REVISION 0

EVALUATION OF LEAD-210 INFORMATION FOR THE JANA ELEMENTARY SCHOOL, HAZELWOOD SCHOOL DISTRICT

ST. LOUIS, MISSOURI

MAY 8, 2023

U.S. Army Corps of Engineers
St. Louis District Office
Formerly Utilized Sites Remedial Action Program

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prepared by

U.S. Army Corps of Engineers St. Louis District
Formerly Utilized Sites Remedial Action Program

with assistance from

Leidos, Inc.
Under Contract No. W912P923P0003

ABSTRACT

Site Name	Hazelwood School District property for the Jana Elementary School (HSD-JES).
Location	Florissant, Missouri
Description	The purpose of this report is to provide information about lead-210 at the HSD-JES. As a report specific to one radionuclide and its progeny, this report does not contain a final status survey evaluation. Separate reports contain the details of the final status survey evaluations, including lead-210, of structures and soil associated with the HSD-JES. The HSD-JES is used for institutional (educational) and recreational purposes. Structures consist of buildings and pavement. The land area consists of four county parcels. Three of the parcels have borders adjacent to Coldwater Creek (CWC), and the fourth parcel crosses a CWC tributary (Lawnview Creek). One parcel also includes land within the banks of CWC. The USACE collected radiological data from structure surfaces and soil at the HSD-JES in response to community concerns about allegations of unacceptable levels of radioactivity, including lead-210, associated with Manhattan Engineer District (MED) and U.S. Atomic Energy Commission (AEC) activities. The allegations are documented in *Radioactive Contamination at the Jana Elementary School, Hazelwood, MO* (RCJES) (Brustowicz, Thompson, and Kaltofen 2022).
Conclusions	**The concentrations of lead-210 at the HSD-JES are safe, are consistent with natural background conditions, and are not associated with historical MED and AEC activities. These conclusions are based on 922 fixed-point structure measurements, 941 structure swipe measurements, 40 analytical results from 9 dust/pavement sediment samples, 1,211 analytical results from 1,211 soil samples, and 4 risk and toxicity health assessments.**
Agency Review	U.S. Environmental Protection Agency (USEPA), Region 7 Missouri Department of Natural Resources
Contractor Oversight	USACE St. Louis District
Contractor	Leidos, Inc.
Radionuclide of Interest	This report is specific to lead-210 and its progeny, but the uranium-238 decay chain is discussed.
Possible Reasons for Lead-210 Concentrations	The following reasons are the only ones that could cause the higher lead-210 concentrations identified at two locations on pavement. 1. Natural processes that concentrate decay products from background levels of radon. 2. Surface water transport of contaminated[a] soil from the St. Louis Airport Site (SLAPS), the Hazelwood Interim Storage Site (HISS), and Futura Coatings Company (Futura) is the predominant mechanism for contamination in CWC. Because of flooding events, the potential exists for the sediment to be deposited on floodplain properties adjacent to CWC. The SLAPS, the HISS, and Futura were former storage locations from the 1940s through 1960s for MED/AEC materials leftover from uranium processing. Remediation of accessible soil was completed at the SLAPS, the HISS, and Futura in 2006, 2011, and 2013, respectively. These former storage sites are approximately 5 miles upstream of the HSD-JES. 3. Soil transfer by human activities from locations within the banks of CWC that are contaminated with MED/AEC radioactivity. 4. Radon gas transport from locations within the banks of CWC that are contaminated with MED/AEC radioactivity.

ABSTRACT (Continued)

<table>
<tr><td>Regulatory Requirements</td><td>In summary, the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and National Oil and Hazardous Substances Pollution Contingency Plan (40 Code of Federal Regulations [CFR] 300.430) identify that protectiveness is achieved when the additional risk[b] to an individual's entire lifetime is generally less than 1 in 10,000. These everyday risks of death are higher than 1 in 10,000 by the listed multiple (NSC 2022).
<table>
<tr><td>Vehicle Crash: 90 times</td><td>Falls: 80 times</td><td>Pedestrian Accident: 18 times</td></tr>
<tr><td>Drowning: 9 times</td><td>Fire/Smoke: 6 times</td><td>Choking on Food: 3 times</td></tr>
</table>
</td></tr>
<tr><td>Data Collection Method and Dates</td><td><u>Structures:</u> Hand-held instruments that detect very low levels were used at 461 locations to take 922 measurements for total alpha radioactivity and total beta radioactivity[c]. The locations were either randomly selected or selected because they were more likely to have radioactivity. At these locations, swipes with standard cloth discs, called swipes, were taken across the surfaces to collect removable radioactivity. These swipes were analyzed for total alpha radioactivity and total beta radioactivity, and 19 swipes from areas of higher indoor dust were analyzed for lead-210.

Dust was collected from 5 indoor locations, and pavement sediment was collected from 4 outdoor locations. These samples underwent laboratory analysis for the primary COCs associated with MED/AEC activities. At only 3 pavement sediment locations was sufficient material available for a second sample that was analyzed for lead-210. Laboratory analysis produced 40 analytical results from these samples.

The structure data were collected from October 24 through November 1, 2022.

<u>Soil:</u> A total of 1,211 samples of surface and subsurface soil were collected from 223 stations on the HSD-JES. These stations were selected based on a systematic grid and because of biased reasons. The biased locations were identified by instrument readings during gamma surveys of the surface soil, as current or historical low-lying areas, or by the sample results from an initial station. Soil samples underwent laboratory analysis for the primary contaminants of concern associated with MED/AEC activities, including radium-226; lead-210 is produced 4 days following decay of radium-226.

The soil sample data were collected in August, September, and October 2018; February, April, May, and June 2019; August and November 2020; July and August 2021; and October and November 2022.</td></tr>
<tr><td>Results</td><td>Regardless of the source of the lead-210 and its progeny, their highest concentrations in pavement sediment do not present a health hazard. The following risk and toxicity health assessments are designed to not underestimate risk or hazard.

The lifetime radiological risk estimate for students from the highest concentration of lead-210 is less than 1/40th of the protectiveness level. The everyday risk of dying from dog attacks is 4 times higher and from storms is 8 times higher (NSC 2022).
The lifetime radiological risk estimate for staff from the highest concentration of lead-210 is less than 1/18th of the protectiveness level. The everyday risk of dying from dog attacks is 1.7 times higher and from storms is 3.5 times higher (NSC 2022).
The additional risk from natural background radiation, excluding radon, from living in Colorado instead of Missouri is 145 times higher than this estimated risk for Jana Elementary School.

</td></tr>
</table>

ABSTRACT (Continued)

Results (Continued)	• The highest lead-210 radiological result is less than 1/600,000,000th of the Toxic Substances Control Act (TSCA) standard for protection of human health. • The USEPA model for estimating the blood concentration of lead from the highest concentration of lead-210 is 0.0 µg/dL. The U.S. Center for Disease Control and Prevention's blood lead reference value for children is 3.5 µg/dL. All possible causes of the 2 locations of higher concentrations of lead-210 at the HSD-JES where evaluated. The only possible cause for those results at only those locations is natural background conditions for radon and its progeny. • These higher lead-210 concentrations were identified in pavement sediment. Pavement sediment is the thin layer of dirt that collects on top of pavement at low spots, cracks with grass, or similar features. • These higher lead-210 concentrations in pavement sediment are consistent with scientifically known variations in natural background conditions. Independent studies at other locations demonstrate the occurrence of higher lead-210 concentrations in pavement sediment from natural background conditions from radon and its progeny. Other evidence that lead-210 is consistent with background radioactivity follows. • Fixed-point measurements from 461 locations for total alpha radioactivity and total beta radioactivity on structure surfaces have statistical distributions that are consistent with background radioactivity in structure materials. • Swipe measurements from 461 locations for removable radioactivity on structure surfaces were less than very low minimum detectable concentrations (MDCs) that were 2 percent or less of investigation levels. In addition to analysis for gross alpha and gross beta radioactivity, 19 swipes from indoor, dusty locations were analyzed for lead-210. • Because lead-210 is produced 4 days following decay of radium-226, radium-226 soil data at the HSD-JES was evaluated for consistency with radium-226 soil background data. Based on the Wilcoxon-Mann-Whitney Comparison Test, the two datasets are consistent with a 95 percent confidence interval for radium-226 results. • The higher lead-210 concentration listed in RCJES for an indoor dust sample was not duplicated by the USACE despite several USACE measurements of dust and swipes in the same room as reported in RCJES. If indoor dust has higher levels of lead-210, the amount is limited and not widespread. • The additional radon from within the banks of CWC that could be contributing radon decay products to the school pavement and building roofs is less than 1/1,500th of background radon for the North St. Louis County Sites.

[a] For the purposes of this report, the term "contamination" refers to the presence of contaminants of concern (COCs) in concentrations that exceed the ROD remediation goals (RGs).

[b] When estimating cancer risk, predictions indicate a lifetime risk level for an exposed individual and how many additional cancer cases might occur in a population of exposed people (i.e., 1×10^{-6} is equal to one additional case in a population of one million). These cancers may or may not occur, but should they occur, they would be in addition to cancers from other causes, such as smoking tobacco or obesity.

[c] Total alpha radioactivity refers to all alpha particles being produced whether naturally occurring or from MED/AEC activities. Total beta radioactivity refers to all beta particles being produced whether naturally occurring or from MED/AEC activities.

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ACRONYMS AND ABBREVIATIONS

2011 EFH	*Exposure Factors Handbook: 2011 Edition*
2017 EFH	*Update for Chapter 5 of the Exposure Factors Handbook: Soil and Dust Ingestion*
AEC	U.S. Atomic Energy Commission
amsl	above mean sea level
ANL	Argonne National Laboratory
ANSI	American National Standards Institute
bgs	below ground surface
BLRV	blood lead reference value
BRA	*Baseline Risk Assessment for Exposure to Contaminants at the St. Louis Site, St. Louis Missouri*
CDC	U.S. Centers for Disease Control and Prevention
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	*Code of Federal Regulations*
COC	contaminant of concern
CWC	Coldwater Creek
DoD	U.S. Department of Defense
DOE	U.S. Department of Energy
DQO	data quality objective
ELAP	Environmental Laboratory Accreditation Program
ER	emission rate
FA	area factor
FS	*Feasibility Study for the St. Louis North County Site*
FSS	final status survey
FSSE	final status survey evaluation
FSSP	*Final Status Survey Plan for Soils, Structures, and Sediments at the St. Louis FUSRAP Sites*
FUSRAP	Formerly Utilized Sites Remedial Action Program
Futura	Futura Coatings Company
GIS	geographic information system
HISS	Hazelwood Interim Storage Site
HSD-JES	Hazelwood School District property for the Jana Elementary School
ICRP	International Commission on Radiological Protection
IEUBK	Integrated Exposure Uptake Biokinetic Model for Lead in Children
LCS	laboratory control sample
MARSAME	*Multi-Agency Radiation Survey and Assessment of Material and Equipment*
MARSSIM	*Multi-Agency Radiation Survey and Site Investigation Manual*
MDC	minimum detectable concentration
MDHSS	Missouri Department of Health and Senior Services
MDL	method detection limit
MDNR	Missouri Department of Natural Resources
MED	Manhattan Engineer District
NAD	normalized absolute difference (unitless)
NCP	National Oil and Hazardous Substances Contingency Plan
NRC	U.S. Nuclear Regulatory Commission

ACRONYMS AND ABBREVIATIONS (Continued)

ORNL	Oak Ridge National Laboratory
OSWER	Office of Solid Waste and Emergency Response
PDI	pre-design investigation
PP	*Proposed Plan for The St. Louis North County Site*
QA	quality assurance
QC	quality control
QCSR	quality control summary report
RCJES	*Radioactive Contamination at the Jana Elementary School, Hazelwood, MO*
RESRAD	RESidual RADioactivity (computer model)
RG	remediation goal
ROD	*Record of Decision for the North St. Louis County Sites*
RPD	relative percent difference (unitless)
RR	release rate
SAG	*Sampling and Analysis Guide for the St. Louis Sites*
SLAPS	St. Louis Airport Site
SOR_N	net sum of ratios (unitless)
SRNL	Savannah River National Laboratory
STSU	structure survey unit
TSCA	Toxic Substances Control Act
UCL_{95}	95 percent upper confidence limit
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
UUUE	unlimited use and unrestricted exposure
VQ	validation qualifier

UNIT ABBREVIATIONS

Both English and metric units are used in this report. The units used in a specific situation are based on common unit usage or regulatory language (e.g., depths are given in feet, and areas are given in square meters). Units included in the following list are not defined at first use in this report.

µg	microgram(s)
µg/dL	microgram(s) per deciliter
µg/g	microgram(s) per gram – equivalent to mg/kg
µg/L	microgram(s) per liter
Ci	curie(s)
cm^2	square centimeter(s)
dpm	disintegrations per minute
dpm/100 cm^2	disintegrations per minute per 100 square centimeters
ft	foot/feet
g	gram(s)
m	meter(s)
m^2	square meter(s)
m^3	cubic meter(s)
mg	milligram(s)
mg/kg	milligram(s) per kilogram – equivalent to µg/g
Mrem	millirem
pCi/g	picocurie(s) per gram
pCi/L	picocurie(s) per liter
pCi/m^2	picocurie(s) per square meter(s)
pCi/m^3	picocurie(s) per cubic meter(s)

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1.0 INTRODUCTION

1.1 PURPOSE

As part of the Formerly Utilized Sites Remedial Action Program (FUSRAP), the U.S. Army Corps of Engineers (USACE) St. Louis District has responsibility for investigation of potential contamination from historical Manhattan Engineer District (MED) and U.S. Atomic Energy Commission (AEC) activities. Community concerns occurred regarding allegations made in an October 10, 2022, document titled *Radioactive Contamination at the Jana Elementary School, Hazelwood, MO* (RCJES) (Brustowicz, Thompson, and Kaltofen 2022)—specifically, that unacceptable levels of lead-210 from MED/AEC activities were at the Hazelwood School District property for the Jana Elementary School (HSD-JES). Information related to the referenced report is provided by the Savannah River National Laboratory (SRNL) in Appendix A, "SRNL Technical Review of the Kaltofen 'Radioactive Contamination at the Jana Elementary School' Document" (SRNL 2022).

The purpose of this lead-210 screening report is to document the USACE screening data and evaluation of that data as it pertains to lead-210 at the HSD-JES, including the following information:

- Health risk from the highest lead-210 concentrations,
- Possible reasons for the highest lead-210 concentrations, and
- Comparison of data to background levels.

This screening report is not a final status survey evaluation (FSSE). As a screening report, information from regulations and standards not specified in the *Record of Decision for the North St. Louis County Sites* (ROD) (USACE 2005a) are referenced. Separate USACE reports for the HSD-JES contain the FSSEs for soil and structure surfaces.

1.2 HISTORICAL INFORMATION

As part of the USACE remediation responsibilities, the agency worked through the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process to develop the ROD (USACE 2005a), which includes Coldwater Creek (CWC) in its requirements. The thorough CERCLA process leading to the ROD included a *Baseline Risk Assessment for Exposure to Contaminants at the St. Louis Site, St. Louis Missouri* (BRA) (DOE 1993), *Remedial Investigation Report for the St. Louis Site* (DOE 1994), *Remedial Investigation Addendum for the St. Louis Site* (DOE 1995), *Feasibility Study for the St. Louis North County Site* (FS) (USACE 2003a), and *Proposed Plan for the St. Louis North County Site* (PP) (USACE 2003b). The decision-making process leading up to the ROD included periods of public input.

The USACE has remediated accessible soil at the St. Louis Airport Site (SLAPS), the Hazelwood Interim Storage Site (HISS), and Futura Coatings Company (Futura) as of 2006, 2011, and 2013, respectively. This remediation removed the primary sources of MED/AEC contamination entering CWC. The SLAPs is located adjacent to Banshee Road, and the HISS/Futura is located adjacent to Latty Avenue, approximately 0.7 mile north of the SLAPS (Figure 1). These former storage sites are approximately 5 miles upstream of the HSD-JES. Besides these former storage areas, another 1,216 acres of land are subject to the ROD between Banshee Road and Dunn Road and at least 727 acres of land associated with CWC north of Dunn Road are subject to the ROD. Experience from working through these land areas follows.

- Remediated or planned remediation for 107 acres.

- Completed FSSEs supporting unlimited use and unrestricted exposure (UUUE) for 938 acres south of Dunn Road.
- Completed FSSEs supporting UUUE for 120 acres of the CWC floodplain north of Dunn Road.
- More than 600 radiological fixed-point measurements representing 176,000 m^2 of surface area have been taken on upstream structures between the SLAPS and the HSD-JES. These upstream structures are within the creek banks and the 10-year floodplain. None of these measurements have identified radioactivity on surfaces at levels requiring remediation. All but 3 of the beta measurements were less than 50 percent of the level requiring remediation, and those 3 measurements were attributed to naturally occurring radioactivity in brick.

1.3 PROPERTY DESCRIPTION

When MED/AEC storage activities began at the SLAPS in 1948, the HSD-JES was part of farmland with a home on the eastern portion of CWC-386 (STLCO 2022). Land use changed with the construction of the initial structures for the school, which opened in 1970. They are located approximately 8,100 m downstream of the SLAPS (Figure 1). The HSD-JES is used for institutional (educational) and recreational purposes.

Surface water transport of contaminated soil from the SLAPS, the HISS, and Futura is the predominant mechanism for contamination in CWC. Because of flooding events, the potential exists for the sediment to be deposited on floodplain properties adjacent to CWC. The extent of the floodplain determines the extent of the property description. The USACE has identified the 10-year floodplain as the primary area for investigation based on evidence of contaminated soil in the CWC floodplain between Banshee Road and Dunn Road. The 10-year floodplain is also flooded more frequently (50 times more frequently than the 500-year floodplain), providing more opportunity for sediment to be deposited. Information obtained during a pre-design investigation (PDI) is evaluated to determine if the investigation should extend beyond the 10-year floodplain. The information, such as the following, is evaluated on a case-by-case basis:

- Sample results that exceed the remediation criteria and are near the outer edge of the 10-year floodplain,
- Fill soil that moved the current outer edge of the 10-year floodplain closer to the creek bank than where the outer edge was before the fill soil, and
- Soil relocation (e.g., for a pool).

During 2018, USACE's PDI activities in the CWC corridor[1] and 10-year floodplain[2] progressed to include the HSD-JES (Figure 2). As a result of community concerns, the PDI area was extended to include the part of the HSD-JES that was outside the 10-year floodplain. The addresses, St. Louis County parcel ID numbers, and year of initial construction for the HSD-JES were identified using the St. Louis County GIS Service Center (STLCO 2022) and are listed in Table 1.

[1] The CWC corridor is generally defined as the area of CWC from the top of one bank to the top of the opposite bank.

[2] The 10-year floodplain is generally defined as the area outside of the CWC corridor from the top of bank to the outer edge of the area, which has a 10 percent chance of annual flooding.

Table 1. Property Information

Address	Parcel	Description	Year Developed[a]	Acres[a]	Longitude Latitude[b]
320 Jana Drive	06J221371	Sidewalk and grassy shoulders.	1970	0.49	-90.191450 38.485122
325 Jana Drive	06J220126	Heavily wooded.	--	0.97	-90.185895 38.485566
345 Jana Drive	06J220094	Heavily wooded.	--	2.22	-90.190093 38.485309
405 Jana Lane	06J220632	Clearing portion contains buildings, paved areas, playgrounds, and athletic fields. Woods portion contains the wooded area that is not within the banks of CWC. Corridor portion contains steep banks, brush, trees, and the creek.	1972	16.58	-90.190563 38.485764

[a] The “Year Developed” and “Acres” columns are based on property assessment data available from St. Louis County (STLCO 2022) for each parcel. An undeveloped parcel is indicated by “--.”

[b] Coordinates for a representative center point of the property are provided in decimal degrees.

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2.0 LEAD-210 EVALUATION

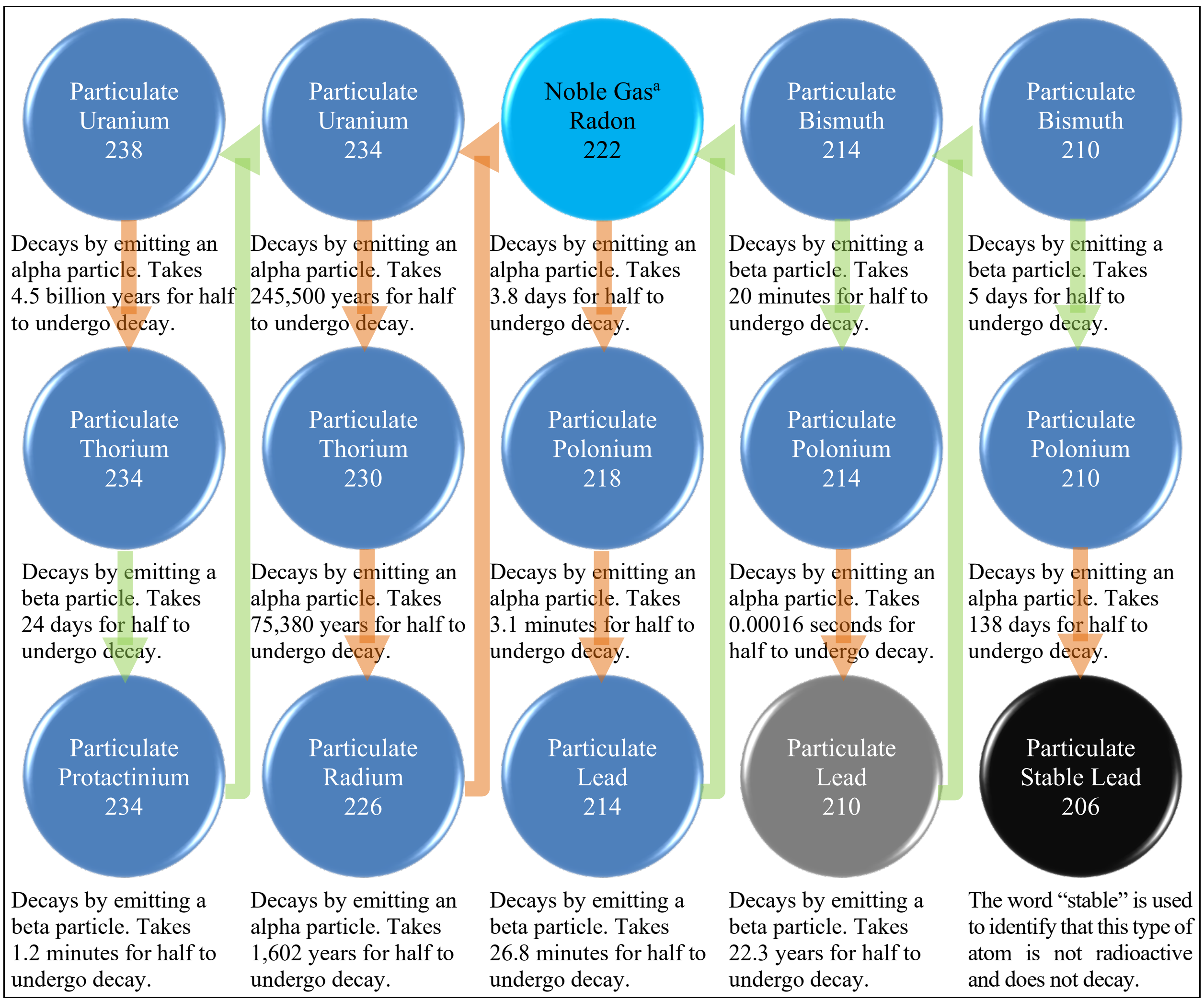
2.1 LEAD-210 DESCRIPTION

2.1.1 Lead-210 Properties

Lead is a common metallic element found in easily accessible lead ore deposits that are widely distributed throughout the world. Lead is naturally present in soil, with typically less than 50 mg of lead per kilogram of soil (ATSDR 2022).

Lead has four stable isotopes, lead-204, lead-206, lead-207, and lead-208, with natural abundances of 1.4, 24.1, 22.1, and 52.4 percent, respectively. Naturally occurring radioactive isotopes of lead are part of the following three natural decay series: (1) the thorium-232 series: lead-212; (2) the uranium-238 series: lead-214 and lead-210; and (3) the uranium-235 series: lead-211. The uranium-238 decay chain is provided on Image 1. While alternate decay methods (e.g., alpha decay instead of beta decay) can occur for radionuclides in this decay chain, they occur 0.1 percent of the time or less; therefore, they are not included on Image 1.

Image 1. Uranium-238 Decay Chain



[a] Noble gases are elements in the far-right column of the periodic chart whose electron configuration is so stable that they are rarely reactive with other elements; rarely form compounds; and are tasteless, odorless, colorless, and nonflammable.

Note: Orange arrows indicate decay by emitting an alpha particle. Green arrows indicate decay by emitting a beta particle.

2.1.2 Radon Influence on Lead-210

Radon is a naturally occurring radioactive noble gas that can migrate out of soil. When radon decays, the non-gas progeny attach to small particulates that float in the air. Those particulates can settle on surfaces, attracted by static electricity or washed out by precipitation. Radon progeny that has settled on surfaces is separated from the original decay chain. Approximately 4 days are required for decay to transform half of a given amount of radon into lead-210. Lead-210 does not decay as quickly, taking approximately 22 years for half of a given amount to decay into polonium-210. Approximately 138 days are required for half of a given amount of polonium-210 to decay to non-radioactive lead.

Natural processes affecting gaseous radon and the settling of its progeny commonly cause wide variations in the amount of radon progeny found in the environment. The following quotation is taken directly from the *Multi-Agency Radiation Survey and Assessment of Material and Equipment* (MARSAME) manual (USEPA 2009). (The radionuclide names are revised to be consistent with the naming convention used in this document.)

> Radon emissions vary significantly over time based on a wide variety of factors. For example, relatively small changes in the relative pressure between the source material and the atmosphere (indoor or outdoor) can result in large changes in radon concentrations in the air. Soil moisture content also has an effect on the radon emanation rate.
>
> Radon progeny tend to become fixed to solid particles in the air. These particles can become attached to surfaces as a result of electrostatic charge or gravitational settling. Air flow through ventilation ducts or outdoor wind can produce an electrostatic charge that will attract these particles. A decrease in atmospheric pressure often precedes a rainstorm, which increases the radon emanation rate. Immediately prior to an electrical storm, an electrostatic charge can build up on equipment resulting in elevated radiation levels from radon progeny. Rainfall acts to scavenge these particles from the air, potentially resulting in elevated dose rates and surface activities during and immediately following rainfall.
>
> Lead-210 is a decay product of radon-222 and uranium-238. The 22-year half-life provides opportunities for buildup lead-210 and progeny in sediments and low-lying areas. As mentioned previously, rain acts to scavenge radon progeny from the air. Areas where rain collects and concentrates can result in elevated levels of lead-210 and progeny over time. In addition, lead is easily oxidized and can become fixed to surfaces through corrosion processes. Rust or oxide films on equipment can be indicators of locations with a potential for elevated background radioactivity.

Lead-210 accumulation is used to estimate soil erosion rates, estimate sedimentation rates, and estimate the age of deposited material. The following documents contain examples of such uses involving lead-210.

- "Pavement Alters Delivery of Sediment and Fallout Radionuclides to Urban Streams" (Gellis et al. 2020).
- "Measuring Soil Erosion Rates Using Natural (^{7}Be, ^{210}Pb) and Anthropogenic (137Cs, 239, 240Pu) Radionuclides" (Mastisoff and Whiting 2011).
- "Dating Recent Sediments by ^{210}Pb: Problems and Solutions" (Appleby 1998).

- "High activity concentrations of ^{210}Pb and ^{7}Be in sediments and their histories" (Kanai 2013).
- *Final Pre-CERCLIS Screening Report Bridgeton Municipal Athletic Complex* (Tetra Tech 2014).
- *Technical Memorandum: A Discussion of Naturally Occurring Pb-210 Levels in Soils, PRG Applicability and Clarification of USACE Activities at the Dayton, Ohio FUSRAP Sites* (USACE 2014).
- "Factors controlling ^{7}Be and ^{210}Pb atmospheric deposition as revealed by sampling individual rain events in the region of Geneva, Switzerland" (Caillet et al. 2001).
- "Lead-210 sediment geochronology in a changing coastal environment" (Chanton 1993).
- "On the use of ^{210}Pb-based records of sedimentation rates and activity concentrations for tracking past environmental changes" (Abril 2022).

2.1.3 Influence of Background Radioactivity on Measurements

The performance of the surveys associated with lead-210 involved five different categories of background radiation described in the following bulleted list. For this report, background levels specific to lead-210 were not subtracted from any lead-210 measurements.

- General Area Background Radiation (Field). Prior to beginning surveys of the surfaces, count rates are taken in the open area of the building away from the walls and floors. These count rates for alpha radioactivity and beta radioactivity are subtracted from the fixed-point measurements of the structure surfaces.
- General Area Background Radiation (Laboratory). General area background radiation within the counting equipment is measured at the laboratory by taking readings without any samples loaded into the equipment. The equipment is shielded to lower general area background inside the equipment to help achieve the desired minimum detectable concentrations (MDCs). The equipment general area background count rate is subtracted from the count rates associated with a sample. This subtraction is why some sample results are reported as negative values.
- Material Background Radiation. The materials used to make a structure can have different amounts of natural radioactivity. Examples of materials with higher levels of natural radioactivity are bricks, stone, ceramic tiles, granite, concrete (from certain sands or coal ash), asphalt, and gypsum. When a radiation instrument is placed on the surface of such materials, the instrument detects the radiation coming from the material itself, in addition to any radioactivity lying on the surface. Determining the count rate of radiation coming from the material alone requires finding the exact same material without any possibility of radioactivity on its surface. Another difficulty is that a large building's bricks may look the same, but the clay may be from different locations with differing levels of background radioactivity. The count rates of material background radiation are often not determined for the following reasons.
  - The material background radiation count rates are generally small compared to limits.
  - The effort to determine the material background radiation for all of a building's materials requiring a survey is generally large.

  - The fixed-point measurement results are generally low enough so the risk and dose estimates made using the measurement results without subtracting material background count rates still meet the risk and dose protectiveness criteria.

  Material background radiation was not subtracted from the fixed-point measurements taken at the HSD-JES.

- Natural Background Radon Progeny Deposits. Radon is a naturally occurring radioactive noble gas that can migrate out of soil. Radon progeny tend to become fixed to dust particles in the air. These particles can become attached to surfaces as a result of an electrostatic charge, gravitational settling, or precipitation. Air flow through ventilation ducts or outdoor wind can produce an electrostatic charge that will attract these particles. A decrease in atmospheric pressure often precedes a rainstorm, which increases the radon release rate. Prior to an electrical storm, an electrostatic charge can build up on equipment resulting in elevated radioactivity from radon progeny.

  The first four radon progeny in the decay chain have short half-lives with a combined half-life[3] of approximately 40 minutes. The fixed-point measurement count rate of a surface can be significantly elevated while those four progeny are decaying on the surface. Count rates from these radon progeny can be readily investigated by covering the surface or placing an item, like a ventilation filter, in a bag to prevent more radon progeny from settling on the surface. Then the fixed-point measurement can be retaken after a few hours (USACE 2019a). If the count rates have decreased significantly, then the first measurement included natural background radon progeny deposits. The second fixed-point measurement is representative of the condition of the surface for the purposes of this report. Because this process takes extra time, some locations where radon progeny were suspected to be causing higher results were not investigated. The initial fixed-point measurements were used without attempting to subtract the count rate from natural background radon progeny deposits or remeasure as described.

- Soil Background Radioactivity. Radioactive elements were part of the formation of the earth. Some of those radioactive elements have very long decay rates, so a portion of the original radioactivity remains present in the earth's crust. These elements are from the uranium-238 decay chain, the uranium-235 decay chain, the thorium-232 decay chain, and potassium-40. Because the concentration of these radioactive elements varies with different soils, unimpacted local soil is sampled to determine the background concentrations. Because the dust and pavement sediment discussed in this report eventually becomes part of soil, sample results for dust and pavement sediment are compared against background soil concentrations.

2.2 RISK AND TOXICITY HEALTH ASSESSMENTS

The FS documents the investigation of various chemicals to determine the contaminants of concern (COCs). As a chemical, lead was evaluated, was determined to be too low to be a COC, and was not carried forward in the ROD as a COC requiring remediation. However, in response to community concerns about lead-210, the chemical toxicity of lead-210 is addressed in addition to the cancer risk from the radioactivity. Although the evaluations in Sections 2.3 through 2.5 of this report identified no evidence that lead-210 from historical MED/AEC operations has been relocated from areas

[3] A half-life is the amount of time for half of a given amount of radioactivity to decay to the next step in the decay chain.

with MED/AEC radioactivity to the HSD-JES, the following risk and toxicity health assessments for lead-210 have been performed.

2.2.1 Toxicity Assessment

Because of its toxicity, the U.S. Environmental Protection Agency (USEPA) has established that a soil-lead hazard exists when soil sample results for play-area bare soil on residential property or on a child-occupied facility contains total lead of 400 mg/kg or more, or when the rest of the soil on those facilities contains an average total lead of 1,200 mg/kg (40 *Code of Federal Regulations [CFR]* 745.65). This health-protective standard is based on toxicity effects and the Toxic Substances Control Act (TSCA); it is not based on radiological effects. Although the pavement sediment is not representative of a soil play area, this analysis will compare the highest radiological result for lead-210 to the 400 mg/kg standard. The following equation provides the conversion of units from pCi/g to mg/kg. The highest result for lead-210, 46.9 pCi/g, is used as the average result in this equation. This maximum lead-210 result is from review of both USACE sample results and the HSD-JES sample results reported in *Radioactive Contamination at the Jana Elementary School, Hazelwood, MO* (Brustowicz, Thompson, and Kaltofen 2022). While the maximum lead-210 result is higher than the average, its use provides a health-conservative result.

$$\frac{mg_{lead-210}}{kg_{soil}} = \frac{pCi_{lead-210}}{g_{soil}} * \frac{1{,}000\ g_{soil}}{kg_{soil}} * \frac{1}{Specific\ Activity_{lead-210}} * \frac{1{,}000\ mg_{lead-210}}{g_{lead-210}}$$

$$\frac{mg_{lead-210}}{kg_{soil}} = \frac{46.9\ pCi_{lead-210}}{g_{soil}} * \frac{1{,}000\ g_{soil}}{kg_{soil}} * \frac{g_{lead-210}}{76.8x10^{12}\ pCi_{lead-210}} * \frac{1{,}000\ mg_{lead-210}}{g_{lead-210}}$$

$$= 6.1x10^{-7}\ mg/kg\ or\ 0.00000061\ mg/kg$$

This concentration of lead-210 is less than 1/600,000,000th of the 400 mg/kg TSCA toxicity standard[4] for the protection of human health.

2.2.2 Child Blood Lead Assessment

Another evaluation available for lead is the USEPA Integrated Exposure Uptake Biokinetic Model for Lead in Children (IEUBK). This assessment model is specific to children under 7 years of age. The IEUBK model uses data from a variety of scientific studies of lead biokinetics, contact rates of children with contaminated media, and data on the presence and behavior of environmental lead. The input parameters for this model are described in Table 2. These parameters are health-conservative because they are based on maximum values or are rounded up to the minimum value accepted by the software. The result is 0.0 µg/dL, and the U.S. Centers for Disease Control and Prevention's (CDC's) blood lead reference value for children is 3.5 µg/dL. The IEUBK output is contained in Appendix B.

Table 2. Non-Default Input Parameters for IEUBK

Parameter	Value	Basis for Value
Outdoor Soil Lead Concentration	Constant Value 0.001 µg/g	From the preceding section, the value should be 0.0000006159 µg/g, but the model does not allow values less than 0.001. The units µg/g are equivalent to mg/kg.
Indoor Soil Lead Concentration	Constant Value 0.001 µg/g	From the preceding section, the value should be 0.0000006159 µg/g, but the model does not allow values less than 0.001. The units µg/g are equivalent to mg/kg.

[4] The units of µg/g and mg/kg are equivalent.

Table 2. Non-Default Input Parameters for IEUBK (Continued)

Parameter	Value	Basis for Value
Outdoor Air Lead Concentration	0.000052 µg/m³	Per the USEPA, the national average outdoor background radon is 0.4 pCi/L (USEPA 2016). As stated in Appendix A, testing of indoor air at the HSD-JES conducted by the Missouri Department of Health and Senior Services (MDHSS) confirmed radon was less than 4 pCi/L. The air concentration of lead-210 is assumed to be the same as radon's because of the decay chain from radon to lead-210. As health-conservative measure, the higher of the two values of 4 pCi/L is used. $\frac{\mu g_{lead-210}}{m^3_{air}} = \frac{4\ pCi_{lead-210}}{L_{air}} * \frac{1{,}000\ L_{air}}{m^3_{air}} * \frac{\mu g_{lead-210}}{76.8x10^6\ pCi_{lead-210}}$ $= 5.2x10^{-5}\ mg/kg\ or\ 0.000052\ \mu g/m^3$
Indoor Air Lead Concentration	100%	Based on the previous parameter, the outdoor and indoor air concentrations are assumed to be the same.
Time Spent Outdoors	For ages 5-7, 1.5 hours/day For ages 0-5, 0 hours/day	Based on Table 16-20 of the *Exposure Factors Handbook: 2011 Edition* (2011 EFH) (USEPA 2011), the student's outdoor time at school is 88 minutes/day. 88 minutes/day / 60 minutes/hour = 1.5 hours
Dietary Lead Intake (µg/day)	0.001 µg/day	From the preceding toxicity assessment, the maximum lead-210 concentration of 46.9 pCi/g equates to 0.00000061 µg/g. Based on Table 5-1 of the *Update for Chapter 5 of the Exposure Factors Handbook: Soil and Dust Ingestion* (2017 EFH) (USEPA 2017), the USEPA recommended child soil ingestion rate is 200 mg/day. $\frac{\mu g_{lead-210}}{day} = \frac{0.00000061\ \mu g_{lead-210}}{g_{soil}} * \frac{200\ mg_{soil}}{day} * \frac{1\ g}{1000\ mg}$ $= 0.00000012\ \mu g/day$ However, the smallest value that may be entered into the model is 0.001 µg/day.
Lead Concentration in Drinking Water	0 µg/L	No pathway exists for the pavement sediment or dust to enter the drinking water because drinking water is provided by an off-site source.

2.2.3 Radioactivity Cancer Risk Assessment

The impacts of radiation on human health have been part of development of nuclear science from the beginning. Parameters for how radioactivity enters a body have been identified and measured. Equations and conversion factors for quantifying the impact to human health were established. Regulatory guidance was issued to assist in selecting the appropriate parameters for different scenarios of human activity (e.g., workers and residents). Computer models were developed to efficiently perform calculations for site-specific parameters for these scenarios.

Although the evaluation in the other sections of this report identified no evidence that radioactivity from historical MED/AEC operations is causing the higher concentrations of lead-210 in sediment pavement, a risk and dose assessment for these structure surfaces was conducted. Protectiveness is achieved when the additional risk to an individual's entire lifetime is generally less than 1 in 10,000 (i.e., 10^{-4}) based on the CERCLA and the National Oil and Hazardous Substances Contingency Plan (NCP) risk criteria specified in 40 *CFR* 300.430(e)(2)(i)(A)(*1*).

Exposure factors used in this risk assessment are either consistent with or more health-conservative than those published in the USEPA Office of Solid Waste and Emergency Response (OSWER) Directive 9200.1-120, *Human Health Evaluation Manual, Supplemental Guidance, Update of Standard Default Exposure Factors* (USEPA 2014a), which are designed to not underestimate the risk and dose to the receptor. This means that the actual risk and dose received by an individual from lead-210 and its progeny will be lower than the estimates in this assessment. For example, some parameter values are higher for a student than for staff and vice versa; the higher of the student and staff values is selected to be health-conservative.

The RESidual RADioactivity (RESRAD) family of computer codes was developed by the Argonne National Laboratory (ANL) for the U.S. Department of Energy (DOE) and has been used for DOE, U.S. Nuclear Regulatory (NRC), and USEPA projects. The software modeling code RESRAD-ONSITE Version 7.2 is used to assess the health hazard from the radioactivity associated with lead-210 and its progeny in soil. The RESRAD-ONSITE estimate is for a lifetime risk of cancer occurring from radioactivity in soil. For this assessment, the pavement sediment and dust are assumed to be on the surface of soil. The USACE document titled *Final Status Survey Evaluation for Surfaces of Structures Associated with the Jana Elementary School, Hazelwood School District* (USACE 2023) contains an analysis that assumes the pavement sediment and dust remain on structure surfaces.

The receptor scenarios considered in this assessment are summarized as follows.

- Student Receptor: This scenario models a student who spends 11.5 hours per day at the school for 170 days per year for 6 years. The parameter of 11.5 hours per day is based on a child receiving before- and after-school care. The parameter of 170 days is based on the school academic calendar for 2022 through 2023, and the parameter of 6 years is based on kindergarten through fifth grade.
- Staff Receptor: This scenario models a staff member who spends 8.5 hours per day at the school for 250 days per year for 25 years. The parameter of 8.5 hours per day includes being onsite for regular working hours plus a half-hour lunch. The parameter values of 250 days and 25 years are based on worker duration in OSWER Directive 9200.1-120, *Human Health Evaluation Manual, Supplemental Guidance, Update of Standard Default Exposure Factors* (USEPA 2014a).

The receptor scenarios incorporate default modeling program input parameters, as well as parameters modified to reflect site-specific conditions. The RESRAD-ONSITE non-default input parameters for the receptor scenarios are provided in Table 3.

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Table 3. Non-Default Input Parameters for RESRAD-ONSITE

Parameter	Description	Value		Basis for Value
		Student	Staff	
Area of Contaminated Zone	The area assumed to have pavement sediment or indoor dust.	100 m^2		The estimated area of pavement where sediment and dust have accumulated is 35 m^2. For areas less than 1,000 m^2, RESRAD-ONSITE uses an area factor (FA) as part of the ingestion pathway analysis. To ensure the ingestion pathway is not understated, an area of 100 m^2 is selected to be health conservative.
Depth of Contaminated Zone	The observed thickness of the pavement sediment.	0.00635 m		Based on observation of the average pavement sediment thickness of 0.25 inches. Indoor dust was a fraction of this thickness.
Depth of Soil Mixing Layer	Depth to which soil mixing occurs due to activities at the surface.	0.00635 m		
Contaminated Zone Erosion Rate	The soil is assumed to erode at this rate.	0 m/year		Although erosion would occur, setting this parameter to 0 m/year provides a conservatively high estimate.
Exposure Duration	The number of years a person could be on pavement sediment or dusty surfaces.	6 years	25 years	Student: 6 years (kindergarten through fifth grade). Staff: 25 years (USEPA 2014a).
Outdoor Time Fraction	The fraction of time each year a person spends outdoors on pavement sediment.	0.0611	0.0903	Based on Table 16-20 of the 2011 EFH (USEPA 2011), outdoor time fractions follow. Student: Outdoor time at school is 88 minutes/day. 88 minutes/day / 1440 minutes/day = 0.0611. Staff: Outdoor time at school is 130 minutes/day. 130 minutes/day / 1440 minutes/day = 0.0903.
Indoor Time Fraction	The fraction of time each year a person spends indoors around dusty surfaces.	0.194	0.180	Student: 170 days/year (Hazelwood School District academic calendar 2022-2023), 11.5 hours/day (assumes before- and after-school onsite childcare); from the previous row of this table, the outdoor time for students is 88 minutes/day (rounded to 1.5 hours/day). $\frac{(11.5\ hours/day - 1.5\ hours/day) * 170\ days}{8{,}760\ hours/year} = 0.194$ Staff: 250 days/year (USEPA 2014a), 8.5 hours/day (8 hours onsite for work plus half-hour lunch); from the previous row the outdoor time for staff is 130 minutes/day (rounded to 2.2 hours/day). $\frac{(8.5\ hours/day - 2.2\ hours/day) * 250\ days}{8{,}760\ hours/year} = 0.180$
Inhalation Rate	The average breathing rate while on pavement sediment or dusty surfaces.	4,380 m^3/year	5,840 m^3/year	Based on Table 6-1 of the 2011 EFH (USEPA 2011), respiratory rates follow. Student: 12 m^3/day. $12\ m^3$ per day x $365\ \text{days/year} = 4{,}380\ m^3\ /\text{year}$ Staff: 16 m^3/day. $16\ m^3$ per day x $365\ \text{days/year} = 5{,}840\ m^3\ /\text{year}$
Soil Ingestion	The yearly amount of pavement sediment or dust entering the body through the mouth.	73 g/year	36.5 g/year	Based on Table 5-1 of the 2017 EFH (USEPA 2017), combined soil and dust ingestion rates follow. Student: 200 mg/day. 200 mg/day x (1 g/1,000 mg) x 365 days/year = 73 g/year Staff: 100 mg/day. 100 mg/day x (1 g/1,000 mg) x 365 days/year = 36.5 g/year These are upper percentile rates; central tendency ingestion rates are 60 to 80 mg/day for elementary school ages and 30 mg/day for adults. Thus, these values are health conservative.
External Gamma Shielding Fraction	Fraction of gamma radiation from outdoors that remains after shielding provided by the building.	0.4		Based on Section 2.4.1 of the *Soil Screening Guidance for Radionuclides: Technical Background Document* (USEPA 2000).
Cut-Off Half-Life	Decay progeny with this half-life or less are automatically included in the calculation (days).	30 days		Selected to allow independent entry of polonium-210. Bismuth-210 will be treated as being in equilibrium with lead-210 because its half-life is less than 30 days.
Radionuclide Transformations	Accounts for radioactivity created from decay of the inputted radionuclide concentrations.	ICRP 107		International Commission on Radiological Protection (ICRP) 107 (ICRP 2008). Most recent nuclear data issued for RESRAD-ONSITE.
Dose Conversion Factors, Risk Slope Factors	The numerical factors for converting radioactivity concentrations to risk estimates.	DCFPAK3.02 Morbidity		DCFPAK 3.02 Morbidity reflects the most recent collection of risk multiplication factors for cancer occurring but not necessarily leading to death.
Soil Concentrations	The radionuclides being modeled and the average pavement sediment and dust concentrations.	Lead-210: 46.9 pCi/g Polonium-210: 60.1 pCi/g		The maximum lead-210 and polonium-210 results are used as the upper bound estimate of the average concentration. These values are health-conservative because they are higher than average results and no background values were subtracted even though the evidence demonstrates these lead-210 sample results are only background.

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The calculated lifetime risk estimate is student 2.3 x 10^{-6} and staff 5.4 x 10^{-6}, which are less than 1/20th of the CERCLA risk standard of 10^{-4} for the protection of human health. Copies of the RESRAD-ONSITE output files are contained in Appendix C. These everyday risks of death are higher by the listed multiple in Table 4 (NSC 2022).

Table 4. Number of Times Higher Everyday Risk is Compared to Radiological Risk

Everyday Risk	Student	Staff
Vehicle Crash	4,100	1,770
Falls	3,800	1,640
Pedestrian Accident	770	330
Drowning	390	160
Fire/Smoke	290	120
Choking on Food	150	65
Bicycling Accident	110	45
Sunstroke	49	21
Storm	8	3.5
Hot items	8	3.4
Dog Attack	4	1.7
Earthquake and Other Earth Movements	3	1.3

Background radiation from natural sources other than radon varies widely in the United States. Terrestrial radiation is from natural radioactivity in the Earth's crust. Excluding radon, terrestrial background radiation varies from 14 mrem per year in Florida to 29 mrem per year in Missouri to 43 mrem per year in Colorado (Mauro et al. 2005). Cosmic radiation is from space, primarily the sun, that interacts with the atmosphere to produce secondary radiation that reaches the Earth's surface. Cosmic radiation generally varies by elevation because higher elevations have less atmosphere to provide shielding. Cosmic background radiation varies from 26 mrem per year in Florida to 28 mrem per year in Missouri to 47 mrem per year in Colorado (Mauro et al. 2005). Combining these terrestrial and cosmic background radiation doses, Colorado residents receive 33 mrem per year more than Missouri residents. Using the USEPA generalized radiation dose to risk conversion of 12 mrem per year to 3 x 10^{-4} (USEPA 2014b), this additional 33 mrem per year equates to an additional risk of 8 x 10^{-4}. The estimates for lead-210 at the HSD-JES are significantly lower (1/145) than these terrestrial and cosmic variations in natural background radioactivity.

2.3 EVALUATION OF INDOOR AND OUTDOOR STRUCTURE SURFACE DATA

A separate report contains the detailed evaluation of the structure surface data to establish whether the conditions required by the ROD are met. This lead-210 evaluation takes a different approach by comparing the structure surface data to natural background radioactivity.

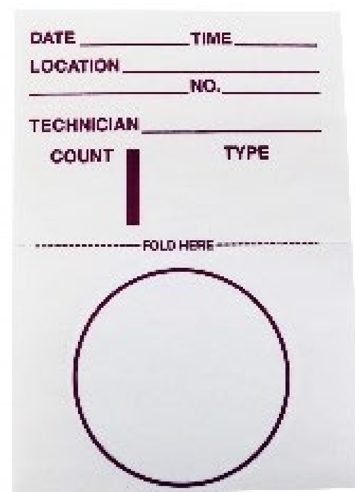
The USACE surveyed for total alpha radioactivity and total beta radioactivity deposited on structure surfaces by scans, readings, and swipes. All the radionuclides in the decay chain can contribute to those results. Results exceeding the general area background do not identify which radionuclide(s) in the decay chain is the cause.

- Scan surveys were performed on 100 percent of the accessible floor surfaces on the first story of the buildings and over a 2-m^2 area surrounding each of the random locations not on the floor of the first story. Scan surveys were performed as follows.

- The floor monitor was a Ludlum Model 43-37 probe (584-cm^2 gas flow proportional detector) coupled with a Ludlum Model 2360 scaler/rate meter. The probe and scaler/rate meter were mounted on a Ludlum Model 239-1 floor monitor cart. The rate of scan for the floor monitor was 3 inches per second.
- The hand-held instruments were a Ludlum Model 43-89 probe (125-cm^2 zinc-sulfide plastic alpha/beta scintillation detector) coupled with a Ludlum Model 2360 scaler/rate meter. The scan surveys were performed by keeping the probe face within 0.4 inch of the surface while moving the probe at a rate of 1 to 2 inches per second. A wheeled skate was used to hold the probe at the proper distance during the scan survey.
- For either set of instruments, the technician listened for increases in the count rate to identify locations for biased fixed-point measurements. The scaler/rate meter has different-sounding chirps for alpha and beta radioactivity. The technician operating the floor monitor would inform another technician of increased count rates, and that technician would investigate the area with the Ludlum Model 43-89 and collect a biased fixed-point measurement where increased count rates were observed.

- A total of 461 fixed-point measurements of the structures at the HSD-JES were taken using a Ludlum Model 43-89 probe (125-cm^2 zinc-sulfide plastic alpha/beta scintillation detector) coupled with a Ludlum Model 2360 scaler/rate meter. The detector was held in place for a one-minute count using a built-in timer on the scaler/rate meter. The locations of these measurements are shown on Figures 3 through 6.
- After the fixed-point measurement was completed, the potential for loose surface radioactivity was investigated by wiping a dry swipe over an area of 100 cm^2. A 100-cm^2 area is approximated by moving the swipe in an "S" shape through a 4-inch-by-4-inch square area. A swipe is a cloth disc of 20 cm^2 in size that is mounted on a piece of paper (Image 2). The paper is folded to prevent cross contamination between swipes. Investigation levels for swipes were 280 dpm/100 cm^2 for total alpha radioactivity, 600 dpm/100 cm^2 for total beta radioactivity, and 1,000 dpm/100 cm^2 for lead-210. The swipes intended for lead-210 analysis were provided by the laboratory to support their analytical process.

Image 2. Swipe



The materials used in constructing a structure have their own levels of natural background radioactivity. The amount of background radioactivity in a material can be too small to justify the effort to quantify it. The smallness is relative to the concentration of radioactivity deposited on a structure's surfaces that requires remediation. However, variations in the background radioactivity in materials are large enough to influence survey results. Granite, brick, asphalt, concrete, ceramics, stone, marble, tile, and gypsum, generally have higher survey results than wood, paper products, metal, and plastic. Background radioactivity in structure materials was not subtracted from these measures.

As discussed in Section 2.1 of this report, static electricity can attract airborne radon progeny. Plastic, metal, and pavement are surfaces where static electricity can occur that preferentially causes settling of radon progeny on those surfaces. Like background radioactivity in materials, the effort to remove radon progeny background radioactivity is often not made because of the smallness of the increase compared to the level that requires remediation. However, variations in the background radioactivity from radon progeny are large enough to influence survey results.

Accordingly, the data were organized by material types to account for the differing amounts of natural background with the materials used in the structure's construction. For a normal distribution of background radioactivity measurements, 99.7 percent of the measurements will be within 3 standard deviations of the average, and 99.99 percent will be within 4 standard deviations of the average. Appendix D contains the fixed-point measurement results for both total alpha radioactivity and total beta radioactivity with summary statistics for different structural materials. Of the 922 measurements, 99.7 percent were within 3 standard deviations of the average, and all were within 4 standard deviations of the average. Thus, the fixed-point measurements are consistent with expected natural background.

The swipes for removable radioactivity were analyzed for total alpha radioactivity and total beta radioactivity by an accredited laboratory. Appendix D contains the swipe measurement results. No swipe measurement result exceeded its MDCs[5]. The maximum MDCs were 6.14, 8.50, and 4.35 dpm/100 cm^2 for alpha, beta, and lead-210, respectively. These very low MDCs were 2 percent or less of investigation levels.

Quality assurance (QA) information for these structure surface measurements is contained in Appendix E.

2.4 EVALUATION OF SOIL DATA

A separate report contains the detailed evaluation of soil data in terms of whether the conditions required by the ROD are met. This lead-210 evaluation takes a different approach in comparing the soil data to expected natural background radioactivity.

Laboratory analysis of soil samples provides results for uranium-238, thorium-230, and radium-226 that are in the uranium-238 decay chain. Results for these primary radionuclides are used to characterize the radioactivity from the entire decay chain. Radionuclides in the decay chain with half-lives less than 180 days are assumed to be in equilibrium (i.e., at the same concentration) with their primary radionuclide. Early in the project, source term analysis was performed for soil at the SLAPS, the HISS, and Futura (DOE 1993). The source term analysis established relationships of these primary radionuclides to lead-210 and uranium-234, which have half-lives exceeding 180 days. Specifically, lead-210 in soil is linked to radium-226 in soil by a factor of 2.4. Thus, radium-226 results for the dataset for the HSD-JES being consistent with the radium-226 results in the background dataset is an indication of no MED/AEC-related lead-210 in the soil.

Appendix F contains the radium-226 results of soil samples collected from the HSD-JES and the adjacent CWC corridor. All the sample locations, called stations, are shown on Figure 2. An expanded view of the station locations with identification labels is shown on Figures 7 and 8. The stations are arranged into three groups as follows:

- Clearing - stations in the area around the buildings and in the athletic fields;
- Woods - stations in the wooded areas that are not within the banks of CWC; and
- Corridor - stations within the banks of the portion of CWC adjacent to the HSD-JES.

[5] An MDC is the activity concentration equivalent to the mean value of the net instrument count that gives a specified probability, 95 percent for this report, of yielding an observed net instrument signal or count greater than its critical value (DoD 2009). The critical value defines the lowest value of the net instrument count that is large enough to disprove the premise that no radioactivity is present. Despite its name of "MDC," the detection decision is associated with the critical value and not the MDC; the MDC is greater than the critical value.

Additional statistical analyses of the sample results were performed using the USEPA-designed software ProUCL Version 5.2. Appendix G contains the ProUCL output files for analysis of these radium-226 sample results against the background dataset using the Wilcoxon-Mann-Whitney Comparison Test. The test conclusions, with a 95 percent confidence interval, are summarized in the following list.

- The clearing soil dataset was consistent with or less than the values for the background soil dataset.
- The woods soil dataset was greater than the values for the background soil dataset.
- The corridor soil dataset was greater than the values for the background soil dataset.

Based on the information in the first bullet, the radium-226 data for the clearing soil indicates no MED/AEC-related lead-210 is in the soil. The radium-226 data for the woods soil and corridor soil indicates some of the soil may have MED/AEC-related radioactivity, and the significance of that will be assessed separately. As discussed in Section 2.5.3, approximately 6 percent of the area with the creek banks that is owned by the Hazelwood School District requires remediation. The woods area will be part of the construction zone for that remediation. The health risk associated with the soil for the woods and corridor areas will be documented in an FSSE after remediation is completed.

QA information for these soil sample results is contained in Appendix E.

2.5 EVALUATION OF SURFACE DUST AND PAVEMENT SEDIMENT SAMPLES

Sufficient surface dust was available and collected at five indoor locations (structure survey unit [STSU]3-UB1, STSU3-UB6, STSU3-UB11, STSU3-UB14, and STSU3-UB18); these locations are identified on Images 3 through 6 and Figure 3. Sufficient pavement sediment was available and collected at four outdoor locations (SVP264222, SVP264223, SVP264224, and SVP264225). Locations of the pavement sediment are shown on Images 7 through 10 and Figure 4. Copies of the field logbook entries for the surface dust and pavement sediment samples from structure surfaces are contained in Appendix H.

The five indoor dust and four pavement sediment samples had small sample volumes, so laboratory analysis was limited to alpha spectroscopy. The analytical results included the following primary COCs, which are radionuclides in the uranium-238 decay chain: radium-226, thorium-230, uranium-234, and uraninum-238.

The required analyses for lead-210 and polonium-210 are different than the required analysis for these four radionuclides. Therefore, more material in the form of a second sample was required for analysis for lead-210 and polonium-210. At three of the pavement sediment sample locations, enough pavement sediment was available in the same area to collect a second sample (SVP264231, SVP264332, and SVP264333) for analysis for lead-210 and polonium-210 at the Eurofins St. Louis laboratory. The fourth pavement sediment area and none of the areas where dust samples were collected had enough material for a second sample to be collected. The 40 analytical results are contained in Table D-8 of Appendix D.

