DOE Review Release 07/16/2019

Mound Plant – Occupational Environmental Dose

ORAUT-TKBS-0016-4 Rev. 02
Effective Date: 07/02/2019
Supersedes: Revision 01

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☐ New ☒ Total Rewrite ☐ Revision ☐ Page Change

PUBLICATION RECORD

EFFECTIVE DATE	REVISION NUMBER	DESCRIPTION
10/06/2004	00	First approved issue. Initiated by Jeffrey S. Vollmer.
03/13/2009	00 PC-1	Approved page change initiated to remove information pertaining to Monsanto Chemical Company, the subject of a class of employees added to the Special Exposure Cohort. The changes necessitated the reordering and renumbering of tables on the following pages: 9, 10, 12 - 34 in Sections 4.2 and 4.3. NIOSH required language was revised on pages 7 and 8 in Section 4.1. Updated NIOSH reference on page 48. No sections were deleted. Incorporates formal internal and NIOSH review comments. Training required: As determined by the Task Manager. Initiated by Donald N. Stewart. Signature on File 03/04/2009 Donald N. Stewart, Document Owner Signature on File 03/04/2009 John M. Byrne, Task 3 Manager Signature on File 03/04/2009 Edward F. Maher, Task 5 Manager Signature on File 03/11/2009 Kate Kimpan, Project Director Signature on File 03/13/2009 James W. Neton, Associate Director for Science
02/07/2013	01	Revision initiated to add Special Exposure Cohort Section 4.1.3. Revised Table 4-1 to include end of operation and end of remediation. Revised Section 4.3 to provide direction for assigning environmental dose from 2003 to 2010. Made editorial changes and removed text and references for the Dayton Project. Incorporates formal internal and NIOSH review comments. Training required: As determined by the Objective Manager. Initiated by Donald N. Stewart and Robert M. Leib.

EFFECTIVE DATE	REVISION NUMBER	DESCRIPTION
07/02/2019	02	Incorporated aspects of ORAUT-PROC-0060 Rev. 01 prior to its cancellation. Changed Mound Site to Mound Plant throughout document. Clarified SEC description regarding a tritium sample as indication of work in SW or R buildings, in section 4.1.3 to more closely reflect the HHS designation letter dated July 14, 2010. Added ICRP Publication 23 references in sections 4.2.3.1 and 4.2.3.2 and References section. Changed numerical values and units in Table 4-20 from Sieverts to rem to be consistent with dose reconstruction reporting. Corrected references to sections 4.2.5, 4.2.6 and 4.2.7 in the first paragraph of section 4.2.2. Clarified statement in section 4.2.4 to indicate that submersion dose from effluent was not included in onsite ambient dose. Provided site-specific justification for 2,500 hr/yr work assumption for assignment of onsite ambient dose. Incorporates formal internal and NIOSH review comments. Constitutes a total rewrite of the document. Training required: As determined by the Objective Manager. Initiated by Robert M. Leib.

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ACRONYMS AND ABBREVIATIONS

AWE	atomic weapons employer
Bq	becquerel
Ci	curie
cm	centimeter
cpm	counts per minute
d	day
D&D	decontamination and decommissioning
DCF	dose conversion factor
DOE	U.S. Department of Energy
DOL	U.S. Department of Labor
dpm	disintegrations per minute
EEOICPA	Energy Employees Occupational Illness Compensation Program Act of 2000
g	gram
gal	gallon
GP	General Purpose
GSD	geometric standard deviation
HH	Hydrolysis House
hr	hour
HTO	tritiated water vapor
H(10)*	ambient dose equivalent
kg	kilogram
km	kilometer
LDL	lower detection limit
LLW	low-level radioactive waste
m	meter
mCi	millicurie
MED	Manhattan Engineer District
mi	mile
mL	milliliter
mph	miles per hour
mR	milliroentgen
mrem	millirem
NIOSH	National Institute for Occupational Safety and Health
ORAU	Oak Ridge Associated Universities
PP	Plutonium Processing
PuBe	plutonium-beryllium (alloy)
qtr	quarter

RTG	radioisotopic thermoelectric generator
s	second
SEC	Special Exposure Cohort
SM	Special Metallurgical
SNM	special nuclear material
SRDB Ref ID	Site Research Database Reference Identification (number)
SRS	Savannah River Site
Sv	sievert
SW	Semi-Works
U.S.C.	United States Code
W	watt
WSF	Waste Staging Facility
yd	yard
yr	year
µCi	microcurie
µR	microroentgen
§	section or sections

4.1 INTRODUCTION

Technical basis documents and site profile documents are not official determinations made by the National Institute for Occupational Safety and Health (NIOSH) but are rather general working documents that provide historical background information and guidance to assist in the preparation of dose reconstructions at particular Department of Energy (DOE) or Atomic Weapons Employer (AWE) facilities or categories of DOE or AWE facilities. They will be revised in the event additional relevant information is obtained about the affected DOE or AWE facility(ies). These documents may be used to assist NIOSH staff in the evaluation of Special Exposure Cohort (SEC) petitions and the completion of the individual work required for each dose reconstruction.

In this document the word "facility" is used to refer to an area, building, or group of buildings that served a specific purpose at a DOE or AWE facility. It does not mean nor should it be equated to an "AWE facility" or a "DOE facility." The terms AWE and DOE facility are defined in sections 7384l(5) and (12) of the Energy Employees Occupational Illness Compensation Program Act of 2000 (EEOICPA), respectively. An AWE facility means "a facility, owned by an atomic weapons employer, that is or was used to process or produce, for use by the United States, material that emitted radiation and was used in the production of an atomic weapon, excluding uranium mining or milling." 42 U.S.C. § 7384l(5). On the other hand, a DOE facility is defined as "any building, structure, or premise, including the grounds upon which such building, structure, or premise is located … in which operations are, or have been, conducted by, or on behalf of, the [DOE] (except for buildings, structures, premises, grounds, or operations … pertaining to the Naval Nuclear Propulsion Program);" and with regard to which DOE has or had a proprietary interest, or "entered into a contract with an entity to provide management and operation, management and integration, environmental remediation services, construction, or maintenance services." 42 U.S.C. § 7384l(12). The Department of Energy (DOE) determines whether a site meets the statutory definition of an AWE facility and the Department of Labor (DOL) determines if a site is a DOE facility and, if it is, designates it as such.

Accordingly, a Part B claim for benefits must be based on an energy employee's eligible employment and occupational radiation exposure at a DOE or AWE facility during the facility's designated time period and location (i.e., covered employee). After DOL determines that a claim meets the eligibility requirements under EEOICPA, DOL transmits the claim to NIOSH for a dose reconstruction. EEOICPA provides, among other things, guidance on eligible employment and the types of radiation exposure to be included in an individual dose reconstruction. Under EEOICPA, eligible employment at a DOE facility includes individuals who are or were employed by DOE and its predecessor agencies, as well as their contractors and subcontractors at the facility. Unlike the abovementioned statutory provisions on DOE facility definitions that contain specific descriptions or exclusions on facility designation, the statutory provision governing types of exposure to be included in dose reconstructions for DOE covered employees only requires that such exposures be incurred in the performance of duty. As such, NIOSH broadly construes radiation exposures incurred in the performance of duty to include all radiation exposures received as a condition of employment at covered DOE facilities in its dose reconstructions for covered employees. For covered employees at DOE facilities, individual dose reconstructions may also include radiation exposures related to the Naval Nuclear Propulsion Program at DOE facilities, if applicable. No efforts are made to determine the eligibility of any fraction of total measured exposure for inclusion in dose reconstruction.

NIOSH does not consider the following types of exposure as those incurred in the performance of duty as a condition of employment at a DOE facility. Therefore these exposures are not included in dose reconstructions for covered employees (NIOSH 2010):

- Background radiation, including radiation from naturally occurring radon present in conventional structures
- Radiation from X-rays received in the diagnosis of injuries or illnesses or for therapeutic reasons

4.1.1 Purpose

The Mound Plant has commonly been known as the Mound Site and Mound Laboratory. The occupational environmental dose is the dose received by workers on the job but outside the operational buildings at the Mound Plant. Annual inhalation intakes of radioactive material at the Mound Plant were estimated based on onsite environmental air monitoring station results from 1971 through 2002. For years in which onsite air monitoring data were unavailable (before 1971) and total Mound stack effluent data were available, empirically derived onsite atmospheric dispersion factors (χ/Q values) for plutonium, polonium particulates, and tritiated water vapor (HTO) were used to estimate the intake air concentration. The χ/Q derivation coupled the sitewide median air concentration (^{238}Pu, ^{210}Po, and ^{3}H concentration) with the corresponding total Mound effluent source term for 1973 through 1983. Ingestion intakes and ambient external dose were estimated using radionuclide concentrations measured in 30-cm-thick soil samples. The site remediation period ended in 2010, and there is no potential for receiving environmental dose after this year. The doses and intakes estimated for 2002 can be assigned for energy employees from 2003 to 2010 as an assumption that is favorable to claimants.

4.1.2 Scope

Sections 4.1 and 4.2 discuss reconstruction of dose for unmonitored environmental exposures at Mound Plant. Section 4.3 discusses uncertainties for this analysis.

4.1.3 Special Exposure Cohort

Classes Added to the SEC

> *Employees of the Department of Energy (DOE), its predecessor agencies, and DOE contractors or subcontractors who worked in any areas at the Mound Plant site from October 1, 1949, through February 28, 1959, for a number of work days aggregating at least 250 work days or in combination with work days within the parameters established for one or more other classes of employees in the SEC* (Leavitt 2008).
>
> *All employees of the Department of Energy (DOE), its predecessor agencies, and its contractors and subcontractors who had at least one tritium bioassay sample and worked at the Mound Plant in Miamisburg, Ohio from March 1, 1959 through March 5, 1980, for a number of work days aggregating at least 250 work days, occurring either solely under this employment, or in combination with work days within the parameters established for one or more other classes of employees in the Special Exposure Cohort* (Sebelius 2010).
>
> *All employees of the Department of Energy (DOE), its predecessor agencies, and their contractors and subcontractors who worked at the Mound Plant in Miamisburg, Ohio, from September 1, 1972 through December 31, 1972, or from January 1, 1975 through December 31, 1976, for a number of work days aggregating at least 250 work days, occurring either solely under this employment or in combination with work days within the parameters established for one or more other classes of employees included in the Special Exposure Cohort* (Sebelius 2012).

Although NIOSH has found that it is not possible to completely reconstruct radiation doses for the SEC classes described in this section, NIOSH intends to use any internal and external monitoring data that might become available for an individual claim and that can be interpreted using existing NIOSH dose reconstruction processes or procedures. Therefore, for employees who worked in any Mound area during the above periods from October 1, 1949 through February 28, 1959, or September 1, 1972 through December 31, 1972, or January 1, 1975 through December 31, 1976, or employees with at least one tritium bioassay sample (taken as evidence of potential employment in

the SW (Semi-works) or R (Research) Buildings) during the period from March 1, 1959, through March 5, 1980, who do not qualify for inclusion in the SEC class, partial dose reconstructions may be performed using these data as appropriate.

To summarize the SEC classes:

- The first class of employees was added because the potential for unmonitored intakes of radium, actinium, and thorium was assumed to be present for all Mound employees; therefore, it was not possible to reconstruct doses or assign maximum doses to all Mound employees for October 1, 1949, through February 28, 1959;

- The second class was added because it is not possible to bound radon doses to workers in SW and R Buildings from March 1, 1959, through March 5, 1980. These workers are identified by at least one bioassay sample for tritium in their internal dose records; and

- The third class was added because tritium records for some periods could not be found. This includes all employees in all locations from September 1 through December 31, 1972, and from January 1, 1975, through December 31, 1976.

For all of these classes of workers, internal doses are to be reconstructed using case-specific data, if available, when those doses may be estimated using current dose estimation processes and procedures.

4.2 MOUND PLANT

The Mound Plant was an integrated research, development, and production facility that supported DOE weapon and nonweapon programs with emphasis on chemical explosives and nuclear technology. The organization that would later operate the Mound Plant originated as a technical organization in 1943 when the federal government requested Monsanto Chemical Company to accept responsibility for determining the chemical and metallurgical properties of polonium as a project of the Manhattan Engineer District (MED). Work occurred at the Monsanto Central Research Department and several satellite units in the Dayton, Ohio, area. Late in 1945, the MED determined that the research, development, and production organization at Dayton should become a permanent facility. A search for a suitable location in early 1946 led to the selection of a 728,000-m^2 (182-acre) tract adjacent to Miamisburg, Ohio, about 16 km (10 mi) south-southwest of Dayton. The facility is surrounded by residential and recreational properties as well as agricultural areas and sits atop an elevated area overlooking Miamisburg, the Great Miami River, and the river plain area to the west. In 1981, DOE purchased an additional 123 acres of land south of the original 182 acres for unrealized mission expansion. This parcel was never developed.

Construction of the Mound Plant began in February 1947 and ended in 1949. In late 1948, work at the Dayton Units moved to the Mound Plant. The following paragraphs describe key Mound facilities and their historic functions (DOE 1993a, 1999; Monsanto 1975).

Semi-Works (SW/R) Tritium Complex
This two-story facility was used primarily for handling tritium. Four major operations occurred in the SW/R Tritium Complex: component development, component evaluation operations, tritium recovery, and materials analysis. SW/R, which was built in 1950, underwent 13 major additions. One corridor of rooms in the adjacent building, Research (R), was converted to tritium operations; this corridor, together with the SW building and Building 58, formed the SW/R complex. While the complex was primarily a tritium facility, there were three additional areas. From 1951 through 1953, Mound intermittently conducted a research and development program to recover ^{227}Ac and ^{228}Th from neutron irradiated ^{226}Ra (EG&G 1995a). The three parent radionuclides of ^{227}Ac, ^{226}Ra, and ^{228}Th, and their

radioactive progeny, were present in the irradiated material. The recovery operation was conducted in a special shielded process facility referred to as the Old Cave (Room SW-19) on the east side of the building. From 1951 to 1953, work in the cave resulted in the release of 1.6×10^5 µCi of ^{227}Ac, ^{226}Ra, ^{228}Th, and their radioactive progeny (Storey 1973). From 1964 to 1968, purified ^{227}Ac in oxide and nitrate forms was processed in a hot cell and analytical lab area (Room SW-140) in the SW Building (EG&G 1995a). This work resulted in the release of 5.3 µCi of ^{227}Ac to the atmosphere (Storey 1973). This facility has been demolished.

Technical (T) Building
The T Building was operational in 1949 and was originally used to purify ^{210}Po for use in nuclear weapon initiators. Decontamination work was done from 1971 through 1974 on the ^{210}Po processing areas. Its last mission was to support tritium programs for reconfiguration, safe shutdown, and remaining operations. The facility has also been used to extract radionuclides, to house the plutonium verification facility, and to store transuranic materials. Since 1980, KYLE (classified), Tritium Emission Recovery Facility, Hydrogen Isotope Separations System, and other tritium facilities large enough to handle multikilogram quantities were added to T Building. Special nuclear material (SNM), primarily ^{239}Pu, was stored in T Building storage areas A and B before transfer to Building 38 for repackaging. The SNM was in the form of metal, metal oxide, residue, or combinations thereof; these materials were in sealed drums and other metal containers.

Building 38
Building 38 was originally designed to be a radiochemical processing facility for ^{238}Pu used in the oxide form as fuel for radioisotopic thermoelectric generators (RTGs). Building design began in 1965, and construction was complete in December 1967. Assembly and disassembly associated with manufacturing ^{238}Pu heat source modules for RTGs were the primary operations in Building 38. Other programs included assembly of three types of heat sources and two types of RTGs and general purpose radionuclide handling. RTG and heat source assembly and disassembly, which were supported in the F-line operations, involved the 5-w, High Power Generator Mod 3, and General Purpose Heat Sources programs.

Building 50
Building 50 was an RTG assembly and test laboratory. Encapsulated ^{238}Pu fuel was loaded into graphite assemblies in Building 38 and welded into stainless-steel containers. The containers were transferred to Building 50 for fuel reduction and subsequent installation in electrical converters.

Building 22, Waste Staging Facility
The Waste Staging Facility (WSF) provided storage and staging for solid low-level radioactive waste (LLW) containers before offsite shipment. The facility could store as many as 186 metal boxes, stage lined and unlined 30- or 55-gal metal drums with or without overpack, and staged closed wooden boxes that contained LLW. Transition to the WSF was complete in June 1995. Building 22, built in 1967, previously housed a property management warehouse, office spaces, and a test facility for glovebox operations.

Building 72
Building 72 was used to store miscellaneous hazardous wastes until they could be shipped off the site for disposal. The wastes were in steel drums, plastic drums, plastic and steel containers of various sizes, and gas cylinders. In addition, waste sampling, packaging, and repackaging of some wastes; drum over packing; and container inspection and marking occurred in this facility. Building 72 was a steel-framed building with metal panel siding on three walls.

Table 4-1 lists significant programs and events that occurred at the Mound Plant that are potentially relevant to dose reconstruction.

Table 4-1. Significant programs and events.[a]

Year	Description
1946	Mound Plant planning started.
1948	Mound Plant occupied.
1949	Polonium operations moved from Dayton Units to Mound Plant.
1950	Separation of Po-208 and Po-209 from proton (accelerator) irradiation of bismuth. Separation of Ac-227 from irradiated Ra-226 in Room SW-19 (old cave). Uranyl sulfate – heavy water fuel system research. Civilian power reactor research involving uranium, Pa-231, and Pu-239; mission ended in 1963.
1954	Invention of Po-210-fueled thermoelectric generator. Tritium studies began in 1954, with the first of several programs requiring tritium-handling technology starting in 1958. There were facilities for the recovery and purification of tritium from all types of wastes generated at DOE sites that handled tritium. Construction of thorium refinery for breeder reactor program; refinery never operated. In late 1954, Mound Plant received 400 tons of Th-232 sludge from Brazilian ore residues, which was subsequently stored outdoors in 55-gal drums.
1955	Repackaging of 6,000 55-gal drums containing thorium ore and sludge occurred through 1965 at three different times to help prevent possibility of further contamination. In 1964, the thorium sludge was transferred to a special building for storage. Early in 1975, the thorium ore residues were removed from Mound and sold to a commercial organization.
1956	Completed separation of 1.3 g of Pa-231 in HH Building. Weighable quantities of Th-230 (ionium) separated. PuBe (Pu-239) neutron sources manufactured. Nuclear weapon detonator development, production, and surveillance; mission ended in 1989.
1959	Pu-239 reactor fuels laboratory operational. Tritium waste recovery and purification facility operational.
1960	The first reduction of metallic Pu-238 was achieved in the spring of 1960.
1961	Pu-238 production started and development of Pu-238 heat sources for thermoelectric generators.
1965	Gaseous effluent control system operational in SW Building.
1966	Thorium ore and sludge moved to bulk storage in Building 21.
1968	PP (Plutonium Processing) Building 38 operational for processing Pu-238.
1969	Waste line break and subsequent contamination of abandoned Miami-Erie Canal bed with Pu-238. Began tritium recycling from retired weapon parts.
1972	Tritium effluent control project began. Nonweapons polonium work terminated.
1974	Thorium ore and sludge completely removed from site. Po-210 decontamination of T Building completed.
1975	Pu-238 recovery operations terminated.
1977	Californium Multiplier Neutron Radiography Facility installed.
1989	Removal of soil contaminated with uranium near Building 34.
1990	Pu-238 decontamination of inactive laboratories in R Building.
1991	Removal of Pu-238-contaminated waste line connecting HH Building with WD Building.
1993	DOE decision to transfer defense mission from Mound. Pu-238 decontamination of PP Building 38 and Acid Leach Field (Area D).
1994	Demolition of SM (Special Metallurgical) Building structure contaminated with Pu-238.
1995	All weapon components production terminated.
1996	Demolition of SD Building (sanitary waste treatment facility) and Building 21 (thorium ore and sludge bulk storage facility), including excavation of contaminated soil. Miami-Erie Canal removal action (Pu-238-contaminated sediments) fieldwork began in October.
1997	Removal of soil contaminated with Ac-227 at Area 7.
1998	Miami-Erie Canal removal action fieldwork completed; approximately 30,000 yd^3 removed for offsite disposal.
2003	Operations ceased.
2010	Remediation activities completed.

a. Adapted from DOE (1993a, 1999, 2011) and EPA (2003).

Most early programs were concerned with ^{210}Po and its applications, particularly the fabrication of neutron and alpha sources for weapon and nonweapon use. From 1950 to 1963, laboratory investigations of uranium, ^{231}Pa, and ^{239}Pu were part of the national civilian power reactor program.

Separation of stable isotopes of noble gases began in 1954. In addition, in 1954 Mound scientists invented the thermoelectric generator fueled with ^{210}Po. A limited amount of research and development work with ^{239}Pu in gram quantities began in 1955. In 1957, Mound Plant began the development, production, and surveillance of detonators for military applications. Beginning in 1959, ^{238}Pu in quantities up to a kilogram was used in research, development, and production operations; however, *Summary of Environmental Monitoring Report for 1959 and First Quarter 1960* states that "during the year 1959, a year of transition, the alpha-emitting isotope that would have contributed to environmental background was polonium" (Monsanto 1960).

From 1959 to 1960, the initial plutonium program activities were conducted in R Building. During this early phase, the program consisted of research and development efforts to understand the chemistry and metallurgy of ^{238}Pu. The thermal hazards as well as the chemical reactivity and containment of plutonium during processing and fabrication led to major safety concerns.

In 1960, the SM Building was constructed to provide the technical and safety-related features that were absent in the R Building. The elevated emissions of plutonium (see Section 4.2.2) in 1960 were due to R Building operations. The SM Building became operational in 1961 and emissions of plutonium decreased significantly (see Section 4.2.2). In 1967, Building 38 [also known as the Plutonium Processing Building (PP)] and an annex on the WD Building were constructed to take over the increased plutonium program demands. The SM Building processes and fabrication operations were transferred to the new Building 38 facility.

The total quantity of ^{238}Pu used in operations at Mound Plant was sharply reduced in June 1977. Encapsulation of ^{238}Pu for the large heat sources (containing in some cases more than 4 kg of this material) was terminated. In late 1979, Mound ended production of plutonium oxide feedstock for heat sources and began receiving this material already in primary encapsulation.

4.2.1 Environmental Air Monitoring

The Mound Plant had various environmental air monitoring programs through most of its history, starting in 1948 and continuing to the present. Gross alpha, HTO, ^{210}Po, ^{238}Pu, $^{239/240}$Pu, ^{228}Th, ^{230}Th, and ^{232}Th measurements occurred during these years, although not all measurements were collected in any given year. The tables in Attachments B, C, and D list environmental air monitoring data from 1948 to September 1959, 1959 to 1972, and 1973 to 2002, respectively, along with references for the data.

From 1948 to 1959, air monitoring consisted of offsite, downwind air samples taken at unspecified locations and counted for gross alpha radiation. From 1960 to 1966, Mound conducted roving air sampler measurements of gross alpha activity obtained by truck-mounted equipment driven over a planned route in areas adjacent to the Mound Plant. From 1967 to 1971, Mound monitored concentrations of HTO, ^{238}Pu, and ^{210}Po off the site. Available data do not contain onsite air sampling data for these three periods (with the exception of 1971, when "Site Center, Southern and Northern Perimeter" data were acquired). The usefulness of the offsite data before 1971 are limited because the air samples were not collected in one location around the clock. Therefore, it is not certain if the offsite concentrations reflect a maximum or even average concentration. As a consequence, the offsite data cannot be used to infer onsite airborne radionuclide concentrations.

A program to acquire onsite meteorological data began in 1972 (Eimutis and Mote 1976). The average onsite wind speed was approximately 8 mph (13 km/hr) and the predominant wind direction

was from the southwest. From 1972 to 2002, air monitoring data were obtained from a network of onsite (Figure 4-1) and offsite (Figure 4-2) stationary air samplers. This analysis used the sitewide median air concentration from the annual average onsite air monitoring station results to determine intake concentrations from 1971 through 2002 (see Tables C-13, C-14, and D-1 through D-29). For years in which onsite air monitoring data were unavailable (before 1971) and effluent data were available, empirically derived onsite atmospheric dispersion factors (χ/Q) for plutonium, polonium particulates, and HTO were used to estimate the intake air concentration. Table 4-2 summarizes the annual median effluent air concentrations used to derive intakes for dose reconstruction. Subsequent sections discuss the intakes estimated from these data and effluent release monitoring data.

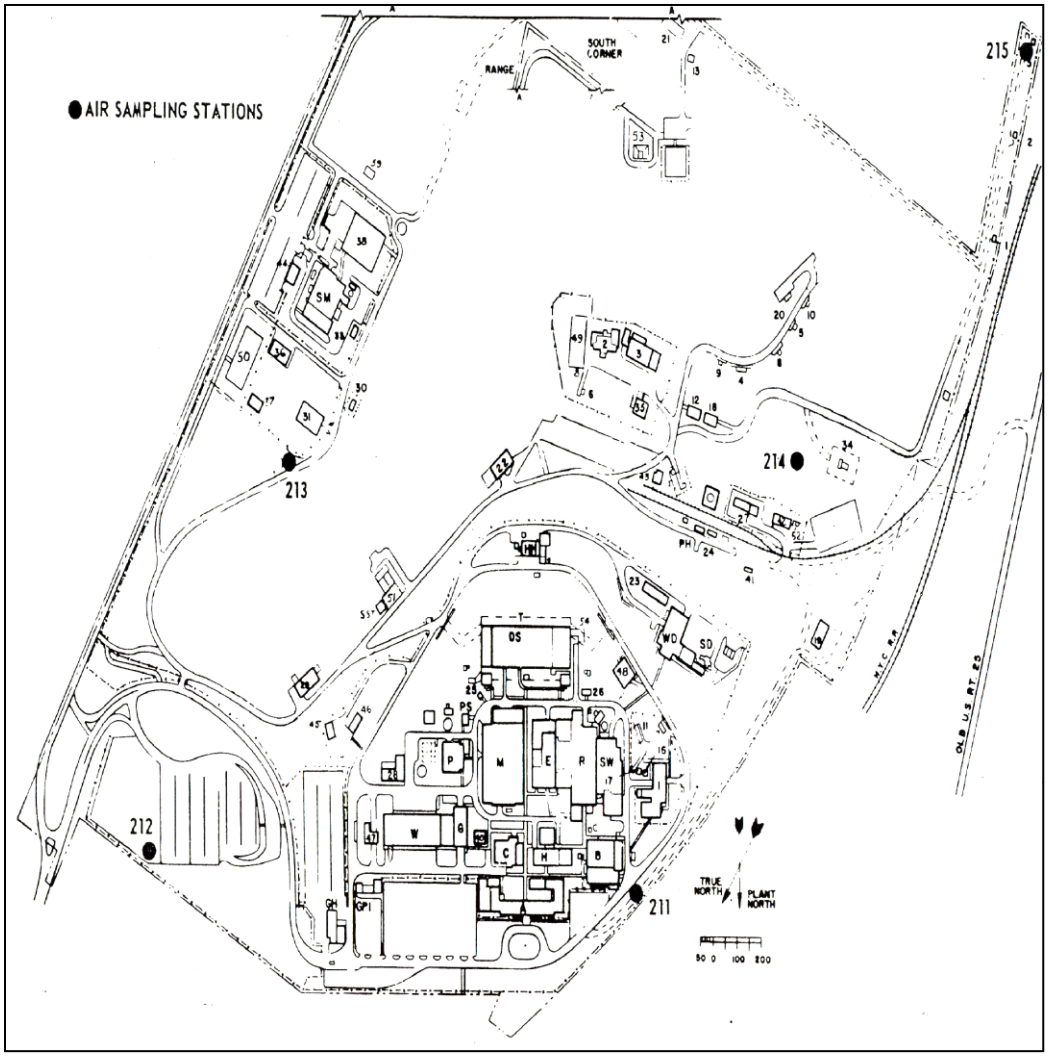

Figure 4-1. Mound onsite airborne radioactivity monitoring locations.

Some of the environmental air monitoring station results (See Tables C-13, C-14, and D-1 through D-30) were reported as "incremental" to reflect that the measured "environmental level" concentration at the control (28 mi upwind) location was subtracted from the concentration at the monitoring stations. As a consequence, if nonincremental concentration results were reported, the contribution from control location No. 119 was subtracted from the sitewide median results. For all years for which onsite environmental air monitoring data were available, the median concentration from the onsite annual average monitoring station results was selected to assign radionuclide intakes. For years for which onsite air monitoring data were unavailable (before 1971) and effluent data were available, empirically derived onsite atmospheric dispersion factors (χ/Qs) for plutonium, polonium particulates, and HTO were used to estimate the onsite intake air concentration.

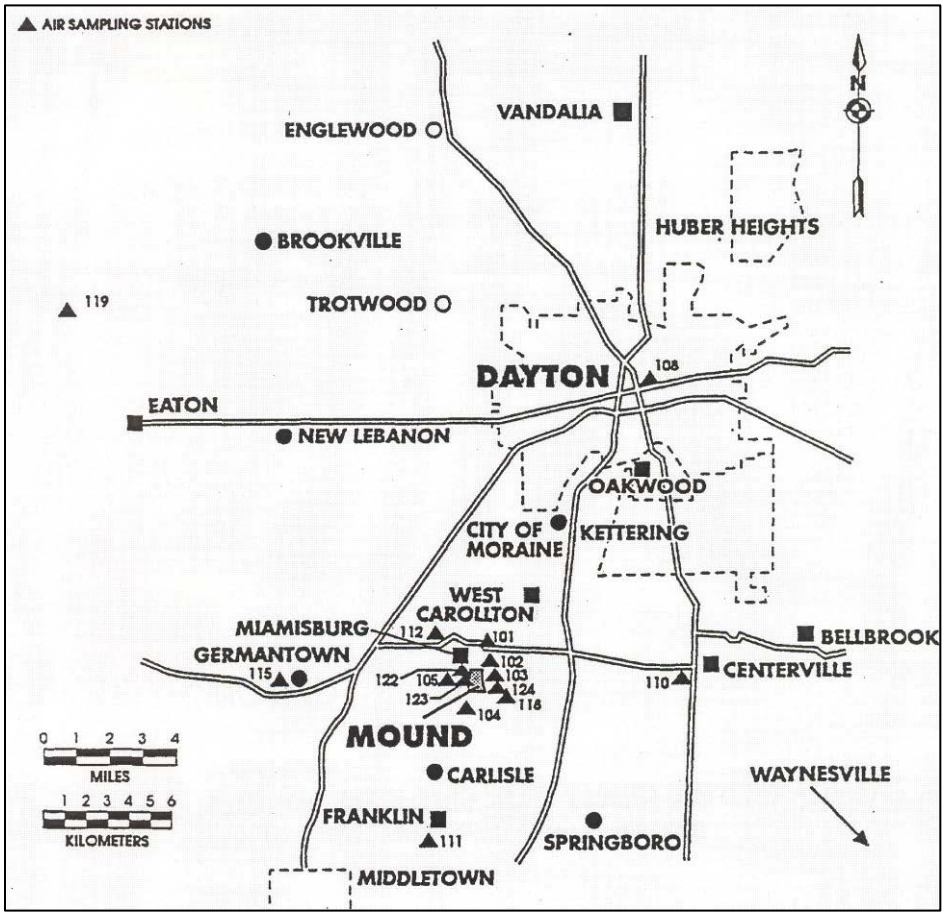

Figure 4-2. Mound offsite airborne radioactivity monitoring locations.

In 1997, Mound Plant added ^{232}Th, ^{230}Th, and ^{228}Th to the environmental air filter analyses conducted as part of the routine environmental air monitoring program in support of several decontamination and decommissioning (D&D) projects involving thorium-contaminated soil and structures. Although these radionuclides are not effluents, the median of the annual average environmental air monitoring station results for ^{232}Th, ^{230}Th, and ^{228}Th are included in this section.

To account for trace radionuclides that were not included in the routine environmental air or effluent discharge sampling and analysis programs at Mound, ^{238}Pu scaling factors were developed based on an assay of the feed material (plutonium dioxide) from the Savannah River Site (SRS), as listed below. As a result, the scaling factor (activity concentration ratio) table (Table 4-3) infers concentrations of trace radionuclides and $^{239/240}$Pu for years in which effluent or air monitoring station data include only ^{238}Pu.

Table 4-2. Sitewide annual median effluent intake concentrations by radionuclide (µCi/mL).

Year	Pu-238	Po-210	HTO	Pu-239/240	Th-232	Th-230	Th-228	Ra-226	Ac-227
1949	No data	1.18E–13	No data	No data	No data	No data	No data	No data	No data
1950	No data	1.18E–13	No data	No data	No data	No data	No data	No data	No data
1951	No data	1.18E–13	No data	No data	No data	No data	8.16E–19	1.57E–18	4.94E–19
1952	No data	1.18E–13	No data	No data	No data	No data	8.16E–19	1.57E–18	4.94E–19
1953	No data	1.18E–13	No data	No data	No data	No data	8.16E–19	1.57E–18	4.94E–19
1954	No data	1.42E–13	1.59E–10	No data	No data	No data	No data	No data	No data
1955	No data	1.71E–13	1.75E–10	No data	No data	No data	No data	No data	No data
1956	No data	2.05E–13	1.92E–10	No data	No data	No data	No data	No data	No data

Year	Pu-238	Po-210	HTO	Pu-239/240	Th-232	Th-230	Th-228	Ra-226	Ac-227
1957	No data	2.46E–13	2.11E–10	No data	No data	No data	No data	No data	No data
1958	No data	2.95E–13	2.33E–10	No data	No data	No data	No data	No data	No data
1959	No data	3.54E–13	2.56E–10	No data	No data	No data	No data	No data	No data
1960	6.83E–13	4.24E–13	8.31E–10	2.20E–14	No data	No data	No data	No data	No data
1961	4.37E–16	5.09E–13	1.95E–09	1.41E–17	No data	No data	No data	No data	No data
1962	3.82E–16	6.11E–13	1.98E–09	1.23E–17	No data	No data	No data	No data	No data
1963	2.95E–16	7.33E–13	2.55E–09	9.50E–18	No data	No data	No data	No data	No data
1964	6.88E–16	8.80E–13	2.13E–09	2.22E–17	No data	No data	No data	No data	1.53E–03
1965	1.58E–14	1.06E–12	1.68E–09	5.10E–16	No data	No data	No data	No data	1.53E–03
1966	8.31E–14	1.27E–12	1.62E–09	2.68E–15	No data	No data	No data	No data	1.53E–03
1967	1.48E–13	1.37E–12	2.96E–09	4.78E–15	No data	No data	No data	No data	1.53E–03
1968	1.56E–14	3.54E–13	2.24E–09	5.03E–16	No data	No data	No data	No data	1.53E–03
1969	2.88E–14	2.70E–13	2.56E–09	9.27E–16	No data	No data	No data	No data	No data
1970	1.19E–14	1.94E–13	1.46E–09	3.82E–16	No data	No data	No data	No data	No data
1971	4.00E–16	2.00E–15	4.80E–09	1.29E–17	No data	No data	No data	No data	No data
1972	1.40E–16	1.30E–15	8.20E–11	4.51E–18	No data	No data	No data	No data	No data
1973	1.56E–16	1.10E–15	7.40E–11	5.03E–18	No data	No data	No data	No data	No data
1974	1.88E–16	1.10E–15	1.53E–10	6.06E–18	No data	No data	No data	No data	No data
1975	6.40E–17	No data	2.90E–11	3.00E–18	No data	No data	No data	No data	No data
1976	8.40E–17	No data	2.00E–11	2.20E–18	No data	No data	No data	No data	No data
1977	2.80E–17	No data	1.60E–11	0.00E+00	No data	No data	No data	No data	No data
1978	2.50E–17	No data	6.20E–12	4.00E–18	No data	No data	No data	No data	No data
1979	1.60E–17	No data	8.60E–12	5.00E–19	No data	No data	No data	No data	No data
1980	8.80E–18	No data	8.88E–11	6.00E–19	No data	No data	No data	No data	No data
1981	2.07E–17	No data	6.76E–11	0.00E+00	No data	No data	No data	No data	No data
1982	2.39E–17	No data	3.93E–11	0.00E+00	No data	No data	No data	No data	No data
1983	1.32E–17	No data	3.43E–11	1.30E–18	No data	No data	No data	No data	No data
1984	2.32E–17	No data	2.21E–11	3.00E–19	No data	No data	No data	No data	No data
1985	1.26E–16	No data	2.73E–11	6.30E–19	No data	No data	No data	No data	No data
1986	9.34E–17	No data	2.13E–11	4.50E–19	No data	No data	No data	No data	No data
1987	4.35E–17	No data	3.33E–11	1.60E–19	No data	No data	No data	No data	No data
1988	5.80E–17	No data	2.41E–11	2.00E–19	No data	No data	No data	No data	No data
1989	1.50E–17	No data	2.50E–11	2.90E–19	No data	No data	No data	No data	No data
1990	5.64E–18	No data	1.86E–11	7.00E–20	No data	No data	No data	No data	No data
1991	7.70E–18	No data	1.17E–11	0.00E+00	No data	No data	No data	No data	No data
1992	5.83E–18	No data	7.43E–12	2.40E–19	No data	No data	No data	No data	No data
1993	7.10E–18	No data	4.16E–12	3.90E–19	No data	No data	No data	No data	No data
1994	7.29E–18	No data	3.69E–12	3.10E–19	No data	No data	No data	No data	No data
1995	5.99E–18	No data	2.11E–12	1.20E–19	No data	No data	No data	No data	No data
1996	5.94E–18	No data	6.94E–12	8.00E–20	No data	No data	No data	No data	No data
1997	2.06E–17	No data	7.19E–12	0.00E+00	2.14E–18	4.47E–18	3.00E–18	No data	No data
1998	5.11E–18	No data	1.01E–11	7.00E–20	1.80E–19	0.00E+00	0.00E+00	No data	No data
1999	1.43E–18	No data	8.45E–12	1.50E–19	4.42E–18	4.41E–18	4.60E–18	No data	No data
2000	4.08E–18	No data	2.28E–12	1.70E–19	2.91E–18	4.12E–18	3.71E–18	No data	No data
2001	4.01E–18	No data	4.83E–12	3.00E–20	2.25E–18	3.04E–18	3.79E–18	No data	No data
2002	3.76E–18	No data	3.50E–12	1.90E–19	0.00E+00	0.00E+00	0.00E+00	No data	No data
2003	No data	No data	No data	No data	No data	No data	No data	No data	No data

The feed material profile discussed above was adjusted to reflect the actual observed air sample ratio of ^{238}Pu to $^{239/240}$Pu to infer the $^{239/240}$Pu concentration in air for years in which only ^{238}Pu data were available. The actual activity concentration ratio for $^{239/240}$Pu was inferred from measurements of air samples taken by Mound for 1975 through 1980 (see Table 4-4.). The observed ratio of ^{238}Pu to $^{239/240}$Pu in air samples from onsite sampling stations recording the highest annual average plutonium

Table 4-3. SRS plutonium dioxide feed material and Mound scaling factors.

Radionuclide	Half-life (yr)	Specific activity (Ci/g)	Reported weight fraction	Activity concentration (Ci/g)	Theoretical activity fraction	Theoretical Pu-238 activity concentration ratios	Corrected[a] Pu-238 activity concentration ratios
Pu-236[b]	2.86E+00	5.30E+01	1.00E–06	5.30E–05	3.69E–06	3.86E–06	No data
Pu-238[b]	8.77E+01	1.71E+01	8.02E–01	1.37E+01	9.56E–01	1.00E+00	No data
Pu-239[b]	2.41E+04	6.20E–02	1.59E–01	9.86E–03	6.86E–04	7.18E–04	No data
Pu-240[b]	6.56E+03	2.27E–01	3.00E–02	6.81E–03	4.74E–04	4.96E–04	No data
Pu-239/240	No data	No data	No data	No data	1.16E–03	1.21E–03	3.22E–02
Pu-242[b]	3.73E+05	3.96E–03	1.00E–03	3.96E–06	2.76E–07	2.88E–07	No data
Pu-241[b]	1.44E+01	1.03E+02	6.00E–03	6.20E–01	4.31E–02	4.52E–02	No data
U-234[c]	2.46E+05	6.22E–03	1.90E–03	1.18E–05	8.22E–07	8.61E–07	No data
Np-237[c]	2.14E+06	7.05E–04	3.00E–04	2.12E–07	1.47E–08	1.54E–08	No data
Am-241[c]	4.32E+02	3.43E+00	5.00E–04	1.72E–03	1.19E–04	1.25E–04	No data
Pa-231[c]	3.28E+04	4.72E–02	1.00E–05	4.72E–07	3.28E–08	3.44E–08	No data
Th-232[c]	1.41E+10	1.10E–07	1.00E–05	1.10E–12	7.63E–14	7.99E–14	No data
U-232[c]	6.89E+01	2.24E+01	1.00E–05	2.24E–04	1.56E–05	1.63E–05	No data
U-235[c]	7.04E+08	2.16E–06	1.00E–05	2.16E–11	1.50E–12	1.57E–12	No data
U-236[c]	2.34E+07	6.47E–05	1.00E–05	6.47E–10	4.50E–11	4.71E–11	No data
Ac-227[c]	2.18E+01	7.23E+01	1.00E–05	7.23E–04	5.03E–05	5.27E–05	No data
Total	Not applicable	Not applicable	**1.00E+00**	**1.44E+01**	**1.00E+00**	Not applicable	Not applicable

a. The actual ratio of Pu-238 to Pu-239/240 based on air sample analytical results for 5 years (1975 to 1980) is 31.0:1. This ratio was calculated using the annual mean concentration of Pu-238 and Pu-239 at maximum sampler location and corrected for offsite contributions of Pu-238 and Pu-239/240 indicated at the location of the minimum Pu-238 and Pu-239/240 offsite concentrations. (These data are presented in Table 4-4.)
b. EG&G (1995a).
c. DOE (1993a).

Table 4-4. ^{238}Pu:$^{239/240}$Pu annual mean activity concentrations and ratios inferred from measurements of environmental air samples (10^{-18} µCi/mL).[a]

Year	Highest onsite Pu-238	Lowest offsite Pu-238	Highest onsite Pu-239/240	Lowest offsite Pu-239/240	Pu-238:Pu-239/240 net activity concentration ratio
1975	1,033	1.2	41.0	16.0	41.3
1976	267	0.5	13.0	3.8	29.0
1977	81	0.9	31.0	16.0	5.3
1978	110	0.8	27.0	22.0	21.8
1979	190	0.5	11.0	7.4	52.6
1980	58	0.2	4.9	3.3	36.1
Min.	58	0.2	4.9	3.3	5.3
Max.	1,033	1.2	41.0	22.0	52.6
Median	150	0.7	20.0	11.7	32.5
Mean	290	0.7	21.3	11.4	31.0
StdDev	372	0.4	13.8	7.7	16.4

a. Data from Attachment D, Tables D-3 through D-8.

concentration from 1975 to 1980 is 31.0 to 1 in comparison with the theoretical ratio of 824 (i.e., the inverse of the theoretical $^{239/240}$Pu activity concentration shown above). The discrepancy between the feed material ratio of ^{238}Pu to $^{239/240}$Pu and the observed air sample ratio of ^{238}Pu to $^{239/240}$Pu is probably the result of $^{239/240}$Pu effluent emissions associated with $^{239/240}$Pu research rather than the SRS feed material profile.

The relative internal dose contribution from radionuclides in SRS plutonium dioxide feed material was assessed using International Commission on Radiological Protection Publication 68 dose conversion factors (DCFs) as discussed below (ICRP 1995). Most of the internal dose (99.8%) is attributable to ^{238}Pu (96.5%) and $^{239/240}$Pu (3.3%). As a result, dose reconstructors should neglect the internal dose

contribution from trace radionuclides other than $^{239/240}$Pu in effluent associated with the feed material. See Table 4-5.

Table 4-5. SRS plutonium dioxide feed material relative dose contribution.

Radionuclide	ICRP (1995) DCF (Sv/Bq)	Activity concentration (Ci/g)	Activity fraction	Weighted DCF	Percent dose contribution
Pu-236	1.30E–05	5.30E–05	3.58E–06	4.66E–11	1.61E–04
Pu-238[a]	3.00E–05	1.37E+01	9.28E–01	2.78E–05	9.65E+01
Pu-239/240[a]	3.20E–05	4.42E–01	2.99E–02	9.56E–07	3.31E–00
Pu-242	3.10E–05	3.96E–06	2.68E–07	8.30E–12	2.88E–05
Pu-241	5.80E–07	6.20E–01	4.19E–02	2.43E–08	8.42E–02
U-234	6.80E–06	1.18E–05	7.99E–07	5.43E–12	1.88E–05
U-235	6.10E–06	2.16E–11	1.46E–12	8.91E–18	3.09E–11
U-236	6.30E–06	6.47E–10	4.37E–11	2.76E–16	9.55E–10
U-232	2.60E–05	2.24E–04	1.51E–05	3.93E–10	1.36E–03
Am-241	2.70E–05	1.72E–03	1.16E–04	3.13E–09	1.08E–02
Pa-231	8.90E–05	4.72E–07	3.19E–08	2.84E–12	9.84E–06
Th-232	2.90E–05	1.10E–12	7.41E–14	2.15E–18	7.45E–12
Np-237	1.50E–05	2.12E–07	1.43E–08	2.14E–13	7.43E–07
Ac-227	6.30E–04	7.23E–04	4.89E–05	3.08E–08	1.07E–01

a. Dosimetrically significant.

For years in which onsite air monitoring data were unavailable (before 1971) and total annual stack effluent data were available, empirically derived onsite atmospheric dispersion factors (χ/Qs) for plutonium, polonium particulates, and HTO were used to estimate the intake air concentration.

The χ/Q derivation coupled the sitewide median air concentration (^{238}Pu, ^{210}Po, and ^{3}H concentration) with the corresponding total annual effluent discharges (Table 4-6). This derivation was repeated for the 11-year period from1973 to 1983 for plutonium and HTO and for 1 year (1973) for polonium. For assigning an intake concentration, the 11- and 1-year average χ/Q was selected: 8.61×10^{-5} s/m^3 for plutonium, 5.12×10^{-4} s/m^3 for polonium, and 2.56×10^{-7} s/m^3 for tritium (Table 4-7). The calculated dispersion factor data for the 11- and 1-year period are listed in Table 4-7 below.

Polonium production and research at Mound were discontinued in the early 1970s (DOE 1993a). Polonium effluent discharge data are available only for 1953, 1973, and 1974; as a result, the ratio of ^{210}Po to ^{238}Pu observed in environmental air samples was used to infer the ^{210}Po effluent release rate from 1967 through 1970. In addition, the 1973 and 1974 onsite polonium air monitoring results were influenced by the D&D of the Mound polonium processing facilities (DOE 1993a). As a consequence, the 1974 polonium effluent and air monitoring results in Table 4-7 were not used in the χ/Q derivation for polonium.

4.2.2 Effluent Intake Concentrations

The following discussion describes the technical approach used to establish airborne radionuclide concentrations to determine radionuclide intakes (Section 4.2.5) and submersion exposures (Section 4.2.6). Section 4.2.7 describes the technical approach and results for the contaminated soil exposure pathways. These exposure pathways are (1) resuspension intakes, (2) external submersion, and (3) direct external from the contaminated soil layer.

For ^{238}Pu, the effluent concentration data from 1971 through 2002 are based on the median onsite annual environmental air monitoring results. From 1960 through 1970, the effluent concentration data are based on the reported ^{238}Pu annual effluent source term from Table 4-6 combined with the derived

Table 4-6. Total radioactive effluent discharges, 1949 to 1983.[a]

Year	Pu-238 (µCi)	Po-210:Pu-238 ratio[b]	Po-210 (µCi)	H-3 (Ci)	Ra-226 (µCi)	Ac-227 (µCi)	Th-228 (µCi)
1949	No data	No data	7,305	No data	No data	No data	No data
1950	No data	No data	7,305	No data	No data	No data	No data
1951	No data	No data	7,305	No data	0.097	0.03	0.05
1952	No data	No data	7,305	No data	0.097	0.03	0.05
1953	No data	No data	7,305	No data	0.097	0.03	0.05
1954	No data	No data	8,773[c]	18,616[d]	No data	No data	No data
1955	No data	No data	10,509	20,685	No data	No data	No data
1956	No data	No data	12,623	22,983	No data	No data	No data
1957	No data	No data	15,148	25,537	No data	No data	No data
1958	No data	No data	18,177	28,374	No data	No data	No data
1959	No data	No data	21,806	31,527	No data	No data	No data
1960	250,125[e]	0.10	26,161	102,427	No data	No data	No data
1961	160	196.25	31,400	240,644	No data	No data	No data
1962	140	268.24	37,554	244,455	No data	No data	No data
1963	108	417.84	45,127	313,932	No data	No data	No data
1964	252	215.40	54,279	262,638	No data	1.06	No data
1965	5,803	11.20	65,009	206,750	No data	1.06	No data
1966	30,442	2.57	78,263	199,561	No data	1.06	No data
1967	54,347	1.55	84,238	364,685	No data	1.06	No data
1968	5,720	3.82	21,850	275,856	No data	1.06	No data
1969	10,544	1.58	16,660	315,252	No data	No data	No data
1970	4,342	2.76	11,984	179,468	No data	No data	No data
1971	401	3.38	1,355	73,503	No data	No data	No data
1972	74	5.75	426	30,483	No data	No data	No data
1973	84	0.81	68[f]	15,331	No data	No data	No data
1974	28	0.025	0.7[f]	10,031	No data	No data	No data
1975	23	No data	No data	8,859	No data	No data	No data
1976	15	No data	No data	6,206	No data	No data	No data
1977	12	No data	No data	4,896	No data	No data	No data
1978	14	No data	No data	7,346	No data	No data	No data
1979	12	No data	No data	3,831	No data	No data	No data
1980	15	No data	No data	3,795	No data	No data	No data
1981	8	No data	No data	4,285	No data	No data	No data
1982	21	No data	No data	4,283	No data	No data	No data
1983	4	No data	No data	4,293	No data	No data	No data

a. Adapted from DOE (1993a).
b. From 1967 through 1972, the ratio of Po-210 to Pu-238 is based on radionuclide-specific (Pu-238 and Po-210) analyses of offsite (onsite for 1972) air samples obtained at the 0- to 3-mi roving locations from 1967 to 1972 (see Attachment C, Tables C-9 through C-14).
c. For 1954 through 1966, it is assumed that the Po-210 release rate increased 20% each year from the constant value for 1949 through 1953.
d. For 1954 through 1958, it is assumed that the HTO release rate decreased 10% each year from that reported for 1959.
e. Elevated Pu-238 levels due to R Building operations before the SM Building becoming operational in 1961. In 1962, a second bank of high-efficiency particulate air filters was installed in the SM Building plenum (DOE 1993a).
f. 1973 and 1974 Po-210 effluent data (Carfagno and Westendorf 1974; Carfagno and Robinson 1975).

atmospheric dispersion factor for ^{238}Pu from Table 4-7 to infer the median onsite environmental concentration.

For ^{210}Po, the effluent concentration data from 1971 through 1974 are based on the median onsite annual environmental air monitoring results. From 1967 through 1970, the data are based on reported ^{238}Pu annual effluent source terms (scaled to infer ^{210}Po based on the ratio of ^{210}Po to ^{238}Pu in air samples) combined with the derived atmospheric dispersion factor for polonium from Table 4-7

Table 4-7. Inferred onsite dispersion factors (χ/Q, s/m^3) by radionuclide, 1973 to 1983.

