major Point Source	Type Control	Efficiency	Distance to Nearest Receptor
C-310 Purge Stack	NaF Traps[2]	>99.9%	1755 M ESE
	Alumina Traps[2]	≈98.6%	

MINOR POINT SOURCES

Minor Point Source	Type Control	Efficiency	Distance to Nearest Receptor
C-400 Cylinder Drying Station[3]	None	0	1908 M ESE

MINOR GROUPED SOURCES

Grouped Sources	Type Control	Efficiency %	Distance to Nearest Receptor
Wet air/seal exhausts (6)	Alumina Traps[2]	≈ 98.6	1524 M ESE
Cylinder valve connection activities (3)	HEPA Filters and Vacuums	99.95	N/A[4]
Cylinder valve connection activities not included above; i.e., not serviced by a stack (3).[3] No "whiffs and puffs" documented in 1994.	HEPA Vacuums	99.0 (Appendix D)	1524 M ESE
C-400 sources (3)[3]	None	0	1901 M E ESE
C-710 laboratory hoods (36)[3]	None	0	1944 M NNE
Building ventilation (10)[5]	None	0	1524 M ESE
C-720 motor burnout ovens (2)[3]	None	0	1944 M N

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[2]See January 28, 1994, correspondence from D. F. Hutcheson to W. A. Smith discussing "Potential to Emit."

[3]Emissions estimated by 40 CFR 61, Appendix D.

[4]Stack sampling data results indicted that emissions were not distinguishable from zero, based on a statistical one-tailed test of significant difference from zero. Therefore, dose modeling was not performed and no receptor was determined.

[5]Average air concentrations were less than 10 percent of the most stringent DAC.

PGDP RADIONUCLIDE EMISSIONS

Radionuclide emissions (Ci)[6] during 1994											
Emission source			C-310	C-710 Lab	Seal/wet air exhaust	C-400	C-400 cyl. drying station	C-720 Motor burnout ovens	Cyl. conn.–no dedicated exhaust	Cyl. conn.–dedicated exhaust[7]	Total
Nuclide	Solubility	AMAD									
^{99}Tc[8]	W	1.0	5.9E-4			1.6E-5	8.9E-9	1.3E-6			6.0E-4
^{230}Th[8]	W	1.0	5.8E-6			1.5E-7	7.0E-10	6.4E-7			6.6E-6
^{234}U	D	1.0	6.4E-5[9]	1.1E-3	2.0E-5	3.0E-5	8.1E-7	9.9E-7	4.4E-11		1.2E-3
^{235}U	D	1.0	2.5E-6[9]	3.4E-5	6.0E-7	1.6E-6	4.1E-8	3.9E-8	5.6E-9		3.9E-5
^{238}U	D	1.0	1.9E-5[9]	1.1E-4	5.8E-6	3.2E-5	8.9E-7	2.9E-7	2.3E-8		2.0E-4
^{237}Np[8]	W	1.0	1.2E-6			1.1E-7	2.3E-12	4.3E-8			1.4E-6
^{238}Pu[8]	W	1.0	8.7E-7		2.3E-6	7.7E-9	5.0-12	7.9E-8			3.3E-6
Total Ci/year			7.0E-4	1.2E-3	2.9E-5	1.0E-4	1.8E-6	3.4E-6	2.9E-8		2.0E-3
Check totals											2.0E-3

[6] 1 Curie=3.7×10^{10} Becquerels.

[7] No emissions distinguishable from zero, based on one-tailed test of significance of difference from zero.

[8] PGDP is only required to sample for uranium from the C-310 stack since none of the other potential radionuclide emissions comprise 10 percent of the resulting potential dose (see correspondence from W. L. Smith to D. C. Booher dated January 10, 1992). Emission data from all sources pertaining to the other radionuclides, if available, is included in the actual dose calculations and is presented in this report for informational purposes only. Also, the uranium emissions from the C-310 stack were enriched to a 1.9 percent ^{235}U assay or less for 1994. As a conservative measure, dose assessment was based on enrichment to 2.0 percent assay.

[9] For release of 57.6 grams of 2 percent enriched uranium based on an isotopic distribution as follows: ^{238}U, 3.292E-7 Ci/gU; ^{235}U, 4.320 E-8 Ci/gU; ^{234}U, 1.102 E-6 Ci/gU.

SECTION III--DOSE ASSESSMENT

DESCRIPTION OF DOSE MODEL

The radiation dose calculations were performed using the Clean Air Act (CAA) Assessment Package-88 of computer codes. This package contains EPA's most recent version of the AIRDOS-EPA computer code, which implements a steady-state, Gaussian plume, atmospheric dispersion model to calculate environmental concentrations of released radionuclides and Regulatory Guide 1.109 food chain models to calculate human exposures, both internal and external, to radionuclides deposited in the environment. The human exposure values are then used by EPA's latest version of the DARTAB computer code to calculate radiation doses to man from radionuclides released during the year. The dose calculations use dose conversion factors in the latest version of the RADRISK data file, which is provided by EPA with CAA Assessment Package-88.

SUMMARY OF INPUT PARAMETERS

Except for the radionuclide parameters given in Section II and those given below, all important input parameter values used are the default values provided with the CAP-88 computer codes and data bases.

Joint frequency distribution: 1992[10] data from 60 meters station on Paducah meteorological tower
Rainfall rate: 121 centimeters/year
Average air temperature: 20°C
Average mixing layer height: 930 meters

Fraction of foodstuffs from:	Local area	50-mile radius	Beyond 50 miles
Vegetables and produce:	0.700	0.300	0.000
Meat:	0.442	0.558	0.000
Milk:	0.399	0.601	0.000

[10]Due to technical problems in the meteorological system computer software, 1994 meteorological data recovery was only 25 percent and not sufficient for modeling purposes. 1992 data was used.