Image 3. STSU3-UB6
(dust on top of conduit piping)

Image 4. STSU3-UB11
(dust on top of water heater)

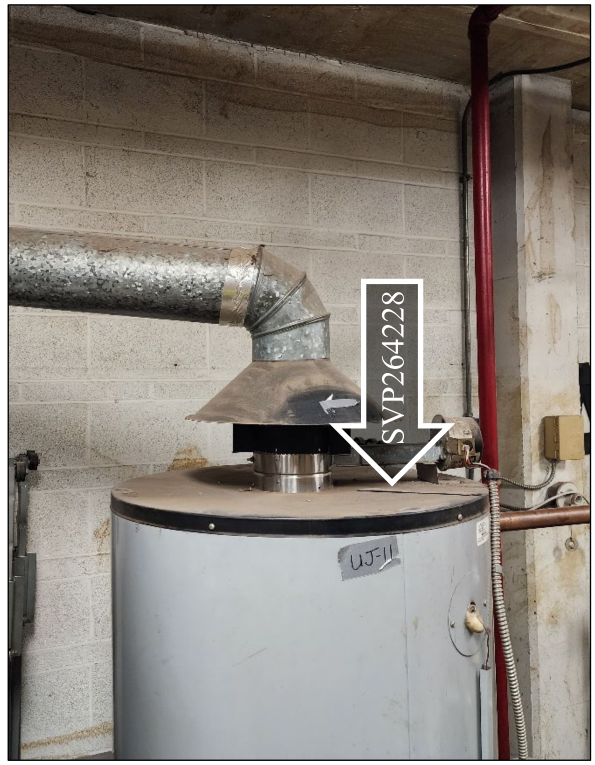


Image 5. STSU3-UB14
(dust on top of supports)

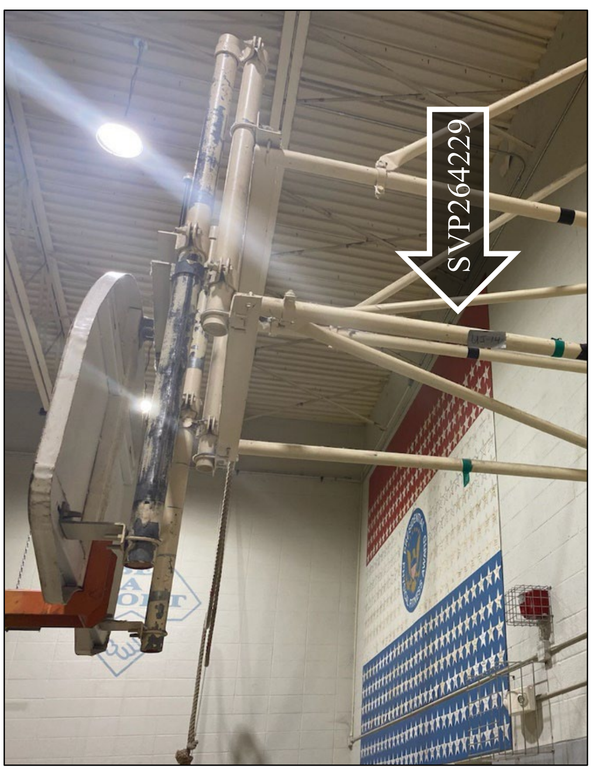


Image 6. STSU3-UB18
(dust on top of ducting)

Image 7. STSU3-UB1
(dust on top of fan blades in kitchen)

Image 8. Pavement Sediment Southwest of Basketball Courts

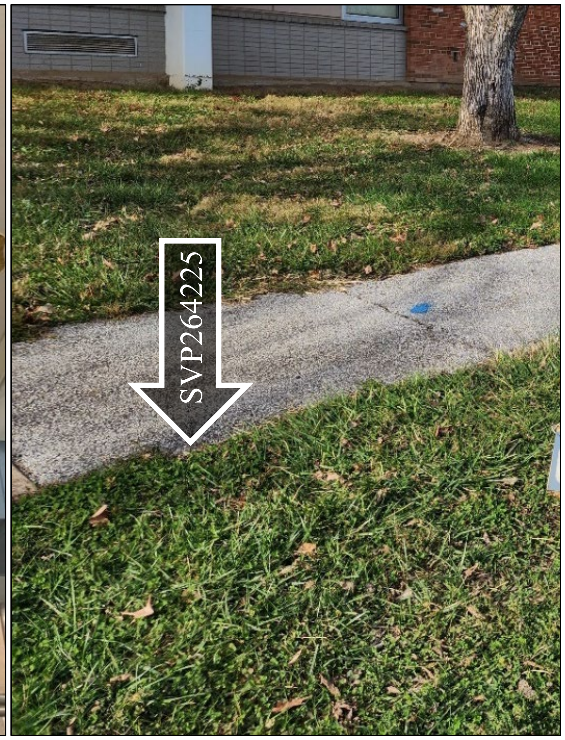


Image 9. Pavement Sediment Near Kindergarten Play Area

Image 10. Pavement Sediment Near Basketball Courts

For radium-226, thorium-230, uranium-234, and uraninum-238, the average result for these samples was less than the natural background average value. Additional statistical analyses of the sample results were performed using the USEPA-designed software ProUCL Version 5.2. Appendix I contains the ProUCL output files for analysis of these sample results against the background dataset using the Wilcoxon-Mann-Whitney Comparison Test. The test conclusions for each of the four radionuclides indicated the results for the dust and pavement sediment dataset were consistent with or smaller than the values for the background dataset. These conclusions are based on a 95 percent confidence interval. These results indicate MED/AEC radioactivity is not present in pavement sediment and dust.

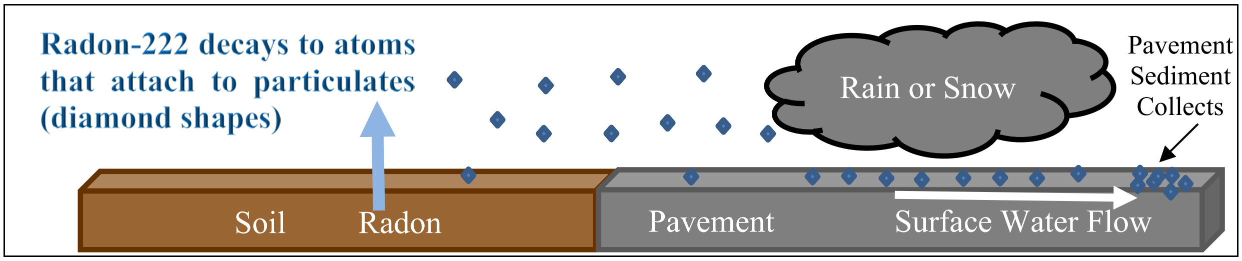
However, two of the pavement sediment samples (SVP264231 and SVP264332) had lead-210 results that were approximately 10 and 40 times higher than the results for radium-226, thorium-230, and uranium 238. Lead-210 is in the same uranium-238 decay chain as these three radionuclides. As discussed in Section 2.4 of this report, source term analysis was performed for soil at the SLAPS, the HISS, and Futura (DOE 1993). The source term analysis established relationships of these primary radionuclides to lead-210. Specifically, lead-210 in soil is linked to radium-226 in soil by a factor up to 2.4. Thus, the factors of 10 and 40 of lead-210 to radium-226 requires investigation. The following subsections contain evaluations of possible reasons why these two samples had higher lead-210 results.

The polonium-210 results for pavement sediment samples SVP264231 and SVP264332 are closely related to the lead-210 results. As shown on Image 1, lead-210 decays to bismuth-210, which decays to polonium-210. Because the half-life of lead-210 is in years and the half-life for the other two radionuclides are in days, polonium-210 is expected to be at concentrations consistent with lead-210. The polonium-210 results for samples SVP264231 and SVP264332 were relatively close to the lead-210 results. The variances are attributed to different analysis methods that had different yields, and the polonium-210 results meet the criteria for the estimated "J" validation qualifier. The bottom line is that the polonium-210 results substantiate the lead-210 results.

2.5.1 Investigation of Whether Natural Processes Involving Radon Could Cause Lead-210 and its Progeny to be Present in Pavement Sediment

As discussed in Section 2.1 of this report, radon is a naturally occurring radioactive noble gas that can migrate out of soil. When radon decays, the non-gas progeny attach to small particulates that float in the air. These particulates can settle on surfaces, attracted by static electricity or washed out by precipitation. Particulates landing on pavement can attach to a thin coating of sediment (i.e., surface dirt and dust) lying on top of the pavement. Pavement sediment, because it is characteristically a thin veneer, has a small mass to rainwater ratio resulting in a greater concentration of lead-210 than does topsoil on a per gram basis. Precipitation concentrates pavement sediment at low spots, cracks with grass, or similar features (Image 11). These natural concentrating processes for pavement sediment have been found to have background lead-210 concentrations as high as 71 pCi/g with an average of 44 pCi/g (Gellis, et al 2020). Thus, the levels of lead-210 in pavement sediment at the HSD-JES are consistent with background levels of radon gas decaying through to lead-210; settling on pavement; and concentrating pavement sediment at low spots, cracks with grass, or similar features through precipitation.

Image 11. Natural Background Radon Gaseous Diffusion, Settling, and Concentration in Pavement Sediment



2.5.2 Investigation of Whether Coldwater Creek Flooding Deposited Lead-210 in Pavement Sediment

The school pavement is located on a knoll approximately 3 ft higher than the highest recorded flooding of CWC in 1957 (USGS 1971). The extent of that flooding on the HSD-JES is shown on Figure 9. Additional evidence that the height has prevented CWC from flooding the knoll is provided on Image 12 taken during the flooding event on July 26, 2022. This image was taken from the playground near the southern corner of the building. Flooding is visible in the lower portion of athletic field area and the woods. The flooding occurred because a portion of the land area that drains to CWC received a narrow band of 6 to 12 inches of rainfall over a 15-hour period on July 25 and July 26, 2022 (NWS 2022). The U.S. Geological Survey (USGS) monitoring gauge on CWC, number 06936475, is located near Old Jamestown Road in Black Jack, Missouri. This gauge recorded a peak height of 15.7 ft from the rainfall on July 26, 2022, and the 1957 record flooding was reported to reach 20.6 ft.

Image 12. CWC Floodwaters on Athletic Field and Woods Behind Jana Elementary School

2.5.3 Investigation of Whether School Children Playing Within the Creek Banks Where Remediation is Required Could Accidently Bring Lead-210 In Sediment to School Pavement

The creek banks along the HSD-JES are steep, high, and brushy. School children would be in danger of physical harm if trying to go up or down the banks. Images 13 and 14 show the portion of the creek bank owned by the Hazelwood School District. The photographs for these images were taken on November 15, 2022. School staff are required to be protective of the physical safety of 5- to 10-year-olds. School staff would not allow students to descend and climb the steep and brushy bank to access CWC where drowning could occur. The worker in the images provides perspective on the height of the banks.

The white arrows on Image 15 point to the areas on the HSD-JES that require remediation. These areas are covered with brush and represent approximately 6 percent of the area with the creek banks that is owned by the Hazelwood School District, and approximately 90 percent of the soil that will be remediated is covered by soil that does not require remediation.

The physical conditions in the creek banks and the protective measures provided by school staff prevent students from being a method for moving incidental amounts of soil requiring remediation to the school itself.

Image 13. CWC Banks on Land Owned by the Hazelwood School District

Image 14. CWC Banks on Land Owned by the Hazelwood School District

Image 15. Remediation Areas within the CWC Corridor on Land Owned by the Hazelwood School District

2.5.4 Investigation of Whether the Area Requiring Remediation Within the Creek Banks Generated Radon Gas that Deposited Lead-210 in Pavement Sediment

The radium-226 data results for the CWC corridor adjacent to the HSD-JES were used to estimate the radon emission rate (ER) to the air above the soil within the CWC corridor. That ER was used to estimate the deposition of radon decay products, including lead-210, on the school pavement and building roofs.

- RESRAD-ONSITE Version 7.2 was used to estimate the radon ER from the soil in the CWC corridor.
- The CAP88-PC Version 4.1 computer code is endorsed by the USEPA for use in demonstrating compliance with the National Emission Standards for Hazardous Air Pollutants applicable to radionuclides. CAP88 was used to estimate the ground deposition of radon decay products on school pavement and building roofs based on the RESRAD-ONSITE result for the radon ER from soil within the CWC corridor adjacent to the HSD-JES.

The non-default input parameters for these computer models are provided in Table 5. The highest estimated radon ER from RESRAD-ONSITE, which occurred at year zero of the evaluation times, was 0.43 pCi/m^2 per second. The RESRAD-ONSITE output files are contained in Appendix J.

Table 5. Non-Default Input Parameters for RESRAD-ONSITE and CAP88

Parameter	Description	Value	Basis for Value
Radium-226 Soil Concentration[a]	Radium-226 decays to radon-222, so this soil concentration represents the source of radon in addition to normal background.	0.56 pCi/g	The maximum depth where radium-226 results in the CWC corridor exceed the maximum background value is 10 ft. All corridor radium-226 results to a depth of 10 ft were used in the ProUCL program to obtain the 95 percent upper confidence limit (UCL_{95}) of the average, 1.61 pCi/g. The average of surface and subsurface background radium-226 is 1.05 pCi/g. Thus, the radium-226 concentration contributing to radon in excess of background is 0.56 pCi/g for this sample.
Area of Contaminated Zone[a]	Area of soil is assumed to have radium-226 at 0.56 pCi/g.	13,727 m^2	A geographic information system (GIS) analyst determined the CWC corridor area shown on Figure 2. Even though some areas within the CWC corridor do not have radium-226 in excess of background, the entire area was selected to provide a conservatively high ER.
Depth of Contaminated Zone[a]	The thickness of the soil assumed to have 0.56 pCi/g more radium-226 than background.	3 m	The maximum depth where radium-226 results in the CWC corridor exceed the maximum background value is 10 ft or 3 m.
Cover Depth[a]	Thickness of soil with radium-226 at background values that is on top of soil assumed to have 0.56 pCi/g more radium-226 than background.	0 m	Although such cover soil exists within the CWC corridor adjacent to the HSD-JES, setting this parameter to 0 m provides a conservatively high ER.
Contaminated Zone Erosion Rate[a]	The soil is assumed to erode at this rate.	0 m/year	Although erosion would occur, setting this parameter to 0 m/year provides a conservatively high ER.
Indoor and Outdoor Fraction[a]	The fractions of time a person spends indoors and outdoors at the site.	0	These parameter values are not needed for estimating radon emissions.

Table 5. Non-Default Input Parameters for RESRAD-ONSITE and CAP88 (Continued)

Parameter	Description	Value	Basis for Value
Meteorological[b]	Wind, precipitation, humidity, and temperature data.	File 13994	CAP88 File 13994 has meteorological data for St. Louis Lambert International Airport.
Run Type[b]	Determines whether the result is for a specific location or integrated over an area.	Individual	The ground deposition value being estimated is for a specific location.
Midpoints[b]	Distance from the source to the location of deposition.	255 m	A GIS analyst determined the distance from the center of the CWC corridor adjacent to the HSD-JES to the approximate center of the school pavement and building roofs.
Height[b]	This is the starting height of the radon gas being modeled.	0.3 m	This height is representative of radon from soil emissions.
Plume Type and Rise	This is the additional height the plume rises before flowing horizontally.	Fixed 4.5 m	A 30-ft elevation difference exists between the bottom of the creek bank and the school. The radon is assumed to reach half of that height to then flow horizontally toward the school.
Area[b]	Area of radon emissions.	13,727 m^2	A GIS analyst determined the CWC corridor area shown on Figure 2.
Nuclide[b]	The radionuclide being modeled and its release rate (RR).	Radon-222 0.19 Ci/year	The RR is calculated by the following equation. $RR = (ER)(Area)(31{,}536{,}000\ seconds/year)(1x10^{-12}\ \text{Ci/pCi})$ $RR = (0.43)(13{,}727)(31{,}536{,}000)(1x10^{-12}) = 0.19\ Ci/year$

[a] RESRAD-ONSITE input parameters.

[b] CAP88 input parameters.

Based on the CAP88 results for the northwest direction, the additional concentration of radon and airborne decay products reaching the school from the CWC corridor is 0.12 pCi/m^3, which equates to 0.00012 pCi/L. Over the past 10 years, the average outdoor background radon for the North St. Louis County Sites is 0.2 pCi/L (USACE 2013, 2014, 2015b, 2016-2018, 2019b, 2020-2022). Per the USEPA, the national average outdoor background radon is 0.4 pCi/L (USEPA 2016). The additional radon that could be contributing radon decay products to the school pavement and building roofs is less than 1/1,500th of background radon for the North St. Louis County Sites.

2.5.5 Investigation of Whether Additional Radon Came From Contaminated Fill Soil or Flooding Sediment Subsequently Buried by Fill Soil on the HSD-JES

The soil borings used to collect the samples were specifically planned to reach the depth of native soil under any fill. The soil boring materials were examined by a geologist for changes in soil conditions that are representative of fill. No evidence of fill was identified in the soil on the hill plateau where the structures are built. These results are consistent with a review of historical documentation that the knoll existed prior to the structures being built. Seven boring locations with evidence of fill material were all within or southwest of the athletic field area behind the school. The fill is up to 5 ft thick and was sampled. As previously discussed in Section 2.4, the soil sample results for radium-226 in the clearing area were consistent with background values.

3.0 CONCLUSIONS

The following conclusions regarding the state of lead-210 are supported by the radiological data obtained for the HSD-JES. These data consist of 1,211 soil samples, 461 fixed-point measurements, 480 swipes, and 9 dust and pavement samples with a total of 3,114 analysis results evaluating 19,800 m^2 of structure surfaces and 20 acres of soil.

- Regardless of the source of the lead-210 and its progeny, their highest concentrations in pavement sediment do not present a health hazard.
  - The lifetime radiological risk estimate for students is 2.3 x 10^{-6} when using the highest results as the averages. This risk is less than 1/40th of the CERCLA risk standard of 10^{-4} for the protection of human health. The everyday risk of dying from dog attacks is 4 times higher and from storms is 8 times higher (NSC 2022).
  - The lifetime radiological risk estimate for staff is 4.9 x 10^{-6} when using the highest results as the averages. This risk is less than 1/20th of the CERCLA risk standard of 10^{-4} for the protection of human health. The everyday risk of dying from dog attacks is 1.9 times higher and from storms is 3 times higher (NSC 2022).
  - The highest lead-210 radiological result equates to a concentration of 6.1x10^{-7} mg/kg in the pavement sediment. This concentration is less than 1/600,000,000th of the TSCA standard for protection of human health.
  - The USEPA model for estimating the blood concentration of lead from 6.1x10^{-7} mg/kg is 0.0 µg/dL. The CDC's blood lead reference value for children is 3.5 µg/dL.
- All possible causes of the 2 locations of higher concentrations of lead-210 on pavement at the HSD-JES where evaluated. The only possible cause for those results at only those locations is natural background conditions for radon and its progeny.
  - These higher lead-210 concentrations were identified in pavement sediment. Pavement sediment is the thin layer of dirt that collects on top of pavement at low spots, cracks with grass, or similar features.
  - These higher lead-210 concentrations in pavement sediment are consistent with scientifically known variations in natural background conditions. Independent studies at other locations demonstrate the occurrence of higher lead-210 concentrations in pavement sediment from natural background conditions from radon and its progeny.
- Other evidence that lead-210 is consistent with background radioactivity follows.
  - Fixed-point measurements from 461 locations for total alpha radioactivity and total beta radioactivity on structure surfaces have statistical distributions that are consistent with background radioactivity.
  - Swipe measurements from 461 locations for removable radioactivity on structure surfaces were less than very low MDCs that were 0.2 percent or less of established control numbers.
  - Because lead-210 is produced 4 days following decay of radium-226, radium-226 soil data at HSD-JES were evaluated for consistency with radium-226 soil background data. Based on the Wilcoxon-Mann-Whitney Comparison Test, the two datasets are consistent with 95 percent confidence interval for radium-226 results.

- The higher lead-210 concentration listed in RCJES (Brustowicz, Thompson, and Kaltofen 2022) for an indoor dust sample was not duplicated by the USACE despite several USACE measurements of dust and swipes in the same room as reported in RCJES. If indoor dust has higher levels of lead-210, the amount is limited and not widespread.
- The additional radon from within the banks of CWC that could be contributing radon decay products to the school pavement and building roofs is less than 1/1,500th of background radon for the North St. Louis County Sites.

Note: A draft of this report was reviewed by the USEPA, the Missouri Department of Natural Resources (MDNR), and the Missouri Department of Health and Senior Services (MDHSS). Their comments and USACE responses are contained in Appendix K.

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FIGURES

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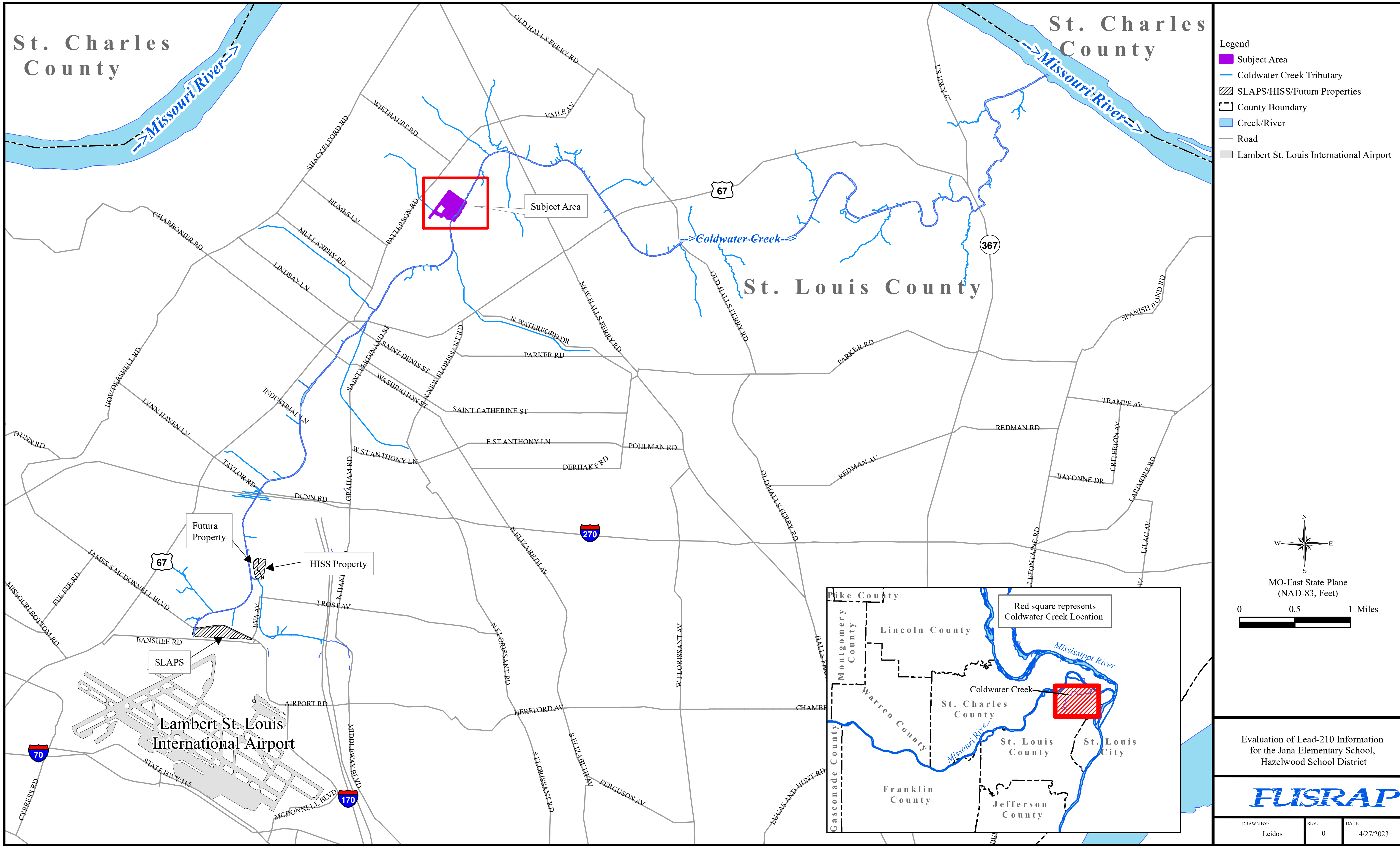
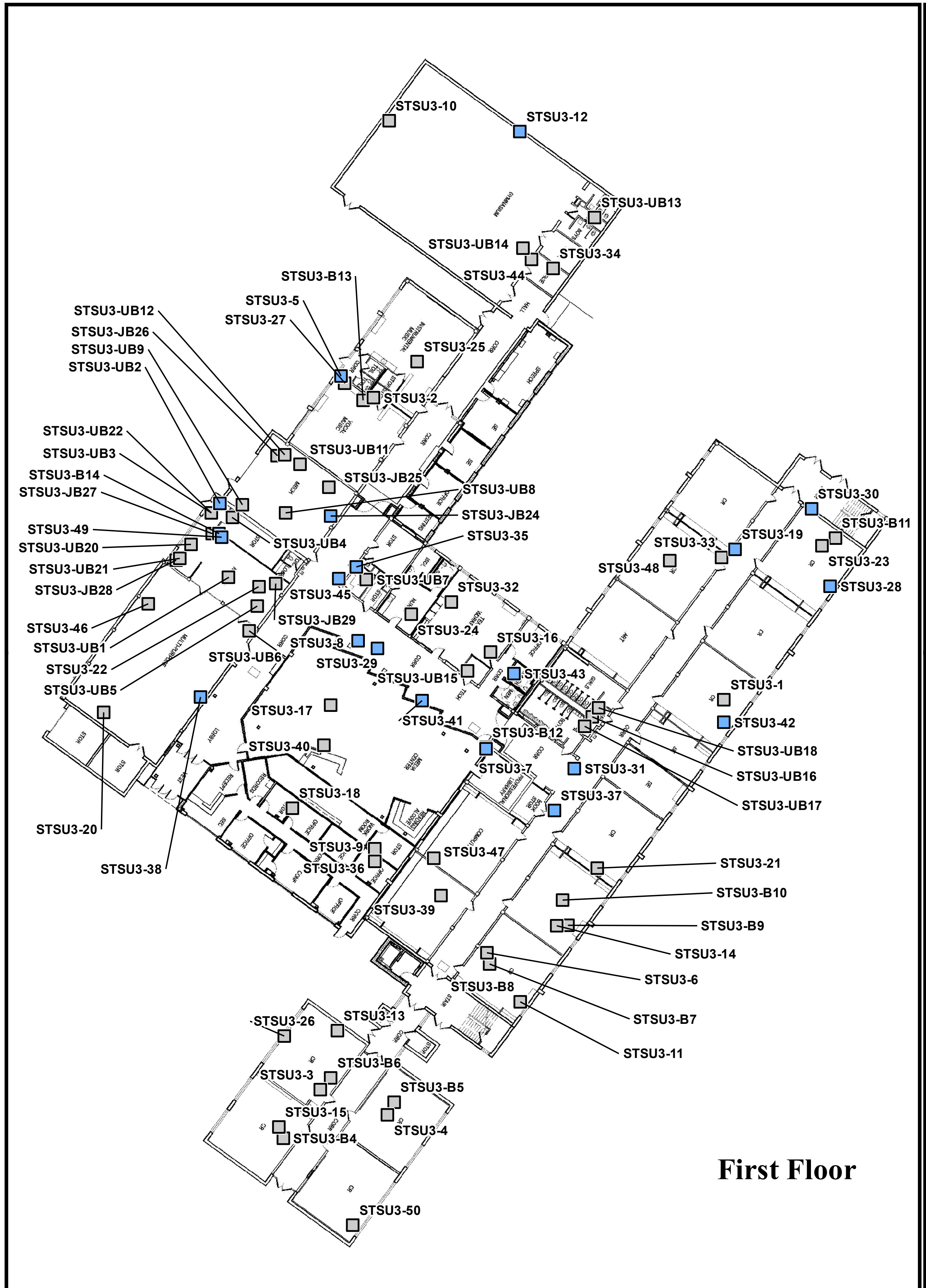


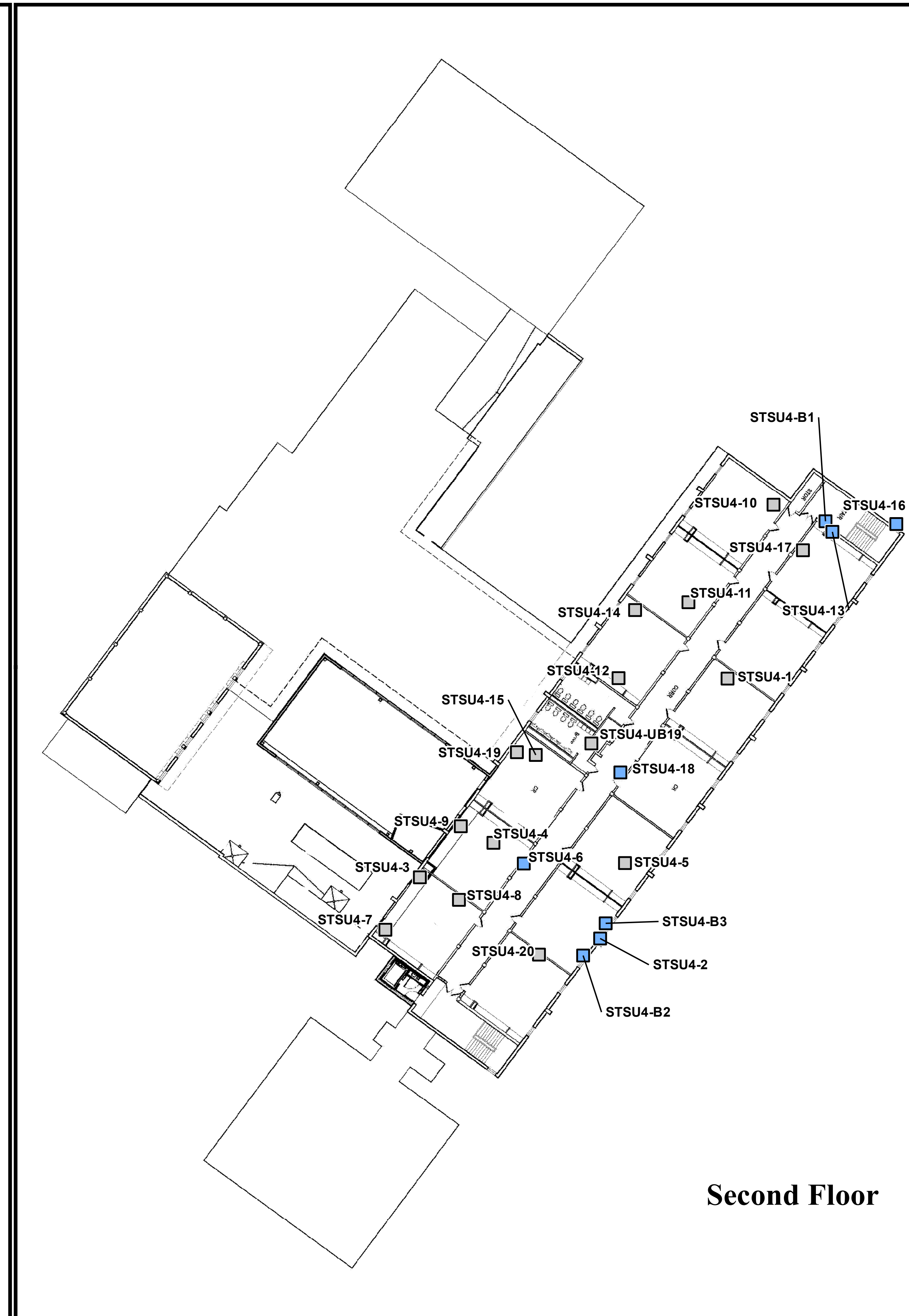
Figure 1. Location of North St. Louis County Sites

Document Path: U:\GPS\NorthCoCWC\Hazelwood School District\Lead-210 Report\Projects\Rev 0\Figure 2 Sample Stations.mxd

Figure 2. Sample Stations

Document Path: U:\GPS\NorthCo\CWC\Hazelwood School District\Lead-210 Report\Projects\Rev 0\Figure 3 Structure Surface Survey Locations for Interior Walls and Equipment.mxd





Legend

- Location on Walls and Equipment Containing Brick, Ceramics, Tile, or Concrete
- Location on Walls and Equipment Made of Other Materials
- Door

N
W E
S

MO-East State Plane
(NAD-83, Feet)

0 25 50 Feet

Evaluation of Lead-210 Information for the Jana Elementary School, Hazelwood School District

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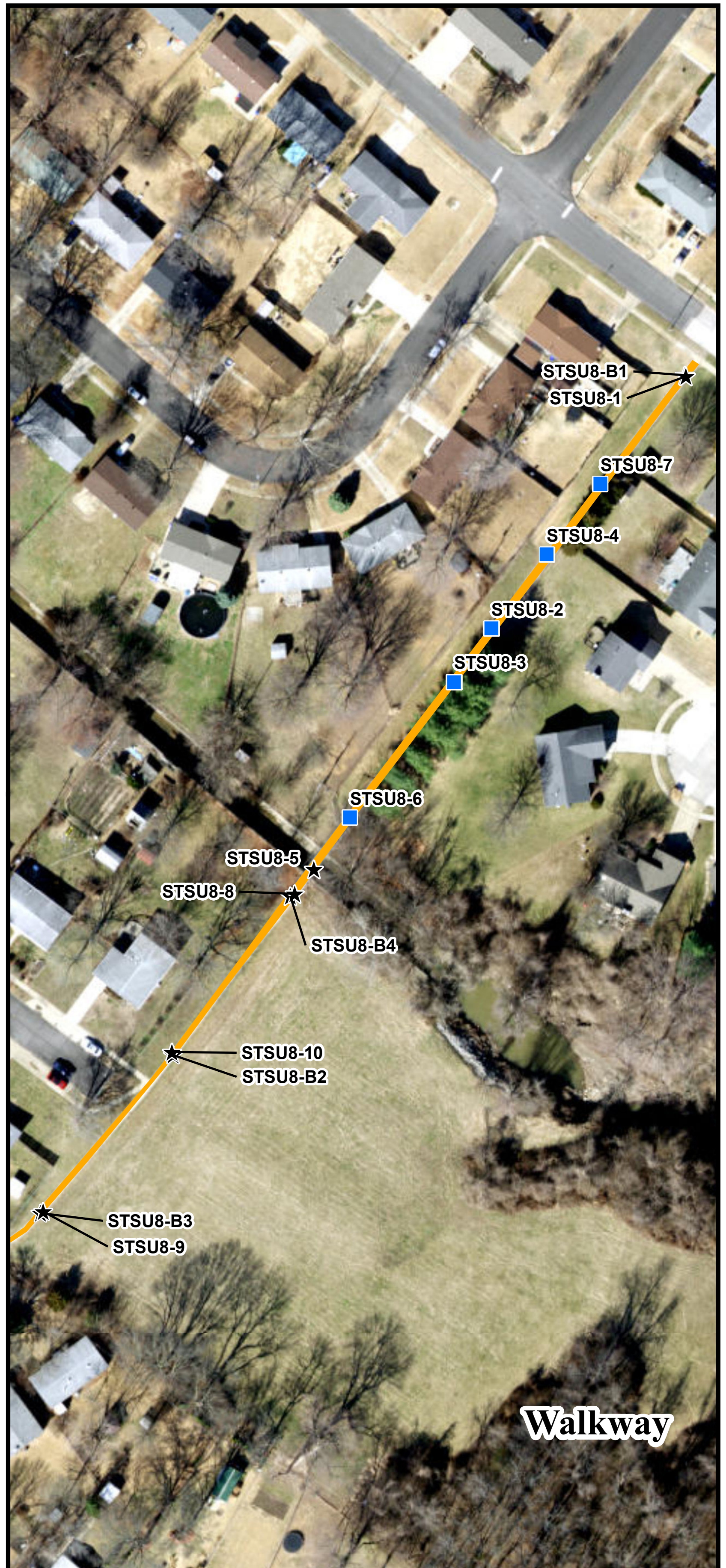
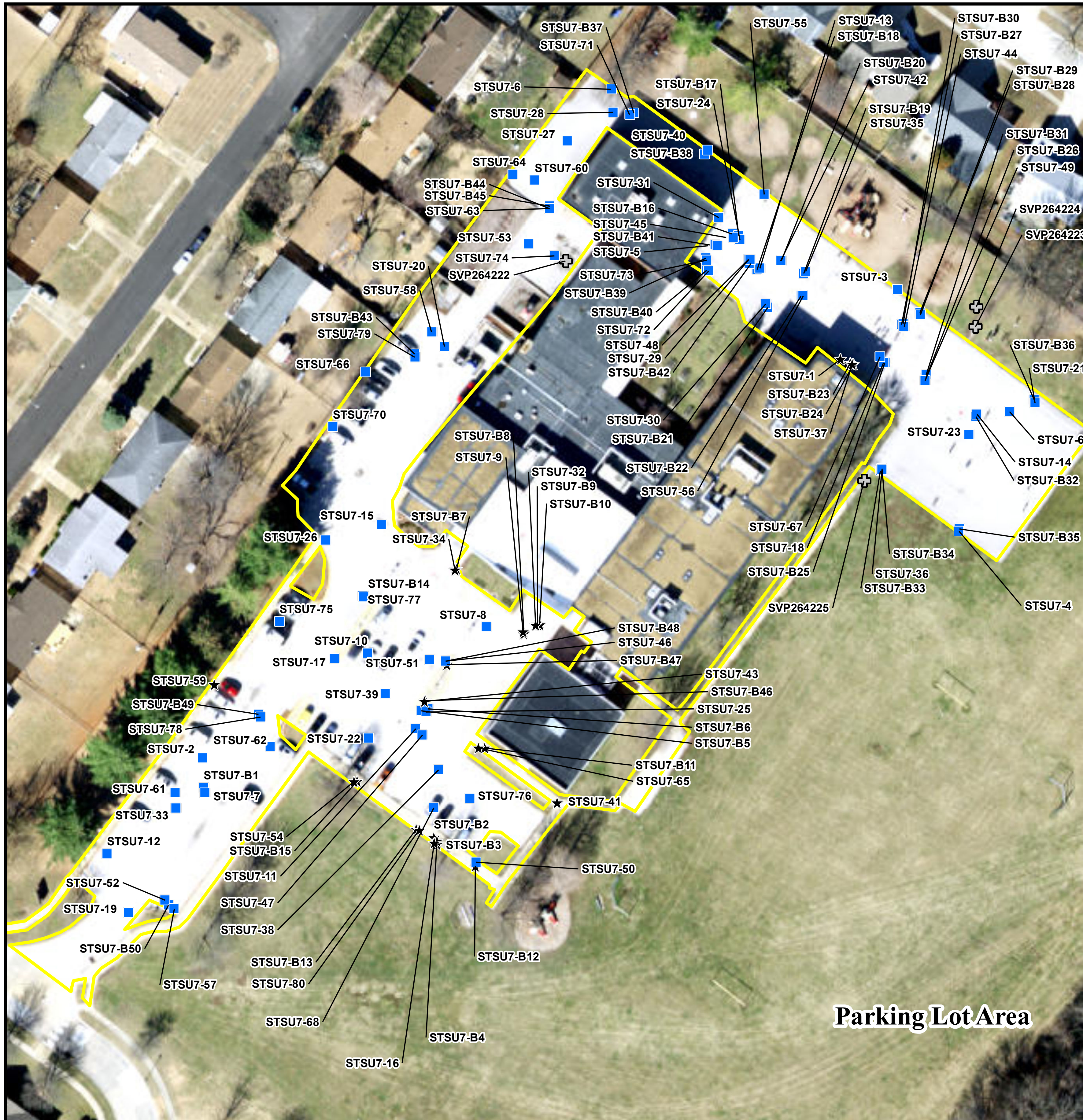
Figure 3. Structure Surface Survey Locations for Interior Walls and Equipment





Legend
- Location on Asphalt Pavement
- ★ Location on Concrete Pavement
- Pavement Sediment Location
- Walkway
- Pavement Area

N W E S

MO-East State Plane (NAD-83, Feet)

0 25 50 Feet

Evaluation of Lead-210 Information for the Jana Elementary School, Hazelwood School District

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Figure 4. Structure Surface Survey Locations for Pavement

Document Path: U:\GPS\NorthCo\CWC\Hazelwood School District\Lead-210 Report\Projects\Rev 0\Figure 5 Structure Surface Survey Locations for Floor Materials.mxd

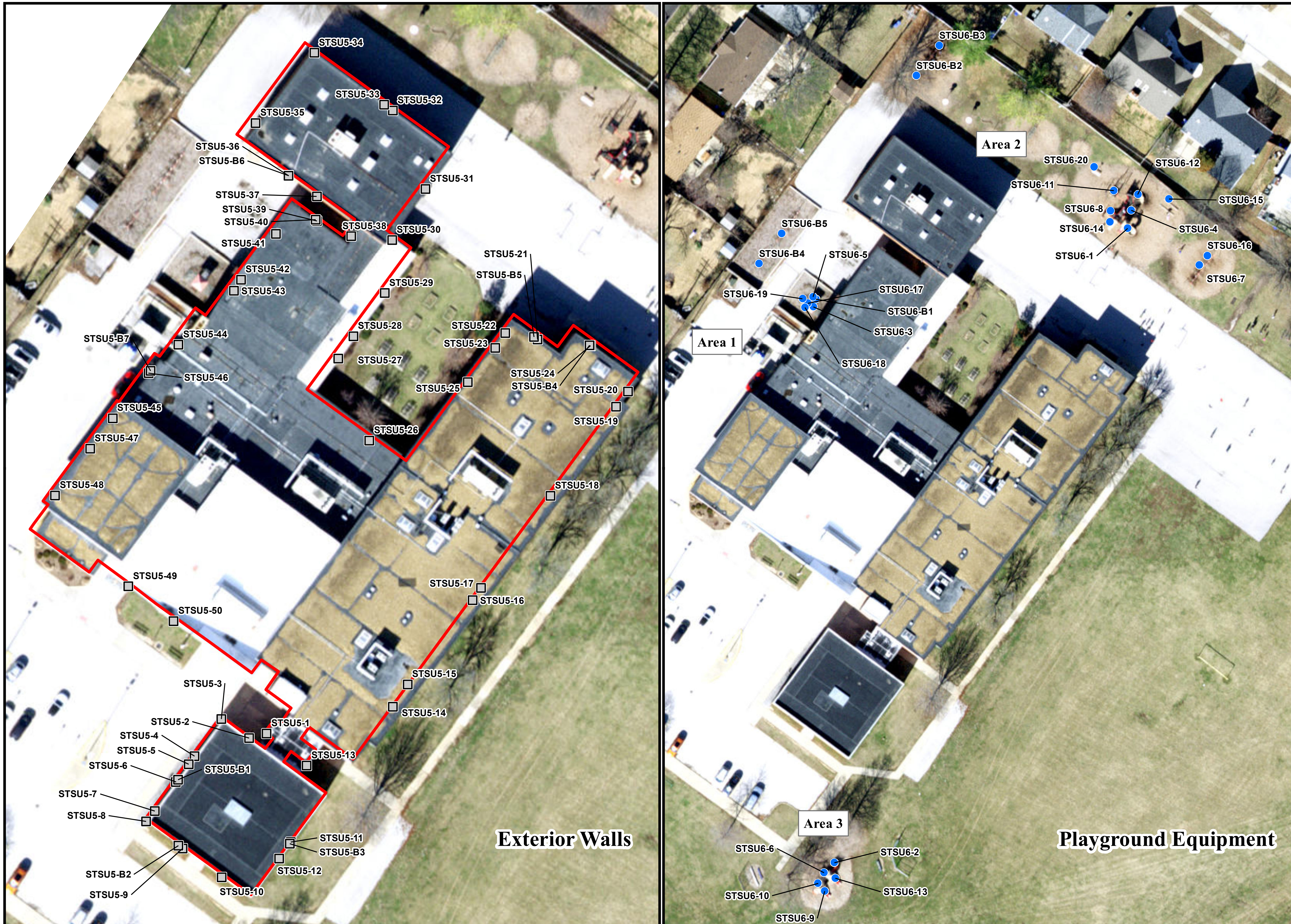
Evaluation of Lead-210 Information for the Jana Elementary School, Hazelwood School District

FUSRAP

DRAWN BY:	REV:	DATE:
Leidos	0	4/27/2023

Figure 5. Structure Surface Survey Locations for Floor Materials

Document Path: U:\GPS\NorthCo\CWC\Hazelwood School District\Lead-210 Report\Projects\Rev 0\Figure 6 Structure Surface Survey Locations for Exterior Walls.mxd



Legend

- ☐ Location on Exterior Walls
- ● Location on Playground Equipment
- — Building Exterior Wall

N / W / E / S

MO-East State Plane
(NAD-83, Feet)

0 25 50 Feet

Evaluation of Lead-210 Information for the Jana Elementary School, Hazelwood School District

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Figure 6. Structure Surface Survey Locations for Exterior Walls and Playground Equipment

Document Path: U:\GPS\NorthCoCWC\Hazelwood School District\Lead-210 Report\Projects\Rev 0\Figure 7 Clearing and Woods Stations.mxd

Figure 7. Clearing and Woods Sample Stations

Document Path: U:\GPS\NorthCo\CWC\Hazelwood School District\Lead-210 Report\Projects\Rev 0\Figure 8 Corridor Stations.mxd

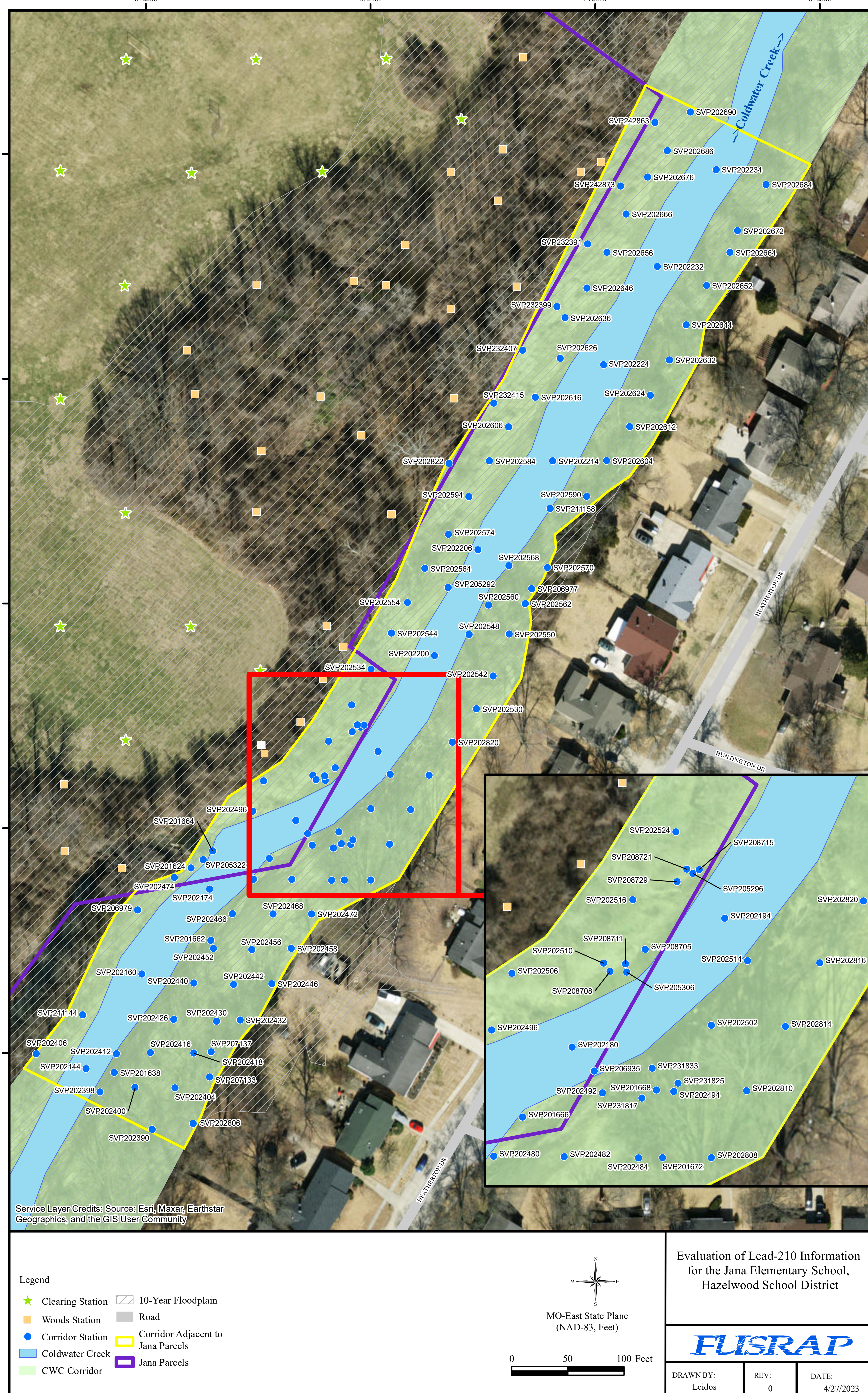
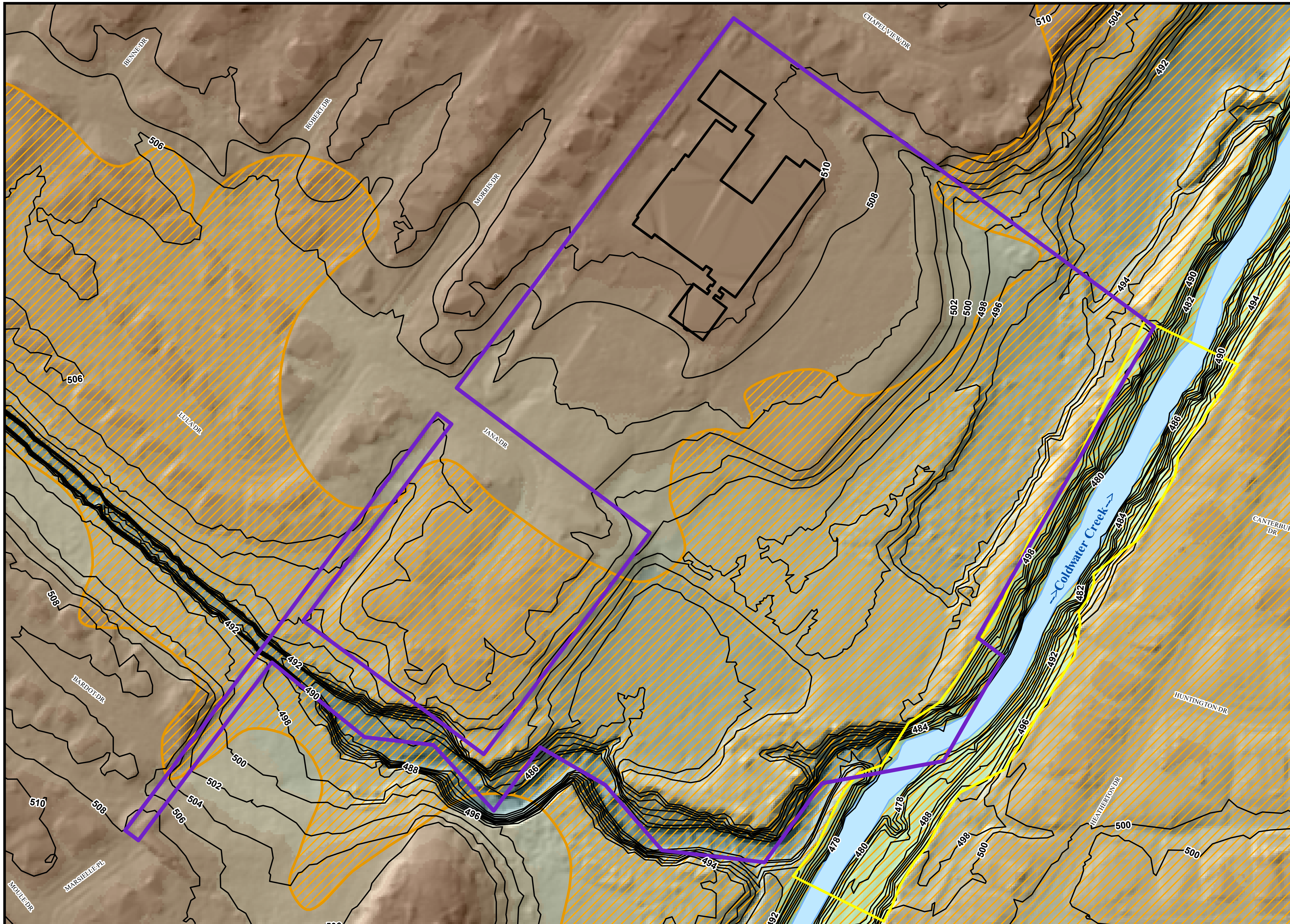


Figure 8. CWC Corridor Sample Stations



Legend
- Jana School Building
- Jana Parcels
- Corridor Adjacent to Jana Parcels
- LiDAR Contour (ft)
- 1957 Record Flood
- Coldwater Creek
- CWC Corridor

MO-East State Plane
(NAD-83, Feet)

0 50 100 Feet

Evaluation of Lead-210 Information for the Jana Elementary School, Hazelwood School District

FUSRAP

DRAWN BY:	REV:	DATE:
Leidos	0	4/27/2023

Document Path: U:\GPS\NorthCoCWC\Hazelwood School District\Lead-210 Report\Projects\Rev 0\Figure 9 Extent of Record 1957 Flooding.mxd

Figure 9. Extent of Record 1957 Flooding

APPENDIX A

SRNL TECHNICAL REVIEW OF THE KALTOFEN "RADIOACTIVE CONTAMINATION AT THE JANA ELEMENTARY SCHOOL" DOCUMENT

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April 18, 2023 SRNL-L3000- 2022-00017, Rev. 1

TO: Phil Moser, USACE
Nicki Fatherly, USACE
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CC: Darina Castillo, DOE-LM
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FROM: DAVID DIPRETE (Affiliate) Digitally signed by DAVID DIPRETE (Affiliate) Date: 2023.04.18 11:29:34 -04'00'
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Connie C. Herman, Associate Laboratory Director, SRNL

<u>SRNL Technical Review of the Kaltofen "Radioactive Contamination at the Jana Elementary School" Document</u>

The U.S. Army Corps of Engineers (USACE) St. Louis District (MVS) requested the services of the Department of Energy (DOE) Network of National Laboratories for Environmental Management and Stewardship (NNLEMS) to assist with USACE's Jana Elementary School response at the Formerly Utilized Sites Remedial Action Program (FUSRAP) St. Louis Airport Site Vicinity Properties (SLAPS VPs). The objective of the response is to evaluate the presence, nature, and/or extent of radiological contaminants of concern, if any, on the school property. Jana Elementary is located at 405 Jana Drive, Florissant, Missouri and is situated along the banks of Coldwater Creek. Coldwater Creek is a part of the SLAPS VPs FUSRAP site.

As part of this request, SRNL was called upon to review the October 10, 2022, report titled "Radioactive Contamination at the Jana Elementary School, Hazelwood, MO" issued to Brustowicz and Thompson by Kaltofen of the Boston Chemical Data Corporation. This report will be referred to as the Kaltofen Report hence forth in this review. Boston Chemical Data Corporation was contracted to sample areas in and around the Jana Elementary School to investigate concerns of contamination at this site, which borders Coldwater Creek, and radiochemical analyses were subcontracted to Eberline Analytical. Coldwater Creek is part of a designated FUSRAP Site including the SLAPS and the Hazelwood Interim Storage Site (HISS). The US Army Corps of Engineers is monitoring and remediating Coldwater Creek for contamination from the nation's early atomic energy program, conducted by Mallinckrodt Chemical Works.

Key observations from the limited review of the report include the following:

- None of the Jana Elementary School sample data reported by Eberline Analytical in the Kaltofen Report exceeded criteria set forth in 40 CFR Part 192.
- The Kaltofen Report claims the Jana School is never screened for radioactivity but was in fact screened by the Missouri Department of Health and Senior Services (MDHSS) and was found to be less than the EPA recommended 4 pCi/L concentration for the primary radiological dose hazard (radon) from naturally occurring uranium and thorium radiological material.
- The Kaltofen Report cites recommendations of a public health assessment from the Agency for Toxic Substances and Disease Registry (ATSDR) as justification for sampling of the school building, but the ATSDR only recommends sampling for areas flooded by the Coldwater Creek. Flooding from Coldwater Creek has never impacted the school building.
- The Kaltofen Report cites historic sample data with high levels of radioactivity attributed to Coldwater Creek, but the referenced sample data is actually from a contaminated site not physically connected to Coldwater Creek.
- The Kaltofen Report cites examples of levels of radioactivity elevated well above background levels measured at the Jana School by the USACE. These statements are misleading as the school property lines at one point actually extend into the Coldwater Creek FUSRAP Site, the high levels were limited to the creek bank, and these areas are recognized as needing remediation by the USACE.
- The Kaltofen Report cites a number of other radioisotopes sampled and measured in the school and surrounding area by Boston Chemical Data Corporation as concerning, but these isotopes (e.g. metallic thorium, Cs-137, etc.) are not attributable to the Mallinckrodt Chemical Work Processes that contaminated the Coldwater Creek FUSRAP Site.
- The Kaltofen Report highlights the presence of naturally-occurring radon (Rn-222) daughter radioisotopes Pb-210 and Po-210 levels measured by the Boston Chemical Data Corporation in the Jana School. There is no data available that points to Coldwater Creek

contamination causing excessive levels of Pb-210 and Po-210 to be present in the Jana School. Samples collected from the Coldwater Creek near Jana do not contain Ra-226 (the parent of Rn-222) levels above the EPA guidelines of 5 pCi/g. The Jana school was screened for elevated radon levels and elevated levels of radon were not detected.

- Details of the Boston Chemical Data Corporation sample collection and Eberline data analysis were not provided in the Kaltofen Report; therefore, only a limited evaluation of the sampling and analyses methods could be performed based on information provided in the Kaltofen Report.

Given the limited access to the supporting data and the sampling and analyses methods that team used to generate the report, a peer review of all of the Kaltofen Report documents, data, and methodology is recommended.

Boston Chemical Data Assessment: The Kaltofen Report states the results of the radiological analyses on surface sediment conducted by Eberline indicated the combined activities of radium and thorium on the Jana School Site exceed the level of "5 pCi/g above background". There is no indication that background levels of radium and thorium were subtracted from the concentrations reported in the Kaltofen Report "5 pCi/g above background" criteria.

Also, the Kaltofen Report misinterprets how the 5 pCi/g limit for the sum of Ra-226 and Ra-228 in surface soils provided in 40 CFR Part 192 applies. The Kaltofen Report cites "Use of Soil Cleanup Criteria in 40 CFR Part 192 As Remediation Goals for CERCLA Sites" (1988, p. 5) as justification for the Kaltofen Report "5 pCi/g above background" criteria. The EPA Directive # 9200.4-25 titled "Use of Soil Cleanup Criteria in 40 CFR Part 192 As Remediation Goals for CERCLA Sites" (a 1998 document, not a 1988 as cited in the Kaltofen Report) clarifies the requirements set forth in the federal regulation 40 CFR Part 192 for health and environmental protection standards for uranium and thorium mill tailings. It explains how thorium isotope remediation goals should also be part of developing "a relevant and appropriate requirement" (ARAR) remediation goal for CERCLA sites as the radium isotopes activity levels will rise to match the radiological parent thorium isotopes activity over tens of thousands of years when environmental transport conditions allow. Directive 9200.4-25 does not call for the sum of radium and thorium isotopes to be maintained below a 5 pCi/g limit for surface soils. Additionally, in Directive no. 9200.4-35P "Remediation Goals for Radioactively Contaminated CERCLA Sites Using the Benchmark Dose Cleanup Criteria in 10 CFR Part 40 Appendix A I, Criterion 6(6)" page 8, the example clearly defines the 5 pCi/g limit to apply to the sum of radium isotopes **or** to the sum of thorium isotopes in surface soils. The Kaltofen Report mistakenly applied the 5 pCi/g limit to the sum of both the radium **and** the thorium isotopes. Federal Regulation 40 CFR Part 192 does allow for the sum of fractions of radium and thorium isotopes when the ARAR remediation goals are factored in, which in this case would be 5 pCi/g for the radium isotopes and 14 pCi/g thorium isotopes for surface soils. Additionally, the Eberline Data in the Kaltofen Report from the Kaltofen Jana School samples did not exceed the 5 pCi/g combined sum of Th and Ra isotopes above background applied Kaltofen Report criteria.

The Kaltofen Report cites the EPA Region 7 Proposed Record of Decision for the nearby Westlake Landfill as setting limits for the sum of Ra-226 + Ra-228 activity to be less than 2.9 pCi/g, and the sum of Th-230 + Th-232 to be less than 2.9 pCi/g. However, these limits were listed in that document as preliminary remediation goals based on levels indistinguishable from normal environmental background levels of these isotopes and were established for a different region than the Coldwater Creek area. The EPA Region 7 Proposed Record of Decision also clearly states the final cleanup levels were to be determined in the amended Record of Decision. At the time of writing this memo, SRNL did not have access to the amended Record of Decision so these limits cannot be validated.

The Directive (9200.4-25) also clearly states these are guidelines, and applicable or relevant and appropriate requirements can be developed for the individual CERCLA Sites. The USACE has developed ARAR remediation goals (RGs) for soils, structures, and sediments at the North St. Louis County sites. For surface soils up to 6" depth, the Ra-226 RG is 5 pCi/g and the Th-230 RG is 14 pCi/g. The Kaltofen Report did not provide background levels, which would have to be subtracted from the analytical results to generate a value above background levels. The highest result for the gross sum of radium and thorium results above method detection limits provided by the Kaltofen Report was 6.99 pCi/g +/- 55.3% in a 95% confidence interval in the sample having Lab ID 22-08062-08. The USACE Coldwater Creek background levels for the sum of these same isotopes is 4.42 pCi/g. When this background is considered, the sample with the highest radium and thorium activity reported by the Kaltofen Report is substantially below even the "5 pCi/g above background" Kaltofen assumed limit used in the Kaltofen Report.