Year	H-3	Pu-238	Po-210
1973[a]	1.52E–07	5.86E–05	5.12E–04
1974[b]	4.81E–07	2.12E–04	4.96E–02
1975	1.03E–07	8.78E–05	No data
1976	1.02E–07	1.77E–04	No data
1977	1.03E–07	7.36E–05	No data
1978	2.66E–08	5.64E–05	No data
1979	7.08E–08	4.21E–05	No data
1980[c]	7.38E–07	1.85E–05	No data
1981[d]	4.98E–07	8.17E–05	No data
1982	2.90E–07	3.59E–05	No data
1983	2.52E–07	1.04E–04	No data
N	11	11	2
Min.	2.66E–08	1.85E–05	5.12E–04
Max.	7.38E–07	2.12E–04	4.96E–02
Mean	2.56E–07	8.61E–05	2.51E–02

a. Po-210 χ/Q used in this analysis based on 1973 data.
b. Year of maximum Po-210 χ/Q due to Mound D&D Program activity.
c. Year of maximum H-3 χ/Q.
d. Year of maximum Pu-238 χ/Q.

to infer median onsite environmental concentrations. As discussed above, polonium effluent discharge data are available only for 1953, 1973 and 1974; as a consequence, for 1949 through 1953 it is assumed that the ^{210}Po effluent source term remained constant at the 20-µCi/d level (Bradley 1953a). For 1954 through 1966, it is assumed that the ^{210}Po release rate increased 20% each year from the constant daily values for 1949 through 1953 (Table 4-6). This annual increase was considered necessary and reasonable to extrapolate between 1953 and 1967 effluent release rates. The ^{210}Po annual effluent source terms for 1949 through 1966 were combined with the atmospheric dispersion factor derived for polonium (Table 4-7) to infer onsite environmental concentrations.

For HTO, the data from 1971 through 2002 are based on the median onsite annual environmental air monitoring results. Beginning in 1959 through 1970, the data are based on reported tritium effluent source terms (Table 4-6) combined with the derived atmospheric dispersion factor derived for tritium in Table 4-7 to infer onsite environmental concentrations. No data were available for 1954 through 1958. To estimate the amounts of tritium effluent, data for 1958 was assumed to be 90% of the measured effluent for 1959 (31,527 Ci/yr); data for 1957 was assumed to be 90% of the value assigned to 1958, etc. For 1954 through 1958, the HTO annual effluent source terms were combined with the derived atmospheric dispersion factor for tritium to infer onsite median environmental concentrations.

From 1951 through 1953, Mound intermittently conducted a research and development program to recover ^{227}Ac, ^{226}Ra, and ^{228}Th from neutron-irradiated ^{226}Ra. The three parent radionuclides of ^{227}Ac, ^{226}Ra, and ^{228}Th, and their radioactive progeny, were in the irradiated material. The recovery operation was conducted in a special shielded process facility referred to as the old cave (Room SW-19) on the east side of the building (EG&G 1995a). From 1951 to 1953, work in the cave resulted in the release of 1.6×10^5 µCi of ^{227}Ac, ^{226}Ra, ^{228}Th and their radioactive progeny (Storey 1973). At the completion of the program, 47.5 Ci of ^{226}Ra, 14.9 Ci of ^{227}Ac, and 24.6 Ci of ^{228}Th were purified.

Health Physics Monthly Information Reports before September 1952 do not contain useful air sample or effluent data from the Ra-Ac Program work areas. Beginning in September 1952, most of the Monthly and Quarterly Health Physics Reports contain a summary of the monthly average of initial air filter counts and a summary of the monthly average of final air filter counts performed between 20 to

30 days after the initial count. Initial and final air sample counting data from high-risk Ra-Ac work areas are listed in Table 4-8. These data were used to calculate the release rate of long-lived radionuclides (^{227}Ac, ^{226}Ra, and ^{228}Th) from the release of 1.6×10^5 µCi reported by Storey (1973) assuming equal quantities were released each year from 1951 through 1953 and assuming the long-lived radionuclides consisted of ^{227}Ac, ^{226}Ra, and ^{228}Th in the same proportion as the amounts purified at the completion of the program (55% ^{226}Ra, 17% ^{227}Ac, and 28% ^{228}Th).

Table 4-8. Ratio of initial to final air sample counts from Ra-Ac program areas.

High-risk Ra, Ac, and Th area air samples	Month/year	Ratio of initial to final count	Reference
GP1A	September 1952	2E+04	Bradley 1952a
General Purpose (GP) cave	November 1952	5E+04	Bradley 1952b
GP lab	December 1952	3E+04	Bradley 1952c
GP exhaust	February 1953	1E+05	Bradley 1953a
GP high-risk area air samples (5)	April 1953	2E+06	Bradley 1953b
GP high-risk area air samples (5)	May 1953	1E+06	Bradley 1953c
GP high-risk area air samples (5)	June 1953	8E+04	Bradley 1953d
GP high-risk area air samples (5)	July 1953	6E+04	Bradley 1953e
GP high-risk area air samples (5)	August 1953	3E+03	Bradley 1953f
High-risk air lock	September 1953	3E+04	Bradley 1953g
High-risk air lock	October 1953	1E+05	Bradley 1953h
High-risk air lock	November 1953	2E+05	Bradley 1953i
High-risk air lock	December 1953	5E+04	Bradley 1953j
Average	Not applicable	3E+05	Not applicable
Minimum	Not applicable	3E+03	Not applicable
Maximum	Not applicable	2E+06	Not applicable

The median sitewide intake concentrations of ^{227}Ac, ^{226}Ra, and ^{228}Th in Table 4-2 were calculated assuming that the T west polonium stack was the source of the emissions with a dispersion factor (χ/Q) of 5.12×10^{-4} s/m^3.

From 1964 through 1968, purified ^{227}Ac in oxide and nitrate forms was processed in a hot cell and analytical lab area (Room SW-140) in the SW Building (EG&G 1995a). This work resulted in the release of 5.3 µCi of ^{227}Ac to the atmosphere (Storey 1973).

The median sitewide concentration of ^{227}Ac in Table 4-2 was calculated assuming that equal quantities were released each year from 1964 through 1968 from the T west polonium stack with a dispersion factor (χ/Q) of 5.12×10^{-4} s/m^3.

Table 4-2 lists the annual average effluent median intake concentrations used to calculate annual worker intakes described in Section 4.2.3 and listed in Table 4-9.

4.2.3 Mound Effluent Inhalation Intakes

4.2.3.1 Sitewide Annual Median Effluent Radionuclide Inhalation Intakes

The sitewide annual median radionuclide intakes in Table 4-9 were derived by multiplying the annual median effluent air concentrations (Table 4-2) by 2,400 m^3/yr, which is the product of Reference Man's default breathing rate (1.2 m^3/hr) (ICRP 1975) and 2,000 work hours per year. The tritium intake was increased by a factor of 1.5 to account for skin absorption. As discussed above, most of the internal dose (99.8%) from SRS feed material is attributable to ^{238}Pu and $^{239/240}$Pu. As a result, only intakes of ^{238}Pu, $^{239/240}$Pu, HTO, ^{210}Po, ^{232}Th, ^{230}Th, ^{228}Th, ^{226}Ra, and ^{227}Ac from Mound effluents are significant for dose reconstruction. The absorption type most favorable to claimants should be

chosen for dose reconstruction because of the various chemical forms of polonium, thorium, and plutonium used at Mound Plant.

Table 4-9. Sitewide annual median effluent inhalation intakes (Bq).

Year	^{238}Pu	^{210}Po	HTO	$^{239/240}$Pu	^{232}Th	^{230}Th	^{228}Th	^{227}Ac	^{226}Ra
1949	No data	1.05E+01	No data	No data	No data	No data	No data	No data	No data
1950	No data	1.05E+01	No data	No data	No data	No data	No data	No data	No data
1951	No data	1.05E+01	No data	No data	No data	No data	7.24E–05	4.39E–05	1.40E–04
1952	No data	1.05E+01	No data	No data	No data	No data	7.24E–05	4.39E–05	1.40E–04
1953	No data	1.05E+01	No data	No data	No data	No data	7.24E–05	4.39E–05	1.40E–04
1954	No data	1.26E+01	2.12E+04	No data	No data	No data	No data	No data	No data
1955	No data	1.51E+01	2.33E+04	No data	No data	No data	No data	No data	No data
1956	No data	1.82E+01	2.56E+04	No data	No data	No data	No data	No data	No data
1957	No data	2.18E+01	2.82E+04	No data	No data	No data	No data	No data	No data
1958	No data	2.62E+01	3.10E+04	No data	No data	No data	No data	No data	No data
1959	No data	3.14E+01	3.41E+04	No data	No data	No data	No data	No data	No data
1960	6.06E+01	3.77E+01	1.11E+05	1.95E+00	No data	No data	No data	No data	No data
1961	3.88E–02	4.52E+01	2.60E+05	1.25E–03	No data	No data	No data	No data	No data
1962	3.39E–02	5.43E+01	2.64E+05	1.09E–03	No data	No data	No data	No data	No data
1963	2.62E–02	6.51E+01	3.39E+05	8.44E–04	No data	No data	No data	No data	No data
1964	6.11E–02	7.81E+01	2.84E+05	1.97E–03	No data	No data	No data	1.53E–03	No data
1965	1.41E+00	9.38E+01	2.24E+05	4.53E–02	No data	No data	No data	1.53E–03	No data
1966	7.38E+00	1.13E+02	2.16E+05	2.38E–01	No data	No data	No data	1.53E–03	No data
1967	1.32E+01	1.21E+02	3.94E+05	4.24E–01	No data	No data	No data	1.53E–03	No data
1968	1.39E+00	3.15E+01	2.98E+05	4.47E–02	No data	No data	No data	1.53E–03	No data
1969	2.56E+00	2.40E+01	3.41E+05	8.24E–02	No data	No data	No data	No data	No data
1970	1.05E+00	1.73E+01	1.94E+05	3.39E–02	No data	No data	No data	No data	No data
1971	3.55E–02	1.78E–01	6.39E+05	1.14E–03	No data	No data	No data	No data	No data
1972	1.24E–02	1.15E–01	1.09E+04	4.01E–04	No data	No data	No data	No data	No data
1973	1.39E–02	9.77E–02	9.86E+03	4.47E–04	No data	No data	No data	No data	No data
1974	1.67E–02	9.77E–02	2.04E+04	5.38E–04	No data	No data	No data	No data	No data
1975	5.68E–03	No data	3.86E+03	2.66E–04	No data	No data	No data	No data	No data
1976	7.46E–03	No data	2.66E+03	1.95E–04	No data	No data	No data	No data	No data
1977	2.49E–03	No data	2.13E+03	0.00E+00	No data	No data	No data	No data	No data
1978	2.22E–03	No data	8.26E+02	3.55E–04	No data	No data	No data	No data	No data
1979	1.42E–03	No data	1.15E+03	4.44E–05	No data	No data	No data	No data	No data
1980	7.81E–04	No data	1.18E+04	5.33E–05	No data	No data	No data	No data	No data
1981	1.84E–03	No data	9.00E+03	0.00E+00	No data	No data	No data	No data	No data
1982	2.12E–03	No data	5.23E+03	0.00E+00	No data	No data	No data	No data	No data
1983	1.17E–03	No data	4.57E+03	1.15E–04	No data	No data	No data	No data	No data
1984	2.06E–03	No data	2.94E+03	2.66E–05	No data	No data	No data	No data	No data
1985	1.12E–02	No data	3.64E+03	5.59E–05	No data	No data	No data	No data	No data
1986	8.29E–03	No data	2.84E+03	4.00E–05	No data	No data	No data	No data	No data
1987	3.86E–03	No data	4.44E+03	1.42E–05	No data	No data	No data	No data	No data
1988	5.15E–03	No data	3.21E+03	1.78E–05	No data	No data	No data	No data	No data
1989	1.33E–03	No data	3.33E+03	2.66E–05	No data	No data	No data	No data	No data
1990	5.01E–04	No data	2.47E+03	6.22E–06	No data	No data	No data	No data	No data
1991	6.84E–04	No data	1.55E+03	0.00E+00	No data	No data	No data	No data	No data
1992	5.18E–04	No data	9.90E+02	2.13E–05	No data	No data	No data	No data	No data
1993	6.30E–04	No data	5.54E+02	3.46E–05	No data	No data	No data	No data	No data
1994	6.47E–04	No data	4.92E+02	2.75E–05	No data	No data	No data	No data	No data
1995	5.32E–04	No data	2.81E+02	1.07E–05	No data	No data	No data	No data	No data
1996	5.27E–04	No data	9.24E+02	7.10E–06	No data	No data	No data	No data	No data
1997	1.83E–03	No data	9.58E+02	0.00E+00	1.90E–04	3.97E–04	2.66E–04	No data	No data
1998	4.54E–04	No data	1.34E+03	6.22E–06	1.60E–05	0.00E+00	0.00E+00	No data	No data
1999	1.27E–04	No data	1.13E+03	1.33E–05	3.92E–04	3.92E–04	4.08E–04	No data	No data
2000	3.62E–04	No data	3.04E+02	1.51E–05	2.58E–04	3.66E–04	3.29E–04	No data	No data
2001	3.56E–04	No data	6.43E+02	2.66E–06	2.00E–04	2.70E–04	3.37E–04	No data	No data
2002	3.34E–04	No data	4.66E+02	1.69E–05	0.00E+00	0.00E+00	0.00E+00	No data	No data
2003	No data	No data	No data	No data	No data	No data	No data	No data	No data

4.2.3.2 Sitewide Maximum Annual Average Effluent Inhalation Intakes

Sitewide maximum annual radionuclide intakes were calculated to estimate the upper 95th-percentile effluent intake. These intakes were calculated in a manner similar to the median intakes in Table 4-9. From 1971 to 2002, the maximum annual average onsite air monitoring station results (Tables C-13, C-14, and D-1 through D-30) were used to determine intake concentrations.

For years for which onsite air monitoring data were unavailable (before 1971) and annual effluent data were available, empirically derived onsite atmospheric dispersion factors (χ/Qs) for plutonium, polonium particulates, and HTO were used to estimate the intake air concentration. The χ/Q derivation coupled the onsite air monitoring location indicating the highest annual average air concentration (^{238}Pu, ^{210}Po, and ^{3}H concentration) with the corresponding effluent source term (Table 4-7). This derivation was repeated for an 11-year period (1973 to 1983) for plutonium and HTO and 1 year (1973) for polonium. For assigning an intake concentration, the 11- and 1-year average χ/Q was selected: 6.03×10^{-4} s/m^3 for plutonium; 7.43×10^{-4} s/m^3 for polonium, actinium, and thorium; and 5.90×10^{-7} s/m^3 for gases or vapors [e.g., elemental tritium (tritiated gas) or HTO]. The dispersion factor data used to infer maximum annual average radionuclide intakes are listed in Table 4-10. The maximum intakes listed in Table 4-11 were derived by multiplying the maximum sitewide annual average effluent air concentrations by 2,400 m^3/yr, which is the product of Reference Man's default breathing rate (1.2 m^3/hr) (ICRP 1975) and 2,000 work hours per year. The tritium intake was increased by a factor of 1.5 to account for skin absorption.

An estimate of the uncertainty associated with the median environmental intakes at Mound in Table 4-9 was made by assuming that the intakes are lognormally distributed and that the median intakes represent the 50th-percentile intake rate. The sitewide maximum annual average intakes in Table 4-11 are assumed to represent the upper 95th-percentile intake. The resulting geometric standard deviations (GSDs) are listed in Table 4-12.

Table 4-10. Inferred maximum onsite dispersion factors (χ/Q, s/m^3) by radionuclide, 1983 to 1973.

Year	H-3	Pu-238	Po-210, Ac-227, Th-228, and Ra-226
1983	3.12E–07	5.85E–04	No data
1982	4.16E–07	1.32E–04	No data
1981	5.78E–07	1.44E–03	No data
1980	3.43E–06	1.22E–04	No data
1979	1.11E–07	5.00E–04	No data
1978	3.87E–08	2.48E–04	No data
1977	1.80E–07	2.05E–04	No data
1976	1.32E–07	5.55E–04	No data
1975	1.14E–07	1.41E–03	No data
1974	9.85E–07	9.11E–04	No data
1973	1.89E–07	5.21E–04	7.43E–04
N	11	11	1
Minimum	3.87E–08	1.22E–04	7.43E–04
Maximum	3.43E–06	1.44E–03	7.43E–04
Mean	5.90E–07	6.03E–04	7.43E–04

Table 4-11. Sitewide maximum annual intakes (Bq).

Year	Pu-238	Po-210	HTO	Pu-239/240	Th-232	Th-230	Th-228	Ac-227	Ra-226
1949	No data	1.53E+01	No data	No data	No data	No data	No data	No data	No data
1950	No data	1.53E+01	No data	No data	No data	No data	No data	No data	No data
1951	No data	1.53E+01	No data	No data	No data	No data	1.05E–04	6.37E–05	1.40E–04
1952	No data	1.53E+01	No data	No data	No data	No data	1.05E–04	6.37E–05	1.40E–04

Year	Pu-238	Po-210	HTO	Pu-239/240	Th-232	Th-230	Th-228	Ac-227	Ra-226
1953	No data	1.53E+01	No data	No data	No data	No data	1.05E–04	6.37E–05	1.40E–04
1954	No data	1.83E+01	4.88E+04	No data	No data	No data	No data	No data	No data
1955	No data	2.20E+01	5.36E+04	No data	No data	No data	No data	No data	No data
1956	No data	2.64E+01	5.90E+04	No data	No data	No data	No data	No data	No data
1957	No data	3.17E+01	6.49E+04	No data	No data	No data	No data	No data	No data
1958	No data	3.80E+01	7.14E+04	No data	No data	No data	No data	No data	No data
1959	No data	4.56E+01	7.85E+04	No data	No data	No data	No data	No data	No data
1960	4.24E+02	5.47E+01	2.55E+05	1.37E+01	No data	No data	No data	No data	No data
1961	2.71E–01	6.57E+01	5.99E+05	8.74E–03	No data	No data	No data	No data	No data
1962	2.37E–01	7.88E+01	6.09E+05	7.65E–03	No data	No data	No data	No data	No data
1963	1.83E–01	9.46E+01	7.82E+05	5.90E–03	No data	No data	No data	No data	No data
1964	4.27E–01	1.13E+02	6.54E+05	1.38E–02	No data	No data	No data	2.22E–03	No data
1965	9.84E+00	1.36E+02	5.15E+05	3.17E–01	No data	No data	No data	2.22E–03	No data
1966	5.16E+01	1.63E+02	4.97E+05	1.66E+00	No data	No data	No data	2.22E–03	No data
1967	9.22E+01	1.76E+02	9.08E+05	2.97E+00	No data	No data	No data	2.22E–03	No data
1968	9.70E+00	4.57E+01	6.87E+05	3.13E–01	No data	No data	No data	2.22E–03	No data
1969	1.79E+01	3.48E+01	7.85E+05	5.76E–01	No data	No data	No data	No data	No data
1970	7.36E+00	2.51E+01	4.47E+05	2.37E–01	No data	No data	No data	No data	No data
1971	3.55E–02	3.55E–01	7.19E+05	1.14E–03	No data	No data	No data	No data	No data
1972	3.55E–02	2.04E–01	2.66E+04	1.14E–03	No data	No data	No data	No data	No data
1973	1.23E–01	1.33E–01	1.29E+04	3.97E–03	No data	No data	No data	No data	No data
1974	7.18E–02	1.07E–01	4.26E+04	2.31E–03	No data	No data	No data	No data	No data
1975	9.15E–02	No data	4.53E+03	1.95E–03	No data	No data	No data	No data	No data
1976	2.34E–02	No data	3.46E+03	8.17E–04	No data	No data	No data	No data	No data
1977	6.93E–03	No data	3.73E+03	8.88E–04	No data	No data	No data	No data	No data
1978	9.77E–03	No data	1.20E+03	4.44E–04	No data	No data	No data	No data	No data
1979	1.69E–02	No data	1.80E+03	2.84E–04	No data	No data	No data	No data	No data
1980	5.15E–03	No data	5.50E+04	1.33E–04	No data	No data	No data	No data	No data
1981	3.23E–02	No data	1.05E+04	2.66E–05	No data	No data	No data	No data	No data
1982	7.81E–03	No data	7.53E+03	2.66E–05	No data	No data	No data	No data	No data
1983	6.59E–03	No data	5.66E+03	1.78E–04	No data	No data	No data	No data	No data
1984	1.12E–02	No data	3.77E+03	6.22E–05	No data	No data	No data	No data	No data
1985	1.62E–02	No data	4.36E+03	9.59E–05	No data	No data	No data	No data	No data
1986	1.58E–02	No data	5.45E+03	9.06E–05	No data	No data	No data	No data	No data
1987	1.68E–02	No data	5.17E+03	6.22E–05	No data	No data	No data	No data	No data
1988	7.10E–03	No data	5.41E+03	5.33E–05	No data	No data	No data	No data	No data
1989	4.08E–03	No data	4.13E+03	4.44E–05	No data	No data	No data	No data	No data
1990	3.11E–03	No data	5.11E+03	2.49E–05	No data	No data	No data	No data	No data
1991	3.04E–03	No data	5.18E+03	0.00E+00	No data	No data	No data	No data	No data
1992	1.98E–03	No data	2.20E+03	3.29E–05	No data	No data	No data	No data	No data
1993	3.68E–03	No data	9.00E+02	1.18E–04	No data	No data	No data	No data	No data
1994	3.15E–02	No data	1.00E+03	3.11E–04	No data	No data	No data	No data	No data
1995	2.90E–02	No data	4.46E+02	1.40E–04	No data	No data	No data	No data	No data
1996	7.91E–03	No data	1.26E+03	1.32E–04	No data	No data	No data	No data	No data
1997	5.12E–03	No data	1.57E+03	1.65E–04	3.61E–04	5.48E–04	3.89E–04	No data	No data
1998	6.75E–04	No data	1.79E+03	6.22E–06	3.55E–05	0.00E+00	0.00E+00	No data	No data
1999	1.39E–04	No data	2.65E+03	2.13E–05	4.40E–04	5.14E–04	4.93E–04	No data	No data
2000	9.85E–04	No data	5.89E+02	1.51E–05	5.86E–04	8.01E–04	6.60E–04	No data	No data
2001	1.41E–03	No data	1.01E+03	1.78E–05	2.50E–04	3.47E–04	3.82E–04	No data	No data
2002	8.32E–04	No data	1.51E+03	2.93E–05	0.00E+00	0.00E+00	0.00E+00	No data	No data
2003	No data	No data	No data	No data	No data	No data	No data	No data	No data

Table 4-12. GSD for effluent intakes at Mound.[a]

Year	Pu-238	Po-210	H-3	Pu-239/240	Th-232	Th-230	Th-228	Ac-227	Ra-226
1949	No data	1.3	1.7	No data	No data	No data	No data	No data	No data
1950	No data	1.3	1.7	No data	No data	No data	No data	No data	No data
1951	No data	1.3	1.7	No data	No data	No data	1.3	1.3	1.3
1952	No data	1.3	1.7	No data	No data	No data	1.3	1.3	1.3

Year	Pu-238	Po-210	H-3	Pu-239/240	Th-232	Th-230	Th-228	Ac-227	Ra-226
1953	No data	1.3	1.7	No data	No data	No data	1.3	1.3	1.3
1954	No data	1.3	1.7	No data	No data	No data	No data	No data	No data
1955	No data	1.3	1.7	No data	No data	No data	No data	No data	No data
1956	No data	1.3	1.7	No data	No data	No data	No data	No data	No data
1957	No data	1.3	1.7	No data	No data	No data	No data	No data	No data
1958	No data	1.3	1.7	No data	No data	No data	No data	No data	No data
1959	No data	1.3	1.7	No data	No data	No data	No data	No data	No data
1960	3.2	1.3	1.7	3.2	No data	No data	No data	No data	No data
1961	3.2	1.3	1.7	3.2	No data	No data	No data	No data	No data
1962	3.2	1.3	1.7	3.2	No data	No data	No data	No data	No data
1963	3.2	1.3	1.7	3.2	No data	No data	No data	No data	No data
1964	3.2	1.3	1.7	3.2	No data	No data	No data	1.3	No data
1965	3.2	1.3	1.7	3.2	No data	No data	No data	1.3	No data
1966	3.2	1.3	1.7	3.2	No data	No data	No data	1.3	No data
1967	3.2	1.3	1.7	3.2	No data	No data	No data	1.3	No data
1968	3.2	1.3	1.7	3.2	No data	No data	No data	1.3	No data
1969	3.2	1.3	1.7	3.2	No data	No data	No data	No data	No data
1970	3.2	1.3	1.7	3.2	No data	No data	No data	No data	No data
1971	1.0	1.5	1.1	1.0	No data	No data	No data	No data	No data
1972	1.9	1.4	1.7	1.9	No data	No data	No data	No data	No data
1973	3.7	1.2	1.2	3.7	No data	No data	No data	No data	No data
1974	2.4	1.1	1.6	2.4	No data	No data	No data	No data	No data
1975	5.4	No data	1.1	3.3	No data	No data	No data	No data	No data
1976	2.0	No data	1.2	2.4	No data	No data	No data	No data	No data
1977	1.9	No data	1.4	<EL	No data	No data	No data	No data	No data
1978	2.4	No data	1.3	1.1	No data	No data	No data	No data	No data
1979	4.5	No data	1.3	3.1	No data	No data	No data	No data	No data
1980	3.1	No data	2.5	1.7	No data	No data	No data	No data	No data
1981	5.6	No data	1.1	<EL	No data	No data	No data	No data	No data
1982	2.2	No data	1.2	<EL	No data	No data	No data	No data	No data
1983	2.8	No data	1.1	1.3	No data	No data	No data	No data	No data
1984	2.8	No data	1.2	1.7	No data	No data	No data	No data	No data
1985	1.2	No data	1.1	1.4	No data	No data	No data	No data	No data
1986	1.5	No data	1.5	1.6	No data	No data	No data	No data	No data
1987	2.4	No data	1.1	2.4	No data	No data	No data	No data	No data
1988	1.2	No data	1.4	1.9	No data	No data	No data	No data	No data
1989	2.0	No data	1.1	1.7	No data	No data	No data	No data	No data
1990	3.0	No data	1.6	2.3	No data	No data	No data	No data	No data
1991	2.5	No data	2.1	<EL	No data	No data	No data	No data	No data
1992	2.3	No data	1.6	1.3	No data	No data	No data	No data	No data
1993	2.9	No data	1.3	2.1	No data	No data	No data	No data	No data
1994	10.4	No data	1.5	4.3	No data	No data	No data	No data	No data
1995	11.2	No data	1.3	4.7	No data	No data	No data	No data	No data
1996	5.1	No data	1.2	5.8	1.3	1.3	1.2	No data	No data
1997	1.9	No data	1.3	<EL	1.5	1.2	1.3	No data	No data
1998	1.3	No data	1.2	1.0	1.6	<EL	<EL	No data	No data
1999	1.1	No data	1.7	1.3	1.1	1.2	1.1	No data	No data
2000	1.8	No data	1.5	1.0	1.6	1.6	1.5	No data	No data
2001	2.3	No data	1.3	3.1	1.1	1.2	1.1	No data	No data
2002	1.7	No data	2.0	1.7	<EL	<EL	<EL	No data	No data
2003	No data	No data	No data	No data	No data	No data	No data	No data	No data
Mean GSD	3.1	1.3	1.5	2.6	1.3	1.3	1.2	1.3	1.3

a. <EL – 50th-percentile intake concentration is less than the environmental level measured 28 mi off site.

4.2.4 Annual Effluent Submersion External Exposures

Annual average air submersion external exposures were calculated by multiplying the effluent air intake concentrations in Table 4-2 by 2,000 work hours per year as listed in Table 4-13. To assess the magnitude of submersion dose, the values in Table 4-13 were multiplied by the effective dose coefficient for air submersion (Eckerman and Ryman 1993). The results of the assessment indicate that the annual effective submersion dose from all radionuclides in Mound effluents was less than 5.0×10^{-10} Sv (<1 mrem) in any year during Mound operations. As a consequence, because the annual dose is several orders of magnitude less than 1 mrem, dose reconstructors need not consider submersion dose from effluents.

4.2.5 Resuspension Intakes, Submersion External Exposures, and Ground Layer External Exposures Attributed to Soil Contamination

This analysis estimated the intake of radionuclides resuspended from soil at the Mound facility using a sitewide average profile of radionuclide soil concentrations measured in 30-cm-thick soil samples (Lyons 2003). The analysis assumes that all soil samples were obtained in 1990. In addition, the assumption that is favorable to claimants that the soil contamination is due to a combination of spills, pipeline breaks, and effluent deposition in 1949 was made. As a result, 1990 radionuclide concentrations were decay-corrected to obtain radionuclide activities in 1949, 1950, 1955, 1960, 1965, 1970, 1975, 1980, and 1985 to provide an estimate of radiological conditions for each period (see Tables 4-14 through 4-19). No decay correction was applied to radionuclides with a relatively long half-life or radionuclide progeny in secular equilibrium with a long-lived parent radionuclide in the soil. Plutonium and americium soil contamination from SRS feed material is assumed to be present beginning in 1960.

Because there are no ^{210}Po soil data available, the ^{210}Po soil concentrations in Tables 4-14 through 4-19 were inferred based on the relationship between the sum of ^{238}Pu effluent from 1960 to 1983 (362,670 µCi) and the decay-corrected soil concentration of ^{238}Pu in 1960 (2,160.8 Bq/kg). The resulting ratio of 5.96×10^{-3} Bq/kg per µCi emitted was applied to the 1949 through 1974 annual ^{210}Po emissions. To account for the buildup and decay of ^{210}Po in soil, 16% of the previous year's ^{210}Po soil concentration was added to the next consecutive year's ^{210}Po soil concentration starting in 1950, because after 1 year, only 16% of the original ^{210}Po activity remains. The highest ^{210}Po soil concentration in the periods in Tables 4-14 through 4-19 was used in the calculations. Because effluent emissions of ^{210}Po at Mound ceased in 1974, ^{210}Po soil contamination is assumed to have decayed by 1975.

The mean soil concentrations (picocuries per gram) were converted to resuspension concentrations using the four-factor formula in ORAUT (2005, Equation 3-3). Resuspension air concentrations were used to calculate (1) external exposures by submersion and (2) submersion (resuspension) intakes (becquerels) by multiplying the air concentrations by 2,000 hr/yr and using a breathing rate of 2,400 m^3/yr for inhalation intake. Resuspension intakes for ^{3}H, ^{238}Pu, $^{239/240}$Pu, and ^{210}Po were not calculated because the derivation of the inhalation intakes in Table 4-9 already accounts for soil resuspension intakes at the Mound Plant. The results are listed in Tables 4-14 through 4-19 and are applicable (persist) for the indicated periods.

Table 4-13. Annual average effluent submersion external exposures by year and radionuclide (Bq s/m^3).

Year	Pu-238	Po-210	HTO	Pu-236	Pu-239/240	Pu-242	Pu-241	U-234	Np-237	Am-241	Pa-231	Th-232	U-232	U-235	U-236	Ac-227
1949	No data	3.16E+04	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data
1950	No data	3.16E+04	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data
1951	No data	3.16E+04	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data
1952	No data	3.16E+04	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data
1953	No data	3.16E+04	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data
1954	No data	3.79E+04	4.23E+07	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data
1955	No data	4.54E+04	4.66E+07	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data
1956	No data	5.45E+04	5.12E+07	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data
1957	No data	6.54E+04	5.63E+07	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data
1958	No data	7.85E+04	6.20E+07	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data
1959	No data	9.42E+04	6.82E+07	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data
1960	1.82E+05	1.13E+05	2.21E+08	7.02E–01	5.86E+03	5.25E–02	8.21E+03	1.57E–01	2.80E–03	2.27E+01	6.25E–03	1.45E–08	2.96E+00	2.86E–07	8.57E–06	9.58E+00
1961	1.16E+02	1.36E+05	5.20E+08	4.49E–04	3.75E+00	3.36E–05	5.25E+00	1.00E–04	1.79E–06	1.45E–02	4.00E–06	9.30E–12	1.89E–03	1.83E–10	5.48E–09	6.13E–03
1962	1.02E+02	1.63E+05	5.29E+08	3.93E–04	3.28E+00	2.94E–05	4.60E+00	8.76E–05	1.57E–06	1.27E–02	3.50E–06	8.13E–12	1.66E–03	1.60E–10	4.80E–09	5.36E–03
1963	7.85E+01	1.95E+05	6.79E+08	3.03E–04	2.53E+00	2.26E–05	3.55E+00	6.76E–05	1.21E–06	9.81E–03	2.70E–06	6.27E–12	1.28E–03	1.24E–10	3.70E–09	4.14E–03
1964	1.83E+02	2.34E+05	5.68E+08	7.07E–04	5.90E+00	5.28E–05	8.27E+00	1.58E–04	2.82E–06	2.29E–02	6.30E–06	1.46E–11	2.98E–03	2.88E–10	8.63E–09	9.65E–03
1965	4.22E+03	2.81E+05	4.47E+08	1.63E–02	1.36E+02	1.22E–03	1.91E+02	3.63E–03	6.50E–05	5.27E–01	1.45E–04	3.37E–10	6.87E–02	6.64E–09	1.99E–07	2.22E–01
1967	3.95E+04	3.64E+05	7.88E+08	1.53E–01	1.27E+03	1.14E–02	1.78E+03	3.40E–02	6.09E–04	4.94E+00	1.36E–03	3.16E–09	6.44E–01	6.22E–08	1.86E–06	2.08E+00
1968	4.16E+03	9.44E+04	5.96E+08	1.61E–02	1.34E+02	1.20E–03	1.88E+02	3.58E–03	6.41E–05	5.19E–01	1.43E–04	3.32E–10	6.77E–02	6.54E–09	1.96E–07	2.19E–01
1968	2.21E+04	3.38E+05	4.31E+08	8.54E–02	7.13E+02	6.38E–03	1.00E+03	1.91E–02	3.41E–04	2.76E+00	7.61E–04	1.77E–09	3.60E–01	3.48E–08	1.04E–06	1.17E+00
1969	7.67E+03	7.20E+04	6.82E+08	2.96E–02	2.47E+02	2.21E–03	3.46E+02	6.60E–03	1.18E–04	9.58E–01	2.64E–04	6.13E–10	1.25E–01	1.21E–08	3.61E–07	4.04E–01
1970	3.16E+03	5.18E+04	3.88E+08	1.22E–02	1.02E+02	9.11E–04	1.43E+02	2.72E–03	4.86E–05	3.94E–01	1.09E–04	2.52E–10	5.14E–02	4.97E–09	1.49E–07	1.66E–01
1971	1.07E+02	1.07E+03	1.44E+09	4.11E–04	3.43E+00	3.07E–05	4.81E+00	9.17E–05	1.64E–06	1.33E–02	3.66E–06	8.51E–12	1.74E–03	1.68E–10	5.02E–09	5.61E–03
1972	3.73E+01	3.46E+02	2.18E+07	1.44E–04	1.20E+00	1.08E–05	1.68E+00	3.21E–05	5.75E–07	4.66E–03	1.28E–06	2.98E–12	6.07E–04	5.87E–11	1.76E–09	1.96E–03
1973	4.16E+01	3.04E+02	1.97E+07	1.60E–04	1.34E+00	1.20E–05	1.88E+00	3.58E–05	6.41E–07	5.19E–03	1.43E–06	3.32E–12	6.77E–04	6.54E–11	1.96E–09	2.19E–03
1974	5.01E+01	2.93E+02	4.08E+07	1.93E–04	1.61E+00	1.45E–05	2.26E+00	4.31E–05	7.72E–07	6.26E–03	1.72E–06	4.00E–12	8.16E–04	7.88E–11	2.36E–09	2.64E–03
1975	1.70E+01	No data	7.73E+06	6.58E–05	7.99E–01	4.92E–06	7.70E–01	1.47E–05	2.63E–07	2.13E–03	5.86E–07	1.36E–12	2.78E–04	2.68E–11	8.03E–10	8.98E–04
1976	2.24E+01	No data	5.33E+06	8.64E–05	5.86E–01	6.45E–06	1.01E+00	1.93E–05	3.45E–07	2.80E–03	7.69E–07	1.79E–12	3.64E–04	3.52E–11	1.05E–09	1.18E–03
1977	7.46E+00	No data	4.26E+06	2.88E–05	0.00E+00	2.15E–06	3.37E–01	6.42E–06	1.15E–07	9.32E–04	2.56E–07	5.96E–13	1.21E–04	1.17E–11	3.51E–10	3.93E–04
1978	6.66E+00	No data	1.65E+06	2.57E–05	1.07E+00	1.92E–06	3.01E–01	5.73E–06	1.03E–07	8.32E–04	2.29E–07	5.32E–13	1.08E–04	1.05E–11	3.14E–10	3.51E–04
1979	4.26E+00	No data	2.29E+06	1.65E–05	1.33E–01	1.23E–06	1.92E–01	3.67E–06	6.57E–08	5.32E–04	1.47E–07	3.41E–13	6.94E–05	6.71E–12	2.01E–10	2.25E–04
1980	2.34E+00	No data	2.37E+07	9.05E–06	1.60E–01	6.76E–07	1.06E–01	2.02E–06	3.61E–08	2.93E–04	8.06E–08	1.87E–13	3.82E–05	3.69E–12	1.10E–10	1.23E–04
1981	5.51E+00	No data	1.80E+07	2.13E–05	0.00E+00	1.59E–06	2.49E–01	4.75E–06	8.49E–08	6.89E–04	1.90E–07	4.41E–13	8.98E–05	8.68E–12	2.60E–10	2.90E–04
1982	6.37E+00	No data	1.05E+07	2.46E–05	0.00E+00	1.84E–06	2.88E–01	5.48E–06	9.81E–08	7.95E–04	2.19E–07	5.09E–13	1.04E–04	1.00E–11	3.00E–10	3.35E–04
1983	3.52E+00	No data	9.14E+06	1.36E–05	3.46E–01	1.01E–06	1.59E–01	3.03E–06	5.42E–08	4.39E–04	1.21E–07	2.81E–13	5.73E–05	5.53E–12	1.66E–10	1.85E–04
1984	6.18E+00	No data	5.89E+06	2.39E–05	7.99E–02	1.78E–06	2.79E–01	5.32E–06	9.52E–08	7.72E–04	2.12E–07	4.94E–13	1.01E–04	9.72E–12	2.91E–10	3.26E–04
1985	3.36E+01	No data	7.27E+06	1.30E–04	1.68E–01	9.68E–06	1.52E+00	2.89E–05	5.17E–07	4.19E–03	1.15E–06	2.68E–12	5.47E–04	5.28E–11	1.58E–09	1.77E–03
1986	2.49E+01	No data	5.67E+06	9.60E–05	1.20E–01	7.18E–06	1.12E+00	2.14E–05	3.83E–07	3.11E–03	8.55E–07	1.99E–12	4.05E–04	3.91E–11	1.17E–09	1.31E–03
1987	1.16E+01	No data	8.87E+06	4.47E–05	4.26E–02	3.34E–06	5.23E–01	9.97E–06	1.79E–07	1.45E–03	3.98E–07	9.26E–13	1.89E–04	1.82E–11	5.46E–10	6.10E–04
1988	1.55E+01	No data	6.42E+06	5.96E–05	5.33E–02	4.46E–06	6.98E–01	1.33E–05	2.38E–07	1.93E–03	5.31E–07	1.23E–12	2.52E–04	2.43E–11	7.28E–10	8.14E–04
1989	4.00E+00	No data	6.66E+06	1.54E–05	7.99E–02	1.15E–06	1.80E–01	3.44E–06	6.16E–08	4.99E–04	1.37E–07	3.19E–13	6.51E–05	6.29E–12	1.88E–10	2.10E–04
1990	1.50E+00	No data	4.95E+06	5.80E–06	1.86E–02	4.33E–07	6.79E–02	1.29E–06	2.31E–08	1.88E–04	5.17E–08	1.20E–13	2.45E–05	2.36E–12	7.08E–11	7.91E–05
1991	2.05E+00	No data	3.10E+06	7.92E–06	0.00E+00	5.92E–07	9.26E–02	1.77E–06	3.16E–08	2.56E–04	7.05E–08	1.64E–13	3.34E–05	3.23E–12	9.67E–11	1.08E–04
1992	1.55E+00	No data	1.98E+06	5.99E–06	6.39E–02	4.48E–07	7.01E–02	1.34E–06	2.39E–08	1.94E–04	5.34E–08	1.24E–13	2.53E–05	2.44E–12	7.32E–11	8.18E–05
1993	1.89E+00	No data	1.11E+06	7.30E–06	1.04E–01	5.46E–07	8.54E–02	1.63E–06	2.91E–08	2.36E–04	6.50E–08	1.51E–13	3.08E–05	2.98E–12	8.91E–11	9.96E–05
1994	1.94E+02	No data	9.83E+05	7.50E–04	8.26E–02	5.60E–05	8.77E+00	1.67E–04	2.99E–06	2.43E–02	6.68E–06	1.55E–11	3.16E–03	3.06E–10	9.15E–09	1.02E–02
1995	1.60E+00	No data	5.62E+05	6.16E–06	3.20E–02	4.60E–07	7.21E–02	1.37E–06	2.46E–08	1.99E–04	5.49E–08	1.27E–13	2.60E–05	2.51E–12	7.52E–11	8.41E–05
1996	1.58E+00	No data	1.85E+06	6.11E–06	2.13E–02	4.56E–07	7.15E–02	1.36E–06	2.44E–08	1.98E–04	5.44E–08	1.26E–13	2.58E–05	2.49E–12	7.46E–11	8.33E–05
1997	5.49E+00	No data	1.92E+06	2.12E–05	1.77E–01	1.58E–06	2.48E–01	4.72E–06	8.45E–08	6.85E–04	1.89E–07	5.70E–01	8.94E–05	8.63E–12	2.59E–10	2.89E–04
1998	1.36E+00	No data	2.68E+06	5.25E–06	1.86E–02	3.93E–07	6.15E–02	1.17E–06	2.10E–08	1.70E–04	4.68E–08	4.80E–02	2.22E–05	2.14E–12	6.41E–11	7.17E–05
1999	3.81E–01	No data	2.25E+06	1.47E–06	4.00E–02	1.10E–07	1.72E–02	3.28E–07	5.87E–09	4.76E–05	1.31E–08	1.18E+00	6.20E–06	5.99E–13	1.80E–11	2.01E–05
2000	1.09E+00	No data	6.07E+05	4.19E–06	4.53E–02	3.13E–07	4.91E–02	9.36E–07	1.67E–08	1.36E–04	3.74E–08	7.75E–01	1.77E–05	1.71E–12	5.12E–11	5.72E–05
2001	1.07E+00	No data	1.29E+06	4.12E–06	7.99E–03	3.08E–07	4.82E–02	9.19E–07	1.65E–08	1.33E–04	3.67E–08	5.99E–01	1.74E–05	1.68E–12	5.03E–11	5.63E–05
2002	1.14E+00	No data	9.32E+05	4.40E–06	6.13E–02	3.29E–07	5.15E–02	9.81E–07	1.76E–08	1.42E–04	3.92E–08	2.00E–02	1.86E–05	1.79E–12	5.37E–11	6.01E–05
2003	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data

Table 4-14. Annual average ground layer external exposure, resuspension submersion external exposure, and resuspension submersion intake by radionuclide, 1949.

Nuclide	Half-life (yr)	Mean soil (Bq/kg)	Airborne (Bq/m^3)	Submersion intake (Bq)[a]	ICRP (1995) DCF (Sv/Bq)	Submersion intake dose (Sv)	External submersion (Bq s/m^3)[a]	Effective DCF [Sv/(Bq s/m^3)]	Submersion effective dose (Sv)	Soil layer[b] (Bq s/m^3)[a]	Infinite thickness DCF [Sv/(Bq s/m^3)]	Soil exposure dose (Sv/yr)
Th-227	5.12E–02	12.58	1.61E–06	3.86E–03	7.60E–06	2.94E–08	1.16E+01	4.88E–15	5.66E–14	1.45E+11	2.79E–18	4.04E–07
Am-241[c]	4.32E+02	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data
Pu-238[c]	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data
Pu-239/240[c]	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data
Pu-241[c]	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data
Co-60	5.27E+00	732.60	9.38E–05	2.25E–01	1.70E–08	3.83E–09	6.75E+02	1.26E–13	8.51E–11	8.44E+12	8.68E–17	7.33E–04
Pa-231	3.28E+04	42.18	5.40E–06	1.30E–02	8.90E–05	1.15E–06	3.89E+01	1.72E–15	6.69E–14	4.86E+11	1.02E–18	4.96E–07
Th-230	7.70E+04	110.26	1.41E–05	3.39E–02	2.80E–05	9.48E–07	1.02E+02	1.74E–17	1.77E–15	1.27E+12	6.47E–21	8.22E–09
Th-232	1.41E+10	51.06	6.54E–06	1.57E–02	2.90E–05	4.55E–07	4.71E+01	8.72E–18	4.10E–16	5.88E+11	2.79E–21	1.64E–09
Ac-228	6.99E–04	37.37	4.78E–06	1.15E–02	2.90E–08	3.33E–10	3.44E+01	4.78E–14	1.65E–12	4.31E+11	3.20E–17	1.38E–05
Ra-228	5.76E+00	37.37	4.78E–06	1.15E–02	1.70E–06	1.95E–08	3.44E+01	0.00E+00	0.00E+00	4.31E+11	0.00E+00	0.00E+00
Bi-207	3.22E+01	5.37	6.87E–07	1.65E–03	3.20E–09	5.27E–12	4.94E+00	7.54E–14	3.73E–13	6.18E+10	5.02E–17	3.10E–06
Bi-210	1.37E–02	2.96	3.79E–07	9.09E–04	6.00E–08	5.46E–11	2.73E+00	3.29E–17	8.97E–17	3.41E+10	1.93E–20	6.58E–10
Bi-210m	3.00E+06	2.96	3.79E–07	9.09E–04	2.10E–06	1.91E–09	2.73E+00	1.22E–14	3.33E–14	3.41E+10	7.37E–18	2.51E–07
Bi-214	3.78E–05	28.86	3.69E–06	8.87E–03	2.10E–08	1.86E–10	2.66E+01	7.65E–14	2.03E–12	3.32E+11	5.25E–17	1.75E–05
Ra-226	1.60E+03	48.10	6.16E–06	1.48E–02	2.20E–06	3.25E–08	4.43E+01	3.15E–16	1.40E–14	5.54E+11	1.70E–19	9.42E–08
Cs-137	3.02E+01	22.79	2.92E–06	7.00E–03	6.70E–09	4.69E–11	2.10E+01	7.74E–18	1.63E–16	2.63E+11	4.02E–21	1.06E–09
Ba-137m	8.08E–08	22.79	2.92E–06	7.00E–03	See Cs-137	See Cs-137	2.10E+01	2.88E–14	6.05E–13	2.63E+11	1.93E–17	5.07E–06
Eu-152	1.34E+01	27.75	3.55E–06	8.52E–03	2.70E–08	2.30E–10	2.56E+01	5.65E–14	1.44E–12	3.20E+11	3.75E–17	1.20E–05
Eu-154	8.50E+00	125.80	1.61E–05	3.86E–02	3.50E–08	1.35E–09	1.16E+02	6.14E–14	7.12E–12	1.45E+12	4.11E–17	5.96E–05
Np-237	2.14E+06	0.74	9.47E–08	2.27E–04	1.50E–05	3.41E–09	6.82E–01	1.03E–15	7.02E–16	8.52E+09	4.17E–19	3.55E–09
Pu-242[c]	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data
Sr-90	2.86E+01	71.78	9.19E–06	2.21E–02	7.70E–08	1.70E–09	6.62E+01	7.53E–18	4.98E–16	8.27E+11	3.77E–21	3.12E–09
Y-90	7.30E–03	71.78	9.19E–06	2.21E–02	1.70E–09	3.75E–11	6.62E+01	1.90E–16	1.26E–14	8.27E+11	1.28E–19	1.06E–07
Tc-99	2.13E+05	50.32	6.44E–06	1.55E–02	3.20E–09	4.95E–11	4.64E+01	1.62E–18	7.51E–17	5.80E+11	6.72E–22	3.90E–10
H-3	1.23E+01	1,058.20	1.35E–04	(d)	4.50E–11	(d)	9.75E+02	3.31E–19	3.23E–16	1.22E+13	0.00E+00	0.00E+00
Po-210	3.79E–01	48,396.00	6.19E–03	(d)	2.20E–06	(d)	4.46E+04	4.16E–19	1.86E–14	5.58E+14	2.80E–22	1.56E–07
Total	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	**5.09E–06**	Not applicable	Not applicable	**9.85E–11**	Not applicable	Not applicable	**8.45E–04**

a. Based on an exposure duration of 2,000 hr/yr.
b. Uppermost 30 cm of soil layer [adapted from Lyons (2003)].
c. Plutonium and americium not environmental contaminants until 1960.
d. H-3 and Po-210 resuspension taken into account in derivation of effluent intakes.

Table 4-15. Annual average ground layer external exposure, resuspension submersion external exposure, and resuspension submersion intake by radionuclide, 1950 through 1959.

Nuclide	Half-life (yr)	Mean soil (Bq/kg)	Airborne (Bq/m^3)	Submersion intake (Bq)[a]	ICRP (1995) DCF (Sv/Bq)	Submersion intake dose (Sv)	External submersion (Bq s/m^3)[a]	Effective DCF [Sv/(Bq s/m^3)]	Submersion effective dose (Sv)	Soil layer[b] (Bq s/m^3)[a]	Infinite thickness DCF [Sv/(Bq s/m^3)]	Soil exposure dose (Sv/yr)
Ac-227	2.18E+01	12.58	1.61E–06	3.86E–03	6.30E–04	2.43E–06	1.16E+01	5.82E–18	6.75E–17	1.45E+11	2.65E–21	3.84E–10
Th-227	5.12E–02	12.58	1.61E–06	3.86E–03	7.60E–06	2.94E–08	1.16E+01	4.88E–15	5.66E–14	1.45E+11	2.79E–18	4.04E–07
Am-241[c]	4.32E+02	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data
Pu-238[c]	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data
Pu-239/240[c]	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data
Pu-241[c]	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data
Co-60	5.27E+00	640.10	8.19E–05	1.97E–01	1.70E–08	3.34E–09	5.90E+02	1.26E–13	7.43E–11	7.37E+12	8.68E–17	6.40E–04
Pa-231	3.28E+04	42.18	5.40E–06	1.30E–02	8.90E–05	1.15E–06	3.89E+01	1.72E–15	6.69E–14	4.86E+11	1.02E–18	4.96E–07
Th-230	7.70E+04	110.26	1.41E–05	3.39E–02	2.80E–05	9.48E–07	1.02E+02	1.74E–17	1.77E–15	1.27E+12	6.47E–21	8.22E–09
Th-232	1.41E+10	51.06	6.54E–06	1.57E–02	2.90E–05	4.55E–07	4.71E+01	8.72E–18	4.10E–16	5.88E+11	2.79E–21	1.64E–09
Ac-228	6.99E–04	37.37	4.78E–06	1.15E–02	2.90E–08	3.33E–10	3.44E+01	4.78E–14	1.65E–12	4.31E+11	3.20E–17	1.38E–05
Ra-228	5.76E+00	37.37	4.78E–06	1.15E–02	1.70E–06	1.95E–08	3.44E+01	0.00E+00	0.00E+00	4.31E+11	0.00E+00	0.00E+00
Bi-207	3.22E+01	5.25	6.73E–07	1.61E–03	3.20E–09	5.16E–12	4.84E+00	7.54E–14	3.65E–13	6.05E+10	5.02E–17	3.04E–06
Bi-210	1.37E–02	2.96	3.79E–07	9.09E–04	6.00E–08	5.46E–11	2.73E+00	3.29E–17	8.97E–17	3.41E+10	1.93E–20	6.58E–10
Bi-210m	3.00E+06	2.96	3.79E–07	9.09E–04	2.10E–06	1.91E–09	2.73E+00	1.22E–14	3.33E–14	3.41E+10	7.37E–18	2.51E–07
Bi-214	3.78E–05	28.86	3.69E–06	8.87E–03	2.10E–08	1.86E–10	2.66E+01	7.65E–14	2.03E–12	3.32E+11	5.25E–17	1.75E–05
Ra-226	1.60E+03	48.10	6.16E–06	1.48E–02	2.20E–06	3.25E–08	4.43E+01	3.15E–16	1.40E–14	5.54E+11	1.70E–19	9.42E–08
Cs-137	3.02E+01	22.27	2.85E–06	6.84E–03	6.70E–09	4.58E–11	2.05E+01	7.74E–18	1.59E–16	2.57E+11	4.02E–21	1.03E–09
Ba-137m	8.08E–08	22.27	2.85E–06	6.84E–03	See Cs-137	See Cs-137	2.05E+01	2.88E–14	5.91E–13	2.57E+11	1.93E–17	4.95E–06
Eu-152	1.34E+01	26.38	3.38E–06	8.10E–03	2.70E–08	2.19E–10	2.43E+01	5.65E–14	1.37E–12	3.04E+11	3.75E–17	1.14E–05
Eu-154	8.50E+00	115.81	1.48E–05	3.56E–02	3.50E–08	1.25E–09	1.07E+02	6.14E–14	6.55E–12	1.33E+12	4.11E–17	5.48E–05
Np-237	2.14E+06	0.74	9.47E–08	2.27E–04	1.50E–05	3.41E–09	6.82E–01	1.03E–15	7.02E–16	8.52E+09	4.17E–19	3.55E–09
Pu-242[c]	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data
Sr-90	2.86E+01	70.30	9.00E–06	2.16E–02	7.70E–08	1.66E–09	6.48E+01	7.53E–18	4.88E–16	8.10E+11	3.77E–21	3.05E–09
Y-90	7.30E–03	70.30	9.00E–06	2.16E–02	1.70E–09	3.67E–11	6.48E+01	1.90E–16	1.23E–14	8.10E+11	1.28E–19	1.04E–07
Tc-99	2.13E+05	50.32	6.44E–06	1.55E–02	3.20E–09	4.95E–11	4.64E+01	1.62E–18	7.51E–17	5.80E+11	6.72E–22	3.90E–10
H-3	1.23E+01	1,002.70	1.28E–04	(d)	4.50E–11	(d)	9.24E+02	3.31E–19	3.06E–16	1.16E+13	0.00E+00	0.00E+00
Po-210	3.79E–01	126.17	1.61E–05	(d)	2.20E–06	(d)	1.16E+02	4.16E–19	4.84E–17	1.45E+12	2.80E–22	4.07E–10
Total	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	**5.09E–06**	Not applicable	Not applicable	**8.71E–11**	Not applicable	Not applicable	**7.47E–04**

a. Based on an exposure duration of 2,000 hr/yr.
b. Uppermost 30 cm of soil layer [adapted from Lyons (2003)].
c. Plutonium and americium not environmental contaminants until 1960.
d. H-3 and Po-210 resuspension taken into account in derivation of effluent intakes.