SOURCE CHARACTERISTICS

Source Name	Type	Height (m)	Diameter (m)	Gas exit velocity (m/s)	Gas exit temperature (oC)	Distance (m) and direction to maximally exposed individual	
						Source	Plant
C-310	Point	61.0	0.3	0	Ambient	2438 N	2438 N
C-400	Point[11]	11.3	None	0	Ambient	2097 N	2097 N
C-400 Cyl. drying station	Point	2.4	0.05	0	Ambient	2170 N	2170 N
C-710	Point[11]	7.1	None	0	Ambient	2401 N	2401 N
C-720 Ovens	Point	15.8	0.5	0	Ambient	1944 N	1944 N
Seal/wet air exhausts	Point[11]	21.0	None	0	Ambient	2365 N	2743 NNW
Cylinder valve connection	Point[11]	1.0	None	0	Ambient	N/A	N/A

Source Name	Nearest individua	Distances (m) to selected receptors				
		Nearest Business	Nearest School	Nearest Farms		
				Dairy	Beef	Vegetable
C-310	1755	2705	3962	>5000	2896	1700
C-400	1901	2819	4267	>5000	3124	1943
C-400 Cyl. drying station	1908	2819	4267	>5000	3124	1943
C-710	1944	2705	3962	>5000	2896	1700
C-720 Ovens	1944	3086	4267	>5000	3048	2210
Seal/wet air exhausts	1524	2438	3962	>5000	3124	1524
Cylinder valve connection	1524	2705	3962	>5000	2896	1700

[11]Modeling was performed assuming a theoretical stack located at the approximate center of each grouped source.

COMPLIANCE ASSESSMENT

Effective dose equivalent (mrem)[12] to maximally exposed individual for:

Emission Source	EDE
C-310	0.0002
C-400	0.0002
C-400 Cyl. drying station	0.000004
C-710	0.0025
C-720 Ovens	0.00009
Seal/wet air exhausts	0.0001
C-310 Release[13]	0.003
C-337-A Release[13]	0.01
Total	**0.0161**

Maximum effective dose equivalent = 0.0161 mrem

Location of maximally exposed individual: 2401 meters north of greatest contributor to dose (C-710)

---

[12]1 mrem=0.01 millisieverts.

[13]Perimeter ambient air monitors detected no significant increase in radioactivity during the release periods.

CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted herein, and based on my inquiry of those individual immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment (see 18 U.S. C1001).

	Patrick N. Gorman for T. Michael Taimi
Department of Energy	United States Enrichment Corporation

SECTION IV--ADDITIONAL INFORMATION

There were no construction projects of radionuclide point sources at PGDP in 1994. However, PGDP did use one existing facility, the C-720 motor burn-out ovens, which had not been used in recent years. Refer to Section I, *Source Description,* for a discussion of this minor source.

For a discussion of diffuse and fugitive sources, see Section I *Nonpoint Source.*

UNPLANNED RELEASES

"Whiffs and puffs" of UF_6 are classified in the DOE Occurrence Reporting System as unplanned releases. These insignificant emissions occur primarily during cylinder valve cold pressure checks and pigtail disconnections. The "whiffs and puffs" are usually described as resembling cigar smoke. There was one documented "whiff and puff" at C-315 to the ambient air in 1994.

On February 17, 1994, at 1438, during a routine cylinder change at the C-310 Burp Station, a UF_6 release occurred when a cylinder which was still connected to a pigtail was moved by mistake. The cylinder movement ruptured the pigtail and caused the closed cylinder valve to leak. An estimated 454 grams of UF_6 was released during a 30-minute period. Air samples taken by HP in the vicinity of the release indicated the presence of uranium in the immediate area of the release. Based on the estimated quantity of the release and an assay of 1.95 percent, the estimated off-site dose from the release is 0.003 mrem. Ambient air samples from site boundary locations indicated no significantly elevated values of uranium; therefore, it is likely that actual off-site dose from this event was significantly less than that estimated from modeling.

On December 14, 1994, at 1326, a rupture in a feed header released an estimated 4536 grams of UF_6. The rupture was caused by the expansion of solidified UF_6 in the header as it was heated following the flooding of a steam trap on the feed header steam heating system. Based on the estimated quantity released, a uranium assay of 0.711 percent, and air dispersion modeling from the point of the release, the resulting off-site dose is estimated at 0.01 mrem. However, ambient air samples from site boundary fence locations indicated no significantly elevated levels of uranium, so it is likely that the actual off-site dose from this event was significantly less than that estimated from modeling.

SECTION V--SUPPLEMENTAL INFORMATION REQUESTED BY DOE

Collective effective dose equivalent (person-Roentgen Equivalent Man [rem]/year)-50-mile radius:

Emission Source	CEDE, person/rem
C-310 purge stack	0.002
C-400	0.0006
C-400 cylinder drying facility	0.00001
C-710	0.008
C-720 ovens	0.0003
Wet air/seal exhausts	0.0015
C-310 Release[13]	0.004
C-337-A Release[13]	0.02
Total	**0.025**

COMPLIANCE WITH SUBPARTS Q AND T OF 40 CFR 61

Not applicable.

RADON 220, RADON 222 EMISSIONS

Although radon 222 is an uranium decay product, the long half-lives of the elements in the decay chain preceding radon 222 preclude its presence or emission in any significant amounts from PGDP operations. There are no known sources of ^{232}Th and ^{232}U at PGDP; therefore, there are no known emissions of radon 220.

STATUS OF COMPLIANCE WITH NESHAP MONITORING REQUIREMENTS OF SUBPART H

The status of compliance with the new NESHAP monitoring requirements is thoroughly described in the revised NESHAP Compliance Plan, which was submitted to EPA January 1992. PGDP has only one stack subject to the continuous monitoring requirements of Subpart H, the C-310 stack.[14] Particulate stack sampling was performed on the C-310 purge cascade stack February 1992. Results of the sampling project were forwarded to EPA by March 31, 1992. Documentation from EPA[15] stated that PGDP is exempted from the requirement to install an isokinetic sampling system.

Minor Sources: The periodic confirmatory measurement plan for minor sources is outlined in detail in the Revised NESHAP Compliance Plan for PGDP, which was submitted to EPA on January 15, 1992. The initial plan for confirmatory measurements is to estimate emissions using Appendix D and/or mass balance methods on an annual basis, and to stack sample those sources for which stack sampling is the only feasible estimation method on a five-year basis.