Boston Chemical Data was recently contracted to perform additional sampling in and around the Jana School. This sampling effort is consistent with the recommendations of the ATSDR 2019 report assuming the Jana School was flooded by Coldwater Creek. However, historic Coldwater Creek flooding data indicates the Jana School building has never been flooded by Coldwater Creek. Thirty-two samples of soil, dust, and plant materials were collected and sent to a contract radioanalytical laboratory, Eberline Analytical. The Kaltofen Report datasets are difficult to validate with the information provided in the Kaltofen Report. However, as reported, the results of these analyses indicate elevated levels of Pb-210 and its decay products above background levels, and elevated levels of Ra-226 above background levels. The levels of Pb-210 are significantly higher than what would be expected from the measured levels of its radiological parent, Ra-226. These samples are surface samples. Consequently, one would not expect to find Pb-210 in equilibrium with the Ra-226 parent, but rather would be deposited unevenly following the decay of Rn-222, a daughter of Ra-226. These isotopes are ubiquitous in nature.

Qualitative analysis results by scanning electron microscopy/ energy dispersive X-ray spectrometry (SEM/EDS) were also provided that identified particles high in elemental thorium. SEM/EDS is a qualitative elemental analysis useful for characterizing and visualizing particle morphology but is not considered an accurate method for determining quantities of the element. This SEM/EDS measurement identifying the presence of elemental thorium is not relevant as trace Th-230 at levels cited throughout the Kaltofen Report for this area were likely well below the detection limits for an SEM/EDS analysis. Additionally, the data provided from Eberline in the Kaltofen Report indicated that by mass, thorium in these samples was overwhelmingly Th-232. The thorium present would be normal background Th-232, which is also ubiquitous in nature, and is not related to the Mallinckrodt processes, which were the source of the Coldwater Creek's designation as a FUSRAP Site. The Kaltofen Report analyses in fact found no statistically relevant evidence of elevated Th-230, which is the contaminant that is driving the remediation of various sites along Coldwater Creek. The highest level of Th-230 reported in the Kaltofen Report from the sampling executed by the Boston Chemical Data Corporation was 3.13 pCi/g with a 51% uncertainty in the 95% confidence interval, well below the remediation goals of this FUSRAP Site. Additionally, this datapoint was not in fact from the Jana Elementary School, but from a 2018 sampling of the Moule Drive property.

School Location and Geology Assessment: The Kaltofen Report details that the Jana School property is bordered on two sides by the Coldwater Creek. Based on Google Earth maps, the Jana School property appears to share one border with the Coldwater Creek and not two. An adjacent neighborhood is bordered by a Coldwater creek tributary. The Coldwater Creek is a recognized down gradient extension of a FUSRAP Site, and the creek is in the process of being remediated by the Army Corps of Engineers. Contaminant levels requiring remediation have not been documented for the tributary. The Kaltofen Report cites NUREG CR2722, Table 4 as detailing high Th-230 activity levels in Coldwater Creek (up to 178,000 pCi/g Th-230). The NUREG CR2722 Table 4 does indeed have a datapoint of 178,000 pCi/g Th-230, but this datapoint is from a sample taken from Area 1 of the West Lake Landfill Superfund Site, approximately 5 miles away, and not located near or on Coldwater Creek, or the tributary creek, so this datapoint and value cannot be validated. Drainage from West Lake landfill does not flow into Coldwater Creek; therefore, they should not be considered the same site.

The Kaltofen Report cites data from the reference 2018 US EPA Record of Decision, West Lake Landfill as contributing to the body of evidence of the levels of contamination in and around Coldwater Creek, but in fact, this EPA report specifically states that it only addresses the West Lake Landfill Superfund Site, and not the Coldwater Creek area. The West Lake Site is located approximately 5 miles from the Coldwater Creek area and is not a part of the SLAPS VP FUSRAP Site that includes Coldwater Creek. The Kaltofen Report also cites this EPA report for elevated Th-230 data from 84 locations and depths sampled at the Jana School, but again, as the EPA report does not address this Coldwater Creek area. The source of the data cited by the Kaltofen Report is also not clear for these 84 locations. The Kaltofen Report claims the average of these 84 samples had Th-230 levels averaging 6.18 ±1.46 pCi/g. However, these levels are not above the USACE RGs for this FUSRAP Site and consequently not over EPA guidelines for residual risk. The USACE provided SRNL with a dataset of 215 locations where samples were collected in 2018 and 2019 inside the Jana School property lines regions subjected to flooding by Coldwater Creek. It is assumed the 84 location data has been extracted from this dataset of 215 points. The Jana School property lines actually extend at a point into the FUSRAP Site

Coldwater Creek's banks and water. There are some locations in the creek bed and banks where residual contamination has been identified and remediation of those locations by the USACE is planned. A number of sampling points in the creek banks were measured over RG goals by the USACE and are marked as such in the data reports SRNL received. There are no data points in the Jana School grounds floodplain (again, above the actual banks of the creek) that are above the RG for Th-230. It would be a misrepresentation of risk to the Jana School population to average datapoints from the actual FUSRAP Site's creek banks and creek area that are scheduled for remediation with a subset of the 215 datapoints from the Jana School grounds floodplain. The report appears to further imply that the entire region exceeds the average Kaltofen Report "5 pCi/g above background" criteria . It should be noted that all of these 215 datapoints were well below RGs for radium isotopes alone.

The Kaltofen Report raises the scenario of potential contamination of the Jana School by flooding from Coldwater Creek. Examination of the topographic map of Jana School shows that the difference in elevation between the creek bed and the southeast corner of the Jana School is greater than 20 ft. The steep creek embankment bounds the edge of lower play field and is approximately 10 feet. The USGS has maintained a water level gauge upstream in Coldwater Creek for the last 20 years and the highest water level measured in the creek was only fourteen feet which would not impact the school building (https://waterdata.usgs.gov/nwis/uv: Coldwater Creek). The largest recorded flood at the Jana School area occurred in 1957 before the current school building was constructed. A map developed by the USACE shows the extent of flooding for the 1957 event (prior to the construction of the school), which shows the location of the lower fields was impacted but that the school building site was never impacted by flooding with water from the stream. This data shows that flooding from Coldwater has not impacted the Jana School.

Assessment of Army Corp Data and Sampling Plan: The Kaltofen Report cites Army Corps test results well in excess of 5 pCi/g, as high as 22.6 +/- 4.39 pCi/g at soil surfaces of Jana School, and as high as 34.30 +/- 6.61 pCi/g subsurface soils. The Kaltofen Report does not provide the reference for these datapoints so the validity of the assumptions, data corrections, and limits comparisons cannot be verified.

A review of the most recent "North St. Louis County Sites Annual Environmental Monitoring Data and Analysis Report for Calendar Year 2021" report showed all values of sediment samples taken from the Coldwater Creek were well below the remediation goals for Th-230 and Ra-226 of the record of decision for the North St. Louis County Sites. All the Ra-226 and Ra-228 measurements were below the EPA protective health-based level of 5 pCi/g above background for surface soils. NUREG CR2722 clearly indicated Ra-226 is not in radio-equilibrium with Th-230. Consequentially, Ra-226 and its chain of radiological daughters including Rn-222, are present at substantially lower levels than Th-230. Three of the 10 Coldwater Creek sampling site sediment samples exceeded the 5 pCi/g levels of Th-230 and Th-232 (C007 at 8.15pCi/g, C-009 at 5.44 pCi/g, C011 at 5.37 pCi/g) in the 1st sampling event. One of the 10 Coldwater Creek samples exceeded the 5 pCi/g level of Th-230 and Th-232 (C011 at 13.17) in the second sampling event. But again, all of these values were below the applicable or relevant and appropriate requirement (ARAR) remediation goal of 14 pCi/g for surface and 43 pCi/g for deep sediments for thorium isotopes set by the record of decision for the North St. Louis County Sites. A review of the historical data available in the 2021 monitoring report for the period of 3/11 – 10/21 indicates no Coldwater Creek sediment sample has ever exceeded the EPA protective health-based level of 5 pCi/g for the sum of the Ra-226 and Ra-228 isotopes. No thorium values exceeded the remediation goals over that historical period, with the highest value being 8.32 pCi/g on 3/21 at station C007. However, the ATSDR 2019 Report supports ongoing efforts to identify and properly remediate radiological waste around Coldwater Creek. The basis for the ATSDR 2019 Reports conclusion were that Th-230 has been found above FUSRAP RGs in several areas of the Coldwater Creek floodplain and reducing Th-230 levels in accessible areas will reduce the risk of harmful exposure. For example, soil erosion on the banks of Coldwater Creek could expose deep sediments that pass the 43 pCi/g RG, but later fail the 14 pCi/g surface RG.

The Kaltofen Report stated that the current USACE sampling plan is inadequate to assess the presence or levels of radium and thorium contamination at the Jana Elementary School. The Kaltofen Report states the USACE only sampled at points that were located at least 300 feet from the school and cites numerous sampling points in and around the school that were not sampled. The Kaltofen Report also cites the risk of contamination of the surrounding area from flooding events in the past. However, because the creek is the source of the contamination, the USACE sampling points were closer to the source of contamination (Coldwater Creek) than the school itself, and intuitively, samples taken closer to the source of contamination should be more radioactive than points located closer to the school. The school building itself is significantly elevated above the 1000-year floodplain and has never been subjected to a flooding event. Some portions of the fields south of the school are located within the 1000-year floodplain. The school ground points in the Coldwater Creek floodplain sampled by the USACE in 2018 and 2019 were all measured to be below remediation goals for Ra-226. All points were also below remediation goals for Th-230 except for several points in the banks of the creek itself.

The Jana Elementary School was, in fact, screened for the primary radiological dose hazard (radon) from naturally occurring uranium and thorium radiological material by the Missouri Department of Health and Senior Services (MDHSS) and found to have radon concentrations below the EPA recommended 4 pCi/L concentration in air. Jana was screened for radon contamination by MDHSS along with the rest of the 31 schools in the Hazelwood School District. The set of test results showed Jana had on average the lowest level of radon concentration (tied with 12 other schools at 0.3 pCi/L). Of the 28 radon samples taken at Jana, the highest measurement of 1.5 pCi/L ranked #19 out of the 31 schools. All of the Jana radon test results showed radon levels well below EPA guidelines of 4 pCi/L.

The Kaltofen Report claims the contamination on Jana School grounds extends from surface to 6-foot depths below the surface but does not cite the reference for the information. A portion of the school grounds extends into the creek itself, and if this is the datapoint the Kaltofen Report refers to, the claim misrepresents the risk to the physical school population.

The Kaltofen Report cites the ATSDR public health assessment titled “Evaluation of Community Exposures Related to Coldwater Creek”, issued April 30, 2019, as justification for sampling the Jana School building. The ATSDR report evaluated potential exposures to people who played or lived near Coldwater Creek in North St. Louis County, Missouri. The ATSDR report acknowledges the presence of radiological contamination in and around Coldwater Creek prior to remediation activities (prior to year 2000), that could have increased the risk of some types of cancer in people who played or lived there. The ATSDR report concluded that recent exposures after the completion of the 2000 remediation efforts would not likely result in detectable increased cancer rates in the community as a whole.

The ATSDR supported ongoing efforts to identify and properly remediate radiological waste around Coldwater Creek. The ATSDR recommended that the FUSRAP program continue to investigate and remediate Coldwater Creek sediments and floodplain soils to meet regulatory goals. To increase knowledge about contaminant distribution and allay community concerns relating to buildings adjacent to Coldwater Creek, the ATSDR recommended future activities include sampling of indoor dust and sediments and soils present in basements that were directly flooded by Coldwater Creek in the past. The Kaltofen Report accurately restates the conclusions of the ATSDR report regarding the need for sampling structures adjacent to Coldwater Creek that have been flooded by Coldwater Creek. However, the Jana Elementary School has never been flooded by Coldwater Creek, so the ATSDR recommendations do not apply to sampling of the Jana Elementary School.

Assessment of Additional Data Cited in Kaltofen Report: The Kaltofen Report cites testing data from a home on Moule Drive. The source of this data was not provided and cannot be verified. A number of the radioisotopes listed were decay products of U-238 (i.e., Th-230 and Pb-210) and could have originated from the Mallinckrodt processes if they are elevated above normal environmental background levels. A number of the radioisotopes listed were not used in the Mallinckrodt Chemical Works and so would not be attributable to that process. Mallinckrodt Chemical Works processed uranium ore, which was shipped to other DOE Sites (Y-12 at Oak Ridge, the Portsmouth Site in Ohio, the Paducah Site in Kentucky) for U-235 enrichment. From there, the uranium would be used in the weapons programs or used for fuel for nuclear reactors. Metallic thorium was not part of a Mallinckrodt process. Cs-137 is a fission product, which requires neutron irradiation of fissile material like U-235, which was also not part of the Mallinckrodt process. Cs-137 is also ubiquitous in the environment at trace levels from radioactive fall-out from past nuclear weapons testing.

Summary Assessment: In conclusion, portions of the Kaltofen Report attribute elevated radioactivity measurements (as high as 178,000 pCi/g) to the Coldwater Creek but our assessment indicates the data were from samples of the West Lake superfund site and should not be attributed to Coldwater Creek. Portions of the Kaltofen Report improperly average USACE datasets to imply Jana School grounds exceed EPA guidelines for the site. However, these high datapoints on school grounds are a result of the fact the school property actually extends into the Coldwater Creek FUSRAP Site, and the creek bank areas in question are known to the USACE and are slated for further remediation. In addition, analytes that were not attributable to the Mallinckrodt process have been included and are not relevant to this FUSRAP project. There is no evidence that the school has ever been contaminated by Coldwater Creek floodwaters; therefore, recommendations from the ATSDR public health assessment do not apply. The Eberline data from the school samples provided in the Kaltofen Report for the Th-230 and Ra-226 isotopes being remediated in Coldwater Creek were all within EPA guidelines. The Jana Elementary school was analyzed for the major radiological hazard (radon) from the decay of naturally occurring radiological material and has been found to be in the lowest radon concentration grouping of the 31 schools in the Hazelwood School district and was well within EPA guidelines of 4 pCi/L in air for acceptable radon levels in a public facility. However, to allay community concerns potentially created from the reported data, SRNL recommends a structured sampling and analyses of the Jana Elementary School and associated property using regulatory methods and protocols for the radioisotopes of concern. The follow-up analyses and the generated data should be compared to the appropriate federal and regulatory limits for protecting the health of the local community. Given the limited access to the supporting data and the sampling and analyses team, a peer review of all of the Kaltofen Report documents, data, and methodology is recommended.

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APPENDIX B

INTEGRATED EXPOSURE UPTAKE BIOKINETIC MODEL FOR LEAD IN CHILDREN OUTPUT FILE FOR BLOOD LEAD LEVEL FROM LEAD-210

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LEAD MODEL FOR WINDOWS Version 2.0

These IEUBK Model results are valid as long as they were produced with an official, unmodified version of the IEUBK Model with a software certificate.

While IEUBK Model output is generally written with three digits to the right of the decimal point, the true precision of the output is strongly influenced by least precise input values.

==

Model Version: 2.0 Build1
User Name:
Date:
Site Name:
Operable Unit:
Run Mode: Research

==

****** Air ******

Indoor Air Pb Concentration: 100.000 percent of outdoor.
Other Air Parameters:

Month	Time Outdoors (hours)	Ventilation Rate (m│/day)	Lung Absorption (%)	Outdoor Air Pb Conc (╡g Pb/m│)
6-12	0.000	3.216	32.000	0.000
12-24	0.000	4.970	32.000	0.000
24-36	0.000	6.086	32.000	0.000
36-48	0.000	6.954	32.000	0.000
48-60	0.000	7.682	32.000	0.000
60-72	1.500	8.318	32.000	0.000
72-84	1.500	8.887	32.000	0.000

****** Diet ******

Month	Diet Intake(╡g/day)
6-12	0.000
12-24	0.000
24-36	0.000
36-48	0.000
48-60	0.000
60-72	0.001
72-84	0.001

****** Drinking Water ******

Water Consumption:

Month	Water (L/day)
6-12	0.400
12-24	0.430
24-36	0.510
36-48	0.540
48-60	0.570
60-72	0.600
72-84	0.630

Drinking Water Concentration: 0.000 ╡g Pb/L

****** Soil & Dust ******

Month	Soil (╡g Pb/g)	House Dust (╡g Pb/g)
6-12	0.001	0.001
12-24	0.001	0.001
24-36	0.001	0.001
36-48	0.001	0.001
48-60	0.001	0.001
60-72	0.001	0.001
72-84	0.001	0.001

****** Alternate Intake ******

Month	Alternate (╡g Pb/day)
6-12	0.000
12-24	0.000
24-36	0.000
36-48	0.000
48-60	0.000
60-72	0.000
72-84	0.000

****** Maternal Contribution: Infant Model ******

Maternal Blood Concentration: 0.600 ╡g Pb/dL

****
CALCULATED BLOOD LEAD AND LEAD UPTAKES:
****

Month	Air (╡g/day)	Diet (╡g/day)	Alternate (╡g/day)	Water (╡g/day)
6-12	0.000	0.000	0.000	0.000
12-24	0.000	0.000	0.000	0.000
24-36	0.000	0.000	0.000	0.000
36-48	0.000	0.000	0.000	0.000
48-60	0.000	0.000	0.000	0.000
60-72	0.000	0.000	0.000	0.000
72-84	0.000	0.000	0.000	0.000

Month	Soil+Dust (╡g/day)	Total (╡g/day)	Blood (╡g/dL)
6-12	0.000	0.000	0.0
12-24	0.000	0.000	0.0
24-36	0.000	0.000	0.0
36-48	0.000	0.000	0.0
48-60	0.000	0.000	0.0
60-72	0.000	0.001	0.0
72-84	0.000	0.001	0.0

APPENDIX C

RESRAD-ONSITE OUTPUT FILES FOR LIFETIME CANCER RISK FROM LEAD-210 AND POLONIUM-210 IN PAVEMENT SEDIMENT

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HSD-JES Pavement Sediment, Student Scenario
RESRAD Risk Summary

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Part III: Intake Quantities and Health Risk Factors

Cancer Risk Slope Factors Summary Table
Risk Library: DCFPAK3.02 Morbidity

0

Menu	Parameter	Current Value	Base Case*	Parameter Name
Sf-1	Ground external radiation slope factors, 1/yr per (pCi/g):			
Sf-1	Pb-210+D	4.25E-09	1.48E-09	SLPF(1,1)
Sf-1	Pb-210+D1	1.72E-08	1.48E-09	SLPF(2,1)
Sf-1	Po-210	4.51E-11	4.51E-11	SLPF(3,1)
Sf-2	Inhalation, slope factors, 1/(pCi):			
Sf-2	Pb-210+D	1.63E-08	1.59E-08	SLPF(1,2)
Sf-2	Pb-210+D1	1.63E-08	1.59E-08	SLPF(2,2)
Sf-2	Po-210	1.45E-08	1.45E-08	SLPF(3,2)
Sf-3	Food ingestion, slope factors, 1/(pCi):			
Sf-3	Pb-210+D	1.19E-09	1.18E-09	SLPF(1,3)
Sf-3	Pb-210+D1	1.19E-09	1.18E-09	SLPF(2,3)
Sf-3	Po-210	2.25E-09	2.25E-09	SLPF(3,3)
Sf-3	Water ingestion, slope factors, 1/(pCi):			
Sf-3	Pb-210+D	8.93E-10	8.84E-10	SLPF(1,4)
Sf-3	Pb-210+D1	8.93E-10	8.84E-10	SLPF(2,4)
Sf-3	Po-210	1.78E-09	1.78E-09	SLPF(3,4)
Sf-3	Soil ingestion, slope factors, 1/(pCi):			
Sf-3	Pb-210+D	1.19E-09	1.18E-09	SLPF(1,5)
Sf-3	Pb-210+D1	1.19E-09	1.18E-09	SLPF(2,5)
Sf-3	Po-210	2.25E-09	2.25E-09	SLPF(3,5)

*Base Case means Default.Lib w/o Associate Nuclide contributions.

Risk Slope and Environmental Transport Factors for the Ground Pathway

0Nuclide (i)	Slope(i)*	ETFG(i,t) At Time in Years (dimensionless) t= 0.000E+00	1.000E+00	3.000E+00	9.000E+00
Bi-210	2.770E-09	3.164E-02	3.164E-02	3.164E-02	3.164E-02
Hg-206	4.830E-07	9.340E-03	9.340E-03	9.340E-03	9.340E-03
Pb-210	1.480E-09	6.762E-02	6.762E-02	6.762E-02	6.762E-02
Po-210	4.510E-11	8.441E-03	8.441E-03	8.441E-03	8.441E-03
Tl-206	6.110E-09	3.380E-02	3.380E-02	3.380E-02	3.380E-02

* - Units are 1/yr per (pCi/g) at infinite depth and area. Multiplication by ETFG(i,t) converts to site conditions.

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 0.000E+00 years

Radio-Nuclide	Water Independent Pathways (Inhalation w/o radon): Inhalation	Plant	Meat	Milk	Soil	Water Dependent Pathways: Water	Fish	Plant	Meat	Milk	Total Ingestion*
Pb-210	2.977E-01	0.000E+00	0.000E+00	0.000E+00	8.734E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	8.734E+01
Po-210	3.815E-01	0.000E+00	0.000E+00	0.000E+00	1.119E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.119E+02

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
and water-dependent water, fish, plant, meat, milk pathways
0
Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 0.000E+00 years
0 Water Independent Pathways (Inhalation excludes radon)
0

Radio-Nuclide	Ground risk	Ground fract.	Inhalation risk	Inhalation fract.	Plant risk	Plant fract.	Meat risk	Meat fract.	Milk risk	Milk fract.	Soil risk	Soil fract.
Pb-210	5.283E-08	0.0235	2.916E-08	0.0130	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.231E-07	0.2768
Po-210	1.373E-10	0.0001	3.319E-08	0.0147	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.513E-06	0.6720
Total	5.296E-08	0.0235	6.235E-08	0.0277	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.136E-06	0.9488

0
Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 0.000E+00 years

Water Dependent Pathways

Radio-Nuclide	Water risk	Water fract.	Fish risk	Fish fract.	Plant risk	Plant fract.	Meat risk	Meat fract.	Milk risk	Milk fract.	All Pathways** risk	All Pathways** fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.051E-07	0.3132
Po-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.546E-06	0.6868
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.251E-06	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

Total Excess Cancer Risk CNRS(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 0.000E+00 years

0

Water Independent Pathways (Inhalation excludes radon)

0

Radio-Nuclide	Ground risk	Ground fract.	Inhalation risk	Inhalation fract.	Radon risk	Radon fract.	Plant risk	Plant fract.	Meat risk	Meat fract.	Milk risk	Milk fract.	Soil risk	Soil fract.
Pb-210	5.283E-08	0.0235	2.916E-08	0.0130	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.231E-07	0.2768
Po-210	1.373E-10	0.0001	3.319E-08	0.0147	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.513E-06	0.6720
Total	5.296E-08	0.0235	6.235E-08	0.0277	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.136E-06	0.9488

0

Total Excess Cancer Risk CNRS(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 0.000E+00 years

Water Dependent Pathways

Radio-Nuclide	Water risk	Water fract.	Fish risk	Fish fract.	Radon risk	Radon fract.	Plant risk	Plant fract.	Meat risk	Meat fract.	Milk risk	Milk fract.	All pathways risk	All pathways fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.051E-07	0.3132
Po-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.546E-06	0.6868
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.251E-06	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 1.000E+00 years

Radio-	Water Independent Pathways (Inhalation w/o radon)					Water Dependent Pathways					Total
Nuclide	Inhalation	Plant	Meat	Milk	Soil	Water	Fish	Plant	Meat	Milk	Ingestion*
Pb-210	1.709E-01	0.000E+00	0.000E+00	0.000E+00	5.014E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	5.014E+01
Po-210	4.903E-02	0.000E+00	0.000E+00	0.000E+00	1.438E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.438E+01

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
and water-dependent water, fish, plant, meat, milk pathways

0

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+00 years

0 Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Pb-210	3.032E-08	0.0503	1.674E-08	0.0277	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.577E-07	0.5927
Po-210	1.764E-11	0.0000	4.266E-09	0.0071	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.944E-07	0.3222
Total	3.034E-08	0.0503	2.101E-08	0.0348	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.521E-07	0.9149

0

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Plant		Meat		Milk		All Pathways**	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.047E-07	0.6707
Po-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.987E-07	0.3293
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.035E-07	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

Total Excess Cancer Risk CNRS(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+00 years

0
Water Independent Pathways (Inhalation excludes radon)

0

Radio-Nuclide	Ground risk	Ground fract.	Inhalation risk	Inhalation fract.	Radon risk	Radon fract.	Plant risk	Plant fract.	Meat risk	Meat fract.	Milk risk	Milk fract.	Soil risk	Soil fract.
Pb-210	3.034E-08	0.0503	2.097E-08	0.0348	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.507E-07	0.9126
Po-210	1.291E-13	0.0000	3.122E-11	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.423E-09	0.0024
Total	3.034E-08	0.0503	2.101E-08	0.0348	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.521E-07	0.9149

0

Total Excess Cancer Risk CNRS(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+00 years

Water Dependent Pathways

Radio-Nuclide	Water risk	Water fract.	Fish risk	Fish fract.	Radon risk	Radon fract.	Plant risk	Plant fract.	Meat risk	Meat fract.	Milk risk	Milk fract.	All pathways risk	All pathways fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.020E-07	0.9976
Po-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.454E-09	0.0024
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.035E-07	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 3.000E+00 years

Radio-	Water Independent Pathways (Inhalation w/o radon)					Water Dependent Pathways					Total
Nuclide	Inhalation	Plant	Meat	Milk	Soil	Water	Fish	Plant	Meat	Milk	Ingestion*
Pb-210	5.632E-02	0.000E+00	0.000E+00	0.000E+00	1.652E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.652E+01
Po-210	1.606E-02	0.000E+00	0.000E+00	0.000E+00	4.713E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	4.713E+00

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
and water-dependent water, fish, plant, meat, milk pathways

0

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+00 years

0 Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Pb-210	9.993E-09	0.0503	5.516E-09	0.0278	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.179E-07	0.5938
Po-210	5.780E-12	0.0000	1.398E-09	0.0070	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.371E-08	0.3210
Total	9.999E-09	0.0504	6.914E-09	0.0348	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.816E-07	0.9148

0

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Plant		Meat		Milk		All Pathways**	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.334E-07	0.6720
Po-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.511E-08	0.3280
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.985E-07	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

Total Excess Cancer Risk CNRS(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+00 years

0 Water Independent Pathways (Inhalation excludes radon)

0

Radio-Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Pb-210	9.999E-09	0.0504	6.914E-09	0.0348	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.816E-07	0.9148
Po-210	1.142E-19	0.0000	2.762E-17	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.259E-15	0.0000
Total	9.999E-09	0.0504	6.914E-09	0.0348	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.816E-07	0.9148

0

Total Excess Cancer Risk CNRS(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+00 years

Water Dependent Pathways

Radio-Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All pathways	
	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.985E-07	1.0000
Po-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.287E-15	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.985E-07	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 9.000E+00 years

Radio-	Water Independent Pathways (Inhalation w/o radon)					Water Dependent Pathways					Total
Nuclide	Inhalation	Plant	Meat	Milk	Soil	Water	Fish	Plant	Meat	Milk	Ingestion*
Pb-210	2.015E-03	0.000E+00	0.000E+00	0.000E+00	5.912E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	5.912E-01
Po-210	5.749E-04	0.000E+00	0.000E+00	0.000E+00	1.687E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.687E-01

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
and water-dependent water, fish, plant, meat, milk pathways
0
Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 9.000E+00 years
0
Water Independent Pathways (Inhalation excludes radon)
0

Radio-	Ground		Inhalation		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Pb-210	3.576E-10	0.0503	1.974E-10	0.0278	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.218E-09	0.5938
Po-210	2.069E-13	0.0000	5.002E-11	0.0070	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.280E-09	0.3210
Total	3.578E-10	0.0504	2.474E-10	0.0348	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.498E-09	0.9148

0
Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 9.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Plant		Meat		Milk		All Pathways**	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.773E-09	0.6720
Po-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.330E-09	0.3280
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.103E-09	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

Total Excess Cancer Risk CNRS(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 9.000E+00 years

0 Water Independent Pathways (Inhalation excludes radon)

0

Radio-Nuclide	Ground risk	Ground fract.	Inhalation risk	Inhalation fract.	Radon risk	Radon fract.	Plant risk	Plant fract.	Meat risk	Meat fract.	Milk risk	Milk fract.	Soil risk	Soil fract.
Pb-210	3.578E-10	0.0504	2.474E-10	0.0348	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.498E-09	0.9148
Po-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	3.578E-10	0.0504	2.474E-10	0.0348	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.498E-09	0.9148

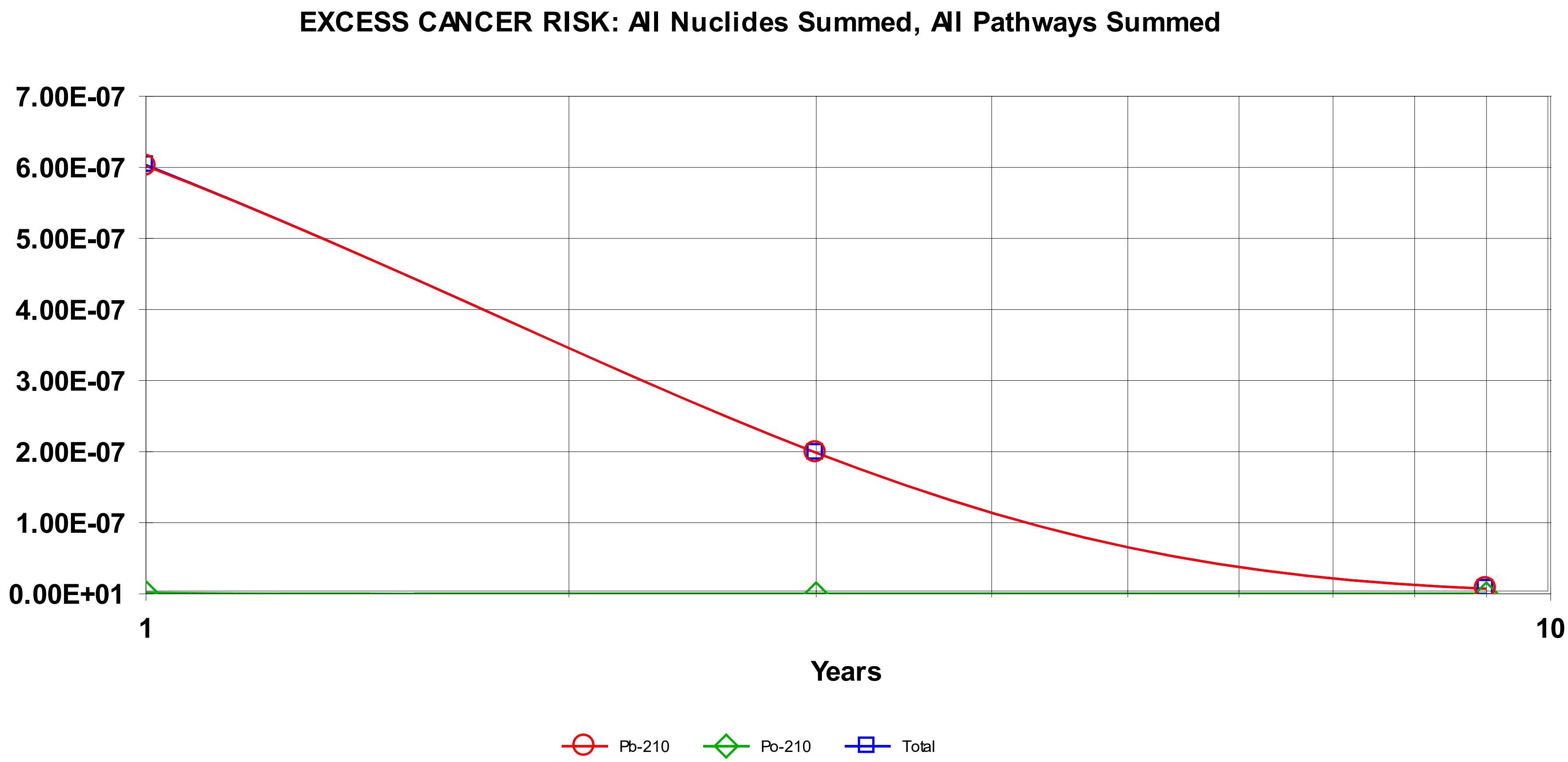
0

Total Excess Cancer Risk CNRS(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 9.000E+00 years

Water Dependent Pathways

Radio-Nuclide	Water risk	Water fract.	Fish risk	Fish fract.	Radon risk	Radon fract.	Plant risk	Plant fract.	Meat risk	Meat fract.	Milk risk	Milk fract.	All pathways risk	All pathways fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.103E-09	1.0000
Po-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.103E-09	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides



C:\RESRAD_FAMILY\ONSITE\7.2\USERFILES\JANA STUDENT PAVEMENT SED PB PO-210 RV0.RAD 04/28/2023 10:28 GRAPHICS.ASC Includes All Pathways

Note: The RESRAD-ONLINE graph starts at year 1, not year 0; year 0 had the highest risk. The data line for each radionuclide includes risk contributions from that radionuclide's decay chain isotopes (e.g., the Pb-210 data line includes the risk contribution from Po-210 that results from the radioactive decay of Pb-210; the Po-210 data line does not include the Po-210 resulting from Pb-210 decay).

HSD-JES Pavement Sediment, Student Scenario
RESRAD Input Summary

Table of Contents

Part I: Mixture Sums and Single Radionuclide Guidelines

Dose Conversion Factor (and Related) Parameter Summary
Dose Library: DCFPAK3.02 (Age 5)

0 Menu	Parameter	Current Value#	Base Case*	Parameter Name
A-1	DCF's for external ground radiation, (mrem/yr)/(pCi/g)			
A-1	Bi-210 (Source: DCFPAK3.02)	5.473E-03	5.473E-03	DCF1(1)
A-1	Hg-206 (Source: DCFPAK3.02)	6.127E-01	6.127E-01	DCF1(2)
A-1	Pb-210 (Source: DCFPAK3.02)	2.092E-03	2.092E-03	DCF1(3)
A-1	Po-210 (Source: DCFPAK3.02)	5.641E-05	5.641E-05	DCF1(4)
A-1	Tl-206 (Source: DCFPAK3.02)	1.278E-02	1.278E-02	DCF1(5)
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Pb-210+D	4.341E-02	4.240E-02	DCF2(1)
B-1	Pb-210+D1	4.339E-02	4.240E-02	DCF2(2)
B-1	Po-210	3.195E-02	3.195E-02	DCF2(3)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Pb-210+D	8.084E-03	8.066E-03	DCF3(1)
D-1	Pb-210+D1	8.084E-03	8.066E-03	DCF3(2)
D-1	Po-210	1.621E-02	1.621E-02	DCF3(3)
D-34	Food transfer factors:			
D-34	Pb-210+D , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(1,1)
D-34	Pb-210+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-04	8.000E-04	RTF(1,2)
D-34	Pb-210+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.000E-04	3.000E-04	RTF(1,3)
D-34				
D-34	Pb-210+D1 , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(2,1)
D-34	Pb-210+D1 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-04	8.000E-04	RTF(2,2)
D-34	Pb-210+D1 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.000E-04	3.000E-04	RTF(2,3)
D-34				
D-34	Po-210 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(3,1)
D-34	Po-210 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	5.000E-03	5.000E-03	RTF(3,2)
D-34	Po-210 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.400E-04	3.400E-04	RTF(3,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Pb-210+D , fish	3.000E+02	3.000E+02	BIOFAC(1,1)
D-5	Pb-210+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(1,2)
D-5				
D-5	Pb-210+D1 , fish	3.000E+02	3.000E+02	BIOFAC(2,1)
D-5	Pb-210+D1 , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(2,2)
D-5				
D-5	Po-210 , fish	1.000E+02	1.000E+02	BIOFAC(3,1)
D-5	Po-210 , crustacea and mollusks	2.000E+04	2.000E+04	BIOFAC(3,2)

#For DCF1(xxx) only, factors are for infinite depth & area. See ETFG table in Ground Pathway of Detailed Report.
*Base Case means Default.Lib w/o Associate Nuclide contributions.

Site-Specific Parameter Summary

0 Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R011	Area of contaminated zone (m**2)	1.000E+02	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	6.350E-03	2.000E+00	---	THICK0
R011	Fraction of contamination that is submerged	0.000E+00	0.000E+00	---	SUBMFRACT
R011	Length parallel to aquifer flow (m)	not used	1.000E+02	---	LCZPAQ
R011	Basic radiation dose limit (mrem/yr)	1.900E+01	3.000E+01	---	BRDL
R011	Time since placement of material (yr)	0.000E+00	0.000E+00	---	TI
R011	Times for calculations (yr)	1.000E+00	1.000E+00	---	T(2)
R011	Times for calculations (yr)	3.000E+00	3.000E+00	---	T(3)
R011	Times for calculations (yr)	9.000E+00	1.000E+01	---	T(4)
R011	Times for calculations (yr)	not used	3.000E+01	---	T(5)
R011	Times for calculations (yr)	not used	1.000E+02	---	T(6)
R011	Times for calculations (yr)	not used	3.000E+02	---	T(7)
R011	Times for calculations (yr)	not used	1.000E+03	---	T(8)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(9)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): Pb-210	4.690E+01	0.000E+00	---	S1(1)
R012	Initial principal radionuclide (pCi/g): Po-210	6.010E+01	0.000E+00	---	S1(3)
R012	Concentration in groundwater (pCi/L): Pb-210	not used	0.000E+00	---	W1(1)
R012	Concentration in groundwater (pCi/L): Po-210	not used	0.000E+00	---	W1(3)
R013	Cover depth (m)	0.000E+00	0.000E+00	---	COVER0
R013	Density of cover material (g/cm**3)	not used	1.500E+00	---	DENSCV
R013	Cover depth erosion rate (m/yr)	not used	1.000E-03	---	VCV
R013	Density of contaminated zone (g/cm**3)	1.500E+00	1.500E+00	---	DENSCZ
R013	Contaminated zone erosion rate (m/yr)	0.000E+00	1.000E-03	---	VCZ
R013	Contaminated zone total porosity	4.000E-01	4.000E-01	---	TPCZ
R013	Contaminated zone field capacity	2.000E-01	2.000E-01	---	FCCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	1.000E+01	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	5.300E+00	5.300E+00	---	BCZ
R013	Average annual wind speed (m/sec)	2.000E+00	2.000E+00	---	WIND
R013	Humidity in air (g/m**3)	not used	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	5.000E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	1.000E+00	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	2.000E-01	2.000E-01	---	RI
R013	Irrigation mode	overhead	overhead	---	IDITCH
R013	Runoff coefficient	2.000E-01	2.000E-01	---	RUNOFF
R013	Watershed area for nearby stream or pond (m**2)	not used	1.000E+06	---	WAREA
R013	Accuracy for water/soil computations	not used	1.000E-03	---	EPS
R014	Density of saturated zone (g/cm**3)	not used	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	not used	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	not used	2.000E-01	---	EPSZ
R014	Saturated zone field capacity	not used	2.000E-01	---	FCSZ
R014	Saturated zone hydraulic conductivity (m/yr)	not used	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	not used	2.000E-02	---	HGWT
R014	Saturated zone b parameter	not used	5.300E+00	---	BSZ
R014	Water table drop rate (m/yr)	not used	1.000E-03	---	VWT
R014	Well pump intake depth (m below water table)	not used	1.000E+01	---	DWIBWT
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	not used	ND	---	MODEL

Site-Specific Parameter Summary (continued)

0 Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R014	Well pumping rate (m**3/yr)	not used	2.500E+02	---	UW
R015	Number of unsaturated zone strata	not used	1	---	NS
R015	Unsat. zone 1, thickness (m)	not used	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm**3)	not used	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	not used	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	not used	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, field capacity	not used	2.000E-01	---	FCUZ(1)
R015	Unsat. zone 1, soil-specific b parameter	not used	5.300E+00	---	BUZ(1)
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	not used	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for Pb-210				
R016	Contaminated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	not used	1.000E+02	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	not used	1.000E+02	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.238E-01	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R016	Distribution coefficients for Po-210				
R016	Contaminated zone (cm**3/g)	1.000E+01	1.000E+01	---	DCNUCC(3)
R016	Unsaturated zone 1 (cm**3/g)	not used	1.000E+01	---	DCNUCU(3,1)
R016	Saturated zone (cm**3/g)	not used	1.000E+01	---	DCNUCS(3)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.139E+00	ALEACH(3)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(3)
R017	Inhalation rate (m**3/yr)	4.380E+03	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	1.000E-04	1.000E-04	---	MLINH
R017	Exposure duration	6.000E+00	3.000E+01	---	ED
R017	Shielding factor, inhalation	4.000E-01	4.000E-01	---	SHF3
R017	Shielding factor, external gamma	4.000E-01	7.000E-01	---	SHF1
R017	Fraction of time spent indoors	1.940E-01	5.000E-01	---	FIND
R017	Fraction of time spent outdoors (on site)	6.110E-02	2.500E-01	---	FOTD
R017	Shape factor flag, external gamma	1.000E+00	1.000E+00	>0 shows circular AREA.	FS
R017	Radii of shape factor array (used if FS = -1):				
R017	Outer annular radius (m), ring 1:	not used	5.000E+01	---	RAD_SHAPE(1)
R017	Outer annular radius (m), ring 2:	not used	7.071E+01	---	RAD_SHAPE(2)
R017	Outer annular radius (m), ring 3:	not used	0.000E+00	---	RAD_SHAPE(3)
R017	Outer annular radius (m), ring 4:	not used	0.000E+00	---	RAD_SHAPE(4)
R017	Outer annular radius (m), ring 5:	not used	0.000E+00	---	RAD_SHAPE(5)
R017	Outer annular radius (m), ring 6:	not used	0.000E+00	---	RAD_SHAPE(6)
R017	Outer annular radius (m), ring 7:	not used	0.000E+00	---	RAD_SHAPE(7)
R017	Outer annular radius (m), ring 8:	not used	0.000E+00	---	RAD_SHAPE(8)
R017	Outer annular radius (m), ring 9:	not used	0.000E+00	---	RAD_SHAPE(9)
R017	Outer annular radius (m), ring 10:	not used	0.000E+00	---	RAD_SHAPE(10)
R017	Outer annular radius (m), ring 11:	not used	0.000E+00	---	RAD_SHAPE(11)
R017	Outer annular radius (m), ring 12:	not used	0.000E+00	---	RAD_SHAPE(12)

Site-Specific Parameter Summary (continued)

0 Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R017	Fractions of annular areas within AREA:				
R017	Ring 1	not used	1.000E+00	---	FRACA(1)
R017	Ring 2	not used	2.732E-01	---	FRACA(2)
R017	Ring 3	not used	0.000E+00	---	FRACA(3)
R017	Ring 4	not used	0.000E+00	---	FRACA(4)
R017	Ring 5	not used	0.000E+00	---	FRACA(5)
R017	Ring 6	not used	0.000E+00	---	FRACA(6)
R017	Ring 7	not used	0.000E+00	---	FRACA(7)
R017	Ring 8	not used	0.000E+00	---	FRACA(8)
R017	Ring 9	not used	0.000E+00	---	FRACA(9)
R017	Ring 10	not used	0.000E+00	---	FRACA(10)
R017	Ring 11	not used	0.000E+00	---	FRACA(11)
R017	Ring 12	not used	0.000E+00	---	FRACA(12)
R018	Fruits, vegetables and grain consumption (kg/yr)	not used	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	not used	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	not used	9.200E+01	---	DIET(3)
R018	Meat and poultry consumption (kg/yr)	not used	6.300E+01	---	DIET(4)
R018	Fish consumption (kg/yr)	not used	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	not used	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	7.300E+01	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	not used	5.100E+02	---	DWI
R018	Contamination fraction of drinking water	not used	1.000E+00	---	FDW
R018	Contamination fraction of household water	not used	1.000E+00	---	FHHW
R018	Contamination fraction of livestock water	not used	1.000E+00	---	FLW
R018	Contamination fraction of irrigation water	not used	1.000E+00	---	FIRW
R018	Contamination fraction of aquatic food	not used	5.000E-01	---	FR9
R018	Contamination fraction of plant food	not used	-1	---	FPLANT
R018	Contamination fraction of meat	not used	-1	---	FMEAT
R018	Contamination fraction of milk	not used	-1	---	FMILK
R019	Livestock fodder intake for meat (kg/day)	not used	6.800E+01	---	LFI5
R019	Livestock fodder intake for milk (kg/day)	not used	5.500E+01	---	LFI6
R019	Livestock water intake for meat (L/day)	not used	5.000E+01	---	LWI5
R019	Livestock water intake for milk (L/day)	not used	1.600E+02	---	LWI6
R019	Livestock soil intake (kg/day)	not used	5.000E-01	---	LSI
R019	Mass loading for foliar deposition (g/m**3)	not used	1.000E-04	---	MLFD
R019	Depth of soil mixing layer (m)	6.350E-03	1.500E-01	---	DM
R019	Depth of roots (m)	not used	9.000E-01	---	DROOT
R019	Drinking water fraction from ground water	not used	1.000E+00	---	FGWDW
R019	Household water fraction from ground water	not used	1.000E+00	---	FGWHH
R019	Livestock water fraction from ground water	not used	1.000E+00	---	FGWLW
R019	Irrigation fraction from ground water	not used	1.000E+00	---	FGWIR
R19B	Wet weight crop yield for Non-Leafy (kg/m**2)	not used	7.000E-01	---	YV(1)
R19B	Wet weight crop yield for Leafy (kg/m**2)	not used	1.500E+00	---	YV(2)
R19B	Wet weight crop yield for Fodder (kg/m**2)	not used	1.100E+00	---	YV(3)
R19B	Growing Season for Non-Leafy (years)	not used	1.700E-01	---	TE(1)
R19B	Growing Season for Leafy (years)	not used	2.500E-01	---	TE(2)
R19B	Growing Season for Fodder (years)	not used	8.000E-02	---	TE(3)

Site-Specific Parameter Summary (continued)

0 Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R19B	Translocation Factor for Non-Leafy	not used	1.000E-01	---	TIV(1)
R19B	Translocation Factor for Leafy	not used	1.000E+00	---	TIV(2)
R19B	Translocation Factor for Fodder	not used	1.000E+00	---	TIV(3)
R19B	Dry Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---	RDRY(1)
R19B	Dry Foliar Interception Fraction for Leafy	not used	2.500E-01	---	RDRY(2)
R19B	Dry Foliar Interception Fraction for Fodder	not used	2.500E-01	---	RDRY(3)
R19B	Wet Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---	RWET(1)
R19B	Wet Foliar Interception Fraction for Leafy	not used	2.500E-01	---	RWET(2)
R19B	Wet Foliar Interception Fraction for Fodder	not used	2.500E-01	---	RWET(3)
R19B	Weathering Removal Constant for Vegetation	not used	2.000E+01	---	WLAM
C14	C-12 concentration in water (g/cm**3)	not used	2.000E-05	---	C12WTR
C14	C-12 concentration in contaminated soil (g/g)	not used	3.000E-02	---	C12CZ
C14	Fraction of vegetation carbon from soil	not used	2.000E-02	---	CSOIL
C14	Fraction of vegetation carbon from air	not used	9.800E-01	---	CAIR
C14	C-14 evasion layer thickness in soil (m)	not used	3.000E-01	---	DMC
C14	C-14 evasion flux rate from soil (1/sec)	not used	7.000E-07	---	EVSN
C14	C-12 evasion flux rate from soil (1/sec)	not used	1.000E-10	---	REVSN
C14	Fraction of grain in beef cattle feed	not used	8.000E-01	---	AVFG4
C14	Fraction of grain in milk cow feed	not used	2.000E-01	---	AVFG5
STOR	Storage times of contaminated foodstuffs (days):				
STOR	Fruits, non-leafy vegetables, and grain	1.400E+01	1.400E+01	---	STOR_T(1)
STOR	Leafy vegetables	1.000E+00	1.000E+00	---	STOR_T(2)
STOR	Milk	1.000E+00	1.000E+00	---	STOR_T(3)
STOR	Meat and poultry	2.000E+01	2.000E+01	---	STOR_T(4)
STOR	Fish	7.000E+00	7.000E+00	---	STOR_T(5)
STOR	Crustacea and mollusks	7.000E+00	7.000E+00	---	STOR_T(6)
STOR	Well water	1.000E+00	1.000E+00	---	STOR_T(7)
STOR	Surface water	1.000E+00	1.000E+00	---	STOR_T(8)
STOR	Livestock fodder	4.500E+01	4.500E+01	---	STOR_T(9)
R021	Thickness of building foundation (m)	not used	1.500E-01	---	FLOOR1
R021	Bulk density of building foundation (g/cm**3)	not used	2.400E+00	---	DENSFL
R021	Total porosity of the cover material	not used	4.000E-01	---	TPCV
R021	Total porosity of the building foundation	not used	1.000E-01	---	TPFL
R021	Volumetric water content of the cover material	not used	5.000E-02	---	PH2OCV
R021	Volumetric water content of the foundation	not used	3.000E-02	---	PH2OFL
R021	Diffusion coefficient for radon gas (m/sec):				
R021	in cover material	not used	2.000E-06	---	DIFCV
R021	in foundation material	not used	3.000E-07	---	DIFFL
R021	in contaminated zone soil	not used	2.000E-06	---	DIFCZ
R021	Radon vertical dimension of mixing (m)	not used	2.000E+00	---	HMIX
R021	Average building air exchange rate (1/hr)	not used	5.000E-01	---	REXG
R021	Height of the building (room) (m)	not used	2.500E+00	---	HRM
R021	Building interior area factor	not used	0.000E+00	---	FAI
R021	Building depth below ground surface (m)	not used	-1.000E+00	---	DMFL
R021	Emanating power of Rn-222 gas	not used	2.500E-01	---	EMANA(1)
R021	Emanating power of Rn-220 gas	not used	1.500E-01	---	EMANA(2)
TITL	Number of graphical time points	32	---	---	NPTS

Site-Specific Parameter Summary (continued)

0 Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
TITL	Maximum number of integration points for dose	17	---	---	LYMAX
TITL	Maximum number of integration points for risk	1	---	---	KYMAX

Summary of Pathway Selections

Pathway	User Selection
1 -- external gamma	active
2 -- inhalation (w/o radon)	active
3 -- plant ingestion	suppressed
4 -- meat ingestion	suppressed
5 -- milk ingestion	suppressed
6 -- aquatic foods	suppressed
7 -- drinking water	suppressed
8 -- soil ingestion	active
9 -- radon	suppressed
Find peak pathway doses	active

Summary : Jana Student - Pavement Sed Pb, Po-210 Rev0
File   : C:\RESRAD_FAMILY\ONSITE\7.2\USERFILES\JANA STUDENT PAVEMENT SED PB PO-210 RV0.RAD

```
      Contaminated Zone Dimensions           Initial Soil Concentrations, pCi/g
      ____________________________           __________________________________

        Area:    100.00 square meters                Pb-210     4.690E+01
   Thickness:      0.01 meters                       Po-210     6.010E+01
 Cover Depth:      0.00 meters
0
                        Total Dose TDOSE(t), mrem/yr
                  Basic Radiation Dose Limit = 1.900E+01 mrem/yr
 Total Mixture Sum M(t) = Fraction of Basic Dose Limit Received at Time (t)
 __________________________________________________________________________

    t (years):  0.000E+00  1.000E+00  3.000E+00  9.000E+00
     TDOSE(t):  1.079E+00  5.025E-01  1.655E-01  5.923E-03
         M(t):  5.677E-02  2.645E-02  8.712E-03  3.118E-04
0Maximum TDOSE(t):  1.079E+00 mrem/yr   at t = 0.000E+00 years
```

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years

0 Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground mrem/yr	Ground fract.	Inhalation mrem/yr	Inhalation fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	Milk mrem/yr	Milk fract.	Soil mrem/yr	Soil fract.
Pb-210	1.133E-02	0.0105	1.161E-02	0.0108	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.938E-01	0.7360
Po-210	4.103E-06	0.0000	1.748E-03	0.0016	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.601E-01	0.2411
Total	1.133E-02	0.0105	1.336E-02	0.0124	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.054E+00	0.9771

0

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years

0 Water Dependent Pathways

Radio-Nuclide	Water mrem/yr	Water fract.	Fish mrem/yr	Fish fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	Milk mrem/yr	Milk fract.	All Pathways* mrem/yr	All Pathways* fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.167E-01	0.7572
Po-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.618E-01	0.2428
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.079E+00	1.0000

0*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years
0 Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground mrem/yr	Ground fract.	Inhalation mrem/yr	Inhalation fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	Milk mrem/yr	Milk fract.	Soil mrem/yr	Soil fract.
Pb-210	6.504E-03	0.0129	6.888E-03	0.0137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.889E-01	0.9729
Po-210	3.859E-09	0.0000	1.644E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.446E-04	0.0005
Total	6.504E-03	0.0129	6.890E-03	0.0137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.891E-01	0.9733

0

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years
0 Water Dependent Pathways

Radio-Nuclide	Water mrem/yr	Water fract.	Fish mrem/yr	Fish fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	Milk mrem/yr	Milk fract.	All Pathways* mrem/yr	All Pathways* fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.022E-01	0.9995
Po-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.463E-04	0.0005
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.025E-01	1.0000

0*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+00 years

0 Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground mrem/yr	Ground fract.	Inhalation mrem/yr	Inhalation fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	Milk mrem/yr	Milk fract.	Soil mrem/yr	Soil fract.
Pb-210	2.143E-03	0.0129	2.270E-03	0.0137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.611E-01	0.9733
Po-210	3.415E-15	0.0000	1.454E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.164E-10	0.0000
Total	2.143E-03	0.0129	2.270E-03	0.0137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.611E-01	0.9733

0

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+00 years

0 Water Dependent Pathways

Radio-Nuclide	Water mrem/yr	Water fract.	Fish mrem/yr	Fish fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	Milk mrem/yr	Milk fract.	All Pathways* mrem/yr	All Pathways* fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.655E-01	1.0000
Po-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.179E-10	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.655E-01	1.0000

0*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 9.000E+00 years
0 Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground mrem/yr	Ground fract.	Inhalation mrem/yr	Inhalation fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	Milk mrem/yr	Milk fract.	Soil mrem/yr	Soil fract.
Pb-210	7.670E-05	0.0129	8.123E-05	0.0137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.765E-03	0.9733
Po-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.499E-28	0.0000
Total	7.670E-05	0.0129	8.123E-05	0.0137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.765E-03	0.9733

0

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 9.000E+00 years
0 Water Dependent Pathways

Radio-Nuclide	Water mrem/yr	Water fract.	Fish mrem/yr	Fish fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	Milk mrem/yr	Milk fract.	All Pathways* mrem/yr	All Pathways* fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.923E-03	1.0000
Po-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.499E-28	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.923E-03	1.0000

0*Sum of all water independent and dependent pathways.

Dose/Source Ratios Summed Over All Pathways
Parent and Progeny Principal Radionuclide Contributions Indicated

0 Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	9.000E+00
Pb-210+D	Pb-210+D	1.000E+00	1.201E-02	6.892E-03	2.271E-03	8.127E-05
Pb-210+D	Po-210	1.000E+00	5.408E-03	3.817E-03	1.258E-03	4.502E-05
Pb-210+D	ΣDSR(j)		1.741E-02	1.071E-02	3.529E-03	1.263E-04
0Pb-210+D1	Pb-210+D1	1.339E-06	1.660E-08	9.529E-09	3.140E-09	1.124E-10
0Po-210	Po-210	1.000E+00	4.356E-03	4.098E-06	3.625E-12	2.511E-30

The DSR includes contributions from associated (half-life ≤ 30 days) daughters.
0

Single Radionuclide Soil Guidelines G(i,t) in pCi/g
Basic Radiation Dose Limit = 1.900E+01 mrem/yr

0Nuclide (i)	t= 0.000E+00	1.000E+00	3.000E+00	9.000E+00
Pb-210	1.091E+03	1.774E+03	5.383E+03	1.504E+05
Po-210	4.361E+03	4.637E+06	5.241E+12	*4.472E+15

*At specific activity limit
0

Summed Dose/Source Ratios DSR(i,t) in (mrem/yr)/(pCi/g)
and Single Radionuclide Soil Guidelines G(i,t) in pCi/g
at tmin = time of minimum single radionuclide soil guideline
and at tmax = time of maximum total dose = 0.000E+00 years

0Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Pb-210	4.690E+01	0.000E+00	1.741E-02	1.091E+03	1.741E-02	1.091E+03
Po-210	6.010E+01	0.000E+00	4.356E-03	4.361E+03	4.356E-03	4.361E+03

Individual Nuclide Dose Summed Over All Pathways
Parent Nuclide and Branch Fraction Indicated

0Nuclide (j)	Parent (i)	THF(i)	DOSE(j,t), mrem/yr t= 0.000E+00	1.000E+00	3.000E+00	9.000E+00
Pb-210	Pb-210	1.000E+00	5.631E-01	3.232E-01	1.065E-01	3.812E-03
Pb-210	Pb-210	1.339E-06	7.785E-07	4.469E-07	1.473E-07	5.270E-09
Pb-210	ΣDOSE(j)		5.631E-01	3.232E-01	1.065E-01	3.812E-03
0Po-210	Pb-210	1.000E+00	2.537E-01	1.790E-01	5.901E-02	2.112E-03
Po-210	Po-210	1.000E+00	2.618E-01	2.463E-04	2.179E-10	1.499E-28
Po-210	ΣDOSE(j)		5.155E-01	1.793E-01	5.901E-02	2.112E-03

THF(i) is the thread fraction of the parent nuclide.

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

0Nuclide (j)	Parent (i)	THF(i)	S(j,t), pCi/g t= 0.000E+00	1.000E+00	3.000E+00	9.000E+00
Pb-210	Pb-210	1.000E+00	4.690E+01	2.692E+01	8.872E+00	3.175E-01
Pb-210	Pb-210	1.339E-06	6.280E-05	3.605E-05	1.188E-05	4.251E-07
Pb-210	ΣS(j):		4.690E+01	2.692E+01	8.872E+00	3.175E-01
0Po-210	Pb-210	1.000E+00	0.000E+00	7.667E+00	2.531E+00	9.056E-02
Po-210	Po-210	1.000E+00	6.010E+01	5.653E-02	5.002E-08	3.464E-26
Po-210	ΣS(j):		6.010E+01	7.724E+00	2.531E+00	9.056E-02

THF(i) is the thread fraction of the parent nuclide.
0RESCALC.EXE execution time = 13.79 seconds

HSD-JES Pavement Sediment, Staff Scenario
RESRAD Risk Summary

Table of Contents

Part III: Intake Quantities and Health Risk Factors

Cancer Risk Slope Factors Summary Table
Risk Library: DCFPAK3.02 Morbidity

0

Menu	Parameter	Current Value	Base Case*	Parameter Name
Sf-1	Ground external radiation slope factors, 1/yr per (pCi/g):			
Sf-1	Pb-210+D	4.25E-09	1.48E-09	SLPF(1,1)
Sf-1	Pb-210+D1	1.72E-08	1.48E-09	SLPF(2,1)
Sf-1	Po-210	4.51E-11	4.51E-11	SLPF(3,1)
Sf-2	Inhalation, slope factors, 1/(pCi):			
Sf-2	Pb-210+D	1.63E-08	1.59E-08	SLPF(1,2)
Sf-2	Pb-210+D1	1.63E-08	1.59E-08	SLPF(2,2)
Sf-2	Po-210	1.45E-08	1.45E-08	SLPF(3,2)
Sf-3	Food ingestion, slope factors, 1/(pCi):			
Sf-3	Pb-210+D	1.19E-09	1.18E-09	SLPF(1,3)
Sf-3	Pb-210+D1	1.19E-09	1.18E-09	SLPF(2,3)
Sf-3	Po-210	2.25E-09	2.25E-09	SLPF(3,3)
Sf-3	Water ingestion, slope factors, 1/(pCi):			
Sf-3	Pb-210+D	8.93E-10	8.84E-10	SLPF(1,4)
Sf-3	Pb-210+D1	8.93E-10	8.84E-10	SLPF(2,4)
Sf-3	Po-210	1.78E-09	1.78E-09	SLPF(3,4)
Sf-3	Soil ingestion, slope factors, 1/(pCi):			
Sf-3	Pb-210+D	1.19E-09	1.18E-09	SLPF(1,5)
Sf-3	Pb-210+D1	1.19E-09	1.18E-09	SLPF(2,5)
Sf-3	Po-210	2.25E-09	2.25E-09	SLPF(3,5)

*Base Case means Default.Lib w/o Associate Nuclide contributions.