Table 4-16. Annual average ground layer external exposure, resuspension submersion external exposure, and resuspension submersion intake by radionuclide, 1960 through 1969.

Nuclide	Half-life (yr)	Mean soil (Bq/kg)	Airborne (Bq/m^3)	Submersion intake (Bq)[a]	ICRP (1995) DCF (Sv/Bq)	Submersion intake dose (Sv)	External submersion (Bq s/m^3)[a]	Effective DCF [Sv/(Bq s/m^3)]	Submersion effective dose (Sv)	Soil layer[b] (Bq s/m^3)[a]	Infinite thickness DCF [Sv/(Bq s/m^3)]	Soil exposure dose (Sv/yr)
Ac-227	2.18E+01	12.58	1.61E–06	3.86E–03	6.30E–04	2.43E–06	1.16E+01	5.82E–18	6.75E–17	1.45E+11	2.65E–21	3.84E–10
Th-227	5.12E–02	12.58	1.61E–06	3.86E–03	7.60E–06	2.94E–08	1.16E+01	4.88E–15	5.66E–14	1.45E+11	2.79E–18	4.04E–07
Am-241	4.32E+02	4.81	6.16E–07	1.48E–03	2.70E–05	3.99E–08	4.43E+00	8.18E–16	3.63E–15	5.54E+10	2.34E–19	1.30E–08
Pu-238	8.78E+01	2,160.80	2.77E–04	(c)	3.00E–05	(c)	1.99E+03	4.88E–18	9.72E–15	2.49E+13	8.10E–22	2.02E–08
Pu-239/240	2.41E+04	1.11	1.42E–07	(c)	3.20E–05	(c)	1.02E+00	4.75E–18	4.86E–18	1.28E+10	1.58E–21	2.02E–11
Pu-241	1.44E+01	1,875.90	2.40E–04	5.76E–01	5.80E–07	3.34E–07	1.73E+03	7.25E–20	1.25E–16	2.16E+13	3.16E–23	6.83E–10
Co-60	5.27E+00	172.05	2.20E–05	5.29E–02	1.70E–08	8.99E–10	1.59E+02	1.26E–13	2.00E–11	1.98E+12	8.68E–17	1.72E–04
Pa-231	3.28E+04	42.18	5.40E–06	1.30E–02	8.90E–05	1.15E–06	3.89E+01	1.72E–15	6.69E–14	4.86E+11	1.02E–18	4.96E–07
Th-230	7.70E+04	110.26	1.41E–05	3.39E–02	2.80E–05	9.48E–07	1.02E+02	1.74E–17	1.77E–15	1.27E+12	6.47E–21	8.22E–09
Th-232	1.41E+10	51.06	6.54E–06	1.57E–02	2.90E–05	4.55E–07	4.71E+01	8.72E–18	4.10E–16	5.88E+11	2.79E–21	1.64E–09
Ac-228	6.99E–04	37.37	4.78E–06	1.15E–02	2.90E–08	3.33E–10	3.44E+01	4.78E–14	1.65E–12	4.31E+11	3.20E–17	1.38E–05
Ra-228	5.76E+00	37.37	4.78E–06	1.15E–02	1.70E–06	1.95E–08	3.44E+01	0.00E+00	0.00E+00	4.31E+11	0.00E+00	0.00E+00
Bi-207	3.22E+01	4.22	5.40E–07	1.30E–03	3.20E–09	4.15E–12	3.89E+00	7.54E–14	2.93E–13	4.86E+10	5.02E–17	2.44E–06
Bi-210	1.37E–02	2.96	3.79E–07	9.09E–04	6.00E–08	5.46E–11	2.73E+00	3.29E–17	8.97E–17	3.41E+10	1.93E–20	6.58E–10
Bi-10m	3.00E+06	2.96	3.79E–07	9.09E–04	2.10E–06	1.91E–09	2.73E+00	1.22E–14	3.33E–14	3.41E+10	7.37E–18	2.51E–07
Bi-214	3.78E–05	28.86	3.69E–06	8.87E–03	2.10E–08	1.86E–10	2.66E+01	7.65E–14	2.03E–12	3.32E+11	5.25E–17	1.75E–05
Ra-226	1.60E+03	48.10	6.16E–06	1.48E–02	2.20E–06	3.25E–08	4.43E+01	3.15E–16	1.40E–14	5.54E+11	1.70E–19	9.42E–08
Cs-137	3.02E+01	17.69	2.26E–06	5.43E–03	6.70E–09	3.64E–11	1.63E+01	7.74E–18	1.26E–16	2.04E+11	4.02E–21	8.19E–10
Ba-137m	8.08E–08	17.69	2.26E–06	5.43E–03	See Cs-137	See Cs-137	1.63E+01	2.88E–14	4.69E–13	2.04E+11	1.93E–17	3.93E–06
Eu-152	1.34E+01	15.73	2.01E–06	4.83E–03	2.70E–08	1.30E–10	1.45E+01	5.65E–14	8.19E–13	1.81E+11	3.75E–17	6.79E–06
Eu-154	8.50E+00	51.43	6.58E–06	1.58E–02	3.50E–08	5.53E–10	4.74E+01	6.14E–14	2.91E–12	5.92E+11	4.11E–17	2.44E–05
Np-237	2.14E+06	0.74	9.47E–08	2.27E–04	1.50E–05	3.41E–09	6.82E–01	1.03E–15	7.02E–16	8.52E+09	4.17E–19	3.55E–09
Pu-242	3.76E+05	1.11	1.42E–07	3.41E–04	3.10E–05	1.06E–08	1.02E+00	4.01E–18	4.10E–18	1.28E+10	6.85E–22	8.76E–12
Sr-90	2.86E+01	55.13	7.06E–06	1.69E–02	7.70E–08	1.30E–09	5.08E+01	7.53E–18	3.83E–16	6.35E+11	3.77E–21	2.39E–09
Y-90	7.30E–03	55.13	7.06E–06	1.69E–02	1.70E–09	2.88E–11	5.08E+01	1.90E–16	9.65E–15	6.35E+11	1.28E–19	8.13E–08
Tc-99	2.13E+05	50.32	6.44E–06	1.55E–02	3.20E–09	4.95E–11	4.64E+01	1.62E–18	7.51E–17	5.80E+11	6.72E–22	3.90E–10
H-3	1.23E+01	569.80	7.29E–05	1.75E–01	4.50E–11	7.88E–12	5.25E+02	3.31E–19	1.74E–16	6.56E+12	0.00E+00	0.00E+00
Po-210	3.79E–01	493	6.31E–05	(c)	2.20E–06	(c)	4.54E+02	4.16E–19	1.89E–16	5.68E+12	2.80E–22	1.59E–09
Total	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	**5.47E–06**	Not applicable	Not applicable	**2.84E–11**	Not applicable	Not applicable	**2.43E–04**

a. Based on an exposure duration of 2,000 hr/yr.
b. Uppermost 30 cm of soil layer [adapted from Lyons (2003)].
c. H-3, Pu-239, Pu-238, and Po-210 resuspension taken into account in derivation of effluent intakes.

Table 4-17. Annual average ground layer external exposure, resuspension submersion external exposure, and resuspension submersion intake by radionuclide, 1970 through 1979.

Nuclide	Half-life (yr)	Mean soil (Bq/kg)	Airborne (Bq/m^3)	Submersion intake (Bq)[a]	ICRP (1995) DCF (Sv/Bq)	Submersion intake dose (Sv)	External submersion (Bq s/m^3)[a]	Effective DCF [Sv/(Bq s/m^3)]	Submersion effective dose (Sv)	Soil layer[b] (Bq s/m^3)[a]	Infinite thickness DCF [Sv/(Bq s/m^3)]	Soil exposure dose (Sv/yr)
Ac-227	2.18E+01	12.58	1.61E–06	3.86E–03	6.30E–04	2.43E–06	1.16E+01	5.82E–18	6.75E–17	1.45E+11	2.65E–21	3.84E–10
Th-227	5.12E–02	12.58	1.61E–06	3.86E–03	7.60E–06	2.94E–08	1.16E+01	4.88E–15	5.66E–14	1.45E+11	2.79E–18	4.04E–07
Am-241	4.32E+02	4.81	6.16E–07	1.48E–03	2.70E–05	3.99E–08	4.43E+00	8.18E–16	3.63E–15	5.54E+10	2.34E–19	1.30E–08
Pu-238	8.78E+01	1,998.00	2.56E–04	(c)	3.00E–05	(c)	1.84E+03	4.88E–18	8.99E–15	2.30E+13	8.10E–22	1.86E–08
Pu-239/240	2.41E+04	1.11	1.42E–07	(c)	3.20E–05	(c)	1.02E+00	4.75E–18	4.86E–18	1.28E+10	1.58E–21	2.02E–11
Pu-241	1.44E+01	1,158.10	1.48E–04	3.56E–01	5.80E–07	2.06E–07	1.07E+03	7.25E–20	7.74E–17	1.33E+13	3.16E–23	4.22E–10
Co-60	5.27E+00	46.25	5.92E–06	1.42E–02	1.70E–08	2.42E–10	4.26E+01	1.26E–13	5.37E–12	5.33E+11	8.68E–17	4.62E–05
Pa-231	3.28E+04	42.18	5.40E–06	1.30E–02	8.90E–05	1.15E–06	3.89E+01	1.72E–15	6.69E–14	4.86E+11	1.02E–18	4.96E–07
Th-230	7.70E+04	110.26	1.41E–05	3.39E–02	2.80E–05	9.48E–07	1.02E+02	1.74E–17	1.77E–15	1.27E+12	6.47E–21	8.22E–09
Th-232	1.41E+10	51.06	6.54E–06	1.57E–02	2.90E–05	4.55E–07	4.71E+01	8.72E–18	4.10E–16	5.88E+11	2.79E–21	1.64E–09
Ac-228	6.99E–04	37.37	4.78E–06	1.15E–02	2.90E–08	3.33E–10	3.44E+01	4.78E–14	1.65E–12	4.31E+11	3.20E–17	1.38E–05
Ra-228	5.76E+00	37.37	4.78E–06	1.15E–02	1.70E–06	1.95E–08	3.44E+01	0.00E+00	0.00E+00	4.31E+11	0.00E+00	0.00E+00
Bi-207	3.22E+01	3.42	4.37E–07	1.05E–03	3.20E–09	3.36E–12	3.15E+00	7.54E–14	2.37E–13	3.93E+10	5.02E–17	1.97E–06
Bi-210	1.37E–02	2.96	3.79E–07	9.09E–04	6.00E–08	5.46E–11	2.73E+00	3.29E–17	8.97E–17	3.41E+10	1.93E–20	6.58E–10
Bi-210m	3.00E+06	2.96	3.79E–07	9.09E–04	2.10E–06	1.91E–09	2.73E+00	1.22E–14	3.33E–14	3.41E+10	7.37E–18	2.51E–07
Bi-214	3.78E–05	28.86	3.69E–06	8.87E–03	2.10E–08	1.86E–10	2.66E+01	7.65E–14	2.03E–12	3.32E+11	5.25E–17	1.75E–05
R-226	1.60E+03	48.10	6.16E–06	1.48E–02	2.20E–06	3.25E–08	4.43E+01	3.15E–16	1.40E–14	5.54E+11	1.70E–19	9.42E–08
Cs-137	3.02E+01	14.06	1.80E–06	4.32E–03	6.70E–09	2.89E–11	1.30E+01	7.74E–18	1.00E–16	1.62E+11	4.02E–21	6.51E–10
Ba-137m	8.08E–08	14.06	1.80E–06	4.32E–03	See Cs-137	See Cs-137	1.30E+01	2.88E–14	3.73E–13	1.62E+11	1.93E–17	3.13E–06
Eu-152	1.34E+01	9.36	1.20E–06	2.88E–03	2.70E–08	7.76E–11	8.63E+00	5.65E–14	4.87E–13	1.08E+11	3.75E–17	4.04E–06
Eu-154	8.50E+00	22.68	2.90E–06	6.97E–03	3.50E–08	2.44E–10	2.09E+01	6.14E–14	1.28E–12	2.61E+11	4.11E–17	1.07E–05
Np-237	2.14E+06	0.74	9.47E–08	2.27E–04	1.50E–05	3.41E–09	6.82E–01	1.03E–15	7.02E–16	8.52E+09	4.17E–19	3.55E–09
Pu-142	3.76E+05	1.11	1.42E–07	3.41E–04	3.10E–05	1.06E–08	1.02E+00	4.01E–18	4.10E–18	1.28E+10	6.85E–22	8.76E–12
Sr-90	2.86E+01	43.29	5.54E–06	1.33E–02	7.70E–08	1.02E–09	3.99E+01	7.53E–18	3.00E–16	4.99E+11	3.77E–21	1.88E–09
Y-90	7.30E–03	43.29	5.54E–06	1.33E–02	1.70E–09	2.26E–11	3.99E+01	1.90E–16	7.58E–15	4.99E+11	1.28E–19	6.38E–08
Tc-99	2.13E+05	50.32	6.44E–06	1.55E–02	3.20E–09	4.95E–11	4.64E+01	1.62E–18	7.51E–17	5.80E+11	6.72E–22	3.90E–10
H-3	1.23E+01	324.49	4.15E–05	(c)	4.50E–11	(c)	2.99E+02	3.31E–19	9.90E–17	3.74E+12	0.00E+00	0.00E+00
Po-210	3.79E–01	78.07	9.99E–06	(c)	2.20E–06	(c)	7.19E+01	4.16E–19	2.99E–17	8.99E+11	2.80E–22	2.52E–10
Total	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	**5.34E–06**	Not applicable	Not applicable	**1.16E–11**	Not applicable	Not applicable	**9.87E–05**

a. Based on an exposure duration of 2,000 hr/yr.
b. Uppermost 30 cm of soil layer [adapted from Lyons (2003)].
c. H-3, Pu-239, Pu-238, and Po-210 resuspension taken into account in derivation of effluent intakes.

Table 4-18. Annual average ground layer external exposure, resuspension submersion external exposure, and resuspension submersion intake by radionuclide, 1980 through 1989.

Nuclide	Half-life (yr)	Mean soil (Bq/kg)	Airborne (Bq/m^3)	Submersion intake (Bq)[a]	ICRP (1995) DCF (Sv/Bq)	Submersion intake dose (Sv)	External submersion (Bq s/m^3)[a]	Effective DCF [Sv/(Bq s/m^3)]	Submersion effective dose (Sv)	Soil layer[b] (Bq s/m^3)[a]	Infinite thickness DCF [Sv/(Bq s/m^3)]	Soil exposure dose (Sv/yr)
Ac-227	2.18E+01	12.58	1.61E–06	3.86E–03	6.30E–04	2.43E–06	1.16E+01	5.82E–18	6.75E–17	1.45E+11	2.65E–21	3.84E–10
Th-227	5.12E–02	12.58	1.61E–06	3.86E–03	7.60E–06	2.94E–08	1.16E+01	4.88E–15	5.66E–14	1.45E+11	2.79E–18	4.04E–07
Am-241	4.32E+02	4.81	6.16E–07	1.48E–03	2.70E–05	3.99E–08	4.43E+00	8.18E–16	3.63E–15	5.54E+10	2.34E–19	1.30E–08
Pu-238	8.78E+01	1,846.30	2.36E–04	(c)	3.00E–05	(c)	1.70E+03	4.88E–18	8.30E–15	2.13E+13	8.10E–22	1.72E–08
Pu-239/240	2.41E+04	1.11	1.42E–07	(c)	3.20E–05	(c)	1.02E+00	4.75E–18	4.86E–18	1.28E+10	1.58E–21	2.02E–11
Pu-241	1.44E+01	714.10	9.14E–05	2.19E–01	5.80E–07	1.27E–07	6.58E+02	7.25E–20	4.77E–17	8.23E+12	3.16E–23	2.60E–10
Co-60	5.27E+00	12.40	1.59E–06	3.81E–03	1.70E–08	6.47E–11	1.14E+01	1.26E–13	1.44E–12	1.43E+11	8.68E–17	1.24E–05
Pa-231	3.28E+04	42.18	5.40E–06	1.30E–02	8.90E–05	1.15E–06	3.89E+01	1.72E–15	6.69E–14	4.86E+11	1.02E–18	4.96E–07
Th-230	7.70E+04	110.26	1.41E–05	3.39E–02	2.80E–05	9.48E–07	1.02E+02	1.74E–17	1.77E–15	1.27E+12	6.47E–21	8.22E–09
Th-232	1.41E+10	51.06	6.54E–06	1.57E–02	2.90E–05	4.55E–07	4.71E+01	8.72E–18	4.10E–16	5.88E+11	2.79E–21	1.64E–09
Ac-228	6.99E–04	37.37	4.78E–06	1.15E–02	2.90E–08	3.33E–10	3.44E+01	4.78E–14	1.65E–12	4.31E+11	3.20E–17	1.38E–05
Ra-228	5.76E+00	37.37	4.78E–06	1.15E–02	1.70E–06	1.95E–08	3.44E+01	0.00E+00	0.00E+00	4.31E+11	0.00E+00	0.00E+00
Bi-207	3.22E+01	2.75	3.52E–07	8.46E–04	3.20E–09	2.71E–12	2.54E+00	7.54E–14	1.91E–13	3.17E+10	5.02E–17	1.59E–06
Bi-210	1.37E–02	2.96	3.79E–07	9.09E–04	6.00E–08	5.46E–11	2.73E+00	3.29E–17	8.97E–17	3.41E+10	1.93E–20	6.58E–10
Bi-210m	3.00E+06	2.96	3.79E–07	9.09E–04	2.10E–06	1.91E–09	2.73E+00	1.22E–14	3.33E–14	3.41E+10	7.37E–18	2.51E–07
Bi-241	3.78E–05	28.86	3.69E–06	8.87E–03	2.10E–08	1.86E–10	2.66E+01	7.65E–14	2.03E–12	3.32E+11	5.25E–17	1.75E–05
Ra-226	1.60E+03	48.10	6.16E–06	1.48E–02	2.20E–06	3.25E–08	4.43E+01	3.15E–16	1.40E–14	5.54E+11	1.70E–19	9.42E–08
Cs-137	3.02E+01	11.17	1.43E–06	3.43E–03	6.70E–09	2.30E–11	1.03E+01	7.74E–18	7.97E–17	1.29E+11	4.02E–21	5.17E–10
Ba-137m	8.08E–08	11.17	1.43E–06	3.43E–03	See Cs-137	See Cs-137	1.03E+01	2.88E–14	2.97E–13	1.29E+11	1.93E–17	2.48E–06
Eu-152	1.34E+01	5.59	7.15E–07	1.72E–03	2.70E–08	4.63E–11	5.15E+00	5.65E–14	2.91E–13	6.44E+10	3.75E–17	2.41E–06
Eu-154	8.50E+00	10.03	1.28E–06	3.08E–03	3.50E–08	1.08E–10	9.24E+00	6.14E–14	5.67E–13	1.16E+11	4.11E–17	4.75E–06
Np-237	2.14E+06	0.74	9.47E–08	2.27E–04	1.50E–05	3.41E–09	6.82E–01	1.03E–15	7.02E–16	8.52E+09	4.17E–19	3.55E–09
Pu-242	3.76E+05	1.11	1.42E–07	3.41E–04	3.10E–05	1.06E–08	1.02E+00	4.01E–18	4.10E–18	1.28E+10	6.85E–22	8.76E–12
Sr-90	2.86E+01	33.93	4.34E–06	1.04E–02	7.70E–08	8.03E–10	3.13E+01	7.53E–18	2.35E–16	3.91E+11	3.77E–21	1.47E–09
Y-90	7.30E–03	33.93	4.34E–06	1.04E–02	1.70E–09	1.77E–11	3.13E+01	1.90E–16	5.94E–15	3.91E+11	1.28E–19	5.00E–08
Tc-99	2.13E+05	50.32	6.44E–06	1.55E–02	3.20E–09	4.95E–11	4.64E+01	1.62E–18	7.51E–17	5.80E+11	6.72E–22	3.90E–10
H-3	1.23E+01	184.63	2.36E–05	(c)	4.50E–11	(c)	1.70E+02	3.31E–19	5.63E–17	2.13E+12	0.00E+00	0.00E+00
Total	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	**5.26E–06**	Not applicable	Not applicable	**6.66E–12**	Not applicable	Not applicable	**5.62E–05**

a. Based on an exposure duration of 2,000 hr/yr.
b. Uppermost 30 cm of soil layer [adapted from Lyons (2003)].
c. H-3, Pu-238, and Pu-239 resuspension taken into account in derivation of effluent intakes.

Table 4-19. Annual average ground layer external exposure, resuspension submersion external exposure, and resuspension submersion intake by radionuclide, 1990 to present.

Nuclide	Half-life (yr)	Mean soil (Bq/kg)	Airborne (Bq/m^3)	Submersion intake (Bq)[a]	ICRP (1995) DCF (Sv/Bq)	Submersion intake dose (Sv)	External submersion (Bq s/m^3)[a]	Effective DCF [Sv/(Bq s/m^3)]	Submersion effective dose (Sv)	Soil layer[b] (Bq s/m^3)[a]	Infinite thickness DCF [Sv/(Bq s/m^3)]	Soil exposure dose (Sv/yr)
Ac-227	2.18E+01	12.58	1.61E–06	3.86E–03	6.30E–04	2.43E–06	1.16E+01	5.82E–18	6.75E–17	1.45E+11	2.65E–21	3.84E–10
Th-227	5.12E–02	12.58	1.61E–06	3.86E–03	7.60E–06	2.94E–08	1.16E+01	4.88E–15	5.66E–14	1.45E+11	2.79E–18	4.04E–07
Am-241	4.32E+02	4.81	6.16E–07	1.48E–03	2.70E–05	3.99E–08	4.43E+00	8.18E–16	3.63E–15	5.54E+10	2.34E–19	1.30E–08
Pu-238	8.78E+01	1,705.70	2.18E–04	(c)	3.00E–05	(c)	1.57E+03	4.88E–18	7.67E–15	1.96E+13	8.10E–22	1.59E–08
Pu-239/240	2.41E+04	1.11	1.42E–07	(c)	3.20E–05	(c)	1.02E+00	4.75E–18	4.86E–18	1.28E+10	1.58E–21	2.02E–11
Pu-241	1.44E+01	440.30	5.64E–05	1.35E–01	5.80E–07	7.85E–08	4.06E+02	7.25E–20	2.94E–17	5.07E+12	3.16E–23	1.60E–10
Co-60	5.27E+00	3.33	4.26E–07	1.02E–03	1.70E–08	1.74E–11	3.07E+00	1.26E–13	3.87E–13	3.84E+10	8.68E–17	3.33E–06
Pa-231	3.28E+04	42.18	5.40E–06	1.30E–02	8.90E–05	1.15E–06	3.89E+01	1.72E–15	6.69E–14	4.86E+11	1.02E–18	4.96E–07
Th-230	7.70E+04	110.26	1.41E–05	3.39E–02	2.80E–05	9.48E–07	1.02E+02	1.74E–17	1.77E–15	1.27E+12	6.47E–21	8.22E–09
Th-232	1.41E+10	51.06	6.54E–06	1.57E–02	2.90E–05	4.55E–07	4.71E+01	8.72E–18	4.10E–16	5.88E+11	2.79E–21	1.64E–09
Ac-228	6.99E–04	37.37	4.78E–06	1.15E–02	2.90E–08	3.33E–10	3.44E+01	4.78E–14	1.65E–12	4.31E+11	3.20E–17	1.38E–05
Ra-228	5.76E+00	37.37	4.78E–06	1.15E–02	1.70E–06	1.95E–08	3.44E+01	0.00E+00	0.00E+00	4.31E+11	0.00E+00	0.00E+00
Bi-207	3.22E+01	2.22	2.84E–07	6.82E–04	3.20E–09	2.18E–12	2.05E+00	7.54E–14	1.54E–13	2.56E+10	5.02E–17	1.28E–06
Bi-210	1.37E–02	2.96	3.79E–07	9.09E–04	6.00E–08	5.46E–11	2.73E+00	3.29E–17	8.97E–17	3.41E+10	1.93E–20	6.58E–10
Bi-210m	3.00E+06	2.96	3.79E–07	9.09E–04	2.10E–06	1.91E–09	2.73E+00	1.22E–14	3.33E–14	3.41E+10	7.37E–18	2.51E–07
Bi-241	3.78E–05	28.86	3.69E–06	8.87E–03	2.10E–08	1.86E–10	2.66E+01	7.65E–14	2.03E–12	3.32E+11	5.25E–17	1.75E–05
Ra-226	1.60E+03	48.10	6.16E–06	1.48E–02	2.20E–06	3.25E–08	4.43E+01	3.15E–16	1.40E–14	5.54E+11	1.70E–19	9.42E–08
Cs-137	3.02E+01	8.88	1.14E–06	2.73E–03	6.70E–09	1.83E–11	8.18E+00	7.74E–18	6.33E–17	1.02E+11	4.02E–21	4.11E–10
Ba-137m	8.08E–08	8.88	1.14E–06	2.73E–03	See Cs-137	See Cs-137	8.18E+00	2.88E–14	2.36E–13	1.02E+11	1.93E–17	1.97E–06
Eu-152	1.34E+01	3.33	4.26E–07	1.02E–03	2.70E–08	2.76E–11	3.07E+00	5.65E–14	1.73E–13	3.84E+10	3.75E–17	1.44E–06
Eu-154	8.50E+00	4.44	5.68E–07	1.36E–03	3.50E–08	4.77E–11	4.09E+00	6.14E–14	2.51E–13	5.11E+10	4.11E–17	2.10E–06
Np-237	2.14E+06	0.74	9.47E–08	2.27E–04	1.50E–05	3.41E–09	6.82E–01	1.03E–15	7.02E–16	8.52E+09	4.17E–19	3.55E–09
Pu-242	3.76E+05	1.11	1.42E–07	3.41E–04	3.10E–05	1.06E–08	1.02E+00	4.01E–18	4.10E–18	1.28E+10	6.85E–22	8.76E–12
Sr-90	2.86E+01	26.64	3.41E–06	8.18E–03	7.70E–08	6.30E–10	2.46E+01	7.53E–18	1.85E–16	3.07E+11	3.77E–21	1.16E–09
Y-90	7.30E–03	26.64	3.41E–06	8.18E–03	1.70E–09	1.39E–11	2.46E+01	1.90E–16	4.66E–15	3.07E+11	1.28E–19	3.93E–08
Tc-99	2.13E+05	50.32	6.44E–06	1.55E–02	3.20E–09	4.95E–11	4.64E+01	1.62E–18	7.51E–17	5.80E+11	6.72E–22	3.90E–10
H-3	1.23E+01	105.08	1.35E–05	(c)	4.50E–11	(c)	9.68E+01	3.31E–19	3.21E–17	1.21E+12	0.00E+00	0.00E+00
Total	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	**5.21E–06**	Not applicable	Not applicable	**5.07E–12**	Not applicable	Not applicable	**4.27E–05**

a. Based on exposure duration of 2,000 hr/yr.
b. Uppermost 30 cm of soil layer [adapted from Lyons (2003)].
c. H-3, Pu-238, and Pu-239 resuspension taken into account in derivation of effluent intakes.

The external submersion and submersion (resuspension) intakes are presented in Tables 4-14 through 4-19. The annual external submersion dose and submersion (resuspension) intake doses due to contaminated soil are less than 1 mrem annually and can be neglected for dose reconstruction.

Estimates of external exposure from radionuclides in soil at the Mound facility were made using the same sitewide average decay-corrected profile of radionuclides in the resuspension intake estimates. Soil mass activity concentrations were converted to equivalent volume activity concentrations using a soil density of 1,600 kg/m^3 and exposure duration of 2,000 hr/yr to derive soil layer external exposures. These results (listed in Tables 4-14 through 4-19) are applicable to the radionuclides and periods applied to the resuspension intake assessment. Table 4-20 summarizes the annual mean sitewide external exposure results for the Mound Plant.

Table 4-20. Mean and maximum environmental external radiation levels (rem) by year.

Year	Mound mean sitewide	SM/PP Hill area maximum
1949	8.45E–02	5.56E–01
1950	7.47E–02	4.92E–01
1951	7.47E–02	4.92E–01
1952	7.47E–02	4.92E–01
1953	7.47E–02	4.92E–01
1954	7.47E–02	4.92E–01
1955	4.17E–02	2.74E–01
1956	4.17E–02	2.74E–01
1957	4.17E–02	2.74E–01
1958	4.17E–02	2.74E–01
1959	4.17E–02	2.74E–01
1960	2.42E–02	1.59E–01
1961	2.42E–02	1.59E–01
1962	2.42E–02	1.59E–01
1963	2.42E–02	1.59E–01
1964	2.42E–02	1.59E–01
1965	1.49E–02	9.81E–02
1966	1.49E–02	9.81E–02
1967	1.49E–02	9.81E–02
1968	1.49E–02	9.81E–02
1969	1.49E–02	9.81E–02
1970	9.87E–03	6.50E–02
1971	9.87E–03	6.50E–02
1972	9.87E–03	6.50E–02
1973	9.87E–03	6.50E–02
1974	9.87E–03	6.50E–02
1975	7.14E–03	4.70E–02
1976	7.14E–03	4.70E–02
1977	7.14E–03	4.70E–02
1978	7.14E–03	4.70E–02
1979	7.14E–03	4.70E–02
1980	5.62E–03	3.70E–02
1981	5.62E–03	3.70E–02
1982	5.62E–03	3.70E–02
1983	5.62E–03	3.70E–02
1984	5.62E–03	3.70E–02
1985	4.77E–03	3.14E–02
1986	4.77E–03	3.14E–02
1987	4.77E–03	3.14E–02
1988	4.77E–03	3.14E–02
1989	4.77E–03	3.14E–02
1990	4.27E–03	2.81E–02
1991	4.27E–03	2.81E–02
1992	4.27E–03	2.81E–02
1993	4.27E–03	2.81E–02
1994	4.27E–03	2.81E–02
1995	4.27E–03	2.81E–02
1996	4.27E–03	2.81E–02
1997	4.27E–03	2.81E–02
1998	4.27E–03	2.81E–02
1999	4.27E–03	2.81E–02
2000	4.27E–03	2.81E–02
2001	4.27E–03	2.81E–02
2002	4.27E–03	2.81E–02
2003	No data	No data

No general area environmental measurements of direct gamma radiation were documented for the Mound facility other than a single aerial survey in July 1976 (DOE 1993b). The maximum exposure rates in the survey report ranged from 20.5 to 23.5 µR/hr around the SM Building and Building 38 on the SM/PP Hill. Data from this report were difficult to interpret in a manner useful to dose reconstruction because they (1) applied to a single moment in time and (2) were probably heavily influenced by isolated radiation sources. Nevertheless, this exposure rate was used to estimate the maximum exposure rate on site by assuming that the maximum exposure rate of 23.5 µR/hr measured in 1976 was due to a spill in 1949. The spill was assumed to contain a mix of radionuclides identical to the sitewide average soil profile of radionuclides measured in 30-cm-thick soil samples

(Lyons 2003). As a consequence, the maximum exposure rate was assumed to decay over time exactly like the sitewide average soil concentrations (see Table 4-20).

When assigning dose, the mean and maximum environmental external radiation levels should be multiplied by the ambient dose equivalent [*H*(10)*] DCF for an isotropic exposure geometry (NIOSH 2007).

An estimate of the uncertainty associated with the ambient dose from soil contamination was made by assuming that the ambient dose is lognormally distributed and that the median annual dose from the soil contamination in Tables 4-14 through 4-19 represents the 50th-percentile dose. The maximum annual exposure rates around the SM Building and Building 38 on the SM/PP Hill were assumed to represent the upper 95th-percentile ambient dose. The resulting GSD is 3.12 for each year from 1949 through 2002.

4.2.6 Direct External Exposure from Facilities

No environmental measurements of direct gamma radiation were documented for the Mound facilities. Direct external ambient dose could have resulted from gamma radiation originating in the operational buildings at Mound or from the storage of waste material or of irradiated bismuth slugs in facility buildings or onsite structures. The following discussion supports the conclusion that it is unlikely that gamma radiation from within the operational buildings of Mound contributed to the ambient environmental dose.

Waste transport vehicles were used at Mound beginning in the 1950s for transporting casks of polonium from their unloading area along the railroad siding to the T Building. The irradiated canned bismuth slugs received from the Hanford Site were removed from casks and stored in a pool of water on the second floor of T Building, where the separation of ^{210}Po from bismuth took place (DOE 1993a).

Drummed radioactive wastes generated at Mound were typically staged in operating areas and moved by health physics personnel to storage warehouses before shipment. In the 1940s and 1950s the “old explosives bunkers” were used to store waste with high gamma radiation levels to avoid worker exposures. The isolated location of the bunkers allowed these wastes to be stored away from the occupied areas of the site. Modern facilities replaced the old warehouses on site in the 1960s and 1970s (DOE 1993a).

The most likely source of environmental exposure from gamma sources originating in Mound facilities would be associated with the ^{226}Ra-^{227}Ac program that separated ^{227}Ac from neutron-irradiated ^{226}Ra target material. The radium-actinium technology developed at Argonne National Laboratory was transferred to Mound in early 1950. The General Purpose (GP) Building, later known as the SW Building, was constructed with a shielded process facility on the east side referred to as the old cave. The cave design was duplicated from the one at Argonne.

By March 1952, three radium-actinium separation runs had been completed in the cave. The first run contained 0.6 g of radium yielding 135 mCi of ^{227}Ac. The second and third runs contained 5 g each and yielded 2.59 and 2.36 Ci of ^{227}Ac, respectively. Gamma surveys during the runs indicated exposure rate levels varying from less than 1 mR/hr in the operational area adjacent to the cave to 7 R/hr inside the cave (Bradley 1952c). Based on the survey results, it is unlikely that gamma radiation from within the SW Building cave contributed to the ambient environmental dose.

No detailed description of the administrative practices involving environmental exposure is available for the early operating years at Mound. Nevertheless, several 1951 Monthly Health Physics Reports state that when routine beta and gamma surveys in operational areas detected radiation levels

greater than 7.5 mR/hr, the area was either shielded or roped off (Bradley 1951f to 1951j). As a consequence, it is unlikely that gamma radiation from within the operational buildings at Mound contributed to the ambient environmental dose.

4.2.7 Assignment of Ambient External Dose

Because there is no indication that elevated background radiation was subtracted from dosimeter results, ambient environmental dose should be assigned only for Mound workers who were not monitored. Because the onsite ambient doses were calculated based on soil concentration data, the annual dose is multiplied by the appropriate ambient dose equivalent [*H*(10)*] DCF in OCAS-IG-001 for an isotropic exposure geometry (NIOSH 2007). A DCF of 1 for onsite ambient dose should be applied for cancers where the skin is used to calculate external dose. Dose reconstructors should assign onsite ambient dose using the mean sitewide values in Table 4-20 as a lognormal distribution with a GSD of 3.12 and adjusted to 2,500 work hours per year. The 2,500 work hours per year assumption is based on a computer-assisted telephone interview search using the fifteen most recently completed claims (as of May 2019; excluding survivor interviews or claims with employment periods of less than 1 year). Twelve of the fifteen selected energy employees indicated overtime work, while the remaining three did not. For partial years of employment or variance in the known number of work hours, the values should be scaled accordingly.

4.3 UNCERTAINTIES

Estimates of the median environmental intakes at the Mound Plant are presented in Section 4.2.3.2 and in Table 4-9. These estimates were made by assuming that the intakes are lognormally distributed and that the median intakes represent the 50th-percentile intake rate. For Mound, the calculated sitewide annual maximum intakes in Table 4-11 are assumed to represent the upper 95th-percentile intake. The resulting GSDs are listed in Table 4-12.

For Mound, the calculated mean ambient dose in Table 4-20 is assumed to represent the 50th-percentile dose. The maximum ambient dose associated with the SM/PP Hill area is assumed to represent the upper 95th-percentile ambient dose, resulting in an annual GSD of 3.12.

Effluent release rate data from Mound was unavailable for some operational periods. As a consequence, extrapolations were necessary to estimate intakes for years in which no onsite air monitoring data were available. Effluent intake data for ^{210}Po from 1954 through 1966 were based on an assumption that the annual increase in the effluent release rate (source term) was 20% greater than the earliest year for which monitoring data were published (i.e., 20 µCi/d from 1949 through 1953). Beginning in 1967 through 1970, the ^{210}Po data are based on reported ^{238}Pu effluent source terms (scaled to infer ^{210}Po based on the ratio of ^{210}Po to ^{238}Pu on air filter samples). Similarly, annual tritium oxide intakes from 1954 through 1958 were backwards extrapolated from the 1959 source term (the first year for which such data were published – 31,527 Ci/yr) using an annual assumed reduction factor of 10%. These assumptions are believed to be a reasonable depiction of the trend in facility operations during the extrapolated timeframes. The total activity released in effluent compares favorably to the inventory of released radionuclides reported by Mound and listed in Table 4-21.

Table 4-21. Radionuclide releases to the atmosphere (Ci), 1949 to 1973.

Radionuclide	Release reported by Mound[a]	Release used in this analysis
Pu-238, -239	3.60E–01 ±50%	3.60E–01
Po-210	4.9E–01 ±50%	6.0E–01
H-3	2.85E+06 ±25%	2.98E+06
Ac-227 (purified)	5.3E–06 ±100%	5.3E–06
Ra-226, Ac-227, Th-228, and their associated progeny	1.6E–01 ±200%	1.6E–01

a. Storey (1973).

At the time of this revision, no additional data were available to estimate environmental external or internal doses after 2002. The doses and intakes estimated for 2002 can be assigned for energy employees from 2003 to 2010 as an assumption that is favorable to claimants. This assumption is favorable to the claimant because the amount of nonnatural radioactivity at the Mound Plant decreased during this period. Because remediation activities were completed in 2010, no occupational environmental dose should be assigned after that year.

4.4 ATTRIBUTIONS AND ANNOTATIONS

All information requiring identification was addressed via references integrated into the reference section of this document.

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GLOSSARY

alpha radiation
Positively charged particle emitted from the nuclei of some radioactive elements. An alpha particle consists of two neutrons and two protons (a helium nucleus) and has an electrostatic charge of +2.

curie (Ci)
Traditional unit of radioactivity equal to 37 billion (3.7×10^{10}) becquerels, which is approximately equal to the activity of 1 gram of pure ^{226}Ra.

decay
(1) Disintegration of atomic nuclei from spontaneous radioactivity including alpha, beta, and neutron radiation, often accompanied by gamma radiation. (2) Decrease in the amount of radioactive material over time. See *half-life*.

dose
In general, the specific amount of energy from ionizing radiation that is absorbed per unit of mass. Effective and equivalent doses are in units of rem or sievert; other types of dose are in units of rad, rep, or grays.

dose conversion factor (DCF)
Multiplier for conversion of potential dose to the personal dose equivalent to the organ of interest (e.g., liver or colon). In relation to radiography, ratio of dose equivalent in tissue or organ to entrance kerma in air at the surface of the person being radiographed.

dose equivalent
In units of rem or sievert, product of absorbed dose in tissue multiplied by a weighting factor and sometimes by other modifying factors to account for the potential for a biological effect from the absorbed dose. See *dose*.

exposure
(1) In general, the act of being exposed to ionizing radiation; see *acute exposure* and *chronic exposure*. (2) Measure of the ionization produced by X- and gamma-ray photons in air in units of roentgens.

external dose
Dose received from radiation (e.g., photons, electrons, and neutrons) that originates outside the body including medical screening examinations.

gamma radiation
Electromagnetic radiation (photons) of short wavelength and high energy (10 kiloelectron-volts to 9 megaelectron-volts) that originates in atomic nuclei and accompanies many nuclear reactions (e.g., fission, radioactive decay, and neutron capture). Gamma photons are identical to X-ray photons of high energy; the difference is that X-rays do not originate in the nucleus.

half-life
Time in which half of a given quantity of a particular radionuclide disintegrates (decays) into another nuclear form. During one half-life, the number of atoms of a particular radionuclide decreases by one half. Each radionuclide has a unique half-life ranging from millionths of a second to billions of years

nuclide

Stable or unstable isotope of any element. Nuclide relates to the atomic mass, which is the sum of the number of protons and neutrons in the nucleus of an atom. A radionuclide is an unstable nuclide.

occupational environmental dose

Dose received while on the grounds of a site but not inside a building or other facility.

parent

Radionuclide that decays to form a progeny radionuclide. See *progeny* and *decay*.

progeny

Nuclides that result from decay of other nuclides. Also called decay products and formerly called daughter products. See *parent*.

radiation

Subatomic particles and electromagnetic rays (photons) with kinetic energy that interact with matter through various mechanisms that involve energy transfer.

radioactive

Of, caused by, or exhibiting radioactivity.

radioactivity

Property possessed by some elements (e.g., uranium) or isotopes (e.g., ^{14}C) of spontaneously emitting energetic particles (electrons or alpha particles) by the disintegration of their atomic nuclei. See *radionuclide*.

radioisotopic thermoelectric generator (RTG)

Generator that obtains its power from passive (natural) radioactive decay using thermocouples to convert the heat of decay into electricity.

radionuclide

Radioactive nuclide. See *nuclide*.

roentgen (R)

Unit of photon (gamma or X-ray) exposure for which the resultant ionization liberates a positive or negative charge equal to 2.58×10^{-4} coulomb per kilogram (or 1 electrostatic unit of electricity per cubic centimeter) of dry air at 0 degrees Celsius and standard atmospheric pressure. An exposure of 1 roentgen is approximately equivalent to an absorbed dose of 1 rad in soft tissue for higher energy photons (generally greater than 100 kiloelectron-volts).

special nuclear material (SNM)

Plutonium or uranium enriched to a higher-than-natural assay including ^{239}Pu, ^{233}U, uranium containing more than the natural abundance of ^{235}U, or any material artificially enriched in one of these isotopes.

ATTACHMENT A
DOSE COEFFICIENTS

LIST OF TABLES

ATTACHMENT A
DOSE COEFFICIENTS (continued)

Table A-1. Dose coefficients for contaminated soil to an infinite depth [Sv/(Bq s/m^3)].[a]

Isotope	Gonad	Breast	Lung	R marrow	Bone surface	Thyroid	Remainder	Effective dose equivalent	Skin
Ac-227	2.76E–21	2.88E–21	2.43E–21	2.22E–21	7.20E–21	2.27E–21	2.29E–21	2.65E–21	3.22E–21
Am-241	2.53E–19	2.74E–19	2.01E–19	1.57E–19	8.43E–19	1.94E–19	1.86E–19	1.34E–19	3.10E–19
Ce-141	1.77E–18	1.84E–18	1.58E–18	1.47E–18	4.34E–18	1.47E–18	1.49E–18	7.93E–18	1.94E–18
Cs-137	4.27E–21	4.50E–21	3.61E–21	3.25E–21	1.09E–20	3.43E–21	3.41E–21	4.02E–21	9.34E–20
Co-60	9.08E–17	9.22E–17	8.36E–17	8.39E–17	1.18E–16	7.82E–17	8.51E–17	8.68E–17	9.94E–17
Pu-238	1.26E–21	1.6E–21	2.99E–22	3.32E–22	1.57E–21	4.04E–22	4.00E–22	8.10E–22	5.09E–21
Pu-239/240	1.82E–21	1.99E–21	1.31E–21	1.25E–21	3.40E–21	1.27E–21	1.28E–21	1.58E–21	4.87E–21
Pu-241	3.28E–23	3.42E–23	2.89E–23	2.60E–23	9.16E–23	2.70E–23	2.70E–23	3.16E–23	3.78E–23
Pa-231	1.08E–18	1.11E–18	9.52E–19	9.26E–19	1.96E–18	8.90E–19	9.13E–19	1.02E–18	1.20E–18
Sr-90	4.02E–21	4.25E–21	3.37E–21	3.00E–21	1.06E–20	3.21E–21	3.17E–21	3.77E–21	1.50E–20
Th-230	6.88E–21	7.38E–21	5.72E–21	5.03E–21	1.91E–20	5.41E–21	5.39E–21	6.47E–21	9.79E–21
Th-232	3.07E–21	3.38E–21	2.36E–21	2.04E–21	8.51E–21	2.26E–21	2.24E–21	2.79E–21	5.55E–21
Th-234	1.34E–19	1.41E–19	1.17E–19	1.01E–19	4.17E–19	1.10E–19	1.09E–19	1.29E–19	1.50E–19
U-234	2.53E–21	2.89E–21	1.64E–21	1.47E–21	5.96E–21	1.62E–21	1.61E–21	2.15E–21	5.99E–21
U-235	4.00E–18	4.16E–18	3.59E–18	3.40E–18	9.04E–18	3.35E–18	3.41E–18	3.86E–18	4.40E–18
U-238	8.19E–22	1.06E–21	2.34E–22	2.18E–22	1.32E–21	2.19E–22	2.86E–22	5.52E–22	3.55E–21
Ac-228	3.36E–17	3.43E–17	3.07E–17	3.06E–17	4.70E–17	2.86E–17	2.96E–17	3.20E–17	3.87E–17
Bi-207	5.27E–17	5.38E–17	4.80E–17	4.77E–17	7.44E–17	4.47E–17	4.64E–17	5.02E–17	5.87E–17
Bi-210	2.03E–20	2.12E–20	1.77E–20	1.64E–20	4.71E–20	1.66E–20	1.67E–20	1.93E–20	1.20E–20
Bi-210m	7.72E–18	7.99E–18	6.91E–18	6.72E–18	1.42E–17	6.45E–18	6.62E–18	7.37E–18	8.48E–18
Bi-214	5.52E–17	5.57E–17	5.05E–17	5.07E–17	7.24E–17	4.75E–17	4.89E–17	5.25E–17	6.51E–17
Ra-226	1.76E–19	1.83E–19	1.58E–19	1.50E–19	3.93E–19	1.47E–19	1.50E–19	1.70E–19	1.94E–19
Eu-152	3.36E–17	3.43E–17	3.10E–17	3.09E–17	4.73E–17	2.90E–17	2.99E–17	3.22E–17	3.69E–17
Eu-154	3.66E–17	3.74E–17	3.39E–17	3.36E–17	5.08E–17	3.18E–17	3.27E–17	3.52E–17	4.10E–17
Np-237	4.37E–19	4.59E–19	3.78E–19	3.34E–19	1.25E–18	3.55E–19	3.53E–19	4.17E–19	5.03E–19
Pu-242	1.04E–21	1.23E–21	2.75E–22	2.93E–22	1.41E–21	3.57E–22	3.52E–22	6.85E–22	4.08E–21
Tc-99	7.35E–22	7.90E–22	5.71E–22	4.83E–22	2.10E–21	5.56E–22	5.39E–22	6.70E–22	9.06E–22
Po-210	2.94E–22	3.01E–22	2.68E–22	2.67E–22	4.10E–22	2.49E–22	2.59E–22	2.80E–22	3.25E–22

Table A-2. Dose coefficients for air submersion [Sv/(Bq s/m^3)].[a]

Isotope	Gonad	Breast	Lung	R marrow	Bone surface	Thyroid	Remainder	Effective dose equivalent	Skin
Pu-238	6.56E–18	1.27E–17	1.06E–18	1.68E–18	9.30E–18	4.01E–18	1.99E–18	4.88E–18	4.09E–17
Pu-239/240	6.36E–18	1.23E–17	2.65E–18	2.67E–18	9.47E–18	3.92E–18	2.86E–18	4.75E–18	3.92E–17
Th-228	9.12E–17	1.09E–16	8.33E–17	7.32E–17	2.64E–16	8.88E–17	7.84E–17	9.20E–17	1.50E–16
Th-230	1.80E–17	2.38E–17	1.43E–17	1.22E–17	5.29E–17	1.63E–17	1.37E–17	1.74E–17	4.51E–17
Th-232	9.34E–18	1.36E–17	6.37E–18	5.52E–18	2.60E–17	7.90E–18	6.34E–18	8.72E–18	3.44E–17
Ac-227	5.78E–18	6.98E–18	5.22E–18	4.59E–18	1.68E–17	5.60E–18	4.92E–18	5.82E–18	1.10E–17
Ac-228	4.67E–14	5.30E–14	4.66E–14	4.56E–14	7.39E–14	4.79E–14	4.48E–14	4.78E–14	7.88E–14
Am-241	8.58E–16	1.07E–15	6.74E–16	5.21E–16	2.87E–15	7.83E–16	6.34E–16	8.18E–16	1.28E–15
Co-60	1.23E–13	1.39E–13	1.24E–13	1.23E–13	1.78E–13	1.27E–13	1.20E–13	1.26E–13	1.45E–13
Pa-231	1.71E–15	1.99E–15	1.62E–15	1.52E–15	3.64E–15	1.70E–15	1.54E–15	1.72E–15	2.44E–15
Bi-207	7.34E–14	8.38E–14	7.35E–14	7.17E–14	1.19E–13	7.55E–14	7.04E–14	7.54E–14	9.31E–14
Bi-210	3.32E–17	3.95E–17	2.95E–17	2.60E–17	8.98E–17	3.22E–17	2.79E–17	3.29E–17	2.30E–14
Cs-137	7.96E–18	9.67E–18	6.68E–18	5.70E–18	2.29E–17	7.55E–18	6.34E–18	7.74E–18	8.63E–15
Bi-210m	1.20E–14	1.37E–14	1.17E–14	1.10E–14	2.59E–14	1.21E–14	1.11E–14	1.22E–14	1.63E–14
Bi-214	7.44E–14	8.42E–14	7.51E–14	7.43E–14	1.09E–13	7.67E–14	7.26E–14	7.65E–14	1.28E–13
Np-237	1.04E–15	1.26E–15	9.02E–16	7.69E–16	3.20E–15	9.94E–16	8.50E–16	1.03E–15	1.54E–15
Eu-152	5.53E–14	6.29E–14	5.50E–14	5.37E–14	8.89E–14	5.66E–14	5.28E–14	5.65E–14	6.90E–14
Eu-154	6.00E–14	6.81E–14	5.99E–14	5.87E–14	9.43E–14	6.15E–14	5.75E–14	6.14E–14	8.29E–14
Pu-242	5.34E–18	1.03E–17	9.69E–19	1.43E–18	7.90E–18	3.32E–18	1.68E–18	4.01E–18	3.27E–17
Sr-90	7.78E–18	9.49E–18	6.44E–18	5.44E–18	2.28E–17	7.33E–18	6.11E–18	7.53E–18	9.20E–15
Tc-99	1.74E–18	2.20E–18	1.29E–18	1.05E–18	5.17E–18	1.57E–18	1.24E–18	1.62E–18	2.74E–15
Po-210	4.08E–19	4.63E–19	4.06E–19	3.97E–19	6.39E–19	4.18E–19	3.89E–19	4.16E–19	4.18E–19

a. Eckerman and Ryman (1993).