On May 26, 1992, PGDP and EPA entered into a Federal Facility Compliance Agreement (FFCA) to bring PGDP into compliance with the sampling provisions established in 40 CFR 61, Subpart H. Appendix A of the FFCA contains a schedule establishing compliance commitments. The major effort of the compliance schedule was the site evaluation in which all potential sources of airborne radionuclides were identified and emissions were determined. The radionuclide sources were identified through a preliminary stack vent survey which was completed in 1991. In November 1992, a more in-depth survey was completed which did not discover any previously unknown airborne radionuclide sources. In September 1992, representatives from EPA inspected PGDP for NESHAP compliance. Correspondence from EPA summarizing the inspection stated there were no NESHAP violations identified during the inspection. PGDP fulfilled all commitments in Appendix A of the FFCA in June 1992; submitted results of the updated, in-depth vent stack survey in December 1992; and officially requested a Certification of Completion of the FFCA on March 11, 1993. EPA issued the Certification of Completion on March 26, 1993. Certification of Completion of the FFCA indicates that PGDP is in compliance with the provisions of 40 CFR 61, Subpart H.

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[14]See correspondence from D. F. Hutcheson to D. L. Booher, January 28, 1994, discussing "Potential to Emit."

[15]See correspondence from W. A. Smith to D. C. Booher, April 20, 1992.

STATUS OF QUALITY ASSURANCE PLAN

PGDP's NESHAP Quality Assurance Plan was revised and issued in August 1994.

file - NESHAP/PORTS

Department of Energy
Portsmouth Site Office
P.O. Box 700
Piketon, Ohio 45661-0700
Phone: 614-897-5010

June 21, 1995
EF-21-6920

Mr. Valdum V. Adamkus
Regional Administrator
U. S. Environmental Protection Agency
Region V
77 West Jackson Blvd., R-19J
Chicago, Illinois 60604-3590

Dear Mr. Adamkus:

PORTSMOUTH GASEOUS DIFFUSION PLANT NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS (NESHAPS) RADIONUCLIDE EMISSIONS REPORT FOR 1994

Enclosed is a certified copy of the annual NESHAP report required under 40 CFR 61.94 for airborne emissions of radionuclides from the Portsmouth Gaseous Diffusion Plant (PORTS) during calendar year 1994. The report is being submitted jointly by the U. S. Department of Energy and the United States Enrichment Corporation since both organizations operated PORTS during 1994. The report addresses all of the emissions, but because of the differences in operating responsibilities, emissions have been assigned to either DOE or USEC.

If you have any questions or require additional information, please call Melda Rafferty of my staff at (614) 897-5521.

Sincerely,

Eugene W. Gillespie
Site Manager
Portsmouth Site Office

EF-21:Rafferty

Enclosure

cc w/enclosures:
M. Murphy, USEPA, Region V
D. Schregardus, OEPA-Columbus
W. Dillow, SE-31/ORO
M. Taimi, USEC-HQ
Mary Young, USEC-PORTS
Steve Skinner, OEPA-Logan (AIP Coordinator)

U.S. Department of Energy
Air Emissions Annual Report
(Under Subpart H, 40 CFR 61.94)
Calendar Year 1994

Site Name: Portsmouth Gaseous Diffusion Plant

Site Information

Owner: U.S. Department of Energy
Portsmouth Site Office

Address: Post Office Box 700
Piketon, Ohio 45661

Contact: Melda J. Rafferty Phone: 614-897-5521

Operator: United States Enrichment Corporation
Portsmouth Site Office

Address: Post Office Box 628
Piketon, Ohio 45661

Contact: Mary Young Phone: 614-897-2144

SECTION I. FACILITY INFORMATION

SITE DESCRIPTION

The Portsmouth Gaseous Diffusion Plant (PORTS) is owned by the Department of Energy (DOE). PORTS was operated by DOE and managed by Martin Marietta Energy Systems, Inc., until July 1, 1993. In 1992 Congress passed legislation amending the Atomic Energy Act of 1954 to create the United States Enrichment Corporation (USEC), a government corporation similar to the Tennessee Valley Authority, to operate the uranium enrichment enterprise in the United States. The new corporation began operation on July 1, 1993. In accordance with the Act, USEC leased all production facilities at PORTS and its sister plant at Paducah, Kentucky, from DOE. DOE retained operational control of all waste storage and handling facilities as well as all sites undergoing environmental restoration. Because of the different operational responsibilities, emissions have been apportioned to DOE and USEC.

The PORTS site is located in sparsely populated, rural Pike County, Ohio, on a 16.2-km^2 (6.3-mile^2) site about 1.6 km (1 mile) east of the Scioto River Valley at an elevation of approximately 36.6 m (120 ft) above the Scioto River floodplain. The terrain surrounding the plant, except for the Scioto River floodplain, consists of marginal farmland and densely forested hills. The Scioto River floodplain is farmed extensively, particularly with grain crops.

Pike County has a generally moderate climate. Winters in Pike County are moderately cold, and summers are moderately warm and humid. The precipitation is usually well distributed with fall being the driest season. Prevailing winds at the site are out of the southwest to south. Average wind speeds are about 5 mph (8 km/h) although winds of up to 75 mph (120 km/h) have been recorded at the plantsite. Usually, high winds are associated with thunderstorms that occur in spring and summer. Southern Ohio is within the midwestern tornado belt although no tornados have struck the plantsite to date.

Pike County has approximately 23,000 residents. Scattered rural development is typical; however, the county contains numerous small villages such as Piketon, Wakefield, and Jasper, which lie within a few kilometers of the plant. The county's largest community, Waverly, is about 19 km (12 miles) north of the plantsite and has a population of approximately 5,100 residents. Additional population centers within 80 km (50 miles) of the plant are Portsmouth (population 25,500), Chillicothe (population 23,420), and Jackson (population 6,675). The total population of the area lying within an 80-km (50-mile) radius of the plant is approximately 600,000.