Risk Slope and Environmental Transport Factors for the Ground Pathway

Nuclide (i)	Slope(i)*	ETFG(i,t) At Time in Years (dimensionless) t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Bi-210	2.770E-09	3.703E-02	3.703E-02	3.703E-02	3.703E-02	3.703E-02	3.703E-02
Hg-206	4.830E-07	1.093E-02	1.093E-02	1.093E-02	1.093E-02	1.093E-02	1.093E-02
Pb-210	1.480E-09	7.912E-02	7.912E-02	7.912E-02	7.912E-02	7.912E-02	7.912E-02
Po-210	4.510E-11	9.877E-03	9.877E-03	9.877E-03	9.877E-03	9.877E-03	9.877E-03
Tl-206	6.110E-09	3.955E-02	3.955E-02	3.955E-02	3.955E-02	3.955E-02	3.955E-02

* - Units are 1/yr per (pCi/g) at infinite depth and area. Multiplication by ETFG(i,t) converts to site conditions.

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 0.000E+00 years

Radio-	Water Independent Pathways (Inhalation w/o radon)					Water Dependent Pathways					Total
Nuclide	Inhalation	Plant	Meat	Milk	Soil	Water	Fish	Plant	Meat	Milk	Ingestion*
Pb-210	4.645E-01	0.000E+00	0.000E+00	0.000E+00	4.627E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	4.627E+01
Po-210	5.952E-01	0.000E+00	0.000E+00	0.000E+00	5.929E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	5.929E+01

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
  and water-dependent water, fish, plant, meat, milk pathways

0

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 0.000E+00 years

0 Water Independent Pathways (Inhalation excludes radon)

0

Radio-	Ground		Inhalation		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Pb-210	2.576E-07	0.0479	1.896E-07	0.0352	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.375E-06	0.2557
Po-210	6.693E-10	0.0001	2.158E-07	0.0401	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.340E-06	0.6209
Total	2.582E-07	0.0480	4.053E-07	0.0754	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.715E-06	0.8766

0

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 0.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Plant		Meat		Milk		All Pathways**	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.823E-06	0.3388
Po-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.556E-06	0.6612
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.379E-06	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
   and water dependent water, fish, plant, meat, milk pathways

Total Excess Cancer Risk CNRS(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 0.000E+00 years

0
Water Independent Pathways (Inhalation excludes radon)

0

Radio- Nuclide	Ground risk	Ground fract.	Inhalation risk	Inhalation fract.	Radon risk	Radon fract.	Plant risk	Plant fract.	Meat risk	Meat fract.	Milk risk	Milk fract.	Soil risk	Soil fract.
Pb-210	2.576E-07	0.0479	1.896E-07	0.0352	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.375E-06	0.2557
Po-210	6.693E-10	0.0001	2.158E-07	0.0401	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.340E-06	0.6209
Total	2.582E-07	0.0480	4.053E-07	0.0754	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.715E-06	0.8766

0

Total Excess Cancer Risk CNRS(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 0.000E+00 years

Water Dependent Pathways

Radio- Nuclide	Water risk	Water fract.	Fish risk	Fish fract.	Radon risk	Radon fract.	Plant risk	Plant fract.	Meat risk	Meat fract.	Milk risk	Milk fract.	All pathways risk	All pathways fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.823E-06	0.3388
Po-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.556E-06	0.6612
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.379E-06	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 1.000E+00 years

Radio-	Water Independent Pathways (Inhalation w/o radon)					Water Dependent Pathways					Total
Nuclide	Inhalation	Plant	Meat	Milk	Soil	Water	Fish	Plant	Meat	Milk	Ingestion*
Pb-210	2.666E-01	0.000E+00	0.000E+00	0.000E+00	2.656E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.656E+01
Po-210	7.650E-02	0.000E+00	0.000E+00	0.000E+00	7.620E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	7.620E+00

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
and water-dependent water, fish, plant, meat, milk pathways

0

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+00 years

0 Water Independent Pathways (Inhalation excludes radon)

0

Radio-	Ground		Inhalation		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Pb-210	1.479E-07	0.0984	1.088E-07	0.0724	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.896E-07	0.5252
Po-210	8.601E-11	0.0001	2.773E-08	0.0184	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.292E-07	0.2855
Total	1.479E-07	0.0984	1.366E-07	0.0908	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.219E-06	0.8108

0

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Plant		Meat		Milk		All Pathways**	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.046E-06	0.6960
Po-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.570E-07	0.3040
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.503E-06	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

Total Excess Cancer Risk CNRS(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+00 years

0 Water Independent Pathways (Inhalation excludes radon)

0

Radio-Nuclide	Ground risk	Ground fract.	Inhalation risk	Inhalation fract.	Radon risk	Radon fract.	Plant risk	Plant fract.	Meat risk	Meat fract.	Milk risk	Milk fract.	Soil risk	Soil fract.
Pb-210	1.479E-07	0.0984	1.364E-07	0.0907	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.216E-06	0.8087
Po-210	6.295E-13	0.0000	2.030E-10	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.141E-09	0.0021
Total	1.479E-07	0.0984	1.366E-07	0.0908	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.219E-06	0.8108

0

Total Excess Cancer Risk CNRS(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+00 years

Water Dependent Pathways

Radio-Nuclide	Water risk	Water fract.	Fish risk	Fish fract.	Radon risk	Radon fract.	Plant risk	Plant fract.	Meat risk	Meat fract.	Milk risk	Milk fract.	All pathways risk	All pathways fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.500E-06	0.9978
Po-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.345E-09	0.0022
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.503E-06	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 3.000E+00 years

Radio-Nuclide	Water Independent Pathways (Inhalation w/o radon)					Water Dependent Pathways					Total
	Inhalation	Plant	Meat	Milk	Soil	Water	Fish	Plant	Meat	Milk	Ingestion*
Pb-210	8.787E-02	0.000E+00	0.000E+00	0.000E+00	8.753E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	8.753E+00
Po-210	2.506E-02	0.000E+00	0.000E+00	0.000E+00	2.497E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.497E+00

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
and water-dependent water, fish, plant, meat, milk pathways

0

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+00 years

0 Water Independent Pathways (Inhalation excludes radon)

0

Radio-Nuclide	Ground		Inhalation		Plant		Meat		Milk		Soil	
	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Pb-210	4.872E-08	0.0985	3.586E-08	0.0725	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.602E-07	0.5261
Po-210	2.818E-11	0.0001	9.086E-09	0.0184	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.406E-07	0.2844
Total	4.875E-08	0.0986	4.495E-08	0.0909	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.008E-07	0.8105

0

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+00 years

Water Dependent Pathways

Radio-Nuclide	Water		Fish		Plant		Meat		Milk		All Pathways**	
	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.448E-07	0.6972
Po-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.497E-07	0.3028
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.945E-07	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

Total Excess Cancer Risk CNRS(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+00 years
0
Water Independent Pathways (Inhalation excludes radon)
0

Radio-Nuclide	Ground risk	Ground fract.	Inhalation risk	Inhalation fract.	Radon risk	Radon fract.	Plant risk	Plant fract.	Meat risk	Meat fract.	Milk risk	Milk fract.	Soil risk	Soil fract.
Pb-210	4.875E-08	0.0986	4.495E-08	0.0909	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.008E-07	0.8105
Po-210	5.570E-19	0.0000	1.796E-16	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.779E-15	0.0000
Total	4.875E-08	0.0986	4.495E-08	0.0909	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.008E-07	0.8105

0
Total Excess Cancer Risk CNRS(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+00 years

Water Dependent Pathways

Radio-Nuclide	Water risk	Water fract.	Fish risk	Fish fract.	Radon risk	Radon fract.	Plant risk	Plant fract.	Meat risk	Meat fract.	Milk risk	Milk fract.	All pathways risk	All pathways fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.945E-07	1.0000
Po-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.959E-15	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.945E-07	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 1.000E+01 years

Radio-	Water Independent Pathways (Inhalation w/o radon)					Water Dependent Pathways					Total
Nuclide	Inhalation	Plant	Meat	Milk	Soil	Water	Fish	Plant	Meat	Milk	Ingestion*
Pb-210	1.805E-03	0.000E+00	0.000E+00	0.000E+00	1.798E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.798E-01
Po-210	5.149E-04	0.000E+00	0.000E+00	0.000E+00	5.129E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	5.129E-02

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
and water-dependent water, fish, plant, meat, milk pathways

0

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+01 years

0 Water Independent Pathways (Inhalation excludes radon)

0

Radio-	Ground		Inhalation		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Pb-210	1.001E-09	0.0985	7.367E-10	0.0725	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.345E-09	0.5261
Po-210	5.789E-13	0.0001	1.866E-10	0.0184	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.889E-09	0.2844
Total	1.001E-09	0.0986	9.233E-10	0.0909	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.234E-09	0.8105

0

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+01 years

Water Dependent Pathways

Radio-	Water		Fish		Plant		Meat		Milk		All Pathways**	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.083E-09	0.6972
Po-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.076E-09	0.3028
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.016E-08	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

Total Excess Cancer Risk CNRS(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+01 years

0
Water Independent Pathways (Inhalation excludes radon)

0

Radio-Nuclide	Ground risk	Ground fract.	Inhalation risk	Inhalation fract.	Radon risk	Radon fract.	Plant risk	Plant fract.	Meat risk	Meat fract.	Milk risk	Milk fract.	Soil risk	Soil fract.
Pb-210	1.001E-09	0.0986	9.233E-10	0.0909	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.234E-09	0.8105
Po-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	1.001E-09	0.0986	9.233E-10	0.0909	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.234E-09	0.8105

0

Total Excess Cancer Risk CNRS(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+01 years

Water Dependent Pathways

Radio-Nuclide	Water risk	Water fract.	Fish risk	Fish fract.	Radon risk	Radon fract.	Plant risk	Plant fract.	Meat risk	Meat fract.	Milk risk	Milk fract.	All pathways risk	All pathways fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.016E-08	1.0000
Po-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.016E-08	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 3.000E+01 years

Radio-	Water Independent Pathways (Inhalation w/o radon)					Water Dependent Pathways					Total
Nuclide	Inhalation	Plant	Meat	Milk	Soil	Water	Fish	Plant	Meat	Milk	Ingestion*
Pb-210	2.726E-08	0.000E+00	0.000E+00	0.000E+00	2.715E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.715E-06
Po-210	7.776E-09	0.000E+00	0.000E+00	0.000E+00	7.746E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	7.746E-07

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
and water-dependent water, fish, plant, meat, milk pathways

0

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+01 years

0 Water Independent Pathways (Inhalation excludes radon)

0

Radio-	Ground		Inhalation		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Pb-210	1.511E-14	0.0985	1.112E-14	0.0725	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.072E-14	0.5261
Po-210	8.743E-18	0.0001	2.819E-15	0.0184	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.363E-14	0.2844
Total	1.512E-14	0.0986	1.394E-14	0.0909	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.243E-13	0.8105

0

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+01 years

Water Dependent Pathways

Radio-	Water		Fish		Plant		Meat		Milk		All Pathways**	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.070E-13	0.6972
Po-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.646E-14	0.3028
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.534E-13	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

Total Excess Cancer Risk CNRS(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+01 years
0
Water Independent Pathways (Inhalation excludes radon)
0

Radio-Nuclide	Ground risk	Ground fract.	Inhalation risk	Inhalation fract.	Radon risk	Radon fract.	Plant risk	Plant fract.	Meat risk	Meat fract.	Milk risk	Milk fract.	Soil risk	Soil fract.
Pb-210	1.512E-14	0.0986	1.394E-14	0.0909	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.243E-13	0.8105
Po-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	1.512E-14	0.0986	1.394E-14	0.0909	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.243E-13	0.8105

0

Total Excess Cancer Risk CNRS(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+01 years

Water Dependent Pathways

Radio-Nuclide	Water risk	Water fract.	Fish risk	Fish fract.	Radon risk	Radon fract.	Plant risk	Plant fract.	Meat risk	Meat fract.	Milk risk	Milk fract.	All pathways risk	All pathways fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.534E-13	1.0000
Po-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.534E-13	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 1.000E+02 years

Radio-	Water Independent Pathways (Inhalation w/o radon)					Water Dependent Pathways					Total
Nuclide	Inhalation	Plant	Meat	Milk	Soil	Water	Fish	Plant	Meat	Milk	Ingestion*
Pb-210	3.648E-25	0.000E+00	0.000E+00	0.000E+00	3.634E-23	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.634E-23
Po-210	1.041E-25	0.000E+00	0.000E+00	0.000E+00	1.037E-23	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.037E-23

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
and water-dependent water, fish, plant, meat, milk pathways

0

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+02 years

0 Water Independent Pathways (Inhalation excludes radon)

0

Radio-	Ground		Inhalation		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Po-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

0

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+02 years

Water Dependent Pathways

Radio-	Water		Fish		Plant		Meat		Milk		All Pathways**	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Po-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

Total Excess Cancer Risk CNRS(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+02 years

0
Water Independent Pathways (Inhalation excludes radon)

0

Radio-Nuclide	Ground risk	Ground fract.	Inhalation risk	Inhalation fract.	Radon risk	Radon fract.	Plant risk	Plant fract.	Meat risk	Meat fract.	Milk risk	Milk fract.	Soil risk	Soil fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Po-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

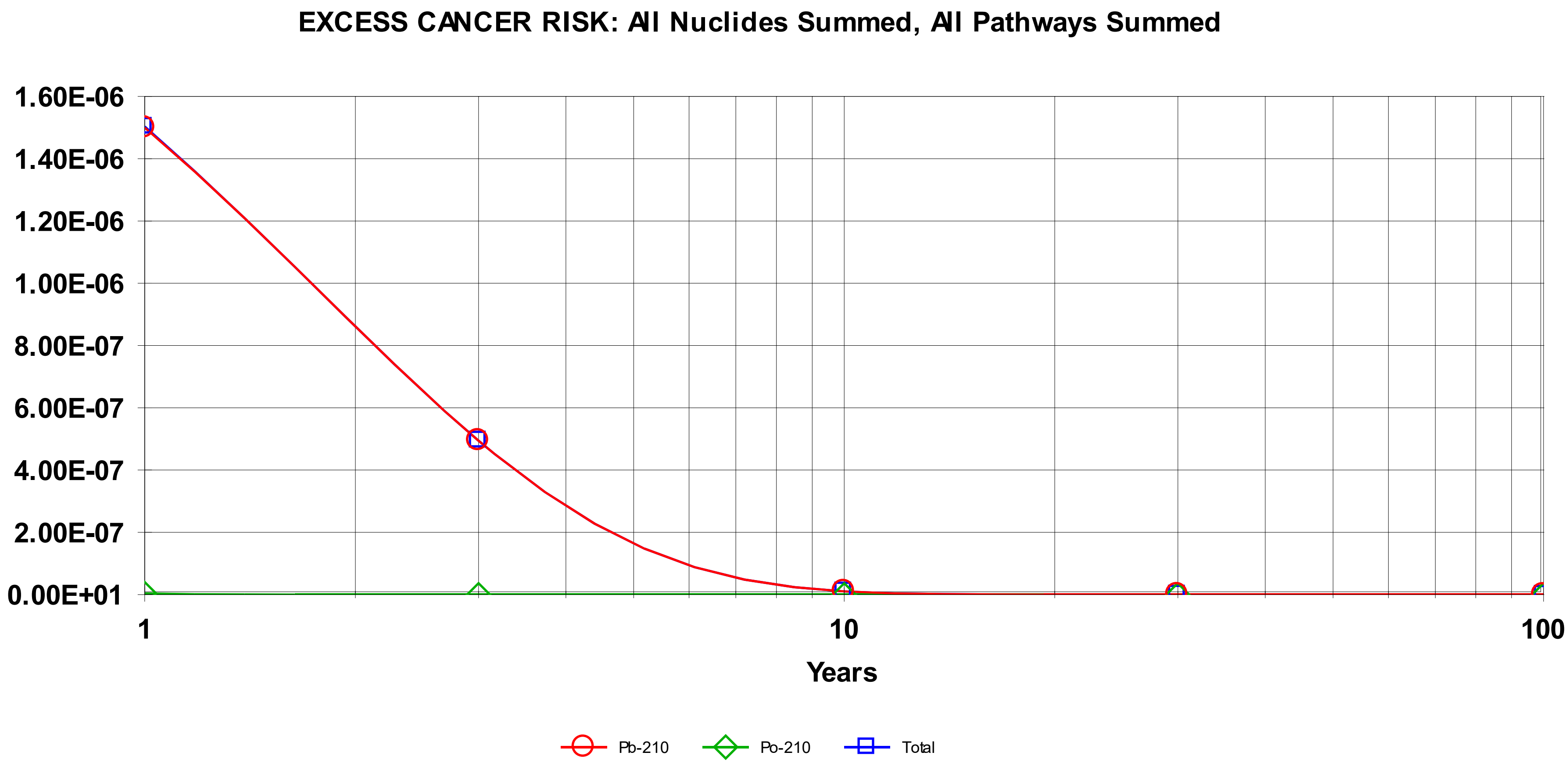
0

Total Excess Cancer Risk CNRS(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+02 years

Water Dependent Pathways

Radio-Nuclide	Water risk	Water fract.	Fish risk	Fish fract.	Radon risk	Radon fract.	Plant risk	Plant fract.	Meat risk	Meat fract.	Milk risk	Milk fract.	All pathways risk	All pathways fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Po-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides



C:\RESRAD_FAMILY\ONSITE\7.2\USERFILES\JANA STAFF PAVEMENT SEDIMENT PB-210 PO-210 RV0.RAD 04/28/2023 10:50 GRAPHICS.ASC Includes All Pathways

Note: The RESRAD-ONLINE graph starts at year 1, not year 0; year 0 had the highest risk. The data line for each radionuclide includes risk contributions from that radionuclide's decay chain isotopes (e.g., the Pb-210 data line includes the risk contribution from Po-210 that results from the radioactive decay of Pb-210; the Po-210 data line does not include the Po-210 resulting from Pb-210 decay).

HSD-JES Pavement Sediment, Staff Scenario
RESRAD Input Summary

Table of Contents

Part I: Mixture Sums and Single Radionuclide Guidelines

Dose Conversion Factor (and Related) Parameter Summary
Dose Library: DCFPAK3.02 (Adult)

0 Menu	Parameter	Current Value#	Base Case*	Parameter Name
A-1	DCF's for external ground radiation, (mrem/yr)/(pCi/g)			
A-1	Bi-210 (Source: DCFPAK3.02)	5.473E-03	5.473E-03	DCF1(1)
A-1	Hg-206 (Source: DCFPAK3.02)	6.127E-01	6.127E-01	DCF1(2)
A-1	Pb-210 (Source: DCFPAK3.02)	2.092E-03	2.092E-03	DCF1(3)
A-1	Po-210 (Source: DCFPAK3.02)	5.641E-05	5.641E-05	DCF1(4)
A-1	Tl-206 (Source: DCFPAK3.02)	1.278E-02	1.278E-02	DCF1(5)
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Pb-210+D	2.126E-02	2.077E-02	DCF2(1)
B-1	Pb-210+D1	2.126E-02	2.077E-02	DCF2(2)
B-1	Po-210	1.582E-02	1.582E-02	DCF2(3)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Pb-210+D	2.580E-03	2.575E-03	DCF3(1)
D-1	Pb-210+D1	2.580E-03	2.575E-03	DCF3(2)
D-1	Po-210	4.477E-03	4.477E-03	DCF3(3)
D-34	Food transfer factors:			
D-34	Pb-210+D , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(1,1)
D-34	Pb-210+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-04	8.000E-04	RTF(1,2)
D-34	Pb-210+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.000E-04	3.000E-04	RTF(1,3)
D-34				
D-34	Pb-210+D1 , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(2,1)
D-34	Pb-210+D1 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-04	8.000E-04	RTF(2,2)
D-34	Pb-210+D1 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.000E-04	3.000E-04	RTF(2,3)
D-34				
D-34	Po-210 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(3,1)
D-34	Po-210 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	5.000E-03	5.000E-03	RTF(3,2)
D-34	Po-210 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.400E-04	3.400E-04	RTF(3,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Pb-210+D , fish	3.000E+02	3.000E+02	BIOFAC(1,1)
D-5	Pb-210+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(1,2)
D-5				
D-5	Pb-210+D1 , fish	3.000E+02	3.000E+02	BIOFAC(2,1)
D-5	Pb-210+D1 , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(2,2)
D-5				
D-5	Po-210 , fish	1.000E+02	1.000E+02	BIOFAC(3,1)
D-5	Po-210 , crustacea and mollusks	2.000E+04	2.000E+04	BIOFAC(3,2)

#For DCF1(xxx) only, factors are for infinite depth & area. See ETFG table in Ground Pathway of Detailed Report.
*Base Case means Default.Lib w/o Associate Nuclide contributions.

Site-Specific Parameter Summary

0 Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R011	Area of contaminated zone (m**2)	1.000E+02	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	6.350E-03	2.000E+00	---	THICK0
R011	Fraction of contamination that is submerged	0.000E+00	0.000E+00	---	SUBMFRACT
R011	Length parallel to aquifer flow (m)	not used	1.000E+02	---	LCZPAQ
R011	Basic radiation dose limit (mrem/yr)	1.900E+01	3.000E+01	---	BRDL
R011	Time since placement of material (yr)	0.000E+00	0.000E+00	---	TI
R011	Times for calculations (yr)	1.000E+00	1.000E+00	---	T(2)
R011	Times for calculations (yr)	3.000E+00	3.000E+00	---	T(3)
R011	Times for calculations (yr)	1.000E+01	1.000E+01	---	T(4)
R011	Times for calculations (yr)	3.000E+01	3.000E+01	---	T(5)
R011	Times for calculations (yr)	1.000E+02	1.000E+02	---	T(6)
R011	Times for calculations (yr)	not used	3.000E+02	---	T(7)
R011	Times for calculations (yr)	not used	1.000E+03	---	T(8)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(9)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): Pb-210	4.690E+01	0.000E+00	---	S1(1)
R012	Initial principal radionuclide (pCi/g): Po-210	6.010E+01	0.000E+00	---	S1(3)
R012	Concentration in groundwater (pCi/L): Pb-210	not used	0.000E+00	---	W1(1)
R012	Concentration in groundwater (pCi/L): Po-210	not used	0.000E+00	---	W1(3)
R013	Cover depth (m)	0.000E+00	0.000E+00	---	COVER0
R013	Density of cover material (g/cm**3)	not used	1.500E+00	---	DENSCV
R013	Cover depth erosion rate (m/yr)	not used	1.000E-03	---	VCV
R013	Density of contaminated zone (g/cm**3)	1.500E+00	1.500E+00	---	DENSCZ
R013	Contaminated zone erosion rate (m/yr)	0.000E+00	1.000E-03	---	VCZ
R013	Contaminated zone total porosity	4.000E-01	4.000E-01	---	TPCZ
R013	Contaminated zone field capacity	2.000E-01	2.000E-01	---	FCCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	1.000E+01	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	5.300E+00	5.300E+00	---	BCZ
R013	Average annual wind speed (m/sec)	2.000E+00	2.000E+00	---	WIND
R013	Humidity in air (g/m**3)	not used	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	5.000E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	1.000E+00	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	2.000E-01	2.000E-01	---	RI
R013	Irrigation mode	overhead	overhead	---	IDITCH
R013	Runoff coefficient	2.000E-01	2.000E-01	---	RUNOFF
R013	Watershed area for nearby stream or pond (m**2)	not used	1.000E+06	---	WAREA
R013	Accuracy for water/soil computations	not used	1.000E-03	---	EPS
R014	Density of saturated zone (g/cm**3)	not used	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	not used	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	not used	2.000E-01	---	EPSZ
R014	Saturated zone field capacity	not used	2.000E-01	---	FCSZ
R014	Saturated zone hydraulic conductivity (m/yr)	not used	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	not used	2.000E-02	---	HGWT
R014	Saturated zone b parameter	not used	5.300E+00	---	BSZ
R014	Water table drop rate (m/yr)	not used	1.000E-03	---	VWT
R014	Well pump intake depth (m below water table)	not used	1.000E+01	---	DWIBWT
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	not used	ND	---	MODEL

Site-Specific Parameter Summary (continued)

0 Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R014	Well pumping rate (m**3/yr)	not used	2.500E+02	---	UW
R015	Number of unsaturated zone strata	not used	1	---	NS
R015	Unsat. zone 1, thickness (m)	not used	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm**3)	not used	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	not used	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	not used	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, field capacity	not used	2.000E-01	---	FCUZ(1)
R015	Unsat. zone 1, soil-specific b parameter	not used	5.300E+00	---	BUZ(1)
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	not used	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for Pb-210				
R016	Contaminated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	not used	1.000E+02	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	not used	1.000E+02	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.238E-01	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R016	Distribution coefficients for Po-210				
R016	Contaminated zone (cm**3/g)	1.000E+01	1.000E+01	---	DCNUCC(3)
R016	Unsaturated zone 1 (cm**3/g)	not used	1.000E+01	---	DCNUCU(3,1)
R016	Saturated zone (cm**3/g)	not used	1.000E+01	---	DCNUCS(3)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.139E+00	ALEACH(3)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(3)
R017	Inhalation rate (m**3/yr)	5.840E+03	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	1.000E-04	1.000E-04	---	MLINH
R017	Exposure duration	2.500E+01	3.000E+01	---	ED
R017	Shielding factor, inhalation	4.000E-01	4.000E-01	---	SHF3
R017	Shielding factor, external gamma	4.000E-01	7.000E-01	---	SHF1
R017	Fraction of time spent indoors	1.800E-01	5.000E-01	---	FIND
R017	Fraction of time spent outdoors (on site)	9.030E-02	2.500E-01	---	FOTD
R017	Shape factor flag, external gamma	1.000E+00	1.000E+00	>0 shows circular AREA.	FS
R017	Radii of shape factor array (used if FS = -1):				
R017	Outer annular radius (m), ring 1:	not used	5.000E+01	---	RAD_SHAPE(1)
R017	Outer annular radius (m), ring 2:	not used	7.071E+01	---	RAD_SHAPE(2)
R017	Outer annular radius (m), ring 3:	not used	0.000E+00	---	RAD_SHAPE(3)
R017	Outer annular radius (m), ring 4:	not used	0.000E+00	---	RAD_SHAPE(4)
R017	Outer annular radius (m), ring 5:	not used	0.000E+00	---	RAD_SHAPE(5)
R017	Outer annular radius (m), ring 6:	not used	0.000E+00	---	RAD_SHAPE(6)
R017	Outer annular radius (m), ring 7:	not used	0.000E+00	---	RAD_SHAPE(7)
R017	Outer annular radius (m), ring 8:	not used	0.000E+00	---	RAD_SHAPE(8)
R017	Outer annular radius (m), ring 9:	not used	0.000E+00	---	RAD_SHAPE(9)
R017	Outer annular radius (m), ring 10:	not used	0.000E+00	---	RAD_SHAPE(10)
R017	Outer annular radius (m), ring 11:	not used	0.000E+00	---	RAD_SHAPE(11)
R017	Outer annular radius (m), ring 12:	not used	0.000E+00	---	RAD_SHAPE(12)

Site-Specific Parameter Summary (continued)

0 Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R017	Fractions of annular areas within AREA:				
R017	Ring 1	not used	1.000E+00	---	FRACA(1)
R017	Ring 2	not used	2.732E-01	---	FRACA(2)
R017	Ring 3	not used	0.000E+00	---	FRACA(3)
R017	Ring 4	not used	0.000E+00	---	FRACA(4)
R017	Ring 5	not used	0.000E+00	---	FRACA(5)
R017	Ring 6	not used	0.000E+00	---	FRACA(6)
R017	Ring 7	not used	0.000E+00	---	FRACA(7)
R017	Ring 8	not used	0.000E+00	---	FRACA(8)
R017	Ring 9	not used	0.000E+00	---	FRACA(9)
R017	Ring 10	not used	0.000E+00	---	FRACA(10)
R017	Ring 11	not used	0.000E+00	---	FRACA(11)
R017	Ring 12	not used	0.000E+00	---	FRACA(12)
R018	Fruits, vegetables and grain consumption (kg/yr)	not used	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	not used	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	not used	9.200E+01	---	DIET(3)
R018	Meat and poultry consumption (kg/yr)	not used	6.300E+01	---	DIET(4)
R018	Fish consumption (kg/yr)	not used	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	not used	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	3.650E+01	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	not used	5.100E+02	---	DWI
R018	Contamination fraction of drinking water	not used	1.000E+00	---	FDW
R018	Contamination fraction of household water	not used	1.000E+00	---	FHHW
R018	Contamination fraction of livestock water	not used	1.000E+00	---	FLW
R018	Contamination fraction of irrigation water	not used	1.000E+00	---	FIRW
R018	Contamination fraction of aquatic food	not used	5.000E-01	---	FR9
R018	Contamination fraction of plant food	not used	-1	---	FPLANT
R018	Contamination fraction of meat	not used	-1	---	FMEAT
R018	Contamination fraction of milk	not used	-1	---	FMILK
R019	Livestock fodder intake for meat (kg/day)	not used	6.800E+01	---	LFI5
R019	Livestock fodder intake for milk (kg/day)	not used	5.500E+01	---	LFI6
R019	Livestock water intake for meat (L/day)	not used	5.000E+01	---	LWI5
R019	Livestock water intake for milk (L/day)	not used	1.600E+02	---	LWI6
R019	Livestock soil intake (kg/day)	not used	5.000E-01	---	LSI
R019	Mass loading for foliar deposition (g/m**3)	not used	1.000E-04	---	MLFD
R019	Depth of soil mixing layer (m)	6.350E-03	1.500E-01	---	DM
R019	Depth of roots (m)	not used	9.000E-01	---	DROOT
R019	Drinking water fraction from ground water	not used	1.000E+00	---	FGWDW
R019	Household water fraction from ground water	not used	1.000E+00	---	FGWHH
R019	Livestock water fraction from ground water	not used	1.000E+00	---	FGWLW
R019	Irrigation fraction from ground water	not used	1.000E+00	---	FGWIR
R19B	Wet weight crop yield for Non-Leafy (kg/m**2)	not used	7.000E-01	---	YV(1)
R19B	Wet weight crop yield for Leafy (kg/m**2)	not used	1.500E+00	---	YV(2)
R19B	Wet weight crop yield for Fodder (kg/m**2)	not used	1.100E+00	---	YV(3)
R19B	Growing Season for Non-Leafy (years)	not used	1.700E-01	---	TE(1)
R19B	Growing Season for Leafy (years)	not used	2.500E-01	---	TE(2)
R19B	Growing Season for Fodder (years)	not used	8.000E-02	---	TE(3)

Site-Specific Parameter Summary (continued)

0 Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R19B	Translocation Factor for Non-Leafy	not used	1.000E-01	---	TIV(1)
R19B	Translocation Factor for Leafy	not used	1.000E+00	---	TIV(2)
R19B	Translocation Factor for Fodder	not used	1.000E+00	---	TIV(3)
R19B	Dry Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---	RDRY(1)
R19B	Dry Foliar Interception Fraction for Leafy	not used	2.500E-01	---	RDRY(2)
R19B	Dry Foliar Interception Fraction for Fodder	not used	2.500E-01	---	RDRY(3)
R19B	Wet Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---	RWET(1)
R19B	Wet Foliar Interception Fraction for Leafy	not used	2.500E-01	---	RWET(2)
R19B	Wet Foliar Interception Fraction for Fodder	not used	2.500E-01	---	RWET(3)
R19B	Weathering Removal Constant for Vegetation	not used	2.000E+01	---	WLAM
C14	C-12 concentration in water (g/cm**3)	not used	2.000E-05	---	C12WTR
C14	C-12 concentration in contaminated soil (g/g)	not used	3.000E-02	---	C12CZ
C14	Fraction of vegetation carbon from soil	not used	2.000E-02	---	CSOIL
C14	Fraction of vegetation carbon from air	not used	9.800E-01	---	CAIR
C14	C-14 evasion layer thickness in soil (m)	not used	3.000E-01	---	DMC
C14	C-14 evasion flux rate from soil (1/sec)	not used	7.000E-07	---	EVSN
C14	C-12 evasion flux rate from soil (1/sec)	not used	1.000E-10	---	REVSN
C14	Fraction of grain in beef cattle feed	not used	8.000E-01	---	AVFG4
C14	Fraction of grain in milk cow feed	not used	2.000E-01	---	AVFG5
STOR	Storage times of contaminated foodstuffs (days):				
STOR	Fruits, non-leafy vegetables, and grain	1.400E+01	1.400E+01	---	STOR_T(1)
STOR	Leafy vegetables	1.000E+00	1.000E+00	---	STOR_T(2)
STOR	Milk	1.000E+00	1.000E+00	---	STOR_T(3)
STOR	Meat and poultry	2.000E+01	2.000E+01	---	STOR_T(4)
STOR	Fish	7.000E+00	7.000E+00	---	STOR_T(5)
STOR	Crustacea and mollusks	7.000E+00	7.000E+00	---	STOR_T(6)
STOR	Well water	1.000E+00	1.000E+00	---	STOR_T(7)
STOR	Surface water	1.000E+00	1.000E+00	---	STOR_T(8)
STOR	Livestock fodder	4.500E+01	4.500E+01	---	STOR_T(9)
R021	Thickness of building foundation (m)	not used	1.500E-01	---	FLOOR1
R021	Bulk density of building foundation (g/cm**3)	not used	2.400E+00	---	DENSFL
R021	Total porosity of the cover material	not used	4.000E-01	---	TPCV
R021	Total porosity of the building foundation	not used	1.000E-01	---	TPFL
R021	Volumetric water content of the cover material	not used	5.000E-02	---	PH2OCV
R021	Volumetric water content of the foundation	not used	3.000E-02	---	PH2OFL
R021	Diffusion coefficient for radon gas (m/sec):				
R021	in cover material	not used	2.000E-06	---	DIFCV
R021	in foundation material	not used	3.000E-07	---	DIFFL
R021	in contaminated zone soil	not used	2.000E-06	---	DIFCZ
R021	Radon vertical dimension of mixing (m)	not used	2.000E+00	---	HMIX
R021	Average building air exchange rate (1/hr)	not used	5.000E-01	---	REXG
R021	Height of the building (room) (m)	not used	2.500E+00	---	HRM
R021	Building interior area factor	not used	0.000E+00	---	FAI
R021	Building depth below ground surface (m)	not used	-1.000E+00	---	DMFL
R021	Emanating power of Rn-222 gas	not used	2.500E-01	---	EMANA(1)
R021	Emanating power of Rn-220 gas	not used	1.500E-01	---	EMANA(2)
TITL	Number of graphical time points	32	---	---	NPTS

Site-Specific Parameter Summary (continued)

0 Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
TITL	Maximum number of integration points for dose	17	---	---	LYMAX
TITL	Maximum number of integration points for risk	1	---	---	KYMAX

Summary of Pathway Selections

Pathway	User Selection
1 -- external gamma	active
2 -- inhalation (w/o radon)	active
3 -- plant ingestion	suppressed
4 -- meat ingestion	suppressed
5 -- milk ingestion	suppressed
6 -- aquatic foods	suppressed
7 -- drinking water	suppressed
8 -- soil ingestion	active
9 -- radon	suppressed
Find peak pathway doses	active

Contaminated Zone Dimensions		Initial Soil Concentrations, pCi/g	
Area:	100.00 square meters	Pb-210	4.690E+01
Thickness:	0.01 meters	Po-210	6.010E+01
Cover Depth:	0.00 meters		

0

Total Dose TDOSE(t), mrem/yr
Basic Radiation Dose Limit = 1.900E+01 mrem/yr
Total Mixture Sum M(t) = Fraction of Basic Dose Limit Received at Time (t)

t (years):	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
TDOSE(t):	1.901E-01	9.154E-02	3.016E-02	6.195E-04	9.355E-09	1.252E-25
M(t):	1.000E-02	4.818E-03	1.587E-03	3.260E-05	4.924E-10	6.589E-27

0Maximum TDOSE(t): 1.901E-01 mrem/yr   at t = 0.000E+00 years

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years

0 Water Independent Pathways (Inhalation excludes radon)

0

Radio-Nuclide	Ground mrem/yr	Ground fract.	Inhalation mrem/yr	Inhalation fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	Milk mrem/yr	Milk fract.	Soil mrem/yr	Soil fract.
Pb-210	1.326E-02	0.0697	8.887E-03	0.0468	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.285E-01	0.6761
Po-210	4.801E-06	0.0000	1.350E-03	0.0071	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.806E-02	0.2003
Total	1.326E-02	0.0698	1.024E-02	0.0539	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.666E-01	0.8764

0

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years

0 Water Dependent Pathways

0

Radio-Nuclide	Water mrem/yr	Water fract.	Fish mrem/yr	Fish fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	Milk mrem/yr	Milk fract.	All Pathways* mrem/yr	All Pathways* fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.506E-01	0.7926
Po-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.942E-02	0.2074
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.901E-01	1.0000

0*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

0 Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground mrem/yr	Ground fract.	Inhalation mrem/yr	Inhalation fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	Milk mrem/yr	Milk fract.	Soil mrem/yr	Soil fract.
Pb-210	7.610E-03	0.0831	5.274E-03	0.0576	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.862E-02	0.8588
Po-210	4.516E-09	0.0000	1.270E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.580E-05	0.0004
Total	7.610E-03	0.0831	5.275E-03	0.0576	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.865E-02	0.8592

0

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

0 Water Dependent Pathways

Radio-Nuclide	Water mrem/yr	Water fract.	Fish mrem/yr	Fish fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	Milk mrem/yr	Milk fract.	All Pathways* mrem/yr	All Pathways* fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.150E-02	0.9996
Po-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.708E-05	0.0004
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.154E-02	1.0000

0*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+00 years

0 Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground mrem/yr	Ground fract.	Inhalation mrem/yr	Inhalation fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	Milk mrem/yr	Milk fract.	Soil mrem/yr	Soil fract.
Pb-210	2.508E-03	0.0832	1.738E-03	0.0576	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.591E-02	0.8592
Po-210	3.996E-15	0.0000	1.124E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.168E-11	0.0000
Total	2.508E-03	0.0832	1.738E-03	0.0576	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.591E-02	0.8592

0

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+00 years

0 Water Dependent Pathways

Radio-Nuclide	Water mrem/yr	Water fract.	Fish mrem/yr	Fish fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	Milk mrem/yr	Milk fract.	All Pathways* mrem/yr	All Pathways* fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.016E-02	1.0000
Po-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.280E-11	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.016E-02	1.0000

0*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years

0 Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Pb-210	5.152E-05	0.0832	3.570E-05	0.0576	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.323E-04	0.8592
Po-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	5.152E-05	0.0832	3.570E-05	0.0576	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.323E-04	0.8592

0

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years

0 Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.195E-04	1.0000
Po-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.195E-04	1.0000

0*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+01 years

0
Water Independent Pathways (Inhalation excludes radon)

0

Radio-Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Pb-210	7.780E-10	0.0832	5.392E-10	0.0576	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.038E-09	0.8592
Po-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	7.780E-10	0.0832	5.392E-10	0.0576	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.038E-09	0.8592

0

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+01 years

0
Water Dependent Pathways

0

Radio-Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.355E-09	1.0000
Po-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.355E-09	1.0000

0*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years
0 Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground mrem/yr	Ground fract.	Inhalation mrem/yr	Inhalation fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	Milk mrem/yr	Milk fract.	Soil mrem/yr	Soil fract.
Pb-210	1.041E-26	0.0831	7.216E-27	0.0576	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.076E-25	0.8592
Po-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	1.041E-26	0.0831	7.216E-27	0.0576	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.076E-25	0.8592

0

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years
0 Water Dependent Pathways

Radio-Nuclide	Water mrem/yr	Water fract.	Fish mrem/yr	Fish fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	Milk mrem/yr	Milk fract.	All Pathways* mrem/yr	All Pathways* fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.252E-25	1.0000
Po-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.252E-25	1.0000

0*Sum of all water independent and dependent pathways.

Dose/Source Ratios Summed Over All Pathways
Parent and Progeny Principal Radionuclide Contributions Indicated

0 Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Pb-210+D	Pb-210+D	1.000E+00	2.398E-03	1.376E-03	4.536E-04	9.317E-06	1.407E-10	1.883E-27
Pb-210+D	Po-210	1.000E+00	8.142E-04	5.746E-04	1.894E-04	3.891E-06	5.876E-11	7.864E-28
Pb-210+D	ΣDSR(j)		3.212E-03	1.951E-03	6.430E-04	1.321E-05	1.995E-10	2.669E-27
0Pb-210+D1	Pb-210+D1	1.339E-06	3.824E-09	2.195E-09	7.234E-10	1.486E-11	2.244E-16	3.003E-33
0Po-210	Po-210	1.000E+00	6.559E-04	6.169E-07	5.458E-13	3.556E-34	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 30 days) daughters.
0

Single Radionuclide Soil Guidelines G(i,t) in pCi/g
Basic Radiation Dose Limit = 1.900E+01 mrem/yr

0Nuclide (i)	t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Pb-210	5.916E+03	9.739E+03	2.955E+04	1.438E+06	9.526E+10	*7.632E+13
Po-210	2.897E+04	3.080E+07	3.481E+13	*4.472E+15	*4.472E+15	*4.472E+15

*At specific activity limit
0

Summed Dose/Source Ratios DSR(i,t) in (mrem/yr)/(pCi/g)
and Single Radionuclide Soil Guidelines G(i,t) in pCi/g
at tmin = time of minimum single radionuclide soil guideline
and at tmax = time of maximum total dose = 0.000E+00 years

0Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Pb-210	4.690E+01	0.000E+00	3.212E-03	5.916E+03	3.212E-03	5.916E+03
Po-210	6.010E+01	0.000E+00	6.559E-04	2.897E+04	6.559E-04	2.897E+04

Individual Nuclide Dose Summed Over All Pathways
Parent Nuclide and Branch Fraction Indicated

0Nuclide (j)	Parent (i)	THF(i)	DOSE(j,t), mrem/yr t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Pb-210	Pb-210	1.000E+00	1.124E-01	6.455E-02	2.127E-02	4.370E-04	6.599E-09	8.831E-26
Pb-210	Pb-210	1.339E-06	1.794E-07	1.030E-07	3.393E-08	6.970E-10	1.053E-14	0.000E+00
Pb-210	ΣDOSE(j)		1.124E-01	6.455E-02	2.127E-02	4.370E-04	6.599E-09	8.831E-26
0Po-210	Pb-210	1.000E+00	3.819E-02	2.695E-02	8.884E-03	1.825E-04	2.756E-09	3.688E-26
Po-210	Po-210	1.000E+00	3.942E-02	3.708E-05	3.280E-11	0.000E+00	0.000E+00	0.000E+00
Po-210	ΣDOSE(j)		7.761E-02	2.699E-02	8.884E-03	1.825E-04	2.756E-09	3.688E-26

THF(i) is the thread fraction of the parent nuclide.

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

0Nuclide (j)	Parent (i)	THF(i)	S(j,t), pCi/g t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Pb-210	Pb-210	1.000E+00	4.690E+01	2.692E+01	8.872E+00	1.823E-01	2.752E-06	3.683E-23
Pb-210	Pb-210	1.339E-06	6.280E-05	3.605E-05	1.188E-05	2.440E-07	3.685E-12	4.932E-29
Pb-210	ΣS(j):		4.690E+01	2.692E+01	8.872E+00	1.823E-01	2.752E-06	3.683E-23
0Po-210	Pb-210	1.000E+00	0.000E+00	7.667E+00	2.531E+00	5.199E-02	7.851E-07	1.051E-23
Po-210	Po-210	1.000E+00	6.010E+01	5.653E-02	5.002E-08	3.258E-29	0.000E+00	0.000E+00
Po-210	ΣS(j):		6.010E+01	7.724E+00	2.531E+00	5.199E-02	7.851E-07	1.051E-23

THF(i) is the thread fraction of the parent nuclide.
0RESCALC.EXE execution time = 12.62 seconds

APPENDIX D

FIXED-POINT AND SWIPE MEASUREMENT RESULTS FOR STRUCTURE SURFACES

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Table D-1. Structure Surface Survey Data for Floor Materials

Table D-1a. Summary Statistics

Statistic	Fixed-Point Measurements						Swipe Measurements	
	Number Collected	Average	Standard Deviation	Maximum	Number Exceeding Mean Plus		Number Collected	Number Exceeding MDC
		(dpm/100 cm^2)			3 Standard Deviations	4 Standard Deviations		
Alpha Activity	124	53	52	262	2	0	124	0
Beta Activity	124	113	191	678	0	0	124	0
Lead-210	--	--	--	--	--	--	1	0

Note: Fixed-point measurements that exceed 4 standard deviations from the average indicate the measurements are inconsistent with material background radiation. More than 3 fixed-point measurements from Tables D-1 through D-7 that exceed 3 standard deviations from the average indicate the measurements are inconsistent with material background radiation. Swipe measurements less than the MDC supports the fixed-point measurements being from background radioactivity other than surface radioactivity.

Table D-1b. Data

Location ID[a]	Survey Surface Material	Fixed-Point Measurements		Swipe Measurements									
		Alpha	Beta	Swipe ID	Alpha			Beta			Lead-210		
		Activity	Activity		Activity	Error	MDC	Activity	Error	MDC	Activity	Error	MDC
		(dpm/100 cm^2)			(dpm/swipe of 100 cm^2)								
STSU1-1	Tile Floor	102	0	JF-1	-0.12	0.03	5.97	-1.41	0.14	7.03	--	--	--
STSU1-2	Carpet	53	0	JF-2	-0.12	0.03	5.97	-0.32	2.18	7.03	--	--	--
STSU1-3	Tile Floor	77	0	JF-3	-0.12	0.03	5.97	1.86	3.78	7.03	--	--	--
STSU1-4	Tile Floor	41	383	JF-4	-0.12	0.03	5.97	-1.41	0.14	7.03	--	--	--
STSU1-5	Tile Floor	53	0	JF-5	-0.12	0.03	5.97	-0.32	2.18	7.03	--	--	--
STSU1-6	Tile Floor	77	0	JF-6	-0.12	0.03	5.97	5.12	5.35	7.03	--	--	--
STSU1-7	Tile Floor	28	0	JF-7	-0.12	0.03	5.97	0.77	3.08	7.03	--	--	--
STSU1-8	Tile Floor	16	169	JF-8	-0.12	0.03	5.97	0.77	3.08	7.03	--	--	--
STSU1-9	Tile Floor	187	187	JF-9	-0.12	0.03	5.97	-0.32	2.18	7.03	--	--	--
STSU1-10	Tile Floor	4	0	JF-10	1.54	3.33	5.97	-0.32	2.18	7.03	--	--	--
STSU1-11	Tile Floor	53	0	JF-11	-0.12	0.03	5.97	-0.32	2.18	7.03	--	--	--
STSU1-12	Tile Floor	151	0	JF-12	1.54	3.33	5.97	-1.41	0.14	7.03	--	--	--
STSU1-13	Carpet	0	0	JF-13	-0.12	0.03	5.97	1.86	3.78	7.03	--	--	--
STSU1-14	Tile Floor	102	36	JF-14	-0.12	0.03	5.97	-1.41	0.14	7.03	--	--	--
STSU1-15	Carpet	16	0	JF-15	-0.12	0.03	5.97	-0.32	2.18	7.03	--	--	--
STSU1-16	Carpet	41	0	JF-16	-0.12	0.03	5.97	-1.41	0.14	7.03	--	--	--

Table D-1b. Data (Continued)

Location ID[a]	Survey Surface Material	Fixed-Point Measurements		Swipe ID	Swipe Measurements								
		Alpha Activity	Beta Activity		Alpha			Beta			Lead-210		
					Activity	Error	MDC	Activity	Error	MDC	Activity	Error	MDC
		(dpm/100 cm^2)			(dpm/swipe of 100 cm^2)								
STSU1-17	Tile Floor	77	45	JF-17	-0.12	0.03	5.97	2.95	4.36	7.03	--	--	--
STSU1-18	Tile Floor	65	18	JF-18	-0.12	0.03	5.97	4.04	4.88	7.03	--	--	--
STSU1-19	Tile Floor	16	0	JF-19	-0.12	0.03	5.97	1.86	3.78	7.03	--	--	--
STSU1-20	Tile Floor	28	0	JF-20	-0.12	0.03	5.97	-0.32	2.18	7.03	--	--	--
STSU1-21	Carpet	28	0	JF-21	1.54	3.33	5.97	-0.32	2.18	7.03	--	--	--
STSU1-22	Tile Floor	41	27	JF-22	1.54	3.33	5.97	0.77	3.08	7.03	--	--	--
STSU1-23	Tile Floor	126	357	JF-23	-0.12	0.03	5.97	-0.32	2.18	7.03	--	--	--
STSU1-24	Tile Floor	65	169	JF-24	-0.12	0.03	5.97	-1.41	0.14	7.03	--	--	--
STSU1-25	Tile Floor	138	214	JF-25	-0.12	0.03	5.97	1.86	3.78	7.03	--	--	--
STSU1-26	Carpet	4	0	JF-26	-0.12	0.03	5.97	1.86	3.78	7.03	--	--	--
STSU1-27	Tile Floor	102	0	JF-27	-0.12	0.03	5.97	1.86	3.78	7.03	--	--	--
STSU1-28	Tile Floor	4	0	JF-28	-0.12	0.03	5.97	2.95	4.36	7.03	--	--	--
STSU1-29	Carpet	28	0	JF-29	-0.12	0.03	5.97	-1.41	0.14	7.03	--	--	--
STSU1-30	Tile Floor	114	0	JF-30	-0.12	0.03	5.97	2.95	4.36	7.03	--	--	--
STSU1-31	Tile Floor	16	0	JF-31	-0.12	0.03	5.97	-1.41	0.14	7.03	--	--	--
STSU1-32	Tile Floor	53	0	JF-32	-0.12	0.03	5.97	-1.41	0.14	7.03	--	--	--
STSU1-33	Tile Floor	151	0	JF-33	-0.12	0.03	5.97	0.77	3.08	7.03	--	--	--
STSU1-34	Tile Floor	0	0	JF-34	-0.12	0.03	5.97	0.77	3.08	7.03	--	--	--
STSU1-35	Tile Floor	53	508	JF-35	-0.12	0.03	5.97	0.77	3.08	7.03	--	--	--
STSU1-36	Tile Floor	114	0	JF-36	-0.12	0.03	5.97	0.77	3.08	7.03	--	--	--
STSU1-37	Carpet	102	0	JF-37	-0.12	0.03	5.97	1.86	3.78	7.03	--	--	--
STSU1-38	Tile Floor	4	0	JF-38	-0.12	0.03	5.97	-0.32	2.18	7.03	--	--	--
STSU1-39	Tile Floor	28	0	JF-39	-0.12	0.03	5.97	0.77	3.08	7.03	--	--	--
STSU1-40	Tile Floor	16	0	JF-40	-0.12	0.03	5.97	0.77	3.08	7.03	--	--	--
STSU1-41	Tile Floor	90	0	JF-41	-0.12	0.03	5.97	0.77	3.08	7.03	--	--	--
STSU1-42	Tile Floor	28	0	JF-42	-0.12	0.03	5.97	-0.32	2.18	7.03	--	--	--
STSU1-43	Carpet	16	0	JF-43	-0.12	0.03	5.97	-1.41	0.14	7.03	--	--	--
STSU1-44	Tile Floor	53	0	JF-44	1.54	3.33	5.97	-0.32	2.18	7.03	--	--	--
STSU1-45	Tile Floor	16	0	JF-45	-0.12	0.03	5.97	1.86	3.78	7.03	--	--	--
STSU1-46	Carpet	53	0	JF-46	-0.12	0.03	5.97	-0.32	2.18	7.03	--	--	--
STSU1-47	Tile Floor	53	0	JF-47	-0.12	0.03	5.97	0.77	3.08	7.03	--	--	--

Table D-1b. Data (Continued)

Location ID[a]	Survey Surface Material	Fixed-Point Measurements		Swipe Measurements									
		Alpha Activity	Beta Activity	Swipe ID	Alpha			Beta			Lead-210		
					Activity	Error	MDC	Activity	Error	MDC	Activity	Error	MDC
		(dpm/100 cm^2)			(dpm/swipe of 100 cm^2)								
STSU1-48	Tile Floor	28	0	JF-48	-0.12	0.03	5.97	-0.32	2.18	7.03	--	--	--
STSU1-49	Tile Floor	41	0	JF-49	-0.12	0.03	5.97	-1.41	0.14	7.03	--	--	--
STSU1-50	Tile Floor	53	0	JF-50	-0.12	0.03	5.97	-0.32	2.18	7.03	--	--	--
STSU1-B1	Tile Floor	126	37	JF-B1	1.54	3.33	5.97	4.04	4.88	7.03	--	--	--
STSU1-B2	Tile Floor	189	584	JF-B2	-0.12	0.03	5.97	-1.41	0.14	7.03	--	--	--
STSU1-B3	Tile Floor	105	149	JF-B3	-0.09	0.03	5.61	0.64	3.77	8.50	--	--	--
STSU1-B4	Tile Floor	101	420	JF-B4	-0.09	0.03	5.61	0.64	3.77	8.50	--	--	--
STSU1-B5	Tile Floor	206	421	JF-B5	-0.09	0.03	5.61	-0.45	3.08	8.50	--	--	--
STSU1-B6	Tile Floor	248	388	JF-B6	-0.09	0.03	5.61	2.82	4.87	8.50	--	--	--
STSU1-B7	Tile Floor	28	0	JF-B7	-0.09	0.03	5.61	1.73	4.35	8.50	--	--	--
STSU1-B8	Tile Floor	56	255	JF-B8	-0.09	0.03	5.61	1.73	4.35	8.50	--	--	--
STSU1-B9	Tile Floor	101	0	JF-B9	-0.09	0.03	5.61	1.73	4.35	8.50	--	--	--
STSU1-B10	Tile Floor	76	0	JF-B10	-0.09	0.03	5.61	-1.53	2.18	8.50	--	--	--
STSU1-B11	Tile Floor	76	112	JF-B11	-0.09	0.03	5.61	-2.62	0.24	8.50	--	--	--
STSU1-B12	Tile Floor	24	439	JF-B12	1.52	3.22	5.61	0.64	3.77	8.50	--	--	--
STSU1-B13	Tile Floor	140	0	JF-B13	-0.09	0.03	5.61	-1.53	2.18	8.50	--	--	--
STSU1-B14	Tile Floor	262	676	JF-B14	-0.09	0.03	5.61	0.64	3.77	8.50	--	--	--
STSU1-B15	Tile Floor	110	0	JF-B15	-0.09	0.03	5.61	-1.53	2.18	8.50	--	--	--
STSU1-B16	Tile Floor	81	653	JF-B16	1.52	3.22	5.61	-0.45	3.08	8.50	--	--	--
STSU1-B17	Tile Floor	0	0	JF-B17	-0.09	0.03	5.61	-1.53	2.18	8.50	--	--	--
STSU1-B18	Tile Floor	26	0	JF-B18	1.52	3.22	5.61	3.90	5.34	8.50	--	--	--
STSU1-B19	Tile Floor	0	53	JF-B19	-0.09	0.03	5.61	-1.53	2.18	8.50	--	--	--
STSU1-B20	Tile Floor	15	0	JF-B20	-0.09	0.03	5.61	-0.45	3.08	8.50	--	--	--
STSU1-B21	Carpet	85	558	JF-B21	-0.09	0.03	5.61	-1.53	2.18	8.50	--	--	--
STSU1-B22	Tile Floor	81	99	JF-B22	-0.09	0.03	5.61	-0.45	3.08	8.50	--	--	--
STSU1-B23	Tile Floor	93	264	JF-B23	1.47	3.27	6.14	0.70	3.65	8.14	--	--	--
STSU1-B24	Tile Floor	101	0	JBC-B3	-0.09	0.03	5.61	-0.45	3.08	8.50	--	--	--
STSU1-B25	Tile Floor	89	0	JBC-B4	-0.09	0.03	5.61	-2.62	0.24	8.50	--	--	--
STSU1-B26	Tile Floor	89	0	JBC-B5	-0.09	0.03	5.61	-1.53	2.18	8.50	--	--	--
STSU1-B27	Tile Floor	89	203	JBC-B6	-0.09	0.03	5.61	-2.62	0.24	8.50	--	--	--
STSU1-JB1	Aluminium Threshold	7	8	IJ-B1	-0.09	0.03	5.61	-2.62	0.24	8.50	--	--	--

Table D-1b. Data (Continued)

Location ID[a]	Survey Surface Material	Fixed-Point Measurements		Swipe Measurements									
		Alpha Activity	Beta Activity	Swipe ID	Alpha			Beta			Lead-210		
					Activity	Error	MDC	Activity	Error	MDC	Activity	Error	MDC
		(dpm/100 cm^2)			(dpm/swipe of 100 cm^2)								
STSU1-JB2	Aluminium Threshold	49	40	IJ-B2	-0.09	0.03	5.61	-0.45	3.08	8.50	--	--	--
STSU1-JB3	Floor Tile	0	0	IJ-B3	-0.09	0.03	5.61	-0.45	3.08	8.50	--	--	--
STSU1-JB4	Carpet	7	527	IJ-B4	-0.09	0.03	5.61	-0.45	3.08	8.50	--	--	--
STSU1-JB5	Concrete	59	407	IJ-B5	-0.09	0.03	5.61	-0.45	3.08	8.50	--	--	--
STSU1-JB6	Concrete	7	415	IJ-B6	-0.09	0.03	5.61	1.73	4.35	8.50	--	--	--
STSU1-JB7	Concrete	38	152	IJ-B7	-0.09	0.03	5.61	-1.53	2.18	8.50	--	--	--
STSU1-JB8	Concrete	17	192	IJ-B8	1.52	3.22	5.61	-0.45	3.08	8.50	--	--	--
STSU1-JB9	Concrete	7	567	IJ-B9	-0.09	0.03	5.61	-0.45	3.08	8.50	--	--	--
STSU1-JB10	Concrete	38	503	IJ-B10	-0.09	0.03	5.61	1.73	4.35	8.50	--	--	--
STSU1-JB11	Aluminium Threshold	49	88	IJ-B11	-0.09	0.03	5.61	-1.53	2.18	8.50	--	--	--
STSU1-JB12	Concrete	38	391	IJ-B12	-0.09	0.03	5.61	0.64	3.77	8.50	--	--	--
STSU1-JB13	Aluminium Threshold	28	0	IJ-B13	-0.09	0.03	5.61	-2.62	0.24	8.50	--	--	--
STSU1-JB14	Concrete	0	192	IJ-B14	-0.09	0.03	5.61	-1.53	2.18	8.50	--	--	--
STSU1-JB15	Floor Tile	0	335	IJ-B15	-0.09	0.03	5.61	-0.45	3.08	8.50	--	--	--
STSU1-JB16	Floor Tile	49	311	IJ-B16	-0.09	0.03	5.61	0.64	3.77	8.50	--	--	--
STSU1-JB17	Floor Tile	49	239	IJ-B17	-0.09	0.03	5.61	-2.62	0.24	8.50	--	--	--
STSU1-JB18	Aluminium Threshold	132	630	IJ-B18	-0.09	0.03	5.61	-0.45	3.08	8.50	--	--	--
STSU1-JB19	Floor Tile	28	678	IJ-B19	-0.09	0.03	5.61	-2.62	0.24	8.50	--	--	--
STSU1-JB20	Floor Tile	0	0	IJ-B20	-0.09	0.03	5.61	-0.45	3.08	8.50	--	--	--
STSU1-JB21	Concrete	38	0	IJ-B21	-0.17	0.04	6.14	-0.35	2.98	8.14	--	--	--
STSU1-JB22	Floor Tile	70	215	IJ-B22	-0.17	0.04	6.14	-1.41	2.11	8.14	--	--	--
STSU1-JB23	Floor Tile	17	0	IJ-B23	-0.17	0.04	6.14	-0.35	2.98	8.14	--	--	--
STSU1-UB10	Floor Pit	94	510	UJ10	-0.12	0.03	5.97	4.04	4.88	7.03	-2.03	2.14	3.75
STSU2-1	Floor Tile	17	0	J2F-1	1.47	3.27	6.14	-2.46	0.22	8.14	--	--	--
STSU2-2	Floor Tile	0	0	J2F-2	1.47	3.27	6.14	-0.35	2.98	8.14	--	--	--
STSU2-3	Floor Tile	27	0	J2F-3	-0.17	0.04	6.14	-1.41	2.11	8.14	--	--	--
STSU2-4	Floor Tile	7	0	J2F-4	-0.17	0.04	6.14	0.70	3.65	8.14	--	--	--
STSU2-5	Floor Tile	38	0	J2F-5	-0.17	0.04	6.14	2.80	4.71	8.14	--	--	--
STSU2-6	Floor Tile	7	0	J2F-6	-0.17	0.04	6.14	-1.41	2.11	8.14	--	--	--
STSU2-7	Floor Tile	38	0	J2F-7	-0.17	0.04	6.14	-0.35	2.98	8.14	--	--	--
STSU2-8	Floor Tile	0	0	J2F-8	-0.17	0.04	6.14	-1.41	2.11	8.14	--	--	--

Table D-1b. Data (Continued)

Location ID[a]	Survey Surface Material	Fixed-Point Measurements		Swipe Measurements									
		Alpha Activity	Beta Activity	Swipe ID	Alpha			Beta			Lead-210		
					Activity	Error	MDC	Activity	Error	MDC	Activity	Error	MDC
		(dpm/100 cm^2)			(dpm/swipe of 100 cm^2)								
STSU2-9	Floor Tile	7	0	J2F-9	-0.17	0.04	6.14	0.70	3.65	8.14	--	--	--
STSU2-10	Floor Tile	7	0	J2F-10	-0.17	0.04	6.14	-1.41	2.11	8.14	--	--	--
STSU2-11	Floor Tile	7	0	J2F-11	-0.17	0.04	6.14	2.80	4.71	8.14	--	--	--
STSU2-12	Floor Tile	0	0	J2F-12	-0.17	0.04	6.14	0.70	3.65	8.14	--	--	--
STSU2-13	Floor Tile	7	0	J2F-13	1.47	3.27	6.14	-0.35	2.98	8.14	--	--	--
STSU2-14	Floor Tile	7	0	J2F-14	1.47	3.27	6.14	0.70	3.65	8.14	--	--	--
STSU2-15	Floor Tile	0	0	J2F-15	-0.17	0.04	6.14	-0.35	2.98	8.14	--	--	--
STSU2-16	Floor Tile	7	0	J2F-16	-0.17	0.04	6.14	-2.46	0.22	8.14	--	--	--
STSU2-17	Floor Tile	0	0	J2F-17	-0.17	0.04	6.14	-0.35	2.98	8.14	--	--	--
STSU2-18	Floor Tile	27	0	J2F-18	-0.17	0.04	6.14	0.70	3.65	8.14	--	--	--
STSU2-19	Floor Tile	7	0	J2F-19	-0.17	0.04	6.14	0.70	3.65	8.14	--	--	--
STSU2-20	Floor Tile	7	0	J2F-20	-0.17	0.04	6.14	-0.35	2.98	8.14	--	--	--
STSU2-B1	Floor Tile	31	0	JBC-B1	-0.09	0.03	5.61	2.82	4.87	8.50	--	--	--
STSU2-B2	Floor Tile	66	47	JBC-B2	-0.09	0.03	5.61	3.90	5.34	8.50	--	--	--
STSU7-1a	Rubber Mat	35	322	JA-1a	-0.17	0.04	6.14	8.07	6.69	8.14	--	--	--

[a] Location ID is the STSU number followed by the location within that STSU.