ATTACHMENT B
OFFSITE ENVIRONMENTAL AIR SAMPLING DATA FOR 1948 TO SEPTEMBER 1959

Table B-1. Mound offsite air sampling data for 1948 to 1959.

1948

Reference	Description of data	Maximum (cpm/cm^3)	Maximum (dpm/cm^3)[a]	Maximum ($\mu Ci/cm^3$)
Bradley 1948a	Missing pages - No offsite air sample data available for September.	No data	No data	No data
Bradley 1948b	67 offsite samples were collected during October: 62.7% of results were 0 cpm/m^3 26.9% of results were 1-10 cpm/m^3 6.0% of results were 11 to 20 cpm/m^3 4.4% of results were 21 to 40 cpm/m^3 0% of results were >41 cpm/m^3	4.1E–05	2.05E–04	9.23E–11
Bradley 1948c	Missing pages - No offsite air sample data available for November.	No data	No data	No data

1949

Reference	Description of data	Maximum (cpm/cm^3)	Maximum (dpm/cm^3)[a]	Maximum ($\mu Ci/cm^3$)
Bradley 1949a	68 offsite samples were collected during December: 54.4% of the results were 0 cpm/m^3 33.8% of the results were 1-10 cpm/m^3 5.9% of the results were 11 to 20 cpm/m^3 4.5% of the results were 21 to 40 cpm/m^3 0% of the results were 41 to 80 cpm/m^3 31.4% of the results were >80 cpm/m^3	8.0E–05	4.00E–04	1.80E–10
Bradley 1949b	Missing pages - No offsite air sample data available	No data	No data	No data
Bradley 1949c	66 offsite samples were collected during February: 94.8% of the results were 1-10 cpm/m^3 2.6% of the results were 11 to cpm/m^3 1.3% of the results were 21 to cpm/m^3 0% of the results were 41-80 cpm/m^3 1.3% of the results were >80 cpm/m^3	8.0E–05	4.00E–04	1.80E–10
Bradley 1949d	49 offsite samples were collected during March: 47.3% of the results were 0 cpm/m^3 34.0% of the results were 1-10 cpm/m^3 17.0% of the results were 11 to 20 cpm/m^3 0% of the results were 21 to 40 cpm/m^3 1.7% of the results were 41-80 cpm/m^3 0% of the results were >80 cpm/m^3	8.0E–05	4.00E–04	1.80E–10
Bradley 1949e	106 offsite samples were collected during April: 40.6% of the results were 0 cpm/m^3 56.6% of the results were 1-10 cpm/m^3 2.8% of the results were 11 to 20 cpm/m^3 0% of the results were >20 cpm/m^3.	2.0E–05	1.00E–04	4.50E–11
Bradley 1949f	62 offsite samples were collected during May: 83.9% of the results were 0 cpm/m^3 14.5% of the results were 1-10 cpm/m^3 0% of the results were 11 to 20 cpm/m^3 0% of the results were 21 to 40 cpm/m^3 1.6% of the results were 41 to 80 cpm/m^3 0% of the results were >80 cpm/m^3	8.0E–5	4.0E–4	1.8E–10
Bradley 1949g	*June offsite air sample data pages missing.*	No data	No data	No data
Bradley 1949h	61 offsite samples were collected during July: 63.9% of the results were 0 cpm/m^3 34.4% of the results were 1-10 cpm/m^3 1.7% of the results were 11 to 20 cpm/m^3 0% of the results were >20 cpm/m^3	2.0E–5	9.0E–12	4.5E–11

ATTACHMENT B
OFFSITE ENVIRONMENTAL AIR SAMPLING DATA FOR 1948 TO SEPTEMBER 1959
(continued)

Reference	Description of data	Maximum (cpm/cm^3)	Maximum (dpm/cm^3)[a]	Maximum ($\mu Ci/cm^3$)
Bradley 1949i	64 offsite samples were collected during August: 67.2% of the results were 0 cpm/m^3 34.4% of the results were 1-10 cpm/m^3 1.5% of the results were 11 to 20 cpm/m^3 0% of the results were >20 cpm/m^3	2.0E–5	9.0E–12	4.5E–11
Bradley 1949j	16 offsite samples were collected during September: 1.25% of the results were 0 cpm/m^3 56.25% of the results were 1-10 cpm/m^3 6.25% of the results were 11 to 20 cpm/m^3 6.25% of the results were 21 to 40 cpm/m^3 0% of the results were >40 cpm/m^3	4.0E–05	2.00E–04	9.01E–11
Bradley 1949k	62 offsite samples were collected downwind from Mound Plant in October: 37.1% of the results were 0 dpm/m^3 62.9% of the results were 1 to 20 dpm/m^3 0% of the results were >20 dpm/m^3	No data	2.00E–05	9.01E–12
Bradley 1949l	61 offsite samples were collected downwind from Mound Plant in November: 55.7% of the results were 0 dpm/m^3 44.3% of the results were 1 to 20 dpm/m^3 0% of the results were >20 dpm/m^3	No data	2.00E–05	9.01E–12

1950

Reference	Description of data	Maximum (cpm/cm^3)	Maximum (dpm/cm^3)[a]	Maximum ($\mu Ci/cm^3$)
Bradley 1950a	53 offsite samples were collected downwind from Mound Plant December: 17.0% of the results were 0 dpm/m^3 83.0% of the results were 1 to 20 dpm/m^3 0% of the results were >20 dpm/m^3.	No data	2.00E–05	9.01E–12
Bradley 1950b	75 offsite samples were collected during January: 57.3% of the results were 0 dpm/m^3 42.6% of the results were 1-10 dpm/m^3 0% of the results were >20 dpm/m^3	No data	2.00E–05	9.01E–12
Bradley 1950c	74 offsite samples were collected during February: 52.7% of the results were 0 dpm/m^3 47.3% of the results were 1-10 dpm/m^3 0% of the results were >20 dpm/m^3	No data	2.00E–05	9.01E–12
Bradley 1950d	85 offsite samples were collected during March: 63.5% of the results were 0 dpm/m^3 36.5% of the results were 1-20 dpm/m^3 0% of the results were >20 dpm/m^3	No data	2.00E–05	9.01E–12
Bradley 1950e	90 offsite samples were collected during April: 61.1% of the results were 0 dpm/m^3 38.9% of the results were 1-20 dpm/m^3 0% of the results were >20 dpm/m^3	No data	2.00E–05	9.01E–12
Bradley 1950f	75 offsite samples were collected during May: 70.4% of the results were 0 dpm/m^3 29.6% of the results were 1-20 dpm/m^3 0% of the results were >20 dpm/m^3	No data	2.00E–05	9.01E–12
Bradley 1950g	74 offsite samples were collected during June: 55.4% of the results were 0 dpm/m^3 44.6% of the results were 1-20 dpm/m^3 0% of the results were >20 dpm/m^3	No data	2.00E–05	9.01E–12

ATTACHMENT B
OFFSITE ENVIRONMENTAL AIR SAMPLING DATA FOR 1948 TO SEPTEMBER 1959
(continued)

Reference	Description of data	Maximum (cpm/cm^3)	Maximum (dpm/cm^3)[a]	Maximum (µCi/cm^3)
Bradley 1950h	89 offsite samples were collected during July: 61.8% of the results were 0 dpm/m^3 38.2% of the results were 1-20 dpm/m^3 0% of the results were >20 dpm/m^3	No data	2.00E–05	9.01E–12
Bradley 1950i	69 offsite samples were collected during August: 62.3% of the results were 0 dpm/m^3 37.3% of the results were 1-20 dpm/m^3 0% of the results were >20 dpm/m^3	No data	2.00E–05	9.01E–12
Bradley 1950j	84 offsite samples were collected during September: 45.2% of the results were 0 dpm/m^3 54.8% of the results were 1-20 dpm/m^3 0% of the results were >20 dpm/m^3	No data	2.00E–05	9.01E–12
Bradley 1950k	74 offsite samples were collected during October: 59.5% of the results were 0 dpm/m^3 40.5% of the results were 1-20 dpm/m^3 0% of the results were >20 dpm/m^3	No data	2.00E–05	9.01E–12
Bradley 1950l	78 offsite samples were collected during November: 83.3% of the results were 0 dpm/m^3 16.7% of the results were 1-20 dpm/m^3 0% of the results were >20 dpm/m^3	No data	2.00E–05	9.01E–12

1951

Reference	Description of data	Maximum (cpm/cm^3)	Maximum (dpm/cm^3)[a]	Maximum (µCi/cm^3)
Bradley 1951a	27 offsite samples were collected during December: 63% of the results were 0 dpm/m^3 37% of the results were 1-20 dpm/m^3 0% of the results were >20 dpm/m^3	No data	2.00E–05	9.01E–12
Bradley 1951b	85 offsite samples were collected during January: 83.6% of the results were 0 dpm/m^3 16.4% of the results were 1-20 dpm/m^3 0% of the results were >20 dpm/m^3	No data	2.00E–05	9.01E–12
Bradley 1951c	85 offsite samples were collected during February: 78.8% of the results were 0 dpm/m^3 21.2% of the results were 1-20 dpm/m^3 0% of the results were >20 dpm/m^3	No data	2.00E–05	9.01E–12
Bradley 1951d	73 offsite samples were collected during March: 71.2% of the results were 0 dpm/m^3 28.8% of the results were 1-20 dpm/m^3 0% of the results were >20 dpm/m^3	No data	2.00E–05	9.01E–12
Bradley 1951e	78 offsite samples were collected during April: 78.2% of the results were 0 dpm/m^3 21.8% of the results were 1-20 dpm/m^3 0% of the results were >20 dpm/m^3	No data	2.00E–05	9.01E–12
Bradley 1951f	*May offsite air sample data pages missing.*	No data	No data	No data
Bradley 1951g	71 offsite samples were collected during June: 66.2% of the results were 0 dpm/m^3 33.8% of the results were 1-20 dpm/m^3 0% of the results were >20 dpm/m^3	No data	2.00E–05	9.01E–12
Bradley 1951h	55 offsite samples were collected during July: 61.8% of the results were 0 dpm/m^3 38.2% of the results were 1-20 dpm/m^3 0% of the results were >20 dpm/m^3	No data	2.00E–05	9.01E–12
Bradley 1951i	85 offsite samples were collected during August: 95.3% of the results were 0 dpm/m^3 4.7% of the results were 1-20 dpm/m^3 0% of the results were >20 dpm/m^3	No data	2.00E–05	9.01E–12

ATTACHMENT B
OFFSITE ENVIRONMENTAL AIR SAMPLING DATA FOR 1948 TO SEPTEMBER 1959
(continued)

Reference	Description of data	Maximum (cpm/cm^3)	Maximum (dpm/cm^3)[a]	Maximum (µCi/cm^3)
Bradley 1951j	42 offsite samples were collected during September: 0% of the results were >10 dpm/m^3	No data	1.00E–05	4.50E–12
Bradley 1951k	94 offsite samples were collected during October: 93 of the results were 0 dpm/m^3 1 result was 6 dpm/m^3	No data	6.00E–06	2.70E–12
Bradley 1951l	57 offsite samples were collected during November: 55 of the results were 0 dpm/m^3 2 results were between 1 and 10 dpm/m^3	No data	1.00E–05	4.50E–12

1952

Reference	Description of data	Maximum (cpm/cm^3)	Maximum (dpm/cm^3)[a]	Maximum (µCi/cm^3)
Bradley 1952e	44 offsite samples were collected during November: 35 of the results were 0 dpm/m^3 9 results were < 20 dpm/m^3	No data	2.00E–05	9.01E–12
Bradley 1952a	87 offsite samples were collected during January: 67 of the results were 0 dpm/m^3 20 results were between 1 and 10 dpm/m^3	No data	No data	No data
Bradley 1952d	60 offsite samples were collected during February: 50 of the results were 0 dpm/m^3 10 results were between 1 and 10 dpm/m^3	No data	1.00E–05	4.50E–12
Bradley 1952b	71 offsite samples were collected during March: 47 of the results were 0 dpm/m^3 14 results were less than 20 dpm/m^3	No data	2.00E–05	9.01E–12
Bradley 1952c	78 offsite samples were collected during April: 43 of the results were 0 dpm/m^3 35 results were less than 20 dpm/m^3	No data	2.00E–05	9.01E–12
Bradley 1952f	33 offsite samples were collected during May: 24 of the results were 0 dpm/m^3 9 results were less than 20 dpm/m^3	No data	2.00E–05	9.01E–12
Bradley 1952g	86 offsite samples were collected during June: 51 of the results were 0 dpm/m^3 35 results were less than 20 dpm/m^3	No data	2.00E–05	9.01E–12
Bradley 1952h	83 offsite samples were collected during July: 41 of the results were 0 dpm/m^3 41 results were between 1 and 20 dpm/m^3 1 result was between 20 and 40 dpm/m^3	No data	4.00E–05	1.80E–11
Bradley 1952i	41 offsite samples were collected during August: 20 of the results were 0 dpm/m^3 21 results were between 1 and 20 dpm/m^3	No data	2.00E–05	9.01E–12
Bradley 1952j	66 offsite samples were collected during September: 32 of the results were 0 dpm/m^3 32 results were between 1 and 20 dpm/m^3 2 results were between 21 and 40 dpm/m^3	No data	4.00E–05	1.80E–11
Bradley 1952k	82 offsite samples were collected during October: 50 of the results were 0 dpm/m^3 31 results were between 1 and 20 dpm/m^3 1 result was between 21 and 40 dpm/m^3	No data	4.00E–05	1.80E–11
Bradley 1952l	56 offsite samples were collected during November: 35 of the results were 0 dpm/m^3 (“below background”) 21 results were between 1 and 20 dpm/m^3	No data	2.00E–05	9.01E–12

ATTACHMENT B
OFFSITE ENVIRONMENTAL AIR SAMPLING DATA FOR 1948 TO SEPTEMBER 1959 (continued)

1953

Reference	Description of data	Maximum (cpm/cm^3)	Maximum (dpm/cm^3)[a]	Maximum ($\mu Ci/cm^3$)
Bradley 1953l	78 offsite samples were collected during December: 55 of the results were 0 dpm/m^3 21 results were between 1 and 20 dpm/m^3 2 results were between 21 and 40 dpm/m^3	No data	4.00E–05	1.80E–11
Bradley 1953a	65 offsite samples were collected during January: Thirty-six of these samples gave no evidence of airborne contamination. Of the remaining 29, the highest yield was 17.3 dpm/m^3.	No data	1.73E–05	7.80E–12
Bradley 1953m	61 offsite samples were collected during February: 42 of the results were 0 dpm/m^3 19 results were between 1 and 16 dpm/m^3	No data	1.60E–05	7.20E–12
Bradley 1953b	73 offsite samples were collected during March: 71% of the results were 0 dpm/m^3 The 2 highest results were 15 dpm/m^3	No data	1.50E–05	6.80E–12
Bradley 1953c	29 offsite samples were collected during April: 65% of the results were 0 dpm/m^3 The highest result was 11 dpm/m^3	No data	1.10E–05	5.00E–12
Bradley 1953d	25 offsite samples were collected during May: 44% of the results were 0 dpm/m^3 The highest result was 10 dpm/m^3	No data	1.00E–05	4.50E–12
Bradley 1953e	9 offsite samples were collected during June: 55% of the results were 0 dpm/m^3 The highest result was 16 dpm/m^3	No data	1.60E–05	7.20E–12
Bradley 1953f	8 offsite samples were collected during July: 7 of the results were 0 dpm/m^3 1 result was 3 dpm/m^3	No data	3.00E–06	1.40E–12
Bradley 1953g	Zero offsite samples were collected during August.	No data	No data	No data
Bradley 1953h	9 offsite samples were collected during September: The highest result was 4 dpm/m^3	No data	4.00E–06	1.80E–12
Bradley 1953i	17 offsite samples were collected during October: The highest result was 14.4 dpm/m^3	No data	1.40E–05	6.50E–12
Bradley 1953j	18 offsite samples were collected during November: The highest result was 10.6 dpm/m^3	No data	1.06E–05	4.80E–12

1954

Reference	Description of data	Maximum (cpm/cm^3)	Maximum (dpm/cm^3)[a]	Maximum ($\mu Ci/cm^3$)
Bradley 1954a	31 offsite samples were collected during December: The highest result was 5.4 dpm/m^3	No data	5.40E–06	2.40E–12
Bradley 1954b	Zero offsite samples were collected during January.	No data	No data	No data
Bradley 1954c	35 offsite samples were collected during February: The highest result was 7 dpm/m^3	No data	7.00E–06	3.20E–12
Bradley 1954d	31 offsite samples were collected during March: 16% of the results were 0 dpm/m^3 The highest result was 3 dpm/m^3	No data	3.00E–06	1.40E–12
Bradley 1954e	Complete data for April, May, and June is missing.	No data	No data	No data
Bradley 1954f	47 samples were collected during July, August, and September: 19 of the results were 0 $\mu Ci/cm^3$ The maximum result was 1E–12 $\mu Ci/cm^3$	No data	No data	1.0E–12

ATTACHMENT B
OFFSITE ENVIRONMENTAL AIR SAMPLING DATA FOR 1948 TO SEPTEMBER 1959 (continued)

1955

Reference	Description of data	Maximum (cpm/cm^3)	Maximum (dpm/cm^3)[a]	Maximum ($\mu Ci/cm^3$)
Meyer 1955a	84 samples were collected during October, November, and December: 25 of the results were 0 $\mu Ci/cm^3$ The maximum result was 3.3E–12 $\mu Ci/cm^3$	No data	No data	3.3E–12
Meyer 1955b	79 samples were collected during January, February, and March: 32 of the results were 0 $\mu Ci/cm^3$ The maximum result was 2.7E–13 $\mu Ci/cm^3$	No data	No data	2.7E–13
Meyer 1955c	79 samples were collected during April, May, and June: 59 of the results were 0 $\mu Ci/cm^3$ The maximum result was 3E–12 $\mu Ci/cm^3$	No data	No data	3.0E–12
Meyer 1955d	65 samples were collected during July, August, and September: 64 of the results were 0 $\mu Ci/cm^3$ The maximum result was 1.1E–12 $\mu Ci/cm^3$	No data	No data	1.1E–12

1956

Reference	Description of data	Maximum (cpm/cm^3)	Maximum (dpm/cm^3)[a]	Maximum ($\mu Ci/cm^3$)
Meyer 1956a	67 samples were collected during October, November, and December: 65 of the results were 0 $\mu Ci/cm^3$ The maximum result was 5.8E–13 $\mu Ci/cm^3$	No data	No data	5.8E–13
Meyer 1956b	30 samples were collected during January, February, and March: 25 of the results were 0 $\mu Ci/cm^3$ The maximum result was 1.93E–12 $\mu Ci/cm^3$ Po	No data	No data	1.93E–12
Meyer 1956c	65 samples were collected during April, May, and June: 50 of the results were 0 $\mu Ci/cm^3$ The maximum result was 7.2E–13 $\mu Ci/cm^3$ Po	No data	No data	7.2E–13
Meyer 1956d	66 samples were collected during July, August, and September: 59 of the results were 0 $\mu Ci/cm^3$ The maximum result was 1.38E–12 $\mu Ci/cm^3$ Po	No data	No data	1.38E–12

1957

Reference	Description of data	Maximum (cpm/cm^3)	Maximum (dpm/cm^3)[a]	Maximum ($\mu Ci/cm^3$)
Meyer 1957a	67 samples were collected during October, November, and December: 58 of the results were 0 $\mu Ci/cm^3$ The maximum result was 1.95E–11 $\mu Ci/cm^3$ Po	No data	No data	1.95E–11
Meyer 1957b	67 samples were collected during January, February, and March 62 of the results were 0 $\mu Ci/cm^3$ The maximum result was 1.27E–12 $\mu Ci/cm^3$ Po	No data	No data	1.27E–12
Meyer 1957c	67 samples were collected during April, May, and June: 56 of the results were 0 $\mu Ci/cm^3$ The maximum result was 3.85E–12 $\mu Ci/cm^3$ Po	No data	No data	3.85E–12
Meyer 1957d	67 samples were collected during July, August, and September: 33 of the results were 0 $\mu Ci/cm^3$ The maximum result was 2.75E–12 $\mu Ci/cm^3$ Po	No data	No data	2.75E–12

1958

Reference	Description of data	Maximum (cpm/cm^3)	Maximum (dpm/cm^3)[a]	Maximum ($\mu Ci/cm^3$)
Meyer 1958a	67 samples were collected during October, November, and December: 51 of the results were 0 $\mu Ci/cm^3$ The maximum result was 1.28E–12 $\mu Ci/cm^3$ Po	No data	No data	1.28E–12

ATTACHMENT B
OFFSITE ENVIRONMENTAL AIR SAMPLING DATA FOR 1948 TO SEPTEMBER 1959
(continued)

Reference	Description of data	Maximum (cpm/cm^3)	Maximum (dpm/cm^3)[a]	Maximum ($\mu Ci/cm^3$)
Meyer 1958b	66 samples were collected during January, February, and March: 51 of the results were 0 $\mu Ci/cm^3$ The maximum result was 4.46E–12 $\mu Ci/cm^3$ Po	No data	No data	4.46E–12
Meyer 1958c	55 samples were collected during April, May, and June: 51 of the results were 0 $\mu Ci/cm^3$ The maximum result was 1.03E–12 $\mu Ci/cm^3$ Po	No data	No data	1.03E–12
Meyer 1958d	76 samples were collected during July, August, and September: 69 of the results were 0 $\mu Ci /cm^3$ The maximum result was 6.56E–11 $\mu Ci/cm^3$ Po	No data	No data	6.56E–11

1959

Reference	Description of data	Maximum (cpm/cm^3)	Maximum (dpm/cm^3)[a]	Maximum ($\mu Ci/cm^3$)
Meyer 1959a	67 samples were collected during October, November, and December: 62 of the results were 0 $\mu Ci/cm^3$ The maximum result was 6.31E–13 $\mu Ci/cm^3$ Po	No data	No data	6.31E–13
Meyer 1959b	67 samples were collected during January, February, and March: 59 of the results were 0 $\mu Ci/cm^3$ The maximum result was 7.03E–13 $\mu Ci/cm^3$ Po	No data	No data	7.03E–13
No data	*Data for April, May, and June is unavailable.*	No data	No data	No data
Meyer 1959c	36 samples were collected during July, August, and September: 35 of the results were 0 $\mu Ci/cm^3$ The maximum result was 3.87E–13 $\mu Ci/cm^3$	No data	No data	3.87E–13

a. 20% detector efficiency assumed to convert cpm/cm^3 to dpm/cm^3.
b. No data = no data.

ATTACHMENT C
ENVIRONMENTAL AIR SAMPLING DATA FOR 1959 TO 1972

LIST OF TABLES

ATTACHMENT C
ENVIRONMENTAL AIR SAMPLING DATA FOR 1959 TO 1972 (continued)

Table C-1. Mound offsite air monitoring data for 1959.[a,b]

HTO offsite concentration (10^{-12} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
12 locations – 0 to 5 mi	No data	(d)	(d)	(d)	No data
15 locations – 5 to 15 mi	No data	(d)	(d)	(d)	No data
20 locations – 15 to 30 mi	No data	(d)	(d)	(d)	No data
14 locations – 30 to 40 mi	No data	(d)	(d)	(d)	No data
N	No data	No data	No data	No data	No data
Min.	No data	No data	No data	No data	No data
Max.	No data	No data	No data	No data	No data
Median	No data	No data	No data	No data	No data
Mean	No data	No data	No data	No data	No data
StdDev	No data	No data	No data	No data	No data

Effluent intake concentration (e)

Po-210 offsite concentration (10^{-18} µCi/mL)[c]

Location	Samples	LDL	Min.	Max.	Mean
12 locations –0 to 5 mi	No data	No data	No data	No data	123,000
15 locations –5 to 15 mi	No data	No data	No data	No data	118,000
20 locations – 15 to 30 mi	No data	No data	No data	No data	94,000
14 locations – 30 to 40 mi	No data	No data	No data	No data	116,000
N	No data	No data	No data	No data	4
Min.	No data	No data	No data	No data	94,000
Max.	No data	No data	No data	No data	123,000
Median	No data	No data	No data	No data	117,000
Mean	No data	No data	No data	No data	112,750
StdDev	No data	No data	No data	No data	12,842

Effluent intake concentration (e)

a. Source: Monsanto (1960).
b. LDL = lower detection limit.
c. Gross alpha including naturally occurring alpha.
d. All values not detectable before 1967 (Sheehan and Anderson 1966).
e. Not used (derived by alternate method).

ATTACHMENT C
ENVIRONMENTAL AIR SAMPLING DATA FOR 1959 TO 1972 (continued)

Table C-2. Mound offsite air monitoring data for 1960.[a,b]

HTO offsite concentration (10^{-12} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
12 locations – 0 to 5 mi	119	(d)	(d)	(d)	No data
15 locations – 5 to 15 mi	146	(d)	(d)	(d)	No data
20 locations – 15 to 30 mi	117	(d)	(d)	(d)	No data
14 locations – 30 to 40 mi	154	(d)	(d)	(d)	No data
N	536	No data	No data	No data	No data
Min.	No data	No data	No data	No data	No data
Max.	No data	No data	No data	No data	No data
Median	No data	No data	No data	No data	No data
Mean	No data	No data	No data	No data	No data
StdDev	No data	No data	No data	No data	No data

Effluent intake concentration (e)

Pu – Po offsite concentration (10^{-18} µCi/mL)[c]

Location	Samples	LDL	Min.	Max.	Mean
12 locations – 0 to 5 mi	119	No data	No data	No data	27,100
15 locations – 5 to 15 mi	146	No data	No data	No data	24,200
20 locations – 15 to 30 mi	117	No data	No data	1,171	10,500
14 locations – 30 to 40 mi	154	No data	No data	3,153	19,800
N	536	No data	No data	2	4
Min.	No data	No data	No data	117,100	10,500
Max.	No data	No data	No data	315,300	27,100
Median	No data	No data	No data	216,200	22,000
Mean	No data	No data	No data	216,200	20,400
StdDev	No data	No data	No data	140,149	7,250

Effluent intake concentration (e)

a. Source: Monsanto (1961a).
b. LDL = lower detection limit.
c. Gross alpha; no discrimination between Pu and Po.
d. All values not detectable before 1967 (Sheehan and Anderson 1966).
e. Not used (derived by alternate method).

ATTACHMENT C
ENVIRONMENTAL AIR SAMPLING DATA FOR 1959 TO 1972 (continued)

Table C-3. Mound offsite air monitoring data for 1961.[a,b]

HTO offsite concentration (10^{-12} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
All locations 1st qtr	154	(d)	(d)	(d)	(d)
All locations 3rd qtr	179	(d)	(d)	(d)	(d)
All locations 4th qtr	183	(d)	(d)	(d)	(d)
N	516	No data	No data	No data	No data
Min.	No data	No data	No data	No data	No data
Max.	No data	No data	No data	No data	No data
Median	No data	No data	No data	No data	No data
Mean	No data	No data	No data	No data	No data
StdDev	No data	No data	No data	No data	No data

Effluent intake concentration (e)

Pu – Po offsite concentration (10^{-18} µCi/mL)[c]

Location	Samples	LDL	Min.	Max.	Mean
All locations 1st qtr	154	No data	No data	90,100	9,300
All locations 3rd qtr	155	No data	No data	54,000	12,000
All locations 4th qtr	159	No data	No data	1,413,000	25,400
N	468	No data	No data	3	3
Min.	No data	No data	No data	54,000	9,300
Max.	No data	No data	No data	1,413,000	25,400
Median	No data	No data	No data	90,100	12,000
Mean	No data	No data	No data	519,033	15,567
StdDev	No data	No data	No data	774,408	8,622

Effluent intake concentration (e)

a. Sources: Monsanto (1961b, Adams (1961, 1962a).
b. LDL = lower detection limit.
c. Downwind sample gross alpha; no discrimination between Pu and Po.
d. All values not detectable before 1967 (Sheehan and Anderson 1966).
e. Not used (derived by alternate method).

Table C-4. Mound offsite air monitoring data for 1962.[a,b]

HTO offsite concentration (10^{-12} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
Upwind locations	18	(d)	(d)	(d)	(d)
Downwind locations	115	(d)	(d)	(d)	(d)
N	133	No data	No data	No data	No data
Min.	No data	No data	No data	No data	No data
Max.	No data	No data	No data	No data	No data
Median	No data	No data	No data	No data	No data
Mean	No data	No data	No data	No data	No data
StdDev	No data	No data	No data	No data	No data

Effluent intake concentration (e)

Pu – Po offsite concentration (10^{-18} µCi/mL)[c]

Location	Samples	LDL	Min.	Max.	Mean
Upwind locations	18	No data	No data	9,400	1,100
Downwind locations	115	No data	No data	60,700	1,900
N	133	No data	No data	2	2
Min.	No data	No data	No data	9,400	1,100
Max.	No data	No data	No data	60,700	1,900
Median	No data	No data	No data	35,050	1,500
Mean	No data	No data	No data	35,050	1,500
StdDev	No data	No data	No data	36,275	566

Effluent intake concentration (e)

a. Sources: Adams (1962b, 1963a).
b. LDL = lower detection limit.
c. Gross alpha; no discrimination between Pu and Po.
d. All values not detectable before 1967 (Sheehan and Anderson 1966).
e. Not used (derived by alternate method).

ATTACHMENT C
ENVIRONMENTAL AIR SAMPLING DATA FOR 1959 TO 1972 (continued)

Table C-5. Mound offsite air monitoring data for January to June 1963.[a,b]

HTO offsite concentration (10^{-12} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
Upwind locations	26	(d)	(d)	(d)	(d)
Downwind locations	154	(d)	(d)	(d)	(d)
N	180	No data	No data	No data	No data
Min.	No data	No data	No data	No data	No data
Max.	No data	No data	No data	No data	No data
Median	No data	No data	No data	No data	No data
Mean	No data	No data	No data	No data	No data
StdDev	No data	No data	No data	No data	No data

Effluent intake concentration (e)

Pu – Po offsite concentration (10^{-18} µCi/mL)[c]

Location	Samples	LDL	Min.	Max.	Mean
Upwind locations	26	No data	No data	20,700	3,400
Downwind locations	154	No data	No data	41,800	3,000
N	180	No data	No data	2	2
Min.	No data	No data	No data	20,700	3,000
Max.	No data	No data	No data	41,800	3,400
Median	No data	No data	No data	31,250	3,200
Mean	No data	No data	No data	31,250	3,200
StdDev	No data	No data	No data	14,920	283

Effluent intake concentration (e)

a. Source: Adams (1963b).
b. LDL = lower detection limit.
c. Gross alpha; no discrimination between Pu and Po.
d. All values not detectable before 1967 (Sheehan and Anderson 1966).
e. Not used (derived by alternate method).

Table C-6. Mound offsite air monitoring data for 1964.[a,b]

HTO offsite concentration (10^{-12} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
Upwind locations	94	(d)	(d)	(d)	(d)
Downwind locations	566	(d)	(d)	(d)	(d)
N	660	No data	No data	No data	No data
Min.	No data	No data	No data	No data	No data
Max.	No data	No data	No data	No data	No data
Median	No data	No data	No data	No data	No data
Mean	No data	No data	No data	No data	No data
StdDev	No data	No data	No data	No data	No data

Effluent intake concentration (e)

Pu – Po offsite concentration (10^{-18} µCi/mL)[c]

Location	Samples	LDL	Min.	Max.	Mean
Upwind locations	94	No data	No data	43,700	2,550
Downwind locations	566	No data	No data	144,000	3,600
N	660	No data	No data	2	2
Min.	No data	No data	No data	43,700	2,550
Max.	No data	No data	No data	144,000	3,600
Median	No data	No data	No data	93,850	3,075
Mean	No data	No data	No data	93,850	3,075
StdDev	No data	No data	No data	70,923	742

Effluent intake concentration (e)

a. Sources: Adams (1964, 1965a).
b. LDL = lower detection limit.
c. Gross alpha; no discrimination between Pu and Po.
d. All values not detectable before 1967 (Sheehan and Anderson 1966).
e. Not used (derived by alternate method).

ATTACHMENT C
ENVIRONMENTAL AIR SAMPLING DATA FOR 1959 TO 1972 (continued)

Table C-7. Mound offsite air monitoring data for 1965.[a,b]

HTO offsite concentration (10^{-12} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
Upwind locations	104	(d)	(d)	(d)	(d)
Downwind locations	620	(d)	(d)	(d)	(d)
N	724	No data	No data	No data	No data
Min.	No data	No data	No data	No data	No data
Max.	No data	No data	No data	No data	No data
Median	No data	No data	No data	No data	No data
Mean	No data	No data	No data	No data	No data
StdDev	No data	No data	No data	No data	No data

Effluent intake concentration (e)

Pu – Po offsite concentration (10^{-18} µCi/mL)[c]

Location	Samples	LDL	Min.	Max.	Mean
Upwind locations	104	No data	No data	27,000	2,500
Downwind locations	620	No data	No data	82,800	2,600
N	724	No data	No data	2	2
Min.	No data	No data	No data	27,000	2,500
Max.	No data	No data	No data	82,800	2,600
Median	No data	No data	No data	54,900	2,550
Mean	No data	No data	No data	54,900	2,550
StdDev	No data	No data	No data	39,457	71

Effluent intake concentration (e)

a. Sources: Adams (1965b), Adams and Anderson (1966).
b. LDL = lower detection limit.
c. Gross alpha; no discrimination between Pu and Po.
d. All values not detectable before 1967 (Sheehan and Anderson 1966).
e. Not used (derived by alternate method).

Table C-8. Mound offsite air monitoring data for 1966.[a,b]

HTO offsite concentration (10^{-12} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
0-3 mi upwind	77	(d)	(d)	(d)	(d)
0-3 mi downwind	127	(d)	(d)	(d)	(d)
3-5 mi downwind	82	(d)	(d)	(d)	(d)
5-10 mi downwind	82	(d)	(d)	(d)	(d)
10-15 mi downwind	87	(d)	(d)	(d)	(d)
15-20 mi downwind	123	(d)	(d)	(d)	(d)
N	578	No data	No data	No data	No data
Min.	No data	No data	No data	No data	No data
Max.	No data	No data	No data	No data	No data
Median	No data	No data	No data	No data	No data
Mean	No data	No data	No data	No data	No data
StdDev	No data	No data	No data	No data	No data

Effluent intake concentration (e)

Pu – Po offsite concentration (10^{-18} µCi/mL)[c]

Location	Samples	LDL	Min.	Max.	Mean
0-3 mi upwind	77	3,500	No data	16,800	3,900
0-3 mi downwind	127	3,500	No data	534,200	11,100
3-5 mi downwind	82	3,500	No data	12,900	4,300
5-10 mi downwind	82	3,500	No data	54,600	5,000
10-15 mi downwind	87	3,500	No data	23,200	5,000
15-20 mi downwind	123	3,500	No data	11,120	5,600
N	578	No data	No data	6	6
Min.	No data	3,500	No data	11,120	3,900
Max.	No data	3,500	No data	534,200	11,100
Median	No data	3,500	No data	20,000	5,000
Mean	No data	3,500	No data	108,803	5,817
StdDev	No data	No data	No data	209,013	2,656

Effluent intake concentration (e)

a. Sources: Sheehan and Anderson (1966), Anderson and Sheehan (1967a).
b. LDL = lower detection limit; unknown confidence level.
c. Gross alpha; no discrimination between Pu and Po.
d. All values not detectable before 1967 (Sheehan and Anderson 1966).
e. Not used (derived by alternate method).

ATTACHMENT C
ENVIRONMENTAL AIR SAMPLING DATA FOR 1959 TO 1972 (continued)

Table C-9. Mound offsite air monitoring data for 1967.[a,b]

HTO concentration (10^{-12} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
0-3 mi upwind	33	8,000	No data	25,000	8,650
0-3 mi downwind	32	8,000	No data	26,900	9,020
3-5 mi downwind	31	8,000	No data	12,790	8,080
5-10 mi downwind	31	8,000	No data	10,690	8,090
10-15 mi downwind	29	8,000	No data	8,000	8,000
15-20 mi downwind	24	8,000	No data	9,400	8,090
N	180	No data	No data	6	6
Min.	No data	8,000	No data	8,000	8,000
Max.	No data	8,000	No data	26,900	9,020
Median	No data	8,000	No data	11,740	8,090
Mean	No data	8,000	No data	15,463	8,322
StdDev	No data	No data	No data	8,296	416
Effluent intake concentration (c)					

Pu-238 concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
0-3 mi upwind	46	1,300	No data	282,200	12,000
0-3 mi downwind	46	900	No data	121,700	9,900
3-5 mi downwind	46	1,300	No data	111,400	11,100
5-10 mi downwind	45	1,300	No data	14,200	4,700
10-15 mi downwind	46	1,300	No data	98,400	8,300
15-20 mi downwind	46	900	No data	27,300	4,500
N	275	No data	No data	6	6
Min.	No data	900	No data	14,200	4,500
Max.	No data	1,300	No data	282,200	12,000
Median	No data	1,300	No data	104,900	9,100
Mean	No data	1,167	No data	109,200	8,417
StdDev	No data	No data	No data	95,853	3,207
Effluent intake concentration (c)					

Po-210 concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
0-3 mi upwind	45	8,000	No data	669,000	33,300
0-3 mi downwind	44	5,300	No data	104,700	15,300
3-5 mi downwind	45	8,000	No data	689,200	35,200
5-10 mi downwind	45	8,000	No data	99,100	22,500
10-15 mi downwind	45	8,000	No data	80,000	19,700
15-20 mi downwind	44	5,300	No data	36,600	14,100
N	268	No data	No data	6	6
Min.	No data	5,300	No data	36,600	14,100
Max.	No data	8,000	No data	689,200	35,200
Median	No data	8,000	No data	101,900	21,100
Mean	No data	7,100	No data	279,767	23,350
StdDev	No data	No data	No data	310,311	8,987
Effluent intake concentration (c)					

a. Sources: HTO and Pu-238, Anderson and Sheehan (1967b, 1968a); Po-210, Anderson and Sheehan (1968a, Table 5).
b. LDL = lower detection limit; unknown confidence level.
c. Not used (derived by alternate method).

Table C-10. Mound offsite air monitoring data for 1968.[a,b]

HTO concentration (10^{-12} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
0-3 mi upwind	40	2,000	No data	16,550	3,690
0-3 mi downwind	40	2,000	No data	41,740	4,050
3-5 mi downwind	40	2,000	No data	10,950	2,730
5-10 mi downwind	40	2,000	No data	12,850	3,010
10-15 mi downwind	40	2,000	No data	10,150	2,890
15-20 mi downwind	40	2,000	No data	16,900	3,210
N	240	No data	No data	6	6
Min.	No data	2,000	No data	10,150	2,730
Max.	No data	2,000	No data	41,740	4,050
Median	No data	2,000	No data	14,700	3,110
Mean	No data	2,000	No data	18,190	3,263
StdDev	No data	No data	No data	11,870	508

Effluent intake concentration (c)

Pu-238 concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
0-3 mi upwind	38	1,300	No data	37,900	11,900
0-3 mi downwind	38	900	No data	36,500	9,200
3-5 mi downwind	24	1,300	No data	81,100	14,700
5-10 mi downwind	23	1,300	No data	55,000	13,100
10-15 mi downwind	23	1,300	No data	36,500	12,900
15-20 mi downwind	22	900	No data	54,400	9,100
N	168	No data	No data	6	6
Min.	No data	900	No data	36,500	9,100
Max.	No data	1,300	No data	81,100	14,700
Median	No data	1,300	No data	46,150	12,400
Mean	No data	1,167	No data	50,233	11,817
StdDev	No data	No data	No data	17,448	2,252

Effluent intake concentration (c)

Po-210 concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
0-3 mi upwind	40	8,000	No data	440,200	32,900
0-3 mi downwind	40	5,300	No data	404,200	35,100
3-5 mi downwind	40	8,000	No data	396,600	34,900
5-10 mi downwind	40	8,000	No data	331,500	31,300
10-15 mi downwind	40	8,000	No data	312,700	33,700
15-20 mi downwind	40	5,300	No data	236,800	23,100
N	240	No data	No data	6	6
Min.	No data	5,300	No data	236,800	23,100
Max.	No data	8,000	No data	440,200	35,100
Median	No data	8,000	No data	364,050	33,300
Mean	No data	7,100	No data	353,667	31,833
StdDev	No data	No data	No data	74,448	4,500

Effluent intake concentration (c)

a. Sources: HTO and Pu-238, Anderson and Sheehan (1968b, 1969a); Po-210, Anderson and Sheehan (1969a, Table 5).
b. LDL = lower detection limit; unknown confidence level.
c. Not used (derived by alternate method).

ATTACHMENT C
ENVIRONMENTAL AIR SAMPLING DATA FOR 1959 TO 1972 (continued)

Table C-11. Mound offsite air monitoring data for 1969.[a,b]

HTO concentration (10^{-12} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
0-3 mi upwind	35	1,000	No data	5,480	1,390
0-3 mi downwind	35	1,000	No data	12,190	1,400
3-5 mi downwind	34	1,000	No data	3,990	1,120
5-10 mi downwind	34	1,000	No data	2,390	1,060
10-15 mi downwind	34	1,000	No data	1,510	1,020
15-20 mi downwind	33	1,000	No data	3,580	1,110
N	205	No data	No data	6	6
Min.	No data	1,000	No data	1,510	1,020
Max.	No data	1,000	No data	12,190	1,400
Median	No data	1,000	No data	3,785	1,115
Mean	No data	1,000	No data	4,857	1,183
StdDev	No data	No data	No data	3,843	168

Effluent intake concentration (d)

Pu-238 concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
0-3 mi upwind	37	1,300	No data	12,700	5,400
0-3 mi downwind	38	900	No data	61,100	6,800
3-5 mi downwind	38	1,300	No data	183,300	10,500
5-10 mi downwind	37	1,300	No data	16,000	6,300
10-15 mi downwind	38	1,300	No data	19,700	5,900
15-20 mi downwind	37	900	No data	15,600	4,200
N	225	No data	No data	6	6
Min.	No data	900	No data	12,700	4,200
Max.	No data	1,300	No data	183,300	10,500
Median	No data	1,300	No data	17,850	6,100
Mean	No data	1,167	No data	51,400	6,517
StdDev	No data	No data	No data	67,125	2,144

Effluent intake concentration (d)

Po-210 concentration (10^{-18} µCi/mL)[c]

Location	Samples	LDL	Min.	Max.	Mean
0-3 mi upwind	37	8,000	No data	39,500	15,600
0-3 mi downwind	38	5,300	No data	35,800	9,400
3-5 mi downwind	37	8,000	No data	38,900	14,500
5-10 mi downwind	38	8,000	No data	64,900	15,600
10-15 mi downwind	39	8,000	No data	30,300	14,400
15-20 mi downwind	37	5,300	No data	35,700	10,400
N	226	No data	No data	6	6
Min.	No data	5,300	No data	30,300	9,400
Max.	No data	8,000	No data	64,900	15,600
Median	No data	8,000	No data	37,350	14,450
Mean	No data	7,100	No data	40,850	13,317
StdDev	No data	No data	No data	12,226	2,715

Effluent intake concentration (d)

a. Sources: HTO and Pu-238, Anderson and Sheehan (1969b, 1970); Po-210, Anderson and Sheehan 1970, (Table 5).
b. LDL = lower detection limit; unknown confidence level.
c. Gross alpha attributed to Pu-238 after separation of Po (naturally occurring alpha is included).
d. Not used (derived by alternate method).

ATTACHMENT C
ENVIRONMENTAL AIR SAMPLING DATA FOR 1959 TO 1972 (continued)

Table C-12. Mound offsite air monitoring data for 1970.[a,b]

HTO concentration (10^{-12} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
0-3 mi upwind	82	200	No data	No data	480
0-3 mi downwind	83	200	No data	No data	3,910
3-5 mi downwind	83	200	No data	No data	610
5-10 mi downwind	84	200	No data	No data	420
10-15 mi downwind	84	200	No data	No data	520
15-20 mi downwind	84	200	No data	No data	430
N	500	No data	No data	No data	6
Min.	No data	200	No data	No data	420
Max.	No data	200	No data	No data	3,910
Median	No data	200	No data	No data	500
Mean	No data	200	No data	No data	1,062
StdDev	No data	No data	No data	No data	1,397

Effluent intake concentration (c)

Pu-238 concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
0-3 mi upwind	81	1,300	No data	No data	3,300
0-3 mi downwind	81	900	No data	No data	2,900
3-5 mi downwind	81	1,300	No data	No data	3,300
5-10 mi downwind	81	1,300	No data	No data	2,700
10-15 mi downwind	81	1,300	No data	No data	2,700
15-20 mi downwind	81	900	No data	No data	2,300
N	486	No data	No data	No data	6
Min.	No data	900	No data	No data	2,300
Max.	No data	1,300	No data	No data	3,300
Median	No data	1,300	No data	No data	2,800
Mean	No data	1,167	No data	No data	2,867
StdDev	No data	No data	No data	No data	388

Effluent intake concentration (c)

Po-210 concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
0-3 mi upwind	84	8,000	No data	No data	14,000
0-3 mi downwind	84	5,000	No data	No data	8,000
3-5 mi downwind	83	8,000	No data	No data	10,000
5-10 mi downwind	84	8,000	No data	No data	11,000
10-15 mi downwind	84	8,000	No data	No data	12,000
15-20 mi downwind	84	5,000	No data	No data	8,000
N	503	No data	No data	No data	6
Min.	No data	5,000	No data	No data	8,000
Max.	No data	8,000	No data	No data	14,000
Median	No data	8,000	No data	No data	10,500
Mean	No data	7,000	No data	No data	10,500
StdDev	No data	No data	No data	No data	2,345

Effluent intake concentration (c)

a. Sources: Monsanto (1971a, 1971b).
b. LDL = lower detection limit at 95% confidence level.
c. Not used (derived by alternate method).

ATTACHMENT C
ENVIRONMENTAL AIR SAMPLING DATA FOR 1959 TO 1972 (continued)

Table C-13. Mound air monitoring data for 1971.[a,b]

HTO concentration (10^{-12} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
0-3 mi upwind	136	40	No data	No data	610
0-3 mi downwind	136	40	No data	No data	2,880
3-5 mi downwind	136	40	No data	No data	760
5-10 mi downwind	136	40	No data	No data	410
Southern perimeter	No data	No data	No data	No data	140
Northern perimeter	No data	No data	No data	No data	4,800
Site center	No data	No data	No data	No data	5,400
N	816	No data	No data	No data	No data
Min.	No data	40	No data	No data	No data
Max.	No data	40	No data	No data	No data
Median	No data	40	No data	No data	No data
Mean	No data	40	No data	No data	No data
StdDev	No data	No data	No data	No data	No data

Effluent intake concentration 4,800

Pu-238 concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
0-3 mi upwind	116	30	No data	No data	2,270
0-3 mi downwind	116	30	No data	No data	2,960
3-5 mi downwind	115	30	No data	No data	1,540
5-10 mi downwind	110	30	No data	No data	1,630
Southern perimeter	No data	No data	No data	No data	500
Northern perimeter	No data	No data	No data	No data	300
Site center	No data	No data	No data	No data	400
N	677	No data	No data	No data	No data
Min.	No data	30	No data	No data	No data
Max.	No data	30	No data	No data	No data
Median	No data	30	No data	No data	No data
Mean	No data	30	No data	No data	No data
StdDev	No data	No data	No data	No data	No data

Effluent intake concentration 400

Po-210 concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
0-3 mi upwind	134	2,000	No data	No data	12,000
0-3 mi downwind	134	2,000	No data	No data	1,000
3-5 mi downwind	134	2,000	No data	No data	10,000
5-10 mi downwind	134	2,000	No data	No data	14,000
Southern perimeter	No data	No data	No data	No data	2,000
Northern perimeter	No data	No data	No data	No data	2,000
Site center	No data	No data	No data	No data	4,000
N	804	No data	No data	No data	No data
Min.	No data	2,000	No data	No data	No data
Max.	No data	2,000	No data	No data	No data
Median	No data	2,000	No data	No data	No data
Mean	No data	2,000	No data	No data	No data
StdDev	No data	No data	No data	No data	No data

Effluent intake concentration 2,000

a. Source: Monsanto (1972), Carfagno and Westendorf (1972a).
b. LDL = lower detection limit at 95% confidence level.

ATTACHMENT C
ENVIRONMENTAL AIR SAMPLING DATA FOR 1959 TO 1972 (continued)

Table C-14. Mound air monitoring data for 1972.[a,b]

HTO concentration (10^{-12} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	26	3	<3.0	290	77
212 *On*	26	3	<3.0	2,200	200
213 *On*	26	3	<3.0	1,250	110
214 *On*	26	3	<3.0	690	82
215 *On*	26	3	<3.0	430	51
N	130	5	0	5	5
Min.	No data	3	BEL	290	51
Max.	No data	3	BEL	2,200	200
Median	No data	3.00	ND	690.00	82.00
Mean	No data	3.00	ND	972.00	104.00
StdDev	No data	0.00	ND	778.41	57.61
101 *Off*	46	3	<3.0	580	101
102 *Off*	37	3	<3.0	250	61
103 *Off*	45	3	<3.0	1,640	81
104 *Off*	42	3	<3.0	270	30
105 *Off*	45	3	<3.0	110	12
106 *Off*	45	3	<3.0	59	8
107 *Off*	43	3	<3.0	25	4
108 *Off*	44	3	<3.0	16	3
109 *Off*	45	3	<3.0	21	4
110 *Off*	43	3	<3.0	79	5
N	435	10	0	10	10
Min.	No data	3	BEL	16	3
Max.	No data	3	BEL	1,640	101
Median	No data	3.00	No data	95	10
Mean	No data	3.00	No data	305	31
StdDev	No data	0.00	No data	500	37
EL	N/A	N/A	N/A	N/A	No data

Effluent intake concentration 82.00

Pu-238 concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	26	1	10	928	400
212 *On*	26	1	10	129	58
213 *On*	26	1	8	1,101	400
214 *On*	26	1	39	153	140
215 *On*	26	1	18	33	22
N	130	5	5	5	5
Min.	No data	1	8	33	22
Max.	No data	1	39	1,101	400
Median	No data	0.50	10.00	153.00	140.00
Mean	No data	0.50	17.00	468.80	204.00
StdDev	No data	0.00	12.88	503.90	183.96
101 *Off*	46	1	11	95	34
102 *Off*	3	1	(c)	(c)	69
103 *Off*	44	1	5	188	56
104 *Off*	45	1	6	51	20
105 *Off*	45	1	4	27	10
106 *Off*	45	1	3	78	13
107 *Off*	25	1	2	11	5
108 *Off*	43	1	3	14	8
109 *Off*	41	1	2	9	5
110 *Off*	27	1	4	7	5
N	364	10	9	9	10
Min.	No data	1	2	7	5
Max.	No data	1	11	188	69
Median	No data	0.50	3.50	27.00	11.30
Mean	No data	0.50	4.36	53.38	22.43
StdDev	No data	0.00	2.73	59.78	23.14
EL	N/A	N/A	N/A	N/A	No data

Effluent intake concentration 140.00

Po-210 concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	26	20	930	3,700	2,300
212 *On*	26	20	700	2,400	1,300
213 *On*	26	20	660	2,600	1,200
214 *On*	26	20	740	4,500	1,300
215 *On*	26	20	590	2,300	1,200
N	130	5	5	5	5
Min.	No data	20	590	2,300	1,200
Max.	No data	20	930	4,500	2,300
Median	No data	20.00	700.00	2,600.00	1,300.00
Mean	No data	20.00	724.00	3,100.00	1,460.00
StdDev	No data	0.00	127.79	961.77	472.23
101 *Off*	46	20	520	3,700	1,300
102 *Off*	No data	No data	No data	No data	No data
103 *Off*	No data	No data	No data	No data	No data
104 *Off*	No data	No data	No data	No data	No data
105 *Off*	No data	No data	No data	No data	No data
106 *Off*	No data	No data	No data	No data	No data
107 *Off*	No data	No data	No data	No data	No data
108 *Off*	42	20	600	2,900	1,300
109 *Off*	No data	No data	No data	No data	No data
110 *Off*	No data	No data	No data	No data	No data
N	88	2	2	2	2
Min.	No data	20	520	2,900	1,300
Max.	No data	20	600	3,700	1,300
Median	No data	20.00	560.00	3,300.00	1,300.00
Mean	No data	20.00	560.00	3,300.00	1,300.00
StdDev	No data	0.00	56.57	565.69	0.00
EL	N/A	N/A	N/A	N/A	No data

Effluent intake concentration 1,300.00

a. Sources: HTO and Pu-238, Anderson and Sheehan (1967b, 1968a); Po-210, Anderson and Sheehan (1968a, Table 5).
b. BEL = below environmental level; EL = environmental (activity concentration) level; LDL = lower detection limit at 95% confidence level; N/A = not applicable.
c. Pu-238 sample location 102 value is composite of three samples.