USEC is responsible for the principal site process and support operations. The principal site process is the separation of uranium isotopes through gaseous diffusion. Support operations include the feed and withdrawal of material from the primary process, treatment of water for both potable and cooling purposes, steam generation for heating purposes, decontamination of equipment removed from the process for maintenance or replacement, recovery of uranium from various waste materials, and treatment of industrial wastes generated onsite. DOE is responsible for the decontamination activities in the X-326 building, X-326 "L-Cage" and its glovebox, X-345 high assay sampling area (HASA), X-744G glovebox and site remediation activities. All emissions from DOE sources listed in this report represent 27% of the air emissions from stack one, emissions from stack three, and the gloveboxes. Because of the separation of responsibilities, DOE and

USEC are certifying only those activities for which they have direct responsibility. Following is a description of the emission sources and the responsible agency. The responsible agency is indicated after the system heading in parenthesis.

X-326 SHUTDOWN (DOE)

In 1991, the decision was made to suspend production of highly enriched uranium (HEU) and very highly enriched uranium (VHE) and to shut down the portion of the diffusion cascade that produces the higher assay materials. In 1992, DOE ended production of HEU and VHE and began decontaminating the X-326 process equipment to safely place it in long-term shutdown. X-326 emissions resulting from the decontamination activities are the responsibility of DOE.

The gaseous diffusion cascade consists of over 4,000 stages of equipment, each of which consists of an electric motor, a compressor, and a converter in which the isotopic separation takes place. The stages are grouped into cells, a cell being the smallest entity that can be taken off line. The cells are further grouped into units, and each of the three process buildings contains several units. DOE cleanup of the HEU proceeded on a cell-by-cell basis with those cells containing the largest amounts of uranium deposits being cleaned up first.

During normal operation, some of the uranium hexafluoride undergoes adverse reactions, causing the formation and subsequent deposition of particulate matter in the process equipment. These deposits are removed by taking a cell off stream and treating it with fluorine and chlorine trifluoride to convert the deposits to uranium hexafluoride. The uranium hexafluoride thus formed is transferred into surge drums for later reintroduction into the cascade. This cell treatment process is a normal maintenance activity that has been routinely performed for many years, both to recover uranium as a valuable asset and to prevent any possibility of a nuclear criticality incident. For equipment which is going into long-term shutdown, the cell is buffered with dry air following removal of the deposits.

The initial work on the X-326 shutdown project began in mid-1992 when the main enrichment cascade was reconfigured to bypass the section that produced the HEU. In the last quarter of 1992, DOE began to remove accumulated uranium deposits from the equipment that had been taken out of service. HEU suspension is based on the following assumptions:

1. All HEU treatment activities are bled to the top purge.

2. An average of two cells a week are evacuated to interim purge/side purge to perform maintenance.

3. Average X-326 cell volume evacuated for maintenance is 1810 standard cubic feet (scf).

4. Ten percent of the side purge vent rate is spilled over to the top purge.

These cleanup activities continued through 1994. Due to these activities, it was determined that the reportable quantities of radiological air emissions be based on the percent of work accomplished in the X-326 to total cascade operations. DOE activities noted in this report for the X-326 building reflect 27 percent of the total air emissions.

The cascade also contains technetium that was introduced into the nuclear fuel cycle in the late 1960s and early 1970s when spent reactor fuel was reprocessed. Technetium does not occur in nature but is a product of nuclear fission. This practice was stopped after the discovery of technetium in the cascade in the mid 1970s, but significant quantities of technetium had already been deposited in the cascade. Technetium is primarily adsorbed on metal surfaces, and the cell treatment process volatilizes it along with the uranium.

Prior to beginning the decontamination, it was not realized how much gaseous technetium was going to be generated during the cleanup process. Due to the shutdown project, many more cells are being treated than during normal operations. This has resulted in an increase in the amount of technetium being volatilized and reintroduced into the process gas stream. The control traps on the process vents contain activated alumina, which is very effective in trapping uranium emissions but quickly becomes saturated with technetium.

Several steps have been taken to control the technetium including adding soda lime—a more effective adsorbent for technetium—at the inlet of the control systems. Administrative controls were also instituted. Technetium emissions peaked in June 1993; emissions then fell until leveling off at normal levels in October 1993. These measures have been effective so far; technetium emissions have remained low through January 1995.

Once the decontamination process is complete, radionuclide emissions from PORTS will drop significantly compared to historical levels since the ratio of the more active isotopes to the least active ^{238}U will drop considerably. It is reiterated that cell cleanup operations are routinely performed but that the number of cells being treated has increased due to the X-326 shutdown process.

SOURCE DESCRIPTION

Monitored Sources (USEC, DOE)

The 14 sources discussed in this section are the significant and potentially significant contributors to airborne radionuclide emissions due to USEC and DOE operations. The X-326 top purge, E-jet vents, and X-345 discussed in this section are the significant and potentially significant DOE contributors to airborne radionuclide emissions. Twenty-seven percent of the airborne emissions from the X-326 top purge and E-jet vents are due to DOE decontamination operations. All PORTS emission sources combined routinely cause less than 0.1 millirem (mrem)/year (0.001 millisievert (mSv)/yr) effective dose equivalent (EDE) to the most exposed member of the public under normal operating conditions. However, due to the DOE HEU shutdown project, plant emissions rose to 0.3 mrem/yr (0.003 mSv) in 1992 and 0.91 mrem/yr (0.0091 mSv) in 1993. The majority of the dose came from the X-326 top purge and E-jet vents and were due primarily to technetium emissions. The plant emissions dropped to 0.06 mrem/yr (0.0006 mSv) in 1994. The majority of the dose came from the X-326 top purge and E-jet vents and were due primarily to uranium emissions. Technetium emissions were effectively controlled in late 1993 and throughout 1994. The judgement that no other significant sources exist is supported by ambient air monitoring data that indicate that the actual ambient airborne radionuclide concentrations are within standard modeling accuracy of the ambient concentrations predicted from the measured emissions of these 14 sources.

All 14 of these sources are continuously sampled by flow-proportional, isokinetic samplers to provide emissions data. Samplers had been operational on nine of the sources for several years. Six of these sources (the purge cascades, the cold recovery systems, and the building evacuation systems) are also monitored in real-time by ionization chamber instruments for operational control. The samplers are more sensitive, more accurate, and more reliable than the ionization chambers but cannot provide real-time data that are required for process control. The ionization chambers also provide early warning of upset conditions in the diffusion process.