Notes:

-- indicates data not available or not applicable.

Negative results are less than the laboratory system's background level. The system's background level was determined using a 48-hour count time, while the smears were counted for 2 minutes; the number of negative results is attributed to this difference in count times.

Table D-2. Structure Survey Data for Interior Walls and Equipment Made of Brick, Ceramics, Tile, or Concrete

Table D-2a. Summary Statistics

Statistic	Fixed-Point Measurements						Swipe Measurements	
	Number Collected	Average	Standard Deviation	Maximum	Number Exceeding Mean Plus		Number Collected	Number Exceeding MDC
		(dpm/100 cm^2)			3 Standard Deviations	4 Standard Deviations		
Alpha Activity	29	91	70	295	0	0	29	0
Beta Activity	29	785	912	2,973	0	0	29	0
Lead-210	--	--	--	--	--	--	1	0

Note: Fixed-point measurements that exceed 4 standard deviations from the average indicate the measurements are inconsistent with material background radiation. More than 3 fixed-point measurements from Tables D-1 through D-7 that exceed 3 standard deviations from the average indicate the measurements are inconsistent with material background radiation. Swipe measurements less than the MDC supports the fixed-point measurements being from background radioactivity other than surface radioactivity.

Table D-2b. Data

Location ID[a]	Height	Survey Surface Material	Fixed-Point Measurements		Swipe Measurements									
			Alpha Activity	Beta Activity	Swipe ID	Alpha			Beta			Lead-210		
						Activity	Error	MDC	Activity	Error	MDC	Activity	Error	MDC
	(ft)		(dpm/100 cm^2)			(dpm/swipe of 100 cm^2)								
STSU3-5	5	Cinder Block Wall	98	437	JIW-5	-0.12	0.03	5.97	-1.41	0.14	7.03	--	--	--
STSU3-7	6	Cinder Block Wall	24	178	JIW-7	-0.12	0.03	5.97	-0.32	2.18	7.03	--	--	--
STSU3-8	1	Painted Concrete Pilar	61	0	JIW-8	1.54	3.33	5.97	2.95	4.36	7.03	--	--	--
STSU3-12	5	Cinder Block Wall	134	143	JIW-12	-0.12	0.03	5.97	0.77	3.08	7.03	--	--	--
STSU3-19	5.5	Cinder Block Wall	61	0	JIW-19	1.54	3.33	5.97	2.95	4.36	7.03	--	--	--
STSU3-28	2	Cinder Block Wall	98	606	JIW-28	-0.17	0.04	6.14	3.86	5.17	8.14	--	--	--
STSU3-29	2.5	Cinder Block Wall	85	223	JIW-29	-0.17	0.04	6.14	1.75	4.21	8.14	--	--	--
STSU3-30	1	Brick Wall	61	1,310	JIW-30	-0.17	0.04	6.14	-1.41	2.11	8.14	--	--	--
STSU3-31	5.5	Painted Concrete Pilar	37	0	JIW-31	-0.17	0.04	6.14	-0.35	2.98	8.14	--	--	--
STSU3-35	2.5	Cinder Block Wall	49	205	JIW-35	-0.17	0.04	6.14	1.75	4.21	8.14	--	--	--
STSU3-37	2	Painted Cinder Block	110	223	JIW-37	-0.17	0.04	6.14	0.70	3.65	8.14	--	--	--
STSU3-38	3.5	Painted Cinder Block	37	348	JIW-38	-0.17	0.04	6.14	-1.41	2.11	8.14	--	--	--
STSU3-41	1	Cinder Block Wall	110	107	JIW-41	-0.12	0.03	5.97	-1.41	0.14	7.03	--	--	--
STSU3-42	3	Cinder Block Wall	49	464	JIW-42	-0.12	0.03	5.97	-1.41	0.14	7.03	--	--	--
STSU3-43	2	Tile Wall	220	1,578	JIW-43	-0.12	0.03	5.97	2.95	4.36	7.03	--	--	--
STSU3-45	0.5	Cinder Block Wall	37	0	JIW-45	-0.12	0.03	5.97	0.77	3.08	7.03	--	--	--

Table D-2b. Data (Continued)

Location ID[a]	Height	Survey Surface Material	Fixed-Point Measurements		Swipe Measurements									
			Alpha	Beta	Swipe ID	Alpha			Beta			Lead-210		
			Activity	Activity		Activity	Error	MDC	Activity	Error	MDC	Activity	Error	MDC
	(ft)		(dpm/100 cm^2)			(dpm/swipe of 100 cm^2)								
STSU3-49	1	Ceramic Tile	195	2,344	JIW-49	-0.12	0.03	5.97	0.77	3.08	7.03	--	--	--
STSU3-B12	1	Cinder Block Wall	70	0	JIW-B12	-0.12	0.03	5.97	0.77	3.08	7.03	--	--	--
STSU3-B14	2	Tile Wall	164	1,907	JIW-B14	-0.09	0.03	5.61	-1.53	2.18	8.50	--	--	--
STSU3-JB24	--	Ceramic Sink	76	0	IJ-B24	-0.17	0.04	6.14	-0.35	2.98	8.14	--	--	--
STSU3-UB2	--	Ceramic Tile on Wall	75	2,973	UJ2	1.52	3.22	5.61	4.99	5.77	8.50	-2.82	2.26	4.00
STSU4-2	3.0	Ceramic Wall Tile	192	2,146	J2IW-2	-0.12	0.03	5.97	-1.41	0.14	7.03	--	--	--
STSU4-6	1.0	Cinder Block Wall	27	242	J2IW-6	-0.12	0.03	5.97	0.77	3.08	7.03	--	--	--
STSU4-13	2.0	Brick Wall	58	1,369	J2IW-13	-0.12	0.03	5.97	1.86	3.78	7.03	--	--	--
STSU4-16	4.0	Painted Concrete Wall	38	0	J2IW-16	-0.12	0.03	5.97	-0.32	2.18	7.03	--	--	--
STSU4-18	5.0	Cinder Block Wall	0	176	J2IW-18	-0.12	0.03	5.97	1.86	3.78	7.03	--	--	--
STSU4-B1	3.5	Brick Wall	16	1,621	J2IW-B1	1.47	3.27	6.14	0.70	3.65	8.14	--	--	--
STSU4-B2	3.0	Ceramic Wall Tile	295	1,999	J2IW-B2	-0.17	0.04	6.14	0.70	3.65	8.14	--	--	--
STSU4-B3	3.0	Ceramic Wall Tile	172	2,168	J2IW-B3	-0.17	0.04	6.14	-1.41	2.11	8.14	--	--	--

[a] Location ID is the STSU number followed by the location within that STSU.

Notes:

-- indicates data not available or not applicable.

Negative results are less than the laboratory system’s background level. The system's background level was determined using a 48-hour count time, while the smears were counted for 2 minutes; the number of negative results is attributed to this difference in count times.

Table D-3. Structure Survey Data for Interior Walls and Equipment Made of Other Materials

Table D-3a. Summary Statistics

Statistic	Fixed-Point Measurements						Swipe Measurements	
	Number Collected	Average (dpm/100 cm^2)	Standard Deviation (dpm/100 cm^2)	Maximum (dpm/100 cm^2)	Number Exceeding Mean Plus 3 Standard Deviations	Number Exceeding Mean Plus 4 Standard Deviations	Number Collected	Number Exceeding MDC
Alpha Activity	82	68	48	208	0	0	82	0
Beta Activity	82	118	210	830	1	0	82	0
Lead-210	--	--	--	--	--	--	17	0

Note: Fixed-point measurements that exceed 4 standard deviations from the average indicate the measurements are inconsistent with material background radiation. More than 3 fixed-point measurements from Tables D-1 through D-7 that exceed 3 standard deviations from the average indicate the measurements are inconsistent with material background radiation. Swipe measurements less than the MDC supports the fixed-point measurements being from background radioactivity other than surface radioactivity.

Table D-3b. Data

Location ID[a]	Height (ft)	Survey Surface Material	Fixed-Point Measurements Alpha Activity (dpm/100 cm^2)	Fixed-Point Measurements Beta Activity (dpm/100 cm^2)	Swipe ID	Alpha Activity	Alpha Error	Alpha MDC	Beta Activity	Beta Error	Beta MDC	Lead-210 Activity	Lead-210 Error	Lead-210 MDC
						(dpm/swipe of 100 cm^2)								
STSU3-UB15	--	Air Conditioner	152	85	UJ15	1.54	3.33	5.97	-1.41	0.14	7.03	-1.48	2.15	3.75
STSU3-UB4	--	Air Vent	36	71	UJ4	3.13	4.56	5.61	-0.45	3.08	8.50	-2.22	2.13	3.75
STSU3-UB14	--	Basketball Hoop Frame	114	418	UJ14	-0.12	0.03	5.97	-0.32	2.18	7.03	-2.22	2.20	3.86
STSU3-17	1.5	Book Shelf	134	0	JIW-17	-0.12	0.03	5.97	0.77	3.08	7.03	--	--	--
STSU3-50	3	Book Shelf	73	53	JIW-50	-0.12	0.03	5.97	-0.32	2.18	7.03	--	--	--
STSU3-UB12	--	Cleaning Equipment	45	255	UJ12	-0.12	0.03	5.97	1.86	3.78	7.03	-2.31	2.05	3.62
STSU3-UB6	--	Conduit Pipe	65	78	UJ6	-0.12	0.03	5.97	-1.41	0.14	7.03	-1.88	1.97	3.46
STSU3-2	4.5	Counter Top	147	0	JIW-2	-0.12	0.03	5.97	-0.32	2.18	7.03	--	--	--
STSU3-16	1	Counter Top	85	0	JIW-16	-0.12	0.03	5.97	2.95	4.36	7.03	--	--	--
STSU3-25	2	Counter Top	98	0	JIW-25	-0.17	0.04	6.14	1.75	4.21	8.14	--	--	--
STSU3-27	2.5	Counter Top	73	0	JIW-27	-0.17	0.04	6.14	0.70	3.65	8.14	--	--	--
STSU3-B13	2.5	Counter Top	122	0	JIW-B13	-0.12	0.03	5.97	-0.32	2.18	7.03	--	--	--
STSU3-26	3	Bulletin Board	37	0	JIW-26	-0.17	0.04	6.14	0.70	3.65	8.14	--	--	--
STSU3-4	2	Desk	61	0	JIW-4	-0.12	0.03	5.97	1.86	3.78	7.03	--	--	--
STSU3-14	2.5	Desk	37	0	JIW-14	-0.12	0.03	5.97	-0.32	2.18	7.03	--	--	--
STSU3-15	4	Desk	122	0	JIW-15	-0.12	0.03	5.97	-1.41	0.14	7.03	--	--	--

Table D-3b. Data (Continued)

Location ID[a]	Height	Survey Surface Material	Fixed-Point Measurements		Swipe Measurements									
			Alpha	Beta	Swipe ID	Alpha			Beta			Lead-210		
			Activity	Activity		Activity	Error	MDC	Activity	Error	MDC	Activity	Error	MDC
	(ft)		(dpm/100 cm^2)			(dpm/swipe of 100 cm^2)								
STSU3-24	3	Desk	61	0	JIW-24	-0.17	0.04	6.14	-1.41	2.11	8.14	--	--	--
STSU3-34	1	Desk	85	392	JIW-34	-0.17	0.04	6.14	-1.41	2.11	8.14	--	--	--
STSU3-39	3	Desk	73	0	JIW-39	-0.17	0.04	6.14	-1.41	2.11	8.14	--	--	--
STSU3-40	2.5	Desk	61	0	JIW-40	-0.17	0.04	6.14	1.75	4.21	8.14	--	--	--
STSU3-48	2.5	Desk	73	0	JIW-48	-0.12	0.03	5.97	0.77	3.08	7.03	--	--	--
STSU4-1	2.5	Desk	17	0	J2IW-1	-0.12	0.03	5.97	-1.41	0.14	7.03	--	--	--
STSU4-5	2.5	Desk	17	0	J2IW-5	-0.12	0.03	5.97	-0.32	2.18	7.03	--	--	--
STSU4-11	2.5	Desk	7	0	J2IW-11	-0.12	0.03	5.97	-1.41	0.14	7.03	--	--	--
STSU4-15	2.5	Desk	0	0	J2IW-15	-0.12	0.03	5.97	0.77	3.08	7.03	--	--	--
STSU4-17	2.5	Desk	0	220	J2IW-17	-0.12	0.03	5.97	2.95	4.36	7.03	--	--	--
STSU3-3	3.0	Desk Top	24	80	JIW-3	-0.12	0.03	5.97	0.77	3.08	7.03	--	--	--
STSU3-6	2.5	Desk Top	73	0	JIW-6	-0.12	0.03	5.97	-0.32	2.18	7.03	--	--	--
STSU3-B4	2.5	Desk Top	133	0	JIW-B4	-0.12	0.03	5.97	-1.41	0.14	7.03	--	--	--
STSU3-B5	2.5	Desk Top	206	0	JIW-B5	1.54	3.33	5.97	1.86	3.78	7.03	--	--	--
STSU3-B6	2.5	Desk Top	70	0	JIW-B6	-0.12	0.03	5.97	0.77	3.08	7.03	--	--	--
STSU3-B7	2.5	Desk Top	101	0	JIW-B7	-0.12	0.03	5.97	-1.41	0.14	7.03	--	--	--
STSU3-44	0.5	Door Frame	122	357	JIW-44	-0.12	0.03	5.97	-1.41	0.14	7.03	--	--	--
STSU3-13	3	Dry Erase Board	73	579	JIW-13	-0.12	0.03	5.97	-1.41	0.14	7.03	--	--	--
STSU3-9	1	Drywall	73	0	JIW-9	-0.12	0.03	5.97	-1.41	0.14	7.03	--	--	--
STSU3-18	1	Drywall	37	0	JIW-18	-0.12	0.03	5.97	0.77	3.08	7.03	--	--	--
STSU3-36	6	Drywall	61	0	JIW-36	-0.17	0.04	6.14	-1.41	2.11	8.14	--	--	--
STSU4-8	3	Drywall	7	0	J2IW-8	-0.12	0.03	5.97	-0.32	2.18	7.03	--	--	--
STSU4-9	4	Drywall	48	0	J2IW-9	-0.12	0.03	5.97	-1.41	0.14	7.03	--	--	--
STSU4-14	2	Drywall	7	0	J2IW-14	-0.12	0.03	5.97	-1.41	0.14	7.03	--	--	--
STSU4-20	2	Drywall	27	0	J2IW-20	-0.12	0.03	5.97	-0.32	2.18	7.03	--	--	--
STSU3-UB22	--	Exhaust Fan	63	0	JIW-B3	-0.12	0.03	5.97	-0.32	2.18	7.03	--	--	--
STSU3-UB3	--	Exterior Kitchen Door Ledge	7	78	UJ3	1.52	3.22	5.61	-1.53	2.18	8.50	-3.75	2.18	3.91
STSU3-UB8	--	Filter	133	687	UJ8	4.87	5.77	5.97	-0.32	2.18	7.03	-2.14	2.17	3.80
STSU3-UB1	--	Kitchen Fan Blade	55	71	UJ1	-0.09	0.03	5.61	-1.53	2.18	8.50	-1.97	1.85	3.24
STSU3-JB25	--	Metal bench	35	0	IJ-B25	1.47	3.27	6.14	-0.35	2.98	8.14	--	--	--

Table D-3b. Data (Continued)

Location ID[a]	Height	Survey Surface Material	Fixed-Point Measurements		Swipe ID	Swipe Measurements								
			Alpha	Beta		Alpha			Beta			Lead-210		
			Activity	Activity		Activity	Error	MDC	Activity	Error	MDC	Activity	Error	MDC
	(ft)		(dpm/100 cm^2)			(dpm/swipe of 100 cm^2)								
STSU3-11	3.5	Metal Cabinet	85	0	JIW-11	-0.12	0.03	5.97	-1.41	0.14	7.03	--	--	--
STSU3-B8	1	Metal Cabinet	154	0	JIW-B8	1.54	3.33	5.97	-1.41	0.14	7.03	--	--	--
STSU3-JB27	--	Metal Countertop	35	447	IJ-B27	-0.17	0.04	6.14	-2.46	0.22	8.14	--	--	--
STSU3-JB28	--	Metal Countertop	24	830	IJ-B28	-0.17	0.04	6.14	1.75	4.21	8.14	--	--	--
STSU3-JB26	--	Metal Pipe	108	670	IJ-B26	-0.17	0.04	6.14	-1.41	2.11	8.14	--	--	--
STSU3-JB29	--	Oven	35	567	IJ-B29	1.47	3.27	6.14	-0.35	2.98	8.14	--	--	--
STSU3-UB9	--	Pipes	65	50	UJ9	-0.12	0.03	5.97	5.12	5.35	7.03	-1.91	2.22	3.89
STSU3-23	2.5	Plastic Desk	73	0	JIW-23	-0.17	0.04	6.14	1.75	4.21	8.14	--	--	--
STSU3-B9	2.5	Plastic Desk	80	0	JIW-B9	-0.12	0.03	5.97	2.95	4.36	7.03	--	--	--
STSU3-B10	2.5	Plastic Desk	101	0	JIW-B10	1.54	3.33	5.97	0.77	3.08	7.03	--	--	--
STSU3-B11	2.5	Plastic Desk	80	0	JIW-B11	-0.12	0.03	5.97	1.86	3.78	7.03	--	--	--
STSU3-1	2.5	Plastic Table	183	0	JIW-1	-0.12	0.03	5.97	0.77	3.08	7.03	--	--	--
STSU3-47	2	Power Strip	85	0	JIW-47	-0.12	0.03	5.97	0.77	3.08	7.03	--	--	--
STSU3-UB20	--	Refrigerator	0	0	JIW-B1	-0.12	0.03	5.97	-0.32	2.18	7.03	--	--	--
STSU3-UB21	--	Refrigerator	83	455	JIW-B2	3.21	4.71	5.97	-1.41	0.14	7.03	--	--	--
STSU3-UB5	--	Refrigerator Top	84	304	UJ5	4.74	5.59	5.61	7.17	6.55	8.50	-2.49	2.08	3.69
STSU3-UB16	--	Sink	45	0	UJ16	-0.12	0.03	5.97	-1.41	0.14	7.03	-4.00	2.44	4.35
STSU3-22	3.5	Stainless Steel Table	208	0	JIW-22	-0.17	0.04	6.14	2.80	4.71	8.14	--	--	--
STSU3-46	2.5	Table	98	0	JIW-46	-0.12	0.03	5.97	-1.41	0.14	7.03	--	--	--
STSU4-4	2.5	Table	27	0	J2IW-4	1.54	3.33	5.97	1.86	3.78	7.03	--	--	--
STSU3-20	3	Table Top	24	0	JIW-20	1.54	3.33	5.97	0.77	3.08	7.03	--	--	--
STSU3-32	1.5	Table Top	98	0	JIW-32	-0.17	0.04	6.14	-1.41	2.11	8.14	--	--	--
STSU3-UB18	--	Top of Vent	55	0	UJ18	1.54	3.33	5.97	-0.32	2.18	7.03	-1.20	2.08	3.62
STSU3-UB13	--	Vent	114	545	UJ13	-0.12	0.03	5.97	0.77	3.08	7.03	-2.60	2.15	3.80
STSU3-UB17	--	Vent	36	241	UJ17	-0.12	0.03	5.97	1.86	3.78	7.03	-0.96	2.12	3.66
STSU4-UB19	--	Vent	26	637	UJ19	-0.12	0.03	5.97	0.77	3.08	7.03	-0.75	2.21	3.80
STSU3-10	1.5	Wall	37	544	JIW-10	-0.12	0.03	5.97	-0.32	2.18	7.03	--	--	--
STSU3-UB7	--	Water Heater	55	0	UJ7	1.54	3.33	5.97	1.86	3.78	7.03	-2.93	2.20	3.91
STSU3-UB11	--	Water Heater	143	106	UJ11	1.54	3.33	5.97	1.86	3.78	7.03	-0.52	2.16	3.71
STSU3-33	3	Wood Cabinet	37	0	JIW-33	-0.17	0.04	6.14	-1.41	2.11	8.14	--	--	--
STSU3-21	3.5	Wood Shelf	73	0	JIW-21	-0.17	0.04	6.14	-0.35	2.98	8.14	--	--	--

Table D-3b. Data (Continued)

Location ID[a]	Height	Survey Surface Material	Fixed-Point Measurements		Swipe Measurements									
			Alpha	Beta	Swipe ID	Alpha			Beta			Lead-210		
			Activity	Activity		Activity	Error	MDC	Activity	Error	MDC	Activity	Error	MDC
	(ft)		(dpm/100 cm^2)			(dpm/swipe of 100 cm^2)								
STSU4-3	3	Wood Shelf	0	0	J2IW-3	1.54	3.33	5.97	-1.41	0.14	7.03	--	--	--
STSU4-7	2	Wood Shelf	58	249	J2IW-7	1.54	3.33	5.97	-0.32	2.18	7.03	--	--	--
STSU4-10	3	Wood Shelf	7	425	J2IW-10	-0.12	0.03	5.97	0.77	3.08	7.03	--	--	--
STSU4-12	5	Wood Shelf	0	205	J2IW-12	-0.12	0.03	5.97	-0.32	2.18	7.03	--	--	--
STSU4-19	3	Wood Shelf	17	0	J2IW-19	-0.12	0.03	5.97	0.77	3.08	7.03	--	--	--

[a] Location ID is the STSU number followed by the location within that STSU.

Notes:

-- indicates data not available or not applicable.

Negative results are less than the laboratory system's background level. The system's background level was determined using a 48-hour count time, while the smears were counted for 2 minutes; the number of negative results is attributed to this difference in count times.

Table D-4. Structure Survey Data for Exterior Walls

Table D-4a. Summary Statistics

Statistic	Fixed-Point Measurements						Swipe Measurements	
	Number Collected	Average	Standard Deviation	Maximum	Number Exceeding Mean Plus 3 Standard Deviations	Number Exceeding Mean Plus 4 Standard Deviations	Number Collected	Number Exceeding MDC
		(dpm/100 cm^2)						
Alpha Activity	57	35	27	97	0	0	57	0
Beta Activity	57	1,095	596	2,308	0	0	57	0

Note: Fixed-point measurements that exceed 4 standard deviations from the average indicate the measurements are inconsistent with material background radiation. More than 3 fixed-point measurements from Tables D-1 through D-7 that exceed 3 standard deviations from the average indicate the measurements are inconsistent with material background radiation. Swipe measurements less than the MDC supports the fixed-point measurements being from background radioactivity other than surface radioactivity.

Table D-4b. Data

Location ID[a]	Easting	Northing	Height	Survey Surface Material	Fixed-Point Measurements		Swipe Measurements						
					Alpha Activity	Beta Activity	Swipe ID	Alpha			Beta		
								Activity	Error	MDC	Activity	Error	MDC
	(ft)				(dpm/100 cm^2)			(dpm/swipe of 100 cm^2)					
STSU5-1	871957.5	1085909.7	1.5	Brick Wall	81	1,277	JEW1	1.52	3.22	5.61	-0.45	3.08	8.50
STSU5-2	871948.7	1085907.4	0.5	Brick Wall	30	1,621	JEW2	1.52	3.22	5.61	-0.45	3.08	8.50
STSU5-3	871934.9	1085916.9	5.5	Brick Wall	71	1,713	JEW3	-0.09	0.03	5.61	1.73	4.35	8.50
STSU5-4	871921.6	1085898.5	2	Brick Wall	32	1,373	JEW4	-0.09	0.03	5.61	2.82	4.87	8.50
STSU5-5	871918.7	1085894.4	0.5	Brick Wall	37	1,345	JEW5	-0.09	0.03	5.61	-1.53	2.18	8.50
STSU5-6	871912.3	1085885.5	2.5	Brick Wall	52	1,447	JEW6	-0.09	0.03	5.61	1.73	4.35	8.50
STSU5-7	871901.7	1085871.1	5.5	Glass Window	37	0	JEW7	1.52	3.22	5.61	1.73	4.35	8.50
STSU5-8	871897.4	1085866.0	6	Brick Wall	32	1,423	JEW8	-0.09	0.03	5.61	2.82	4.87	8.50
STSU5-9	871915.6	1085852.4	5	Brick Wall	32	1,473	JEW9	1.52	3.22	5.61	-1.53	2.18	8.50
STSU5-10	871935.1	1085838.1	4.5	Brick Wall	26	0	JEW10	-0.09	0.03	5.61	2.82	4.87	8.50
STSU5-11	871969.5	1085855.7	6	Brick Wall	23	1,742	JEW11	-0.09	0.03	5.61	0.64	3.77	8.50
STSU5-12	871963.7	1085847.4	6	Brick Wall	97	1,513	JEW12	-0.09	0.03	5.61	2.82	4.87	8.50
STSU5-13	871977.4	1085893.7	2	Brick Wall	48	1,535	JEW13	-0.09	0.03	5.61	-2.62	0.24	8.50
STSU5-14	872020.3	1085923.1	3	Grey Brick Wall	13	2,308	JEW14	3.13	4.56	5.61	-0.45	3.08	8.50
STSU5-15	872027.7	1085934.2	5	Glass Window	4	0	JEW15	-0.09	0.03	5.61	-1.53	2.18	8.50
STSU5-16	872060.0	1085976.2	0.5	Brick Wall	8	1,290	JEW16	-0.09	0.03	5.61	3.90	5.34	8.50
STSU5-17	872064.3	1085982.2	1.5	Grey Brick Wall	48	2,143	JEW17	-0.09	0.03	5.61	-0.45	3.08	8.50
STSU5-18	872098.8	1086028.0	2	Brick Wall	32	1,529	JEW18	-0.09	0.03	5.61	0.64	3.77	8.50

Table D-4b. Data (Continued)

Location ID[a]	Easting (ft)	Northing (ft)	Height (ft)	Survey Surface Material	Fixed-Point Measurements Alpha Activity (dpm/100 cm²)	Fixed-Point Measurements Beta Activity (dpm/100 cm²)	Swipe ID	Swipe Alpha Activity (dpm/swipe of 100 cm²)	Swipe Alpha Error	Swipe Alpha MDC	Swipe Beta Activity	Swipe Beta Error	Swipe Beta MDC
STSU5-19	872131.5	1086072.4	0.5	Concrete Foundation	26	927	JEW19	-0.09	0.03	5.61	-0.45	3.08	8.50
STSU5-20	872137.5	1086080.1	1.5	Brick Wall	75	1,637	JEW20	-0.09	0.03	5.61	1.73	4.35	8.50
STSU5-21	872092.4	1086105.9	1.5	Brick Wall	23	1,331	JEW21	1.47	3.27	6.14	0.70	3.65	8.14
STSU5-22	872076.4	1086109.2	0.5	Brick Wall	81	2,090	JEW22	-0.17	0.04	6.14	2.80	4.71	8.14
STSU5-23	872071.3	1086101.8	4.5	Grey Brick Wall	32	0	JEW23	-0.17	0.04	6.14	-0.35	2.98	8.14
STSU5-24	872118.7	1086102.9	2.0	Brick Wall	15	806	JEW24	-0.17	0.04	6.14	-0.35	2.98	8.14
STSU5-25	872057.6	1086084.7	1.0	Grey Brick Wall	59	1,893	JEW25	-0.17	0.04	6.14	-2.46	0.22	8.14
STSU5-26	872008.6	1086055.6	3.0	Brick Wall	59	1,133	JEW26	-0.17	0.04	6.14	-0.35	2.98	8.14
STSU5-27	871993.2	1086096.5	2.5	Brick Wall	32	658	JEW27	-0.17	0.04	6.14	4.91	5.58	8.14
STSU5-28	872000.7	1086107.6	5.5	Tan Brick Wall	48	806	JEW28	1.47	3.27	6.14	1.75	4.21	8.14
STSU5-29	872016.2	1086129.0	2.5	Tan Brick Wall	32	892	JEW29	-0.17	0.04	6.14	0.70	3.65	8.14
STSU5-30	872020.0	1086155.5	5.5	Brick Wall	52	800	JEW30	-0.17	0.04	6.14	3.86	5.17	8.14
STSU5-31	872036.5	1086180.8	4.5	Brick Wall	0	1,011	JEW31	-0.17	0.04	6.14	-1.41	2.11	8.14
STSU5-32	872020.3	1086220.0	3	Brick Wall	13	1,041	JEW32	-0.17	0.04	6.14	-1.41	2.11	8.14
STSU5-33	872016.0	1086222.9	6	Brick Wall	11	1,110	JEW33	-0.17	0.04	6.14	2.80	4.71	8.14
STSU5-34	871981.2	1086248.7	3	Brick Wall	0	777	JEW34	1.47	3.27	6.14	1.75	4.21	8.14
STSU5-35	871952.0	1086213.8	3	Brick Wall	81	1,097	JEW35	-0.17	0.04	6.14	0.70	3.65	8.14
STSU5-36	871968.3	1086187.6	3.5	Brick Wall	13	977	JEW36	-0.17	0.04	6.14	0.70	3.65	8.14
STSU5-37	871982.4	1086177.3	4.5	Brick Wall	0	1,604	JEW37	-0.17	0.04	6.14	-0.35	2.98	8.14
STSU5-38	871999.6	1086157.3	0.5	Glass Door	0	0	JEW38	-0.17	0.04	6.14	0.70	3.65	8.14
STSU5-39	871982.5	1086165.0	1.5	Brick Wall	22	1,254	JEW39	-0.17	0.04	6.14	0.70	3.65	8.14
STSU5-40	871981.8	1086165.7	1	Brick Wall	32	1,713	JEW40	1.47	3.27	6.14	2.80	4.71	8.14
STSU5-41	871962.0	1086158.6	0.5	Grey Brick Wall	26	1,588	JEW41	-0.12	0.03	5.97	-0.32	2.18	7.03
STSU5-42	871944.6	1086135.7	5	Brick Wall	0	864	JEW42	-0.12	0.03	5.97	1.86	3.78	7.03
STSU5-43	871941.1	1086130.3	1	Aluminium Vent Cover	0	0	JEW43	-0.12	0.03	5.97	2.95	4.36	7.03
STSU5-44	871913.5	1086103.4	4.5	Glass Window	33	0	JEW44	-0.12	0.03	5.97	0.77	3.08	7.03
STSU5-45	871880.8	1086066.6	1.5	Brick Wall	0	860	JEW45	1.54	3.33	5.97	-1.41	0.14	7.03
STSU5-46	871898.6	1086089.1	4.5	Brick Wall	62	1,097	JEW46	-0.12	0.03	5.97	-1.41	0.14	7.03
STSU5-47	871869.5	1086051.5	0.5	Brick Wall	15	1,199	JEW47	-0.12	0.03	5.97	0.77	3.08	7.03
STSU5-48	871852.1	1086028.2	4.5	Brick Wall	66	965	JEW48	-0.12	0.03	5.97	0.77	3.08	7.03

Table D-4b. Data (Continued)

Location ID[a]	Easting	Northing	Height	Survey Surface Material	Fixed-Point Measurements		Swipe Measurements						
					Alpha Activity	Beta Activity	Swipe ID	Alpha			Beta		
								Activity	Error	MDC	Activity	Error	MDC
	(ft)				(dpm/100 cm^2)			(dpm/swipe of 100 cm^2)					
STSU5-49	871888.5	1085983.0	1	Dark Brick Wall	0	779	JEW49	-0.12	0.03	5.97	-1.41	0.14	7.03
STSU5-50	871911.1	1085965.7	4	Glass Window	0	0	JEW50	-0.12	0.03	5.97	2.95	4.36	7.03
STSU5-B1	871913.4	1085886.6	5	Glass Window	75	0	JEW-B1	-0.12	0.03	5.97	0.77	3.08	7.03
STSU5-B2	871913.5	1085853.8	3.0	Brick Wall	52	1,359	JEW-B2	-0.12	0.03	5.97	-0.32	2.18	7.03
STSU5-B3	871969.0	1085854.9	4.5	Brick Wall	62	1,338	JEW-B3	-0.12	0.03	5.97	0.77	3.08	7.03
STSU5-B4	872118.3	1086103.1	3.5	Brick Wall	15	905	JEW-B4	-0.12	0.03	5.97	1.86	3.78	7.03
STSU5-B5	872090.7	1086107.2	4	Brick Wall	42	1,692	JEW-B5	-0.12	0.03	5.97	-1.41	0.14	7.03
STSU5-B6	871968.4	1086187.5	4	Brick Wall	71	1,225	JEW-B6	-0.12	0.03	5.97	-0.32	2.18	7.03
STSU5-B7	871899.7	1086090.4	3.5	Brick Wall	81	1,246	JEW-B7	-0.12	0.03	5.97	1.86	3.78	7.03

[a] Location ID is the STSU number followed by the location within that STSU.

Note:

Negative results are less than the laboratory system's background level. The system's background level was determined using a 48-hour count time, while the smears were counted for 2 minutes; the number of negative results is attributed to this difference in count times.

Table D-5. Structure Survey Data for Playground Equipment

Table D-5a. Summary Statistics

Statistic	Number Collected	Fixed-Point Measurements Average (dpm/100 cm²)	Standard Deviation (dpm/100 cm²)	Maximum (dpm/100 cm²)	Number Exceeding Mean Plus 3 Standard Deviations	Number Exceeding Mean Plus 4 Standard Deviations	Swipe Measurements Number Collected	Number Exceeding MDA
Alpha Activity	25	52	34	137	0	0	25	0
Beta Activity	25	325	287	1,026	0	0	25	0

Note: Fixed-point measurements that exceed 4 standard deviations from the average indicate the measurements are inconsistent with material background radiation. More than 3 fixed-point measurements from Tables D-1 through D-7 that exceed 3 standard deviations from the average indicate the measurements are inconsistent with material background radiation. Swipe measurements less than the MDC supports the fixed-point measurements being from background radioactivity other than surface radioactivity.

Table D-5b. Data

Location ID[a]	Easting (ft)	Northing (ft)	Survey Surface Material	Fixed-Point Alpha Activity (dpm/100 cm²)	Fixed-Point Beta Activity (dpm/100 cm²)	Swipe ID	Swipe Alpha Activity (dpm/swipe of 100 cm²)	Alpha Error	Alpha MDC	Swipe Beta Activity	Beta Error	Beta MDC
STSU6-1	872138.3	1086187.0	Plastic Slide	70	98	JPG1	1.14	1.85	2.86	-0.35	1.89	4.49
STSU6-2	871939.9	1085758.0	Plastic Slide	0	400	JPG2	-0.09	0.03	5.61	-1.53	2.18	8.50
STSU6-3	871925.6	1086134.0	Coated Metal Platform	15	83	JPG3	-0.09	0.03	5.61	-1.53	2.18	8.50
STSU6-4	872140.7	1086199.4	Plastic Vertical Wall	48	0	JPG4	-0.09	0.03	5.61	-0.45	3.08	8.50
STSU6-5	871925.6	1086140.8	Plastic Slide	26	347	JPG5	-0.09	0.03	5.61	-2.62	0.24	8.50
STSU6-6	871932.8	1085751.4	Coated Metal Steps	48	257	JPG6	-0.09	0.03	5.61	3.90	5.34	8.50
STSU6-7	872186.8	1086162.2	Rubber Swing Seat	70	491	JPG7	-0.09	0.03	5.61	0.64	3.77	8.50
STSU6-8	872126.6	1086198.9	Coated Metal Steps	70	0	JPG8	-0.09	0.03	5.61	1.73	4.35	8.50
STSU6-9	871933.3	1085738.8	Plastic Slide	48	551	JPG9	-0.09	0.03	5.61	0.64	3.77	8.50
STSU6-10	871928.8	1085744.1	Coated Metal Platform	15	294	JPG10	1.52	3.22	5.61	-0.45	3.08	8.50
STSU6-11	872128.9	1086212.6	Coated Metal Platform	37	257	JPG11	1.52	3.22	5.61	6.08	6.17	8.50
STSU6-12	872145.1	1086210.1	Plastic Slide	81	60	JPG12	1.52	3.22	5.61	-1.53	2.18	8.50
STSU6-13	871940.6	1085747.7	Plastic Slide	26	226	JPG13	-0.09	0.03	5.61	-0.45	3.08	8.50
STSU6-14	872126.2	1086191.5	Plastic	115	158	JPG14	-0.09	0.03	5.61	-0.45	3.08	8.50
STSU6-15	872166.2	1086207.0	Wood Balance Beam	48	460	JPG15	1.52	3.22	5.61	-1.53	2.18	8.50
STSU6-16	872192.1	1086168.6	Rubber Swing Seat	48	400	JPG16	-0.09	0.03	5.61	2.82	4.87	8.50
STSU6-17	871922.0	1086136.4	Metal Tube Step	48	113	JPG17	-0.09	0.03	5.61	1.73	4.35	8.50
STSU6-18	871920.1	1086133.6	Coated Metal Platform	4	38	JPG18	-0.09	0.03	5.61	1.73	4.35	8.50

Table D-5b. Data (Continued)

Location ID[a]	Easting	Northing	Survey Surface Material	Fixed-Point Measurements		Swipe Measurements						
				Alpha Activity	Beta Activity	Swipe ID	Alpha			Beta		
							Activity	Error	MDC	Activity	Error	MDC
	(ft)			(dpm/100 cm^2)			(dpm/swipe of 100 cm^2)					
STSU6-19	871918.4	1086139.4	Metal Tube Step	37	121	JPG19	3.13	4.56	5.61	-0.45	3.08	8.50
STSU6-20	872115.4	1086228.6	Aluminium Bench	48	483	JPG20	-0.09	0.03	5.61	3.90	5.34	8.50
STSU6-B1	871927.5	1086139.2	Plastic Slide	48	106	JPG-B1	-0.17	0.04	6.14	2.80	4.71	8.14
STSU6-B2	871995.3	1086290.4	Rubber Swing Seat	37	347	JPG-B2	-0.17	0.04	6.14	-0.35	2.98	8.14
STSU6-B3	872010.9	1086310.7	Rubber Swing Seat	48	1,026	JPG-B3	-0.17	0.04	6.14	2.80	4.71	8.14
STSU6-B4	871889.1	1086163.2	Rubber Swing Seat	115	1,004	JPG-B4	-0.17	0.04	6.14	1.75	4.21	8.14
STSU6-B5	871904.4	1086183.5	Rubber Swing Seat	137	808	JPG-B5	-0.17	0.04	6.14	2.80	4.71	8.14

[a] Location ID is the STSU number followed by the location within that STSU.

Note:

Negative results are less than the laboratory system's background level. The system's background level was determined using a 48-hour count time, while the smears were counted for 2 minutes; the number of negative results is attributed to this difference in count times.

Table D-6. Structure Survey Data for Concrete Pavement

Table D-6a. Summary Statistics

Statistic	Number Collected	Fixed-Point Measurements: Average (dpm/100 cm²)	Standard Deviation (dpm/100 cm²)	Maximum (dpm/100 cm²)	Number Exceeding Mean Plus 3 Standard Deviations	Number Exceeding Mean Plus 4 Standard Deviations	Swipe Measurements: Number Collected	Number Exceeding MDC
Alpha Activity	37	140	60	280	0	0	37	0
Beta Activity	37	759	311	1,534	0	0	37	0

Note: Fixed-point measurements that exceed 4 standard deviations from the average indicate the measurements are inconsistent with material background radiation. More than 3 fixed-point measurements from Tables D-1 through D-7 that exceed 3 standard deviations from the average indicate the measurements are inconsistent with material background radiation. Swipe measurements less than the MDC supports the fixed-point measurements being from background radioactivity other than surface radioactivity.

Table D-6b. Data

Location ID[a]	Easting (ft)	Northing (ft)	Survey Surface Material	Fixed-Point Alpha Activity (dpm/100 cm²)	Fixed-Point Beta Activity (dpm/100 cm²)	Swipe ID	Alpha Activity (dpm/swipe of 100 cm²)	Alpha Error	Alpha MDC	Beta Activity	Beta Error	Beta MDC
STSU8-B4	871255.6	1085315.7	Concrete	103	91	JWB4	-0.11	0.03	5.91	0.82	3.08	6.96
STSU8-B3	871075.4	1085086.9	Concrete	124	561	JWB3	-0.11	0.03	5.91	1.91	3.78	6.96
STSU8-B2	871170.9	1085201.3	Concrete	124	734	JWB2	-0.11	0.03	5.91	-0.27	2.18	6.96
STSU8-B1	871540.3	1085691.5	Concrete	92	1,344	JWB1	1.55	3.33	5.91	0.82	3.08	6.96
STSU8-9	871077.5	1085088.2	Concrete	62	709	JW-9	-0.11	0.03	5.91	-1.36	0.14	6.96
STSU8-8	871258.6	1085317.5	Concrete	97	654	JW-8	-0.11	0.03	5.91	0.82	3.08	6.96
STSU8-5	871272.5	1085335.0	Concrete	0	553	JW-5	-0.11	0.03	5.91	1.91	3.78	6.96
STSU8-10	871170.4	1085203.2	Concrete	85	576	JW-10	-0.11	0.03	5.91	-1.36	0.14	6.96
STSU8-1	871540.9	1085690.6	Concrete	97	1,534	JW-1	-0.11	0.03	5.91	-0.27	2.18	6.96
STSU7-9	871922.4	1085930.3	Concrete	184	841	JA9	1.54	3.33	5.97	-1.41	0.14	7.03
STSU7-16	871865.7	1085795.4	Concrete	85	751	JA16	-0.12	0.03	5.97	1.86	3.78	7.03
STSU7-1	872125.2	1086104.7	Concrete	60	247	JA1	-0.12	0.03	5.97	-1.41	0.14	7.03
STSU7-32	871930.4	1085934.6	Concrete	142	882	JA32	1.54	3.33	5.97	1.86	3.78	7.03
STSU7-34	871878.9	1085970.0	Concrete	131	396	JA34	-0.12	0.03	5.97	-0.32	2.18	7.03
STSU7-37	872132.6	1086101.4	Concrete	165	422	JA37	-0.12	0.03	5.97	-0.32	2.18	7.03
STSU7-41	871944.0	1085821.2	Concrete	67	635	JA41	-0.09	0.03	5.61	1.73	4.35	8.50
STSU7-43	871859.4	1085885.9	Concrete	163	825	JA43	-0.09	0.03	5.61	-0.45	3.08	8.50
STSU7-54	871814.4	1085834.6	Concrete	100	255	JA54	-0.09	0.03	5.61	1.73	4.35	8.50

Table D-6b. Data (Continued)

Location ID[a]	Easting	Northing	Survey Surface Material	Fixed-Point Measurements		Swipe Measurements						
				Alpha Activity	Beta Activity	Swipe ID	Alpha			Beta		
							Activity	Error	MDC	Activity	Error	MDC
	(ft)			(dpm/100 cm^2)			(dpm/swipe of 100 cm^2)					
STSU7-59	871725.2	1085896.7	Concrete	130	326	JA59	-0.09	0.03	5.61	2.82	4.87	8.50
STSU7-65	871893.9	1085856.1	Concrete	142	775	JA65	-0.17	0.04	6.14	-1.41	2.11	8.14
STSU7-80	871856.1	1085803.7	Concrete	35	668	JA80	-0.17	0.04	6.14	1.75	4.21	8.14
STSU7-B2	871816.5	1085835.0	Concrete	172	988	JA-B2	-0.12	0.03	5.97	2.95	4.36	7.03
STSU7-B3	872056.1	1086184.6	Concrete	162	853	JA-B3	-0.12	0.03	5.97	1.86	3.78	7.03
STSU7-B4	872060.2	1086183.5	Concrete	140	953	JA-B4	-0.12	0.03	5.97	-0.32	2.18	7.03
STSU7-B7	872087.3	1086167.5	Concrete	111	960	JA-B7	-0.12	0.03	5.97	-1.41	0.14	7.03
STSU7-B8	872078.6	1086137.8	Concrete	187	1,038	JA-B8	-0.12	0.03	5.97	-1.41	0.14	7.03
STSU7-B9	872100.0	1086144.8	Concrete	208	1,216	JA-B9	-0.12	0.03	5.97	-1.41	0.14	7.03
STSU7-B10	872131.5	1086101.9	Concrete	165	1,003	JA-B10	-0.12	0.03	5.97	2.95	4.36	7.03
STSU7-B11	872133.4	1086101.3	Concrete	165	683	JA-B11	-0.12	0.03	5.97	0.77	3.08	7.03
STSU7-B12	872153.5	1086102.1	Concrete	165	932	JA-B12	1.54	3.33	5.97	-0.32	2.18	7.03
STSU7-B13	872179.7	1086092.3	Concrete	144	1,145	JA-B13	-0.12	0.03	5.97	-0.32	2.18	7.03
STSU7-B15	872175.9	1086134.5	Concrete	238	665	JAB15	3.13	4.56	5.61	0.64	3.77	8.50
STSU7-B23	872248.9	1086078.5	Concrete	170	627	JAB23	1.52	3.22	5.61	0.64	3.77	8.50
STSU7-B24	871993.1	1086261.9	Concrete	202	808	JAB24	-0.09	0.03	5.61	0.64	3.77	8.50
STSU7-B46	871931.6	1085934.9	Concrete	280	451	JAB46	-0.17	0.04	6.14	-0.35	2.98	8.14
STSU7-B47	871933.1	1085934.9	Concrete	227	1,182	JAB47	-0.17	0.04	6.14	-1.41	2.11	8.14
STSU7-B48	871897.8	1085856.1	Concrete	238	783	JAB48	-0.17	0.04	6.14	-1.41	2.11	8.14

[a] Location ID is the STSU number followed by the location within that STSU.

Note:

Negative results are less than the laboratory system's background level. The system's background level was determined using a 48-hour count time, while the smears were counted for 2 minutes; the number of negative results is attributed to this difference in count times.

Table D-7. Structure Survey Data for Asphalt Pavement

Table D-7a. Summary Statistics

Statistic	Number Collected	Fixed-Point Measurements					Swipe Measurements	
		Average (dpm/100 cm^2)	Standard Deviation (dpm/100 cm^2)	Maximum (dpm/100 cm^2)	Number Exceeding Mean Plus 3 Standard Deviations	Number Exceeding Mean Plus 4 Standard Deviations	Number Collected	Number Exceeding MDC
Alpha Activity	107	70	62	206	0	0	107	0
Beta Activity	107	459	263	1,029	0	0	107	0

Note: Fixed-point measurements that exceed 4 standard deviations from the average indicate the measurements are inconsistent with material background radiation. More than 3 fixed-point measurements from Tables D-1 through D-7 that exceed 3 standard deviations from the average indicate the measurements are inconsistent with material background radiation. Swipe measurements less than the MDC supports the fixed-point measurements being from background radioactivity other than surface radioactivity.

Table D-7b. Data

Location ID[a]	Easting (ft)	Northing (ft)	Survey Surface Material	Fixed-Point Measurements: Alpha Activity (dpm/100 cm^2)	Fixed-Point Measurements: Beta Activity (dpm/100 cm^2)	Swipe ID	Alpha Activity (dpm/swipe of 100 cm^2)	Alpha Error	Alpha MDC	Beta Activity	Beta Error	Beta MDC
STSU8-7	871479	1085613	Asphalt	0	872	JW-7	-0.11	0.03	5.91	3.00	4.36	6.96
STSU8-6	871299	1085372	Asphalt	0	459	JW-6	-0.11	0.03	5.91	-0.27	2.18	6.96
STSU8-4	871441	1085562	Asphalt	62	794	JW-4	-0.11	0.03	5.91	-0.27	2.18	6.96
STSU8-3	871374	1085470	Asphalt	0	802	JW-3	-0.11	0.03	5.91	1.91	3.78	6.96
STSU8-2	871400	1085508	Asphalt	0	413	JW-2	-0.11	0.03	5.91	0.82	3.08	6.96
STSU7-8	871899	1085933	Asphalt	14	330	JA8	-0.12	0.03	5.97	-0.32	2.18	7.03
STSU7-7	871719	1085827	Asphalt	0	165	JA7	-0.12	0.03	5.97	-0.32	2.18	7.03
STSU7-6	871979	1086277	Asphalt	4	536	JA6	-0.12	0.03	5.97	-0.32	2.18	7.03
STSU7-5	872047	1086177	Asphalt	25	586	JA5	-0.12	0.03	5.97	0.77	3.08	7.03
STSU7-4	872201	1085995	Asphalt	110	544	JA4	-0.12	0.03	5.97	-1.41	0.14	7.03
STSU7-3	872162	1086149	Asphalt	46	577	JA3	-0.12	0.03	5.97	-0.32	2.18	7.03
STSU7-28	871980	1086262	Asphalt	57	379	JA28	-0.12	0.03	5.97	-1.41	0.14	7.03
STSU7-27	871951	1086244	Asphalt	35	594	JA27	-0.12	0.03	5.97	4.04	4.88	7.03
STSU7-26	871796	1085989	Asphalt	14	82	JA26	-0.12	0.03	5.97	-0.32	2.18	7.03
STSU7-25	871860	1085879	Asphalt	21	635	JA25	-0.12	0.03	5.97	1.86	3.78	7.03
STSU7-24	872061	1086181	Asphalt	4	511	JA24	-0.12	0.03	5.97	-0.32	2.18	7.03
STSU7-23	872207	1086056	Asphalt	25	487	JA23	-0.12	0.03	5.97	0.77	3.08	7.03
STSU7-22	871824	1085862	Asphalt	43	503	JA22	-0.12	0.03	5.97	1.86	3.78	7.03

Table D-7b. Data (Continued)

Location ID[a]	Easting	Northing	Survey Surface Material	Fixed-Point Measurements		Swipe Measurements						
				Alpha Activity	Beta Activity	Swipe ID	Alpha			Beta		
							Activity	Error	MDC	Activity	Error	MDC
	(ft)			(dpm/100 cm²)			(dpm/swipe of 100 cm²)					
STSU7-21	872249	1086077	Asphalt	57	470	JA21	-0.12	0.03	5.97	-1.41	0.14	7.03
STSU7-20	871872	1086113	Asphalt	14	181	JA20	-0.12	0.03	5.97	1.86	3.78	7.03
STSU7-2	871718	1085850	Asphalt	53	553	JA2	-0.12	0.03	5.97	0.77	3.08	7.03
STSU7-19	871670	1085751	Asphalt	43	429	JA19	-0.12	0.03	5.97	0.77	3.08	7.03
STSU7-18	872153	1086102	Asphalt	57	223	JA18	-0.12	0.03	5.97	-1.41	0.14	7.03
STSU7-17	871802	1085913	Asphalt	4	322	JA17	-0.12	0.03	5.97	-0.32	2.18	7.03
STSU7-15	871832	1085999	Asphalt	25	322	JA15	-0.12	0.03	5.97	1.86	3.78	7.03
STSU7-14	872212	1086069	Asphalt	25	280	JA14	-0.12	0.03	5.97	-1.41	0.14	7.03
STSU7-13	872074	1086163	Asphalt	4	379	JA13	-0.12	0.03	5.97	-1.41	0.14	7.03
STSU7-12	871657	1085788	Asphalt	11	478	JA12	-0.12	0.03	5.97	-1.41	0.14	7.03
STSU7-11	871854	1085868	Asphalt	32	223	JA11	-0.12	0.03	5.97	2.95	4.36	7.03
STSU7-10	871823	1085917	Asphalt	25	231	JA10	-0.12	0.03	5.97	2.95	4.36	7.03
STSU7-29	872067	1086168	Asphalt	35	445	JA29	-0.12	0.03	5.97	0.77	3.08	7.03
STSU7-30	872077	1086140	Asphalt	78	784	JA30	1.54	3.33	5.97	0.77	3.08	7.03
STSU7-31	872047	1086195	Asphalt	14	701	JA31	1.54	3.33	5.97	-1.41	0.14	7.03
STSU7-33	871701	1085818	Asphalt	35	223	JA33	-0.12	0.03	5.97	-0.32	2.18	7.03
STSU7-35	872103	1086161	Asphalt	23	191	JA35	-0.12	0.03	5.97	0.77	3.08	7.03
STSU7-36	872152	1086034	Asphalt	8	496	JA36	-0.12	0.03	5.97	-0.32	2.18	7.03
STSU7-38	871868	1085842	Asphalt	11	297	JA38	-0.12	0.03	5.97	-1.41	0.14	7.03
STSU7-39	871834	1085891	Asphalt	53	107	JA39	-0.12	0.03	5.97	2.95	4.36	7.03
STSU7-40	872040	1086238	Asphalt	57	808	JA40	-0.12	0.03	5.97	-0.32	2.18	7.03
STSU7-42	872087	1086167	Asphalt	14	404	JA42	-0.09	0.03	5.61	1.73	4.35	8.50
STSU7-44	872166	1086125	Asphalt	57	280	JA44	-0.09	0.03	5.61	2.82	4.87	8.50
STSU7-45	872057	1086182	Asphalt	78	553	JA45	-0.09	0.03	5.61	0.64	3.77	8.50
STSU7-46	871873	1085912	Asphalt	4	470	JA46	-0.09	0.03	5.61	0.64	3.77	8.50
STSU7-47	871858	1085864	Asphalt	14	247	JA47	-0.09	0.03	5.61	0.64	3.77	8.50
STSU7-48	872067	1086168	Asphalt	25	462	JA48	-0.09	0.03	5.61	2.82	4.87	8.50
STSU7-49	872179	1086091	Asphalt	99	652	JA49	-0.09	0.03	5.61	2.82	4.87	8.50
STSU7-50	871892	1085783	Asphalt	120	1,006	JA50	-0.09	0.03	5.61	4.99	5.77	8.50
STSU7-51	871863	1085912	Asphalt	35	289	JA51	-0.09	0.03	5.61	3.90	5.34	8.50

Table D-7b. Data (Continued)

Location ID[a]	Easting	Northing	Survey Surface Material	Fixed-Point Measurements		Swipe Measurements						
				Alpha Activity	Beta Activity	Swipe ID	Alpha			Beta		
							Activity	Error	MDC	Activity	Error	MDC
	(ft)			(dpm/100 cm²)			(dpm/swipe of 100 cm²)					
STSU7-52	871694	1085759	Asphalt	42	0	JA52	-0.09	0.03	5.61	-0.45	3.08	8.50
STSU7-53	871926	1086178	Asphalt	42	156	JA53	-0.09	0.03	5.61	2.82	4.87	8.50
STSU7-55	872076	1086210	Asphalt	32	262	JA55	-0.09	0.03	5.61	-0.45	3.08	8.50
STSU7-56	872101	1086145	Asphalt	62	0	JA56	-0.09	0.03	5.61	0.64	3.77	8.50
STSU7-57	871699	1085753	Asphalt	13	0	JA57	-0.09	0.03	5.61	-1.53	2.18	8.50
STSU7-58	871864	1086122	Asphalt	3	57	JA58	1.52	3.22	5.61	0.64	3.77	8.50
STSU7-60	871930	1086219	Asphalt	52	149	JA60	-0.09	0.03	5.61	1.73	4.35	8.50
STSU7-61	871700	1085827	Asphalt	23	0	JA61	-0.17	0.04	6.14	0.70	3.65	8.14
STSU7-62	871761	1085857	Asphalt	23	0	JA62	1.47	3.27	6.14	-2.46	0.22	8.14
STSU7-63	871939	1086201	Asphalt	71	354	JA63	-0.17	0.04	6.14	5.96	5.97	8.14
STSU7-64	871916	1086223	Asphalt	23	78	JA64	-0.17	0.04	6.14	-1.41	2.11	8.14
STSU7-66	871822	1086096	Asphalt	4	322	JA66	-0.17	0.04	6.14	-1.41	2.11	8.14
STSU7-67	872150	1086106	Asphalt	57	429	JA67	-0.17	0.04	6.14	2.80	4.71	8.14
STSU7-68	871865	1085818	Asphalt	35	107	JA68	-0.17	0.04	6.14	1.75	4.21	8.14
STSU7-69	872233	1086071	Asphalt	35	313	JA69	-0.17	0.04	6.14	3.86	5.17	8.14
STSU7-70	871801	1086061	Asphalt	46	404	JA70	1.47	3.27	6.14	-1.41	2.11	8.14
STSU7-71	871991	1086261	Asphalt	35	214	JA71	1.47	3.27	6.14	4.91	5.58	8.14
STSU7-72	872041	1086161	Asphalt	89	759	JA72	-0.17	0.04	6.14	1.75	4.21	8.14
STSU7-73	872040	1086168	Asphalt	120	948	JA73	-0.17	0.04	6.14	-0.35	2.98	8.14
STSU7-74	871942	1086171	Asphalt	46	742	JA74	-0.17	0.04	6.14	-1.41	2.11	8.14
STSU7-75	871767	1085937	Asphalt	14	173	JA75	-0.17	0.04	6.14	-0.35	2.98	8.14
STSU7-76	871888	1085824	Asphalt	14	223	JA76	-0.17	0.04	6.14	-1.41	2.11	8.14
STSU7-77	871821	1085953	Asphalt	4	487	JA77	-0.17	0.04	6.14	-0.35	2.98	8.14
STSU7-78	871755	1085876	Asphalt	4	165	JA78	-0.17	0.04	6.14	-1.41	2.11	8.14
STSU7-79	871853	1086106	Asphalt	14	223	JA79	1.47	3.27	6.14	-0.35	2.98	8.14
STSU7-B1	871820	1085953	Asphalt	43	647	JA-B1	-0.12	0.03	5.97	-1.41	0.14	7.03
STSU7-B5	872072	1086162	Asphalt	54	256	JA-B5	-0.12	0.03	5.97	-0.32	2.18	7.03
STSU7-B6	872102	1086159	Asphalt	86	85	JA-B6	-0.12	0.03	5.97	-0.32	2.18	7.03
STSU7-B14	872164	1086127	Asphalt	133	436	JAB14	-0.09	0.03	5.61	1.73	4.35	8.50
STSU7-B16	872176	1086133	Asphalt	132	918	JAB16	-0.09	0.03	5.61	-1.53	2.18	8.50
STSU7-B17	872165	1086127	Asphalt	143	539	JAB17	-0.09	0.03	5.61	-1.53	2.18	8.50

Table D-7b. Data (Continued)

Location ID[a]	Easting (ft)	Northing (ft)	Survey Surface Material	Fixed-Point Measurements Alpha Activity (dpm/100 cm^2)	Fixed-Point Measurements Beta Activity (dpm/100 cm^2)	Swipe ID	Swipe Alpha Activity (dpm/swipe of 100 cm^2)	Swipe Alpha Error	Swipe Alpha MDC	Swipe Beta Activity	Swipe Beta Error	Swipe Beta MDC
STSU7-B18	872180	1086095	Asphalt	164	820	JAB18	-0.09	0.03	5.61	-1.53	2.18	8.50
STSU7-B19	872212	1086068	Asphalt	117	767	JAB19	-0.09	0.03	5.61	-1.53	2.18	8.50
STSU7-B20	872151	1086033	Asphalt	163	535	JAB20	-0.09	0.03	5.61	-1.53	2.18	8.50
STSU7-B21	872152	1086035	Asphalt	132	638	JAB21	1.52	3.22	5.61	0.64	3.77	8.50
STSU7-B22	872201	1085996	Asphalt	196	680	JAB22	-0.09	0.03	5.61	-0.45	3.08	8.50
STSU7-B25	872038	1086236	Asphalt	154	606	JAB25	-0.09	0.03	5.61	0.64	3.77	8.50
STSU7-B26	872039	1086169	Asphalt	159	742	JAB26	-0.09	0.03	5.61	0.64	3.77	8.50
STSU7-B27	872040	1086161	Asphalt	195	583	JAB27	1.52	3.22	5.61	-2.62	0.24	8.50
STSU7-B28	872045	1086178	Asphalt	154	643	JAB28	-0.09	0.03	5.61	-1.53	2.18	8.50
STSU7-B29	872067	1086166	Asphalt	206	702	JAB29	-0.09	0.03	5.61	-0.45	3.08	8.50
STSU7-B30	871853	1086108	Asphalt	142	407	JAB30	-0.09	0.03	5.61	-1.53	2.18	8.50
STSU7-B31	871939	1086201	Asphalt	202	990	JAB31	1.52	3.22	5.61	-2.62	0.24	8.50
STSU7-B32	871939	1086202	Asphalt	185	628	JAB32	-0.09	0.03	5.61	4.99	5.77	8.50
STSU7-B33	871860	1085886	Asphalt	122	878	JAB33	-0.09	0.03	5.61	-2.62	0.24	8.50
STSU7-B34	871874	1085909	Asphalt	174	583	JAB34	1.47	3.27	6.14	0.70	3.65	8.14
STSU7-B35	871874	1085912	Asphalt	181	726	JAB35	-0.17	0.04	6.14	-1.41	2.11	8.14
STSU7-B36	871753	1085878	Asphalt	132	471	JAB36	-0.17	0.04	6.14	-2.46	0.22	8.14
STSU7-B37	871696	1085756	Asphalt	101	495	JAB37	-0.17	0.04	6.14	-2.46	0.22	8.14
STSU7-B38	871718	1085831	Asphalt	154	443	JAB38	-0.17	0.04	6.14	0.70	3.65	8.14
STSU7-B39	871865	1085799	Asphalt	163	1,029	JAB39	-0.17	0.04	6.14	-0.35	2.98	8.14
STSU7-B40	871867	1085794	Asphalt	164	894	JAB40	-0.17	0.04	6.14	1.75	4.21	8.14
STSU7-B41	871867	1085797	Asphalt	149	948	JAB41	-0.17	0.04	6.14	0.70	3.65	8.14
STSU7-B42	871857	1085880	Asphalt	163	734	JAB42	-0.17	0.04	6.14	-1.41	2.11	8.14
STSU7-B43	871862	1085881	Asphalt	143	96	JAB43	-0.17	0.04	6.14	-0.35	2.98	8.14
STSU7-B44	871880	1085970	Asphalt	163	694	JAB44	-0.17	0.04	6.14	1.75	4.21	8.14
STSU7-B45	871923	1085929	Asphalt	153	646	JAB45	-0.17	0.04	6.14	-1.41	2.11	8.14

Table D-7b. Data (Continued)

Location ID[a]	Easting	Northing	Survey Surface Material	Fixed-Point Measurements		Swipe Measurements						
				Alpha Activity	Beta Activity	Swipe ID	Alpha			Beta		
							Activity	Error	MDC	Activity	Error	MDC
	(ft)			(dpm/100 cm^2)			(dpm/swipe of 100 cm^2)					
STSU7-B49	871892	1085781	Asphalt	185	148	JAB49	-0.17	0.04	6.14	0.70	3.65	8.14
STSU7-B50	871854	1085804	Asphalt	132	327	JAB50	-0.17	0.04	6.14	0.70	3.65	8.14

[a] Location ID is the STSU number followed by the location within that STSU.