ATTACHMENT D
ENVIRONMENTAL AIR SAMPLING DATA FOR 1973 TO 2002

LIST OF TABLES

ATTACHMENT D
ENVIRONMENTAL AIR SAMPLING DATA FOR 1959 TO 1972 (continued)

Table D-1. Mound air monitoring data for 1973.[a,b]

HTO concentration (10^{-12} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	52	3	<3.0	280.00	59.00
212 *On*	52	3	<3.0	880.00	81.00
213 *On*	52	3	<3.0	670	97.00
214 *On*	50	3	<3.0	570	79
215 *On*	51	3	<3.0	340.00	33.00
N	257	5	0	5	5
Min.	No data	3	BEL[c]	280.00	33.00
Max.	No data	3	BEL[c]	880.00	97.00
Median	No data	3	No data	570.00	79.00
Mean	No data	3	No data	548.00	69.80
StdDev	No data	0	No data	245.30	24.60
101 *Off*	49	3	<3.0	810.00	87.00
102 *Off*	51	3	<3.0	970.00	124.00
103 *Off*	52	3	<3.0	3040.00	115.00
104 *Off*	51	3	<3.0	570.00	40.00
105 *Off*	52	3	<3.0	350.00	14.00
106 *Off*	51	3	<3.0	130.00	12.00
107 *Off*	52	3	<3.0	200.00	15.00
108 *Off*	52	3	<3.0	110.00	8.00
109 *Off*	52	3	<3.0	660.00	26.00
110 *Off*	52	3	<3.0	80.00	8.00
111 *Off*	52	3	<3.0	80.00	9.00
112 *Off*	50	3	<3.0	490.00	37.00
113 *Off*	51	3	<3.0	130.00	13.00
114 *Off*	51	3	<3.0	110.00	10.00
115 *Off*	50	3	<3.0	80.00	10.00
116 *Off*	49	3	<3.0	210.00	14.00
117 *Off*	50	3	<3.0	100.00	9.00
118 *Off*	45	3	<3.0	910.00	45.00
119 *Off*	41	3	<3.0	60.00	5.00
120 *Off*	42	3	<3.0	100.00	9.00
121 *Off*	44	3	<3.0	50.00	7.00
N	1,039	21	0	21	21
Min.	No data	3	BEL	50.00	5.00
Max.	No data	3	BEL	3,040.00	124.00
Median	No data	3	No data	130.00	13.00
Mean	No data	3	No data	440.00	29.38
StdDev	No data	0	No data	667.52	35.56
EL[c]	No data	No data	No data	No data	5

Effluent intake concentration 74.00

Pu-238 concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	51	0.5	180.00	2850.00	940.00
212 *On*	51	0.5	47.00	600.00	160.00
213 *On*	51	0.5	130	9000	1390
214 *On*	48	0.5	59	180	110
215 *On*	50	0.5	18.00	350.00	68.00
N	251	5	5	5	5
Min.	No data	0.5	18.00	180.00	68.00
Max.	No data	0.5	180.00	9000.00	1390.00
Median	No data	0.5	59.00	600.00	160.00
Mean	No data	0.5	86.80	2596.00	533.60
StdDev	No data	0.0	66.41	3739.70	598.83
101 *Off*	50	0.36	11.00	157.00	47.00
102 *Off*	43	0.36	9.90	146.00	56.00
103 *Off*	52	0.36	4.60	184.00	58.00
104 *Off*	51	0.36	4.00	444.00	51.00
105 *Off*	51	0.36	0.60	55.00	16.00
106 *Off*	40	0.36	0.50	21.00	7.80
107 *Off*	45	0.36	<0.36	61.00	8.80
108 *Off*	52	0.36	2.60	143.00	25.00
109 *Off*	49	0.36	0.60	594.00	52.00
110 *Off*	38	0.36	<0.36	19.00	4.60
111 *Off*	52	0.36	<0.36	26.00	4.00
112 *Off*	50	0.36	0.70	60.00	16.00
113 *Off*	46	0.36	<0.36	11.00	4.20
114 *Off*	51	0.36	<0.36	12.00	2.50
115 *Off*	49	0.36	<0.36	12.00	3.10
116 *Off*	48	0.36	<0.36	18.00	3.90
117 *Off*	50	0.36	<0.36	10.00	1.90
118 *Off*	30	0.36	2.80	26.00	9.10
119 *Off*	41	0.36	<0.36	20.00	3.90
120 *Off*	42	0.36	<0.36	12.00	3.00
121 *Off*	42	0.36	<0.36	10.00	2.60
N	972	21	10	21	21
Min.	No data	0.36	0.5	10.00	1.90
Max.	No data	0.36	11	594.00	58.00
Median	No data	0.36	2.70	26.00	7.80
Mean	No data	0.36	3.73	97.19	18.11
StdDev	No data	0.00	3.85	152.62	20.74
EL	No data	No data	No data	No data	3.9

Effluent intake concentration 156.10

Po-210 concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	51	20	590	6,500	1,500
212 *On*	51	20	480	2,000	1,100
213 *On*	52	20	500	5,500	1,100
214 *On*	49	20	260	3,300	1,000
215 *On*	51	20	500	1,900	1,000
N	254	5	5	5	5
Min.	No data	20.0	260	1,900	1,000
Max.	No data	20.0	260	1,900	1,500
Median	No data	20.0	500	3,300	1,100
Mean	No data	20.0	466	3,840	1,140
StdDev	No data	0.0	123	2,078	207
101 *Off*	50	20	370	2,400	1,100
102 *Off*	No data	No data	No data	No data	No data
103 *Off*	No data	No data	No data	No data	No data
104 *Off*	No data	No data	No data	No data	No data
105 *Off*	No data	No data	No data	No data	No data
106 *Off*	No data	No data	No data	No data	No data
107 *Off*	No data	No data	No data	No data	No data
108 *Off*	52	20	450	2,200	1,300
109 *Off*	No data	No data	No data	No data	No data
110 *Off*	No data	No data	No data	No data	No data
111 *Off*	No data	No data	No data	No data	No data
112 *Off*	No data	No data	No data	No data	No data
113 *Off*	No data	No data	No data	No data	No data
114 *Off*	No data	No data	No data	No data	No data
115 *Off*	No data	No data	No data	No data	No data
116 *Off*	No data	No data	No data	No data	No data
117 *Off*	No data	No data	No data	No data	No data
118 *Off*	No data	No data	No data	No data	No data
119 *Off*	No data	No data	No data	No data	No data
120 *Off*	No data	No data	No data	No data	No data
121 *Off*	No data	No data	No data	No data	No data
N	102	2	2	2	2
Min.	No data	20	370	2,200	1,100
Max.	No data	20	450	2,400	1,300
Median	No data	20	410	2,300	1,200
Mean	No data	20	410	2,300	1,200
StdDev	No data	0	57	141	141
EL	No data	No data	No data	No data	No data

Effluent intake concentration 1,100.00

a. Source: Carfagno and Westendorf (1973b, 1974).
b. BEL = below environmental level; EL = environmental (activity concentration) level; LDL = lower detection limit at 95% confidence level.
c. BEL values from sample location 119.

ATTACHMENT D
ENVIRONMENTAL AIR SAMPLING DATA FOR 1959 TO 1972 (continued)

Table D-2. Mound air monitoring data for 1974.[a,b]

HTO concentration (10^{-12} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	53	3	<3.0	550.00	86.00
212 *On*	50	3	<3.0	1220.00	110.00
213 *On*	53	3	20.00	3330	320.00
214 *On*	53	3	<3.0	1440	170
215 *On*	53	3	<3.0	1750.00	160.00
N	262	5	1	5	5
Min.	No data	3	20.00	550.00	86.00
Max.	No data	3	20.00	3330.00	320.00
Median	No data	3	No data	1440.00	160.00
Mean	No data	3	No data	1658.00	169.20
StdDev	No data	0	No data	1033.33	91.18
101 *Off*	53	2	<2.0	900.00	110.00
102 *Off*	53	2	<2.0	1700.00	140.00
103 *Off*	53	2	<2.0	2490.00	148.00
104 *Off*	53	2	<2.0	520.00	49.00
105 *Off*	53	2	<2.0	510.00	54.00
106 *Off*	53	2	<2.0	230.00	29.00
107 *Off*	52	2	<2.0	260.00	21.00
108 *Off*	52	2	<2.0	140.00	16.00
109 *Off*	53	2	<2.0	130.00	15.00
110 *Off*	52	2	<2.0	90.00	17.00
111 *Off*	52	2	<2.0	60.00	11.00
112 *Off*	53	2	<2.0	530.00	40.00
113 *Off*	53	2	<2.0	50.00	9.00
114 *Off*	53	2	<2.0	60.00	8.00
115 *Off*	53	2	<2.0	160.00	12.00
116 *Off*	53	2	<2.0	100.00	10.00
117 *Off*	53	2	<2.0	40.00	7.00
118 *Off*	53	2	<2.0	1800.00	87.00
119 *Off*	52	2	<2.0	40.00	7.00
120 *Off*	53	2	<2.0	30.00	6.00
121 *Off*	53	2	<2.0	30.00	8.00
N	1108	21	0	21	21
Min.	No data	2	BEL	30.00	6.00
Max.	No data	2	BEL	2490.00	148.00
Median	No data	2	No data	140.00	16.00
Mean	No data	2	No data	470.00	38.29
StdDev	No data	0	No data	690.22	44.76
EL[d]	No data	No data	No data	No data	7

Effluent intake concentration 153.00

Pu-238 concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	52	0.4	51.00	3920.00	810.00
212 *On*	50	0.4	60.00	530.00	190.00
213 *On*	53	0.4	200	1900	570
214 *On*	53	0.4	67	460	170
215 *On*	52	0.4	23.00	190.00	82.00
N	260	5	5	5	5
Min.	No data	0.4	23.00	190.00	82.00
Max.	No data	0.4	200.00	3920.00	810.00
Median	No data	0.4	60.00	530.00	190.00
Mean	No data	0.4	80.20	1400.00	364.40
StdDev	No data	0.0	69.03	1557.64	311.76
101 *Off*	52	0.36	23.00	316.00	100.00
102 *Off*	53	0.36	9.60	293.00	60.00
103 *Off*	53	0.36	18.00	335.00	64.00
104 *Off*	53	0.36	3.80	34.00	13.00
105 *Off*	35	0.36	3.30	36.00	12.00
106 *Off*	22	0.36	2.10	21.00	6.30
107 *Off*	30	0.36	0.60	37.00	6.00
108 *Off*	47	0.36	0.60	84.00	32.00
109 *Off*	53	0.36	1.20	16.00	5.60
110 *Off*	18[c]	0.36	1.90	43.00	13.00
111 *Off*	53	0.36	0.90	32.00	7.80
112 *Off*	53	0.36	2.80	79.00	20.00
113 *Off*	53	0.36	0.80	23.00	5.60
114 *Off*	53	0.36	1.70	15.00	6.30
115 *Off*	50	0.36	0.30	71.00	10.00
116 *Off*	47	0.36	0.70	35.00	5.60
117 *Off*	48	0.36	0.70	32.00	7.30
118 *Off*	53	0.36	4.00	32.00	14.00
119 *Off*	48	0.36	1.10	5.40	1.90
120 *Off*	53	0.36	1.60	19.00	4.30
121 *Off*	53	0.36	0.50	28.00	5.50
N	980	21	21	21	21
Min.	No data	0.36	0.3	5.40	1.90
Max.	No data	0.36	23	335.00	100.00
Median	No data	0.36	1.60	34.00	7.80
Mean	No data	0.36	3.77	75.54	19.06
StdDev	No data	0.00	5.98	102.23	25.15
EL	No data	No data	No data	No data	1.9

Effluent intake concentration 188.10

Po-210 concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	52	20	310.00	2800.00	1100.00
212 *On*	50	20	420.00	2200.00	1200.00
213 *On*	53	20	600.00	2500.00	1100.00
214 *On*	53	20	630.00	2500.00	1100.00
215 *On*	52	20	460.00	2400.00	1100.00
N	260	5	5	5	5
Min.	No data	20.0	310.0	2200.0	1100.0
Max.	No data	20.0	310.0	2200.0	1200.0
Median	No data	20.0	460.00	2500.00	1100.00
Mean	No data	20.0	484.00	2480.00	1120.00
StdDev	No data	0.0	132.02	216.79	44.72
101 *Off*	52	20	590.00	3000.00	1200.00
102 *Off*	No data	No data	No data	No data	No data
103 *Off*	No data	No data	No data	No data	No data
104 *Off*	No data	No data	No data	No data	No data
105 *Off*	No data	No data	No data	No data	No data
106 *Off*	No data	No data	No data	No data	No data
107 *Off*	No data	No data	No data	No data	No data
108 *Off*	47	20	430.00	2400.00	1300.00
109 *Off*	No data	No data	No data	No data	No data
110 *Off*	No data	No data	No data	No data	No data
111 *Off*	No data	No data	No data	No data	No data
112 *Off*	No data	No data	No data	No data	No data
113 *Off*	No data	No data	No data	No data	No data
114 *Off*	No data	No data	No data	No data	No data
115 *Off*	No data	No data	No data	No data	No data
116 *Off*	No data	No data	No data	No data	No data
117 *Off*	No data	No data	No data	No data	No data
118 *Off*	No data	No data	No data	No data	No data
119 *Off*	No data	No data	No data	No data	No data
120 *Off*	No data	No data	No data	No data	No data
121 *Off*	No data	No data	No data	No data	No data
N	99	2	2	2	2
Min.	No data	20	430	2400	1200
Max.	No data	20	590	3000	1300
Median	No data	20	510	2700.00	1250.00
Mean	No data	20	510	2700.00	1250.00
StdDev	No data	0	113.14	424.26	70.71
EL	52	20	310.00	2800.00	1100.00

Effluent intake concentration 1,100.00

a. Source: Carfagno and Robinson (1975).
b. BEL = below environmental level; EL = environmental (activity concentration) level; LDL = lower detection limit at 95% confidence level; No data = not applicable.
c. Pu-239 samples from location 110 were collected only during the fall season; concentrations are typically lower; Min. values less than LDL included as reported; however, these values should be interpreted as "BEL"; tritium "Mean" concentrations "Onsite" and "Offsite" included LDL values for averaging purposes.
d. EL values from sample location 119.

ATTACHMENT D
ENVIRONMENTAL AIR SAMPLING DATA FOR 1959 TO 1972 (continued)

Table D-3. Mound air monitoring data for 1975.[a,b]

HTO concentration (10^{-12} µCi/mL)

Location	Samples	LDL	Min.[c]	Max.	Mean
211 *On*	52	12.2	<12.2	100.00	31.00
212 *On*	50	12.2	<12.2	90.00	33.00
213 *On*	52	12.2	<12.2	117	31.00
214 *On*	52	12.2	<12.2	290	34
215 *On*	51	12.2	<12.2	83.00	20.00
N	257	5	0	5	5
Min.	No data	12.2	BEL	83.00	20.00
Max.	No data	12.2	BEL	290.00	34.00
Median	No data	12.2	No data	100.00	31.00
Mean	No data	12.2	No data	136.00	29.80
StdDev	No data	0	No data	87.03	5.63
101 *Off*	52	7.2	<7.2	42.00	13.00
102 *Off*	52	7.2	<7.2	49.00	16.00
103 *Off*	52	7.2	<7.2	52.00	14.00
104 *Off*	52	7.2	<7.2	27.00	9.00
105 *Off*	52	7.2	<7.2	68.00	11.00
106 *Off*	27	7.2	<7.2	11.00	7.30
107 *Off*	27	7.2	<7.2	14.00	7.90
108 *Off*	52	7.2	<7.2	21.00	7.80
109 *Off*	27	7.2	<7.2	18.00	8.00
110 *Off*	52	7.2	<7.2	16.00	7.40
111 *Off*	52	7.2	<7.2	13.00	7.40
112 *Off*	52	7.2	<7.2	46.00	10.00
113 *Off*	27	7.2	<7.2	13.00	7.60
114 *Off*	23	7.2	<7.2	14.00	7.70
115 *Off*	52	7.2	<7.2	17.00	7.50
116 *Off*	27	7.2	<7.2	12.00	7.40
117 *Off*	23	7.2	<7.2	13.00	7.70
118 *Off*	52	7.2	<7.2	18.00	8.90
119 *Off*	51	7.2	<7.2	13.00	7.40
120 *Off*	27	7.2	<7.2	8.70	7.20
121 *Off*	27	7.2	<7.2	10.00	7.30
122 *Off*	No data	No data	No data	No data	No data
N	858	21	0	21	21
Min.	No data	7.2	BEL	8.70	7.20
Max.	No data	7.2	BEL	68.00	16.00
Median	No data	7.2	No data	16.00	7.70
Mean	No data	7.2	No data	23.60	8.93
StdDev	No data	0	No data	17.00	2.50
EL[d]	No data	No data	No data	No data	2

Effluent intake concentration 29.00

Pu-238 concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	52	0.9	68.00	729.00	212.00
212 *On*	49	0.9	23.00	142.00	52.00
213 *On*	52	0.9	87	10959	1033
214 *On*	44	0.9	13	173	67
215 *On*	51	0.9	17.00	91.00	38.00
N	248	5	5	5	5
Min.	No data	0.9	13.00	91.00	38.00
Max.	No data	0.9	87.00	10959.00	1033.00
Median	No data	0.9	23.00	173.00	67.00
Mean	No data	0.9	41.60	2418.80	280.40
StdDev	No data	0.0	33.64	4781.12	426.48
101 *Off*	52	0.79	3.70	56.00	23.00
102 *Off*	52	0.79	5.80	30.00	14.00
103 *Off*	52	0.79	4.50	31.00	13.00
104 *Off*	52	0.79	2.30	94.00	14.00
105 *Off*	41	0.79	0.80	54.00	9.40
106 *Off*	13	0.79	2.70	3.50	3.20
107 *Off*	25	0.79	1.60	16.00	6.20
108 *Off*	52	0.79	1.10	16.00	7.50
109 *Off*	25	0.79	0.80	8.60	3.30
110 *Off*	52	0.79	<.79	4.70	2.30
111 *Off*	52	0.79	<.79	5.30	3.30
112 *Off*	52	0.79	1.20	4.90	3.50
113 *Off*	25	0.79	1.40	1.80	1.60
114 *Off*	22	0.79	1.50	2.10	1.80
115 *Off*	52	0.79	<.79	3.80	1.70
116 *Off*	25	0.79	1.00	1.30	1.20
117 *Off*	21	0.79	1.50	7.40	4.80
118 *Off*	52	0.79	1.40	7.60	4.40
119 *Off*	50	0.79	<.79	2.00	1.40
120 *Off*	25	0.79	1.70	1.80	1.80
121 *Off*	25	0.79	1.40	1.80	1.60
122 *Off*	44	0.79	6.40	74.00	17.00
N	861	22	18	22	22
Min.	No data	0.79	0.8	1.30	1.20
Max.	No data	0.79	6.4	94.00	23.00
Median	No data	0.79	1.50	6.35	3.40
Mean	No data	0.79	2.27	19.44	6.36
StdDev	No data	0.00	1.70	26.49	6.10
EL	No data	No data	No data	No data	3

Effluent intake concentration 64.00

Pu-239 concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	52	0.52	No data	No data	22.00
212 *On*	49	0.52	No data	No data	21.00
213 *On*	52	0.52	No data	No data	41
214 *On*	44	0.52	No data	No data	25
215 *On*	51	0.52	No data	No data	22.00
N	248	5	0	0	5
Min.	No data	0.5	BEL	BEL	21.00
Max.	No data	0.5	BEL	BEL	41.00
Median	No data	0.5	No data	No data	22.00
Mean	No data	0.5	No data	No data	26.20
StdDev	No data	0.0	No data	No data	8.41
101 *Off*	52	0.46	No data	No data	29.00
102 *Off*	52	0.46	No data	No data	29.00
103 *Off*	52	0.46	No data	No data	23.00
104 *Off*	52	0.46	No data	No data	22.00
105 *Off*	41	0.46	No data	No data	19.00
106 *Off*	13	0.46	No data	No data	38.00
107 *Off*	25	0.46	No data	No data	36.00
108 *Off*	52	0.46	No data	No data	19.00
109 *Off*	25	0.46	No data	No data	37.00
110 *Off*	52	0.46	No data	No data	19.00
111 *Off*	52	0.46	No data	No data	22.00
112 *Off*	52	0.46	No data	No data	31.00
113 *Off*	25	0.46	No data	No data	40.00
114 *Off*	22	0.46	No data	No data	40.00
115 *Off*	52	0.46	No data	No data	26.00
116 *Off*	25	0.46	No data	No data	35.00
117 *Off*	21	0.46	No data	No data	34.00
118 *Off*	52	0.46	No data	No data	18.00
119 *Off*	50	0.46	No data	No data	19.00
120 *Off*	25	0.46	No data	No data	35.00
121 *Off*	25	0.46	No data	No data	37.00
122 *Off*	44	0.46	No data	No data	16.00
N	861	22	0	0	22
Min.	No data	0.46	BEL	BEL	16.00
Max.	No data	0.46	BEL	BEL	40.00
Median	No data	0.46	No data	No data	29.00
Mean	No data	0.46	No data	No data	28.36
StdDev	No data	0	No data	No data	8.24
EL	No data	No data	No data	No data	19

Effluent intake concentration 3.00

a. Source: Farmer, Robinson, and Carfagno (1976).
b. BEL = below environmental level; EL = environmental (activity concentration) level; LDL = lower detection limit at 95% confidence level; No data = not applicable.
c. Min. values less than LDL included as reported; however, these values should be interpreted as "BEL"; tritium "Mean" concentrations "Onsite" and "Offsite" included LDL values for averaging purposes; Pu-238 "Mean" concentrations "Offsite" included LDL values for averaging purposes.
d. EL values from sample location 119.

ATTACHMENT D
ENVIRONMENTAL AIR SAMPLING DATA FOR 1959 TO 1972 (continued)

Table D-4. Mound air monitoring data for 1976.[a,b]

HTO concentration (10^{-12} µCi/mL)[c]

Location	Samples	LDL	Min.[f]	Max.	Mean
211 *On*	49	7.4	<7.4	86.00	18.00
212 *On*	48	7.4	<7.4	52.00	20.00
213 *On*	51	7.4	<7.4	200	28.00
214 *On*	50	7.4	<7.4	102	22
215 *On*	50	7.4	<7.4	339.00	24.00
N	248	5	0	5	5
Min.	No data	7.4	BEL	52.00	18.00
Max.	No data	7.4	BEL	339.00	28.00
Median	No data	7.4	No data	102.00	22.00
Mean	No data	7.4	No data	155.80	22.40
StdDev	No data	0	No data	116.25	3.85
101 *Off*	51	4.5	<4.5	136.00	13.00
102 *Off*	51	4.5	<4.5	192.00	15.00
103 *Off*	51	4.5	<4.5	75.00	11.00
104 *Off*	49	4.5	<4.5	38.00	9.40
105 *Off*	51	4.5	<4.5	53.00	8.90
108 *Off*	50	4.5	<4.5	41.00	8.90
110 *Off*	51	4.5	<4.5	54.00	9.00
111 *Off*	51	4.5	<4.5	18.00	8.10
112 *Off*	51	4.5	<4.5	31.00	9.20
115 *Off*	51	4.5	<4.5	35.00	8.50
118 *Off*	50	4.5	<4.5	19.00	9.00
119 *Off*	51	4.5	<4.5	35.00	8.80
122 *Off*	No data	No data	No data	No data	No data
123 *Off*	25	4.5	<4.5	31.00	11.00
N	633	13	0	13	13
Min.	No data	4.5	BEL	18.00	8.10
Max.	No data	4.5	BEL	192.00	15.00
Median	No data	4.5	No data	38.00	9.00
Mean	No data	4.5	No data	58.31	9.98
StdDev	No data	0	No data	50.58	2.01
EL[g]	No data	0	No data	No data	2

Effluent intake concentration 20.00

Pu-238 concentration (10^{-18} µCi/mL)[d]

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	52	0.8	2.60	373.00	87.00
212 *On*	52	0.8	14.00	110.00	35.00
213 *On*	52	0.8	72	776	267
214 *On*	47	0.8	17	379	91
215 *On*	50	0.8	7.50	68.00	33.00
N	253	5	5	5	5
Min.	No data	0.8	2.60	68.00	33.00
Max.	No data	0.8	72.00	776.00	267.00
Median	No data	0.8	14.00	373.00	87.00
Mean	No data	0.8	22.62	341.20	102.60
StdDev	No data	0.0	28.17	282.66	95.94
101 *Off*	52	0.77	2.60	144.00	39.00
102 *Off*	52	0.77	7.60	74.00	26.00
103 *Off*	52	0.77	5.90	75.00	29.00
104 *Off*	52	0.77	<0.77	19.00	7.90
105 *Off*	52	0.77	<0.77	4.70	2.10
108 *Off*	44	0.77	0.80	7.10	3.90
110 *Off*	52	0.77	<0.77	4.20	1.70
111 *Off*	52	0.77	1.60	10.00	4.10
112 *Off*	51	0.77	1.20	4.30	2.60
115 *Off*	52	0.77	0.40	14.00	2.10
118 *Off*	51	0.77	3.50	17.00	6.50
119 *Off*	52	0.27	<0.27	0.60	0.50
122 *Off*	51	0.77	5.50	107.00	38.00
123 *Off*	25	0.77	31.00	294.00	160.00
N	690	14	10	14	14
Min.	No data	0.27	0.4	0.60	0.50
Max.	No data	0.77	31	294.00	160.00
Median	No data	0.77	3.05	15.50	5.30
Mean	No data	0.73	6.01	55.35	23.10
StdDev	No data	0.13	9.11	82.22	41.85
EL	No data	No data	No data	No data	3

Effluent intake concentration 84.00

Pu-239 concentration (10^{-18} µCi/mL)[e]

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	52	0.45	No data	No data	5.90
212 *On*	52	0.45	No data	No data	5.40
213 *On*	52	0.45	No data	No data	13
214 *On*	47	0.45	No data	No data	8.1
215 *On*	50	0.45	No data	No data	6.00
N	253	5	0	0	5
Min.	No data	0.5	BEL	BEL	5.40
Max.	No data	0.5	BEL	BEL	13.00
Median	No data	0.5	No data	No data	6.00
Mean	No data	0.5	No data	No data	7.68
StdDev	No data	0.0	No data	No data	3.15
101 *Off*	52	0.43	No data	No data	6.70
102 *Off*	52	0.43	No data	No data	5.20
103 *Off*	52	0.43	No data	No data	8.50
104 *Off*	52	0.43	No data	No data	5.20
105 *Off*	52	0.43	No data	No data	4.80
108 *Off*	44	0.43	No data	No data	4.40
110 *Off*	52	0.43	No data	No data	4.60
111 *Off*	52	0.43	No data	No data	5.90
112 *Off*	51	0.43	No data	No data	5.10
115 *Off*	52	0.43	No data	No data	5.50
118 *Off*	51	0.43	No data	No data	5.60
119 *Off*	52	0.43	No data	No data	3.80
122 *Off*	51	0.43	No data	No data	6.00
123 *Off*	25	0.43	No data	No data	5.10
N	690	14	0	0	14
Min.	No data	0.43	BEL	BEL	3.80
Max.	No data	0.43	BEL	BEL	8.50
Median	No data	0.43	No data	No data	5.20
Mean	No data	0.43	No data	No data	5.46
StdDev	No data	0	No data	No data	1.13
EL	No data	No data	No data	No data	3.8

Effluent intake concentration 2.20

a. Source: Farmer, Robinson, and Carfagno (1977).
b. BEL = below environmental level; EL = environmental (activity concentration) level; LDL = lower detection limit at 95% confidence level; No data = not applicable.
c. Tritium oxide "Onsite" LDL in air during the first half of the year was 16.5E–12 µCi/mL and 7.4E–12 µCi/mL for the second half. Tritium oxide "Offsite" LDL in air during the first half of the year was 9.9E–12 µCi/mL and 4.5E–12 µCi/mL for the second half.
d. Pu-238 "Onsite" LDL in air during the first half of the year was 0.81E–18 µCi/mL and 0.27E–18 µCi/mL for the second half. Pu-238 "Offsite" LDL in air during the first half of the year was 0.77E–18 µCi/mL and 0.27E–18 µCi/mL for the second half.
e. Pu-239 "Onsite" LDL in air during the first half of the year was 0.45E–18 µCi/mL and 0.15E–18 µCi/mL for the second half. Pu-239 "Offsite" LDL in air during the first half of the year was 0.43E–18 µCi/mL and 0.15E–18 µCi/mL for the second half.
f. Min. values less than LDL included as reported; however, these values should be interpreted as "BEL"; tritium "Mean" concentrations "Onsite" and "Offsite" included LDL values for averaging purposes; Pu-238 "Mean" concentrations "Offsite" included LDL values for averaging purposes.
g. EL values from sample location 119.

ATTACHMENT D
ENVIRONMENTAL AIR SAMPLING DATA FOR 1959 TO 1972 (continued)

Table D-5. Mound air monitoring data for 1977.[a,b]

HTO concentration (10^{-12} µCi/mL)

Location	Samples	LDL	Min.[c]	Max.	Mean
211 *On*	51	7.3	<7.3	278.00	18.00
212 *On*	40	7.3	<7.3	143.00	30.00
213 *On*	35	7.3	<7.3	67	20.00
214 *On*	52	7.3	<7.3	68	16
215 *On*	52	7.3	<7.3	64.00	16.00
N	230	5	0	5	5
Min.	No data	7.3	BEL	64.00	16.00
Max.	No data	7.3	BEL	278.00	30.00
Median	No data	7.3	No data	68.00	18.00
Mean	No data	7.3	No data	124.00	20.00
StdDev	No data	0	No data	92.28	5.83
101 *Off*	52	2.9	<2.9	21.60	6.40
102 *Off*	52	2.9	<2.9	97.30	12.30
103 *Off*	52	2.9	<2.9	27.70	7.20
104 *Off*	52	2.9	<2.9	12.70	4.40
105 *Off*	52	2.9	<2.9	14.50	4.00
108 *Off*	52	2.9	<2.9	9.40	3.70
110 *Off*	52	2.9	<2.9	12.20	4.00
111 *Off*	52	2.9	<2.9	75.30	6.20
112 *Off*	52	2.9	<2.9	21.00	5.90
115 *Off*	52	2.9	<2.9	26.60	5.60
118 *Off*	52	2.9	<2.9	23.70	5.70
119 *Off*	51	2.9	<2.9	23.30	4.40
122 *Off*	No data	No data	No data	No data	No data
123 *Off*	52	2.9	<2.9	43.60	8.80
124 *Off*	52	2.9	<2.9	59.80	9.40
N	727	14	0	14	14
Min.	No data	2.9	BEL	9.40	3.70
Max.	No data	2.9	BEL	97.30	12.30
Median	No data	2.9	No data	23.50	5.80
Mean	No data	2.9	No data	33.48	6.29
StdDev	No data	0	No data	26.34	2.45
EL[d]	No data	No data	No data	No data	2

Effluent intake concentration 16.00

Pu-238 concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	43	2.6	24.00	101.00	51.00
212 *On*	43	2.6	9.80	117.00	25.00
213 *On*	43	2.6	42	148	81
214 *On*	43	2.6	9.8	85	31
215 *On*	43	2.6	3.70	29.00	13.00
N	215	5	5	5	5
Min.	No data	2.6	3.70	29.00	13.00
Max.	No data	2.6	42.00	148.00	81.00
Median	No data	2.6	9.80	101.00	31.00
Mean	No data	2.6	17.86	96.00	40.20
StdDev	No data	0.0	15.42	44.10	26.63
101 *Off*	51	0.76	1.50	32.00	10.00
102 *Off*	52	0.76	5.20	13.00	8.10
103 *Off*	51	0.76	4.20	8.80	6.20
104 *Off*	52	0.76	2.20	5.00	3.70
105 *Off*	52	0.76	<.76	2.30	1.50
108 *Off*	48	0.76	<.76	2.90	1.50
110 *Off*	51	0.76	<.76	1.50	0.90
111 *Off*	52	0.76	<.76	3.20	2.10
112 *Off*	48	0.76	<.76	2.10	1.60
115 *Off*	51	0.76	<.76	2.10	1.30
118 *Off*	51	0.76	2.50	12.00	7.50
119 *Off*	51	0.76	<.76	1.10	1.00
122 *Off*	47	2.58	6.10	63.00	21.00
123 *Off*	52	2.58	5.40	96.00	29.00
124 *Off*	52	2.58	3.50	42.00	17.00
N	761	15	8	15	15
Min.	No data	0.76	1.5	1.10	0.90
Max.	No data	2.58	6.1	96.00	29.00
Median	No data	0.76	3.85	5.00	3.70
Mean	No data	1.12	3.83	19.13	7.49
StdDev	No data	0.75	1.67	27.95	8.53
EL	No data	No data	No data	No data	3

Effluent intake concentration 28.00

Pu-239 concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	43	1.21	No data	No data	20.00
212 *On*	43	1.21	No data	No data	19.00
213 *On*	43	1.21	No data	No data	31
214 *On*	43	1.21	No data	No data	19
215 *On*	43	1.21	No data	No data	17.00
N	215	5	0	0	5
Min.	No data	1.2	BEL	BEL	17.00
Max.	No data	1.2	BEL	BEL	31.00
Median	No data	1.2	No data	No data	19.00
Mean	No data	1.2	No data	No data	21.20
StdDev	No data	0.0	No data	No data	5.59
101 *Off*	51	0.33	No data	No data	24.00
102 *Off*	52	0.33	No data	No data	22.00
103 *Off*	51	0.33	No data	No data	21.00
104 *Off*	52	0.33	No data	No data	22.00
105 *Off*	52	0.33	No data	No data	20.00
108 *Off*	48	0.33	No data	No data	27.00
110 *Off*	51	0.33	No data	No data	23.00
111 *Off*	52	0.33	No data	No data	25.00
112 *Off*	48	0.33	No data	No data	21.00
115 *Off*	51	0.33	No data	No data	25.00
118 *Off*	51	0.33	No data	No data	25.00
119 *Off*	51	0.33	No data	No data	21.00
122 *Off*	47	1.21	No data	No data	16.00
123 *Off*	52	1.21	No data	No data	21.00
124 *Off*	52	1.21	No data	No data	24.00
N	761	15	0	0	15
Min.	No data	0.33	BEL	BEL	16.00
Max.	No data	1.21	BEL	BEL	27.00
Median	No data	0.33	No data	No data	22.00
Mean	No data	0.506	No data	No data	22.47
StdDev	No data	0.364	No data	No data	2.70
EL	No data	No data	No data	No data	21

Effluent intake concentration 0.00

a. Source: Farmer, Robinson, and Carfagno (1978).
b. BEL = below environmental level; EL = environmental (activity concentration) level; LDL = lower detection limit at 95% confidence level; No data = not applicable.
c. Min. values less than LDL included as reported; however, these values should be interpreted as "BEL"; tritium "Mean" concentrations "Onsite" and "Offsite" included LDL values for averaging purposes; Pu-238 "Mean" concentrations "Offsite" included LDL values for averaging purposes; Pu-239 "Mean" concentration "215 On" included LDL values for averaging purposes.
d. EL values from sample location 119.

ATTACHMENT D
ENVIRONMENTAL AIR SAMPLING DATA FOR 1959 TO 1972 (continued)

Table D-6. Mound air monitoring data for 1978.[a,b]

HTO incremental concentration (10^{-12} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	52	1.2	EL[b]	36.10	3.40
212 *On*	52	1.2	EL	30.30	6.20
213 *On*	52	1.2	EL	41.2	9.00
214 *On*	50	1.2	EL	38	8.7
215 *On*	52	1.2	EL	38.70	4.50
N	258	5	0	5	5
Min.	No data	1.2	BEL	30.30	3.40
Max.	No data	1.2	BEL	41.20	9.00
Median	No data	1.2	No data	38.00	6.20
Mean	No data	1.2	No data	36.86	6.36
StdDev	No data	0	No data	4.10	2.48
101 *Off*	52	1.2	EL	40.30	4.40
102 *Off*	52	1.2	EL	56.50	8.60
103 *Off*	52	1.2	EL	87.80	5.20
104 *Off*	52	1.2	EL	35.70	3.40
105 *Off*	52	1.2	EL	28.10	2.00
108 *Off*	52	1.2	EL	44.90	1.70
110 *Off*	52	1.2	EL	26.80	1.40
111 *Off*	52	1.2	EL	41.70	3.00
112 *Off*	52	1.2	EL	41.20	2.90
115 *Off*	52	1.2	EL	22.00	0.70
118 *Off*	52	1.2	EL	17.80	1.90
122 *Off*	27	1.2	EL	28.90	5.60
123 *Off*	51	1.2	EL	35.60	7.30
124 *Off*	52	1.2	EL	50.40	6.00
N	702	14	0	14	14
Min.	No data	1.2	BEL	17.80	0.70
Max.	No data	1.2	BEL	87.80	8.60
Median	No data	1.2	No data	38.00	3.20
Mean	No data	1.2	No data	39.84	3.86
StdDev	No data	0	No data	17.51	2.38
EL[c,d]	No data	No data	No data	No data	4.5

Effluent intake concentration 6.20

Pu-238 incremental concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	12	0.8	3.20	33.00	25.00
212 *On*	12	0.8	6.40	26.00	13.00
213 *On*	12	0.8	21	240	110
214 *On*	12	0.8	3.8	96	32
215 *On*	12	0.8	2.00	37.00	11.00
N	60	5	5	5	5
Min.	No data	0.8	2.00	26.00	11.00
Max.	No data	0.8	21.00	240.00	110.00
Median	No data	0.8	3.80	37.00	25.00
Mean	No data	0.8	7.28	86.40	38.20
StdDev	No data	0.0	7.84	90.31	41.06
101 *Off*	4	0.8	EL	4.90	1.50
102 *Off*	4	0.8	EL	11.00	5.00
103 *Off*	4	0.8	4.40	97.00	29.00
104 *Off*	4	0.8	EL	2.50	1.10
105 *Off*	4	0.8	EL	1.10	EL
108 *Off*	4	0.8	EL	1.70	EL
110 *Off*	4	0.8	EL	0.40	EL
111 *Off*	4	0.8	EL	4.40	1.00
112 *Off*	4	0.8	EL	1.10	EL
115 *Off*	4	0.8	No data	No data	EL
118 *Off*	4	0.8	EL	29.00	7.90
122 *Off*	12	0.8	0.80	21.00	7.80
123 *Off*	12	0.8	1.30	250.00	28.00
124 *Off*	12	0.8	1.10	40.00	13.00
N	80	14	4	13	9
Min.	No data	0.8	0.8	0.40	1.00
Max.	No data	0.8	4.4	250.00	29.00
Median	No data	0.8	1.20	4.90	7.80
Mean	No data	0.80	1.90	35.70	10.48
StdDev	No data	0.00	1.68	69.76	10.95
EL	No data	No data	No data	No data	1.6

Effluent intake concentration 25.00

Pu-239, -240 concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	12	0.4	6	55.00	26.00
212 *On*	12	0.4	7.2	51.00	27.00
213 *On*	12	0.4	6.1	56.00	27
214 *On*	12	0.4	5	52.00	26
215 *On*	12	0.4	5	47.00	25.00
N	60	5	5	5	5
Min.	No data	0.4	5.00	47.00	25.00
Max.	No data	0.4	7.20	56.00	27.00
Median	No data	0.4	6.00	52.00	26.00
Mean	No data	0.4	5.86	52.20	26.20
StdDev	No data	0.0	0.92	3.56	0.84
101 *Off*	4	0.3	8.9	49.00	28.00
102 *Off*	4	0.3	8	60.00	32.00
103 *Off*	4	0.3	7	45.00	27.00
104 *Off*	4	0.3	7.9	47.00	26.00
105 *Off*	4	0.3	6.6	53.00	27.00
108 *Off*	4	0.3	11	77.00	39.00
110 *Off*	4	0.3	8.1	54.00	29.00
111 *Off*	4	0.3	8.1	72.00	33.00
112 *Off*	4	0.3	7.1	55.00	30.00
115 *Off*	4	0.3	6.4	50.00	27.00
118 *Off*	4	0.3	8.3	72.00	36.00
122 *Off*	12	0.4	3.5	44.00	22.00
123 *Off*	12	0.4	6.8	60.00	30.00
124 *Off*	12	0.4	5.8	60.00	30.00
N	80	14	14	14	14
Min.	No data	0.3	3.5	44.00	22.00
Max.	No data	0.4	11	77.00	39.00
Median	No data	0.3	7.5	54.50	29.50
Mean	No data	0.321	7.3929	57.00	29.71
StdDev	No data	0.043	1.7013	10.50	4.30
EL	No data	No data	No data	No data	22

Effluent intake concentration 4.00

a. Source: Farmer and Carfagno (1979).
b. BEL = below environmental level; EL = environmental (activity concentration) level; LDL = lower detection limit at 95% confidence level; No data = not applicable.
c. EL indicates that "Min." and "Mean" values included as reported; however, these values should be interpreted as "BEL."
d. EL values from sample location 119.

ATTACHMENT D
ENVIRONMENTAL AIR SAMPLING DATA FOR 1959 TO 1972 (continued)

Table D-7. Mound air monitoring data for 1979.[a,b]

HTO incremental concentration (10^{-12} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	52	0.3	EL	24.80	8.30
212 *On*	51	0.3	0.41	26.20	9.50
213 *On*	52	0.3	0.12	37.4	13.50
214 *On*	52	0.3	EL	40.9	8.6
215 *On*	51	0.3	EL	37.10	7.40
N	258	5	2	5	5
Min.	No data	0.3	0.12	24.80	7.40
Max.	No data	0.3	0.41	40.90	13.50
Median	No data	0.3	0.27	37.10	8.60
Mean	No data	0.3	0.27	33.28	9.46
StdDev	No data	0	0.21	7.27	2.38
101 *Off*	52	0.3	EL	28.30	5.30
102 *Off*	52	0.3	EL	27.40	10.40
103 *Off*	52	0.3	0.40	47.40	6.50
104 *Off*	52	0.3	EL	28.20	3.90
105 *Off*	52	0.3	EL	16.80	2.80
108 *Off*	52	0.3	EL	18.10	1.00
110 *Off*	52	0.3	EL	4.20	0.60
111 *Off*	52	0.3	EL	4.60	0.50
112 *Off*	52	0.3	EL	12.80	2.20
115 *Off*	52	0.3	EL	7.50	0.30
118 *Off*	52	0.3	EL	19.10	2.90
122 *Off*	52	0.3	EL	29.70	6.20
123 *Off*	52	0.3	EL	41.80	7.60
124 *Off*	52	0.3	0.60	60.30	11.00
N	728	14	2	14	14
Min.	No data	0.3	0.4	4.20	0.30
Max.	No data	0.3	0.6	60.30	11.00
Median	No data	0.3	0.5	23.25	3.40
Mean	No data	0.3	0.5	24.73	4.37
StdDev	No data	0	0.1414	16.48	3.58
EL[c,d]	No data	No data	No data	No data	0.6

Effluent intake concentration 8.60

Pu-238 incremental concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	12	1.5	5.40	33.00	21.00
212 *On*	12	1.5	4.00	37.00	16.00
213 *On*	12	1.5	19	880	190
214 *On*	12	1.5	5.1	39	13
215 *On*	12	1.5	2.30	18.00	6.30
N	60	5	5	5	5
Min.	No data	1.5	2.30	18.00	6.30
Max.	No data	1.5	19.00	880.00	190.00
Median	No data	1.5	5.10	37.00	16.00
Mean	No data	1.5	7.16	201.40	49.26
StdDev	No data	0.0	6.73	379.44	78.86
101 *Off*	4	0.5	0.6	7.00	2.90
102 *Off*	4	0.5	4.60	8.70	6.20
103 *Off*	4	0.5	1.30	6.10	3.60
104 *Off*	4	0.5	0.70	5.60	3.50
105 *Off*	4	0.5	0.10	1.70	0.90
108 *Off*	4	0.5	0.20	1.10	0.60
110 *Off*	4	0.5	EL	1.20	0.50
111 *Off*	4	0.5	0.08	2.20	1.10
112 *Off*	4	0.5	0.20	0.70	0.40
115 *Off*	4	0.5	EL	0.40	0.03
118 *Off*	4	0.5	0.70	9.40	3.50
122 *Off*	12	1.5	1.40	8.80	3.70
123 *Off*	12	1.5	3.40	110.00	35.00
124 *Off*	12	1.5	3.10	29.00	12.00
N	80	14	12	14	14
Min.	No data	0.5	0.08	0.40	0.03
Max.	No data	1.5	4.6	110.00	35.00
Median	No data	0.5	0.70	5.85	3.20
Mean	No data	0.71	1.37	13.71	5.28
StdDev	No data	0.43	1.51	28.66	9.11
EL	No data	No data	No data	No data	0.5

Effluent intake concentration 16.00

Pu-239, -240 concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	12	0.8	2.4	16.00	8.40
212 *On*	12	0.8	2.8	12.00	8.30
213 *On*	12	0.8	2.5	21.00	11
214 *On*	12	0.8	2.8	14.00	8.1
215 *On*	12	0.8	1.8	15.00	7.90
N	60	5	5	5	5
Min.	No data	0.8	1.80	12.00	7.90
Max.	No data	0.8	2.80	21.00	11.00
Median	No data	0.8	2.50	15.00	8.30
Mean	No data	0.8	2.46	15.60	8.74
StdDev	No data	0.0	0.41	3.36	1.28
101 *Off*	4	0.4	3.9	17.00	8.70
102 *Off*	4	0.4	2.8	16.00	8.70
103 *Off*	4	0.4	2.9	17.00	8.50
104 *Off*	4	0.4	3.4	19.00	10.00
105 *Off*	4	0.4	2.9	19.00	9.10
108 *Off*	4	0.4	4.2	20.00	11.00
110 *Off*	4	0.4	2.8	19.00	9.50
111 *Off*	4	0.4	3.4	20.00	9.50
112 *Off*	4	0.4	2.7	16.00	8.80
115 *Off*	4	0.4	3	18.00	9.20
118 *Off*	4	0.4	2.8	19.00	9.90
122 *Off*	12	0.8	2.2	12.00	7.40
123 *Off*	12	0.8	2.1	21.00	9.60
124 *Off*	12	0.8	2.6	20.00	9.80
N	80	14	14	14	14
Min.	No data	0.4	2.1	12.00	7.40
Max.	No data	0.8	4.2	21.00	11.00
Median	No data	0.4	2.85	19.00	9.35
Mean	No data	0.486	2.9786	18.07	9.26
StdDev	No data	0.17	0.582	2.34	0.85
EL	No data	No data	No data	No data	7.8

Effluent intake concentration 0.50

a. Source: Farmer and Carfagno (1980).
b. BEL = below environmental level; EL = environmental (activity concentration) level; LDL = lower detection limit at 95% confidence level; No data = not applicable.
c. EL indicates that "Min." and "Mean" values included as reported; however, these values should be interpreted as "BEL."
d. EL values from sample location 119.

ATTACHMENT D
ENVIRONMENTAL AIR SAMPLING DATA FOR 1959 TO 1972 (continued)

Table D-8. Mound air monitoring data for 1980.[a,b]

HTO incremental concentration (10^{-12} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	51	3	EL	101.00	88.80
212 *On*	49	3	4.1	5090.00	413.00
213 *On*	47	3	2.00	1870	215.00
214 *On*	47	3	2.60	685	85.8
215 *On*	46	3	EL	280.00	39.00
N	240	5	3	5	5
Min.	No data	3	2.00	101.00	39.00
Max.	No data	3	4.10	5090.00	413.00
Median	No data	3	2.60	685.00	88.80
Mean	No data	3	2.90	1605.20	168.32
StdDev	No data	0	1.08	2066.37	151.58
101 *Off*	47	3	EL	469.00	49.60
102 *Off*	49	3	2.3	1630.00	137.00
103 *Off*	49	3	EL	588.00	66.60
104 *Off*	49	3	EL	84.40	14.00
105 *Off*	49	3	EL	29.10	5.40
108 *Off*	47	3	EL	132.00	6.00
110 *Off*	47	3	EL	22.50	1.80
111 *Off*	49	3	EL	11.50	0.10
112 *Off*	50	3	EL	43.80	7.10
115 *Off*	45	3	EL	7.50	EL
118 *Off*	47	3	EL	62.50	8.60
122 *Off*	52	3	EL	667.00	42.10
123 *Off*	47	3	EL	184.00	45.30
124 *Off*	51	3	EL	570.00	76.00
N	678	14	1	14	13
Min.	No data	3	2.3	7.50	0.10
Max.	No data	3	2.3	1630.00	137.00
Median	No data	3	No data	108.20	14.00
Mean	No data	3	No data	321.52	35.35
StdDev	No data	0	No data	448.15	40.21
EL[c,d]	No data	No data	No data	No data	2

Effluent intake concentration 88.80

Pu-238 incremental concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	12	1.6	6.40	160.00	38.00
212 *On*	12	1.6	3.10	26.00	8.80
213 *On*	12	1.6	15	21	58
214 *On*	12	1.6	2.1	12	6.6
215 *On*	12	1.6	0.50	25.00	5.50
N	60	5	5	5	5
Min.	No data	1.6	0.50	12.00	5.50
Max.	No data	1.6	15.00	160.00	58.00
Median	No data	1.6	3.10	25.00	8.80
Mean	No data	1.6	5.42	48.80	23.38
StdDev	No data	0.0	5.77	62.41	23.59
101 *Off*	4	0.2	0.7	3.00	2.00
102 *Off*	4	0.2	2.40	15.00	6.70
103 *Off*	4	0.2	3.10	11.00	5.40
104 *Off*	4	0.2	1.00	5.20	2.30
105 *Off*	4	0.2	EL	1.80	0.60
108 *Off*	4	0.2	EL	0.60	0.20
110 *Off*	4	0.2	EL	1.90	0.50
111 *Off*	4	0.2	0.60	1.40	1.00
112 *Off*	4	0.2	EL	1.00	0.40
115 *Off*	4	0.2	EL	1.80	0.40
118 *Off*	4	0.2	0.50	1.30	0.90
122 *Off*	12	1.6	EL	7.00	2.60
123 *Off*	12	1.6	0.60	78.00	14.00
124 *Off*	12	1.6	EL	20.00	6.40
N	80	14	7	14	14
Min.	No data	0.2	0.5	0.60	0.20
Max.	No data	1.6	3.1	78.00	14.00
Median	No data	0.2	0.70	2.45	1.50
Mean	No data	0.50	1.27	10.64	3.10
StdDev	No data	0.60	1.04	20.28	3.88
EL	No data	No data	No data	No data	0.2

Effluent intake concentration 8.80

Pu-239, -240 concentration (10^{-18}µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	12	0.3	1.2	12.00	4.30
212 *On*	12	0.3	1.3	9.30	4.00
213 *On*	12	0.3	1.8	12.00	4.9
214 *On*	12	0.3	1.3	7.70	3.1
215 *On*	12	0.3	1.2	9.10	3.70
N	60	5	5	5	5
Min.	No data	0.3	1.20	7.70	3.10
Max.	No data	0.3	1.80	12.00	4.90
Median	No data	0.3	1.30	9.30	4.00
Mean	No data	0.3	1.36	10.02	4.00
StdDev	No data	0.0	0.25	1.91	0.67
101 *Off*	4	0.1	1.9	11.00	5.50
102 *Off*	4	0.1	3.2	8.40	4.80
103 *Off*	4	0.1	2.2	8.60	4.90
104 *Off*	4	0.1	2.8	8.10	4.70
105 *Off*	4	0.1	2.5	8.30	4.90
108 *Off*	4	0.1	2.5	9.50	5.10
110 *Off*	4	0.1	2.5	8.30	5.10
111 *Off*	4	0.1	2.1	10.00	5.10
112 *Off*	4	0.1	2.6	7.40	4.20
115 *Off*	4	0.1	2	7.90	4.20
118 *Off*	4	0.1	2	9.80	4.80
122 *Off*	12	0.3	0.9	8.20	0.33
123 *Off*	12	0.3	1.9	10.00	4.40
124 *Off*	12	0.3	1.8	13.00	4.50
N	80	14	14	14	14
Min.	No data	0.1	0.9	7.40	0.33
Max.	No data	0.3	3.2	13.00	5.50
Median	No data	0.1	2.15	8.50	4.80
Mean	No data	0.143	2.2071	9.18	4.47
StdDev	No data	0.085	0.5484	1.50	1.25
EL	No data	No data	No data	No data	3.4

Effluent intake concentration 0.60

a. Source: Farmer and Carfagno (1981).
b. BEL = below environmental level; EL = environmental (activity concentration) level; LDL = lower detection limit at 95% confidence level; No data = not applicable.
c. EL indicates that “Min.” and “Mean” values included as reported; however, these values should be interpreted as “BEL.”
d. EL values from sample location 119.