Top and Side Purge Cascades (USEC, DOE)

The two purge cascades operated by USEC continuously separate light gases from process gas (UF_6) using gaseous diffusion. The separated process gas is returned to the main cascade from the tail of the purge cascades. The light gases are split at the head of the purge cascades with enough "lights" being recycled to the main cascade to maintain normal operating flows and the remainder being vented through chemical adsorbent traps to the atmosphere. The side purge cascade and top purge cascade operate in series at the very head of the main cascade. Due to the comparatively high assays handled in the purge cascades, these two sources are historically PORTS predominant emission sources and accounted for approximately 85.9 percent of the total radionuclide activity emitted from PORTS in 1994. Twenty-seven percent of this amount was due to DOE activities in the X-326.

Continuous operation by USEC of the purge cascades is required for continued operation of the main process cascade. Consequently, the two purge cascades are exhausted by three interconnected air jet educators (the third educator is an operating spare for either or both regular educators) to an interconnected set of four exhaust pipes. The pipes extend up a 50-meter free-standing tower, which is commonly referred to within the plant as the "tall stack," to remove the emissions from the building's wind wake.

Cold Recovery Systems (USEC)

The cold recovery systems are intermittently-operated maintenance support systems used to prepare cascade equipment (cells) for internal maintenance. Process gas in cascade cells scheduled for maintenance is first evacuated to adjacent cascade cells to the extent practical. The cell is then sealed off and alternately purged with dry nitrogen and evacuated repeatedly. The evacuated gases pass through chilled cylinders called "cold traps" to solidify any residual process gas. The non-condensible nitrogen carrier is passed through chemical adsorbents for polishing and then is vented by an air jet educator to the atmosphere. Periodically, individual cold traps are valved off from the vent, and the trapped UF_6 is returned to the cascade by vaporization. There are two cold recovery systems operated at PORTS with one each in the X-330 and X-333 process buildings. In X-330 the cold recovery system shares a common vent and vent sampler with the building evacuation system.

Building Evacuation Systems (USEC)

The building evacuation systems (also called wet air evacuation systems) are intermittently operated maintenance support systems used to prepare off-line cascade cells for return to service. The cell is sealed off and alternately purged with dry nitrogen and evacuated to remove all outside air and moisture from the cell. The evacuated gases are passed through chemical adsorbents to catch residual radionuclides (if any) and vented to the atmosphere by an air jet educator. There are two building evacuation systems, one associated with each of the cold recovery systems described above. In X-330, the cold recovery and building evacuation system share a common vent and sampler.

Seal Exhaust (SE) Stations (USEC, DOE)

The SE stations maintain a vacuum within cascade compressor shaft seals to prevent inleakage of wet air to the cascade. This vacuum is isolated from the compressor side of the seal by a buffer zone. Gases evacuated from the seals are pulled through chemical adsorbent traps by a bank of manifolded vacuum pumps and exhausted to the atmosphere through mist eliminators (for pump oil) and a roof vent.

There is one SE station in each of the cascade's six "areas" each located adjacent to the area control room. Area 1 includes the entire X-333 process building. This SE station was equipped with a continuous vent sampler in late 1989, which confirmed that the emissions were not a significant contributor to plant radionuclide emissions. The X-326 SE vents are potentially significant DOE contributors to airborne radionuclide emissions. Twenty-seven percent of the emissions from X-326 areas 4, 5, and 6 seal exhaust stations is due to DOE activities.

Radionuclide emissions from the other five SE stations should be very low compared to the X-333 Area 1 SE Station during normal operation. To confirm this and to provide for the possibility of unplanned releases, continuous vent samplers were installed on these five vents in 1991 and began operation the first week of 1992.

X-345 High Assay Sampling Area (HASA) Manifold Evacuation/Gulper (DOE)

X-345 HASA, operated by DOE, is an automated sampling and transfer system for UF_6 enriched to a high ^{235}U assay. To avoid cross contamination between samples and trace releases when disconnecting sample containers, the sampling manifold is purged and evacuated by a vacuum pump and air jet educator in series through a bank of cold traps followed by a bank of chemical adsorbent traps. In the event of a trace release occurring in spite of the purge and evacuate procedure, a "gulper" is mounted in back of the manifold connections. The gulper is simply a continuous vacuum nozzle, similar in principal to a lab hood, to pull any small releases out of the room air into the chemical adsorbent traps.

X-344A Manifold Evacuation/Gulper (USEC)

The X-344A facility contains the sampling and transfer system for all UF_6 not handled in the X-345 HASA (low enriched and depleted material). The system is functionally identical to the X-345 HASA but is physically larger and is restricted to materials with much lower specific activity. In addition, the X-344A gulper has a high efficiency particulate air (HEPA) (minimum allowable capture efficiency 99.97 percent) filter prior to the final chemical traps.

Unmonitored and Potential Sources (USEC, DOE)

PORTS has several unmonitored minor and potential emission sources associated with USEC process support activities and DOE decontamination activities. Based on process knowledge and ambient monitoring data, none of these sources are believed to contribute significantly to plant radionuclide emissions under normal operations.

The minor sources, as the term is used at PORTS, have some trace radionuclides in their routine emissions but only in negligible amounts under any normal operating conditions. The potential sources are primarily room ventilation exhausts or pressure relief vents from areas that have a potential for an internal radionuclide release.

Decontamination Facilities (USEC)

Equipment that is removed from the PORTS cascade is sealed at the point of removal and transported to the X-705 decontamination building. Small parts are cleaned in "hand tables" or spray tanks, while large parts are sent through the automated "tunnel." The hand tables consist of shallow acid baths (either nitric or citric depending on the metal to be cleaned) where metal parts are decontaminated by passive soaking. The hand tables have fume hoods over them to protect workers from acid fumes. The spray tanks are enclosed tanks where equipment can be spray cleaned remotely and have the pressure relief vents standard to such equipment. The tunnel is an enclosed series of "booths" that decontaminate large parts by spraying with decontamination solutions (acids and water rinses) as a small rail car carries the parts through the tunnel. The tunnel is ventilated to prevent a buildup of acid fumes. In all cases, radionuclides (uranium and technetium) are dissolved in the liquid phase and collected for recovery of the uranium. None of the radionuclides are volatilized by normal operations of these facilities, and only trace radionuclides carried by entrained droplets would be expected.