Note:

Negative results are less than the laboratory system's background level. The system's background level was determined using a 48-hour count time, while the smears were counted for 2 minutes; the number of negative results is attributed to this difference in count times.

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Table D-8. Analytical Results for Samples of Dust and Pavement Sediment on Structure Surfaces

Sample Name	Easting	Northing	Elevation	Collect Date	Lead-210				Polonium-210				Radium-226				Thorium-230				Uranium-234				Uranium-238			
					Result	Error	MDC	VQ	Result	Error	MDC	VQ	Result	Error	MDC	VQ	Result	Error	MDC	VQ	Result	Error	MDC	VQ	Result	Error	MDC	VQ
	(ft)		(ft amsl)		(pCi/g except for VQ that has no units)																							
Average Reference Area Surface Soil Value				--	--				--				0.95				1.49				0.98				1.08			
UCL_{95} Reference Area Surface Soil Value				--	--				--				1.01				1.58				1.07				1.16			
Maximum Reference Area Surface Soil Value				--	--				--				1.27				2.17				1.52				1.69			
Average Sample Result				--	20.39				27.34				0.67				0.92				0.60				0.66			
Maximum Sample Result				--	44.90				60.10				1.40				1.41				1.13				1.20			
Number of Results				--	3				3				9				9				8				8			
SVP264222 SVP264231	871949.5	1086167.3	509.8	10/24/2022	44.90	6.09	2.41	=	60.10	5.97	0.35	J	1.19	0.53	0.39	=	0.90	0.34	0.21	J	0.54	0.24	0.12	=	0.74	0.29	0.18	=
SVP264223 SVP264332	872211.4	1086125.3	507.5	10/24/2022	12.70	2.74	2.43	=	18.90	2.50	0.43	J	0.78	0.43	0.41	J	1.06	0.36	0.12	J	0.63	0.29	0.22	=	0.78	0.32	0.14	=
SVP264224 SVP264233	872212.0	1086138.1	506.6	10/24/2022	3.56	1.52	1.79	=	3.02	0.71	0.25	J	1.17	0.52	0.25	=	1.37	0.43	0.13	J	0.74	0.30	0.13	=	1.07	0.37	0.20	=
SVP264225	872140.3	1086026.9	508.2	10/24/2022	--	--	--	--	--	--	--	--	1.40	0.53	0.28	=	1.34	0.40	0.12	J	1.13	0.35	0.15	=	1.20	0.36	0.11	=
SVP264226	Dust Inside Buildings at STSU3-UB1 from a 500-cm^2 area			10/26/2022	--	--	--	--	--	--	--	--	0.16	0.17	0.24	UJ	0.34	0.21	0.15	J	--	--	--	--	--	--	--	--
SVP264227	Dust Inside Buildings at STSU3-UB6 from a 500-cm^2 area			10/26/2022	--	--	--	--	--	--	--	--	0.13	0.14	0.17	UJ	0.75	0.30	0.12	J	0.23	0.16	0.12	J	0.07	0.09	0.12	UJ
SVP264228	Dust Inside Buildings at STSU3-UB11 from a 2,000-cm^2 area			10/26/2022	--	--	--	--	--	--	--	--	0.40	0.23	0.15	J	0.78	0.29	0.13	J	1.03	0.38	0.19	=	0.91	0.35	0.19	=
SVP264229	Dust Inside Buildings at STSU3-UB14 from a 1,000-cm^2 area			10/26/2022	--	--	--	--	--	--	--	--	0.14	0.16	0.26	UJ	0.36	0.20	0.16	J	0.07	0.10	0.18	UJ	0.11	0.13	0.21	UJ
SVP264230	Dust Inside Buildings at STSU3-UB18 from a 2,500-cm^2 area			10/26/2022	--	--	--	--	--	--	--	--	0.70	0.32	0.22	=	1.41	0.39	0.11	J	0.40	0.20	0.14	=	0.43	0.20	0.12	=

Notes:

UCL_{95} is the 95 percent upper confidence limit of the arithmetic mean.

For the first three entries in this table, two samples were collected from the same location for separate submittal to different laboratories.

Validation qualifier (VQ) symbols indicate: "=" for positive results, "U" for not detected above this value, "J" for estimated quantity, "UJ" for not detected above estimated value, and "R" for unusable.

The differences in the way lead-210 and pollonium-210 are analyzed and the estimated "J" result for polonium-210 caused disequilibrium in results between the two.

-- indicates data not available or not applicable.

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APPENDIX E

DATA QUALITY

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DATA QUALITY

QA and quality control (QC) measures for final status survey (FSS) analytical data are summarized in the *Final Status Survey Plan for Soils, Structures, and Sediments at the St. Louis FUSRAP Sites* (FSSP) (USACE 2015a) and are presented in the QA and QC sections of the *Sampling and Analysis Guide for the St. Louis Sites* (SAG) (USACE 2000). A primary goal of the QA program is to ensure that the quality of measurements is appropriate for the intended use of the results. To this end, the sample data and survey data were collected using these FSS measures. Through the process of readiness review, training, equipment calibration, QC implementation, and detailed documentation, the project has successfully accomplished the goals set by the QA program.

FIELD INSTRUMENTS

Instruments used to perform the surveys were maintained and calibrated to manufacturers' specifications to ensure QA requirements for traceability, accuracy, precision, and sensitivity criteria of the equipment/instrumentation were met (DoD 2000, USACE 2015a).

Instruments were calibrated at least annually in accordance with American National Standards Institute (ANSI) N323A-1997 or ANSI N323AB-2013, *American National Standard Radiation Protection Instrumentation Test and Calibration, Portable Survey Instruments* (ANSI 1997, 2014). Current calibration and maintenance records for these instruments include, at a minimum, the following information:

- Name of the equipment,
- Equipment identification (model and serial number),
- Manufacturer,
- Date of calibration, and
- Next calibration due date.

To ensure the instrument continues to operate properly between calibrations, source and background checks were performed prior to and after daily use, as follows.

- Selecting a reference location for performance of checks. The reference location is selected based on the low general area ambient background radiation and on being consistently available for the daily checks.
- Inspecting for physical damage and ensuring the calibration is current.
- Performing 1-minute integrated counts with the source positioned in a reproducible geometry at the reference location. For the survey instruments, a designated thorium-230 alpha radiation source and a designated strontium/yttrium-90 beta radiation source were used.
- Performing 1-minute integrated counts of general area ambient background radioactivity (with no designated source) at the reference location.
- Comparing the instruments' responses against the averages established at the post-calibration check-in. Performance criteria of $\pm$20 percent or within 3 standard deviations of the averages were used as investigation action levels for source and background checks, respectively. One exception to these checks occurred. While the floor monitor had met the daily background check at the beginning of the day on October 26, 2022, for alpha radioactivity, the floor monitor exceeded 3 standard deviations of the background value at the end of the day. The next morning, the floor monitor again met the daily background

check for alpha radioactivity. The floor monitor also met the separately performed daily source checks at both the beginning and end of that day. The instrument was determined to still be operating within its calibration. The alpha background check is more susceptible to changes in natural background radioactivity, and if the instrument were biased high, then more (not fewer) biased fixed-point measurements would result.

Other QA parameters for these instruments and the corresponding confirmation data are listed as follows.

- Fixed-point MDCs for the field instruments ranged from 1 to 12 percent of the action level. These MDCs met the goal of being less than 50 percent, and all the alpha MDCs met the preferred goal of being less than 10 percent. Three-quarters of the beta MDCs met the preferred goal of being less than 10 percent, and all the beta MDCs were 12 percent or less.
- The alpha scan probability for all instruments was 100 percent, which is greater than or equal to the goal of 85 percent.
- The lowest instrument efficiencies of 0.262 for alpha radiation and 0.22 for beta radiation are greater than 0.15 to optimize counting statistics.

LABORATORY ANALYSIS

The FUSRAP St. Louis Radioanalytical Laboratory is certified and audited through the U.S. Department of Defense (DoD) Environmental Laboratory Accreditation Program (ELAP) to ensure quality results. The ELAP includes requirements and audits of calibrations, source checks, and general area ambient background checks similar to those discussed for field instruments.

Eurofins St. Louis undergoes similar reviews to be accredited for testing by the following.

- The State of Louisiana Department of Environmental Quality as part of the National Environmental Laboratory Accreditation Program to the "2009 TNI Standard" established by the National Environmental Laboratories Accreditation Conference Institute.
- The ANSI National Accreditation Board to the "ISO/IEC 17025:2017" standard and the U.S. Department of Defense (DoD) Quality Systems Manual for Environmental Laboratories (DoD QSM V5.4).

An evaluation of the laboratory analytical results is performed to determine if they are accurate and adequate, and to ensure satisfactory execution of the FSS. The resulting "definitive" data, as described by the USEPA, have been reported by the laboratory, including the following basic information. Analytical data review, evaluation, and assignment of validation qualifiers are performed on 100 percent of the soil sample analytical results.

- Laboratory case narratives,
- Soil sample results,
- Laboratory method blank results,
- Laboratory control standard results,
- Laboratory duplicate soil sample results,
- Tracer recoveries,
- Soil sample extraction dates, and
- Soil sample analysis dates.

Laboratory Data Validation

Analytical data generated for this project have been subjected to a process of data verification, validation, and review using data validation checklists. These checklists were completed by the project-designated validation staff and were reviewed by the project laboratory coordinator. Data validation checklists or verification summaries for each laboratory sample delivery group have been retained with laboratory data deliverables by Leidos. The SAG and the following documents establish the criteria against which the data are compared and from which a judgment is rendered regarding the acceptance and qualification of the data:

- *Department of Defense (DoD)/Department of Energy (DOE) Consolidated Quality Systems Manual (QSM) for Environmental Laboratories* (DoD and DOE 2017) and/or prior revisions,
- *USACE Kansas City and St. Louis District Radionuclide Data Quality Evaluation Guidance for Alpha and Gamma Spectroscopy* (USACE 2002), and
- *Data Verification and Validation* (Leidos 2015) and/or prior revisions.

Upon receipt of field and analytical data, verification staff performed a systematic examination of the reports to ensure the content, presentation, and administrative validity of the data. In conjunction with data package verification, laboratory electronic data deliverables were available. These data deliverables were subjected to review and verification against the hardcopy deliverable. Both structural and technical assessments of the laboratory-delivered electronic reports were performed. The structural evaluation verified that required data were reported and contract-specified requirements (i.e., analytical holding times, contractual turnaround times, etc.) were met.

During the validation phase of the review and evaluation process, data were subjected to a systematic technical review by examining the field results, analytical QC results, and laboratory documentation, following appropriate guidelines provided in the previously referenced documents. These data validation guidelines define the technical review criteria, methods for evaluation of the criteria, and actions to be taken resulting from the review of these criteria. The primary objective of this phase was to assess and summarize the quality and reliability of the data for the intended use and to document factors that may have affected the usability of the data. Data verification/validation included, but was not necessarily limited to, the following parameters for radiological methods, as appropriate:

- Holding time information and methods requested;
- Discussion of laboratory analysis, including any laboratory problems;
- Soil sample results;
- Initial calibration;
- Efficiency check;
- Background determinations;
- Spike recovery results;
- Internal standard results (tracers or carriers);
- Duplicate soil sample results;
- Self-absorption factor (for alpha and beta radioactivity);
- Cross-talk factor (during simultaneous detection of alpha and beta radioactivity);
- Laboratory control samples (LCSs); and
- Run log.

As an end result of this phase of the review, the data were qualified based on the technical assessment of the validation criteria. Validation qualifiers (VQs) were applied to each analytical result to indicate the usability of the data for the intended purpose, with a reason code to explain the retention or the VQ, as follows:

- "=" Positive result was obtained.
- "U" The analyte was analyzed for but was not detected above the reported sample quantitation limit.
- "J" The associated value is an estimated quantity, indicating a decreased knowledge of the accuracy or precision of the reported value.
- "UJ" The analyte was analyzed for but was not detected above the minimum detectable value, and the reported value is an estimate, indicating a decreased knowledge of the accuracy or precision of the reported value.
- "R" The analyte value reported is unusable. The integrity of the analyte's identification, accuracy, precision, or sensitivity has raised significant question(s) as to the reliability of the information presented.

A positive result is flagged with a "J" qualifier, and a non-detect result is flagged "UJ" when data quality is suspect due to QC issues, either blank contamination or analytical interference. Leidos VQs, reason codes, copies of validation checklists, and qualified data forms are filed with the analytical hardcopy deliverable. Individual soil sample chemical yields and LCS recoveries were within the 25 percent criterion for the verification soil samples, as stated in the SAG.

Laboratory Data Accuracy

Accuracy provides a gauge or measure of the agreement between an observed result and the true value for an analysis. For this report, accuracy is measured through the use of the field split soil samples utilizing a comparison of the prime laboratory results versus the results of an independent laboratory.

Precision is a measure of mutual agreement among individual measurements performed under the same laboratory controls. To evaluate precision, a field duplicate soil sample is submitted to the FUSRAP St. Louis Radioanalytical Laboratory along with the original soil sample. Both soil samples are analyzed under the same laboratory conditions. If any bias was introduced at the laboratory, that bias would affect both soil samples equally.

Accuracy and precision can be measured by the relative percent difference (RPD) for radiological analyses or the normalized absolute difference (NAD) for radiological analyses, using the following equations:

$$RPD = \left(\frac{|S-D|}{\frac{S+D}{2}} \right) * 100$$

$$NAD = \frac{|S-D|}{\sqrt{U_S^2 + U_D^2}}$$

where:

S = parent soil sample result
D = field split/duplicate parent soil sample result
U_S = parent soil sample uncertainty
U_D = field split/duplicate parent soil sample uncertainty
RPD has units of percent (%); NAD is unitless

The RPD is calculated for all radiological soil sample-duplicate/split pairs if a detectable result is reported for both the parent and the QA field split or field duplicate. When the RPD is greater than 50 percent for radiological soil samples, the NAD is used to determine the precision of the method. NAD accounts for uncertainty in the results; RPD does not. The NAD should be equal to or less than a value of 1.96. Neither equation is used when the analyte in one or both of the soil samples is not detected. If neither equation can be used, the comparison is counted as acceptable in the overall number of comparisons.

The SAG (USACE 2000) requires that QA field split and duplicate soil samples be collected and analyzed at a frequency of approximately 1 in every 20 soil samples (5 percent). The USACE Memorandum for the Record, *SAG Implementation Guidance for Interpretation of QA Split Program* (USACE 2005b), provides clarification to the guidance contained within the SAG by stating that this requirement is applicable only to definitive sample results (i.e., samples used for *Multi-Agency Radiation Survey and Site Investigation Manual* [MARSSIM] [DoD 2000] FSS). For radiological analyses, 54 split soil samples and 63 field duplicate soil samples were analyzed for radium-226 using gamma spectroscopy. The quantity of each of these QC checks represent 4.5 and 5.2 percent of the 1,212 soil samples. Split samples in planned remediation areas are generally not submitted for analysis because new samples will be collected following excavation and those will have split soil samples.

The split soil sample pairs were analyzed by the FUSRAP St. Louis Radioanalytical Laboratory and by an independent contract laboratory, Eurofins St. Louis. The ability to compare the results from the laboratories is subject to several factors, such as sample homogeneity, analytical methods, volume of sample, and, for radiological samples, the size of the uncertainty (reported as error) relative to the result (e.g., a low result near the detection limit may have an uncertainty close to or even higher than the result itself). Accuracy is affected by the size of the relative uncertainty in the result. Typically, as the result approaches the MDC, the relative uncertainty increases. Many of the soil sample results described in this report are close to the MDC.

Field duplicate soil samples were collected to ascertain the contribution to variability (i.e., precision) due to the combination of environmental media, sampling consistency, and analytical precision that contribute to the precision for the entire system of collecting and analyzing soil samples. The field duplicate soil samples were collected from the same spatial and temporal conditions as the primary environmental soil samples. Soil samples were collected from the same sampling device after homogenization for all analytes.

To meet the data quality objectives (DQOs) for radiological analyses, the soil sample results comparison must be less than the 50 percent criteria for RPD; or, if the RPD is greater than 50 percent, the NAD must be less than or equal to 1.96. The soil sample result comparisons are shown in Tables E-1 and E-2. Zero split comparisons and zero duplicate comparisons exceeded the criteria, as demonstrated in Table E-1, yielding 100 percent acceptance. This meets the SAG goal of 90 percent acceptance.

Table E-1. Radium-226 Accuracy and Precision

Parent Sample ID	Split Soil Samples			Duplicate Soil Samples		
	Sample ID	RPD (%)	NAD	Sample ID	RPD (%)	NAD
SVP190153	SVP190153-2	5.00	NA	SVP190153-1	5.53	NA
SVP190159	SVP190159-2	10.14	NA	SVP190159-1	1.52	NA
SVP190183	SVP190183-2	7.29	NA	SVP190183-1	6.06	NA
SVP190229	SVP190229-2	13.92	NA	SVP190229-1	0.69	NA
SVP190243	SVP190243-2	17.79	NA	SVP190243-1	8.16	NA
SVP190255	SVP190255-2	52.88	0.47	SVP190255-1	4.14	NA
SVP190267	SVP190267-2	6.15	NA	SVP190267-1	7.19	NA
SVP202160	SVP202160-2	12.88	NA	SVP202160-1	6.67	NA
SVP202200	SVP202200-2	54.40	0.73	SVP202200-1	0.00	NA
SVP202214	SVP202214-2	32.35	NA	SVP202214-1	12.24	NA
SVP202412	NA	NA	NA	SVP202412-1	9.02	NA
SVP202418	NA	NA	NA	SVP202418-1	2.08	NA
SVP202426	SVP202426-2	5.71	NA	SVP202426-1	0.84	NA
SVP202432	NA	NA	NA	SVP202432-1	8.70	NA
SVP202484	SVP202484-2	8.70	NA	SVP202484-1	9.17	NA
SVP202492	SVP202492-2	25.81	NA	SVP202492-1	10.17	NA
SVP202494	SVP202494-2	16.42	NA	SVP202494-1	7.89	NA
SVP202502	SVP202502-2	50.00	NA	SVP202502-1	15.19	NA
SVP202506	SVP202506-2	23.58	NA	SVP202506-1	6.06	NA
SVP202524	NA	NA	NA	SVP202524-1	2.26	NA
SVP202530	SVP202530-2	19.85	NA	SVP202530-1	2.11	NA
SVP202534	SVP202534-2	37.51	NA	SVP202534-1	1.39	NA
SVP202574	SVP202574-2	11.19	NA	SVP202574-1	6.14	NA
SVP202594	SVP202594-2	18.06	NA	SVP202594-1	11.41	NA
SVP202604	SVP202604-2	2.88	NA	SVP202604-1	3.61	NA
SVP202612	SVP202612-2	8.98	NA	SVP202612-1	8.24	NA
SVP202616	NA	NA	NA	SVP202616-1	13.42	NA
SVP202624	SVP202624-2	2.35	NA	SVP202624-1	6.74	NA
SVP202672	SVP202672-2	56.55	0.30	SVP202672-1	0.00	NA
SVP202676	NA	NA	NA	SVP202676-1	4.72	NA
SVP202684	SVP202684-2	84.05	0.06	SVP202684-1	7.09	NA
SVP202690	NA	NA	NA	SVP202690-1	19.26	NA
SVP202810	SVP202810-2	29.85	NA	SVP202810-1	10.96	NA
SVP202816	SVP202816-2	8.37	NA	SVP202816-1	17.46	NA
SVP202820	SVP202820-2	26.23	NA	SVP202820-1	4.95	NA
SVP207127	SVP207127-2	16.45	NA	SVP207127-1	1.61	NA
SVP208705	NA	NA	NA	SVP208705-1	2.03	NA
SVP208721	NA	NA	NA	SVP208721-1	6.23	NA
SVP263662	SVP263662-2	31.30	NA	SVP263662-1	7.92	NA
SVP263693	SVP263693-2	3.92	NA	SVP263693-1	5.83	NA

Table E-1. Radium-226 Accuracy and Precision (Continued)

Parent Sample ID	Split Soil Samples			Duplicate Soil Samples		
	Sample ID	RPD (%)	NAD	Sample ID	RPD (%)	NAD
SVP263708	SVP263708-2	24.00	NA	SVP263708-1	1.67	NA
SVP263726	SVP263726-2	15.91	NA	SVP263726-1	6.38	NA
SVP263769	SVP263769-2	24.14	NA	SVP263769-1	1.98	NA
SVP263795	SVP263795-2	36.51	NA	SVP263795-1	2.87	NA
SVP263817	SVP263817-2	20.69	NA	SVP263817-1	5.77	NA
SVP263826	SVP263826-2	12.62	NA	SVP263826-1	3.23	NA
SVP263844	SVP263844-2	12.71	NA	SVP263844-1	3.06	NA
SVP263862	SVP263862-2	37.26	NA	SVP263862-1	0.94	NA
SVP263871	SVP263871-2	16.95	NA	SVP263871-1	4.74	NA
SVP263889	SVP263889-2	26.38	NA	SVP263889-1	4.78	NA
SVP263902	SVP263902-2	1.89	NA	SVP263902-1	0.94	NA
SVP263919	SVP263919-2	41.65	NA	SVP263919-1	8.32	NA
SVP263943	SVP263943-2	34.48	NA	SVP263943-1	2.74	NA
SVP263954	SVP263954-2	23.08	NA	SVP263954-1	11.01	NA
SVP264007	SVP264007-2	6.06	NA	SVP264007-1	6.45	NA
SVP264028	SVP264028-2	13.33	NA	SVP264028-1	4.92	NA
SVP264045	SVP264045-2	32.68	NA	SVP264045-1	0.53	NA
SVP264063	SVP264063-2	0.86	NA	SVP264063-1	6.17	NA
SVP264080	SVP264080-2	28.33	NA	SVP264080-1	8.61	NA
SVP264104	SVP264104-2	15.87	NA	SVP264104-1	9.84	NA
SVP264130	SVP264130-2	4.26	NA	SVP264130-1	10.05	NA
SVP264149	SVP264149-2	13.19	NA	SVP264149-1	3.75	NA
SVP264289	SVP264289-2	44.97	NA	SVP264289-1	10.53	NA

Notes:

Soil samples ending in “-2” are split soil samples. Soil samples ending in “-1” are duplicate soil samples.

Bold values for RPD/NAD pairs exceed the control limits. Non-bold values for RPD/NAD pairs meet the acceptance criteria.

NA - not applicable

NAD - calculated for additional information when the RPD is greater than 50 percent

Sensitivity

Soil samples were analyzed at the FUSRAP St. Louis Radioanalytical Laboratory to measure the radioactivity at very low levels. In general, the MDC represents the lowest level that the laboratory can achieve for each soil sample given a set of variables, including detection efficiencies and conversion factors due to influences such as individual soil sample aliquot, soil sample density, and variations in analyte background radioactivity at the laboratory. The MDC is reported with each soil sample result in Appendix F.

Determination of MDC values allows the data user to assess the relative confidence that can be placed in a value in comparison to the magnitude or level of analyte concentration observed. The closer a measured value is to the MDC, the lower the established confidence and the greater the variation in the measured value. Project sensitivity goals were expressed as quantitation level goals in the FSSP and in MARSSIM guidance.

MARSSIM guidance (DoD 2000) recommends that analytical techniques be capable of measuring levels of activity (i.e., MDCs) that are less than the established individual radionuclide concentrations in the net sum of ratios (SOR_N) remediation goal (RG). MARSSIM identifies between 10 to 50 percent as the target (i.e., ratios of 0.1 to 0.5). All ratios of MDC to the RG for radium-226 were less than 0.5. Only one ratio was not less than the 0.1 fraction.

Representativeness and Comparability

Representativeness expresses the degree to which data accurately reflect the analyte or parameter of interest for an environmental site and is the qualitative term most concerned with the proper design of a sampling program. Factors that affect the representativeness of analytical data include proper preservation, holding times, use of standard sampling and analytical methods, and determination of matrix or analyte interferences. Soil sample preservation, analytical methodologies, and soil sampling methodologies were documented to be adequate and consistently applied.

Comparability, like representativeness, is a qualitative term relative to a project dataset as an individual. These investigations employed appropriate sampling methodologies, site surveillance, use of standard sampling devices, uniform training, documentation of sampling, standard analytical protocols/procedures, QC checks with standard control limits, and universally accepted data reporting units to ensure comparability to other datasets. Through the proper implementation and documentation of these standard practices, the project has established the confidence that the data will be comparable to other project and programmatic information.

Table E-2 presents the duplicate and split results used in comparison with associated parent soil sample results for alpha spectroscopy and gamma spectroscopy, respectively. The radium-226 results reported by the FUSRAP St. Louis Radioanalytical Laboratory automatically include an upward adjustment factor of 1.5 for all samples analyzed after February 20, 2002. The adjustment is necessary to conservatively account for radium-226 in-growth and to provide proper comparability with the independent laboratory.

Table E-2. Results for Parent Soil Samples and Associated Split and Duplicate Soil Samples

Sample ID	Radium-226 Result (pCi/g)	Error (pCi/g)	MDC (pCi/g)	VQ
SVP190153	1.23	0.31	0.05	=
SVP190153-1	1.30	0.33	0.06	=
SVP190153-2	1.17	0.28	0.20	=
SVP190159	1.31	0.33	0.05	=
SVP190159-1	1.33	0.33	0.05	=
SVP190159-2	1.45	0.37	0.27	=
SVP190183	1.28	0.33	0.06	=
SVP190183-1	1.36	0.34	0.06	=
SVP190183-2	1.19	0.32	0.23	=
SVP190229	1.46	0.37	0.06	=
SVP190229-1	1.45	0.37	0.08	=
SVP190229-2	1.27	0.30	0.19	=
SVP190243	1.53	0.39	0.07	=
SVP190243-1	1.41	0.36	0.07	=
SVP190243-2	1.28	0.35	0.28	=
SVP202810	1.54	0.40	0.07	=
SVP202810-1	1.38	0.35	0.07	=
SVP202810-2	1.14	0.33	0.26	J
SVP202816	1.37	0.38	0.14	=
SVP202816-1	1.15	0.33	0.14	=
SVP202816-2	1.26	0.37	0.31	J
SVP202820	1.38	0.35	0.06	=
SVP202820-1	1.45	0.40	0.15	=
SVP202820-2	1.06	0.24	0.11	J
SVP207127	1.25	0.31	0.06	=
SVP207127-1	1.23	0.31	0.05	=
SVP207127-2	1.06	0.27	0.19	J
SVP208705	1.49	0.37	0.06	=
SVP208705-1	1.46	0.36	0.06	=
SVP208721	1.49	0.37	0.06	=

Table E-2. Results for Parent Soil Samples and Associated Split and Duplicate Soil Samples (Continued)

Sample ID	Radium-226 Result (pCi/g)	Error (pCi/g)	MDC (pCi/g)	VQ
SVP190255	1.48	0.38	0.07	=
SVP190255-1	1.42	0.36	0.07	=
SVP190255-2	0.86	0.23	0.15	J
SVP190267	1.34	0.34	0.07	=
SVP190267-1	1.44	0.37	0.06	=
SVP190267-2	1.26	0.31	0.20	=
SVP202160	1.24	0.32	0.05	=
SVP202160-1	1.16	0.30	0.05	=
SVP202160-2	1.09	0.23	0.11	=
SVP202200	1.12	0.30	0.06	=
SVP202200-1	1.12	0.30	0.06	=
SVP202200-2	0.64	0.17	0.12	=
SVP202214	1.30	0.34	0.07	=
SVP202214-1	1.15	0.30	0.06	=
SVP202214-2	0.94	0.21	0.12	=
SVP202412	1.39	0.36	0.08	=
SVP202412-1	1.27	0.33	0.08	=
SVP202418	1.43	0.36	0.06	=
SVP202418-1	1.46	0.36	0.06	=
SVP202426	1.19	0.33	0.10	=
SVP202426-1	1.20	0.32	0.08	=
SVP202426-2	1.26	0.33	0.23	J
SVP202432	1.32	0.37	0.14	=
SVP202432-1	1.21	0.35	0.15	=
SVP202484	1.56	0.39	0.07	=
SVP202484-1	1.71	0.43	0.07	=
SVP202484-2	1.43	0.38	0.29	J
SVP202492	1.40	0.38	0.13	=
SVP202492-1	1.55	0.42	0.13	=
SVP202492-2	1.08	0.27	0.21	J
SVP202494	1.45	0.36	0.06	=
SVP202494-1	1.34	0.34	0.06	=
SVP202494-2	1.23	0.26	0.17	J
SVP202502	1.70	0.42	0.07	=
SVP202502-1	1.46	0.41	0.14	=
SVP202502-2	1.02	0.24	0.17	J
SVP202506	1.28	0.34	0.10	=
SVP202506-1	1.36	0.36	0.07	=
SVP202506-2	1.01	0.26	0.19	J
SVP202524	1.34	0.34	0.06	=
SVP208721-1	1.40	0.35	0.05	=
SVP263662	0.97	0.26	0.08	=
SVP263662-1	1.05	0.28	0.08	=
SVP263662-2	1.33	0.27	0.13	=
SVP263693	1.00	0.27	0.07	=
SVP263693-1	1.06	0.28	0.08	=
SVP263693-2	1.04	0.24	0.18	=
SVP263708	1.21	0.31	0.06	=
SVP263708-1	1.19	0.30	0.05	=
SVP263708-2	1.54	0.29	0.19	=
SVP263726	0.80	0.22	0.08	=
SVP263726-1	0.86	0.23	0.08	=
SVP263726-2	0.94	0.18	0.08	=
SVP263769	1.02	0.27	0.08	=
SVP263769-1	1.00	0.27	0.08	=
SVP263769-2	1.30	0.26	0.15	=
SVP263795	1.03	0.28	0.08	=
SVP263795-1	1.06	0.29	0.08	=
SVP263795-2	1.49	0.31	0.17	=
SVP263817	0.91	0.24	0.07	=
SVP263817-1	0.86	0.24	0.08	=
SVP263817-2	1.12	0.24	0.14	=
SVP263826	0.94	0.25	0.08	=
SVP263826-1	0.97	0.26	0.08	=
SVP263826-2	1.07	0.22	0.13	=
SVP263844	1.00	0.27	0.08	=
SVP263844-1	0.97	0.26	0.08	=
SVP263844-2	1.13	0.24	0.13	=
SVP263862	1.07	0.29	0.08	=
SVP263862-1	1.06	0.28	0.08	=
SVP263862-2	1.56	0.29	0.13	=
SVP263871	1.08	0.29	0.09	=
SVP263871-1	1.03	0.28	0.09	=
SVP263871-2	1.28	0.23	0.09	=
SVP263889	1.02	0.27	0.09	=
SVP263889-1	1.07	0.29	0.09	=
SVP263889-2	1.33	0.30	0.16	=
SVP263902	1.07	0.27	0.06	=
SVP263902-1	1.06	0.27	0.06	=
SVP263902-2	1.05	0.26	0.19	=

Table E-2. Results for Parent Soil Samples and Associated Split and Duplicate Soil Samples (Continued)

Sample ID	Radium-226 Result (pCi/g)	Error (pCi/g)	MDC (pCi/g)	VQ
SVP202524-1	1.31	0.33	0.06	=
SVP202530	1.44	0.37	0.07	=
SVP202530-1	1.41	0.36	0.07	=
SVP202530-2	1.18	0.28	0.20	J
SVP202534	1.45	0.37	0.07	=
SVP202534-1	1.43	0.36	0.06	=
SVP202534-2	0.99	0.24	0.17	J
SVP202574	1.51	0.39	0.08	=
SVP202574-1	1.42	0.39	0.12	=
SVP202574-2	1.35	0.33	0.25	=
SVP202594	1.57	0.39	0.06	=
SVP202594-1	1.76	0.45	0.07	=
SVP202594-2	1.31	0.33	0.24	=
SVP202604	1.41	0.38	0.12	=
SVP202604-1	1.36	0.37	0.14	=
SVP202604-2	1.37	0.33	0.25	J
SVP202612	1.28	0.34	0.10	=
SVP202612-1	1.39	0.36	0.07	=
SVP202612-2	1.17	0.27	0.16	=
SVP202616	1.59	0.40	0.07	=
SVP202616-1	1.39	0.38	0.14	=
SVP202624	1.29	0.32	0.07	=
SVP202624-1	1.38	0.34	0.07	=
SVP202624-2	1.26	0.31	0.22	J
SVP202672	1.42	0.37	0.08	=
SVP202672-1	1.42	0.36	0.07	=
SVP202672-2	0.79	0.28	0.35	J
SVP202676	1.24	0.36	0.14	=
SVP202676-1	1.30	0.37	0.14	=
SVP202684	1.46	0.36	0.06	=
SVP202684-1	1.36	0.34	0.06	=
SVP202684-2	0.60	0.22	0.37	J
SVP202690	1.48	0.38	0.08	=
SVP202690-1	1.22	0.35	0.14	=

Sample ID	Radium-226 Result (pCi/g)	Error (pCi/g)	MDC (pCi/g)	VQ
SVP263919	0.81	0.22	0.07	=
SVP263919-1	0.88	0.24	0.08	=
SVP263919-2	1.23	0.32	0.25	=
SVP263943	1.08	0.28	0.08	=
SVP263943-1	1.11	0.30	0.08	=
SVP263943-2	1.53	0.38	0.26	=
SVP263954	1.15	0.30	0.08	=
SVP263954-1	1.03	0.28	0.10	=
SVP263954-2	1.45	0.33	0.30	=
SVP264007	1.12	0.29	0.06	=
SVP264007-1	1.05	0.28	0.08	=
SVP264007-2	1.19	0.26	0.15	=
SVP264028	1.19	0.31	0.09	=
SVP264028-1	1.25	0.33	0.10	=
SVP264028-2	1.36	0.25	0.12	=
SVP264045	0.94	0.26	0.08	=
SVP264045-1	0.94	0.26	0.08	=
SVP264045-2	1.31	0.24	0.10	=
SVP264063	1.17	0.31	0.09	=
SVP264063-1	1.10	0.30	0.08	=
SVP264063-2	1.16	0.25	0.16	=
SVP264080	1.00	0.28	0.09	=
SVP264080-1	1.09	0.29	0.09	=
SVP264080-2	1.33	0.29	0.16	=
SVP264104	1.16	0.30	0.08	=
SVP264104-1	1.28	0.33	0.06	=
SVP264104-2	1.36	0.29	0.16	=
SVP264130	1.15	0.30	0.07	=
SVP264130-1	1.04	0.28	0.08	=
SVP264130-2	1.20	0.32	0.24	=
SVP264149	0.82	0.22	0.06	=
SVP264149-1	0.79	0.22	0.07	=
SVP264149-2	0.72	0.22	0.17	=
SVP264289	0.62	0.22	0.16	J
SVP264289-1	0.69	0.24	0.16	J
SVP264289-2	0.39	0.25	0.30	J

Notes:

Negative results are less than the laboratory system's background level.

Soil samples ending in "-1" are duplicate soil samples.

Soil samples ending in "-2" are split soil samples.

VQ symbols indicate: "=" for positive results, "J" for estimated quantity, and "UJ" for not detected above estimated value.

Completeness

Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount expected to be obtained. Acceptable results are defined as those data that pass individual scrutiny during the verification and validation process and are accepted for unrestricted use. The DQO of achieving 90 percent completeness was met. One hundred (100) percent of the data are within acceptance limits.

A total of 1,212 soil samples were collected, with 1,212 discrete analyses obtained, reviewed, and integrated into the assessment with one rejected result. Thus, 99.9 percent of the data are within acceptance limits.

DATA QUALITY ASSESSMENT SUMMARY

The overall quality of these data meets or exceeds the established DQOs. Through proper implementation of the project data verification, validation, and assessment process, the data have been determined to be acceptable for use.

Some data, as presented, have been qualified as usable, but estimated when necessary. Data that have been estimated are those that have concentrations/activities that are below the quantitation limit or are indicative of accuracy, precision, or sensitivity being less than desired but adequate for interpretation. Comparisons that have exceeded the requirements have bolded type in associated tables. Numerous possible explanations for these anomalies include, but are not limited to, the following:

- Dilution of a soil sample due to high analyte concentration(s) that exceed analytical calibration(s);
- Incomplete soil sample homogenization, either at the laboratory or during the field sampling;
- Matrix interferences within the soil sample itself that caused inadequate analytical quantitation;
- Different preparation methods for associated split soil samples at different laboratories;
- Different analytical methods for associated split soil samples at different laboratories; and
- Concentration of an analyte being below the calibration range, or near the method detection limit (MDL) for that analyte.

Further analysis of the data can display trends or even randomness within the dataset that could be explained with one or more of the previously mentioned contributors to anomalies. For instance, a single split soil sample pair analyzed at two different laboratories, for which the RPD was not met for any analyte, could be an indicator of incomplete homogenization in the field, matrix effects in the soil sample, use of different preparation methods, dilutions that were required to overcome soil sample concentration, or analyte concentrations approaching the MDL. Accuracy and/or precision anomalies occurring for some analytes, but not for others, could be the result of a simple matrix effect causing poor quantitation of a soil sample, or perhaps low concentrations of those analytes. When considering split soil sample data, if a laboratory has numerous "out of specification" data for a certain analyte(s) versus the corresponding data produced by another laboratory, differences in sample preparation by the laboratories in question, or perhaps differences in instrument calibrations, could be considered as potential causes for differences in data quality for the specific analyte(s) in question. Exceedance by one laboratory of the RPD acceptance criterion for an analyte measured in a duplicate soil sample pair, for which the same duplicate analysis at another laboratory produced results for which the RPD was within the same acceptance limit, could be attributed to randomness of quantitation within the analysis.

The combined analyses for accuracy and precision included 117 total comparisons with no exceedances. These results were well within the 90 percent completeness DQO, with more than 90 percent of the data being within acceptance limits for accuracy and precision. With respect to completeness, the project produced valid results for 99.9 percent of the soil sample analyses performed, achieving the DQO of 90 percent completeness.

This data quality summary demonstrates that the evaluated project analytical data can withstand scientific scrutiny; are appropriate for their intended purpose; are technically defensible; and are of known and acceptable accuracy, precision, and sensitivity. Confidence in the presented environmental information has been established, allowing the information to be utilized for the project objectives and providing data for future needs.

APPENDIX F

RADIUM-226 RESULTS OF SOIL SAMPLES COLLECTED FROM JANA ELEMENTARY SCHOOL, HAZELWOOD SCHOOL DISTRICT AND THE COLDWATER CREEK CORRIDOR ADJACENT TO THEM

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Table F-1. Soil Sample Results for Radium-226

	Background	Clearing	Woods	Corridor
Mean	1.05	1.10	1.26	1.53
Standard Deviation	0.27	0.19	0.19	0.43
Maximum	1.55	2.05	1.89	4.56
Number of Samples	37	458	254	499
Number of Stations	37	60	43	119

Group	Station Name	Sample Name	Easting	Northing	Elevation	Collect Date	Cover Depth	Start Depth	End Depth	Result	Error	MDC	VQ
			(ft)		(ft amsl)		(ft bgs)			(pCi/g)			
Clearing	HTZ250127	HTZ250127	872032	1085861	508.9	11/7/2022	0.0	0.0	0.5	0.92	0.23	0.05	=
Clearing	HTZ250128	HTZ250128	872149	1086031	508.1	11/7/2022	0.0	0.0	0.5	1.00	0.26	0.05	=
Clearing	HTZ250129	HTZ250129	872278	1086072	505.3	11/7/2022	0.0	0.0	0.5	1.04	0.26	0.05	=
Clearing	SVP190147	SVP190147	871892	1085178	492.1	6/3/2019	0.0	0.0	0.5	1.30	0.36	0.14	=
Clearing		SVP190148	871892	1085178	492.1	6/3/2019	0.0	1.0	1.5	1.35	0.37	0.13	=
Clearing		SVP211095	871892	1085178	492.1	6/3/2019	0.0	3.0	3.5	1.44	0.39	0.14	=
Clearing		SVP211096	871892	1085178	492.1	6/3/2019	0.0	4.0	4.5	1.52	0.41	0.12	=
Clearing		SVP211097	871892	1085178	492.1	6/3/2019	0.0	5.0	5.5	1.53	0.42	0.14	=
Clearing	SVP190161	SVP190161	871718	1085279	495.1	6/3/2019	0.0	0.0	0.5	1.11	0.31	0.11	=
Clearing		SVP190162	871718	1085279	495.1	6/3/2019	0.0	1.0	1.5	1.23	0.34	0.11	=
Clearing		SVP211090	871718	1085279	495.1	6/3/2019	0.0	3.0	3.5	1.25	0.34	0.11	=
Clearing		SVP211091	871718	1085279	495.1	6/3/2019	0.0	5.0	5.5	1.33	0.36	0.12	=
Clearing	SVP190163	SVP190163	871834	1085279	491.4	6/3/2019	0.0	0.0	0.5	1.30	0.36	0.14	=
Clearing		SVP190164	871834	1085279	491.4	6/3/2019	0.0	1.5	2.0	1.52	0.41	0.12	=
Clearing		SVP190165	871834	1085279	491.4	6/3/2019	0.0	3.5	4.0	1.29	0.35	0.13	=
Clearing		SVP190166	871834	1085279	491.4	6/3/2019	0.0	4.0	4.5	1.29	0.36	0.14	=
Clearing	SVP190167	SVP190167	871950	1085279	492.3	6/3/2019	0.0	0.0	0.5	1.22	0.34	0.12	=
Clearing		SVP190168	871950	1085279	492.3	6/3/2019	0.0	1.0	1.5	1.34	0.36	0.10	=
Clearing		SVP211098	871950	1085279	492.3	6/3/2019	0.0	2.5	3.0	1.54	0.41	0.11	=
Clearing		SVP211099	871950	1085279	492.3	6/3/2019	0.0	4.5	5.0	1.74	0.46	0.10	=

Table F-1. Soil Sample Results for Radium-226 (Continued)

Group	Station Name	Sample Name	Easting	Northing	Elevation	Collect Date	Cover Depth	Start Depth	End Depth	Result	Error	MDC	VQ
			(ft)		(ft amsl)		(ft bgs)			(pCi/g)			
Clearing	SVP190169	SVP190169	872066	1085279	493.3	6/4/2019	0.0	0.0	0.5	1.29	0.35	0.12	=
Clearing		SVP190170	872066	1085279	493.3	6/4/2019	0.0	0.5	1.0	1.28	0.35	0.12	=
Clearing		SVP211104	872066	1085279	493.3	6/4/2019	0.0	2.0	2.5	1.56	0.41	0.13	=
Clearing		SVP211105	872066	1085279	493.3	6/4/2019	0.0	4.0	4.5	2.04	0.52	0.12	=
Clearing		SVP211106	872066	1085279	493.3	6/4/2019	0.0	4.5	5.0	2.05	0.53	0.13	=
Clearing	SVP190171	SVP190171	872182	1085279	496.9	6/4/2019	0.0	0.0	0.5	1.18	0.33	0.14	=
Clearing		SVP190172	872182	1085279	496.9	6/4/2019	0.0	1.0	1.5	1.29	0.36	0.14	=
Clearing		SVP211107	872182	1085279	496.9	6/4/2019	0.0	3.5	4.0	1.20	0.34	0.13	=
Clearing		SVP211108	872182	1085279	496.9	6/4/2019	0.0	4.0	4.5	1.24	0.35	0.14	=
Clearing		SVP211109	872182	1085279	496.9	6/4/2019	0.0	6.5	7.0	1.52	0.41	0.13	=
Clearing		SVP211110	872182	1085279	496.9	6/4/2019	0.0	8.0	8.5	1.20	0.34	0.14	=
Clearing	SVP190177	SVP190177	871776	1085380	496.6	6/3/2019	0.0	0.0	0.5	1.49	0.41	0.15	=
Clearing		SVP190178	871776	1085380	496.6	6/3/2019	0.0	1.0	1.5	1.40	0.39	0.14	=
Clearing		SVP211092	871776	1085380	496.6	6/3/2019	0.0	2.5	3.0	1.41	0.39	0.13	=
Clearing	SVP190179	SVP190179	871892	1085380	492.2	6/3/2019	0.0	0.0	0.5	1.26	0.34	0.10	=
Clearing		SVP190180	871892	1085380	492.2	6/3/2019	0.0	0.5	1.0	1.38	0.37	0.12	=
Clearing		SVP211093	871892	1085380	492.2	6/3/2019	0.0	3.0	3.5	1.64	0.43	0.11	=
Clearing		SVP211094	871892	1085380	492.2	6/3/2019	0.0	4.0	4.5	1.19	0.32	0.11	=
Clearing		SVP211100	871892	1085380	492.2	6/3/2019	0.0	5.0	5.5	1.42	0.38	0.10	=
Clearing	SVP190181	SVP190181	872008	1085380	494.0	6/4/2019	0.0	0.0	0.5	1.23	0.34	0.13	=
Clearing		SVP190182	872008	1085380	494.0	6/4/2019	0.0	1.0	1.5	1.50	0.40	0.13	=
Clearing		SVP211101	872008	1085380	494.0	6/4/2019	0.0	3.5	4.0	1.51	0.41	0.15	=
Clearing		SVP211102	872008	1085380	494.0	6/4/2019	0.0	4.5	5.0	1.53	0.41	0.14	=
Clearing		SVP211103	872008	1085380	494.0	6/4/2019	0.0	5.0	5.5	1.85	0.48	0.13	=
Clearing	SVP190183	SVP190183	872124	1085380	497.2	6/4/2019	0.0	0.0	0.5	1.28	0.33	0.06	=
Clearing		SVP190184	872124	1085380	497.2	6/4/2019	0.0	1.0	1.5	1.35	0.37	0.12	=
Clearing		SVP190185	872124	1085380	497.2	6/4/2019	0.0	3.5	4.0	1.42	0.38	0.12	=
Clearing		SVP190186	872124	1085380	497.2	6/4/2019	0.0	5.5	6.0	1.51	0.40	0.13	=
Clearing		SVP211111	872124	1085380	497.2	6/4/2019	0.0	6.0	6.5	1.97	0.54	0.19	=
Clearing		SVP211112	872124	1085380	497.2	6/4/2019	0.0	7.0	7.5	1.61	0.42	0.13	=

Table F-1. Soil Sample Results for Radium-226 (Continued)

Group	Station Name	Sample Name	Easting	Northing	Elevation	Collect Date	Cover Depth	Start Depth	End Depth	Result	Error	MDC	VQ
			(ft)		(ft amsl)		(ft bgs)			(pCi/g)			
Clearing	SVP190187	SVP190187	872240	1085380	496.9	6/4/2019	0.0	0.0	0.5	1.25	0.35	0.13	=
Clearing		SVP190188	872240	1085380	496.9	6/4/2019	0.0	1.5	2.0	1.21	0.34	0.13	=
Clearing		SVP211113	872240	1085380	496.9	6/4/2019	0.0	2.0	2.5	1.23	0.34	0.13	=
Clearing		SVP211114	872240	1085380	496.9	6/4/2019	0.0	4.5	5.0	1.29	0.36	0.14	=
Clearing	SVP190221	SVP190221	871950	1085481	497.2	6/4/2019	0.0	0.0	0.5	1.12	0.31	0.12	=
Clearing		SVP190222	871950	1085481	497.2	6/4/2019	0.0	0.5	1.0	1.14	0.31	0.13	=
Clearing		SVP211118	871950	1085481	497.2	6/4/2019	0.0	3.5	4.0	1.26	0.34	0.12	=
Clearing		SVP211119	871950	1085481	497.2	6/4/2019	0.0	4.5	5.0	1.36	0.36	0.13	=
Clearing	SVP190223	SVP190223	872066	1085481	497.1	6/4/2019	0.0	0.0	0.5	1.14	0.32	0.14	=
Clearing		SVP190224	872066	1085481	497.1	6/4/2019	0.0	0.5	1.0	1.17	0.32	0.12	=
Clearing		SVP190225	872066	1085481	497.1	6/4/2019	0.0	2.0	2.5	1.30	0.35	0.12	=
Clearing		SVP211117	872066	1085481	497.1	6/4/2019	0.0	4.0	4.5	1.25	0.34	0.14	=
Clearing		SVP190226	872066	1085481	497.1	6/4/2019	0.0	5.5	6.0	1.33	0.36	0.13	=
Clearing	SVP190227	SVP190227	872182	1085481	497.3	6/4/2019	0.0	0.0	0.5	1.23	0.34	0.12	=
Clearing		SVP190228	872182	1085481	497.3	6/4/2019	0.0	1.0	1.5	1.18	0.32	0.12	=
Clearing		SVP211115	872182	1085481	497.3	6/4/2019	0.0	3.0	3.5	1.32	0.36	0.13	=
Clearing		SVP211116	872182	1085481	497.3	6/4/2019	0.0	4.5	5.0	1.29	0.35	0.12	=
Clearing	SVP190263	SVP190263	872414	1085885	494.8	6/4/2019	0.0	0.0	0.5	1.33	0.36	0.12	=
Clearing		SVP190264	872414	1085885	494.8	6/4/2019	0.0	1.5	2.0	1.34	0.36	0.11	=
Clearing		SVP211120	872414	1085885	494.8	6/4/2019	0.0	3.0	3.5	1.53	0.40	0.11	=
Clearing	SVP190267	SVP190267	872470	1085988	503.2	8/21/2018	0.0	0.0	0.5	1.34	0.34	0.07	=
Clearing		SVP190268	872470	1085988	503.2	8/21/2018	0.0	1.5	2.0	1.33	0.33	0.06	=
Clearing		SVP205289	872470	1085988	503.2	8/21/2018	0.0	3.5	4.0	1.51	0.38	0.08	=
Clearing		SVP205290	872470	1085988	503.2	8/21/2018	0.0	4.5	5.0	1.56	0.39	0.06	=
Clearing		SVP232388	872470	1085988	503.2	7/6/2021	0.0	6.0	6.5	0.90	0.24	0.06	=
Clearing		SVP232389	872470	1085988	503.2	7/6/2021	0.0	8.0	8.5	0.87	0.23	0.06	=
Clearing		SVP232390	872470	1085988	503.2	7/6/2021	0.0	8.5	9.0	0.98	0.26	0.06	=

Table F-1. Soil Sample Results for Radium-226 (Continued)

Group	Station Name	Sample Name	Easting	Northing	Elevation	Collect Date	Cover Depth	Start Depth	End Depth	Result	Error	MDC	VQ
			(ft)		(ft amsl)		(ft bgs)			(pCi/g)			
Clearing	SVP263644	SVP263644	871834	1085683	505.1	10/26/2022	0.0	0.0	0.5	0.99	0.27	0.08	=
Clearing		SVP263645	871834	1085683	505.1	10/26/2022	0.0	1.0	1.5	1.09	0.27	0.06	=
Clearing		SVP263646	871834	1085683	505.1	10/26/2022	0.0	3.3	3.8	1.10	0.28	0.06	=
Clearing		SVP263647	871834	1085683	505.1	10/26/2022	0.0	4.5	5.0	1.07	0.27	0.05	=
Clearing		SVP263648	871834	1085683	505.1	10/26/2022	0.0	7.2	7.7	1.09	0.27	0.05	=
Clearing		SVP263649	871834	1085683	505.1	10/26/2022	0.0	9.5	10.0	0.93	0.24	0.05	=
Clearing		SVP263650	871834	1085683	505.1	10/26/2022	0.0	11.0	11.5	0.95	0.24	0.05	=
Clearing		SVP263651	871834	1085683	505.1	10/26/2022	0.0	13.5	14.0	0.98	0.25	0.05	=
Clearing		SVP263652	871834	1085683	505.1	10/26/2022	0.0	14.5	15.0	0.85	0.22	0.05	=
Clearing	SVP263653	SVP263653	871892	1085582	500.2	10/26/2022	0.0	0.0	0.5	1.06	0.28	0.08	=
Clearing		SVP263654	871892	1085582	500.2	10/26/2022	0.0	0.5	1.0	1.02	0.26	0.06	=
Clearing		SVP263655	871892	1085582	500.2	10/26/2022	0.0	3.5	4.0	1.10	0.28	0.06	=
Clearing		SVP263656	871892	1085582	500.2	10/26/2022	0.0	4.0	4.5	1.18	0.29	0.06	=
Clearing		SVP263657	871892	1085582	500.2	10/26/2022	0.0	6.0	6.5	1.01	0.26	0.05	=
Clearing		SVP263658	871892	1085582	500.2	10/26/2022	0.0	9.5	10.0	1.00	0.26	0.05	=
Clearing		SVP263659	871892	1085582	500.2	10/26/2022	0.0	10.0	10.5	0.98	0.25	0.05	=
Clearing		SVP263660	871892	1085582	500.2	10/26/2022	0.0	13.5	14.0	0.86	0.22	0.05	=
Clearing		SVP263661	871892	1085582	500.2	10/26/2022	0.0	14.0	14.5	1.01	0.25	0.05	=
Clearing	SVP263662	SVP263662	871950	1085683	503.3	10/26/2022	0.0	0.0	0.5	0.97	0.26	0.08	=
Clearing		SVP263663	871950	1085683	503.3	10/26/2022	0.0	1.0	1.5	1.02	0.26	0.05	=
Clearing		SVP263664	871950	1085683	503.3	10/26/2022	0.0	3.0	3.5	1.01	0.26	0.06	=
Clearing		SVP263665	871950	1085683	503.3	10/26/2022	0.0	5.5	6.0	0.99	0.25	0.05	=
Clearing		SVP263666	871950	1085683	503.3	10/26/2022	0.0	7.0	7.5	1.04	0.27	0.05	=
Clearing		SVP263667	871950	1085683	503.3	10/26/2022	0.0	8.8	9.3	0.93	0.24	0.05	=
Clearing		SVP263668	871950	1085683	503.3	10/26/2022	0.0	11.0	11.5	0.98	0.25	0.05	=
Clearing		SVP263669	871950	1085683	503.3	10/26/2022	0.0	12.5	13.0	0.91	0.23	0.05	=
Clearing		SVP263670	871950	1085683	503.3	10/26/2022	0.0	15.5	16.0	0.99	0.25	0.05	=