ATTACHMENT D
ENVIRONMENTAL AIR SAMPLING DATA FOR 1959 TO 1972 (continued)

Table D-9. Mound air monitoring data for 1981.[a,b]

HTO incremental concentration (10^{-12} µCi/mL

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	51	7	EL[b]	434.00	71.80
212 *On*	52	7	EL	455.00	67.60
213 *On*	49	7	EL	726	78.50
214 *On*	48	7	EL	247	44.5
215 *On*	50	7	EL	329.00	30.40
N	250	5	0	5	5
Min.	No data	7	BEL	247.00	30.40
Max.	No data	7	BEL	726.00	78.50
Median	No data	7	No data	434.00	67.60
Mean	No data	7	No data	438.20	58.56
StdDev	No data	0	No data	181.39	20.28
101 *Off*	50	7	EL	369.00	70.20
102 *Off*	51	7	0.2	357.00	61.00
103 *Off*	51	7	EL	666.00	61.70
104 *Off*	51	7	EL	233.00	29.20
105 *Off*	51	7	EL	129.00	22.50
108 *Off*	49	7	EL	86.40	11.00
110 *Off*	52	7	EL	91.40	11.90
111 *Off*	49	7	EL	79.70	7.20
112 *Off*	51	7	EL	91.70	12.90
115 *Off*	50	7	EL	30.70	1.60
118 *Off*	49	7	EL	846.00	31.20
122 *Off*	52	7	EL	514.00	31.90
123 *Off*	51	7	EL	776.00	52.60
124 *Off*	50	7	EL	899.00	59.40
N	707	14	1	14	14
Min.	No data	7	0.2	30.70	1.60
Max.	No data	7	0.2	899.00	70.20
Median	No data	7	No data	295.00	30.20
Mean	No data	7	No data	369.21	33.16
StdDev	No data	0	No data	315.19	23.51
EL[c,d]	No data	No data	No data	No data	6.5

Effluent intake concentration 67.6

Pu-238 incremental concentration (10^{-18}µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	12	1.7	16.60	2040.00	364.00
212 *On*	12	1.7	0.70	34.70	10.30
213 *On*	12	1.7	11.6	268	66.1
214 *On*	12	1.7	3.2	88.1	20.7
215 *On*	12	1.7	1.60	14.40	6.00
N	60	5	5	5	5
Min.	No data	1.7	0.70	14.40	6.00
Max.	No data	1.7	16.60	2040.00	364.00
Median	No data	1.7	3.20	88.10	20.70
Mean	No data	1.7	6.74	489.04	93.42
StdDev	No data	0.0	7.00	872.75	153.13
101 *Off*	4	0.3	0.2	2.60	1.10
102 *Off*	4	0.3	2.20	5.70	4.00
103 *Off*	4	0.3	2.90	14.30	7.00
104 *Off*	4	0.3	1.90	3.50	2.50
105 *Off*	4	0.3	0.70	1.20	0.90
108 *Off*	4	0.3	EL	0.90	0.40
110 *Off*	4	0.3	EL	2.20	0.90
111 *Off*	4	0.3	0.20	0.60	0.30
112 *Off*	4	0.3	0.30	1.10	0.60
115 *Off*	3	0.3	0.30	0.90	0.60
118 *Off*	4	0.3	0.90	3.40	2.20
122 *Off*	12	1.7	EL	3.70	1.60
123 *Off*	12	1.7	1.20	109.00	16.50
124 *Off*	12	1.7	EL	94.20	15.80
N	79	14	10	14	14
Min.	No data	0.3	0.2	0.60	0.30
Max.	No data	1.7	2.9	109.00	16.50
Median	No data	0.3	0.80	3.00	1.35
Mean	No data	0.60	1.08	17.38	3.89
StdDev	No data	0.60	0.95	35.97	5.50
EL	No data	No data	No data	No data	0.1

Effluent intake concentration 20.70

Pu-239, -240 concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	12	0.3	2.1	47.90	16.60
212 *On*	12	0.3	1.2	39.20	12.60
213 *On*	12	0.3	1.2	36.20	13.6
214 *On*	12	0.3	2.3	36.50	13.8
215 *On*	12	0.3	1.2	37.10	14.80
N	60	5	5	5	5
Min.	No data	0.3	1.20	36.20	12.60
Max.	No data	0.3	2.30	47.90	16.60
Median	No data	0.3	1.20	37.10	13.80
Mean	No data	0.3	1.60	39.38	14.28
StdDev	No data	0.0	0.55	4.90	1.51
101 *Off*	4	0.1	4.2	46.20	18.60
102 *Off*	4	0.1	2.4	43.60	18.30
103 *Off*	4	0.1	2.9	42.40	17.70
104 *Off*	4	0.1	2.7	39.90	17.10
105 *Off*	4	0.1	2.1	36.50	15.70
108 *Off*	4	0.1	3.4	57.50	23.20
110 *Off*	4	0.1	2.6	45.40	18.40
111 *Off*	4	0.1	2.2	43.80	17.70
112 *Off*	4	0.1	2.2	42.60	17.40
115 *Off*	3	0.1	11	34.70	19.30
118 *Off*	4	0.1	2.4	48.10	20.40
122 *Off*	12	0.3	1.3	35.90	13.00
123 *Off*	12	0.3	2.2	48.60	17.10
124 *Off*	12	0.3	1.8	46.30	17.00
N	79	14	14	14	14
Min.	No data	0.1	1.3	34.70	13.00
Max.	No data	0.3	11	57.50	23.20
Median	No data	0.1	2.4	43.70	17.70
Mean	No data	0.143	3.1	43.68	17.92
StdDev	No data	0.085	2.3778	5.95	2.29
EL	No data	No data	No data	No data	16.3

Effluent intake concentration 0.00

a. Source: Farmer and Carfagno (1982).
b. BEL = below environmental level; EL = environmental (activity concentration) level; LDL = lower detection limit at 95% confidence level; No data = not applicable.
c. EL indicates that "Min." and "Mean" values included as reported; however, these values should be interpreted as "BEL."
d. EL values from sample location 119.

ATTACHMENT D
ENVIRONMENTAL AIR SAMPLING DATA FOR 1959 TO 1972 (continued)

Table D-10. Mound air monitoring data for 1982.[a,b]

HTO incremental concentration (10^{-12} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	52	5	EL[b]	158.00	52.60
212 *On*	50	5	EL	107.00	39.30
213 *On*	48	5	EL	610	56.50
214 *On*	41	5	EL	90	30.2
215 *On*	46	5	EL	64.80	20.70
N	237	5	0	5	5
Min.	No data	5	BEL	64.80	20.70
Max.	No data	5	BEL	610.00	56.50
Median	No data	5	No data	107.00	39.30
Mean	No data	5	No data	205.96	39.86
StdDev	No data	0	No data	228.43	15.00
101 *Off*	32	5	EL	175.00	47.00
102 *Off*	52	5	EL	188.00	35.70
103 *Off*	50	5	EL	102.00	31.30
104 *Off*	51	5	EL	63.80	10.90
105 *Off*	50	5	EL	42.70	8.10
108 *Off*	46	5	EL	47.70	7.30
110 *Off*	51	5	EL	47.50	6.30
111 *Off*	49	5	EL	40.40	5.70
112 *Off*	51	5	EL	41.20	8.10
115 *Off*	51	5	EL	36.70	1.10
118 *Off*	37	5	EL	51.40	6.60
122 *Off*	51	5	EL	90.10	17.00
123 *Off*	52	5	EL	278.00	28.00
124 *Off*	43	5	EL	70.70	20.00
N	666	14	0	14	14
Min.	No data	5	BEL	36.70	1.10
Max.	No data	5	BEL	278.00	47.00
Median	No data	5	No data	57.60	9.50
Mean	No data	5	No data	91.09	16.65
StdDev	No data	0	No data	72.52	13.80
EL[c,d]	No data	No data	No data	No data	7.3

Effluent intake concentration 39.30

Pu-238 incremental concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	12	1.0	16.60	630.00	88.00
212 *On*	12	1.0	2.50	34.60	8.50
213 *On*	12	1.0	17.2	125	38.3
214 *On*	12	1.0	7.3	50.2	23.9
215 *On*	12	1.0	1.60	15.10	5.20
N	60	5	5	5	5
Min.	No data	1.0	1.60	15.10	5.20
Max.	No data	1.0	17.20	630.00	88.00
Median	No data	1.0	7.30	50.20	23.90
Mean	No data	1.0	9.04	170.98	32.78
StdDev	No data	0.0	7.50	259.95	33.57
101 *Off*	4	0.3	0.5	4.10	1.80
102 *Off*	4	0.3	2.10	6.30	4.20
103 *Off*	4	0.3	1.00	6.80	3.70
104 *Off*	4	0.3	0.90	2.30	1.40
105 *Off*	4	0.3	0.10	1.20	0.60
108 *Off*	4	0.3	EL	0.30	EL
110 *Off*	4	0.3	EL	0.40	EL
111 *Off*	4	0.3	EL	0.80	0.30
112 *Off*	4	0.3	EL	0.50	0.10
115 *Off*	4	0.3	EL	0.30	0.10
118 *Off*	4	0.3	EL	1.40	0.80
122 *Off*	12	1	0.20	5.00	2.50
123 *Off*	12	1	4.30	65.10	17.10
124 *Off*	12	1	1.50	10.90	4.30
N	80	14	8	14	12
Min.	No data	0.3	0.1	0.30	0.10
Max.	No data	1	4.3	65.10	17.10
Median	No data	0.3	0.95	1.85	1.60
Mean	No data	0.45	1.33	7.53	3.08
StdDev	No data	0.30	1.37	16.87	4.68
EL	No data	No data	No data	No data	0.3

Effluent intake concentration 23.90

Pu-239, -240 concentration (10^{-18}µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	12	0.2	1	5.80	2.90
212 *On*	12	0.2	0.3	5.20	2.50
213 *On*	12	0.2	0.1	5.50	2.4
214 *On*	12	0.2	0.4	5.70	2.8
215 *On*	12	0.2	0.02	4.80	2.40
N	60	5	5	5	5
Min.	No data	0.2	0.02	4.80	2.40
Max.	No data	0.2	1.00	5.80	2.90
Median	No data	0.2	0.30	5.50	2.50
Mean	No data	0.2	0.36	5.40	2.60
StdDev	No data	0.0	0.39	0.41	0.23
101 *Off*	4	0.1	0.03	6.20	2.60
102 *Off*	4	0.1	0.3	5.30	2.60
103 *Off*	4	0.1	0.2	4.70	2.30
104 *Off*	4	0.1	0.4	4.40	2.20
105 *Off*	4	0.1	0.2	4.50	2.10
108 *Off*	4	0.1	0.5	6.30	2.70
110 *Off*	4	0.1	0.3	4.30	2.00
111 *Off*	4	0.1	0.4	5.40	2.60
112 *Off*	4	0.1	0.4	5.60	2.50
115 *Off*	4	0.1	0.5	4.10	2.00
118 *Off*	4	0.1	0.4	5.40	2.70
122 *Off*	12	2	No data	5.30	2.30
123 *Off*	12	2	0.4	6.30	2.60
124 *Off*	12	2	0.4	5.90	2.50
N	80	14	13	14	14
Min.	No data	0.1	0.03	4.10	2.00
Max.	No data	2	0.5	6.30	2.70
Median	No data	0.1	0.4	5.35	2.50
Mean	No data	0.507	0.3408	5.26	2.41
StdDev	No data	0.809	0.1327	0.76	0.25
EL	No data	No data	No data	No data	2.6

Effluent intake concentration 0.00

a. Source: Carfagno and Farmer (1983).
b. BEL = below environmental level; EL = environmental (activity concentration) level; LDL = lower detection limit at 95% confidence level; No data = not applicable.
c. EL indicates that “Min.” and “Mean” values included as reported; however, these values should be interpreted as “BEL.”
d. EL values from sample location 119.

ATTACHMENT D
ENVIRONMENTAL AIR SAMPLING DATA FOR 1959 TO 1972 (continued)

Table D-11. Mound air monitoring data for 1983.[a,b]

HTO incremental concentration (10^{-12} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	49	4	EL[b]	120.00	35.30
212 *On*	49	4	EL	158.00	32.10
213 *On*	46	4	EL	225	42.50
214 *On*	52	4	EL	445	34.3
215 *On*	51	4	EL	173.00	21.20
N	247	5	0	5	5
Min.	No data	4	BEL	120.00	21.20
Max.	No data	4	BEL	445.00	42.50
Median	No data	4	No data	173.00	34.30
Mean	No data	4	No data	224.20	33.08
StdDev	No data	0	No data	129.05	7.70
101 *Off*	51	4	EL	68.20	25.30
102 *Off*	51	4	EL	97.30	26.00
103 *Off*	48	4	EL	102.00	19.70
104 *Off*	49	4	EL	45.60	7.80
105 *Off*	49	4	EL	39.50	7.70
108 *Off*	51	4	EL	28.80	4.50
110 *Off*	50	4	EL	45.00	2.40
111 *Off*	51	4	EL	35.40	4.60
112 *Off*	52	4	EL	29.00	7.30
115 *Off*	51	4	EL	15.20	0.20
118 *Off*	50	4	EL	53.50	7.50
122 *Off*	50	4	EL	172.00	21.50
123 *Off*	52	4	EL	197.00	30.70
124 *Off*	51	4	EL	266.00	32.60
N	706	14	0	14	14
Min.	No data	4	BEL	15.20	0.20
Max.	No data	4	BEL	266.00	32.60
Median	No data	4	No data	49.55	7.75
Mean	No data	4	No data	85.32	14.13
StdDev	No data	0	No data	75.16	11.28
EL[c,d]	No data	No data	No data	No data	1.4

Effluent intake concentration 34.30

Pu-238 incremental concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	12	1.0	7.60	114.00	29.40
212 *On*	12	1.0	2.50	10.70	6.00
213 *On*	12	1.0	38.4	151	74.2
214 *On*	12	1.0	3.3	29.3	13.2
215 *On*	12	1.0	1.30	6.00	2.70
N	60	5	5	5	5
Min.	No data	1.0	1.30	6.00	2.70
Max.	No data	1.0	38.40	151.00	74.20
Median	No data	1.0	3.30	29.30	13.20
Mean	No data	1.0	10.62	62.20	25.10
StdDev	No data	0.0	15.71	66.07	29.32
101 *Off*	4	0.3	0.3	1.30	0.80
102 *Off*	4	0.3	0.70	7.10	2.60
103 *Off*	4	0.3	1.50	12.60	6.30
104 *Off*	4	0.3	0.30	13.60	4.10
105 *Off*	4	0.3	0.20	1.00	0.50
108 *Off*	4	0.3	EL	0.20	EL
110 *Off*	4	0.3	EL	1.00	0.40
111 *Off*	4	0.3	EL	1.20	0.50
112 *Off*	4	0.3	EL	0.60	0.20
115 *Off*	4	0.3	EL	1.80	0.50
118 *Off*	4	0.3	EL	0.70	0.40
122 *Off*	12	1	EL	9.40	1.80
123 *Off*	12	1	2.30	33.10	12.20
124 *Off*	12	1	1.40	12.70	5.80
N	80	14	7	14	13
Min.	No data	0.3	0.2	0.20	0.20
Max.	No data	1	2.3	33.10	12.20
Median	No data	0.3	0.70	1.55	0.80
Mean	No data	0.45	0.96	6.88	2.78
StdDev	No data	0.30	0.80	9.14	3.54
EL	No data	No data	No data	No data	0.2

Effluent intake concentration 13.20

Pu-239, -240 concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	12	0.3	0.3	13.50	2.30
212 *On*	12	0.3	0.4	15.50	2.30
213 *On*	12	0.3	0.3	17.80	3
214 *On*	12	0.3	0.2	15.10	2.2
215 *On*	12	0.3	0.1	14.10	1.90
N	60	5	5	5	5
Min.	No data	0.3	0.10	13.50	1.90
Max.	No data	0.3	0.40	17.80	3.00
Median	No data	0.3	0.30	15.10	2.30
Mean	No data	0.3	0.26	15.20	2.34
StdDev	No data	0.0	0.11	1.66	0.40
101 *Off*	4	0.2	0.6	9.10	2.90
102 *Off*	4	0.2	0.6	7.10	2.40
103 *Off*	4	0.2	0.7	7.60	2.50
104 *Off*	4	0.2	0.6	6.90	2.30
105 *Off*	4	0.2	0.5	7.60	2.50
108 *Off*	4	0.2	0.6	5.20	1.90
110 *Off*	4	0.2	0.2	6.30	2.10
111 *Off*	4	0.2	0.7	4.80	1.90
112 *Off*	4	0.2	0.3	8.00	2.50
115 *Off*	4	0.2	0.3	6.60	2.20
118 *Off*	4	0.2	0.6	9.60	3.10
122 *Off*	12	3	0.02	8.90	1.50
123 *Off*	12	3	No data	20.50	2.70
124 *Off*	12	3	0.3	22.10	2.80
N	80	14	13	14	14
Min.	No data	0.2	0.02	4.80	1.50
Max.	No data	3	0.7	22.10	3.10
Median	No data	0.2	0.6	7.60	2.45
Mean	No data	0.8	0.4631	9.31	2.38
StdDev	No data	1.192	0.2146	5.27	0.44
EL	No data	No data	No data	No data	1

Effluent intake concentration 1.30

a. Source: Carfagno and Farmer (1984).
b. BEL = below environmental level; EL = environmental (activity concentration) level; LDL = lower detection limit at 95% confidence level; No data = not applicable.
c. EL indicates that “Min.” and “Mean” values included as reported; however, these values should be interpreted as “BEL.”
d. EL values from sample location 119.

ATTACHMENT D
ENVIRONMENTAL AIR SAMPLING DATA FOR 1959 TO 1972 (continued)

Table D-12. Mound air monitoring data for 1984.[a,b]

HTO incremental concentration (10^{-12} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	49	7	EL[b]	160.00	22.10
212 *On*	50	7	EL	67.90	21.10
213 *On*	49	7	EL	142	28.30
214 *On*	53	7	EL	173	26.7
215 *On*	51	7	EL	183.00	21.50
N	252	5	0	5	5
Min.	No data	7	BEL	67.90	21.10
Max.	No data	7	BEL	183.00	28.30
Median	No data	7	No data	160.00	22.10
Mean	No data	7	No data	145.18	23.94
StdDev	No data	0	No data	45.84	3.32
101 *Off*	53	7	EL	117.00	18.80
102 *Off*	51	7	EL	69.90	17.20
103 *Off*	53	7	EL	39.60	11.50
104 *Off*	52	7	EL	84.30	8.70
105 *Off*	53	7	EL	38.40	5.00
108 *Off*	50	7	EL	31.80	2.60
110 *Off*	34	7	EL	28.80	0.90
111 *Off*	48	7	EL	18.90	EL
112 *Off*	51	7	EL	44.50	1.10
115 *Off*	53	7	EL	21.20	EL
118 *Off*	52	7	EL	36.80	1.90
122 *Off*	51	7	EL	58.10	14.40
123 *Off*	51	7	EL	92.00	15.80
124 *Off*	52	7	EL	137.00	16.10
N	704	14	0	14	12
Min.	No data	7	BEL	18.90	0.90
Max.	No data	7	BEL	137.00	18.80
Median	No data	7	No data	42.05	10.10
Mean	No data	7	No data	58.45	9.50
StdDev	No data	0	No data	36.67	6.93
EL[c,d]	No data	No data	No data	No data	4.1

Effluent intake concentration 22.10

Pu-238 incremental concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	12	1.0	9.20	99.70	41.90
212 *On*	12	1.0	1.80	74.80	17.10
213 *On*	12	1.0	18.3	270	126
214 *On*	12	1.0	0.5	63.8	23.2
215 *On*	12	1.0	EL	14.00	5.00
N	60	5	4	5	5
Min.	No data	1.0	0.50	14.00	5.00
Max.	No data	1.0	18.30	270.00	126.00
Median	No data	1.0	5.50	74.80	23.20
Mean	No data	1.0	7.45	104.46	42.64
StdDev	No data	0.0	8.19	97.65	48.47
101 *Off*	4	0.3	1.2	5.00	2.90
102 *Off*	4	0.3	1.20	36.10	11.20
103 *Off*	3	0.3	2.70	6.20	4.60
104 *Off*	4	0.3	0.70	4.40	2.30
105 *Off*	4	0.3	0.08	1.50	0.80
108 *Off*	4	0.3	0.10	2.20	0.70
110 *Off*	3	0.3	EL	0.70	0.20
111 *Off*	4	0.3	0.01	0.40	0.20
112 *Off*	4	0.3	EL	0.50	0.20
115 *Off*	4	0.3	EL	0.70	0.30
118 *Off*	4	0.3	1.10	13.70	5.00
122 *Off*	12	1	EL	6.90	2.10
123 *Off*	12	1	1.50	49.00	15.00
124 *Off*	12	1	1.70	126.90	22.00
N	78	14	10	14	14
Min.	No data	0.3	0.01	0.40	0.20
Max.	No data	1	2.7	126.90	22.00
Median	No data	0.3	1.15	4.70	2.20
Mean	No data	0.45	1.03	18.16	4.82
StdDev	No data	0.30	0.85	34.55	6.65
EL	No data	No data	No data	No data	0.002

Effluent intake concentration 23.20

Pu-239, -240 concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	12	0.2	No data	2.10	1.00
212 *On*	12	0.2	0.1	1.90	0.60
213 *On*	12	0.2	0.3	2.10	1.1
214 *On*	12	0.2	0.2	2.10	0.7
215 *On*	12	0.2	0.1	1.60	0.60
N	60	5	4	5	5
Min.	No data	0.2	0.10	1.60	0.60
Max.	No data	0.2	0.30	2.10	1.10
Median	No data	0.2	0.15	2.10	0.70
Mean	No data	0.2	0.18	1.96	0.80
StdDev	No data	0.0	0.10	0.22	0.23
101 *Off*	4	0.2	0.3	1.00	0.60
102 *Off*	4	0.2	0.4	0.70	0.60
103 *Off*	3	0.2	0.4	0.70	0.50
104 *Off*	4	0.2	0.1	0.90	0.40
105 *Off*	4	0.2	0.2	0.50	0.30
108 *Off*	4	0.2	0.2	0.70	0.50
110 *Off*	3	0.2	0.1	0.50	0.30
111 *Off*	4	0.2	0.2	0.90	0.50
112 *Off*	4	0.2	0.2	0.70	0.40
115 *Off*	4	0.2	0.2	0.70	0.40
118 *Off*	4	0.2	0.2	0.80	0.50
122 *Off*	12	0.2	0.2	0.80	0.50
123 *Off*	12	0.2	0.3	1.30	0.70
124 *Off*	12	0.2	0.2	2.10	0.60
N	78	14	14	14	14
Min.	No data	0.2	0.1	0.50	0.30
Max.	No data	0.2	0.4	2.10	0.70
Median	No data	0.2	0.2	0.75	0.50
Mean	No data	0.2	0.2286	0.88	0.49
StdDev	No data	3E–09	0.0914	0.41	0.12
EL	No data	No data	No data	No data	0.4

Effluent intake concentration 0.30

a. Source: Carfagno and Farmer (1985).
b. BEL = below environmental level; EL = environmental (activity concentration) level; LDL = lower detection limit at 95% confidence level; No data = not applicable.
c. EL indicates that “Min.” and “Mean” values included as reported; however, these values should be interpreted as “BEL.”
d. EL values from sample location 119.

ATTACHMENT D
ENVIRONMENTAL AIR SAMPLING DATA FOR 1959 TO 1972 (continued)

Table D-13. Mound air monitoring data for 1985.[a,b]

HTO incremental concentration (10^{-12} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	52	14	EL[b]	167.00	32.70
212 *On*	50	14	1.54	115.00	29.70
213 *On*	49	14	EL	104	27.30
214 *On*	52	14	EL	189	24.8
215 *On*	52	14	EL	134.00	19.80
N	255	5	1	5	5
Min.	No data	14	1.54	104.00	19.80
Max.	No data	14	1.54	189.00	32.70
Median	No data	14	No data	134.00	27.30
Mean	No data	14	No data	141.80	26.86
StdDev	No data	0	No data	35.60	4.91
101 *Off*	42	14	EL	40.40	17.40
102 *Off*	51	14	3.94	70.90	29.20
103 *Off*	52	14	EL	43.60	10.90
104 *Off*	52	14	EL	52.30	9.39
105 *Off*	49	14	EL	26.60	4.89
108 *Off*	50	14	EL	21.20	2.30
110 *Off*	49	14	EL	26.20	0.99
111 *Off*	51	14	EL	20.80	EL
112 *Off*	52	14	EL	19.50	2.45
115 *Off*	45	14	EL	11.60	EL
118 *Off*	50	14	EL	31.70	6.49
122 *Off*	51	14	EL	68.30	11.70
123 *Off*	52	14	EL	116.00	20.20
124 *Off*	50	14	EL	55.50	18.20
N	696	14	1	14	12
Min.	No data	14	3.94	11.60	0.99
Max.	No data	14	3.94	116.00	29.20
Median	No data	14	No data	36.05	10.15
Mean	No data	14	No data	43.19	11.18
StdDev	No data	0	No data	27.99	8.62
EL[c,d]	No data	No data	No data	No data	2.54

Effluent intake concentration 27.30

Pu-238 incremental concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	12	0.7	17.20	1269.00	182.00
212 *On*	12	0.7	2.26	42.80	16.80
213 *On*	12	0.7	35	369	153
214 *On*	12	0.7	12.1	772	126
215 *On*	12	0.7	0.96	137.00	16.50
N	60	5	5	5	5
Min.	No data	0.7	0.96	42.80	16.50
Max.	No data	0.7	35.00	1269.00	182.00
Median	No data	0.7	12.10	369.00	126.00
Mean	No data	0.7	13.50	517.96	98.86
StdDev	No data	0.0	13.80	505.39	77.62
101 *Off*	3	0.14	1.13	4.95	2.46
102 *Off*	4	0.14	3.10	14.70	8.05
103 *Off*	4	0.14	2.20	10.80	6.35
104 *Off*	4	0.14	1.04	2.89	1.73
105 *Off*	4	0.14	0.46	6.03	2.47
108 *Off*	4	0.14	EL	0.19	EL
110 *Off*	4	0.14	EL	0.15	0.04
111 *Off*	4	0.14	0.08	0.32	0.21
112 *Off*	4	0.14	0.01	2.61	0.85
115 *Off*	4	0.14	EL	0.01	0.15
118 *Off*	4	0.14	1.06	17.40	10.80
122 *Off*	12	0.69	0.66	37.40	8.43
123 *Off*	12	0.69	1.06	352.00	40.20
124 *Off*	12	0.69	2.16	56.80	13.70
N	79	14	11	14	13
Min.	No data	0.14	0.005	0.01	0.04
Max.	No data	0.69	3.1	352.00	40.20
Median	No data	0.14	1.06	5.49	2.47
Mean	No data	0.26	1.18	36.16	7.34
StdDev	No data	0.23	0.95	92.38	10.85
EL	No data	No data	No data	No data	0.15

Effluent intake concentration 126.00

Pu-239, -240 concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	12	0.38	No data	7.97	1.21
212 *On*	12	0.38	No data	0.93	0.31
213 *On*	12	0.38	0.1	3.03	0.99
214 *On*	12	0.38	No data	2.29	0.76
215 *On*	12	0.38	No data	1.59	0.37
N	60	5	1	5	5
Min.	No data	0.4	0.10	0.93	0.31
Max.	No data	0.4	0.10	7.97	1.21
Median	No data	0.4	No data	2.29	0.76
Mean	No data	0.4	No data	3.16	0.73
StdDev	No data	0.0	No data	2.80	0.39
101 *Off*	3	0.08	0.07	0.42	0.25
102 *Off*	4	0.08	0.15	0.38	0.27
103 *Off*	4	0.08	0.24	0.55	0.39
104 *Off*	4	0.08	0.12	0.26	0.17
105 *Off*	4	0.08	0.09	0.25	0.17
108 *Off*	4	0.08	0.22	0.42	0.33
110 *Off*	4	0.08	0.01	0.33	0.16
111 *Off*	4	0.08	0.09	0.44	0.21
112 *Off*	4	0.08	0.08	0.38	0.22
115 *Off*	4	0.08	0.1	0.39	0.23
118 *Off*	4	0.08	0.16	0.41	0.29
122 *Off*	12	0.38	No data	0.87	0.33
123 *Off*	12	0.38	0.08	3.72	0.84
124 *Off*	12	0.38	No data	0.70	0.20
N	79	14	12	14	14
Min.	No data	0.08	0.01	0.25	0.16
Max.	No data	0.38	0.24	3.72	0.84
Median	No data	0.08	0.095	0.42	0.24
Mean	No data	0.144	0.1175	0.68	0.29
StdDev	No data	0.128	0.0652	0.89	0.17
EL	No data	No data	No data	No data	0.13

Effluent intake concentration 0.63

a. Source: Carfagno and Westendorf (1973b, 1974).
b. BEL = below environmental level; EL = environmental (activity concentration) level; LDL = lower detection limit at 95% confidence level; No data = not applicable.
c. EL indicates that “Min.” and “Mean” values included as reported; however, these values should be interpreted as “BEL.”
d. EL values from sample location 119.

ATTACHMENT D
ENVIRONMENTAL AIR SAMPLING DATA FOR 1959 TO 1972 (continued)

Table D-14. Mound air monitoring data for 1986.[a,b]

HTO incremental concentration (10^{-12} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	50	17	EL[b]	94.00	23.80
212 *On*	51	17	EL	75.30	21.10
213 *On*	50	17	2.19	123	40.90
214 *On*	50	17	EL	100	21.3
215 *On*	51	17	EL	64.40	15.50
N	252	5	1	5	5
Min.	No data	17	2.19	64.40	15.50
Max.	No data	17	2.19	123.00	40.90
Median	No data	17	No data	94.00	21.30
Mean	No data	17	No data	91.34	24.52
StdDev	No data	0	No data	22.73	9.65
101 *Off*	48	17	EL	85.80	24.50
102 *Off*	50	17	EL	120.00	23.20
103 *Off*	49	17	EL	31.90	8.57
104 *Off*	50	17	EL	60.50	11.00
105 *Off*	50	17	EL	35.30	3.96
108 *Off*	51	17	EL	37.20	5.61
110 *Off*	49	17	EL	32.90	3.68
111 *Off*	52	17	EL	59.00	3.63
112 *Off*	47	17	EL	38.90	4.02
115 *Off*	50	17	EL	188.00	6.73
118 *Off*	48	17	EL	32.00	4.50
122 *Off*	52	17	EL	93.60	13.70
123 *Off*	43	17	EL	53.50	12.00
124 *Off*	48	17	EL	89.60	21.20
N	687	14	0	14	14
Min.	No data	17	BEL	31.90	3.63
Max.	No data	17	BEL	188.00	24.50
Median	No data	17	No data	56.25	7.65
Mean	No data	17	No data	68.44	10.45
StdDev	No data	0	No data	44.36	7.55
EL[c,d]	No data	No data	No data	No data	0.91

Effluent intake concentration 21.30

Pu-238 incremental concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	11	0.2	8.29	388.00	125.00
212 *On*	12	0.2	4.19	194.00	53.40
213 *On*	12	0.2	53	447	178
214 *On*	12	0.2	7.35	372	93.4
215 *On*	12	0.2	1.55	127.00	22.40
N	59	5	5	5	5
Min.	No data	0.2	1.55	127.00	22.40
Max.	No data	0.2	53.00	447.00	178.00
Median	No data	0.2	7.35	372.00	93.40
Mean	No data	0.2	14.88	305.60	94.44
StdDev	No data	0.0	21.48	137.43	60.81
101 *Off*	4	0.08	0.49	10.20	3.50
102 *Off*	4	0.08	3.41	38.30	14.30
103 *Off*	4	0.08	3.08	23.80	10.50
104 *Off*	4	0.08	0.41	19.80	5.91
105 *Off*	4	0.08	0.27	26.40	7.06
108 *Off*	4	0.08	EL	0.26	EL
110 *Off*	4	0.08	EL	0.33	0.05
111 *Off*	4	0.08	EL	0.56	0.30
112 *Off*	4	0.08	0.18	13.30	3.52
115 *Off*	4	0.08	EL	0.81	0.27
118 *Off*	4	0.08	0.58	3.96	1.94
122 *Off*	12	0.23	0.93	77.30	9.90
123 *Off*	10	0.23	1.49	66.50	26.70
124 *Off*	12	0.23	1.14	82.30	20.70
N	78	14	10	14	13
Min.	No data	0.08	0.18	0.26	0.05
Max.	No data	0.23	3.41	82.30	26.70
Median	No data	0.08	0.76	16.55	5.91
Mean	No data	0.11	1.20	25.99	8.05
StdDev	No data	0.06	1.15	29.27	8.29
EL	No data	No data	No data	No data	0.16

Effluent intake concentration 93.40

Pu-239, -240 concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	11	0.15	No data	3.76	0.92
212 *On*	12	0.15	No data	0.82	0.31
213 *On*	12	0.15	0.53	5.53	1.47
214 *On*	12	0.15	No data	1.55	0.63
215 *On*	12	0.15	No data	1.14	0.31
N	59	5	1	5	5
Min.	No data	0.2	0.53	0.82	0.31
Max.	No data	0.2	0.53	5.53	1.47
Median	No data	0.2	No data	1.55	0.63
Mean	No data	0.2	No data	2.56	0.73
StdDev	No data	0.0	No data	2.02	0.49
101 *Off*	4	0.04	0.07	0.41	0.25
102 *Off*	4	0.04	0.05	0.37	0.28
103 *Off*	4	0.04	0.03	0.39	0.24
104 *Off*	4	0.04	0.01	0.62	0.27
105 *Off*	4	0.04	0.08	0.41	0.27
108 *Off*	4	0.04	0.15	0.41	0.22
110 *Off*	4	0.04	0.25	0.58	0.29
111 *Off*	4	0.04	0.09	0.23	0.15
112 *Off*	4	0.04	0.08	0.21	0.13
115 *Off*	4	0.04	0.11	0.28	0.15
118 *Off*	4	0.04	0.07	0.38	0.20
122 *Off*	12	0.15	No data	1.01	0.26
123 *Off*	10	0.15	No data	0.99	0.36
124 *Off*	12	0.15	No data	1.43	0.37
N	78	14	11	14	14
Min.	No data	0.04	0.01	0.21	0.13
Max.	No data	0.15	0.25	1.43	0.37
Median	No data	0.04	0.08	0.41	0.26
Mean	No data	0.064	0.09	0.55	0.25
StdDev	No data	0.047	0.065	0.35	0.07
EL[c,d]	No data	No data	No data	No data	0.18

Effluent intake concentration 0.45

a. Source: Carfagno and Farmer (1987).
b. BEL = below environmental level; EL = environmental (activity concentration) level; LDL = lower detection limit at 95% confidence level; No data = not applicable.
c. EL indicates that "Min." and "Mean" values included as reported; however, these values should be interpreted as "BEL."
d. EL values from sample location 119.

ATTACHMENT D
ENVIRONMENTAL AIR SAMPLING DATA FOR 1959 TO 1972 (continued)

Table D-15. Mound air monitoring data for 1987.[a,b]

HTO incremental concentration (10^{-12} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	51	16	EL[b]	95.00	28.20
212 *On*	51	16	EL	148.00	33.70
213 *On*	51	16	EL	144	38.80
214 *On*	51	16	EL	176	33.3
215 *On*	47	16	EL	152.00	21.70
N	251	5	0	5	5
Min.	No data	16	BEL	95.00	21.70
Max.	No data	16	BEL	176.00	38.80
Median	No data	16	No data	148.00	33.30
Mean	No data	16	No data	143.00	31.14
StdDev	No data	0	No data	29.58	6.47
101 *Off*	51	16	EL	258.00	29.20
102 *Off*	52	16	0.64	85.60	23.50
103 *Off*	52	16	EL	63.50	17.20
104 *Off*	48	16	EL	52.40	9.87
105 *Off*	50	16	EL	39.40	9.39
108 *Off*	48	16	EL	47.70	7.68
110 *Off*	51	16	EL	51.30	5.90
111 *Off*	52	16	EL	16.30	2.47
112 *Off*	52	16	EL	42.30	6.62
115 *Off*	52	16	EL	31.70	2.79
118 *Off*	50	16	EL	69.80	9.33
122 *Off*	49	16	EL	45.20	8.14
123 *Off*	48	16	EL	261.00	24.60
124 *Off*	48	16	EL	75.20	23.30
N	703	14	1	14	14
Min.	No data	16	0.64	16.30	2.47
Max.	No data	16	0.64	261.00	29.20
Median	No data	16	No data	51.85	9.36
Mean	No data	16	No data	81.39	12.86
StdDev	No data	0	No data	77.53	8.88
EL[c,d]	No data	No data	No data	No data	No data

Effluent intake concentration 33.30

Pu-238 incremental concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	12	0.3	29.70	141.00	79.00
212 *On*	12	0.3	6.40	56.20	15.00
213 *On*	12	0.3	65.4	860	189
214 *On*	11	0.3	9.2	95.5	43.5
215 *On*	12	0.3	1.79	21.70	8.40
N	59	5	5	5	5
Min.	No data	0.3	1.79	21.70	8.40
Max.	No data	0.3	65.40	860.00	189.00
Median	No data	0.3	9.20	95.50	43.50
Mean	No data	0.3	22.50	234.88	66.98
StdDev	No data	0.0	26.25	352.27	73.69
101 *Off*	4	0.05	0.11	12.70	4.10
102 *Off*	4	0.05	3.29	20.00	8.60
103 *Off*	4	0.05	1.93	17.70	8.60
104 *Off*	4	0.05	0.85	3.44	2.38
105 *Off*	4	0.05	0.42	1.65	0.79
108 *Off*	4	0.05	0.01	0.10	0.05
110 *Off*	4	0.05	EL	0.32	0.03
111 *Off*	4	0.05	0.07	0.58	0.28
112 *Off*	4	0.05	0.02	0.54	0.27
115 *Off*	4	0.05	0.07	0.13	0.02
118 *Off*	4	0.05	0.62	1.42	1.03
122 *Off*	12	0.34	0.27	10.60	5.28
123 *Off*	10	0.34	2.49	41.60	10.70
124 *Off*	12	0.34	2.44	172.10	22.00
N	78	14	13	14	14
Min.	No data	0.05	0.01	0.10	0.02
Max.	No data	0.34	3.29	172.10	22.00
Median	No data	0.05	0.42	2.55	1.71
Mean	No data	0.11	0.97	20.21	4.58
StdDev	No data	0.12	1.15	45.27	6.23
EL	No data	No data	No data	No data	0.07

Effluent intake concentration 43.50

Pu-239, -240 concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	12	0.14	0.24	2.35	0.83
212 *On*	12	0.14	No data	0.75	0.28
213 *On*	12	0.14	No data	3.43	0.7
214 *On*	11	0.14	No data	0.73	0.29
215 *On*	12	0.14	No data	0.60	0.19
N	59	5	1	5	5
Min.	No data	0.1	0.24	0.60	0.19
Max.	No data	0.1	0.24	3.43	0.83
Median	No data	0.1	No data	0.75	0.29
Mean	No data	0.1	No data	1.57	0.46
StdDev	No data	0.0	No data	1.26	0.29
101 *Off*	4	0.02	0.07	0.30	0.17
102 *Off*	4	0.02	0.07	0.21	0.16
103 *Off*	4	0.02	0.11	0.19	0.16
104 *Off*	4	0.02	0.02	0.23	0.14
105 *Off*	4	0.02	0.01	0.47	0.16
108 *Off*	4	0.02	0.06	0.23	0.11
110 *Off*	4	0.02	No data	0.37	0.14
111 *Off*	4	0.02	0.05	0.19	0.13
112 *Off*	4	0.02	0.03	0.11	0.09
115 *Off*	4	0.02	0.06	0.22	0.12
118 *Off*	4	0.02	0.06	0.18	0.11
122 *Off*	12	0.14	No data	0.71	0.14
123 *Off*	11	0.14	No data	1.36	0.25
124 *Off*	12	0.14	No data	0.73	0.24
N	79	14	10	14	14
Min.	No data	0.02	0.01	0.11	0.09
Max.	No data	0.14	0.11	1.36	0.25
Median	No data	0.02	0.06	0.23	0.14
Mean	No data	0.046	0.054	0.39	0.15
StdDev	No data	0.051	0.0288	0.34	0.05
EL[c]	No data	No data	No data	No data	0.13

Effluent intake concentration 0.22

a. Source: Carfagno and Farmer (1988).
b. BEL = below environmental level; EL = environmental (activity concentration) level; LDL = lower detection limit at 95% confidence level; No data = not applicable.
c. EL indicates that "Min." and "Mean" values included as reported; however, these values should be interpreted as "BEL."
d. EL values from sample location 119.

ATTACHMENT D
ENVIRONMENTAL AIR SAMPLING DATA FOR 1959 TO 1972 (continued)

Table D-16. Mound air monitoring data for 1988.[a,b]

HTO incremental concentration (10^{-12} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	50	13	EL[b]	147.00	20.80
212 *On*	51	13	1.4	81.10	24.10
213 *On*	51	13	2.3	502	40.60
214 *On*	51	13	EL	165	24.5
215 *On*	52	13	EL	189.00	22.20
N	255	5	2	5	5
Min.	No data	13	1.40	81.10	20.80
Max.	No data	13	2.30	502.00	40.60
Median	No data	13	1.85	165.00	24.10
Mean	No data	13	1.85	216.82	26.44
StdDev	No data	0	0.64	164.38	8.05
101 *Off*	52	13	EL	109.00	13.30
102 *Off*	52	13	EL	42.10	14.50
103 *Off*	51	13	EL	163.00	16.20
104 *Off*	52	13	EL	60.50	10.70
105 *Off*	52	13	EL	25.40	5.70
108 *Off*	50	13	EL	33.10	4.90
110 *Off*	51	13	EL	12.60	1.50
111 *Off*	51	13	EL	17.80	1.20
112 *Off*	52	13	EL	53.90	5.10
115 *Off*	52	13	EL	13.20	1.10
118 *Off*	51	13	EL	34.20	5.50
122 *Off*	50	13	EL	107.00	15.80
123 *Off*	52	13	EL	241.00	21.40
124 *Off*	50	13	EL	100.00	17.00
N	718	14	0	14	14
Min.	No data	13	BEL	12.60	1.10
Max.	No data	13	BEL	241.00	21.40
Median	No data	13	No data	48.00	8.20
Mean	No data	13	No data	72.34	9.56
StdDev	No data	0	No data	65.99	6.78
EL[c,d]	No data	No data	No data	No data	2

Effluent intake concentration 24.10

Pu-238 incremental concentration (10^{-18}µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	12	0.3	9.00	313.00	80.00
212 *On*	12	0.3	2.00	85.00	13.00
213 *On*	12	0.3	21	146	61
214 *On*	11	0.3	5	354	58
215 *On*	12	0.3	1.00	19.00	6.00
N	59	5	5	5	5
Min.	No data	0.3	1.00	19.00	6.00
Max.	No data	0.3	21.00	354.00	80.00
Median	No data	0.3	5.00	146.00	58.00
Mean	No data	0.3	7.60	183.40	43.60
StdDev	No data	0.0	8.11	144.92	32.35
101 *Off*	4	0.1	0.1	2.40	1.40
102 *Off*	4	0.1	1.70	20.40	8.20
103 *Off*	4	0.1	1.60	31.10	13.30
104 *Off*	4	0.1	0.20	4.70	2.40
105 *Off*	4	0.1	EL	0.60	0.30
108 *Off*	4	0.1	EL	0.20	0.00
110 *Off*	4	0.1	EL	EL	EL
111 *Off*	4	0.1	EL	0.70	0.30
112 *Off*	4	0.1	EL	0.30	0.10
115 *Off*	4	0.1	EL	0.40	EL
118 *Off*	4	0.1	0.40	1.90	1.10
122 *Off*	12	0.3	0.50	20.20	7.50
123 *Off*	11	0.3	0.50	20.50	8.00
124 *Off*	12	0.3	2.40	16.30	7.10
N	79	14	8	13	12
Min.	No data	0.1	0.1	0.20	0.00
Max.	No data	0.3	2.4	31.10	13.30
Median	No data	0.1	0.50	2.40	1.90
Mean	No data	0.14	0.93	9.21	4.14
StdDev	No data	0.09	0.85	10.83	4.45
EL	No data	No data	No data	No data	0.2

Effluent intake concentration 58.00

Pu-239, -240 concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	12	0.2	No data	2.90	0.80
212 *On*	12	0.2	No data	0.80	0.20
213 *On*	12	0.2	No data	1.30	0.6
214 *On*	11	0.2	No data	1.10	0.4
215 *On*	12	0.2	No data	0.70	0.30
N	59	5	0	5	5
Min.	No data	0.2	BEL	0.70	0.20
Max.	No data	0.2	BEL	2.90	0.80
Median	No data	0.2	No data	1.10	0.40
Mean	No data	0.2	No data	1.36	0.46
StdDev	No data	0.0	No data	0.89	0.24
101 *Off*	4	0.2	0.2	0.80	0.40
102 *Off*	4	0.2	0.2	0.30	0.20
103 *Off*	4	0.2	0.2	0.60	0.40
104 *Off*	4	0.2	0.03	0.40	0.20
105 *Off*	4	0.2	0.1	0.90	0.40
108 *Off*	4	0.2	0.1	0.20	0.20
110 *Off*	4	0.2	0.1	0.20	0.10
111 *Off*	4	0.2	0.2	0.30	0.20
112 *Off*	4	0.2	0.1	0.20	0.10
115 *Off*	4	0.2	0.2	0.40	0.30
118 *Off*	4	0.2	0.1	0.30	0.20
122 *Off*	12	0.02	No data	0.60	0.20
123 *Off*	11	0.02	No data	0.40	0.10
124 *Off*	12	0.02	No data	0.50	0.20
N	79	14	11	14	14
Min.	No data	0.02	0.03	0.20	0.10
Max.	No data	0.2	0.2	0.90	0.40
Median	No data	0.2	0.1	0.40	0.20
Mean	No data	0.16	0.14	0.44	0.23
StdDev	No data	0.08	0.06	0.22	0.11
EL	No data	No data	No data	No data	0.2

Effluent intake concentration 0.20

a. Source: Carfagno and Farmer (1989).
b. BEL = below environmental level; EL = environmental (activity concentration) level; LDL = lower detection limit at 95% confidence level; No data = not applicable.
c. EL indicates that “Min.” and “Mean” values included as reported; however, these values should be interpreted as “BEL.”
d. EL values from sample location 119.

ATTACHMENT D
ENVIRONMENTAL AIR SAMPLING DATA FOR 1959 TO 1972 (continued)

Table D-17. Mound air monitoring data for 1989.[a,b]

HTO incremental concentration (10^{-12} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	50	29	0.2	179.00	25.00
212 *On*	50	29	EL[b]	173.00	28.00
213 *On*	51	29	8	138	31.00
214 *On*	50	29	1	98	24
215 *On*	51	29	EL	83.00	22.00
N	252	5	3	5	5
Min.	No data	29	0.20	83.00	22.00
Max.	No data	29	8.00	179.00	31.00
Median	No data	29	1.00	138.00	25.00
Mean	No data	29	3.07	134.20	26.00
StdDev	No data	0	4.29	43.18	3.54
101 *Off*	53	29	EL	36.00	13.00
102 *Off*	52	29	EL	106.00	19.00
103 *Off*	51	29	EL	47.00	12.00
104 *Off*	53	29	EL	37.00	10.00
105 *Off*	52	29	EL	32.00	6.00
108 *Off*	52	29	EL	14.00	2.00
110 *Off*	52	29	EL	13.00	2.00
111 *Off*	53	29	EL	19.00	2.00
112 *Off*	53	29	EL	204.00	10.00
115 *Off*	53	29	EL	22.00	2.00
118 *Off*	53	29	EL	22.00	6.00
122 *Off*	53	29	EL	68.00	12.00
123 *Off*	53	29	EL	79.00	17.00
124 *Off*	53	29	EL	51.00	14.00
N	736	14	0	14	14
Min.	No data	29	BEL	13.00	2.00
Max.	No data	29	BEL	204.00	19.00
Median	No data	29	No data	36.50	10.00
Mean	No data	29	No data	53.57	9.07
StdDev	No data	0	No data	50.94	5.81
EL[c,d]	No data	No data	No data	No data	0.9

Effluent intake concentration 25.00

Pu-238 incremental concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	12	0.3	2.00	107.00	23.00
212 *On*	12	0.3	EL	8.00	3.00
213 *On*	12	0.3	12	263	46
214 *On*	12	0.3	3	57	15
215 *On*	12	0.3	1.00	15.00	4.00
N	60	5	4	5	5
Min.	No data	0.3	1.00	8.00	3.00
Max.	No data	0.3	12.00	263.00	46.00
Median	No data	0.3	2.50	57.00	15.00
Mean	No data	0.3	4.50	90.00	18.20
StdDev	No data	0.0	5.07	104.47	17.60
101 *Off*	4	0.1	0.2	0.70	0.50
102 *Off*	4	0.1	0.90	2.50	1.60
103 *Off*	4	0.1	0.80	2.30	1.60
104 *Off*	4	0.1	0.20	1.00	0.70
105 *Off*	4	0.1	0.20	1.50	0.50
108 *Off*	4	0.1	EL	0.10	EL
110 *Off*	4	0.1	EL	0.20	EL
111 *Off*	4	0.1	0.10	0.50	0.20
112 *Off*	4	0.1	EL	0.30	0.20
115 *Off*	4	0.1	EL	0.10	EL
118 *Off*	4	0.1	0.10	1.00	0.60
122 *Off*	12	0.3	0.60	8.30	2.40
123 *Off*	12	0.3	1.00	8.10	3.80
124 *Off*	12	0.3	1.30	7.80	3.90
N	80	14	10	14	11
Min.	No data	0.1	0.1	0.10	0.20
Max.	No data	0.3	1.3	8.30	3.90
Median	No data	0.1	0.40	1.00	0.70
Mean	No data	0.14	0.54	2.46	1.45
StdDev	No data	0.09	0.44	3.13	1.37
EL	No data	No data	No data	No data	0.04

Effluent intake concentration 15.00

Pu-239, -240 concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	12	0.1	No data	1.10	0.30
212 *On*	12	0.1	No data	1.20	0.20
213 *On*	12	0.1	No data	2.90	0.6
214 *On*	12	0.1	No data	2.80	0.4
215 *On*	12	0.1	No data	0.50	0.10
N	60	5	0	5	5
Min.	No data	0.1	BEL	0.50	0.10
Max.	No data	0.1	BEL	2.90	0.60
Median	No data	0.1	No data	1.20	0.30
Mean	No data	0.1	No data	1.70	0.32
StdDev	No data	0.0	No data	1.08	0.19
101 *Off*	4	0.03	No data	0.20	0.09
102 *Off*	4	0.03	No data	0.30	0.10
103 *Off*	4	0.03	0.03	0.20	0.10
104 *Off*	4	0.03	No data	0.10	0.08
105 *Off*	4	0.03	No data	0.30	0.10
108 *Off*	4	0.03	0.08	0.10	0.09
110 *Off*	4	0.03	No data	0.10	0.03
111 *Off*	4	0.03	0.04	1.00	0.30
112 *Off*	4	0.03	0.05	0.30	0.10
115 *Off*	4	0.03	0.05	0.20	0.10
118 *Off*	4	0.03	No data	0.30	0.10
122 *Off*	12	0.1	No data	0.70	0.20
123 *Off*	12	0.1	No data	0.30	0.04
124 *Off*	12	0.1	No data	1.20	0.08
N	80	14	5	14	14
Min.	No data	0.03	0.03	0.10	0.03
Max.	No data	0.1	0.08	1.20	0.30
Median	No data	0.03	0.05	0.30	0.10
Mean	No data	0.045	0.05	0.38	0.11
StdDev	No data	0.03	0.0187	0.34	0.07
EL	No data	No data	No data	No data	0.1

Effluent intake concentration 0.30

a. Source: Carfagno and Farmer (1990).
b. BEL = below environmental level; EL = environmental (activity concentration) level; LDL = lower detection limit at 95% confidence level; No data = not applicable.
c. EL indicates that "Min." and "Mean" values included as reported; however, these values should be interpreted as "BEL."
d. EL values from sample location 119.