Calciners (USEC)

Decontamination solutions are treated to yield a concentrated aqueous solution of uranyl nitrate, which is converted into uranium oxide powder in one of three calciners located in the X-705 decontamination building. A calciner consists of an inclined heated tube, with the uranyl nitrate solution entering at the top and air entering at the bottom. The uranium is first dried and then oxidized as it passes down the tube. The uranium oxide powder is collected directly in a five-inch diameter storage "can" at the lower end of the calciner tube. The gaseous stream leaves the

upper end of the calciner and is exhausted through a scrubber for NO_x control. Uranium is recovered from the spent scrubber solution through a microfiltration process and the effluent is discharged to a National Pollutant Discharge Elimination System permitted outfall. Turbulence and flow rates through the calciners are controlled to minimize "blowback" of the uranium oxide, and such blowback that does occur is entrapped by the entering uranium solution.

Gloveboxes (USEC, DOE)

Once produced, uranium oxide powder is handled as needed in one of three gloveboxes. The gloveboxes have airlocks for the entry and removal of work materials and are maintained under negative pressure during use. This negative pressure is produced by a exhaust fan drawing through a HEPA filter. Since 1978, uranium oxide is no longer re-processed into UF_6 at PORTS and consequently the gloveboxes see little or no usage and generate no emissions. DOE is responsible for the operation of the gloveboxes in X-345, X-744G and X-326 "L-cage," all others are the responsibility of USEC.

Laboratory Fume Hoods (USEC)

Laboratory analysis of process and other samples is done on-site at PORTS, usually in hoods, in accordance with standard laboratory practices. There are no emission controls on these lab hoods. The hoods should not see any radionuclide emissions during normal operation except for small amounts of technetium, which is partially volatilized by the analytical method approved by the Environmental Protection Agency under the Safe Drinking Water Act. There is also a possibility of a UF_6 sample container bursting during processing. This is an extremely rare occurrence, however, and cannot be regarded as normal operation as specified in the NESHAP regulations. Most laboratory fume hoods are located in the X-710 laboratory building.

Room Air Exhausts (USEC, DOE)

Several uranium handling areas within the plant buildings have some potential for releasing minute ($\leq$1 gram) amounts of UF_6 into the room air. Releases of this size are characterized as small releases (visually resembling a puff of cigarette smoke). However, it should not be implied that any size release is acceptable or overlooked by PORTS. Studies conducted in the early 1980s demonstrated that a release of one gram of UF_6 produces a much larger release (smoke cloud) than what is normally observed during the operations discussed here. Ventilation exhausts from and worker protection within these areas are controlled according to the probability of releases occurring. Standard policy in the event of a larger internal release is to evacuate the area and remotely close down the local ventilation for confinement and later decontamination.

Material feed and withdrawal areas occasionally have small releases when disconnecting UF_6 containers from process piping. These areas include the X-342A feed and fluorine generation facility, the X-343 feed facility, the X-344 toll transfer facility, the X-330 tails withdrawal area, the X-333 low assay withdrawal area, and the X-326 extended range product and X-326 product withdrawal area. These areas have dedicated ventilation exhausts for worker protection but no emission controls. There are no "environmental" samplers on these exhausts, but the plant's Health Physics (HP) Department samples the air inside these areas continuously for worker

protection. The HP data indicate that average radionuclide concentrations inside the room are typically equivalent to natural background and, based on this, emissions from the room can be presumed to be environmentally insignificant.

The highest probability of internal releases besides the X-345 (DOE) and X-344A sampling/transfer areas (USEC), which were discussed in the previous section, is in the X-705 decontamination building south annex, where contaminated equipment is unsealed and disassembled. The south annex has a separate HEPA filtered ventilation system and operates as a sealed area. Supplied air respirators are mandated for worker protection within the annex when the facility is in use. Normal emissions to the outside air should be negligible, which is consistent with ambient monitoring performed by the plant's HP Department in the past.

The "cell floors" of the process buildings are subject to a lesser potential for unplanned releases when cascade components are being serviced or removed. For several reasons, including the huge volume of air passing through the general ventilation systems (approximately 4,000 process motors are air cooled by the general ventilation system) and the lower potential for a release, special worker protection ventilation systems for the cell floors are not considered necessary. The cell floor air is continuously sampled by the HP Department, with the same results as in the material withdrawal areas. Routine emission levels from process building ventilation should be equal to natural background levels. Plant procedure in the event of an unplanned release larger than a "small release" is to close the building ventilation system to confine the uranium for decontamination and recovery.

The DOE operated X-345 HASA is equipped with a gulper (see the previous section) to handle small releases but would be difficult to evacuate quickly in the event of a large unplanned release. Consequently, this area has an emergency room purge to "dump" a release outside if necessary to protect evacuating workers. Since this vent is closed during normal operations, normal emissions are zero. To date, no large unplanned release has occurred in the X-345 HASA.

Storage Tank Vents (USEC)

Uranium-bearing solutions awaiting treatment are stored in a manifold of five-inch diameter tanks inside the X-705 facility. All of these tanks are manifolded to a common pressure relief vent that has some potential to release radionuclides if the tanks were overfilled or overheated. Normal emissions should be zero since the stored liquids are quiescent, the dissolved radionuclides are non-volatile, and the vents are not open except during filling.

SECTION II. AIR EMISSIONS DATA

Point Sources

Point Source	Type Control	Control Efficiency	Distance in meters to the Nearest:					
			Resident	School	Office Business	Farm		
						Veg.	Meat	Milk
X-326 Tall Stack (Top & Side Purge Cascades) (3 monitors)[a] (27% DOE 73% USEC)	Chemical Adsorbents	0-95%[b]	1410 E	5000 NNW	1520 SSE	4290 N	1370 E	8660 ENE
X-330 Cold Recovery/Wet Air Evacuation Vent (USEC)	Cold Traps Chemical Adsorbents	90-95%[c] 0-95%[b]	1570 E	3930 NNW	1370 W	3200 N	1520 ESE,W	8380 ENE
X-333 Cold Recovery Vent (USEC)	Cold Traps Chemical Adsorbents	90-95%[c] 0-95%[b]	1270 ESE	3840 NNW	1860 WSW	2960 N	1230 SE	7890 ENE
X-333 Wet Air Evacuation Vent (USEC)	Chemical Adsorbents	0-95%[b]	1270 ESE	3840 NNW	1860 WSW	2960 N	1230 SE	7890 ENE
X-345 HASA Manifold Evacuation/Gulper (DOE)	Cold Traps (Manifold only) Chemical Adsorbents	90-95%[c] 0-95%[b]	1430 E	4020 NNW	1560 W	3260 N	1310 ESE	8200 ENE
X-344A Manifold Evacuation/Gulper (USEC)	Cold Traps (Manifold only) HEPA Filters (Gulper only) Chemical Adsorbents	90-95%[c] 99.97% 0-95%[b]	1870 ESE	3410 NNW	1460 WSW	2680 N	1830 SSE	8320 ENE