Table F-1. Soil Sample Results for Radium-226 (Continued)

Group	Station Name	Sample Name	Easting	Northing	Elevation	Collect Date	Cover Depth	Start Depth	End Depth	Result	Error	MDC	VQ
			(ft)		(ft amsl)		(ft bgs)			(pCi/g)			
Clearing	SVP263671	SVP263671	872008	1085582	498.1	10/27/2022	0.0	0.0	0.5	1.08	0.29	0.08	=
Clearing		SVP263672	872008	1085582	498.1	10/27/2022	0.0	1.0	1.5	1.08	0.29	0.08	=
Clearing		SVP263673	872008	1085582	498.1	10/27/2022	0.0	3.0	3.5	0.97	0.25	0.05	=
Clearing		SVP263674	872008	1085582	498.1	10/27/2022	0.0	4.5	5.0	0.96	0.25	0.05	=
Clearing		SVP263675	872008	1085582	498.1	10/27/2022	0.0	7.5	8.0	1.06	0.27	0.05	=
Clearing		SVP263676	872008	1085582	498.1	10/27/2022	0.0	8.5	9.0	0.91	0.23	0.05	=
Clearing		SVP263677	872008	1085582	498.1	10/27/2022	0.0	11.5	12.0	0.91	0.25	0.08	=
Clearing		SVP263678	872008	1085582	498.1	10/27/2022	0.0	13.5	14.0	0.89	0.23	0.05	=
Clearing		SVP263679	872008	1085582	498.1	10/27/2022	0.0	15.0	15.5	0.91	0.23	0.05	=
Clearing	SVP263680	SVP263680	872049	1085480	497.1	10/27/2022	0.0	0.0	0.5	0.78	0.22	0.08	=
Clearing		SVP263681	872049	1085480	497.1	10/27/2022	0.0	1.0	1.5	0.93	0.25	0.08	=
Clearing		SVP263682	872049	1085480	497.1	10/27/2022	0.0	2.5	3.0	0.87	0.24	0.09	=
Clearing		SVP263683	872049	1085480	497.1	10/27/2022	0.0	5.5	6.0	0.82	0.22	0.06	=
Clearing		SVP263684	872049	1085480	497.1	10/27/2022	0.0	6.0	6.5	0.86	0.23	0.05	=
Clearing		SVP263685	872049	1085480	497.1	10/27/2022	0.0	9.5	10.0	1.08	0.28	0.06	=
Clearing		SVP263686	872049	1085480	497.1	10/27/2022	0.0	11.0	11.5	1.10	0.28	0.06	=
Clearing		SVP263687	872049	1085480	497.1	10/27/2022	0.0	12.5	13.0	0.88	0.22	0.05	=
Clearing		SVP263688	872049	1085480	497.1	10/27/2022	0.0	14.8	15.3	0.88	0.23	0.05	=
Clearing		SVP263689	872049	1085480	497.1	10/27/2022	0.0	16.7	17.2	0.87	0.23	0.05	=
Clearing		SVP263690	872049	1085480	497.1	10/27/2022	0.0	18.1	18.6	0.82	0.21	0.05	=
Clearing		SVP263691	872049	1085480	497.1	10/27/2022	0.0	21.0	21.5	0.94	0.24	0.05	=
Clearing		SVP263692	872049	1085480	497.1	10/27/2022	0.0	21.5	22.0	1.00	0.25	0.05	=

Table F-1. Soil Sample Results for Radium-226 (Continued)

Group	Station Name	Sample Name	Easting	Northing	Elevation	Collect Date	Cover Depth	Start Depth	End Depth	Result	Error	MDC	VQ
			(ft)		(ft amsl)		(ft bgs)			(pCi/g)			
Clearing	SVP263693	SVP263693	872124	1085582	498.3	10/27/2022	0.0	0.0	0.5	1.00	0.27	0.07	=
Clearing		SVP263694	872124	1085582	498.3	10/27/2022	0.0	1.0	1.5	1.12	0.28	0.06	=
Clearing		SVP263695	872124	1085582	498.3	10/27/2022	0.0	3.0	3.5	1.06	0.26	0.05	=
Clearing		SVP263696	872124	1085582	498.3	10/27/2022	0.0	5.0	5.5	0.99	0.25	0.06	=
Clearing		SVP263697	872124	1085582	498.3	10/27/2022	0.0	6.0	6.5	0.93	0.23	0.05	=
Clearing		SVP263698	872124	1085582	498.3	10/27/2022	0.0	9.5	10.0	0.85	0.22	0.05	=
Clearing		SVP263699	872124	1085582	498.3	10/27/2022	0.0	10.8	11.3	0.96	0.25	0.05	=
Clearing		SVP263700	872124	1085582	498.3	10/27/2022	0.0	13.0	13.5	0.85	0.22	0.05	=
Clearing		SVP263701	872124	1085582	498.3	10/27/2022	0.0	14.0	14.5	0.90	0.23	0.05	=
Clearing		SVP263702	872124	1085582	498.3	10/27/2022	0.0	17.1	17.6	0.95	0.24	0.05	=
Clearing		SVP263703	872124	1085582	498.3	10/27/2022	0.0	18.0	18.5	0.98	0.25	0.05	=
Clearing		SVP263704	872124	1085582	498.3	10/27/2022	0.0	20.5	21.0	1.19	0.30	0.05	=
Clearing		SVP263705	872124	1085582	498.3	10/27/2022	0.0	22.5	23.0	1.00	0.25	0.05	=
Clearing	SVP263706	SVP263706	872066	1085683	504.5	10/27/2022	0.0	0.0	0.5	1.06	0.28	0.08	=
Clearing		SVP263707	872066	1085683	504.5	10/27/2022	0.0	1.0	1.5	1.03	0.27	0.06	=
Clearing		SVP263708	872066	1085683	504.5	10/27/2022	0.0	3.0	3.5	1.21	0.31	0.06	=
Clearing		SVP263709	872066	1085683	504.5	10/27/2022	0.0	5.5	6.0	1.06	0.27	0.05	=
Clearing		SVP263710	872066	1085683	504.5	10/27/2022	0.0	6.5	7.0	1.10	0.28	0.05	=
Clearing		SVP263711	872066	1085683	504.5	10/27/2022	0.0	9.0	9.5	1.02	0.26	0.05	=
Clearing		SVP263712	872066	1085683	504.5	10/27/2022	0.0	10.0	10.5	0.97	0.25	0.05	=
Clearing		SVP263713	872066	1085683	504.5	10/27/2022	0.0	13.0	13.5	1.09	0.28	0.05	=
Clearing		SVP263714	872066	1085683	504.5	10/27/2022	0.0	15.0	15.5	0.93	0.24	0.05	=

Table F-1. Soil Sample Results for Radium-226 (Continued)

Group	Station Name	Sample Name	Easting	Northing	Elevation	Collect Date	Cover Depth	Start Depth	End Depth	Result	Error	MDC	VQ
			(ft)		(ft amsl)		(ft bgs)			(pCi/g)			
Clearing	SVP263715	SVP263715	872181	1085683	501.9	10/28/2022	0.0	0.0	0.5	1.05	0.29	0.09	=
Clearing		SVP263716	872181	1085683	501.9	10/28/2022	0.0	1.5	2.0	1.00	0.27	0.09	=
Clearing		SVP263717	872181	1085683	501.9	10/28/2022	0.0	2.5	3.0	1.09	0.29	0.09	=
Clearing		SVP263718	872181	1085683	501.9	10/28/2022	0.0	4.5	5.0	1.26	0.32	0.06	=
Clearing		SVP263719	872181	1085683	501.9	10/28/2022	0.0	6.0	6.5	1.13	0.29	0.05	=
Clearing		SVP263720	872181	1085683	501.9	10/28/2022	0.0	9.5	10.0	0.96	0.24	0.05	=
Clearing		SVP263721	872181	1085683	501.9	10/28/2022	0.0	11.0	11.5	0.97	0.25	0.05	=
Clearing		SVP263722	872181	1085683	501.9	10/28/2022	0.0	13.5	14.0	0.85	0.22	0.05	=
Clearing		SVP263723	872181	1085683	501.9	10/28/2022	0.0	15.0	15.5	0.81	0.22	0.08	=
Clearing		SVP263724	872181	1085683	501.9	10/28/2022	0.0	16.5	17.0	0.88	0.23	0.05	=
Clearing		SVP263725	872181	1085683	501.9	10/28/2022	0.0	18.5	19.0	0.78	0.21	0.05	=
Clearing		SVP263726	872181	1085683	501.9	10/28/2022	0.0	21.5	22.0	0.80	0.22	0.08	=
Clearing		SVP263727	872181	1085683	501.9	10/28/2022	0.0	23.0	23.5	0.82	0.21	0.05	=
Clearing		SVP263728	872181	1085683	501.9	10/28/2022	0.0	25.5	26.0	0.89	0.23	0.05	=
Clearing		SVP263729	872181	1085683	501.9	10/28/2022	0.0	27.0	27.5	0.91	0.24	0.06	=
Clearing	SVP263730	SVP263730	871936	1085160	492.8	10/28/2022	0.0	0.0	0.5	0.95	0.26	0.08	=
Clearing		SVP263731	871936	1085160	492.8	10/28/2022	0.0	1.0	1.5	1.10	0.28	0.05	=
Clearing		SVP263732	871936	1085160	492.8	10/28/2022	0.0	3.5	4.0	1.04	0.28	0.09	=
Clearing		SVP263733	871936	1085160	492.8	10/28/2022	0.0	5.5	6.0	1.11	0.29	0.07	=
Clearing		SVP263734	871936	1085160	492.8	10/28/2022	0.0	7.0	7.5	1.06	0.27	0.05	=
Clearing		SVP263735	871936	1085160	492.8	10/28/2022	0.0	8.5	9.0	1.07	0.27	0.05	=
Clearing		SVP263736	871936	1085160	492.8	10/28/2022	0.0	11.0	11.5	1.08	0.29	0.08	=
Clearing		SVP263737	871936	1085160	492.8	10/28/2022	0.0	13.0	13.5	1.06	0.27	0.05	=
Clearing		SVP263738	871936	1085160	492.8	10/28/2022	0.0	15.0	15.5	1.24	0.33	0.08	=
Clearing		SVP263739	871936	1085160	492.8	10/28/2022	0.0	17.0	17.5	0.96	0.25	0.05	=
Clearing		SVP263740	871936	1085160	492.8	10/28/2022	0.0	19.0	19.5	1.08	0.29	0.08	=
Clearing		SVP263741	871936	1085160	492.8	10/28/2022	0.0	21.3	21.8	1.02	0.26	0.05	=
Clearing		SVP263742	871936	1085160	492.8	10/28/2022	0.0	22.5	23.0	1.09	0.28	0.05	=

Table F-1. Soil Sample Results for Radium-226 (Continued)

Group	Station Name	Sample Name	Easting	Northing	Elevation	Collect Date	Cover Depth	Start Depth	End Depth	Result	Error	MDC	VQ
			(ft)		(ft amsl)		(ft bgs)			(pCi/g)			
Clearing	SVP263769	SVP263769	872302	1085341	496.4	10/29/2022	0.0	0.0	0.5	1.02	0.27	0.08	=
Clearing		SVP263770	872302	1085341	496.4	10/29/2022	0.0	1.0	1.5	0.96	0.26	0.08	=
Clearing		SVP263771	872302	1085341	496.4	10/29/2022	0.0	2.5	3.0	1.02	0.26	0.06	=
Clearing		SVP263772	872302	1085341	496.4	10/29/2022	0.0	5.0	5.5	1.09	0.28	0.06	=
Clearing		SVP263773	872302	1085341	496.4	10/29/2022	0.0	6.5	7.0	1.04	0.27	0.05	=
Clearing		SVP263774	872302	1085341	496.4	10/29/2022	0.0	8.5	9.0	1.19	0.30	0.06	=
Clearing		SVP263775	872302	1085341	496.4	10/29/2022	0.0	11.0	11.5	1.02	0.26	0.06	=
Clearing		SVP263776	872302	1085341	496.4	10/29/2022	0.0	13.5	14.0	1.15	0.29	0.05	=
Clearing		SVP263777	872302	1085341	496.4	10/29/2022	0.0	15.0	15.5	1.12	0.28	0.05	=
Clearing		SVP263778	872302	1085341	496.4	10/29/2022	0.0	16.5	17.0	1.23	0.31	0.06	=
Clearing		SVP263779	872302	1085341	496.4	10/29/2022	0.0	19.0	19.5	0.95	0.24	0.06	=
Clearing		SVP263780	872302	1085341	496.4	10/29/2022	0.0	21.0	21.5	0.91	0.24	0.05	=
Clearing		SVP263781	872302	1085341	496.4	10/29/2022	0.0	23.0	23.5	0.90	0.23	0.05	=
Clearing	SVP263808	SVP263808	871718	1085683	504.8	10/31/2022	0.0	0.0	0.5	0.95	0.24	0.06	=
Clearing		SVP263809	871718	1085683	504.8	10/31/2022	0.0	1.5	2.0	1.07	0.28	0.10	=
Clearing		SVP263810	871718	1085683	504.8	10/31/2022	0.0	3.5	4.0	1.07	0.27	0.05	=
Clearing		SVP263811	871718	1085683	504.8	10/31/2022	0.0	5.5	6.0	1.15	0.30	0.09	=
Clearing		SVP263812	871718	1085683	504.8	10/31/2022	0.0	7.5	8.0	1.07	0.27	0.05	=
Clearing		SVP263813	871718	1085683	504.8	10/31/2022	0.0	9.0	9.5	0.93	0.23	0.05	=
Clearing		SVP263814	871718	1085683	504.8	10/31/2022	0.0	10.0	10.5	0.86	0.22	0.05	=
Clearing		SVP263815	871718	1085683	504.8	10/31/2022	0.0	13.5	14.0	0.99	0.25	0.05	=
Clearing		SVP263816	871718	1085683	504.8	10/31/2022	0.0	15.0	15.5	1.00	0.25	0.05	=

Table F-1. Soil Sample Results for Radium-226 (Continued)

Group	Station Name	Sample Name	Easting	Northing	Elevation	Collect Date	Cover Depth	Start Depth	End Depth	Result	Error	MDC	VQ
			(ft)		(ft amsl)		(ft bgs)			(pCi/g)			
Clearing	SVP263817	SVP263817	871769	1085790	506.4	10/31/2022	0.0	0.0	0.5	0.91	0.24	0.07	=
Clearing		SVP263818	871769	1085790	506.4	10/31/2022	0.0	1.5	2.0	1.03	0.26	0.06	=
Clearing		SVP263819	871769	1085790	506.4	10/31/2022	0.0	3.0	3.5	0.98	0.26	0.08	=
Clearing		SVP263820	871769	1085790	506.4	10/31/2022	0.0	5.5	6.0	1.06	0.27	0.06	=
Clearing		SVP263821	871769	1085790	506.4	10/31/2022	0.0	6.5	7.0	1.02	0.26	0.06	=
Clearing		SVP263822	871769	1085790	506.4	10/31/2022	0.0	9.0	9.5	0.90	0.23	0.05	=
Clearing		SVP263823	871769	1085790	506.4	10/31/2022	0.0	10.5	11.0	1.10	0.27	0.05	=
Clearing		SVP263824	871769	1085790	506.4	10/31/2022	0.0	13.0	13.5	0.90	0.23	0.05	=
Clearing		SVP263825	871769	1085790	506.4	10/31/2022	0.0	14.7	15.2	1.08	0.27	0.06	=
Clearing	SVP263826	SVP263826	871882	1085771	506.8	10/31/2022	0.0	0.0	0.5	0.94	0.25	0.08	=
Clearing		SVP263827	871882	1085771	506.8	10/31/2022	0.0	1.5	2.0	1.12	0.28	0.05	=
Clearing		SVP263828	871882	1085771	506.8	10/31/2022	0.0	3.5	4.0	1.32	0.33	0.05	=
Clearing		SVP263829	871882	1085771	506.8	10/31/2022	0.0	5.5	6.0	1.20	0.30	0.06	=
Clearing		SVP263830	871882	1085771	506.8	10/31/2022	0.0	7.5	8.0	1.16	0.30	0.05	=
Clearing		SVP263831	871882	1085771	506.8	10/31/2022	0.0	9.0	9.5	0.99	0.25	0.04	=
Clearing		SVP263832	871882	1085771	506.8	10/31/2022	0.0	11.0	11.5	1.02	0.26	0.05	=
Clearing		SVP263833	871882	1085771	506.8	10/31/2022	0.0	13.5	14.0	0.98	0.25	0.05	=
Clearing		SVP263834	871882	1085771	506.8	10/31/2022	0.0	14.5	15.0	0.90	0.23	0.05	=
Clearing	SVP263835	SVP263835	871781	1085994	510.5	10/31/2022	0.0	0.0	0.5	0.97	0.27	0.09	=
Clearing		SVP263836	871781	1085994	510.5	10/31/2022	0.0	1.0	1.5	1.14	0.31	0.09	=
Clearing		SVP263837	871781	1085994	510.5	10/31/2022	0.0	3.2	3.7	1.40	0.36	0.06	=
Clearing		SVP263838	871781	1085994	510.5	10/31/2022	0.0	5.5	6.0	1.12	0.29	0.05	=
Clearing		SVP263839	871781	1085994	510.5	10/31/2022	0.0	6.0	6.5	1.21	0.30	0.06	=
Clearing		SVP263840	871781	1085994	510.5	10/31/2022	0.0	9.5	10.0	1.04	0.26	0.05	=
Clearing		SVP263841	871781	1085994	510.5	10/31/2022	0.0	11.0	11.5	1.01	0.26	0.05	=
Clearing		SVP263842	871781	1085994	510.5	10/31/2022	0.0	12.5	13.0	0.89	0.23	0.05	=
Clearing		SVP263843	871781	1085994	510.5	10/31/2022	0.0	14.5	15.0	0.91	0.23	0.06	=

Table F-1. Soil Sample Results for Radium-226 (Continued)

Group	Station Name	Sample Name	Easting (ft)	Northing (ft)	Elevation (ft amsl)	Collect Date	Cover Depth (ft bgs)	Start Depth (ft bgs)	End Depth (ft bgs)	Result (pCi/g)	Error (pCi/g)	MDC (pCi/g)	VQ
Clearing	SVP263844	SVP263844	872008	1085784	506.5	11/1/2022	0.0	0.0	0.5	1.00	0.27	0.08	=
Clearing	SVP263844	SVP263845	872008	1085784	506.5	11/1/2022	0.0	1.5	2.0	1.10	0.28	0.06	=
Clearing	SVP263844	SVP263846	872008	1085784	506.5	11/1/2022	0.0	3.5	4.0	1.05	0.28	0.08	=
Clearing	SVP263844	SVP263847	872008	1085784	506.5	11/1/2022	0.0	5.5	6.0	1.14	0.29	0.06	=
Clearing	SVP263844	SVP263848	872008	1085784	506.5	11/1/2022	0.0	7.0	7.5	1.01	0.27	0.09	=
Clearing	SVP263844	SVP263849	872008	1085784	506.5	11/1/2022	0.0	9.0	9.5	1.11	0.28	0.06	=
Clearing	SVP263844	SVP263850	872008	1085784	506.5	11/1/2022	0.0	11.0	11.5	0.96	0.25	0.05	=
Clearing	SVP263844	SVP263851	872008	1085784	506.5	11/1/2022	0.0	13.5	14.0	0.93	0.24	0.04	=
Clearing	SVP263844	SVP263852	872008	1085784	506.5	11/1/2022	0.0	15.5	16.0	0.93	0.24	0.05	=
Clearing	SVP263853	SVP263853	872066	1085885	507.4	11/1/2022	0.0	0.0	0.5	0.98	0.26	0.08	=
Clearing	SVP263853	SVP263854	872066	1085885	507.4	11/1/2022	0.0	1.5	2.0	0.87	0.23	0.07	=
Clearing	SVP263853	SVP263855	872066	1085885	507.4	11/1/2022	0.0	3.0	3.5	1.09	0.28	0.06	=
Clearing	SVP263853	SVP263856	872066	1085885	507.4	11/1/2022	0.0	5.5	6.0	1.02	0.26	0.05	=
Clearing	SVP263853	SVP263857	872066	1085885	507.4	11/1/2022	0.0	7.5	8.0	0.93	0.24	0.06	=
Clearing	SVP263853	SVP263858	872066	1085885	507.4	11/1/2022	0.0	9.5	10.0	1.16	0.29	0.05	=
Clearing	SVP263853	SVP263859	872066	1085885	507.4	11/1/2022	0.0	11.0	11.5	0.95	0.25	0.05	=
Clearing	SVP263853	SVP263860	872066	1085885	507.4	11/1/2022	0.0	13.5	14.0	0.97	0.24	0.05	=
Clearing	SVP263853	SVP263861	872066	1085885	507.4	11/1/2022	0.0	15.0	15.5	0.93	0.23	0.05	=
Clearing	SVP263862	SVP263862	872124	1085986	507.8	11/1/2022	0.0	0.0	0.5	1.07	0.29	0.08	=
Clearing	SVP263862	SVP263863	872124	1085986	507.8	11/1/2022	0.0	1.5	2.0	1.25	0.31	0.05	=
Clearing	SVP263862	SVP263864	872124	1085986	507.8	11/1/2022	0.0	3.2	3.7	1.19	0.30	0.06	=
Clearing	SVP263862	SVP263865	872124	1085986	507.8	11/1/2022	0.0	5.5	6.0	1.14	0.29	0.06	=
Clearing	SVP263862	SVP263866	872124	1085986	507.8	11/1/2022	0.0	7.5	8.0	1.14	0.29	0.05	=
Clearing	SVP263862	SVP263867	872124	1085986	507.8	11/1/2022	0.0	9.0	9.5	0.99	0.25	0.06	=
Clearing	SVP263862	SVP263868	872124	1085986	507.8	11/1/2022	0.0	11.5	12.0	1.15	0.29	0.05	=
Clearing	SVP263862	SVP263869	872124	1085986	507.8	11/1/2022	0.0	13.5	14.0	1.03	0.26	0.06	=
Clearing	SVP263862	SVP263870	872124	1085986	507.8	11/1/2022	0.0	15.0	15.5	1.01	0.26	0.06	=

Table F-1. Soil Sample Results for Radium-226 (Continued)

Group	Station Name	Sample Name	Easting	Northing	Elevation	Collect Date	Cover Depth	Start Depth	End Depth	Result	Error	MDC	VQ
			(ft)		(ft amsl)		(ft bgs)			(pCi/g)			
Clearing	SVP263871	SVP263871	872291	1086080	504.1	11/1/2022	0.0	0.0	0.5	1.08	0.29	0.09	=
Clearing		SVP263872	872291	1086080	504.1	11/1/2022	0.0	1.0	1.5	1.03	0.26	0.06	=
Clearing		SVP263873	872291	1086080	504.1	11/1/2022	0.0	3.5	4.0	1.18	0.30	0.06	=
Clearing		SVP263874	872291	1086080	504.1	11/1/2022	0.0	5.5	6.0	1.23	0.31	0.06	=
Clearing		SVP263875	872291	1086080	504.1	11/1/2022	0.0	7.5	8.0	1.09	0.27	0.06	=
Clearing		SVP263876	872291	1086080	504.1	11/1/2022	0.0	9.5	10.0	0.94	0.24	0.05	=
Clearing		SVP263877	872291	1086080	504.1	11/1/2022	0.0	10.5	11.0	0.92	0.23	0.05	=
Clearing		SVP263878	872291	1086080	504.1	11/1/2022	0.0	13.5	14.0	0.84	0.22	0.05	=
Clearing		SVP263879	872291	1086080	504.1	11/1/2022	0.0	14.8	15.3	1.22	0.30	0.06	=
Clearing	SVP263880	SVP263880	872182	1085885	506.1	11/1/2022	0.0	0.0	0.5	1.01	0.26	0.06	=
Clearing		SVP263881	872182	1085885	506.1	11/1/2022	0.0	1.0	1.5	1.02	0.27	0.10	=
Clearing		SVP263882	872182	1085885	506.1	11/1/2022	0.0	3.5	4.0	1.05	0.28	0.09	=
Clearing		SVP263883	872182	1085885	506.1	11/1/2022	0.0	5.5	6.0	1.03	0.26	0.05	=
Clearing		SVP263884	872182	1085885	506.1	11/1/2022	0.0	7.5	8.0	1.05	0.27	0.05	=
Clearing		SVP263885	872182	1085885	506.1	11/1/2022	0.0	9.5	10.0	1.01	0.26	0.06	=
Clearing		SVP263886	872182	1085885	506.1	11/1/2022	0.0	11.5	12.0	0.96	0.25	0.08	=
Clearing		SVP263887	872182	1085885	506.1	11/1/2022	0.0	12.5	13.0	0.99	0.26	0.05	=
Clearing		SVP263888	872182	1085885	506.1	11/1/2022	0.0	14.5	15.0	0.85	0.22	0.05	=

Table F-1. Soil Sample Results for Radium-226 (Continued)

Group	Station Name	Sample Name	Easting	Northing	Elevation	Collect Date	Cover Depth	Start Depth	End Depth	Result	Error	MDC	VQ
			(ft)		(ft amsl)		(ft bgs)			(pCi/g)			
Clearing	SVP263889	SVP263889	872241	1085783	504.3	11/2/2022	0.0	0.0	0.5	1.02	0.27	0.09	=
Clearing		SVP263890	872241	1085783	504.3	11/2/2022	0.0	0.5	1.0	1.19	0.30	0.06	=
Clearing		SVP263891	872241	1085783	504.3	11/2/2022	0.0	3.5	4.0	1.11	0.28	0.05	=
Clearing		SVP263892	872241	1085783	504.3	11/2/2022	0.0	4.5	5.0	1.18	0.30	0.06	=
Clearing		SVP263893	872241	1085783	504.3	11/2/2022	0.0	6.5	7.0	0.99	0.25	0.05	=
Clearing		SVP263894	872241	1085783	504.3	11/2/2022	0.0	9.5	10.0	0.98	0.25	0.05	=
Clearing		SVP263895	872241	1085783	504.3	11/2/2022	0.0	10.5	11.0	1.01	0.26	0.05	=
Clearing		SVP263896	872241	1085783	504.3	11/2/2022	0.0	13.5	14.0	0.99	0.25	0.05	=
Clearing		SVP263897	872241	1085783	504.3	11/2/2022	0.0	15.0	15.5	1.06	0.26	0.05	=
Clearing		SVP263898	872241	1085783	504.3	11/2/2022	0.0	17.5	18.0	1.09	0.28	0.05	=
Clearing		SVP263899	872241	1085783	504.3	11/2/2022	0.0	18.0	18.5	1.20	0.31	0.06	=
Clearing		SVP263900	872241	1085783	504.3	11/2/2022	0.0	21.0	21.5	1.05	0.26	0.05	=
Clearing		SVP263901	872241	1085783	504.3	11/2/2022	0.0	22.5	23.0	1.10	0.28	0.06	=
Clearing		SVP263902	872241	1085783	504.3	11/2/2022	0.0	25.5	26.0	1.07	0.27	0.06	=
Clearing		SVP263903	872241	1085783	504.3	11/2/2022	0.0	27.0	27.5	1.01	0.26	0.06	=
Clearing	SVP263904	SVP263904	872356	1085986	499.0	11/2/2022	0.0	0.0	0.5	1.16	0.31	0.07	=
Clearing		SVP263905	872356	1085986	499.0	11/2/2022	0.0	1.5	2.0	1.25	0.32	0.07	=
Clearing		SVP263906	872356	1085986	499.0	11/2/2022	0.0	2.5	3.0	1.19	0.30	0.05	=
Clearing		SVP263907	872356	1085986	499.0	11/2/2022	0.0	4.5	5.0	1.32	0.33	0.05	=
Clearing		SVP263908	872356	1085986	499.0	11/2/2022	0.0	7.5	8.0	1.46	0.38	0.09	=
Clearing		SVP263909	872356	1085986	499.0	11/2/2022	0.0	9.0	9.5	1.20	0.30	0.05	=
Clearing		SVP263910	872356	1085986	499.0	11/2/2022	0.0	10.5	11.0	1.09	0.28	0.05	=
Clearing		SVP263911	872356	1085986	499.0	11/2/2022	0.0	13.0	13.5	1.08	0.27	0.05	=
Clearing		SVP263912	872356	1085986	499.0	11/2/2022	0.0	14.5	15.0	0.98	0.25	0.05	=
Clearing		SVP263913	872356	1085986	499.0	11/2/2022	0.0	17.5	18.0	1.35	0.34	0.06	=
Clearing		SVP263914	872356	1085986	499.0	11/2/2022	0.0	19.0	19.5	1.05	0.26	0.06	=
Clearing		SVP263915	872356	1085986	499.0	11/2/2022	0.0	21.5	22.0	1.08	0.27	0.05	=
Clearing		SVP263916	872356	1085986	499.0	11/2/2022	0.0	23.0	23.5	1.01	0.26	0.05	=
Clearing		SVP263917	872356	1085986	499.0	11/2/2022	0.0	25.0	25.5	0.99	0.25	0.05	=
Clearing		SVP263918	872356	1085986	499.0	11/2/2022	0.0	26.0	26.5	1.00	0.26	0.05	=

Table F-1. Soil Sample Results for Radium-226 (Continued)

Group	Station Name	Sample Name	Easting	Northing	Elevation	Collect Date	Cover Depth	Start Depth	End Depth	Result	Error	MDC	VQ
			(ft)		(ft amsl)		(ft bgs)			(pCi/g)			
Clearing	SVP263919	SVP263919	872481	1085831	490.9	11/2/2022	0.0	0.0	0.5	0.81	0.22	0.07	=
Clearing		SVP263920	872481	1085831	490.9	11/2/2022	0.0	1.5	2.0	1.06	0.27	0.05	=
Clearing		SVP263921	872481	1085831	490.9	11/2/2022	0.0	3.0	3.5	1.05	0.27	0.06	=
Clearing		SVP263922	872481	1085831	490.9	11/2/2022	0.0	4.8	5.3	0.97	0.25	0.05	=
Clearing		SVP263923	872481	1085831	490.9	11/2/2022	0.0	7.0	7.5	0.98	0.25	0.05	=
Clearing		SVP263924	872481	1085831	490.9	11/2/2022	0.0	9.5	10.0	1.03	0.26	0.05	=
Clearing		SVP263925	872481	1085831	490.9	11/2/2022	0.0	11.0	11.5	1.06	0.28	0.09	=
Clearing		SVP263926	872481	1085831	490.9	11/2/2022	0.0	13.0	13.5	1.13	0.29	0.05	=
Clearing		SVP263927	872481	1085831	490.9	11/2/2022	0.0	14.0	14.5	1.08	0.28	0.06	=
Clearing		SVP263928	872481	1085831	490.9	11/2/2022	0.0	17.0	17.5	1.01	0.26	0.05	=
Clearing		SVP263929	872481	1085831	490.9	11/2/2022	0.0	19.0	19.5	0.88	0.23	0.06	=
Clearing	SVP263984	SVP263984	871945	1085739	506.0	11/3/2022	0.0	0.0	0.5	1.10	0.30	0.09	=
Clearing		SVP263985	871945	1085739	506.0	11/3/2022	0.0	1.0	1.5	1.24	0.32	0.06	=
Clearing	SVP264000	SVP264000	871665	1085778	504.6	10/31/2022	0.0	0.5	1.0	0.80	0.21	0.04	=
Clearing		SVP264001	871665	1085778	504.6	10/31/2022	0.0	1.0	1.5	1.17	0.30	0.06	=
Clearing		SVP264002	871665	1085778	504.6	10/31/2022	0.0	2.0	2.5	1.25	0.32	0.06	=
Clearing		SVP264003	871665	1085778	504.6	10/31/2022	0.0	5.0	5.5	1.36	0.34	0.05	=
Clearing		SVP264004	871665	1085778	504.6	10/31/2022	0.0	7.0	7.5	1.09	0.28	0.05	=
Clearing		SVP264005	871665	1085778	504.6	10/31/2022	0.0	8.5	9.0	0.98	0.25	0.05	=
Clearing		SVP264006	871665	1085778	504.6	10/31/2022	0.0	10.5	11.0	1.12	0.29	0.06	=
Clearing		SVP264007	871665	1085778	504.6	10/31/2022	0.0	12.5	13.0	1.12	0.29	0.06	=
Clearing		SVP264008	871665	1085778	504.6	10/31/2022	0.0	14.0	14.5	1.00	0.25	0.05	=

Table F-1. Soil Sample Results for Radium-226 (Continued)

Group	Station Name	Sample Name	Easting	Northing	Elevation	Collect Date	Cover Depth	Start Depth	End Depth	Result	Error	MDC	VQ
			(ft)		(ft amsl)		(ft bgs)			(pCi/g)			
Clearing	SVP264009	SVP264009	871722	1085882	507.3	10/31/2022	0.0	1.0	1.5	1.22	0.31	0.06	=
Clearing		SVP264010	871722	1085882	507.3	10/31/2022	0.0	1.5	2.0	1.20	0.31	0.06	=
Clearing		SVP264011	871722	1085882	507.3	10/31/2022	0.0	2.5	3.0	1.18	0.30	0.06	=
Clearing		SVP264012	871722	1085882	507.3	10/31/2022	0.0	5.5	6.0	1.03	0.26	0.05	=
Clearing		SVP264013	871722	1085882	507.3	10/31/2022	0.0	6.5	7.0	0.96	0.25	0.05	=
Clearing		SVP264014	871722	1085882	507.3	10/31/2022	0.0	9.0	9.5	0.99	0.25	0.05	=
Clearing		SVP264015	871722	1085882	507.3	10/31/2022	0.0	10.5	11.0	0.94	0.24	0.05	=
Clearing		SVP264016	871722	1085882	507.3	10/31/2022	0.0	12.0	12.5	1.08	0.28	0.06	=
Clearing		SVP264017	871722	1085882	507.3	10/31/2022	0.0	14.0	14.5	0.98	0.25	0.05	=
Clearing	SVP264018	SVP264018	871834	1085885	507.7	10/31/2022	0.0	1.0	1.5	1.09	0.28	0.05	=
Clearing		SVP264019	871834	1085885	507.7	10/31/2022	0.0	1.5	2.0	1.17	0.30	0.05	=
Clearing		SVP264020	871834	1085885	507.7	10/31/2022	0.0	2.0	2.5	1.32	0.33	0.05	=
Clearing		SVP264021	871834	1085885	507.7	10/31/2022	0.0	5.5	6.0	0.99	0.25	0.05	=
Clearing		SVP264022	871834	1085885	507.7	10/31/2022	0.0	6.5	7.0	1.11	0.28	0.05	=
Clearing		SVP264023	871834	1085885	507.7	10/31/2022	0.0	9.0	9.5	0.97	0.25	0.05	=
Clearing		SVP264024	871834	1085885	507.7	10/31/2022	0.0	11.5	12.0	0.99	0.25	0.05	=
Clearing		SVP264025	871834	1085885	507.7	10/31/2022	0.0	12.5	13.0	0.98	0.25	0.04	=
Clearing		SVP264026	871834	1085885	507.7	10/31/2022	0.0	15.0	15.5	0.87	0.22	0.05	=
Clearing	SVP264027	SVP264027	871842	1086081	509.8	10/31/2022	0.0	0.7	1.2	1.00	0.26	0.05	=
Clearing		SVP264028	871842	1086081	509.8	10/31/2022	0.0	1.5	2.0	1.19	0.31	0.09	=
Clearing		SVP264029	871842	1086081	509.8	10/31/2022	0.0	2.5	3.0	1.23	0.31	0.06	=
Clearing		SVP264032	871842	1086081	509.8	10/31/2022	0.0	4.5	5.0	1.05	0.27	0.06	=
Clearing		SVP264033	871842	1086081	509.8	10/31/2022	0.0	7.0	7.5	0.90	0.23	0.05	=
Clearing		SVP264030	871842	1086081	509.8	10/31/2022	0.0	8.5	9.0	0.76	0.19	0.05	=
Clearing		SVP264031	871842	1086081	509.8	10/31/2022	0.0	10.5	11.0	0.94	0.24	0.05	=
Clearing		SVP264034	871842	1086081	509.8	10/31/2022	0.0	13.5	14.0	0.82	0.21	0.05	=
Clearing		SVP264035	871842	1086081	509.8	10/31/2022	0.0	15.0	15.5	0.93	0.23	0.05	=

Table F-1. Soil Sample Results for Radium-226 (Continued)

Group	Station Name	Sample Name	Easting	Northing	Elevation	Collect Date	Cover Depth	Start Depth	End Depth	Result	Error	MDC	VQ
			(ft)		(ft amsl)		(ft bgs)			(pCi/g)			
Clearing	SVP264036	SVP264036	871912	1086172	510.2	11/1/2022	0.0	1.0	1.5	1.02	0.27	0.06	=
Clearing		SVP264037	871912	1086172	510.2	11/1/2022	0.0	1.5	2.0	1.01	0.26	0.06	=
Clearing		SVP264038	871912	1086172	510.2	11/1/2022	0.0	2.0	2.5	0.97	0.25	0.05	=
Clearing		SVP264039	871912	1086172	510.2	11/1/2022	0.0	4.5	5.0	0.96	0.25	0.05	=
Clearing		SVP264040	871912	1086172	510.2	11/1/2022	0.0	7.0	7.5	0.88	0.23	0.05	=
Clearing		SVP264041	871912	1086172	510.2	11/1/2022	0.0	9.0	9.5	0.86	0.22	0.05	=
Clearing		SVP264042	871912	1086172	510.2	11/1/2022	0.0	10.3	10.8	1.04	0.27	0.06	=
Clearing		SVP264043	871912	1086172	510.2	11/1/2022	0.0	13.0	13.5	0.90	0.23	0.05	=
Clearing		SVP264044	871912	1086172	510.2	11/1/2022	0.0	14.5	15.0	1.09	0.28	0.06	=
Clearing	SVP264045	SVP264045	872053	1086271	509.6	11/1/2022	0.0	0.0	0.5	0.94	0.26	0.08	=
Clearing		SVP264046	872053	1086271	509.6	11/1/2022	0.0	1.0	1.5	1.24	0.32	0.07	=
Clearing		SVP264047	872053	1086271	509.6	11/1/2022	0.0	3.5	4.0	1.23	0.31	0.06	=
Clearing		SVP264048	872053	1086271	509.6	11/1/2022	0.0	4.5	5.0	1.11	0.28	0.06	=
Clearing		SVP264049	872053	1086271	509.6	11/1/2022	0.0	7.0	7.5	1.13	0.29	0.06	=
Clearing		SVP264050	872053	1086271	509.6	11/1/2022	0.0	9.0	9.5	0.97	0.25	0.05	=
Clearing		SVP264051	872053	1086271	509.6	11/1/2022	0.0	10.0	10.5	1.14	0.28	0.06	=
Clearing		SVP264052	872053	1086271	509.6	11/1/2022	0.0	13.5	14.0	0.96	0.24	0.05	=
Clearing		SVP264053	872053	1086271	509.6	11/1/2022	0.0	15.5	16.0	1.02	0.26	0.06	=
Clearing	SVP264054	SVP264054	872111	1086193	508.8	11/1/2022	0.0	0.0	0.5	0.86	0.24	0.08	=
Clearing		SVP264055	872111	1086193	508.8	11/1/2022	0.0	1.5	2.0	1.08	0.27	0.05	=
Clearing		SVP264056	872111	1086193	508.8	11/1/2022	0.0	2.0	2.5	1.06	0.27	0.05	=
Clearing		SVP264057	872111	1086193	508.8	11/1/2022	0.0	5.5	6.0	1.01	0.26	0.05	=
Clearing		SVP264058	872111	1086193	508.8	11/1/2022	0.0	9.0	9.5	1.05	0.27	0.05	=
Clearing		SVP264059	872111	1086193	508.8	11/1/2022	0.0	10.0	10.5	0.98	0.26	0.08	=
Clearing		SVP264060	872111	1086193	508.8	11/1/2022	0.0	13.5	14.0	1.03	0.26	0.05	=
Clearing		SVP264061	872111	1086193	508.8	11/1/2022	0.0	15.0	15.5	1.03	0.26	0.05	=

Table F-1. Soil Sample Results for Radium-226 (Continued)

Group	Station Name	Sample Name	Easting	Northing	Elevation	Collect Date	Cover Depth	Start Depth	End Depth	Result	Error	MDC	VQ
			(ft)		(ft amsl)		(ft bgs)			(pCi/g)			
Clearing	SVP264062	SVP264062	872182	1086087	508.2	11/1/2022	0.0	0.7	1.2	1.13	0.29	0.05	=
Clearing		SVP264063	872182	1086087	508.2	11/1/2022	0.0	1.5	2.0	1.17	0.31	0.09	=
Clearing		SVP264064	872182	1086087	508.2	11/1/2022	0.0	3.0	3.5	1.17	0.30	0.06	=
Clearing		SVP264065	872182	1086087	508.2	11/1/2022	0.0	5.0	5.5	1.12	0.28	0.05	=
Clearing		SVP264066	872182	1086087	508.2	11/1/2022	0.0	6.5	7.0	1.06	0.27	0.05	=
Clearing		SVP264067	872182	1086087	508.2	11/1/2022	0.0	9.5	10.0	1.06	0.27	0.05	=
Clearing		SVP264068	872182	1086087	508.2	11/1/2022	0.0	10.5	11.0	1.02	0.26	0.05	=
Clearing		SVP264069	872182	1086087	508.2	11/1/2022	0.0	13.5	14.0	1.03	0.26	0.05	=
Clearing		SVP264070	872182	1086087	508.2	11/1/2022	0.0	14.0	14.5	0.95	0.24	0.05	=
Clearing	SVP264071	SVP264071	872240	1085986	506.0	11/1/2022	0.0	0.0	0.5	1.25	0.33	0.09	=
Clearing		SVP264072	872240	1085986	506.0	11/1/2022	0.0	1.5	2.0	1.35	0.34	0.05	=
Clearing		SVP264073	872240	1085986	506.0	11/1/2022	0.0	2.5	3.0	1.31	0.33	0.06	=
Clearing		SVP264074	872240	1085986	506.0	11/1/2022	0.0	5.5	6.0	1.26	0.32	0.06	=
Clearing		SVP264075	872240	1085986	506.0	11/1/2022	0.0	6.0	6.5	1.27	0.32	0.05	=
Clearing		SVP264076	872240	1085986	506.0	11/1/2022	0.0	8.5	9.0	1.25	0.31	0.05	=
Clearing		SVP264077	872240	1085986	506.0	11/1/2022	0.0	11.5	12.0	1.22	0.31	0.06	=
Clearing		SVP264078	872240	1085986	506.0	11/1/2022	0.0	12.5	13.0	1.01	0.26	0.05	=
Clearing		SVP264079	872240	1085986	506.0	11/1/2022	0.0	15.0	15.5	1.04	0.27	0.06	=

Table F-1. Soil Sample Results for Radium-226 (Continued)

Group	Station Name	Sample Name	Easting	Northing	Elevation	Collect Date	Cover Depth	Start Depth	End Depth	Result	Error	MDC	VQ
			(ft)		(ft amsl)		(ft bgs)			(pCi/g)			
Clearing	SVP264080	SVP264080	872124	1085785	505.6	11/2/2022	0.0	0.0	0.5	1.00	0.28	0.09	=
Clearing		SVP264081	872124	1085785	505.6	11/2/2022	0.0	1.5	2.0	1.17	0.31	0.09	=
Clearing		SVP264082	872124	1085785	505.6	11/2/2022	0.0	3.0	3.5	1.19	0.30	0.06	=
Clearing		SVP264083	872124	1085785	505.6	11/2/2022	0.0	5.0	5.5	1.22	0.30	0.05	=
Clearing		SVP264084	872124	1085785	505.6	11/2/2022	0.0	6.5	7.0	1.20	0.30	0.06	=
Clearing		SVP264085	872124	1085785	505.6	11/2/2022	0.0	8.5	9.0	1.24	0.31	0.05	=
Clearing		SVP264086	872124	1085785	505.6	11/2/2022	0.0	11.0	11.5	1.07	0.27	0.06	=
Clearing		SVP264087	872124	1085785	505.6	11/2/2022	0.0	13.5	14.0	1.03	0.26	0.06	=
Clearing		SVP264088	872124	1085785	505.6	11/2/2022	0.0	14.0	14.5	0.99	0.25	0.05	=
Clearing	SVP264089	SVP264089	872298	1085885	504.9	11/2/2022	0.0	0.0	0.5	1.31	0.34	0.08	=
Clearing		SVP264090	872298	1085885	504.9	11/2/2022	0.0	1.5	2.0	1.44	0.36	0.07	=
Clearing		SVP264091	872298	1085885	504.9	11/2/2022	0.0	2.5	3.0	1.47	0.37	0.06	=
Clearing		SVP264092	872298	1085885	504.9	11/2/2022	0.0	5.0	5.5	1.14	0.29	0.05	=
Clearing		SVP264093	872298	1085885	504.9	11/2/2022	0.0	7.5	8.0	1.26	0.32	0.06	=
Clearing		SVP264094	872298	1085885	504.9	11/2/2022	0.0	8.0	8.5	1.22	0.31	0.05	=
Clearing		SVP264095	872298	1085885	504.9	11/2/2022	0.0	11.0	11.5	1.17	0.29	0.05	=
Clearing		SVP264096	872298	1085885	504.9	11/2/2022	0.0	13.0	13.5	1.14	0.29	0.05	=
Clearing		SVP264097	872298	1085885	504.9	11/2/2022	0.0	14.5	15.0	1.01	0.26	0.05	=
Clearing		SVP264098	872298	1085885	504.9	11/2/2022	0.0	17.5	18.0	1.17	0.30	0.06	=
Clearing		SVP264099	872298	1085885	504.9	11/2/2022	0.0	18.5	19.0	1.10	0.28	0.05	=
Clearing		SVP264100	872298	1085885	504.9	11/2/2022	0.0	20.5	21.0	1.03	0.26	0.05	=
Clearing		SVP264101	872298	1085885	504.9	11/2/2022	0.0	23.0	23.5	1.11	0.28	0.05	=
Clearing		SVP264102	872298	1085885	504.9	11/2/2022	0.0	25.3	25.8	1.01	0.26	0.05	=
Clearing		SVP264103	872298	1085885	504.9	11/2/2022	0.0	26.5	27.0	0.96	0.25	0.05	=

Table F-1. Soil Sample Results for Radium-226 (Continued)

Group	Station Name	Sample Name	Easting	Northing	Elevation	Collect Date	Cover Depth	Start Depth	End Depth	Result	Error	MDC	VQ
			(ft)		(ft amsl)		(ft bgs)			(pCi/g)			
Clearing	SVP264104	SVP264104	872357	1085785	496.2	11/2/2022	0.0	0.0	0.5	1.16	0.30	0.08	=
Clearing		SVP264105	872357	1085785	496.2	11/2/2022	0.0	1.5	2.0	1.31	0.32	0.06	=
Clearing		SVP264106	872357	1085785	496.2	11/2/2022	0.0	3.5	4.0	1.18	0.31	0.09	=
Clearing		SVP264107	872357	1085785	496.2	11/2/2022	0.0	5.5	6.0	1.04	0.27	0.05	=
Clearing		SVP264108	872357	1085785	496.2	11/2/2022	0.0	6.0	6.5	1.11	0.28	0.06	=
Clearing		SVP264109	872357	1085785	496.2	11/2/2022	0.0	9.5	10.0	0.96	0.25	0.05	=
Clearing		SVP264110	872357	1085785	496.2	11/2/2022	0.0	11.0	11.5	1.01	0.26	0.06	=
Clearing		SVP264111	872357	1085785	496.2	11/2/2022	0.0	12.5	13.0	0.86	0.22	0.05	=
Clearing		SVP264112	872357	1085785	496.2	11/2/2022	0.0	15.0	15.5	0.93	0.24	0.05	=
Clearing		SVP264113	872357	1085785	496.2	11/2/2022	0.0	17.0	17.5	0.91	0.23	0.05	=
Clearing		SVP264114	872357	1085785	496.2	11/2/2022	0.0	19.0	19.5	0.87	0.23	0.05	=
Clearing		SVP264115	872357	1085785	496.2	11/2/2022	0.0	20.5	21.0	0.89	0.23	0.05	=
Clearing		SVP264116	872357	1085785	496.2	11/2/2022	0.0	23.0	23.5	0.93	0.24	0.05	=
Clearing	SVP264145	SVP264145	872186	1086151	508.2	11/3/2022	0.0	0.0	0.5	0.75	0.50	0.74	R
Clearing		SVP264146	872186	1086151	508.2	11/3/2022	0.0	0.5	1.0	0.94	0.25	0.07	=
Clearing	SVP264147	SVP264147	872146	1086185	508.7	11/3/2022	0.0	0.0	0.5	0.92	0.25	0.07	=
Clearing		SVP264148	872146	1086185	508.7	11/3/2022	0.0	1.5	2.0	1.21	0.30	0.06	=
Clearing	SVP264149	SVP264149	872005	1086299	510.4	11/3/2022	0.0	0.0	0.5	0.82	0.22	0.06	=
Clearing		SVP264150	872005	1086299	510.4	11/3/2022	0.0	1.0	1.5	1.29	0.33	0.06	=
Clearing	SVP264151	SVP264151	871931	1086143	511.0	11/3/2022	0.0	0.0	0.5	0.62	0.20	0.12	J
Clearing		SVP264152	871931	1086143	511.0	11/3/2022	0.0	1.5	2.0	1.27	0.32	0.05	=
Clearing	SVP264289	SVP264289	871911	1086188	511.0	11/4/2022	0.0	0.0	0.5	0.62	0.22	0.16	J
Clearing		SVP264290	871911	1086188	511.0	11/4/2022	0.0	1.0	1.5	1.20	0.30	0.06	=

Table F-1. Soil Sample Results for Radium-226 (Continued)

Group	Station Name	Sample Name	Easting (ft)	Northing (ft)	Elevation (ft amsl)	Collect Date	Cover Depth (ft bgs)	Start Depth (ft bgs)	End Depth (ft bgs)	Result (pCi/g)	Error (pCi/g)	MDC (pCi/g)	VQ
Clearing	SVP264291	SVP264291	871367	1085483	502.1	11/4/2022	0.0	0.0	0.5	1.21	0.32	0.08	=
Clearing		SVP264292	871367	1085483	502.1	11/4/2022	0.0	1.5	2.0	1.43	0.36	0.06	=
Clearing		SVP264293	871367	1085483	502.1	11/4/2022	0.0	3.5	4.0	1.39	0.34	0.06	=
Clearing		SVP264294	871367	1085483	502.1	11/4/2022	0.0	5.5	6.0	1.38	0.34	0.06	=
Clearing		SVP264295	871367	1085483	502.1	11/4/2022	0.0	6.5	7.0	1.30	0.32	0.05	=
Clearing		SVP264296	871367	1085483	502.1	11/4/2022	0.0	9.0	9.5	1.26	0.32	0.05	=
Clearing		SVP264297	871367	1085483	502.1	11/4/2022	0.0	11.0	11.5	0.92	0.24	0.05	=
Clearing		SVP264298	871367	1085483	502.1	11/4/2022	0.0	13.0	13.5	0.89	0.23	0.05	=
Clearing		SVP264299	871367	1085483	502.1	11/4/2022	0.0	14.5	15.0	0.90	0.23	0.05	=
Clearing	SVP264300	SVP264300	871301	1085398	499.6	11/4/2022	0.0	0.0	0.5	1.06	0.28	0.08	=
Clearing		SVP264301	871301	1085398	499.6	11/4/2022	0.0	1.0	1.5	1.24	0.32	0.06	=
Clearing		SVP264302	871301	1085398	499.6	11/4/2022	0.0	3.5	4.0	1.12	0.28	0.05	=
Clearing		SVP264303	871301	1085398	499.6	11/4/2022	0.0	5.5	6.0	1.15	0.29	0.05	=
Clearing		SVP264304	871301	1085398	499.6	11/4/2022	0.0	7.0	7.5	1.06	0.27	0.05	=
Clearing		SVP264305	871301	1085398	499.6	11/4/2022	0.0	9.0	9.5	1.13	0.29	0.06	=
Clearing		SVP264306	871301	1085398	499.6	11/4/2022	0.0	11.0	11.5	1.16	0.29	0.05	=
Clearing		SVP264307	871301	1085398	499.6	11/4/2022	0.0	12.5	13.0	1.18	0.30	0.06	=
Clearing		SVP264308	871301	1085398	499.6	11/4/2022	0.0	14.0	14.5	1.14	0.29	0.05	=
Woods	SVP190125	SVP190125	871948	1085078	490.1	8/6/2018	0.0	0.0	0.5	1.19	0.31	0.05	=
Woods		SVP190126	871948	1085078	490.1	8/6/2018	0.0	1.5	2.0	1.20	0.31	0.05	=
Woods		SVP190127	871948	1085078	490.1	8/6/2018	0.0	3.5	4.0	1.19	0.30	0.06	=
Woods		SVP190128	871948	1085078	490.1	8/6/2018	0.0	5.5	6.0	1.17	0.30	0.06	=
Woods	SVP190129	SVP190129	872070	1085086	495.6	9/18/2018	0.0	0.0	0.5	1.31	0.33	0.07	=
Woods		SVP190130	872070	1085086	495.6	9/18/2018	0.0	1.0	1.5	1.33	0.34	0.07	=
Woods		SVP190131	872070	1085086	495.6	9/18/2018	0.0	2.0	2.5	1.44	0.37	0.07	=
Woods		SVP190132	872070	1085086	495.6	9/18/2018	0.0	5.5	6.0	1.35	0.35	0.08	=
Woods	SVP190139	SVP190139	871543	1085173	481.0	10/15/2018	0.0	0.0	0.5	1.38	0.38	0.16	=
Woods		SVP190140	871543	1085173	481.0	10/15/2018	0.0	0.5	1.0	1.55	0.39	0.06	=
Woods		SVP190141	871543	1085173	481.0	10/15/2018	0.0	2.0	2.5	1.39	0.35	0.05	=
Woods	SVP190143	SVP190143	871672	1085164	492.3	8/6/2018	0.0	0.0	0.5	1.29	0.33	0.07	=
Woods		SVP190144	871672	1085164	492.3	8/6/2018	0.0	0.5	1.0	1.34	0.35	0.07	=

Table F-1. Soil Sample Results for Radium-226 (Continued)

Group	Station Name	Sample Name	Easting	Northing	Elevation	Collect Date	Cover Depth	Start Depth	End Depth	Result	Error	MDC	VQ
			(ft)		(ft amsl)		(ft bgs)			(pCi/g)			
Woods	SVP190145	SVP190145	871779	1085175	486.6	8/6/2018	0.0	0.0	0.5	1.36	0.35	0.07	=
Woods		SVP190146	871779	1085175	486.6	8/6/2018	0.0	1.0	1.5	1.36	0.35	0.07	=
Woods	SVP190149	SVP190149	872009	1085178	496.2	8/6/2018	0.0	0.0	0.5	1.25	0.33	0.07	=
Woods		SVP190150	872009	1085178	496.2	8/6/2018	0.0	1.5	2.0	1.23	0.32	0.07	=
Woods		SVP190151	872009	1085178	496.2	8/6/2018	0.0	2.5	3.0	1.34	0.34	0.07	=
Woods		SVP190152	872009	1085178	496.2	8/6/2018	0.0	4.0	4.5	1.40	0.35	0.06	=
Woods	SVP190153	SVP190153	872128	1085179	494.7	8/6/2018	0.0	0.0	0.5	1.23	0.31	0.05	=
Woods		SVP190154	872128	1085179	494.7	8/6/2018	0.0	1.5	2.0	1.34	0.33	0.06	=
Woods		SVP190155	872128	1085179	494.7	8/6/2018	0.0	2.0	2.5	1.21	0.31	0.06	=
Woods		SVP190156	872128	1085179	494.7	8/6/2018	0.0	5.0	5.5	1.62	0.40	0.06	=
Woods	SVP190159	SVP190159	871367	1085285	491.6	10/9/2018	0.0	0.0	0.5	1.31	0.33	0.05	=
Woods		SVP190160	871367	1085285	491.6	10/9/2018	0.0	1.0	1.5	1.37	0.34	0.06	=
Woods		SVP206986	871367	1085285	491.6	10/9/2018	0.0	2.5	3.0	1.45	0.36	0.05	=
Woods	SVP190189	SVP190189	872361	1085380	500.1	8/8/2018	0.0	0.0	0.5	1.29	0.33	0.05	=
Woods		SVP190190	872361	1085380	500.1	8/8/2018	0.0	1.0	1.5	1.18	0.30	0.06	=
Woods		SVP190191	872361	1085380	500.1	8/8/2018	0.0	3.5	4.0	1.22	0.31	0.06	=
Woods		SVP190192	872361	1085380	500.1	8/8/2018	0.0	4.0	4.5	1.20	0.31	0.05	=
Woods	SVP190229	SVP190229	872299	1085481	493.2	8/8/2018	0.0	0.0	0.5	1.46	0.37	0.06	=
Woods		SVP190230	872299	1085481	493.2	8/8/2018	0.0	0.5	1.0	1.47	0.38	0.07	=
Woods		SVP190239	872299	1085481	493.2	8/8/2018	0.0	2.0	2.5	1.33	0.34	0.07	=
Woods		SVP190240	872299	1085481	493.2	8/8/2018	0.0	5.5	6.0	1.46	0.37	0.07	=
Woods	SVP190231	SVP190231	872419	1085479	507.0	9/6/2018	0.0	0.0	0.5	1.49	0.37	0.07	=
Woods		SVP190232	872419	1085479	507.0	9/6/2018	0.0	1.0	1.5	1.57	0.39	0.06	=
Woods		SVP190233	872419	1085479	507.0	9/6/2018	0.0	3.5	4.0	1.37	0.34	0.06	=
Woods		SVP190234	872419	1085479	507.0	9/6/2018	0.0	5.5	6.0	1.47	0.37	0.06	=
Woods	SVP190237	SVP190237	872244	1085586	499.2	8/8/2018	0.0	0.0	0.5	1.40	0.36	0.07	=
Woods		SVP190238	872244	1085586	499.2	8/8/2018	0.0	1.0	1.5	1.21	0.32	0.08	=

Table F-1. Soil Sample Results for Radium-226 (Continued)