ATTACHMENT D
ENVIRONMENTAL AIR SAMPLING DATA FOR 1959 TO 1972 (continued)

Table D-18. Mound air monitoring data for 1990.[a,b]

HTO incremental concentration (10^{-12} µCi/mL)

Location	Samples	LDL	Min.[c]	Max.	Mean
211 *On*	52	29	0.54	222.36	18.57
212 *On*	52	29	1.44	49.70	15.72
213 *On*	52	29	0.87	125	38.39
214 *On*	50	29	-1.44	154.3	20.7
215 *On*	52	29	-2.54	72.45	15.21
N	258	5	5	5	5
Min.	No data	29	-2.54	49.70	15.21
Max.	No data	29	1.44	222.36	38.39
Median	No data	29	0.54	125.04	18.57
Mean	No data	29	-0.23	124.77	21.71
StdDev	No data	0	1.69	68.50	9.58
101 *Off*	51	29	-2.48	32.02	12.25
102 *Off*	52	29	1.82	59.33	14.50
103 *Off*	52	29	-1.07	28.61	9.03
104 *Off*	52	29	-6.19	35.99	7.19
105 *Off*	52	29	-2.48	25.69	3.62
108 *Off*	52	29	-8.94	13.86	2.62
110 *Off*	52	29	-6.39	12.90	0.88
111 *Off*	52	29	-6.79	12.25	1.05
112 *Off*	51	29	-5.53	21.68	4.44
115 *Off*	52	29	-6.21	11.69	0.82
118 *Off*	52	29	-7.56	22.22	3.57
122 *Off*	50	29	-3.83	52.00	6.95
123 *Off*	51	29	-2.89	38.43	7.51
124 *Off*	51	29	-3.56	39.50	8.16
N	722	14	14	14	14
Min.	No data	29	-8.94	11.69	0.82
Max.	No data	29	1.82	59.33	14.50
Median	No data	29	-4.68	27.15	5.70
Mean	No data	29	-4.436	29.01	5.90
StdDev	No data	0	2.8886	14.90	4.23
EL	No data	No data	No data	No data	2.63

Effluent intake concentration 18.60

Pu-238 incremental concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	12	0.5	5.53	89.58	16.43
212 *On*	12	0.5	1.49	9.69	4.32
213 *On*	12	0.5	9.47	79.44	35.04
214 *On*	12	0.5	2.24	12.93	5.64
215 *On*	12	0.5	0.55	3.86	1.83
N	60	5	5	5	5
Min.	No data	0.5	0.55	3.86	1.83
Max.	No data	0.5	9.47	89.58	35.04
Median	No data	0.5	2.24	12.93	5.64
Mean	No data	0.5	3.86	39.10	12.65
StdDev	No data	0.0	3.66	41.73	13.70
101 *Off*	4	0.1	0.28	1.17	0.57
102 *Off*	4	0.1	1.75	3.54	2.67
103 *Off*	4	0.1	1.45	149.28	39.47
104 *Off*	4	0.1	0.34	0.92	0.55
105 *Off*	4	0.1	0.10	0.46	0.26
108 *Off*	4	0.1	-0.05	0.24	0.06
110 *Off*	4	0.1	-0.04	0.15	0.05
111 *Off*	4	0.1	-0.03	0.30	0.12
112 *Off*	4	0.1	-0.04	0.16	0.07
115 *Off*	4	0.1	-0.25	0.15	-0.05
118 *Off*	4	0.1	-0.06	4.83	1.48
122 *Off*	12	0.5	0.52	5.79	1.58
123 *Off*	12	0.5	0.85	18.50	4.18
124 *Off*	12	0.5	-0.25	14.16	3.85
N	80	14	14	14	14
Min.	No data	0.1	-0.25	0.15	-0.05
Max.	No data	0.5	1.75	149.28	39.47
Median	No data	0.1	0.04	1.05	0.56
Mean	No data	0.19	0.33	14.26	3.92
StdDev	No data	0.17	0.62	39.27	10.33
EL	No data	No data	No data	No data	0.06

Effluent intake concentration 5.64

Pu-239, -240 incremental concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	12	0.4	-0.43	0.38	0.07
212 *On*	12	0.4	-0.24	0.51	0.10
213 *On*	12	0.4	0.05	0.84	0.28
214 *On*	12	0.4	-0.04	0.48	0.04
215 *On*	12	0.4	-0.18	0.12	-0.02
N	60	5	5	5	5
Min.	No data	0.4	-0.43	0.12	-0.02
Max.	No data	0.4	0.05	0.84	0.28
Median	No data	0.4	-0.18	0.48	0.07
Mean	No data	0.4	-0.17	0.47	0.09
StdDev	No data	0.0	0.19	0.26	0.11
101 *Off*	4	0.1	-0.06	0.05	0.01
102 *Off*	4	0.1	-0.01	0.03	0.00
103 *Off*	4	0.1	-0.02	0.42	0.15
104 *Off*	4	0.1	-0.08	-0.01	-0.04
105 *Off*	4	0.1	0.03	0.12	0.06
108 *Off*	4	0.1	-0.02	0.06	0.02
110 *Off*	4	0.1	-0.1	0.04	-0.02
111 *Off*	4	0.1	0.02	0.08	0.06
112 *Off*	4	0.1	-0.01	0.02	0.01
115 *Off*	4	0.1	-0.02	0.12	0.04
118 *Off*	12	0.4	-0.02	0.05	0.02
122 *Off*	12	0.4	-0.41	0.24	-0.07
123 *Off*	12	0.4	-0.12	0.52	0.06
124 *Off*	12	0.4	-0.39	0.28	-0.01
N	88	14	14	14	14
Min.	No data	0.1	-0.41	-0.01	-0.07
Max.	No data	0.4	0.03	0.52	0.15
Median	No data	0.1	-0.02	0.07	0.02
Mean	No data	0.186	-0.0864	0.14	0.02
StdDev	No data	0.141	0.1395	0.16	0.05
EL	No data	No data	No data	No data	0.07

Effluent intake concentration 0.07

a. Source: EG&G and SAIC (1991).
b. BEL = below environmental level; EL = environmental (activity concentration) level; LDL = lower detection limit at 95% confidence level; No data = not applicable.
c. Negative “Min.” values included as reported; however, these values should be interpreted as “BEL.”

ATTACHMENT D
ENVIRONMENTAL AIR SAMPLING DATA FOR 1959 TO 1972 (continued)

Table D-19. Mound air monitoring data for 1991.[a,b]

HTO incremental concentration (10^{-12} µCi/mL)

Location	Samples	LDL	Min.[c]	Max.	Mean
211 *On*	51	16	-0.35	42.41	11.65
212 *On*	49	16	-4.93	54.88	13.05
213 *On*	50	16	10.04	112.61	38.91
214 *On*	51	16	-3.06	28.69	9.97
215 *On*	51	16	-9.88	31.45	6.18
N	252	5	5	5	5
Min.	No data	16	-9.88	28.69	6.18
Max.	No data	16	10.04	112.61	38.91
Median	No data	16	-3.06	42.41	11.65
Mean	No data	16	-1.64	54.01	15.95
StdDev	No data	0	7.40	34.35	13.09
101 *Off*	50	16	-5.46	31.14	6.85
102 *Off*	52	16	-11.16	27.79	8.27
103 *Off*	52	16	-13.2	20.20	5.83
104 *Off*	52	16	-9.66	22.43	3.45
105 *Off*	52	16	-10.3	32.85	4.52
108 *Off*	52	16	-10.61	12.79	1.74
110 *Off*	52	16	-13.2	20.88	0.70
111 *Off*	50	16	-11.34	11.42	0.44
112 *Off*	51	16	-6.64	13.43	2.02
115 *Off*	52	16	-12.7	12.93	0.58
118 *Off*	52	16	-10.25	24.59	2.76
122 *Off*	51	16	-4.1	25.63	7.39
123 *Off*	52	16	-4.21	74.37	9.06
124 *Off*	51	16	-12.85	40.50	6.93
N	721	14	14	14	14
Min.	No data	16	-13.2	11.42	0.44
Max.	No data	16	-4.1	74.37	9.06
Median	No data	16	-10.46	23.51	3.99
Mean	No data	16	-9.691	26.50	4.32
StdDev	No data	0	3.2649	16.20	3.04
EL	No data	No data	No data	No data	1.85

Effluent intake concentration 11.65

Pu-238 incremental concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	12	0.7	4.90	49.72	15.73
212 *On*	11	0.7	1.29	9.16	4.92
213 *On*	12	0.7	12.14	69.36	34.23
214 *On*	12	0.7	2.27	24.65	7.7
215 *On*	12	0.7	1.20	27.73	6.82
N	59	5	5	5	5
Min.	No data	0.7	1.20	9.16	4.92
Max.	No data	0.7	12.14	69.36	34.23
Median	No data	0.7	2.27	27.73	7.70
Mean	No data	0.7	4.36	36.12	13.88
StdDev	No data	0.0	4.60	23.55	12.10
101 *Off*	4	0.2	0.2	0.73	0.42
102 *Off*	4	0.2	0.58	2.88	1.77
103 *Off*	4	0.2	1.05	3.51	2.50
104 *Off*	4	0.2	0.31	6.33	2.59
105 *Off*	4	0.2	0.04	2.63	0.88
108 *Off*	4	0.2	-0.18	0.05	-0.11
110 *Off*	4	0.2	-0.45	0.10	-0.19
111 *Off*	4	0.2	-0.25	0.48	0.12
112 *Off*	4	0.2	-0.18	0.72	0.06
115 *Off*	4	0.2	-0.16	0.32	-0.01
118 *Off*	4	0.2	-0.07	5.05	1.50
122 *Off*	12	0.7	-0.52	2.77	1.34
123 *Off*	12	0.7	-0.01	6.10	2.63
124 *Off*	12	0.7	0.01	50.58	10.01
N	80	14	14	14	14
Min.	No data	0.2	-0.52	0.05	-0.19
Max.	No data	0.7	1.05	50.58	10.01
Median	No data	0.2	-0.04	2.70	1.11
Mean	No data	0.31	0.03	5.88	1.68
StdDev	No data	0.21	0.41	13.05	2.61
EL	No data	No data	No data	No data	0.24

Effluent intake concentration 7.70

Pu-239, -240 incremental concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	12	0.3	-0.42	0.46	0.10
212 *On*	11	0.3	-0.47	0.30	-0.04
213 *On*	12	0.3	-0.37	0.89	0.03
214 *On*	12	0.3	-0.27	0.43	-0.05
215 *On*	12	0.3	-0.34	0.17	-0.03
N	59	5	5	5	5
Min.	No data	0.3	-0.47	0.17	-0.05
Max.	No data	0.3	-0.27	0.89	0.10
Median	No data	0.3	-0.37	0.43	-0.03
Mean	No data	0.3	-0.37	0.45	0.00
StdDev	No data	0.0	0.08	0.27	0.06
101 *Off*	4	0.1	-0.14	0.02	-0.05
102 *Off*	4	0.1	-0.1	0.04	-0.05
103 *Off*	4	0.1	-0.02	0.04	0.01
104 *Off*	4	0.1	-0.07	0.03	-0.01
105 *Off*	4	0.1	-0.05	0.03	-0.01
108 *Off*	4	0.1	-0.04	0.04	-0.01
110 *Off*	4	0.1	-0.01	0.08	0.03
111 *Off*	4	0.1	-0.28	0.10	-0.05
112 *Off*	4	0.1	-0.09	0.09	-0.04
115 *Off*	4	0.1	-0.35	-0.02	-0.11
118 *Off*	4	0.1	-0.13	-0.01	-0.06
122 *Off*	12	0.3	-0.35	0.17	-0.08
123 *Off*	12	0.3	-0.3	0.33	0.01
124 *Off*	12	0.3	-0.51	0.27	-0.02
N	80	14	14	14	14
Min.	No data	0.1	-0.51	-0.02	-0.11
Max.	No data	0.3	-0.01	0.33	0.03
Median	No data	0.1	-0.115	0.04	-0.03
Mean	No data	0.143	-0.1743	0.09	-0.03
StdDev	No data	0.085	0.155	0.10	0.04
EL	No data	No data	No data	No data	0.1

Effluent intake concentration 0.00

a. Source: EG&G and SAIC (1992).
b. BEL = below environmental level; EL = environmental (activity concentration) level; LDL = lower detection limit at 95% confidence level; No data = not applicable.
c. Negative "Min." values included as reported; however, these values should be interpreted as "BEL."

ATTACHMENT D
ENVIRONMENTAL AIR SAMPLING DATA FOR 1959 TO 1972 (continued)

Table D-20. Mound air monitoring data for 1992.[a,b]

HTO incremental concentration (10^{-12} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	49	20	BEL	133.14	16.55
212 *On*	51	20	BEL	39.62	7.43
213 *On*	20	20	BEL	43.21	13.78
213R *On*	28	20	BEL	55.20	9.11
214 *On*	20	20	BEL	20.24	4.28
214R *On*	31	20	BEL	55.24	8.09
215 *On*	52	20	BEL	24.15	4.11
216 *On*	31	20	BEL	36.21	5.14
217 *On*	30	20	BEL	34.02	1.90
N	312	9	0	9	9
Min.	No data	20	BEL	20.24	1.90
Max.	No data	20	BEL	133.14	16.55
Median	No data	20	No data	39.62	7.43
Mean	No data	20	No data	49.00	7.82
StdDev	No data	0	No data	33.75	4.77
101 *Off*	52	20	BEL	43.97	6.57
102 *Off*	49	20	BEL	39.71	8.74
103 *Off*	50	20	BEL	35.53	4.32
104 *Off*	51	20	BEL	40.54	2.86
105 *Off*	52	20	BEL	33.89	3.84
108 *Off*	52	20	BEL	25.69	0.27
110 *Off*	51	20	BEL	34.80	0.07
111 *Off*	51	20	BEL	18.01	BEL
112 *Off*	52	20	BEL	25.78	BEL
115 *Off*	48	20	BEL	17.61	BEL
118 *Off*	52	20	BEL	31.80	1.66
122 *Off*	51	20	BEL	27.83	3.31
123 *Off*	51	20	BEL	45.66	6.33
124 *Off*	50	20	BEL	59.39	5.65
N	712	14	0	14	11
Min.	No data	20	BEL	17.61	0.07
Max.	No data	20	BEL	59.39	8.74
Median	No data	20	No data	34.35	3.84
Mean	No data	20	No data	34.30	3.97
StdDev	No data	0	No data	11.30	2.72
EL	No data	No data	No data	No data	6.59

Effluent intake concentration 7.43

Pu-238 concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	12	0.8	3.07	14.99	6.42
212 *On*	12	0.8	0.95	8.04	2.83
213 *On*	5	0.8	12.94	31.78	22.33
213R *On*	7	0.8	3.28	15.76	10.52
214 *On*	5	0.8	1.24	14.17	6.79
214R *On*	7	0.8	2.88	12.51	5.83
215 *On*	12	0.8	0.94	11.34	3.58
216 *On*	7	0.8	0.77	14.53	4.53
217 *On*	7	0.8	0.31	2.73	1.26
N	74	9	9	9	9
Min.	No data	0.8	0.31	2.73	1.26
Max.	No data	0.8	12.94	31.78	22.33
Median	No data	0.8	1.24	14.17	5.83
Mean	No data	0.8	2.93	13.98	7.12
StdDev	No data	0.0	3.91	7.84	6.30
101 *Off*	4	0.5	BEL	0.70	0.32
102 *Off*	4	0.5	0.40	7.84	2.58
103 *Off*	4	0.5	1.05	2.62	1.77
104 *Off*	4	0.5	0.28	1.06	0.53
105 *Off*	4	0.5	BEL	0.58	0.27
108 *Off*	4	0.5	BEL	1.92	0.41
110 *Off*	4	0.5	BEL	1.26	0.24
111 *Off*	4	0.5	BEL	0.72	0.17
112 *Off*	4	0.5	BEL	1.01	0.46
115 *Off*	4	0.5	0.04	0.24	0.12
118 *Off*	4	0.5	0.11	1.67	0.68
122 *Off*	12	0.8	0.37	2.13	0.96
123 *Off*	12	0.8	1.09	4.81	2.55
124 *Off*	12	0.8	0.46	19.67	4.38
N	80	14	8	14	14
Min.	No data	0.5	0.04	0.24	0.12
Max.	No data	0.8	1.09	19.67	4.38
Median	No data	0.5	0.39	1.47	0.50
Mean	No data	0.56	0.48	3.30	1.10
StdDev	No data	0.13	0.39	5.13	1.26
EL	No data	No data	No data	No data	No data

Effluent intake concentration 5.83

Pu-239, -240 incremental concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	12	0.6	BEL	1.16	0.29
212 *On*	12	0.6	BEL	0.67	0.16
213 *On*	5	0.6	0.09	0.78	0.35
213R *On*	7	0.6	BEL	1.34	0.37
214 *On*	5	0.6	BEL	0.55	0.26
214R *On*	7	0.6	BEL	1.48	0.24
215 *On*	12	0.6	BEL	0.64	0.19
216 *On*	7	0.6	BEL	0.41	0.002
217 *On*	7	0.6	BEL	0.24	0.01
N	74	9	1	9	9
Min.	No data	0.6	0.09	0.24	0.00
Max.	No data	0.6	0.09	1.48	0.37
Median	No data	0.6	No data	0.67	0.24
Mean	No data	0.6	No data	0.81	0.21
StdDev	No data	0.0	No data	0.43	0.13
101 *Off*	4	0.04	BEL	0.13	0.05
102 *Off*	4	0.04	0.07	0.11	0.09
103 *Off*	4	0.04	BEL	0.06	BEL
104 *Off*	4	0.04	0.01	0.10	0.06
105 *Off*	4	0.04	BEL	0.08	0.02
108 *Off*	4	0.04	BEL	0.08	0.03
110 *Off*	4	0.04	BEL	0.08	0.03
111 *Off*	4	0.04	BEL	0.03	0.01
112 *Off*	4	0.04	BEL	0.01	BEL
115 *Off*	4	0.04	BEL	0.13	0.03
118 *Off*	4	0.04	BEL	0.04	BEL
122 *Off*	12	0.6	BEL	0.40	0.11
123 *Off*	12	0.6	BEL	1.32	0.17
124 *Off*	12	0.6	BEL	1.36	0.15
N	80	14	2	14	11
Min.	No data	0.04	0.01	0.01	0.01
Max.	No data	0.6	0.07	1.36	0.17
Median	No data	0.04	0.04	0.09	0.05
Mean	No data	0.16	0.04	0.28	0.07
StdDev	No data	0.238	0.0424	0.46	0.05
EL	No data	No data	No data	No data	0.05

Effluent intake concentration 0.24

a. Source: Bauer (1993).
b. BEL = below environmental level; EL = environmental (activity concentration) level; LDL = lower detection limit at 95% confidence level; No data = not applicable.

ATTACHMENT D
ENVIRONMENTAL AIR SAMPLING DATA FOR 1959 TO 1972 (continued)

Table D-21. Mound air monitoring data for 1993.[a,b]

HTO incremental concentration (10^{-12} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	50	19	BEL	205.40	6.76
212 *On*	50	19	BEL	192.47	5.45
213R *On*	52	19	BEL	183.54	4.43
214R *On*	51	19	BEL	223.44	3.88
215 *On*	52	19	BEL	179.96	1.20
216 *On*	52	19	BEL	195.66	1.31
217 *On*	51	19	BEL	186.20	BEL
N	358	7	0	7	6
Min.	No data	19	BEL	179.96	1.20
Max.	No data	19	BEL	223.44	6.76
Median	No data	19	No data	192.47	4.16
Mean	No data	19	No data	195.24	3.84
StdDev	No data	0	No data	15.05	2.23
101 *Off*	51	19	BEL	188.92	3.38
102 *Off*	51	19	BEL	202.45	4.40
103 *Off*	50	19	BEL	226.90	1.19
104 *Off*	51	19	BEL	201.15	BEL
105 *Off*	49	19	BEL	217.19	BEL
108 *Off*	51	19	BEL	252.41	BEL
110 *Off*	51	19	BEL	210.32	BEL
111 *Off*	51	19	BEL	264.65	BEL
112 *Off*	50	19	BEL	199.57	BEL
115 *Off*	51	19	BEL	218.53	BEL
118 *Off*	49	19	BEL	203.49	1.29
122 *Off*	51	19	BEL	227.59	1.15
123 *Off*	52	19	BEL	545.60	4.82
124 *Off*	50	19	BEL	176.27	2.00
N	708	14	0	14	7
Min.	No data	19	BEL	176.27	1.15
Max.	No data	19	BEL	545.60	4.82
Median	No data	19	No data	213.76	2.00
Mean	No data	19	No data	238.22	2.60
StdDev	No data	0	No data	91.51	1.58
EL	No data	No data	No data	No data	12.2

Effluent intake concentration 4.16

Pu-238 incremental concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	12	0.2	2.16	13.11	6.04
212 *On*	12	0.2	1.21	24.57	8.51
213R *On*	12	0.2	10.86	86.49	41.45
214R *On*	12	0.2	1.03	18.54	7.10
215 *On*	12	0.2	1.41	6.60	3.41
216 *On*	12	0.2	2.35	117.49	21.61
217 *On*	12	0.2	0.58	12.93	2.78
N	84	7	7	7	7
Min.	No data	0.2	0.58	6.60	2.78
Max.	No data	0.2	10.86	117.49	41.45
Median	No data	0.2	1.41	18.54	7.10
Mean	No data	0.2	2.80	39.96	12.99
StdDev	No data	0.0	3.61	43.66	14.04
101 *Off*	4	0.06	0.65	24.08	7.01
102 *Off*	4	0.06	1.51	7.63	3.76
103 *Off*	4	0.06	1.66	4.56	3.22
104 *Off*	4	0.06	0.56	6.63	2.19
105 *Off*	4	0.06	0.48	1.76	1.19
108 *Off*	4	0.06	BEL	0.06	BEL
110 *Off*	4	0.06	BEL	0.04	BEL
111 *Off*	4	0.06	0.02	0.48	0.15
112 *Off*	4	0.06	0.06	0.31	0.18
115 *Off*	4	0.06	BEL	0.58	0.11
118 *Off*	4	0.06	0.63	3.28	1.95
122 *Off*	12	0.2	0.29	2.53	1.07
123 *Off*	12	0.2	2.00	12.13	5.90
124 *Off*	12	0.2	0.62	27.55	6.52
N	80	14	11	14	12
Min.	No data	0.06	0.02	0.04	0.11
Max.	No data	0.20	2.00	27.55	7.01
Median	No data	0.06	0.62	2.91	2.07
Mean	No data	0.09	0.77	6.54	2.77
StdDev	No data	0.06	0.66	8.90	2.52
EL	No data	No data	No data	No data	0.07

Effluent intake concentration 7.10

Pu-239, -240 incremental concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	12	0.2	BEL	1.78	0.38
212 *On*	12	0.2	BEL	1.82	0.58
213R *On*	12	0.2	0.17	4.18	1.33
214R *On*	12	0.2	BEL	1.12	0.39
215 *On*	12	0.2	BEL	0.96	0.30
216 *On*	12	0.2	0.08	6.60	1.15
217 *On*	12	0.2	BEL	1.26	0.26
N	84	7	2	7	7
Min.	No data	0.2	0.08	0.96	0.26
Max.	No data	0.2	0.17	6.60	1.33
Median	No data	0.2	0.13	1.78	0.39
Mean	No data	0.2	0.13	2.53	0.63
StdDev	No data	0.0	0.06	2.10	0.43
101 *Off*	4	0.08	BEL	0.05	BEL
102 *Off*	4	0.08	0.03	0.30	0.19
103 *Off*	4	0.08	BEL	0.34	0.12
104 *Off*	4	0.08	0.01	0.63	0.19
105 *Off*	3	0.08	BEL	0.18	0.10
108 *Off*	4	0.08	0.03	0.41	0.15
110 *Off*	4	0.08	BEL	0.75	0.14
111 *Off*	4	0.08	BEL	0.06	0.03
112 *Off*	4	0.08	0.03	0.08	0.05
115 *Off*	4	0.08	BEL	0.08	0.03
118 *Off*	4	0.08	BEL	0.38	0.08
122 *Off*	12	0.2	BEL	0.71	0.15
123 *Off*	12	0.2	BEL	0.77	0.24
124 *Off*	12	0.2	BEL	0.51	0.22
N	79	14	4	14	13
Min.	No data	0.08	0.01	0.05	0.03
Max.	No data	0.20	0.03	0.77	0.24
Median	No data	0.08	0.03	0.36	0.14
Mean	No data	0.11	0.03	0.38	0.13
StdDev	No data	0.05	0.01	0.27	0.07
EL	No data	No data	No data	No data	0.09

Effluent intake concentration 0.39

a. Source: EG&G (1994).
b. BEL = below environmental level; EL = environmental (activity concentration) level; LDL = lower detection limit at 95% confidence level; No data = not applicable.

ATTACHMENT D
ENVIRONMENTAL AIR SAMPLING DATA FOR 1959 TO 1972 (continued)

Table D-22. Mound air monitoring data for 1994.[a,b]

HTO incremental concentration (10^{-12} µCi/mL)

Location[c]	Samples	LDL	Min.	Max.	Mean
211 *On*	51	35	BEL	44.27	7.54
211T *On*	No data	No data	No data	No data	No data
212 *On*	50	28	BEL	47.88	4.82
212T *On*	No data	No data	No data	No data	No data
213R *On*	50	28	BEL	24.29	3.55
213RT *On*	No data	No data	No data	No data	No data
214R *On*	48	28	BEL	30.75	4.29
214RT *On*	No data	No data	No data	No data	No data
215 *On*	48	28	BEL	26.40	3.69
215T *On*	No data	No data	No data	No data	No data
216 *On*	49	28	BEL	23.71	1.97
216T *On*	No data	No data	No data	No data	No data
217 *On*	49	28	BEL	42.48	2.11
217T *On*	No data	No data	No data	No data	No data
N	345	7	0	7	7
Min.	No data	28	BEL	23.71	1.97
Max.	No data	35	BEL	47.88	7.54
Median	No data	28	No data	30.75	3.69
Mean	No data	29	No data	34.25	4.00
StdDev	No data	2.65	No data	10.31	1.88
101 *Off*	48	23	BEL	61.51	5.96
102 *Off*	50	23	BEL	28.22	4.90
103 *Off*	50	23	BEL	26.34	2.14
104 *Off*	52	23	BEL	26.31	1.98
105 *Off*	51	23	BEL	25.35	1.25
108 *Off*	50	23	BEL	34.27	0.74
110 *Off*	50	23	BEL	23.85	0.52
111 *Off*	48	23	BEL	29.03	BEL
112 *Off*	50	23	BEL	36.66	2.09
115 *Off*	51	23	BEL	28.99	0.75
118 *Off*	48	23	BEL	28.98	0.75
122 *Off*	51	23	BEL	35.15	3.37
123 *Off*	50	23	BEL	33.36	5.65
124 *Off*	50	23	BEL	40.51	8.09
N	699	14	0	14	13
Min.	No data	23	BEL	23.85	0.52
Max.	No data	23	BEL	61.51	8.09
Median	No data	23	No data	29.01	2.09
Mean	No data	23	No data	32.75	2.94
StdDev	No data	0	No data	9.57	2.46
EL	No data	No data	No data	No data	3.22

Effluent intake concentration 3.69

Pu-238 incremental concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	12	0.12	2.40	23.56	8.28
211T *On*	12	0.12	1.76	15.78	6.63
212 *On*	12	0.12	1.85	18.17	7.21
212T *On*	12	0.12	3.07	17.16	7.37
213R *On*	12	0.12	29.57	1,994.6	354.26
213RT *On*	12	0.12	8.64	1,292.2	259.65
214R *On*	12	0.12	2.52	11.22	5.55
214RT *On*	12	0.12	1.85	11.27	5.50
215 *On*	12	0.12	0.20	5.20	2.56
215T *On*	12	0.12	0.85	73.19	9.17
216 *On*	12	0.12	0.64	30.53	11.27
216T *On*	12	0.12	1.05	29.99	8.36
217 *On*	12	0.12	0.40	6.89	2.59
217T *On*	12	0.12	0.20	21.90	4.28
N	168	14	14	14	14
Min.	No data	0.12	0.2	5.20	2.56
Max.	No data	0.12	29.57	1994.60	354.26
Median	No data	0.12	1.805	20.04	7.29
Mean	No data	0.12	3.92857	253.69	49.48
StdDev	No data	0	7.68072	604.89	110.68
101 *Off*	4	0.03	0.52	1.27	0.81
102 *Off*	4	0.03	1.96	6.92	4.42
103 *Off*	4	0.03	1.68	7.63	3.60
104 *Off*	4	0.03	0.82	3.51	1.85
105 *Off*	4	0.03	0.11	0.43	0.32
108 *Off*	4	0.03	BEL	2.10	0.60
110 *Off*	4	0.03	BEL	0.34	0.07
111 *Off*	4	0.03	0.11	0.20	0.16
112 *Off*	4	0.03	0.16	0.39	0.26
115 *Off*	4	0.03	0.05	0.14	0.10
118 *Off*	4	0.03	0.66	1.10	0.86
122 *Off*	12	0.12	0.32	2.20	1.37
123 *Off*	12	0.12	1.48	8.40	4.12
124 *Off*	12	0.12	2.44	47.32	13.19
N	80	14	12	14	14
Min.	No data	0.03	0.05	0.14	0.07
Max.	No data	0.12	2.44	47.32	13.19
Median	No data	0.03	0.59	1.69	0.84
Mean	No data	0.05	0.86	5.85	2.27
StdDev	No data	0.04	0.82	12.28	3.50
EL	No data	No data	No data	No data	0.05

Effluent intake concentration 7.29

Pu-239, -240 incremental concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	12	0.2	BEL	1.31	0.44
211T *On*	12	0.2	BEL	1.47	0.34
212 *On*	12	0.2	BEL	0.92	0.26
212T *On*	12	0.2	BEL	0.73	0.25
213R *On*	12	0.2	0.06	14.14	3.50
213RT *On*	12	0.2	0.47	6.71	2.14
214R *On*	12	0.2	BEL	1.05	0.32
214RT *On*	12	0.2	BEL	1.02	0.30
215 *On*	12	0.2	BEL	0.71	0.17
215T *On*	12	0.2	BEL	1.76	0.28
216 *On*	12	0.2	BEL	1.19	0.42
216T *On*	12	0.2	BEL	0.92	0.35
217 *On*	12	0.2	BEL	0.84	0.15
217T *On*	12	0.2	BEL	0.30	0.10
N	168	14	2	14	14
Min.	No data	0.2	0.06	0.30	0.10
Max.	No data	0.2	0.47	14.14	3.50
Median	No data	0.2	0.265	1.04	0.31
Mean	No data	0.2	0.265	2.36	0.64
StdDev	No data	3E–09	0.2899	3.73	0.96
101 *Off*	4	0.05	0.10	0.38	0.19
102 *Off*	4	0.05	BEL	0.74	0.32
103 *Off*	4	0.05	BEL	0.12	0.04
104 *Off*	4	0.05	BEL	0.08	0.03
105 *Off*	4	0.05	BEL	0.05	0.01
108 *Off*	4	0.05	0.03	0.95	0.28
110 *Off*	4	0.05	BEL	0.13	0.05
111 *Off*	4	0.05	BEL	0.60	0.18
112 *Off*	4	0.05	BEL	0.15	0.04
115 *Off*	4	0.05	BEL	0.16	0.05
118 *Off*	4	0.05	BEL	0.26	0.06
122 *Off*	12	0.2	BEL	0.32	0.11
123 *Off*	12	0.2	BEL	0.83	0.21
124 *Off*	12	0.2	BEL	1.61	0.44
N	80	14	2	14	14
Min.	No data	0.05	0.03	0.05	0.01
Max.	No data	0.20	0.10	1.61	0.44
Median	No data	0.05	0.07	0.29	0.09
Mean	No data	0.08	0.07	0.46	0.14
StdDev	No data	0.06	0.05	0.45	0.13
EL	No data	No data	No data	No data	0.07

Effluent intake concentration 0.31

a. Source: EG&G (1995b).
b. BEL = below environmental level; EL = environmental (activity concentration) level; LDL = lower detection limit at 95% confidence level; No data = not applicable.
c. T indicates 2-m sampling height.

ATTACHMENT D
ENVIRONMENTAL AIR SAMPLING DATA FOR 1959 TO 1972 (continued)

Table D-23. Mound air monitoring data for 1995.[a,b]

HTO incremental concentration (10^{-12} µCi/mL)

Location[c]	Samples	LDL	Min.	Max.	Mean
211 *On*	51	35	BEL	44.27	7.54
211T *On*	No data	No data	No data	No data	No data
212 *On*	50	28	BEL	47.88	4.82
212T *On*	No data	No data	No data	No data	No data
213R *On*	50	28	BEL	24.29	3.55
213RT *On*	No data	No data	No data	No data	No data
214R *On*	48	28	BEL	30.75	4.29
214RT *On*	No data	No data	No data	No data	No data
215 *On*	48	28	BEL	26.40	3.69
215T *On*	No data	No data	No data	No data	No data
216 *On*	49	28	BEL	23.71	1.97
216T *On*	No data	No data	No data	No data	No data
217 *On*	49	28	BEL	42.48	2.11
217T *On*	No data	No data	No data	No data	No data
N	345	7	0	7	7
Min.	No data	28	BEL	23.71	1.97
Max.	No data	35	BEL	47.88	7.54
Median	No data	28	No data	30.75	3.69
Mean	No data	29	No data	34.25	4.00
StdDev	No data	2.65	No data	10.31	1.88
101 *Off*	48	23	BEL	61.51	5.96
102 *Off*	50	23	BEL	28.22	4.90
103 *Off*	50	23	BEL	26.34	2.14
104 *Off*	52	23	BEL	26.31	1.98
105 *Off*	51	23	BEL	25.35	1.25
108 *Off*	50	23	BEL	34.27	0.74
110 *Off*	50	23	BEL	23.85	0.52
111 *Off*	48	23	BEL	29.03	BEL
112 *Off*	50	23	BEL	36.66	2.09
115 *Off*	51	23	BEL	28.99	0.75
118 *Off*	48	23	BEL	28.98	0.75
122 *Off*	51	23	BEL	35.15	3.37
123 *Off*	50	23	BEL	33.36	5.65
124 *Off*	50	23	BEL	40.51	8.09
N	699	14	0	14	13
Min.	No data	23	BEL	23.85	0.52
Max.	No data	23	BEL	61.51	8.09
Median	No data	23	No data	29.01	2.09
Mean	No data	23	No data	32.75	2.94
StdDev	No data	0	No data	9.57	2.46
EL	No data	No data	No data	No data	3.22

Effluent intake concentration 3.69

Pu-238 incremental concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	12	0.12	2.40	23.56	8.28
211T *On*	12	0.12	1.76	15.78	6.63
212 *On*	12	0.12	1.85	18.17	7.21
212T *On*	12	0.12	3.07	17.16	7.37
213R *On*	12	0.12	29.57	1,994.6	354.26
213RT *On*	12	0.12	8.64	1,292.2	259.65
214R *On*	12	0.12	2.52	11.22	5.55
214RT *On*	12	0.12	1.85	11.27	5.50
215 *On*	12	0.12	0.20	5.20	2.56
215T *On*	12	0.12	0.85	73.19	9.17
216 *On*	12	0.12	0.64	30.53	11.27
216T *On*	12	0.12	1.05	29.99	8.36
217 *On*	12	0.12	0.40	6.89	2.59
217T *On*	12	0.12	0.20	21.90	4.28
N	168	14	14	14	14
Min.	No data	0.12	0.2	5.20	2.56
Max.	No data	0.12	29.57	1994.60	354.26
Median	No data	0.12	1.805	20.04	7.29
Mean	No data	0.12	3.92857	253.69	49.48
StdDev	No data	0	7.68072	604.89	110.68
101 *Off*	4	0.03	0.52	1.27	0.81
102 *Off*	4	0.03	1.96	6.92	4.42
103 *Off*	4	0.03	1.68	7.63	3.60
104 *Off*	4	0.03	0.82	3.51	1.85
105 *Off*	4	0.03	0.11	0.43	0.32
108 *Off*	4	0.03	BEL	2.10	0.60
110 *Off*	4	0.03	BEL	0.34	0.07
111 *Off*	4	0.03	0.11	0.20	0.16
112 *Off*	4	0.03	0.16	0.39	0.26
115 *Off*	4	0.03	0.05	0.14	0.10
118 *Off*	4	0.03	0.66	1.10	0.86
122 *Off*	12	0.12	0.32	2.20	1.37
123 *Off*	12	0.12	1.48	8.40	4.12
124 *Off*	12	0.12	2.44	47.32	13.19
N	80	14	12	14	14
Min.	No data	0.03	0.05	0.14	0.07
Max.	No data	0.12	2.44	47.32	13.19
Median	No data	0.03	0.59	1.69	0.84
Mean	No data	0.05	0.86	5.85	2.27
StdDev	No data	0.04	0.82	12.28	3.50
EL	No data	No data	No data	No data	0.05

Effluent intake concentration 7.29

Pu-239, -240 incremental concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	12	0.2	BEL	1.31	0.44
211T *On*	12	0.2	BEL	1.47	0.34
212 *On*	12	0.2	BEL	0.92	0.26
212T *On*	12	0.2	BEL	0.73	0.25
213R *On*	12	0.2	0.06	14.14	3.50
213RT *On*	12	0.2	0.47	6.71	2.14
214R *On*	12	0.2	BEL	1.05	0.32
214RT *On*	12	0.2	BEL	1.02	0.30
215 *On*	12	0.2	BEL	0.71	0.17
215T *On*	12	0.2	BEL	1.76	0.28
216 *On*	12	0.2	BEL	1.19	0.42
216T *On*	12	0.2	BEL	0.92	0.35
217 *On*	12	0.2	BEL	0.84	0.15
217T *On*	12	0.2	BEL	0.30	0.10
N	168	14	2	14	14
Min.	No data	0.2	0.06	0.30	0.10
Max.	No data	0.2	0.47	14.14	3.50
Median	No data	0.2	0.265	1.04	0.31
Mean	No data	0.2	0.265	2.36	0.64
StdDev	No data	3E–09	0.2899	3.73	0.96
101 *Off*	4	0.05	0.10	0.38	0.19
102 *Off*	4	0.05	BEL	0.74	0.32
103 *Off*	4	0.05	BEL	0.12	0.04
104 *Off*	4	0.05	BEL	0.08	0.03
105 *Off*	4	0.05	BEL	0.05	0.01
108 *Off*	4	0.05	0.03	0.95	0.28
110 *Off*	4	0.05	BEL	0.13	0.05
111 *Off*	4	0.05	BEL	0.60	0.18
112 *Off*	4	0.05	BEL	0.15	0.04
115 *Off*	4	0.05	BEL	0.16	0.05
118 *Off*	4	0.05	BEL	0.26	0.06
122 *Off*	12	0.2	BEL	0.32	0.11
123 *Off*	12	0.2	BEL	0.83	0.21
124 *Off*	12	0.2	BEL	1.61	0.44
N	80	14	2	14	14
Min.	No data	0.05	0.03	0.05	0.01
Max.	No data	0.20	0.10	1.61	0.44
Median	No data	0.05	0.07	0.29	0.09
Mean	No data	0.08	0.07	0.46	0.14
StdDev	No data	0.06	0.05	0.45	0.13
EL	No data	No data	No data	No data	0.07

Effluent intake concentration 0.31

a. Source: EG&G (1995b),
b. BEL = below environmental level; EL = environmental (activity concentration) level; LDL = lower detection limit at 95% confidence level; No data = not applicable.
c. T indicates 2-m sampling height.

ATTACHMENT D
ENVIRONMENTAL AIR SAMPLING DATA FOR 1959 TO 1972 (continued)

Table D-24. Mound air monitoring data for 1996.[a,b]

HTO incremental concentration (10^{-12} µCi/mL)

Location[c]	Samples	LDL	Min.	Max.	Mean
211 *On*	52	35	BEL	32.51	9.43
211T *On*	No data	No data	No data	No data	No data
212 *On*	51	30	BEL	114.80	9.12
212T *On*	No data	No data	No data	No data	No data
213R *On*	50	30	BEL	50.07	9.16
213RT *On*	No data	No data	No data	No data	No data
214R *On*	50	30	BEL	25.45	6.94
214RT *On*	No data	No data	No data	No data	No data
215 *On*	52	30	BEL	20.26	5.55
215T *On*	No data	No data	No data	No data	No data
216 *On*	52	30	BEL	27.29	5.77
216T *On*	No data	No data	No data	No data	No data
217 *On*	49	30	BEL	23.62	4.89
217T *On*	No data	No data	No data	No data	No data
N	356	7	0	7	7
Min.	No data	30	BEL	20.26	4.89
Max.	No data	35	BEL	114.80	9.43
Median	No data	30	No data	27.29	6.94
Mean	No data	30.7	No data	42.00	7.27
StdDev	No data	1.9	No data	33.56	1.94
101 *Off*	49	23	BEL	41.76	5.09
102 *Off*	52	23	BEL	129.01	9.45
103 *Off*	52	23	BEL	41.84	4.73
104 *Off*	52	23	BEL	23.05	4.44
105 *Off*	51	23	BEL	24.41	6.02
108 *Off*	51	23	BEL	17.42	1.75
110 *Off*	52	23	BEL	19.69	0.80
111 *Off*	52	23	BEL	22.61	0.99
112 *Off*	52	23	BEL	22.97	2.07
115 *Off*	52	23	BEL	16.73	1.62
118 *Off*	52	23	BEL	18.43	3.16
122 *Off*	51	23	BEL	23.22	3.81
123 *Off*	52	23	BEL	24.33	6.82
124 *Off*	50	23	BEL	33.85	5.69
CLN	11	23	BEL	17.16	3.86
CLS	11	23	BEL	15.83	4.17
N	742	16	0	16	16
Min.	No data	23	BEL	15.83	0.80
Max.	No data	23	BEL	129.01	9.45
Median	No data	23	No data	23.01	4.02
Mean	No data	23	No data	30.77	4.03
StdDev	No data	0	No data	27.43	2.32
EL	No data	No data	No data	No data	4.64

Effluent intake concentration 6.94

Pu-238 incremental concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	12	0.5	2.34	13.28	5.42
211T *On*	12	0.5	1.50	12.68	4.27
212 *On*	12	0.5	1.37	20.01	5.76
212T *On*	12	0.5	0.78	10.42	4.05
213R *On*	12	0.5	33.35	216.55	89.12
213RT *On*	12	0.5	17.08	205.52	65.86
214R *On*	12	0.5	1.12	65.17	17.12
214RT *On*	12	0.5	1.81	95.57	20.59
215 *On*	12	0.5	1.06	124.83	27.64
215T *On*	12	0.5	1.25	236.86	51.59
216 *On*	12	0.5	1.04	13.70	5.03
216T *On*	12	0.5	1.18	13.99	6.12
217 *On*	12	0.5	0.18	4.51	1.43
217T *On*	12	0.5	0.34	6.19	1.69
N	168	14	14	14	14
Min.	No data	0.5	0.18	4.51	1.43
Max.	No data	0.5	33.35	236.86	89.12
Median	No data	0.5	1.22	17.00	5.94
Mean	No data	0.5	4.60	74.23	21.84
StdDev	No data	0.0	9.31	86.97	27.61
101 *Off*	4	0.4	0.03	0.38	0.25
102 *Off*	4	0.4	0.64	18.58	5.86
103 *Off*	4	0.4	1.13	3.87	2.32
104 *Off*	4	0.4	0.33	2.79	1.22
105 *Off*	4	0.4	0.00	0.37	0.19
108 *Off*	4	0.4	BEL	0.07	BEL
110 *Off*	4	0.4	BEL	0.35	0.06
111 *Off*	4	0.4	BEL	0.24	0.12
112 *Off*	4	0.4	BEL	0.29	0.13
115 *Off*	4	0.4	BEL	0.06	BEL
118 *Off*	4	0.4	0.04	3.22	1.18
122 *Off*	12	0.5	0.09	3.70	1.07
123 *Off*	12	0.5	1.10	45.95	14.83
124 *Off*	12	0.5	0.89	24.40	6.45
CLN	3	0.4	0.92	4.34	2.26
CLS	3	0.4	1.62	8.27	3.91
N	86	16	11	16	14
Min.	No data	0.4	0.00	0.06	0.06
Max.	No data	0.5	1.62	45.95	14.83
Median	No data	0.4	0.64	3.01	1.20
Mean	No data	0.42	0.62	7.31	2.85
StdDev	No data	0.04	0.56	12.47	4.04
EL	No data	No data	No data	No data	No data

Effluent intake concentration 5.94

Pu-239, -240 incremental concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	12	0.4	BEL	0.52	BEL
211T *On*	12	0.4	BEL	0.62	BEL
212 *On*	12	0.4	BEL	1.00	0.001
212T *On*	12	0.4	BEL	0.12	BEL
213R *On*	12	0.4	BEL	1.46	0.18
213RT *On*	12	0.4	BEL	0.71	0.04
214R *On*	12	0.4	BEL	19.16	1.49
214RT *On*	12	0.4	BEL	3.90	0.35
215 *On*	12	0.4	BEL	0.29	0.01
215T *On*	12	0.4	BEL	1.46	0.18
216 *On*	12	0.4	BEL	1.18	0.08
216T *On*	12	0.4	BEL	0.21	BEL
217 *On*	12	0.4	BEL	0.38	BEL
217T *On*	12	0.4	BEL	1.35	0.01
N	168	14	0	14	9
Min.	No data	0.4	BEL	0.12	0.00
Max.	No data	0.4	BEL	19.16	1.49
Median	No data	0.4	No data	0.86	0.08
Mean	No data	0.4	No data	2.31	0.26
StdDev	No data	0.0	No data	4.94	0.48
101 *Off*	4	0.2	BEL	1.71	0.62
102 *Off*	4	0.2	BEL	1.48	0.47
103 *Off*	4	0.2	BEL	0.07	BEL
104 *Off*	4	0.2	BEL	0.28	0.01
105 *Off*	4	0.2	BEL	0.15	BEL
108 *Off*	4	0.2	BEL	0.60	0.07
110 *Off*	4	0.2	BEL	0.27	0.04
111 *Off*	4	0.2	BEL	BEL	BEL
112 *Off*	4	0.2	BEL	0.80	0.03
115 *Off*	4	0.2	BEL	0.56	0.13
118 *Off*	4	0.2	BEL	0.66	0.22
122 *Off*	12	0.4	BEL	BEL	BEL
123 *Off*	12	0.4	BEL	1.61	0.11
124 *Off*	12	0.4	BEL	1.52	BEL
CLN	3	0.2	BEL	BEL	BEL
CLS	3	0.2	BEL	BEL	BEL
N	86	16	0	12	9
Min.	No data	0.2	BEL	0.07	0.01
Max.	No data	0.4	BEL	1.71	0.62
Median	No data	0.2	No data	0.63	0.11
Mean	No data	0.24	No data	0.81	0.19
StdDev	No data	0.08	No data	0.61	0.21
EL	No data	No data	No data	No data	0.25

Effluent intake concentration 0.08

a. Source: EG&G (1997).
b. BEL = below environmental level; EL = environmental (activity concentration) level; LDL = lower detection limit at 95% confidence level; No data = not applicable.
c. T indicates 2-m sampling height.