Point Source	Type Control	Control Efficiency	Distance in meters to the Nearest:					
			Resident	School	Office Business	Farm		
						Veg.	Meat	Milk
X-326 Seal Exhaust Area 4 (USEC)	Chemical Adsorbents	0-95%[b]	1460 ESE	4420 NNW	1460 WNW	3720 N	1340 E	8470 ENE
X-326 Seal Exhaust Area 5 (USEC)	Chemical Adsorbents	0-95%[b]	1400 E	4630 NNW	1540 WNW	3940 N	1340 E	5830 ENE
X-326 Seal Exhaust Area 6 (USEC)	Chemical Adsorbents	0-95%[b]	1380 E	4880 NNW	1620 SSE	4180 N	1340 E	8630 ENE
X-330 Seal Exhaust Area 2 (USEC)	Chemical Adsorbents	0-95%[b]	1660 E	3690 NNW	1430 WSW	3020 N	1580 SE,W	8320 ENE
X-330 Seal Exhaust Area 3 (USEC)	Chemical Adsorbents	0-95%[b]	1570 E	4080 NNW	1400 W	3350 N	1430 E	8400 ENE
X-333 Seal Exhaust Area 1 (USEC)	Chemical Adsorbents	0-95%[b]	1270 ESE	3840 NNW	1860 WSW	2960 N	1230 SE	7890 ENE
X-705 Storage Tank Vents[f] (USEC)	None	N/A	1160 E	4020 NNW	1800 W	3200 N	1050 ESE	7960 ENE

Grouped Sources

Grouped Source	Type Control	Control Efficiency	Distance in Meters to the Nearest:					
			Resident	School	Office or Business	Farm		
						Veg.	Meat	Milk
X-705 Calciners[1] (3) (USEC)	Wet Scrubber	75%[4]	1160 E	4020 NNW	1800 W	3200 N	1050 ESE	7960 ENE
Gloveboxes[4,1] (3) (USEC)	HEPA Filters	99.97%	850 ESE	4180 NNW	2160 W	3210 N	760 SE	7560 ENE
Laboratory Fume Hoods[1] (31) (USEC)	None	N/A	1190 E	4690 NNW	1660 WNW	3930 N	1130 E	8350 ENE
X-705 Decontamination Facility[1] (USEC)	One area HEPA Others none	99.97% N/A	1160 E	4020 NNW	1800 W	3200 N	1050 ESE	7960 ENE
Room Air Exhausts[1] (USEC)	None	N/A	850 ESE	3410 NNW	1370 W	2680 N	760 SE	7560 ENE

See notes on page 12.

Notes to Tables in Section II

a The top and side purge cascade vent streams pass separately through activated alumina traps. A third line, the emergency jet, connects to both lines through block valves. All three lines have continuous samplers. The three vent lines connect to four exhaust pipes that extend above the 50-meter X-326 tall stack. The top purge jet is vented directly through one pipe. The side purge jet and emergency jet lines are interconnected to the other three pipes.

b Chemical adsorbents (activated alumina) are approximately 95 percent effective at concentrations above 1 ppm. Below this concentration, chemical adsorbents have reduced or have no effect. Normal concentrations entering the purge cascade chemical traps are near or below 1 ppm. The sample traps (which follow the control traps) use activated alumina hydrated to 14 percent moisture content, which is much more effective due to an instantaneous reaction of gaseous UF_6 and Tc with the water to form particulate matter.

c Based on process knowledge, cold traps are estimated to be approximately 90 to 95 percent effective in trapping gaseous UF_6.

d Scrubber efficiency estimated to be approximately 75 percent but has not been rigorously measured. Normal emissions from source are estimated to be negligible compared to monitored sources (<0.001 curies of uranium).

e Normal emissions estimated to be zero due to infrequent use.

f Normal emissions estimated to be negligible compared to monitored sources (<0.001 curies of uranium).

Radionuclide Emissions from Point Sources During CY 1994

Mass emissions of uranium decreased (from 9.5 to 7.93 kg), and the activity level dropped from 0.062 curie to 0.040 curie due to the much lower assay of the product. Technetium emissions decreased from 460.6 (7.83 curies) to 8.18 g (0.139 curies).

There were no unplanned releases during 1994.

Since CAP-88 does not provide for different vent locations, PORTS models its emissions as three co-located stacks, sited at the actual location of the predominate source, the purge cascade vents. Stack 1 corresponds to the actual purge cascade vents (stack height equals 50 meters)(27 percent DOE) Stack 2 (USEC) is a composite of all other process building vents (20 meters) and the X-344A vent (14 meters) and Stack 3 (DOE) represents the X-345 HASA vent (3 meters). The purge cascade vents (Stack 1) accounted for 85.9 percent of the total curies emitted.

NUCLIDE	Solu. Class	AMAD (μm)	Curies released during 1994 from:			
			Stack 1	Stack 2	Stack 3	Total
^{234}U	D	1.0	3.22E-2	4.33E-3	0.00E-0	3.65E-2
^{235}U	D	1.0	7.69E-4	2.00E-4	0.00E-0	9.69E-4
^{236}U	D	1.0	7.47E-6	3.87E-6	0.00E-0	1.13E-5
^{238}U	D	1.0	4.64E-4	2.02E-3	0.00E-0	2.48E-3
^{99}Tc	D	1.0	1.22E-1	1.69E-2	0.00E-0	1.39E-1
^{231}Th	W	1.0	7.69E-4	2.00E-4	0.00E-0	9.69E-4
^{234}Th	W	1.0	4.64E-4	2.02E-3	0.00E-0	2.48E-3
^{234m}Pa	W	1.0	4.64E-4	2.02E-3	0.00E-0	2.48E-3

Note 1: The source serving Stack 3 did not operate during 1994.
Note 2: 27 percent of the releases of Stack 1 and all of Stack 3 are due to DOE activities.