ATTACHMENT D
ENVIRONMENTAL AIR SAMPLING DATA FOR 1959 TO 1972 (continued)

Table D-25. Mound air monitoring data for 1997.[a,b]

HTO incremental concentration (10^{-12} µCi/mL)

Location[c]	Samples	LDL	Min.	Max.	Mean
211 *On*	49	35	BEL	27.08	9.04
212 *On*	53	31	BEL	80.13	11.80
213 *On*	53	31	BEL	39.75	9.93
214 *On*	53	31	BEL	35.32	7.19
215 *On*	32	31	BEL	26.76	6.30
215T *On*	No data	No data	No data	No data	No data
216 *On*	53	31	BEL	18.24	5.77
217 *On*	49	31	BEL	18.92	1.97
N	342	7	0	7	7
Min.	No data	31	BEL	18.24	1.97
Max.	No data	35	BEL	80.13	11.80
Median	No data	31	No data	27.08	7.19
Mean	No data	31.6	No data	35.17	7.43
StdDev	No data	1.5	No data	21.33	3.21
101 *Off*	51	22	BEL	40.64	3.08
102 *Off*	52	22	BEL	51.14	6.51
103 *Off*	52	22	BEL	59.79	4.93
104 *Off*	52	22	BEL	26.96	2.93
105 *Off*	49	22	BEL	43.57	3.44
111 *Off*	51	22	BEL	37.57	2.04
112 *Off*	52	22	BEL	24.08	1.03
115 *Off*	49	22	BEL	22.99	0.13
118 *Off*	52	22	BEL	39.67	1.92
122 *Off*	51	22	BEL	30.73	4.03
123 *Off*	51	22	BEL	41.64	6.11
124 *Off*	50	22	BEL	41.56	8.58
CLN *Off*	52	22	BEL	27.25	2.02
CLS *Off*	50	22	BEL	31.15	3.65
N	714	14	0	14	14
Min.	No data	22	BEL	22.99	0.13
Max.	No data	22	BEL	59.79	8.58
Median	No data	22	No data	38.62	3.26
Mean	No data	22	No data	37.05	3.60
StdDev	No data	0	No data	10.59	2.30
EL	No data	No data	No data	No data	5.74

Effluent intake concentration 7.19

Pu-238 incremental concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	12	0.5	2.17	33.50	9.31
212 *On*	12	0.5	1.25	5.19	3.02
213 *On*	12	0.5	2.89	141.76	33.35
214 *On*	12	0.5	5.85	56.08	31.89
215 *On*	9	0.5	22.54	81.56	44.66
215T *On*	9	0.5	41.38	98.76	57.70
216 *On*	12	0.5	1.58	9.87	3.54
217 *On*	12	0.5	0.12	1.93	0.80
N	90	8	8	8	8
Min.	No data	0.5	0.12	1.93	0.80
Max.	No data	0.5	41.38	141.76	57.70
Median	No data	0.5	2.53	44.79	20.60
Mean	No data	0.5	9.7225	53.58	23.03
StdDev	No data	0.0	14.7	50.61	21.77
101 *Off*	4	0.2	0.26	0.60	0.44
102 *Off*	4	0.2	1.00	6.69	3.26
103 *Off*	4	0.2	0.76	2.26	1.38
104 *Off*	12	0.5	0.09	2.27	0.75
105 *Off*	4	0.2	0.27	0.83	0.45
111 *Off*	4	0.2	BEL	0.18	0.50
112 *Off*	4	0.2	0.22	0.51	0.37
115 *Off*	4	0.2	BEL	0.84	0.15
118 *Off*	4	0.2	0.12	0.44	0.27
122 *Off*	12	0.5	BEL	19.58	4.33
123 *Off*	12	0.5	6.37	318.17	65.59
124 *Off*	12	0.5	1.02	9.33	3.98
CLN *Off*	12	0.5	0.66	44.34	14.26
CLS *Off*	12	0.5	1.65	28.30	11.92
N	104	14	11	14	14
Min.	No data	0.2	0.09	0.18	0.15
Max.	No data	0.5	6.37	318.17	65.59
Median	No data	0.2	0.66	2.27	1.07
Mean	No data	0.33	1.13	31.02	7.69
StdDev	No data	0.15	1.80	83.69	17.25
EL	No data	No data	No data	No data	0.06

Effluent intake concentration 20.60

Pu-239, -240 incremental concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	12	0.3	BEL	0.20	BEL
212 *On*	12	0.3	BEL	BEL	BEL
213 *On*	12	0.3	BEL	0.85	BEL
214 *On*	12	0.3	BEL	0.10	BEL
215 *On*	9	0.3	BEL	0.33	BEL
215T *On*	8	0.3	BEL	0.25	BEL
216 *On*	12	0.3	BEL	BEL	BEL
217 *On*	12	0.3	BEL	0.31	BEL
N	89	8	0	6	0
Min.	No data	0.3	BEL	0.10	BEL
Max.	No data	0.3	BEL	0.85	BEL
Median	No data	0.3	No data	0.28	No data
Mean	No data	0.3	No data	0.34	No data
StdDev	No data	0.0	No data	0.26	No data
101 *Off*	4	0.1	BEL	BEL	BEL
102 *Off*	4	0.1	BEL	1.31	BEL
103 *Off*	4	0.1	BEL	BEL	BEL
104 *Off*	4	0.1	BEL	0.09	BEL
105 *Off*	4	0.1	BEL	0.45	0.14
111 *Off*	4	0.1	BEL	1.27	0.06
112 *Off*	4	0.1	BEL	BEL	BEL
115 *Off*	4	0.1	BEL	BEL	BEL
118 *Off*	4	0.1	BEL	0.79	BEL
122 *Off*	12	0.3	BEL	1.67	BEL
123 *Off*	12	0.3	BEL	0.65	BEL
124 *Off*	12	0.3	BEL	0.09	BEL
CLN *Off*	12	0.3	BEL	0.58	BEL
CLS *Off*	12	0.3	BEL	0.22	BEL
N	96	14	0	10	2
Min.	No data	0.1	BEL	0.09	0.06
Max.	No data	0.3	BEL	1.67	0.14
Median	No data	0.1	No data	0.62	0.10
Mean	No data	0.17	No data	0.71	0.10
StdDev	No data	0.10	No data	0.55	0.06
EL	No data	No data	No data	No data	0.43

Effluent intake concentration 0.00

ATTACHMENT D
ENVIRONMENTAL AIR SAMPLING DATA FOR 1959 TO 1972 (continued)

Th-228 incremental concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
213 *On*	12	0.7	BEL	8.25	1.61
215T *On*	9	0.7	1.12	11.57	4.38
216 *On*	12	0.7	BEL	4.8	BEL
N	33	3	1	3	2
Min.	No data	0.7	1.12	4.80	1.61
Max.	No data	0.7	1.12	11.57	4.38
Median	No data	0.7	No data	8.25	3.00
Mean	No data	0.7	No data	8.21	3.00
StdDev	No data	0.0	No data	3.39	1.96
124 *Off*	12	0.7	BEL	10.63	1.53
N	12	1	0	1	1
Min.	No data	0.7	BEL	10.63	1.53
Max.	No data	0.7	BEL	10.63	1.53
Median	No data	No data	No data	No data	No data
Mean	No data	No data	No data	No data	No data
StdDev	No data	No data	No data	No data	No data
EL	No data	No data	No data	No data	7.37

Effluent intake concentration 3.00

Th-230 incremental concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
213 *On*	12	1.1	BEL	13.6	2.77
215T *On*	9	1.1	BEL	17.5	6.17
216 *On*	12	1.1	BEL	7.87	BEL
N	33	3	0	3	2
Min.	No data	1.1	BEL	7.87	2.77
Max.	No data	1.1	BEL	17.5	6.17
Median	No data	1.1	No data	13.6	4.47
Mean	No data	1.1	No data	13	4.47
StdDev	No data	0.0	No data	4.85	2.4
124 *Off*	12	1.1	BEL	14.2	2.37
N	12	0	0	1	1
Min.	No data	BEL	BEL	14.2	2.37
Max.	No data	BEL	BEL	14.2	2.37
Median	No data	No data			
Mean	No data	No data			
StdDev	No data	No data			
EL	No data	No data	No data	No data	8.3

Effluent intake concentration 4.47

Th-232 incremental concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
213 *On*	12	0.6	BEL	5.10	0.21
215T *On*	9	0.6	BEL	10.04	4.07
216 *On*	12	0.6	BEL	5.68	BEL
N	33	3	0	3	2
Min.	No data	0.6	BEL	5.10	0.21
Max.	No data	0.6	BEL	10.04	4.07
Median	No data	0.6	No data	5.68	2.14
Mean	No data	0.6	No data	6.94	2.14
StdDev	No data	0.0	No data	2.70	2.73
124 *Off*	12	0.6	BEL	10.35	0.45
N	12	1	0	1	1
Min.	No data	0.6	BEL	10.35	0.45
Max.	No data	0.6	BEL	10.35	0.45
Median	No data	No data	No data	No data	No data
Mean	No data	No data	No data	No data	No data
StdDev	No data	No data	No data	No data	No data
EL	No data	No data	No data	6.57	6.52

Effluent intake concentration 2.14

a. Source: BWXT (1998).
b. BEL = below environmental level; CLN = center line north; CLS = center line south; EL = environmental (activity concentration) level; LDL = lower detection limit at 95% confidence level; No data = not applicable; StdDev = standard deviation.
c. T indicates 2-m sampling height.

ATTACHMENT D
ENVIRONMENTAL AIR SAMPLING DATA FOR 1959 TO 1972 (continued)

Table D-26. Mound air monitoring data for 1998.[a,b]

HTO incremental concentration (10^{-12} µCi/mL)

Location[c]	Samples	LDL	Min.	Max.	Mean
211 *On*	51	33	BEL	38.17	12.72
212 *On*	51	30	BEL	64.83	13.44
213 *On*	51	30	BEL	37.93	9.93
214 *On*	51	30	BEL	31.19	10.19
215 *On*	52	30	BEL	40.71	10.38
215T *On*	No data	No data	No data	No data	No data
216 *On*	49	30	BEL	27.28	7.95
217 *On*	50	30	BEL	30.34	6.69
218 *On*	24	30	BEL	44.72	8.45
N	379	8	0	8	8
Min.	No data	30	BEL	27.28	6.69
Max.	No data	33	BEL	64.83	13.44
Median	No data	30	No data	38.05	10.06
Mean	No data	30.4	No data	39.40	9.97
StdDev	No data	1.1	No data	11.81	2.30
101 *Off*	51	28	BEL	61.37	8.09
102 *Off*	51	28	BEL	89.10	11.57
103 *Off*	50	28	BEL	41.06	6.96
104 *Off*	51	28	BEL	36.58	8.53
105 *Off*	51	28	BEL	42.56	4.12
111 *Off*	51	28	BEL	31.25	2.08
112 *Off*	51	28	BEL	25.85	5.32
115 *Off*	49	28	BEL	28.88	4.65
118 *Off*	51	28	BEL	37.41	5.91
122 *Off*	19	28	BEL	20.64	3.23
123 *Off*	9	28	BEL	10.00	3.87
124 *Off*	51	28	BEL	47.12	11.36
CLN *Off*	39	28	BEL	57.13	5.60
CLS *Off*	21	28	BEL	35.09	7.64
N	595	14	0	14	14
Min.	No data	28	BEL	10.00	2.08
Max.	No data	28	BEL	89.10	11.57
Median	No data	28	No data	37.00	5.76
Mean	No data	28	No data	40.29	6.35
StdDev	No data	0	No data	19.49	2.85
EL	No data	No data	No data	BEL	3.68

Effluent intake concentration 10.06

Pu-238 incremental concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	12	1.0	BEL	7.13	1.69
212 *On*	12	1.0	BEL	1.66	BEL
213 *On*	12	1.0	BEL	13.33	5.38
214 *On*	12	1.0	BEL	24.22	7.60
215 *On*	12	1.0	BEL	15.65	4.84
215T *On*	12	1.0	BEL	20.83	5.69
216 *On*	12	1.0	BEL	12.28	0.06
217 *On*	12	1.0	BEL	BEL	BEL
218 *On*	6	1.0	BEL	1.72	BEL
N	102	9	0	8	6
Min.	No data	1	BEL	1.66	0.06
Max.	No data	1	BEL	24.22	7.60
Median	No data	1	No data	12.81	5.11
Mean	No data	1	No data	12.10	4.21
StdDev	No data	0.0	No data	8.27	2.79
101 *Off*	4	0.2	BEL	15.60	1.53
102 *Off*	4	0.2	BEL	14.00	2.34
103 *Off*	4	0.2	BEL	11.30	1.44
104 *Off*	12	1.0	BEL	0.11	BEL
105 *Off*	4	0.2	BEL	13.68	1.60
111 *Off*	4	0.2	BEL	19.27	2.76
112 *Off*	4	0.2	BEL	14.98	1.87
115 *Off*	4	0.2	BEL	9.22	0.20
118 *Off*	4	0.2	BEL	13.64	1.18
122 *Off*	5	1.0	BEL	24.35	5.73
123 *Off*	3	0.2	2.96	21.93	9.36
124 *Off*	12	1.0	BEL	2.10	BEL
CLN *Off*	11	1.0	BEL	16.15	2.30
CLS *Off*	5	1.0	1.21	40.62	11.15
N	80	14	2	14	12
Min.	No data	0.2	1.21	0.11	0.20
Max.	No data	1.0	2.96	40.62	11.15
Median	No data	0.2	2.09	14.49	2.09
Mean	No data	0.49	2.09	15.50	3.46
StdDev	No data	0.40	1.24	9.80	3.46
EL	No data	No data	No data	BEL	3.33

Effluent intake concentration 5.11

Pu-239, -240 incremental concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	12	0.5	BEL	5.93	0.07
212 *On*	12	0.5	BEL	BEL	BEL
213 *On*	12	0.5	BEL	0.97	BEL
214 *On*	12	0.5	BEL	0.14	BEL
215 *On*	9	0.5	BEL	0.06	BEL
215T *On*	8	0.5	BEL	0.76	BEL
216 *On*	12	0.5	BEL	0.16	BEL
217 *On*	12	0.5	BEL	0.04	BEL
218 *On*	6	0.5	BEL	0.31	BEL
N	95	9	0	8	1
Min.	No data	0.5	BEL	0.04	0.07
Max.	No data	0.5	BEL	5.93	0.07
Median	No data	0.5	No data	0.24	No data
Mean	No data	0.5	No data	1.05	No data
StdDev	No data	0.0	No data	2.00	No data
101 *Off*	4	0.2	BEL	BEL	BEL
102 *Off*	4	0.2	BEL	BEL	BEL
103 *Off*	4	0.2	BEL	BEL	BEL
104 *Off*	12	0.5	BEL	3.10	BEL
105 *Off*	4	0.2	BEL	BEL	BEL
111 *Off*	4	0.2	BEL	BEL	BEL
112 *Off*	4	0.2	BEL	BEL	BEL
115 *Off*	4	0.2	BEL	BEL	BEL
118 *Off*	4	0.2	BEL	BEL	BEL
122 *Off*	5	0.5	BEL	BEL	BEL
123 *Off*	3	0.5	BEL	BEL	BEL
124 *Off*	12	0.5	BEL	0.01	BEL
CLN *Off*	11	0.5	BEL	BEL	BEL
CLS *Off*	5	0.5	BEL	0.58	BEL
N	80	14	0	3	0
Min.	No data	0.2	BEL	0.01	BEL
Max.	No data	0.5	BEL	3.10	BEL
Median	No data	0.2	No data	0.58	No data
Mean	No data	0.329	No data	1.23	No data
StdDev	No data	0.154	No data	1.64	No data
EL	No data	No data	No data	BEL	0.62

Effluent intake concentration 0.07

ATTACHMENT D
ENVIRONMENTAL AIR SAMPLING DATA FOR 1959 TO 1972 (continued)

Th-228 incremental concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
213 *On*	12	0.6	BEL	3.20	BEL
215T *On*	12	0.6	BEL	3.22	BEL
216 *On*	12	0.6	BEL	1.22	BEL
218 *On*	6	0.6	BEL	1.33	BEL
N	42	4	0	4	0
Min.	No data	0.6	BEL	1.22	BEL
Max.	No data	0.6	BEL	3.22	BEL
Median	No data	0.6	No data	2.27	No data
Mean	No data	0.6	No data	2.24	No data
StdDev	No data	0.0	No data	1.12	No data
124 *Off*	12	0.6	BEL	5.57	BEL
N	12	1	0	1	0
Min.	No data	0.6	BEL	5.57	BEL
Max.	No data	0.6	BEL	5.57	BEL
Median	No data	No data	No data	No data	No data
Mean	No data	No data	No data	No data	No data
StdDev	No data	No data	No data	No data	No data
EL	No data	No data	No data	No data	7.64

Effluent intake concentration 0.00

Th-230 incremental concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
213 *On*	12	0.9	BEL	3.29	BEL
215T *On*	12	0.9	BEL	4.01	BEL
216 *On*	12	0.9	BEL	6.43	BEL
218 *On*	6	0.9	BEL	1.71	BEL
N	42	4	0	4	0
Min.	No data	0.9	BEL	1.71	BEL
Max.	No data	0.9	BEL	6.43	BEL
Median	No data	0.9	No data	3.65	No data
Mean	No data	0.9	No data	3.86	No data
StdDev	No data	0.0	No data	1.96	No data
124 *Off*	12	0.9	BEL	9.29	BEL
N	12	1	0	1	0
Min.	No data	0.9	BEL	9.29	BEL
Max.	No data	0.9	BEL	9.29	BEL
Median	No data	No data	No data	No data	No data
Mean	No data	No data	No data	No data	No data
StdDev	No data	No data	No data	No data	No data
EL	No data	No data	No data	No data	8.11

Effluent intake concentration 0.00

Th-232 incremental concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
213 *On*	12	0.6	BEL	6.50	0.40
215T *On*	12	0.6	BEL	4.75	0.14
216 *On*	12	0.6	BEL	2.65	0.18
218 *On*	6	0.6	BEL	3.53	BEL
N	42	4	0	4	3
Min.	No data	0.6	BEL	2.65	0.14
Max.	No data	0.6	BEL	6.50	0.40
Median	No data	0.6	No data	4.14	0.18
Mean	No data	0.6	No data	4.36	0.24
StdDev	No data	0.0	No data	1.67	0.14
124 *Off*	12	0.6	BEL	4.06	0.44
N	12	1	0	1	1
Min.	No data	0.6	BEL	4.06	0.44
Max.	No data	0.6	BEL	4.06	0.44
Median	No data	No data	No data	No data	No data
Mean	No data	No data	No data	No data	No data
StdDev	No data	No data	No data	No data	No data
EL	No data	No data	No data	No data	5.58

Effluent intake concentration 0.18

a. Source: BWXT (1999).
b. BEL = below environmental level; CLN = center line north; CLS = center line south; EL = environmental (activity concentration) level; LDL = lower detection limit at 95% confidence level; No data = not applicable; StdDev = standard deviation.
c. T indicates 2-m sampling height.

ATTACHMENT D
ENVIRONMENTAL AIR SAMPLING DATA FOR 1959 TO 1972 (continued)

Table D-27. Mound air monitoring data for 1999.[a,b]

HTO incremental concentration (10^{-12} µCi/mL)

Location[c]	Samples	LDL	Min.	Max.	Mean
211 *On*	51	35	BEL	38.75	10.67
212 *On*	36	31	BEL	98.41	19.86
213 *On*	50	31	BEL	56.60	9.91
214 *On*	51	31	BEL	34.47	8.12
215 *On*	48	31	BEL	33.21	8.80
215T *On*	No data	No data	No data	No data	No data
216 *On*	49	31	BEL	29.82	7.01
217 *On*	51	31	BEL	61.29	5.95
218 *On*	51	31	BEL	41.63	5.12
N	387	8	0	8	8
Min.	No data	31	BEL	29.82	5.12
Max.	No data	35	BEL	98.41	19.86
Median	No data	31	No data	40.19	8.45
Mean	No data	31.5	No data	49.27	9.43
StdDev	No data	1.4	No data	22.79	4.62
101 *Off*	50	47	BEL	26.12	4.10
102 *Off*	48	47	BEL	44.26	7.46
103 *Off*	49	47	BEL	72.32	3.98
104 *Off*	50	47	BEL	35.52	3.21
105 *Off*	50	47	BEL	27.73	2.61
111 *Off*	47	47	BEL	21.86	0.42
112 *Off*	48	47	BEL	25.74	3.45
115 *Off*	49	47	BEL	20.43	BEL
118 *Off*	44	47	BEL	28.55	1.07
124 *Off*	49	47	BEL	51.50	7.73
CLN *Off*	50	47	BEL	22.78	3.05
N	534	11	0	11	10
Min.	No data	47	BEL	20.43	0.42
Max.	No data	47	BEL	72.32	7.73
Median	No data	47	No data	27.73	3.33
Mean	No data	47	No data	34.26	3.71
StdDev	No data	0	No data	15.93	2.36
EL	No data	No data	No data	No data	4.02

Effluent intake concentration 8.45

Pu-238 incremental concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	12	0.7	BEL	0.30	BEL
212 *On*	8	0.7	BEL	BEL	BEL
213 *On*	12	0.7	BEL	9.49	1.30
214 *On*	12	0.7	BEL	5.53	BEL
215 *On*	12	0.7	BEL	0.79	BEL
215T *On*	12	0.7	BEL	2.66	BEL
216 *On*	12	0.7	BEL	12.08	BEL
217 *On*	10	0.7	BEL	BEL	BEL
218 *On*	12	0.7	BEL	37.92	1.56
N	102	9	0	7	2
Min.	No data	0.7	BEL	0.30	1.30
Max.	No data	0.7	BEL	37.92	1.56
Median	No data	0.7	No data	5.53	1.43
Mean	No data	0.7	No data	9.82	1.43
StdDev	No data	0.0	No data	13.14	0.18
101 *Off*	4	0.1	BEL	2.41	BEL
102 *Off*	4	0.1	BEL	10.52	2.83
103 *Off*	4	0.1	BEL	8.34	0.02
104 *Off*	12	0.7	BEL	BEL	BEL
105 *Off*	4	0.1	BEL	10.34	BEL
111 *Off*	4	0.1	BEL	10.34	BEL
112 *Off*	3	0.1	BEL	3.47	BEL
115 *Off*	4	0.1	BEL	12.91	0.37
118 *Off*	4	0.1	BEL	9.11	BEL
124 *Off*	12	0.7	BEL	BEL	BEL
CLN *Off*	11	0.7	BEL	BEL	BEL
N	66	11	0	8	3
Min.	No data	0.1	BEL	2.41	0.02
Max.	No data	0.7	BEL	12.91	2.83
Median	No data	0.1	No data	9.73	0.37
Mean	No data	0.26	No data	8.43	1.07
StdDev	No data	0.28	No data	3.65	1.53
EL	No data	No data	No data	No data	6.6

Effluent intake concentration 1.43

Pu-239, -240 incremental concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	12	0.6	BEL	3.09	0.13
212 *On*	8	0.6	BEL	0.32	BEL
213 *On*	12	0.6	BEL	1.52	0.24
214 *On*	12	0.6	BEL	0.78	BEL
215 *On*	12	0.6	BEL	0.93	BEL
215T *On*	12	0.6	BEL	1.17	BEL
216 *On*	12	0.6	BEL	0.68	0.08
217 *On*	10	0.6	BEL	0.92	BEL
218 *On*	12	0.6	BEL	1.16	0.16
N	102	9	0	9	4
Min.	No data	0.6	BEL	0.32	0.08
Max.	No data	0.6	BEL	3.09	0.24
Median	No data	0.6	No data	0.93	0.15
Mean	No data	0.6	No data	1.17	0.15
StdDev	No data	0.0	No data	0.79	0.07
101 *Off*	4	0.1	BEL	0.02	BEL
102 *Off*	4	0.1	BEL	0.32	BEL
103 *Off*	4	0.1	BEL	BEL	BEL
104 *Off*	12	0.6	BEL	0.80	0.01
105 *Off*	4	0.1	BEL	BEL	BEL
111 *Off*	4	0.1	BEL	BEL	BEL
112 *Off*	3	0.1	BEL	BEL	BEL
115 *Off*	4	0.1	BEL	BEL	BEL
118 *Off*	4	0.1	BEL	0.91	0.01
124 *Off*	12	0.6	BEL	0.91	BEL
CLN *Off*	12	0.6	BEL	1.54	BEL
N	67	11	0	6	2
Min.	No data	0.1	BEL	0.02	0.01
Max.	No data	0.6	BEL	1.54	0.01
Median	No data	0.1	No data	0.86	0.01
Mean	No data	0.2	No data	0.75	0.01
StdDev	No data	0.2	No data	0.53	0.00
EL	No data	No data	No data	No data	0.64

Effluent intake concentration 0.15

ATTACHMENT D
ENVIRONMENTAL AIR SAMPLING DATA FOR 1959 TO 1972 (continued)

Th-228 incremental concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
213 *On*	12	0.6	BEL	14.78	5.55
215T *On*	12	0.6	BEL	10.64	4.02
216 *On*	12	0.6	BEL	18.52	5.18
218 *On*	12	0.6	BEL	19.56	3.02
N	48	4	0	4	4
Min.	No data	0.6	BEL	10.64	3.02
Max.	No data	0.6	BEL	19.56	5.55
Median	No data	0.6	No data	16.65	4.60
Mean	No data	0.6	No data	15.88	4.44
StdDev	No data	0.0	No data	4.05	1.15
124 *Off*	12	0.6	BEL	13.72	3.22
N	12	1	0	1	1
Min.	No data	0.6	BEL	13.72	3.22
Max.	No data	0.6	BEL	13.72	3.22
Median	No data	No data	No data	No data	No data
Mean	No data	No data	No data	No data	No data
StdDev	No data	No data	No data	No data	No data
EL	No data	No data	No data	No data	5.46

Effluent intake concentration 4.60

Th-230 incremental concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
213 *On*	12	1.1	BEL	21.88	5.79
215T *On*	12	1.1	BEL	13.37	3.82
216 *On*	12	1.1	BEL	23.17	5.00
218 *On*	12	1.1	BEL	17.7	1.98
N	48	4	0	4	4
Min.	No data	1.1	BEL	13.37	1.98
Max.	No data	1.1	BEL	23.17	5.79
Median	No data	1.1	No data	19.79	4.41
Mean	No data	1.1	No data	19.03	4.15
StdDev	No data	0.0	No data	4.44	1.66
124 *Off*	12	1.3	BEL	13.72	3.22
N	12	1	0	1	1
Min.	No data	1.3	BEL	13.72	3.22
Max.	No data	1.3	BEL	13.72	3.22
Median	No data	No data	No data	No data	No data
Mean	No data	No data	No data	No data	No data
StdDev	No data	No data	No data	No data	No data
EL	No data	No data	No data	No data	6.44

Effluent intake concentration 4.41

Th-232 incremental concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
213 *On*	12	0.5	BEL	13.25	4.62
215T *On*	12	0.5	BEL	28.99	4.96
216 *On*	12	0.5	BEL	17.40	4.22
218 *On*	12	0.5	BEL	20.77	2.0
N	48	4	0	4	4
Min.	No data	0.5	BEL	13.25	2.00
Max.	No data	0.5	BEL	28.99	4.96
Median	No data	0.5	No data	19.09	4.42
Mean	No data	0.5	No data	20.10	3.95
StdDev	No data	0.0	No data	6.68	1.33
124 *Off*	12	0.5	BEL	20.77	2.0
N	12	1	0	1	1
Min.	No data	0.5	BEL	20.77	2.00
Max.	No data	0.5	BEL	20.77	2.00
Median	No data	No data	No data	No data	No data
Mean	No data	No data	No data	No data	No data
StdDev	No data	No data	No data	No data	No data
EL	No data	No data	No data	No data	4.78

Effluent intake concentration 4.42

a. Source: BWXT (2000).
b. BEL = below environmental level; CLN = center line north; EL = environmental (activity concentration) level; LDL = lower detection limit at 95% confidence level; No data = not applicable; StdDev = standard deviation.
c. T indicates 2-m sampling height.

ATTACHMENT D
ENVIRONMENTAL AIR SAMPLING DATA FOR 1959 TO 1972 (continued)

Table D-28. Mound air monitoring data for 2000.[a,b]

HTO incremental concentration (10^{-12} µCi/mL)

Location[c]	Samples	LDL	Min.	Max.	Mean
211 *On*	48	26	BEL	43.02	2.95
212 *On*	41	23	BEL	20.26	4.42
213 *On*	49	23	BEL	27.22	3.51
214 *On*	48	23	BEL	28.67	2.00
215 *On*	50	23	BEL	19.97	2.49
215T *On*	No data	No data	No data	No data	No data
216 *On*	49	23	BEL	40.15	2.06
217 *On*	50	23	BEL	23.53	0.96
218 *On*	51	23	BEL	33.26	0.93
N	386	8	0	8	8
Min.	No data	23	BEL	19.97	0.93
Max.	No data	26	BEL	43.02	4.42
Median	No data	23	No data	27.95	2.28
Mean	No data	23.4	No data	29.51	2.42
StdDev	No data	1.1	No data	8.69	1.20
101 *Off*	49	28	BEL	13.02	BEL
102 *Off*	49	28	BEL	23.84	2.34
103 *Off*	51	28	BEL	41.49	1.26
104 *Off*	51	28	BEL	28.63	0.02
105 *Off*	51	28	BEL	24.85	BEL
111 *Off*	49	28	BEL	14.07	BEL
112 *Off*	51	28	BEL	10.53	BEL
115 *Off*	51	28	BEL	7.51	BEL
118 *Off*	51	28	BEL	13.68	BEL
124 *Off*	51	28	BEL	26.57	3.41
CLN *Off*	51	28	BEL	24.68	BEL
N	555	11	0	11	4
Min.	No data	28	BEL	7.51	0.02
Max.	No data	28	BEL	41.49	3.41
Median	No data	28	No data	23.84	1.80
Mean	No data	28	No data	20.81	1.76
StdDev	No data	0	No data	10.01	1.45
EL	No data	No data	No data	No data	5.71

Effluent intake concentration 2.28

Pu-238 incremental concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	12	0.5	0.47	108.03	11.09
212 *On*	11	0.5	0.43	4.22	1.42
213 *On*	12	0.5	3.98	15.54	7.99
214 *On*	12	0.5	0.14	7.18	1.74
215 *On*	11	0.5	0.27	8.87	3.00
215T *On*	12	0.5	0.17	16.51	4.08
216 *On*	12	0.5	1.03	11.61	4.11
217 *On*	12	0.5	BEL	1.02	0.33
218 *On*	12	0.5	0.24	42.22	5.81
N	106	9	8	9	9
Min.	No data	0.5	0.14	1.02	0.33
Max.	No data	0.5	3.98	108.03	11.09
Median	No data	0.5	0.35	11.61	4.08
Mean	No data	0.5	0.84	23.91	4.40
StdDev	No data	0.0	1.3	33.74	3.43
101 *Off*	4	0.2	BEL	4.70	2.23
102 *Off*	4	0.2	0.31	1.13	0.73
103 *Off*	4	0.2	0.41	0.94	0.62
104 *Off*	12	0.5	BEL	1.62	0.31
105 *Off*	4	0.2	BEL	0.25	0.07
111 *Off*	4	0.2	BEL	0.68	0.15
112 *Off*	4	0.2	BEL	0.07	BEL
115 *Off*	4	0.2	BEL	0.05	BEL
118 *Off*	4	0.2	0.04	0.53	0.26
124 *Off*	12	0.5	0.72	2.90	1.55
CLN *Off*	12	0.5	BEL	1.55	0.56
N	68	11	4	11	9
Min.	No data	0.2	0.04	0.05	0.07
Max.	No data	0.5	0.72	4.70	2.23
Median	No data	0.2	0.36	0.94	0.56
Mean	No data	0.28	0.37	1.31	0.72
StdDev	No data	0.14	0.28	1.40	0.72
EL	No data	No data	No data	No data	0.09

Effluent intake concentration 4.08

Pu-239, -240 incremental concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	12	0.4	BEL	0.66	BEL
212 *On*	11	0.4	BEL	3.05	0.17
213 *On*	12	0.4	BEL	0.38	BEL
214 *On*	12	0.4	BEL	0.27	BEL
215 *On*	11	0.4	BEL	BEL	BEL
215T *On*	12	0.4	BEL	0.87	BEL
216 *On*	12	0.4	BEL	0.75	BEL
217 *On*	12	0.4	BEL	1.32	BEL
218 *On*	12	0.4	BEL	0.96	BEL
N	106	9	0	8	1
Min.	No data	0.4	BEL	0.27	0.17
Max.	No data	0.4	BEL	3.05	0.17
Median	No data	0.4	No data	0.81	No data
Mean	No data	0.4	No data	1.03	No data
StdDev	No data	0.0	No data	0.88	No data
101 *Off*	4	0.1	BEL	0.06	BEL
102 *Off*	4	0.1	BEL	BEL	BEL
103 *Off*	4	0.1	BEL	BEL	BEL
104 *Off*	12	0.4	BEL	1.35	BEL
105 *Off*	4	0.1	BEL	0.61	BEL
111 *Off*	4	0.1	BEL	0.35	BEL
112 *Off*	4	0.1	BEL	0.34	BEL
115 *Off*	4	0.1	BEL	BEL	BEL
118 *Off*	4	0.1	BEL	BEL	BEL
124 *Off*	12	0.4	BEL	0.45	BEL
CLN *Off*	12	0.4	BEL	0.34	BEL
N	68	11	0	7	0
Min.	No data	0.1	BEL	0.06	BEL
Max.	No data	0.4	BEL	1.35	BEL
Median	No data	0.1	No data	0.35	No data
Mean	No data	0.2	No data	0.50	No data
StdDev	No data	0.1	No data	0.41	No data
EL	No data	No data	No data	No data	0.76

Effluent intake concentration 0.17

ATTACHMENT D
ENVIRONMENTAL AIR SAMPLING DATA FOR 1959 TO 1972 (continued)

Th-228 incremental concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
213 *On*	12	1.0	BEL	22.54	7.43
215T *On*	12	1.0	0.03	9.58	2.84
216 *On*	12	1.0	BEL	8.82	4.57
218 *On*	12	1.0	BEL	5.77	2.27
N	48	4	1	4	4
Min.	No data	1.0	0.03	5.77	2.27
Max.	No data	1.0	0.03	22.54	7.43
Median	No data	1.0	No data	9.20	3.71
Mean	No data	1.0	No data	11.68	4.28
StdDev	No data	0.0	No data	7.43	2.32
124 *Off*	12	1.0	BEL	11.96	2.62
N	12	1	0	1	1
Min.	No data	1	BEL	11.96	2.62
Max.	No data	1	BEL	11.96	2.62
Median	No data	No data	No data	No data	No data
Mean	No data	No data	No data	No data	No data
StdDev	No data	No data	No data	No data	No data
EL	No data	No data	No data	No data	5.18

Effluent intake concentration 3.71

Th-230 incremental concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
213 *On*	12	1.3	BEL	24.83	9.02
215T *On*	12	1.3	BEL	12.02	2.72
216 *On*	12	1.3	BEL	13.59	5.51
218 *On*	12	1.3	BEL	3.89	1.21
N	48	4	0	4	4
Min.	No data	1.3	BEL	3.89	1.21
Max.	No data	1.3	BEL	24.83	9.02
Median	No data	1.3	No data	12.81	4.12
Mean	No data	1.3	No data	13.58	4.62
StdDev	No data	0.0	No data	8.62	3.43
124 *Off*	12	1.3	BEL	10.33	2.74
N	12	1	0	1	1
Min.	No data	1.3	BEL	10.33	2.74
Max.	No data	1.3	BEL	10.33	2.74
Median	No data	No data	No data	No data	No data
Mean	No data	No data	No data	No data	No data
StdDev	No data	No data	No data	No data	No data
EL	No data	No data	No data	No data	5.42

Effluent intake concentration 4.12

Th-232 incremental concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
213 *On*	12	0.5	BEL	22.11	6.60
215T *On*	12	0.5	BEL	7.62	1.72
216 *On*	12	0.5	BEL	11.04	4.10
218 *On*	12	0.5	BEL	4.05	1.04
N	48	4	0	4	4
Min.	No data	0.5	BEL	4.05	1.04
Max.	No data	0.5	BEL	22.11	6.60
Median	No data	0.5	No data	9.33	2.91
Mean	No data	0.5	No data	11.21	3.37
StdDev	No data	0.0	No data	7.81	2.52
124 *Off*	12	0.5	BEL	7.97	1.96
N	12	1	0	1	1
Min.	No data	0.5	BEL	7.97	1.96
Max.	No data	0.5	BEL	7.97	1.96
Median	No data	No data	No data	No data	No data
Mean	No data	No data	No data	No data	No data
StdDev	No data	No data	No data	No data	No data
EL	No data	No data	No data	No data	4.06

Effluent intake concentration 2.91

a. Source: BWXT (2001).
b. BEL = below environmental level; CLN = center line north; EL = environmental (activity concentration) level; LDL = lower detection limit at 95% confidence level; No data = not applicable; StdDev = standard deviation.
c. T indicates 2-m sampling height.

ATTACHMENT D
ENVIRONMENTAL AIR SAMPLING DATA FOR 1959 TO 1972 (continued)

Table D-29. Mound air monitoring data for 2001.[a,b]

HTO incremental concentration (10^{-12} µCi/mL)

Location[c]	Samples	LDL	Min.	Max.	Mean
211 *On*	48	26	BEL	26.01	5.06
213 *On*	50	23	BEL	44.09	7.61
214 *On*	51	23	BEL	24.72	4.60
215 *On*	51	23	BEL	30.61	2.82
215T *On*	No data	No data	No data	No data	No data
216 *On*	49	23	BEL	52.39	5.24
218 *On*	49	23	BEL	48.81	2.98
N	298	6	0	6	6
Min.	No data	23	BEL	24.72	2.82
Max.	No data	26	BEL	52.39	7.61
Median	No data	23	No data	37.35	4.83
Mean	No data	23.5	No data	37.77	4.72
StdDev	No data	1.2	No data	12.13	1.75
101 *Off*	51	15	BEL	37.24	3.99
102 *Off*	49	15	BEL	64.72	6.09
103 *Off*	51	15	BEL	63.13	4.76
104 *Off*	51	15	BEL	19.57	1.33
105 *Off*	50	15	BEL	20.50	0.28
111 *Off*	34	15	BEL	5.56	BEL
112 *Off*	51	15	BEL	27.65	0.83
115 *Off*	51	15	BEL	12.72	BEL
118 *Off*	50	15	BEL	34.08	0.17
124 *Off*	48	15	BEL	76.74	7.28
CLN *Off*	49	15	BEL	30.32	3.91
212 *Off*	51	23	BEL	75.94	9.79
217 *Off*	42	23	BEL	19.28	1.88
N	628	13	0	13	11
Min.	No data	15	BEL	5.56	0.17
Max.	No data	23	BEL	76.74	9.79
Median	No data	15	No data	30.32	3.91
Mean	No data	16.2	No data	37.50	3.66
StdDev	No data	3.0	No data	25.19	3.38
EL	No data	No data	No data	No data	2.5

Effluent intake concentration 4.83

Pu-238 incremental concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	12	0.6	1.46	20.16	5.51
213 *On*	12	0.6	1.26	121.73	15.19
214 *On*	12	0.6	0.72	5.69	2.90
215 *On*	11	0.6	BRB	4.50	1.61
215T *On*	12	0.6	0.24	5.74	1.62
216 *On*	12	0.6	0.39	22.27	5.58
218 *On*	12	0.6	0.96	7.01	4.01
N	83	7	6	7	7
Min.	No data	0.6	0.24	4.50	1.61
Max.	No data	0.6	1.46	121.73	15.19
Median	No data	0.6	0.84	7.01	4.01
Mean	No data	0.6	0.84	26.73	5.20
StdDev	No data	0.0	0.48	42.53	4.70
101 *Off*	4	0.1	BRB	0.20	0.09
102 *Off*	4	0.1	0.25	0.40	0.32
103 *Off*	4	0.1	0.46	5.55	1.91
104 *Off*	12	0.6	BRB	1.44	0.25
105 *Off*	4	0.1	0.02	0.12	0.06
111 *Off*	4	0.1	BRB	0.29	0.09
112 *Off*	4	0.1	BRB	0.08	BRB
115 *Off*	4	0.1	BRB	0.04	0.01
118 *Off*	4	0.1	BRB	0.30	0.14
124 *Off*	12	0.6	0.22	2.45	1.32
CLN *Off*	11	0.6	0.10	2.11	0.91
212 *Off*	12	0.6	0.61	4.57	1.56
217 *Off*	11	0.6	0.01	1.55	0.40
N	90	13	7	13	12
Min.	No data	0.1	0.01	0.04	0.01
Max.	No data	0.6	0.61	5.55	1.91
Median	No data	0.1	0.22	0.40	0.29
Mean	No data	0.29	0.24	1.47	0.59
StdDev	No data	0.25	0.25	1.89	0.71
EL	No data	No data	No data	No data	BRB

Effluent intake concentration 4.01

Pu-239, -240 incremental concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	12	0.7	BEL	0.69	0.01
213 *On*	12	0.7	BEL	1.62	BEL
214 *On*	12	0.7	BEL	0.70	BEL
215 *On*	11	0.7	BEL	1.85	0.2
215T *On*	12	0.7	BEL	1.64	BEL
216 *On*	12	0.7	BEL	0.51	0.03
218 *On*	12	0.7	BEL	1.09	BEL
N	83	7	0	7	3
Min.	No data	0.7	BEL	0.51	0.01
Max.	No data	0.7	BEL	1.85	0.2
Median	No data	0.7	No data	1.09	0.03
Mean	No data	0.7	No data	1.16	0.08
StdDev	No data	0.0	No data	0.5	0.1
101 *Off*	4	0.1	BEL	0.49	BEL
102 *Off*	4	0.1	BEL	0.15	BEL
103 *Off*	4	0.1	BEL	0.17	BEL
104 *Off*	12	0.7	BEL	0.61	BEL
105 *Off*	4	0.1	BEL	1.40	0.17
111 *Off*	4	0.1	BEL	1.17	0.11
112 *Off*	4	0.1	BEL	1.56	0.38
115 *Off*	4	0.1	BEL	1.17	0.26
118 *Off*	4	0.1	BEL	0.53	0.05
124 *Off*	12	0.7	BEL	0.49	0.003
CLN *Off*	11	0.7	BEL	0.90	0.11
212 *Off*	12	0.7	BEL	0.56	BEL
217 *Off*	11	0.7	BEL	1.09	0.04
N	90	13	0	13	8
Min.	No data	0.1	BEL	0.15	0.00
Max.	No data	0.7	BEL	1.56	0.38
Median	No data	0.1	No data	0.61	0.11
Mean	No data	0.33	No data	0.79	0.14
StdDev	No data	0.30	No data	0.44	0.13
EL	No data	No data	No data	No data	0.4

Effluent intake concentration 0.03

ATTACHMENT D
ENVIRONMENTAL AIR SAMPLING DATA FOR 1959 TO 1972 (continued)

Th-228 incremental concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
213 *On*	12	0.8	BEL	20.97	4.01
215T *On*	12	0.8	BEL	13.56	3.29
216 *On*	12	0.8	BEL	12.48	4.30
218 *On*	12	0.8	BEL	12.05	3.56
N	48	4	0	4	4
Min.	No data	0.8	BEL	12.05	3.29
Max.	No data	0.8	BEL	20.97	4.30
Median	No data	0.8	No data	13.02	3.79
Mean	No data	0.8	No data	14.77	3.79
StdDev	No data	0.0	No data	4.19	0.45
124 *Off*	12	0.8	BEL	12.35	1.67
N	12	1	0	1	1
Min.	No data	0.8	BEL	12.35	1.67
Max.	No data	0.8	BEL	12.35	1.67
Median	No data	No data	No data	No data	No data
Mean	No data	No data	No data	No data	No data
StdDev	No data	No data	No data	No data	No data
EL	No data	No data	No data	No data	5.2

Effluent intake concentration 3.79

Th-230 incremental concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
213 *On*	12	1.5	BEL	20.99	3.91
215T *On*	12	1.5	BEL	9.69	2.80
216 *On*	12	1.5	BEL	9.74	3.28
218 *On*	12	1.5	BEL	14.52	2.17
N	48	4	0	4	4
Min.	No data	1.5	BEL	9.69	2.17
Max.	No data	1.5	BEL	20.99	3.91
Median	No data	1.5	No data	12.13	3.04
Mean	No data	1.5	No data	13.74	3.04
StdDev	No data	0.0	No data	5.34	0.74
124 *Off*	12	1.5	BEL	11.77	0.95
N	12	1	0	1	1
Min.	No data	1.5	BEL	11.77	0.95
Max.	No data	1.5	BEL	11.77	0.95
Median	No data	No data	No data	No data	No data
Mean	No data	No data	No data	No data	No data
StdDev	No data	No data	No data	No data	No data
EL	No data	No data	No data	No data	6.39

Effluent intake concentration 3.04

Th-232 incremental concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
213 *On*	12	0.4	BEL	14.31	2.82
215T *On*	12	0.4	BEL	7.00	2.13
216 *On*	12	0.4	BEL	8.15	2.37
218 *On*	12	0.4	BEL	11.01	1.67
N	48	4	0	4	4
Min.	No data	0.4	BEL	7.00	1.67
Max.	No data	0.4	BEL	14.31	2.82
Median	No data	0.4	No data	9.58	2.25
Mean	No data	0.4	No data	10.12	2.25
StdDev	No data	0.0	No data	3.26	0.48
124 *Off*	12	0.4	BEL	9.97	0.94
N	12	1	0	1	1
Min.	No data	0.4	BEL	9.97	0.94
Max.	No data	0.4	BEL	9.97	0.94
Median	No data	No data	No data	No data	No data
Mean	No data	No data	No data	No data	No data
StdDev	No data	No data	No data	No data	No data
EL	No data	No data	No data	No data	4.56

Effluent intake concentration 2.25

a. Source: BWXT (2002).
b. BEL = below environmental level; CLN = center line north; EL = environmental (activity concentration) level; LDL = lower detection limit at 95% confidence level; No data = not applicable; StdDev = standard deviation.
c. T indicates 2-m sampling height.

ATTACHMENT D
ENVIRONMENTAL AIR SAMPLING DATA FOR 1959 TO 1972 (continued)

Table D-30. Mound air monitoring data for 2002.[a,b]

HTO incremental concentration (10^{-12} µCi/mL)

Location[c]	Samples	LDL	Min.	Max.	Mean
211 *On*	31	31	BEL	24.12	4.10
213 *On*	50	28	BEL	26.94	4.83
214 *On*	29	48	BEL	60.18	2.89
215 *On*	50	48	BEL	134.45	11.31
215T *On*	No data	No data	No data	No data	No data
216 *On*	49	48	BEL	38.04	2.09
218 *On*	51	28	BEL	32.31	1.60
N	260	6	No data	6	6
Min.	No data	28	BEL	24.12	1.60
Max.	No data	48	BEL	134.45	11.31
Median	No data	No data	No data	No data	3.50
Mean	No data	No data	No data	No data	4.72
101 *Off*	50	48	BEL	64.75	3.96
102 *Off*	50	48	BEL	52.54	6.14
103 *Off*	50	48	BEL	104.05	3.42
104 *Off*	49	48	BEL	42.04	0.11
105 *Off*	50	48	BEL	26.67	BEL
111 *Off*	50	48	BEL	21.38	BEL
112 *Off*	48	48	BEL	16.78	BEL
115 *Off*	49	48	BEL	15.93	BEL
118 *Off*	50	48	BEL	44.59	0.54
124 *Off*	49	48	BEL	79.09	6.69
CLN *Off*	50	48	BEL	46.55	2.23
212 *Off*	29	48	BEL	226.74	13.14
217 *Off*	29	48	BEL	29.94	0.13
N	603	13	13	13	13
Min.	No data	15	BEL	15.93	BEL
Max.	No data	23	BEL	226.74	13.14
Median	No data	No data	No data	No data	No data
Mean	No data	No data	No data	No data	No data
EL	No data	No data	No data	No data	7.38

Effluent intake concentration 3.50

Pu-238 incremental concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	12	0.6	0.98	9.05	3.06
213 *On*	12	0.6	1.41	13.85	4.92
214 *On*	12	0.6	0.48	61.48	9.37
215 *On*	12	0.6	0.21	11.37	2.11
215T *On*	12	0.6	0.24	8.38	2.18
216 *On*	12	0.6	0.79	11.88	3.76
218 *On*	12	0.6	0.07	26.31	5.08
N	84	7	7	7	7
Min.	No data	No data	0.07	8.38	2.11
Max.	No data	No data	1.41	26.31	9.37
Median	No data	No data	No data	No data	3.76
Mean	No data	No data	No data	No data	4.28
101 *Off*	4	0.2	BRB	0.20	0.07
102 *Off*	4	0.2	0.29	1.76	0.77
103 *Off*	4	0.2	0.29	0.53	0.41
104 *Off*	12	0.6	BRB	1.73	0.33
105 *Off*	4	0.2	BRB	0.15	0.04
111 *Off*	4	0.2	BRB	0.09	0.01
112 *Off*	4	0.2	BRB	0.05	BRB
115 *Off*	4	0.2	BRB	0.08	BRB
118 *Off*	4	0.2	0.05	0.38	0.17
124 *Off*	12	0.6	BRB	2.68	1.10
CLN *Off*	12	0.6	0.08	2.02	0.63
212 *Off*	12	0.6	0.23	4.29	1.57
217 *Off*	12	0.6	BRB	1.68	0.27
N	92	13	13	13	13
Min.	No data	0.2	0.05	0.05	BRB
Max.	No data	0.6	0.29	4.29	1.57
Median	No data	No data	No data	No data	No data
Mean	No data	No data	No data	No data	No data
EL	No data	No data	No data	No data	BRB

Effluent intake concentration 3.76

Pu-239, -240 incremental concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
211 *On*	12	0.6	BEL	0.75	0.11
213 *On*	12	0.6	BEL	1.58	0.30
214 *On*	12	0.6	BEL	1.69	0.27
215 *On*	12	0.6	BEL	1.36	0.19
215T *On*	12	0.6	BEL	1.11	0.19
216 *On*	12	0.6	BEL	1.71	0.33
218 *On*	12	0.6	BEL	0.73	0.19
N	84	7		7	7
Min.	No data	No data	BEL	0.73	0.11
Max.	No data	No data	BEL	1.69	0.33
Median	No data	No data	No data	No data	0.19
Mean	No data	No data	No data	No data	0.23
101 *Off*	4	0.1	BEL	BEL	BEL
102 *Off*	4	0.1	BEL	0.35	BEL
103 *Off*	4	0.1	BEL	0.15	BEL
104 *Off*	12	0.7	BEL	0.68	0.18
105 *Off*	4	0.1	BEL	BEL	BEL
111 *Off*	4	0.1	BEL	BEL	BEL
112 *Off*	4	0.1	BEL	BEL	BEL
115 *Off*	4	0.1	BEL	BEL	BEL
118 *Off*	4	0.1	BEL	0.14	0.05
124 *Off*	12	0.6	BEL	0.25	BEL
CLN *Off*	12	0.6	BEL	0.84	0.13
212 *Off*	12	0.6	BEL	1.03	0.20
217 *Off*	12	0.6	BEL	0.83	0.19
N	90	13	13	13	13
Min.	No data	0.1	BEL	0.15	BEL
Max.	No data	0.6	BEL	0.14	0.20
Median	No data	No data	No data	No data	
Mean	No data	No data	No data	No data	
EL	No data	No data	No data	No data	0.27

Effluent intake concentration 0.19

ATTACHMENT D
ENVIRONMENTAL AIR SAMPLING DATA FOR 1959 TO 1972 (continued)

Th-228 incremental concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
213 *On*	12	0.7	BEL	6.43	BEL
215T *On*	12	0.7	BEL	2.91	BEL
216 *On*	12	0.7	BEL	9.39	BEL
218 *On*	12	0.7	BEL	27.42	0.55
N	48	4	4	4	4
Min.	No data	No data	BEL	2.92	BEL
Max.	No data	No data	BEL	27.42	0.55
Median	No data	No data	No data	No data	0
Mean	No data	No data	No data	No data	0.14
124 *Off*	12	No data	BEL	1.99	BEL
N	12	No data	1	1	1
Min.	No data	0.7	BEL	1.99	1.67
Max.	No data	0.7	BEL	1.99	1.67
Median	No data	No data	No data	No data	No data
Mean	No data	No data	No data	No data	No data
StdDev	No data	No data	No data	No data	No data
EL	No data	No data	No data	No data	10.01

Effluent intake concentration 0.00

Th-230 incremental concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
213 *On*	12	1.3	BEL	0.52	BEL
215T *On*	12	1.3	BEL	2.74	BEL
216 *On*	12	1.3	BEL	3.67	BEL
218 *On*	12	1.3	BEL	18.50	BEL
N	48	4	4	4	4
Min.	No data	No data	BEL	0.52	BEL
Max.	No data	No data	BEL	18.50	BEL
Median	No data	No data	No data	No data	0.00
Mean	No data	No data	No data	No data	0.00
124 *Off*	No data	No data	BEL	BEL	BEL
N	12	1	1	1	1
Min.	No data	No data	BEL	BEL	BEL
Max.	No data	No data	BEL	BEL	BEL
Median	No data	No data	No data	No data	No data
Mean	No data	No data	No data	No data	No data
StdDev	No data	No data	No data	No data	No data
EL	No data	No data	No data	No data	14.17

Effluent intake concentration 0.00

Th-232 incremental concentration (10^{-18} µCi/mL)

Location	Samples	LDL	Min.	Max.	Mean
213 *On*	12	0.5	BEL	5.46	BEL
215T *On*	12	0.5	BEL	3.22	BEL
216 *On*	12	0.5	BEL	6.72	BEL
218 *On*	12	0.5	BEL	23.34	0.30
N	48	4	4	4	4
Min.	No data	No data	No data	3.22	BEL
Max.	No data	No data	No data	23.34	0.30
Median	No data	No data	No data	No data	0
Mean	No data	No data	No data	No data	0.075
124 *Off*	12	0.4	BEL	2.05	BEL
N	12	1	0	1	1
Min.	No data	0.4	BEL	2.05	BEL
Max.	No data	0.4	BEL	2.05	BEL
Median	No data	No data	No data	No data	No data
Mean	No data	No data	No data	No data	No data
StdDev	No data	No data	No data	No data	No data
EL	No data	No data	No data	No data	4.56

Effluent intake concentration 0.00

a. Source: CH2MHILL (2003).
b. BEL = below environmental level; CLN = center line north; EL = environmental (activity concentration) level; LDL = lower detection limit at 95% confidence level; No data = not applicable; StdDev = standard deviation.
c. T indicates 2-m sampling height.