Radionuclide Emissions from Fugitive and Diffuse Sources During CY 1994

There were no significant emissions of radionuclides from diffuse or fugitive sources at PORTS.

Work on two environmental restoration sites, the X-231B (DOE) oil biodegradation plot and the X-701B (DOE) holding pond, was scheduled for completion this year. Both have the potential to emit radiologically contaminated soil (dust) during environmental restoration activities. The soil of the X-231B plot was agitated down to bedrock by means of a vertical cable tool with a horizontal tilling bar through which hot air was injected into the soil. The tool was covered by a dome to collect the offgases. The offgases passed through a bank of HEPA filters and carbon filters prior to being released to the atmosphere. Soil agitation of the X-231B site began on December 27, 1993, and was complete on May 13, 1994. There were no significant emissions of radionuclides from the 231B activities. Due to extremely adverse soil conditions, soil agitation restoration could

not be used for the X-701B holding pond. Restoration activities for this area have been postponed until dewatering and an alternate restoration method can be selected.

PORTS maintains a network of 14 (formerly 17) ambient air monitors (DOE) which continuously sample for particulate radionuclides. All gaseous radionuclides emitted from PORTS operations become particulates within a few feet of the emission point. Data from these monitors confirms that total plant emissions, including those from fugitive and diffuse sources, do not cause the public to receive an effective dose equivalent in excess of the standard of 10 mrem/yr (0.1 mSv).

The air monitors are divided into three groups: onsite, property/line, and offsite. In October 1993, three of the onsite (internal) monitors were removed for use in an investigation of the air medium at PORTS under provisions of the Resource Conservation and Recovery Act (RCRA), which is known as the Air RFI (Air RCRA Facility Investigation). Following the completion of the Air RFI, it was decided to permanently shut down the three internal monitoring locations. The property/line monitors are used to confirm the dose to the public, and one of the offsite monitors is located in Piketon, which is the largest population center in the immediate vicinity of the plant. The onsite monitors are used to determine exposure to plant personnel. In June 1993, PORTS installed three high volume particulate samplers that are collocated with three of the existing low volume samplers, one of which is the background station 13 miles southwest of the plant. In 1994 DOE PORTS installed three additional high volume particulate samplers that are also collocated with existing low volume samplers.

The filters from both the low-volume and high-volume samplers are analyzed for total alpha and total beta activity; the alpha is assumed to come from uranium and the beta from technetium. Data from both systems are statistically the same, and both indicate that the units are measuring background levels of radiation.

SECTION III. DOSE ASSESSMENTS

Description of Dose Model

The radiation dose calculations were performed using the CAP-88 package of computer codes. This package contains EPA's most recent version of the AIRDOS-EPA computer code, which implements a steady-state, Gaussian plume, atmospheric dispersion model to calculate environmental concentrations of released radionuclides and Regulatory Guide 1.109 foodchain models to calculate human exposure, both internal and external, to radionuclides deposited in the environment. The human exposure values are then used by the EPA's latest version of the DARTAB computer code to calculate radiation dose to man from the radionuclides released during the year. The dose calculations use dose conversion factors in the latest version of the RADRISK data file, which is provided by the EPA with the CAP-88 package.

Summary of Input Parameters

Except for the radionuclide parameters given in Section II and those given below, all important input parameter values used are the default values provided with the CAP-88 computer codes and data bases. The maximally exposed individual is considered to reside at the plant boundary.

Meteorological data:	1994 data from onsite tower.
Rainfall rate:	110.5 cm/year (CY 1994)
Average air temperature:	11.8°C (CY 1994)
Average mixing layer height:	2000 meters

Fraction of foodstuffs from:	Local Area	Within 50 mi	Beyond 50 mi
Vegetables and produce	0.700	0.300	0.000
Meat	0.442	0.558	0.000
Milk	0.399	0.601	0.000

*The dose estimate for foodstuffs is very conservative when 0.0 is used as an input parameter in the category of foodstuffs consumed that were produced at a distance of 50 miles or more from the PORTS site. Realistically, it can be assumed that very little of the foodstuffs consumed by residents within a 50 mile radius of PORTS are produced within 50 miles of the PORTS site. The majority of the foodstuffs consumed are purchased at supermarkets that receive foodstuffs from all over the world.

Source characteristics

	Type	Release Height (m)	Inner Diam. (m)	Gas Exit Velocity (m/s)	Gas Exit Temp. (°C)	Dist. (m) & Direction to Max.Individual
Stack 1	Point	50	0.25	0.04	Ambient	1770 ENE
Stack 2	Point	20	0.57	0.04	Ambient	1770 ENE
Stack 3	Point	3	0.10	0.04	Ambient	1770 ENE

Compliance Assessment

The EDE to the most exposed member of the public who is located 1770 meters east northeast of the primary emission point is 0.06 mrem/yr (0.6×10^{-3} mSv/yr). DOE activities contributed 27 percent of the EDE or 0.016 mrem/yr (0.16×10^{-3} mSv/yr).

Certification

I certify under penalty of law that I have personally examined and am familiar with the information submitted herein and based on my inquiry of those individuals immediately responsible for obtaining the information for Department of Energy activities, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information including the possibility of fine and imprisonment (see 18 U.S.C. 1001).

Name: E. W. Gillespie
DOE Site Manager

Signature: Eugene W. Gillespie Date: 6/21/95

Certification

I certify under penalty of law that I have personally examined and am familiar with the information submitted herein and based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete representation of the emissions under United States Enrichment Corporation control. I am aware that there are significant penalties for submitting false information including the possibility of fine and imprisonment (see 18 U.S.C. 1001).

Name: T. Michael Taimi
USEC Environmental Assurance and Policies Manager

Signature: Mary Young for Mike Taimi Date: 6-21-95