Group	Station Name	Sample Name	Easting	Northing	Elevation	Collect Date	Cover Depth	Start Depth	End Depth	Result	Error	MDC	VQ
			(ft)		(ft amsl)		(ft bgs)			(pCi/g)			
Woods	SVP190241	SVP190241	872356	1085584	491.9	6/5/2019	0.0	0.0	0.5	1.36	0.37	0.11	=
Woods		SVP190242	872356	1085584	491.9	6/5/2019	0.0	0.5	1.0	1.35	0.36	0.11	=
Woods		SVP211122	872356	1085584	491.9	6/5/2019	0.0	3.0	3.5	1.58	0.42	0.11	=
Woods		SVP211123	872356	1085584	491.9	6/5/2019	0.0	5.0	5.5	1.48	0.39	0.10	=
Woods		SVP211124	872356	1085584	491.9	6/5/2019	0.0	7.5	8.0	1.87	0.49	0.14	=
Woods	SVP190243	SVP190243	872474	1085582	498.1	8/20/2018	0.0	0.0	0.5	1.53	0.39	0.07	=
Woods		SVP190244	872474	1085582	498.1	8/20/2018	0.0	1.5	2.0	1.45	0.36	0.06	=
Woods		SVP190245	872474	1085582	498.1	8/20/2018	0.0	3.0	3.5	1.54	0.39	0.06	=
Woods		SVP190246	872474	1085582	498.1	8/20/2018	0.0	5.5	6.0	1.25	0.32	0.05	=
Woods	SVP190247	SVP190247	872299	1085683	495.9	8/16/2018	0.0	0.0	0.5	1.33	0.33	0.06	=
Woods		SVP190248	872299	1085683	495.9	8/16/2018	0.0	1.0	1.5	1.24	0.31	0.05	=
Woods	SVP190249	SVP190249	872414	1085683	491.0	6/5/2019	0.0	0.0	0.5	1.46	0.39	0.13	=
Woods		SVP190250	872414	1085683	491.0	6/5/2019	0.0	1.0	1.5	1.39	0.37	0.13	=
Woods		SVP211125	872414	1085683	491.0	6/5/2019	0.0	3.5	4.0	1.62	0.42	0.12	=
Woods		SVP211126	872414	1085683	491.0	6/5/2019	0.0	4.5	5.0	1.89	0.48	0.12	=
Woods		SVP211127	872414	1085683	491.0	6/5/2019	0.0	5.5	6.0	1.88	0.49	0.13	=
Woods	SVP190251	SVP190251	872530	1085682	500.1	8/20/2018	0.0	0.0	0.5	1.46	0.37	0.07	=
Woods		SVP190252	872530	1085682	500.1	8/20/2018	0.0	1.0	1.5	1.59	0.41	0.07	=
Woods		SVP190253	872530	1085682	500.1	8/20/2018	0.0	3.0	3.5	1.50	0.37	0.06	=
Woods		SVP190254	872530	1085682	500.1	8/20/2018	0.0	5.5	6.0	1.40	0.35	0.05	=
Woods	SVP190255	SVP190255	872472	1085784	491.1	6/5/2019	0.0	0.0	0.5	1.48	0.38	0.07	=
Woods		SVP190256	872472	1085784	491.1	6/5/2019	0.0	0.5	1.0	1.27	0.34	0.11	=
Woods		SVP190257	872472	1085784	491.1	6/5/2019	0.0	3.5	4.0	1.50	0.39	0.10	=
Woods		SVP190258	872472	1085784	491.1	6/5/2019	0.0	4.5	5.0	1.56	0.41	0.11	=
Woods		SVP211121	872472	1085784	491.1	6/5/2019	0.0	5.0	5.5	1.46	0.39	0.11	=
Woods	SVP190259	SVP190259	872587	1085784	497.1	8/21/2018	0.0	0.0	0.5	1.43	0.36	0.07	=
Woods		SVP190260	872587	1085784	497.1	8/21/2018	0.0	0.5	1.0	1.46	0.37	0.06	=
Woods		SVP190261	872587	1085784	497.1	8/21/2018	0.0	2.0	2.5	1.53	0.38	0.07	=
Woods		SVP190262	872587	1085784	497.1	8/21/2018	0.0	4.0	4.5	1.29	0.32	0.06	=

Table F-1. Soil Sample Results for Radium-226 (Continued)

Group	Station Name	Sample Name	Easting	Northing	Elevation	Collect Date	Cover Depth	Start Depth	End Depth	Result	Error	MDC	VQ
			(ft)		(ft amsl)		(ft bgs)			(pCi/g)			
Woods	SVP190265	SVP190265	872536	1085886	501.8	8/16/2018	0.0	0.0	0.5	1.34	0.34	0.07	=
Woods		SVP190266	872536	1085886	501.8	8/16/2018	0.0	1.5	2.0	1.29	0.32	0.05	=
Woods		SVP205288	872536	1085886	501.8	8/16/2018	0.0	3.0	3.5	1.46	0.38	0.07	=
Woods	SVP190309	SVP190309	871392	1085225	477.3	10/15/2018	0.0	0.0	0.5	1.53	0.38	0.07	=
Woods		SVP190310	871392	1085225	477.3	10/15/2018	0.0	1.5	2.0	1.29	0.32	0.06	=
Woods	SVP190337	SVP190337	871800	1085127	478.4	10/11/2018	0.0	0.0	0.5	1.11	0.29	0.06	=
Woods		SVP190338	871800	1085127	478.4	10/11/2018	0.0	1.0	1.5	1.24	0.33	0.07	=
Woods		SVP206998	871800	1085127	478.4	10/11/2018	0.0	1.5	2.0	1.34	0.33	0.05	=
Woods	SVP190353	SVP190353	871952	1085035	478.0	10/11/2018	0.0	0.0	0.5	1.44	0.36	0.05	=
Woods		SVP190354	871952	1085035	478.0	10/11/2018	0.0	1.0	1.5	1.74	0.43	0.06	=
Woods	SVP190365	SVP190365	872054	1085024	478.7	10/11/2018	0.0	0.0	0.5	1.67	0.41	0.05	=
Woods		SVP190366	872054	1085024	478.7	10/11/2018	0.0	0.5	1.0	1.81	0.45	0.06	=
Woods	SVP201642	SVP201642	872179	1085164	476.8	10/11/2018	0.0	0.0	0.5	0.98	0.26	0.06	=
Woods		SVP201643	872179	1085164	476.8	10/11/2018	0.0	1.5	2.0	1.02	0.27	0.08	=
Woods	SVP201660	SVP201660	872237	1085625	496.0	8/8/2018	0.0	0.0	0.5	1.33	0.34	0.07	=
Woods		SVP201661	872237	1085625	496.0	8/8/2018	0.0	0.5	1.0	1.35	0.35	0.07	=
Woods	SVP201670	SVP201670	872431	1085719	490.5	8/16/2018	0.0	0.0	0.5	1.48	0.37	0.06	=
Woods		SVP201671	872431	1085719	490.5	8/16/2018	0.0	1.0	1.5	1.71	0.43	0.07	=
Woods		SVP205284	872431	1085719	490.5	8/16/2018	0.0	1.5	2.0	1.39	0.35	0.07	=
Woods	SVP201674	SVP201674	872518	1085804	490.9	8/16/2018	0.0	0.0	0.5	1.36	0.34	0.07	=
Woods		SVP201675	872518	1085804	490.9	8/16/2018	0.0	1.0	1.5	1.39	0.35	0.06	=
Woods		SVP205285	872518	1085804	490.9	8/16/2018	0.0	2.5	3.0	1.47	0.37	0.07	=
Woods		SVP205286	872518	1085804	490.9	8/16/2018	0.0	4.5	5.0	1.36	0.34	0.06	=
Woods		SVP205287	872518	1085804	490.9	8/16/2018	0.0	5.5	6.0	1.40	0.36	0.07	=
Woods	SVP203727	SVP203727	872303	1085274	497.3	8/8/2018	0.0	0.0	0.5	1.38	0.34	0.06	=
Woods		SVP203728	872303	1085274	497.3	8/8/2018	0.0	1.5	2.0	1.45	0.36	0.05	=
Woods		SVP205282	872303	1085274	497.3	8/8/2018	0.0	3.0	3.5	1.30	0.33	0.06	=
Woods		SVP205283	872303	1085274	497.3	8/8/2018	0.0	4.5	5.0	1.28	0.32	0.06	=

Table F-1. Soil Sample Results for Radium-226 (Continued)

Group	Station Name	Sample Name	Easting	Northing	Elevation	Collect Date	Cover Depth	Start Depth	End Depth	Result	Error	MDC	VQ
			(ft)		(ft amsl)		(ft bgs)			(pCi/g)			
Woods	SVP207127	SVP207127	872022	1085072	497.8	6/11/2019	0.0	0.0	0.5	1.25	0.31	0.06	=
Woods		SVP207128	872022	1085072	497.8	6/11/2019	0.0	1.0	1.5	1.27	0.32	0.05	=
Woods		SVP211141	872022	1085072	497.8	6/11/2019	0.0	2.0	2.5	1.26	0.31	0.05	=
Woods	SVP207129	SVP207129	872029	1085057	488.1	6/11/2019	0.0	0.0	0.5	1.26	0.31	0.05	=
Woods		SVP207130	872029	1085057	488.1	6/11/2019	0.0	1.5	2.0	1.36	0.34	0.06	=
Woods		SVP211142	872029	1085057	488.1	6/11/2019	0.0	2.0	2.5	1.79	0.44	0.06	=
Woods	SVP207131	SVP207131	872026	1085064	493.7	6/11/2019	0.0	0.0	0.5	1.21	0.31	0.05	=
Woods		SVP207132	872026	1085064	493.7	6/11/2019	0.0	1.5	2.0	1.25	0.32	0.06	=
Woods	SVP263743	SVP263743	872054	1085141	496.6	10/28/2022	0.0	0.0	0.5	1.04	0.28	0.08	=
Woods		SVP263744	872054	1085141	496.6	10/28/2022	0.0	1.5	2.0	1.00	0.25	0.06	=
Woods		SVP263745	872054	1085141	496.6	10/28/2022	0.0	3.0	3.5	1.08	0.27	0.06	=
Woods		SVP263746	872054	1085141	496.6	10/28/2022	0.0	5.0	5.5	1.10	0.29	0.08	=
Woods		SVP263747	872054	1085141	496.6	10/28/2022	0.0	6.5	7.0	1.40	0.34	0.06	=
Woods		SVP263748	872054	1085141	496.6	10/28/2022	0.0	9.0	9.5	1.31	0.32	0.06	=
Woods		SVP263749	872054	1085141	496.6	10/28/2022	0.0	11.0	11.5	1.26	0.31	0.06	=
Woods		SVP263750	872054	1085141	496.6	10/28/2022	0.0	12.5	13.0	1.15	0.31	0.08	=
Woods		SVP263751	872054	1085141	496.6	10/28/2022	0.0	15.0	15.5	1.17	0.30	0.06	=
Woods		SVP263752	872054	1085141	496.6	10/28/2022	0.0	17.0	17.5	1.29	0.32	0.06	=
Woods		SVP263753	872054	1085141	496.6	10/28/2022	0.0	18.5	19.0	1.30	0.32	0.05	=
Woods		SVP263754	872054	1085141	496.6	10/28/2022	0.0	21.5	22.0	1.24	0.31	0.05	=
Woods		SVP263755	872054	1085141	496.6	10/28/2022	0.0	23.5	24.0	1.00	0.27	0.08	=

Table F-1. Soil Sample Results for Radium-226 (Continued)

Group	Station Name	Sample Name	Easting	Northing	Elevation	Collect Date	Cover Depth	Start Depth	End Depth	Result	Error	MDC	VQ
			(ft)		(ft amsl)		(ft bgs)			(pCi/g)			
Woods	SVP263756	SVP263756	872128	1085239	496.4	10/29/2022	0.0	0.0	0.5	1.07	0.29	0.08	=
Woods		SVP263757	872128	1085239	496.4	10/29/2022	0.0	1.5	2.0	1.02	0.26	0.06	=
Woods		SVP263758	872128	1085239	496.4	10/29/2022	0.0	3.0	3.5	1.10	0.29	0.08	=
Woods		SVP263759	872128	1085239	496.4	10/29/2022	0.0	4.5	5.0	1.06	0.27	0.06	=
Woods		SVP263760	872128	1085239	496.4	10/29/2022	0.0	7.5	8.0	1.13	0.29	0.05	=
Woods		SVP263761	872128	1085239	496.4	10/29/2022	0.0	9.0	9.5	1.14	0.29	0.05	=
Woods		SVP263762	872128	1085239	496.4	10/29/2022	0.0	11.5	12.0	1.16	0.31	0.09	=
Woods		SVP263763	872128	1085239	496.4	10/29/2022	0.0	13.0	13.5	1.38	0.35	0.06	=
Woods		SVP263764	872128	1085239	496.4	10/29/2022	0.0	15.5	16.0	0.99	0.27	0.08	=
Woods		SVP263765	872128	1085239	496.4	10/29/2022	0.0	17.0	17.5	0.97	0.25	0.05	=
Woods		SVP263766	872128	1085239	496.4	10/29/2022	0.0	19.0	19.5	1.05	0.27	0.05	=
Woods		SVP263767	872128	1085239	496.4	10/29/2022	0.0	21.0	21.5	1.08	0.27	0.05	=
Woods		SVP263768	872128	1085239	496.4	10/29/2022	0.0	22.5	23.0	1.02	0.26	0.05	=
Woods	SVP263782	SVP263782	872303	1085536	492.4	10/29/2022	0.0	0.0	0.5	0.86	0.23	0.08	=
Woods		SVP263783	872303	1085536	492.4	10/29/2022	0.0	1.5	2.0	0.98	0.26	0.08	=
Woods		SVP263784	872303	1085536	492.4	10/29/2022	0.0	3.0	3.5	1.10	0.28	0.06	=
Woods		SVP263785	872303	1085536	492.4	10/29/2022	0.0	5.5	6.0	0.99	0.25	0.05	=
Woods		SVP263786	872303	1085536	492.4	10/29/2022	0.0	6.5	7.0	1.06	0.27	0.05	=
Woods		SVP263787	872303	1085536	492.4	10/29/2022	0.0	9.5	10.0	1.17	0.29	0.05	=
Woods		SVP263788	872303	1085536	492.4	10/29/2022	0.0	11.3	11.8	1.33	0.34	0.05	=
Woods		SVP263789	872303	1085536	492.4	10/29/2022	0.0	12.0	12.5	1.29	0.33	0.06	=
Woods		SVP263790	872303	1085536	492.4	10/29/2022	0.0	14.0	14.5	0.93	0.24	0.05	=
Woods		SVP263791	872303	1085536	492.4	10/29/2022	0.0	17.5	18.0	0.92	0.24	0.05	=
Woods		SVP263792	872303	1085536	492.4	10/29/2022	0.0	19.5	20.0	0.95	0.24	0.05	=
Woods		SVP263793	872303	1085536	492.4	10/29/2022	0.0	21.0	21.5	0.99	0.25	0.05	=
Woods		SVP263794	872303	1085536	492.4	10/29/2022	0.0	23.0	23.5	0.98	0.25	0.05	=

Table F-1. Soil Sample Results for Radium-226 (Continued)

Group	Station Name	Sample Name	Easting	Northing	Elevation	Collect Date	Cover Depth	Start Depth	End Depth	Result	Error	MDC	VQ
			(ft)		(ft amsl)		(ft bgs)			(pCi/g)			
Woods	SVP263795	SVP263795	872392	1085550	492.0	10/29/2022	0.0	0.0	0.5	1.03	0.28	0.08	=
Woods		SVP263796	872392	1085550	492.0	10/29/2022	0.0	1.5	2.0	1.09	0.28	0.06	=
Woods		SVP263797	872392	1085550	492.0	10/29/2022	0.0	3.5	4.0	1.20	0.31	0.08	=
Woods		SVP263798	872392	1085550	492.0	10/29/2022	0.0	5.5	6.0	1.27	0.32	0.06	=
Woods		SVP263799	872392	1085550	492.0	10/29/2022	0.0	7.0	7.5	1.13	0.28	0.05	=
Woods		SVP263800	872392	1085550	492.0	10/29/2022	0.0	9.0	9.5	1.15	0.28	0.05	=
Woods		SVP263801	872392	1085550	492.0	10/29/2022	0.0	10.5	11.0	1.13	0.29	0.05	=
Woods		SVP263802	872392	1085550	492.0	10/29/2022	0.0	12.0	12.5	1.01	0.25	0.05	=
Woods		SVP263803	872392	1085550	492.0	10/29/2022	0.0	14.5	15.0	1.04	0.26	0.05	=
Woods		SVP263804	872392	1085550	492.0	10/29/2022	0.0	16.5	17.0	1.00	0.28	0.08	=
Woods		SVP263805	872392	1085550	492.0	10/29/2022	0.0	18.5	19.0	1.10	0.28	0.06	=
Woods		SVP263806	872392	1085550	492.0	10/29/2022	0.0	21.0	21.5	1.13	0.30	0.08	=
Woods		SVP263807	872392	1085550	492.0	10/29/2022	0.0	22.0	22.5	1.07	0.27	0.05	=
Woods	SVP263930	SVP263930	872385	1085687	491.7	11/2/2022	0.0	0.0	0.5	0.93	0.26	0.08	=
Woods		SVP263931	872385	1085687	491.7	11/2/2022	0.0	1.5	2.0	1.23	0.31	0.06	=
Woods		SVP263932	872385	1085687	491.7	11/2/2022	0.0	2.5	3.0	1.24	0.31	0.05	=
Woods		SVP263933	872385	1085687	491.7	11/2/2022	0.0	5.0	5.5	1.14	0.28	0.05	=
Woods		SVP263934	872385	1085687	491.7	11/2/2022	0.0	6.5	7.0	1.10	0.27	0.05	=
Woods		SVP263935	872385	1085687	491.7	11/2/2022	0.0	9.0	9.5	1.26	0.31	0.06	=
Woods		SVP263936	872385	1085687	491.7	11/2/2022	0.0	10.5	11.0	1.25	0.31	0.06	=
Woods		SVP263937	872385	1085687	491.7	11/2/2022	0.0	13.0	13.5	1.22	0.31	0.06	=
Woods		SVP263938	872385	1085687	491.7	11/2/2022	0.0	14.5	15.0	1.07	0.29	0.08	=
Woods		SVP263939	872385	1085687	491.7	11/2/2022	0.0	17.5	18.0	1.03	0.26	0.05	=
Woods		SVP263940	872385	1085687	491.7	11/2/2022	0.0	18.5	19.0	1.03	0.26	0.05	=
Woods		SVP263941	872385	1085687	491.7	11/2/2022	0.0	21.5	22.0	1.04	0.26	0.05	=
Woods		SVP263942	872385	1085687	491.7	11/2/2022	0.0	23.5	24.0	1.04	0.27	0.06	=

Table F-1. Soil Sample Results for Radium-226 (Continued)

Group	Station Name	Sample Name	Easting	Northing	Elevation	Collect Date	Cover Depth	Start Depth	End Depth	Result	Error	MDC	VQ
			(ft)		(ft amsl)		(ft bgs)			(pCi/g)			
Woods	SVP263943	SVP263943	872514	1085758	492.1	11/3/2022	0.0	0.0	0.5	1.08	0.28	0.08	=
Woods		SVP263944	872514	1085758	492.1	11/3/2022	0.0	1.5	2.0	1.08	0.28	0.08	=
Woods		SVP263945	872514	1085758	492.1	11/3/2022	0.0	2.5	3.0	1.21	0.31	0.06	=
Woods		SVP263946	872514	1085758	492.1	11/3/2022	0.0	5.5	6.0	1.17	0.31	0.08	=
Woods		SVP263947	872514	1085758	492.1	11/3/2022	0.0	6.5	7.0	1.22	0.31	0.06	=
Woods		SVP263948	872514	1085758	492.1	11/3/2022	0.0	9.0	9.5	1.06	0.27	0.06	=
Woods		SVP263949	872514	1085758	492.1	11/3/2022	0.0	11.3	11.8	1.26	0.32	0.05	=
Woods		SVP263950	872514	1085758	492.1	11/3/2022	0.0	13.0	13.5	1.28	0.32	0.06	=
Woods		SVP263951	872514	1085758	492.1	11/3/2022	0.0	14.5	15.0	1.16	0.29	0.05	=
Woods		SVP263952	872514	1085758	492.1	11/3/2022	0.0	17.0	17.5	1.31	0.33	0.06	=
Woods		SVP263953	872514	1085758	492.1	11/3/2022	0.0	18.0	18.5	1.11	0.29	0.08	=
Woods	SVP263954	SVP263954	872358	1085333	500.5	11/3/2022	0.0	0.0	0.5	1.15	0.30	0.08	=
Woods		SVP263955	872358	1085333	500.5	11/3/2022	0.0	1.5	2.0	1.02	0.25	0.05	=
Woods		SVP263956	872358	1085333	500.5	11/3/2022	0.0	3.0	3.5	1.07	0.27	0.05	=
Woods		SVP263957	872358	1085333	500.5	11/3/2022	0.0	5.5	6.0	1.09	0.27	0.05	=
Woods		SVP263958	872358	1085333	500.5	11/3/2022	0.0	7.5	8.0	1.16	0.29	0.06	=
Woods		SVP263959	872358	1085333	500.5	11/3/2022	0.0	9.5	10.0	1.33	0.33	0.06	=
Woods		SVP263960	872358	1085333	500.5	11/3/2022	0.0	11.0	11.5	1.45	0.36	0.06	=
Woods		SVP263961	872358	1085333	500.5	11/3/2022	0.0	13.5	14.0	1.21	0.30	0.05	=
Woods		SVP263962	872358	1085333	500.5	11/3/2022	0.0	15.5	16.0	1.18	0.30	0.05	=
Woods		SVP263963	872358	1085333	500.5	11/3/2022	0.0	17.0	17.5	1.16	0.30	0.06	=
Woods		SVP263964	872358	1085333	500.5	11/3/2022	0.0	19.0	19.5	1.26	0.32	0.06	=
Woods		SVP263965	872358	1085333	500.5	11/3/2022	0.0	21.0	21.5	1.12	0.29	0.06	=
Woods		SVP263966	872358	1085333	500.5	11/3/2022	0.0	23.5	24.0	1.09	0.28	0.06	=
Woods		SVP263967	872358	1085333	500.5	11/3/2022	0.0	25.5	26.0	0.96	0.24	0.05	=
Woods		SVP263968	872358	1085333	500.5	11/3/2022	0.0	27.0	27.5	0.99	0.25	0.05	=

Table F-1. Soil Sample Results for Radium-226 (Continued)

Group	Station Name	Sample Name	Easting	Northing	Elevation	Collect Date	Cover Depth	Start Depth	End Depth	Result	Error	MDC	VQ
			(ft)		(ft amsl)		(ft bgs)			(pCi/g)			
Woods	SVP263969	SVP263969	872376	1085361	500.8	11/3/2022	0.0	0.0	0.5	1.18	0.31	0.08	=
Woods		SVP263970	872376	1085361	500.8	11/3/2022	0.0	1.5	2.0	1.32	0.33	0.06	=
Woods		SVP263971	872376	1085361	500.8	11/3/2022	0.0	3.0	3.5	1.26	0.32	0.06	=
Woods		SVP263972	872376	1085361	500.8	11/3/2022	0.0	4.5	5.0	1.24	0.32	0.06	=
Woods		SVP263973	872376	1085361	500.8	11/3/2022	0.0	7.0	7.5	1.35	0.34	0.06	=
Woods		SVP263974	872376	1085361	500.8	11/3/2022	0.0	9.5	10.0	1.50	0.37	0.06	=
Woods		SVP263975	872376	1085361	500.8	11/3/2022	0.0	10.5	11.0	1.40	0.35	0.06	=
Woods		SVP263976	872376	1085361	500.8	11/3/2022	0.0	12.5	13.0	1.24	0.31	0.05	=
Woods		SVP263977	872376	1085361	500.8	11/3/2022	0.0	15.0	15.5	1.34	0.34	0.06	=
Woods		SVP263978	872376	1085361	500.8	11/3/2022	0.0	17.0	17.5	1.28	0.32	0.05	=
Woods		SVP263979	872376	1085361	500.8	11/3/2022	0.0	19.0	19.5	1.32	0.33	0.06	=
Woods		SVP263980	872376	1085361	500.8	11/3/2022	0.0	21.0	21.5	1.16	0.29	0.05	=
Woods		SVP263981	872376	1085361	500.8	11/3/2022	0.0	22.5	23.0	1.05	0.27	0.05	=
Woods		SVP263982	872376	1085361	500.8	11/3/2022	0.0	25.5	26.0	1.07	0.27	0.05	=
Woods		SVP263983	872376	1085361	500.8	11/3/2022	0.0	27.0	27.5	1.12	0.28	0.05	=
Woods	SVP264117	SVP264117	872472	1085662	491.5	11/2/2022	0.0	0.0	0.5	1.01	0.26	0.06	=
Woods		SVP264118	872472	1085662	491.5	11/2/2022	0.0	1.5	2.0	1.10	0.28	0.06	=
Woods		SVP264119	872472	1085662	491.5	11/2/2022	0.0	2.0	2.5	1.13	0.28	0.06	=
Woods		SVP264120	872472	1085662	491.5	11/2/2022	0.0	4.5	5.0	1.09	0.27	0.06	=
Woods		SVP264121	872472	1085662	491.5	11/2/2022	0.0	6.0	6.5	1.18	0.30	0.05	=
Woods		SVP264122	872472	1085662	491.5	11/2/2022	0.0	9.0	9.5	1.08	0.28	0.05	=
Woods		SVP264123	872472	1085662	491.5	11/2/2022	0.0	10.5	11.0	1.18	0.30	0.05	=
Woods		SVP264124	872472	1085662	491.5	11/2/2022	0.0	13.0	13.5	1.25	0.32	0.05	=
Woods		SVP264125	872472	1085662	491.5	11/2/2022	0.0	14.6	15.1	1.08	0.29	0.08	=
Woods		SVP264126	872472	1085662	491.5	11/2/2022	0.0	17.0	17.5	0.88	0.24	0.08	=
Woods		SVP264127	872472	1085662	491.5	11/2/2022	0.0	19.0	19.5	1.15	0.29	0.06	=
Woods		SVP264128	872472	1085662	491.5	11/2/2022	0.0	20.5	21.0	1.11	0.28	0.05	=
Woods		SVP264129	872472	1085662	491.5	11/2/2022	0.0	23.0	23.5	1.13	0.30	0.09	=

Table F-1. Soil Sample Results for Radium-226 (Continued)

Group	Station Name	Sample Name	Easting	Northing	Elevation	Collect Date	Cover Depth	Start Depth	End Depth	Result	Error	MDC	VQ
			(ft)		(ft amsl)		(ft bgs)			(pCi/g)			
Woods	SVP264130	SVP264130	872606	1085793	497.6	11/3/2022	0.0	0.0	0.5	1.15	0.30	0.07	=
Woods		SVP264131	872606	1085793	497.6	11/3/2022	0.0	1.5	2.0	1.23	0.32	0.08	=
Woods		SVP264132	872606	1085793	497.6	11/3/2022	0.0	3.5	4.0	1.14	0.30	0.08	=
Woods		SVP264133	872606	1085793	497.6	11/3/2022	0.0	4.0	4.5	1.09	0.29	0.08	=
Woods		SVP264134	872606	1085793	497.6	11/3/2022	0.0	7.0	7.5	1.26	0.33	0.08	=
Woods		SVP264135	872606	1085793	497.6	11/3/2022	0.0	9.5	10.0	1.28	0.32	0.06	=
Woods		SVP264136	872606	1085793	497.6	11/3/2022	0.0	11.0	11.5	1.32	0.34	0.08	=
Woods		SVP264137	872606	1085793	497.6	11/3/2022	0.0	13.5	14.0	1.36	0.34	0.05	=
Woods		SVP264138	872606	1085793	497.6	11/3/2022	0.0	14.0	14.5	1.29	0.32	0.05	=
Woods		SVP264139	872606	1085793	497.6	11/3/2022	0.0	17.0	17.5	1.01	0.26	0.06	=
Woods		SVP264140	872606	1085793	497.6	11/3/2022	0.0	18.5	19.0	1.11	0.28	0.05	=
Woods		SVP264141	872606	1085793	497.6	11/3/2022	0.0	21.2	21.7	1.35	0.33	0.05	=
Woods		SVP264142	872606	1085793	497.6	11/3/2022	0.0	23.0	23.5	1.28	0.32	0.07	=
Woods		SVP264143	872606	1085793	497.6	11/3/2022	0.0	24.5	25.0	1.12	0.28	0.05	=
Woods		SVP264144	872606	1085793	497.6	11/3/2022	0.0	27.0	27.5	1.15	0.29	0.06	=
Woods	SVP264274	SVP264274	872338	1085294	500.0	11/3/2022	0.0	0.0	0.5	1.21	0.32	0.08	=
Woods		SVP264275	872338	1085294	500.0	11/3/2022	0.0	1.5	2.0	1.32	0.33	0.06	=
Woods		SVP264276	872338	1085294	500.0	11/3/2022	0.0	2.5	3.0	1.34	0.35	0.09	=
Woods		SVP264277	872338	1085294	500.0	11/3/2022	0.0	5.0	5.5	1.32	0.33	0.06	=
Woods		SVP264278	872338	1085294	500.0	11/3/2022	0.0	7.5	8.0	1.43	0.37	0.09	=
Woods		SVP264279	872338	1085294	500.0	11/3/2022	0.0	9.5	10.0	1.50	0.37	0.06	=
Woods		SVP264280	872338	1085294	500.0	11/3/2022	0.0	11.5	12.0	1.54	0.38	0.06	=
Woods		SVP264281	872338	1085294	500.0	11/3/2022	0.0	13.5	14.0	1.42	0.36	0.06	=
Woods		SVP264282	872338	1085294	500.0	11/3/2022	0.0	15.5	16.0	1.53	0.40	0.09	=
Woods		SVP264283	872338	1085294	500.0	11/3/2022	0.0	16.0	16.5	1.45	0.36	0.06	=
Woods		SVP264284	872338	1085294	500.0	11/3/2022	0.0	18.0	18.5	1.43	0.35	0.05	=
Woods		SVP264285	872338	1085294	500.0	11/3/2022	0.0	21.0	21.5	1.38	0.34	0.06	=
Woods		SVP264286	872338	1085294	500.0	11/3/2022	0.0	23.0	23.5	1.09	0.27	0.05	=
Woods		SVP264287	872338	1085294	500.0	11/3/2022	0.0	25.5	26.0	1.10	0.27	0.05	=
Woods		SVP264288	872338	1085294	500.0	11/3/2022	0.0	26.5	27.0	1.04	0.26	0.05	=

Table F-1. Soil Sample Results for Radium-226 (Continued)

Group	Station Name	Sample Name	Easting	Northing	Elevation	Collect Date	Cover Depth	Start Depth	End Depth	Result	Error	MDC	VQ
			(ft)		(ft amsl)		(ft bgs)			(pCi/g)			
Corridor	SVP201624	SVP201624	872240	1085164	481.5	6/12/2019	0.0	0.0	0.5	1.45	0.37	0.07	=
Corridor		SVP201625	872240	1085164	481.5	6/12/2019	0.0	1.5	2.0	1.42	0.37	0.07	=
Corridor		SVP201626	872240	1085164	481.5	6/12/2019	0.0	2.5	3.0	1.43	0.37	0.07	=
Corridor		SVP201627	872240	1085164	481.5	6/12/2019	0.0	4.0	4.5	1.71	0.43	0.07	=
Corridor		SVP211143	872240	1085164	481.5	6/12/2019	0.0	5.0	5.5	1.81	0.47	0.07	=
Corridor	SVP201638	SVP201638	872172	1084982	479.4	2/18/2019	0.0	0.0	0.5	1.00	0.26	0.07	=
Corridor		SVP201639	872172	1084982	479.4	2/18/2019	0.0	1.5	2.0	1.07	0.28	0.07	=
Corridor		SVP208606	872172	1084982	479.4	2/18/2019	0.0	2.5	3.0	1.69	0.43	0.11	=
Corridor		SVP208607	872172	1084982	479.4	2/18/2019	0.0	4.5	5.0	1.59	0.41	0.09	=
Corridor		SVP208608	872172	1084982	479.4	2/18/2019	0.0	6.0	6.5	1.61	0.41	0.07	=
Corridor	SVP201662	SVP201662	872258	1085100	475.7	5/15/2019	0.0	0.0	0.5	1.47	0.37	0.06	=
Corridor		SVP211067	872258	1085100	475.7	5/15/2019	0.0	1.0	1.5	1.67	0.41	0.06	=
Corridor		SVP201663	872258	1085100	475.7	5/15/2019	0.0	1.5	2.0	2.07	0.51	0.06	=
Corridor		SVP211068	872258	1085100	475.7	5/15/2019	0.0	2.0	2.5	2.43	0.61	0.07	=
Corridor		SVP211069	872258	1085100	475.7	5/15/2019	0.0	4.0	4.5	1.56	0.39	0.06	=
Corridor	SVP201664	SVP201664	872260	1085180	471.3	10/11/2018	0.0	0.0	0.5	1.28	0.33	0.07	=
Corridor		SVP201665	872260	1085180	471.3	10/11/2018	0.0	1.5	2.0	1.18	0.31	0.07	=
Corridor	SVP201666	SVP201666	872310	1085173	475.8	9/25/2018	0.0	0.0	0.5	1.62	0.41	0.05	=
Corridor		SVP201667	872310	1085173	475.8	9/25/2018	0.0	0.5	1.0	1.54	0.38	0.05	=
Corridor		SVP206940	872310	1085173	475.8	9/25/2018	0.0	3.0	3.5	1.51	0.37	0.05	=
Corridor	SVP201668	SVP201668	872374	1085186	479.3	9/20/2018	0.0	0.0	0.5	1.45	0.36	0.06	=
Corridor		SVP201669	872374	1085186	479.3	9/20/2018	0.0	1.0	1.5	1.67	0.41	0.06	=
Corridor		SVP205331	872374	1085186	479.3	9/20/2018	0.0	3.5	4.0	2.91	0.73	0.14	=
Corridor		SVP206933	872374	1085186	479.3	9/20/2018	0.0	4.0	4.5	1.84	0.46	0.06	=
Corridor		SVP206934	872374	1085186	479.3	9/20/2018	0.0	5.5	6.0	1.83	0.45	0.06	=

Table F-1. Soil Sample Results for Radium-226 (Continued)

Group	Station Name	Sample Name	Easting (ft)	Northing (ft)	Elevation (ft amsl)	Collect Date	Cover Depth (ft bgs)	Start Depth (ft bgs)	End Depth (ft bgs)	Result (pCi/g)	Error (pCi/g)	MDC (pCi/g)	VQ
Corridor	SVP201672	SVP201672	872377	1085154	489.9	10/1/2018	0.0	0.0	0.5	1.40	0.36	0.08	=
Corridor		SVP201673	872377	1085154	489.9	10/1/2018	0.0	1.5	2.0	1.36	0.35	0.08	=
Corridor		SVP206955	872377	1085154	489.9	10/1/2018	0.0	3.0	3.5	1.43	0.37	0.08	=
Corridor		SVP206956	872377	1085154	489.9	10/1/2018	0.0	5.0	5.5	1.41	0.37	0.08	=
Corridor		SVP206957	872377	1085154	489.9	10/1/2018	0.0	7.5	8.0	1.29	0.33	0.07	=
Corridor		SVP206958	872377	1085154	489.9	10/1/2018	0.0	8.0	8.5	1.39	0.36	0.07	=
Corridor	SVP202144	SVP202144	872147	1084986	471.9	6/25/2019	0.0	0.0	0.5	1.12	0.29	0.05	=
Corridor		SVP202145	872147	1084986	471.9	6/25/2019	0.0	0.5	1.0	1.27	0.32	0.05	=
Corridor	SVP202160	SVP202160	872197	1085070	471.6	6/25/2019	0.0	0.0	0.5	1.24	0.32	0.05	=
Corridor		SVP202161	872197	1085070	471.6	6/25/2019	0.0	0.5	1.0	1.12	0.29	0.05	=
Corridor	SVP202174	SVP202174	872257	1085146	472.2	9/13/2018	0.0	0.0	0.5	1.10	0.29	0.06	=
Corridor		SVP202175	872257	1085146	472.2	9/13/2018	0.0	0.5	1.0	1.27	0.33	0.07	=
Corridor	SVP202180	SVP202180	872334	1085207	471.9	9/13/2018	0.0	0.0	0.5	0.97	0.27	0.07	=
Corridor		SVP202181	872334	1085207	471.9	9/13/2018	0.0	0.5	1.0	1.24	0.32	0.07	=
Corridor	SVP202194	SVP202194	872407	1085268	472.5	9/13/2018	0.0	0.0	0.5	1.20	0.31	0.07	=
Corridor		SVP202195	872407	1085268	472.5	9/13/2018	0.0	0.5	1.0	1.16	0.31	0.06	=
Corridor	SVP202200	SVP202200	872457	1085353	470.8	9/13/2018	0.0	0.0	0.5	1.12	0.30	0.06	=
Corridor		SVP202201	872457	1085353	470.8	9/13/2018	0.0	0.5	1.0	1.05	0.28	0.06	=
Corridor	SVP202206	SVP202206	872496	1085448	470.6	9/13/2018	0.0	0.0	0.5	1.52	0.38	0.07	=
Corridor		SVP202207	872496	1085448	470.6	9/13/2018	0.0	0.5	1.0	1.65	0.42	0.06	=

Table F-1. Soil Sample Results for Radium-226 (Continued)

Group	Station Name	Sample Name	Easting	Northing	Elevation	Collect Date	Cover Depth	Start Depth	End Depth	Result	Error	MDC	VQ
			(ft)		(ft amsl)		(ft bgs)			(pCi/g)			
Corridor	SVP202214	SVP202214	872562	1085527	471.7	9/13/2018	0.0	0.0	0.5	1.30	0.34	0.07	=
Corridor		SVP202215	872562	1085527	471.7	9/13/2018	0.0	0.5	1.0	1.21	0.31	0.07	=
Corridor	SVP202224	SVP202224	872608	1085612	472.6	9/13/2018	0.0	0.0	0.5	1.29	0.34	0.06	=
Corridor		SVP202225	872608	1085612	472.6	9/13/2018	0.0	0.5	1.0	1.29	0.33	0.07	=
Corridor	SVP202232	SVP202232	872655	1085700	471.4	9/13/2018	0.0	0.0	0.5	1.19	0.31	0.06	=
Corridor		SVP202233	872655	1085700	471.4	9/13/2018	0.0	0.5	1.0	1.20	0.31	0.06	=
Corridor	SVP202234	SVP202234	872708	1085786	472.6	9/13/2018	0.0	0.0	0.5	1.25	0.32	0.07	=
Corridor		SVP202235	872708	1085786	472.6	9/13/2018	0.0	0.5	1.0	0.65	0.09	0.07	=
Corridor	SVP202390	SVP202390	872206	1084932	486.7	9/27/2018	0.0	0.0	0.5	1.37	0.35	0.08	=
Corridor		SVP202391	872206	1084932	486.7	9/27/2018	0.0	1.5	2.0	1.77	0.45	0.08	=
Corridor		SVP202392	872206	1084932	486.7	9/27/2018	0.0	2.0	2.5	1.79	0.45	0.06	=
Corridor		SVP202393	872206	1084932	486.7	9/27/2018	0.0	4.0	4.5	1.91	0.48	0.06	=
Corridor		SVP206947	872206	1084932	486.7	9/27/2018	0.0	5.0	5.5	1.68	0.43	0.06	=
Corridor	SVP202398	SVP202398	872159	1084965	478.0	2/19/2019	0.0	0.0	0.5	1.02	0.30	0.15	=
Corridor		SVP202399	872159	1084965	478.0	2/19/2019	0.0	1.5	2.0	1.06	0.30	0.13	=
Corridor		SVP212843	872159	1084965	478.0	2/19/2019	0.0	2.0	2.5	1.71	0.42	0.06	=
Corridor		SVP208613	872159	1084965	478.0	2/19/2019	0.0	5.0	5.5	1.73	0.43	0.06	=
Corridor		SVP210126	872159	1084965	478.0	2/19/2019	0.0	5.5	6.0	1.45	0.37	0.07	=
Corridor	SVP202400	SVP202400	872190	1084969	484.8	2/18/2019	0.0	0.0	0.5	0.96	0.26	0.07	=
Corridor		SVP202401	872190	1084969	484.8	2/18/2019	0.0	1.5	2.0	1.17	0.30	0.06	=
Corridor		SVP202402	872190	1084969	484.8	2/18/2019	0.0	2.0	2.5	1.08	0.28	0.06	=
Corridor		SVP202403	872190	1084969	484.8	2/18/2019	0.0	4.5	5.0	1.17	0.31	0.09	=
Corridor		SVP208605	872190	1084969	484.8	2/18/2019	0.0	5.0	5.5	1.17	0.31	0.06	=
Corridor	SVP202404	SVP202404	872226	1084969	486.2	9/26/2018	0.0	0.0	0.5	1.30	0.33	0.06	=
Corridor		SVP202405	872226	1084969	486.2	9/26/2018	0.0	1.5	2.0	1.85	0.46	0.06	=
Corridor		SVP206989	872226	1084969	486.2	9/26/2018	0.0	4.0	4.5	1.64	0.42	0.08	=
Corridor		SVP206990	872226	1084969	486.2	9/26/2018	0.0	6.0	6.5	2.47	0.62	0.09	=
Corridor		SVP206946	872226	1084969	486.2	9/26/2018	0.0	7.0	7.5	2.09	0.52	0.06	=
Corridor		SVP206999	872226	1084969	486.2	9/26/2018	0.0	7.5	8.0	2.19	0.55	0.09	=
Corridor		SVP207000	872226	1084969	486.2	9/26/2018	0.0	8.0	8.5	2.27	0.57	0.08	=

Table F-1. Soil Sample Results for Radium-226 (Continued)

Group	Station Name	Sample Name	Easting	Northing	Elevation	Collect Date	Cover Depth	Start Depth	End Depth	Result	Error	MDC	VQ
			(ft)		(ft amsl)		(ft bgs)			(pCi/g)			
Corridor	SVP202406	SVP202406	872103	1084999	488.9	4/25/2019	0.0	0.0	0.5	1.53	0.39	0.07	=
Corridor		SVP202407	872103	1084999	488.9	4/25/2019	0.0	0.5	1.0	1.46	0.37	0.07	=
Corridor		SVP202408	872103	1084999	488.9	4/25/2019	0.0	2.5	3.0	1.41	0.36	0.07	=
Corridor	SVP202412	SVP202412	872174	1084999	475.0	5/15/2019	0.0	0.0	0.5	1.39	0.36	0.08	=
Corridor		SVP211070	872174	1084999	475.0	5/15/2019	0.0	1.0	1.5	1.62	0.41	0.07	=
Corridor		SVP202413	872174	1084999	475.0	5/15/2019	0.0	1.5	2.0	1.24	0.32	0.06	=
Corridor		SVP202414	872174	1084999	475.0	5/15/2019	0.0	2.0	2.5	1.29	0.34	0.07	=
Corridor		SVP202415	872174	1084999	475.0	5/15/2019	0.0	5.5	6.0	1.20	0.31	0.06	=
Corridor	SVP202416	SVP202416	872204	1085000	494.4	2/14/2019	0.0	0.0	0.5	1.15	0.30	0.06	=
Corridor		SVP202417	872204	1085000	494.4	2/14/2019	0.0	1.0	1.5	1.25	0.32	0.07	=
Corridor		SVP208604	872204	1085000	494.4	2/14/2019	0.0	4.0	4.5	1.38	0.35	0.07	=
Corridor	SVP202418	SVP202418	872243	1085000	485.7	9/26/2018	0.0	0.0	0.5	1.43	0.36	0.06	=
Corridor		SVP202419	872243	1085000	485.7	9/26/2018	0.0	1.5	2.0	1.74	0.43	0.06	=
Corridor		SVP202420	872243	1085000	485.7	9/26/2018	0.0	2.0	2.5	2.40	0.58	0.06	=
Corridor		SVP206945	872243	1085000	485.7	9/26/2018	0.0	3.5	4.0	1.83	0.46	0.06	=
Corridor		SVP202421	872243	1085000	485.7	9/26/2018	0.0	5.0	5.5	2.14	0.52	0.06	=
Corridor		SVP207001	872243	1085000	485.7	9/26/2018	0.0	5.5	6.0	2.36	0.60	0.09	=
Corridor	SVP202426	SVP202426	872225	1085030	484.1	2/14/2019	0.0	0.0	0.5	1.19	0.33	0.10	=
Corridor		SVP202427	872225	1085030	484.1	2/14/2019	0.0	1.5	2.0	1.30	0.35	0.07	=
Corridor		SVP202428	872225	1085030	484.1	2/14/2019	0.0	3.5	4.0	1.48	0.38	0.07	=
Corridor		SVP202429	872225	1085030	484.1	2/14/2019	0.0	4.5	5.0	1.48	0.38	0.07	=
Corridor	SVP202430	SVP202430	872263	1085028	485.9	9/26/2018	0.0	0.0	0.5	1.39	0.35	0.07	=
Corridor		SVP202431	872263	1085028	485.9	9/26/2018	0.0	1.0	1.5	1.53	0.39	0.06	=
Corridor		SVP206943	872263	1085028	485.9	9/26/2018	0.0	5.0	5.5	1.87	0.47	0.07	=
Corridor		SVP206949	872263	1085028	485.9	9/27/2018	0.0	5.5	6.0	1.90	0.47	0.06	=
Corridor		SVP206950	872263	1085028	485.9	9/27/2018	0.0	6.0	6.5	1.93	0.47	0.07	=

Table F-1. Soil Sample Results for Radium-226 (Continued)

Group	Station Name	Sample Name	Easting	Northing	Elevation	Collect Date	Cover Depth	Start Depth	End Depth	Result	Error	MDC	VQ
			(ft)		(ft amsl)		(ft bgs)			(pCi/g)			
Corridor	SVP202432	SVP202432	872284	1085029	490.7	9/26/2018	0.0	0.0	0.5	1.32	0.37	0.14	=
Corridor		SVP202433	872284	1085029	490.7	9/26/2018	0.0	1.5	2.0	1.44	0.36	0.06	=
Corridor		SVP202434	872284	1085029	490.7	9/26/2018	0.0	2.5	3.0	1.70	0.42	0.06	=
Corridor		SVP202435	872284	1085029	490.7	9/26/2018	0.0	5.0	5.5	1.73	0.43	0.07	=
Corridor		SVP206944	872284	1085029	490.7	9/26/2018	0.0	5.5	6.0	1.67	0.43	0.07	=
Corridor	SVP202440	SVP202440	872243	1085062	480.4	2/19/2019	0.0	0.0	0.5	1.06	0.31	0.14	=
Corridor		SVP202441	872243	1085062	480.4	2/19/2019	0.0	0.5	1.0	1.06	0.31	0.15	=
Corridor		SVP208612	872243	1085062	480.4	2/19/2019	0.0	4.5	5.0	1.19	0.30	0.06	=
Corridor	SVP202442	SVP202442	872278	1085061	485.8	9/26/2018	0.0	0.0	0.5	1.42	0.36	0.07	=
Corridor		SVP202443	872278	1085061	485.8	9/26/2018	0.0	1.0	1.5	1.52	0.38	0.07	=
Corridor		SVP202444	872278	1085061	485.8	9/26/2018	0.0	3.5	4.0	1.63	0.41	0.07	=
Corridor		SVP202445	872278	1085061	485.8	9/26/2018	0.0	5.0	5.5	1.86	0.46	0.07	=
Corridor		SVP206942	872278	1085061	485.8	9/26/2018	0.0	7.0	7.5	1.51	0.38	0.07	=
Corridor		SVP211148	872278	1085061	485.8	9/26/2018	0.0	7.5	8.0	2.57	0.63	0.07	=
Corridor		SVP211149	872278	1085061	485.8	9/26/2018	0.0	8.0	8.5	1.95	0.48	0.07	=
Corridor	SVP202446	SVP202446	872312	1085061	492.3	9/26/2018	0.0	0.0	0.5	1.07	0.32	0.14	=
Corridor		SVP202447	872312	1085061	492.3	9/26/2018	0.0	1.5	2.0	1.34	0.34	0.07	=
Corridor	SVP202452	SVP202452	872260	1085093	480.0	2/18/2019	0.0	0.0	0.5	0.99	0.29	0.15	=
Corridor		SVP202453	872260	1085093	480.0	2/18/2019	0.0	1.0	1.5	1.20	0.31	0.06	=
Corridor		SVP202454	872260	1085093	480.0	2/18/2019	0.0	3.5	4.0	1.20	0.30	0.06	=
Corridor		SVP202455	872260	1085093	480.0	2/18/2019	0.0	5.0	5.5	1.20	0.30	0.06	=
Corridor		SVP208609	872260	1085093	480.0	2/18/2019	0.0	6.5	7.0	1.26	0.32	0.05	=
Corridor		SVP208610	872260	1085093	480.0	2/18/2019	0.0	8.0	8.5	1.05	0.27	0.06	=
Corridor		SVP208611	872260	1085093	480.0	2/18/2019	0.0	8.5	9.0	1.03	0.26	0.06	=
Corridor	SVP202456	SVP202456	872294	1085092	486.3	9/25/2018	0.0	0.0	0.5	1.43	0.36	0.06	=
Corridor		SVP202457	872294	1085092	486.3	9/25/2018	0.0	1.5	2.0	1.72	0.43	0.06	=
Corridor		SVP208564	872294	1085092	486.3	9/25/2018	0.0	5.5	6.0	2.03	0.50	0.07	=
Corridor		SVP208565	872294	1085092	486.3	9/25/2018	0.0	8.0	8.5	2.44	0.60	0.07	=
Corridor		SVP206941	872294	1085092	486.3	9/25/2018	0.0	8.5	9.0	3.05	0.74	0.07	=
Corridor		SVP208566	872294	1085092	486.3	9/25/2018	0.0	9.5	10.0	2.59	0.64	0.08	=

Table F-1. Soil Sample Results for Radium-226 (Continued)

Group	Station Name	Sample Name	Easting	Northing	Elevation	Collect Date	Cover Depth	Start Depth	End Depth	Result	Error	MDC	VQ
			(ft)		(ft amsl)		(ft bgs)			(pCi/g)			
Corridor	SVP202458	SVP202458	872329	1085093	491.9	9/20/2018	0.0	0.0	0.5	0.98	0.30	0.15	=
Corridor	SVP202458	SVP202459	872329	1085093	491.9	9/20/2018	0.0	1.0	1.5	1.40	0.36	0.08	=
Corridor	SVP202458	SVP202460	872329	1085093	491.9	9/20/2018	0.0	3.5	4.0	1.34	0.34	0.07	=
Corridor	SVP202458	SVP202461	872329	1085093	491.9	9/20/2018	0.0	5.5	6.0	1.61	0.41	0.08	=
Corridor	SVP202458	SVP205327	872329	1085093	491.9	9/20/2018	0.0	7.0	7.5	1.44	0.37	0.07	=
Corridor	SVP202458	SVP205328	872329	1085093	491.9	9/20/2018	0.0	8.0	8.5	1.34	0.34	0.06	=
Corridor	SVP202466	SVP202466	872277	1085124	480.0	9/25/2018	0.0	0.0	0.5	1.36	0.34	0.06	=
Corridor	SVP202466	SVP202467	872277	1085124	480.0	9/25/2018	0.0	1.5	2.0	1.52	0.38	0.06	=
Corridor	SVP202466	SVP211146	872277	1085124	480.0	9/25/2018	0.0	8.0	8.5	1.38	0.35	0.06	=
Corridor	SVP202466	SVP211147	872277	1085124	480.0	9/25/2018	0.0	8.5	9.0	1.37	0.34	0.05	=
Corridor	SVP202468	SVP202468	872313	1085123	486.0	9/25/2018	0.0	0.0	0.5	1.41	0.35	0.06	=
Corridor	SVP202468	SVP202469	872313	1085123	486.0	9/25/2018	0.0	1.5	2.0	1.73	0.43	0.06	=
Corridor	SVP202468	SVP202470	872313	1085123	486.0	9/25/2018	0.0	3.0	3.5	1.72	0.43	0.06	=
Corridor	SVP202468	SVP202471	872313	1085123	486.0	9/25/2018	0.0	4.0	4.5	2.24	0.55	0.06	=
Corridor	SVP202468	SVP206939	872313	1085123	486.0	9/25/2018	0.0	7.5	8.0	2.52	0.62	0.06	=
Corridor	SVP202468	SVP207005	872313	1085123	486.0	9/25/2018	0.0	8.0	8.5	2.93	0.71	0.07	=
Corridor	SVP202472	SVP202472	872348	1085124	490.9	9/24/2018	0.0	0.0	0.5	1.27	0.32	0.06	=
Corridor	SVP202472	SVP202473	872348	1085124	490.9	9/24/2018	0.0	0.5	1.0	1.24	0.31	0.06	=
Corridor	SVP202472	SVP206937	872348	1085124	490.9	9/24/2018	0.0	5.0	5.5	1.42	0.36	0.06	=
Corridor	SVP202472	SVP207012	872348	1085124	490.9	9/24/2018	0.0	8.0	8.5	1.51	0.38	0.06	=
Corridor	SVP202472	SVP207013	872348	1085124	490.9	9/24/2018	0.0	8.5	9.0	1.39	0.35	0.06	=
Corridor	SVP202474	SVP202474	872225	1085156	481.8	9/18/2018	0.0	0.0	0.5	1.52	0.39	0.07	=
Corridor	SVP202474	SVP202475	872225	1085156	481.8	9/18/2018	0.0	0.5	1.0	1.49	0.38	0.07	=
Corridor	SVP202474	SVP202476	872225	1085156	481.8	9/18/2018	0.0	3.5	4.0	1.51	0.39	0.07	=
Corridor	SVP202474	SVP202477	872225	1085156	481.8	9/18/2018	0.0	5.0	5.5	1.45	0.37	0.07	=
Corridor	SVP202480	SVP202480	872296	1085154	475.3	10/3/2018	0.0	0.0	0.5	1.67	0.42	0.06	=
Corridor	SVP202480	SVP202481	872296	1085154	475.3	10/3/2018	0.0	1.0	1.5	1.76	0.44	0.06	=
Corridor	SVP202480	SVP202478	872296	1085154	475.3	10/3/2018	0.0	2.5	3.0	1.74	0.43	0.05	=
Corridor	SVP202480	SVP202479	872296	1085154	475.3	10/3/2018	0.0	4.0	4.5	1.62	0.40	0.05	=

Table F-1. Soil Sample Results for Radium-226 (Continued)

Group	Station Name	Sample Name	Easting	Northing	Elevation	Collect Date	Cover Depth	Start Depth	End Depth	Result	Error	MDC	VQ
			(ft)		(ft amsl)		(ft bgs)			(pCi/g)			
Corridor	SVP202482	SVP202482	872330	1085154	483.0	9/26/2018	0.0	0.0	0.5	1.34	0.34	0.07	=
Corridor		SVP202483	872330	1085154	483.0	9/26/2018	0.0	1.5	2.0	1.44	0.37	0.06	=
Corridor		SVP208567	872330	1085154	483.0	9/26/2018	0.0	3.0	3.5	1.64	0.41	0.06	=
Corridor		SVP208568	872330	1085154	483.0	9/26/2018	0.0	5.5	6.0	1.76	0.44	0.07	=
Corridor	SVP202484	SVP202484	872366	1085154	488.4	9/20/2018	0.0	0.0	0.5	1.56	0.39	0.07	=
Corridor		SVP202485	872366	1085154	488.4	9/20/2018	0.0	1.0	1.5	1.45	0.36	0.06	=
Corridor		SVP202486	872366	1085154	488.4	9/20/2018	0.0	3.5	4.0	1.56	0.39	0.06	=
Corridor		SVP202487	872366	1085154	488.4	9/20/2018	0.0	5.5	6.0	1.42	0.36	0.06	=
Corridor		SVP205329	872366	1085154	488.4	9/20/2018	0.0	7.5	8.0	2.17	0.53	0.07	=
Corridor		SVP205330	872366	1085154	488.4	9/20/2018	0.0	8.5	9.0	1.49	0.37	0.06	=
Corridor	SVP202492	SVP202492	872348	1085185	478.5	10/2/2018	0.0	0.0	0.5	1.40	0.38	0.13	=
Corridor		SVP202493	872348	1085185	478.5	10/2/2018	0.0	0.5	1.0	1.55	0.42	0.13	=
Corridor		SVP206962	872348	1085185	478.5	10/2/2018	0.0	5.5	6.0	1.88	0.46	0.06	=
Corridor	SVP202494	SVP202494	872382	1085185	484.9	9/24/2018	0.0	0.0	0.5	1.45	0.36	0.06	=
Corridor		SVP202495	872382	1085185	484.9	9/24/2018	0.0	1.5	2.0	1.51	0.38	0.05	=
Corridor		SVP207014	872382	1085185	484.9	9/24/2018	0.0	6.5	7.0	1.37	0.35	0.06	=
Corridor		SVP207015	872382	1085185	484.9	9/24/2018	0.0	7.0	7.5	1.34	0.33	0.06	=
Corridor	SVP202496	SVP202496	872295	1085215	480.6	9/17/2018	0.0	0.0	0.5	1.15	0.33	0.14	=
Corridor		SVP202497	872295	1085215	480.6	9/17/2018	0.0	1.5	2.0	1.40	0.37	0.08	=
Corridor		SVP205317	872295	1085215	480.6	9/17/2018	0.0	5.0	5.5	1.16	0.30	0.06	=
Corridor	SVP202502	SVP202502	872400	1085217	479.9	10/3/2018	0.0	0.0	0.5	1.70	0.42	0.07	=
Corridor		SVP202503	872400	1085217	479.9	10/3/2018	0.0	1.5	2.0	1.64	0.41	0.07	=
Corridor		SVP202504	872400	1085217	479.9	8/5/2020	0.0	2.0	2.5	1.78	0.45	0.09	=
Corridor		SVP202505	872400	1085217	479.9	8/5/2020	0.0	3.0	3.5	1.79	0.44	0.05	=
Corridor		SVP222746	872400	1085217	479.9	8/5/2020	0.0	4.0	4.5	1.84	0.45	0.05	=
Corridor		SVP222747	872400	1085217	479.9	8/5/2020	0.0	4.5	5.0	1.38	0.34	0.05	=
Corridor	SVP202506	SVP202506	872305	1085242	498.3	9/4/2018	0.0	0.0	0.5	1.28	0.34	0.10	=
Corridor		SVP202507	872305	1085242	498.3	9/4/2018	0.0	0.5	1.0	1.40	0.35	0.06	=
Corridor		SVP202508	872305	1085242	498.3	9/4/2018	0.0	3.0	3.5	1.17	0.30	0.06	=
Corridor		SVP202509	872305	1085242	498.3	9/4/2018	0.0	4.5	5.0	1.17	0.30	0.06	=

Table F-1. Soil Sample Results for Radium-226 (Continued)

Group	Station Name	Sample Name	Easting	Northing	Elevation	Collect Date	Cover Depth	Start Depth	End Depth	Result	Error	MDC	VQ
			(ft)		(ft amsl)		(ft bgs)			(pCi/g)			
Corridor	SVP202510	SVP202510	872349	1085247	481.6	9/17/2018	0.0	0.0	0.5	1.27	0.34	0.09	=
Corridor		SVP202511	872349	1085247	481.6	9/17/2018	0.0	1.0	1.5	1.45	0.38	0.09	=
Corridor	SVP202514	SVP202514	872418	1085248	476.4	10/3/2018	0.0	0.0	0.5	1.44	0.40	0.14	=
Corridor		SVP202515	872418	1085248	476.4	10/3/2018	0.0	1.0	1.5	1.71	0.43	0.08	=
Corridor	SVP202516	SVP202516	872363	1085277	488.9	9/5/2018	0.0	0.0	0.5	1.38	0.35	0.06	=
Corridor		SVP202517	872363	1085277	488.9	9/5/2018	0.0	0.5	1.0	1.52	0.38	0.06	=
Corridor		SVP202518	872363	1085277	488.9	9/5/2018	0.0	2.5	3.0	1.77	0.44	0.06	=
Corridor		SVP202519	872363	1085277	488.9	9/5/2018	0.0	4.5	5.0	1.51	0.39	0.07	=
Corridor	SVP202524	SVP202524	872383	1085309	488.2	9/4/2018	0.0	0.0	0.5	1.34	0.34	0.06	=
Corridor		SVP202525	872383	1085309	488.2	9/4/2018	0.0	1.5	2.0	1.51	0.38	0.07	=
Corridor		SVP208531	872383	1085309	488.2	9/4/2018	0.0	3.0	3.5	1.33	0.34	0.06	=
Corridor	SVP202530	SVP202530	872495	1085306	493.3	10/3/2018	0.0	0.0	0.5	1.44	0.37	0.07	=
Corridor		SVP202531	872495	1085306	493.3	10/3/2018	0.0	1.5	2.0	1.41	0.36	0.06	=
Corridor		SVP202532	872495	1085306	493.3	10/3/2018	0.0	3.5	4.0	1.29	0.33	0.06	=
Corridor		SVP202533	872495	1085306	493.3	10/3/2018	0.0	4.0	4.5	1.40	0.36	0.07	=
Corridor		SVP206965	872495	1085306	493.3	10/3/2018	0.0	7.0	7.5	1.48	0.38	0.07	=
Corridor		SVP206966	872495	1085306	493.3	10/3/2018	0.0	7.5	8.0	1.61	0.41	0.08	=
Corridor		SVP206967	872495	1085306	493.3	10/3/2018	0.0	9.0	9.5	1.55	0.39	0.07	=
Corridor	SVP202534	SVP202534	872401	1085341	489.5	9/4/2018	0.0	0.0	0.5	1.45	0.37	0.07	=
Corridor		SVP202535	872401	1085341	489.5	9/4/2018	0.0	0.5	1.0	1.44	0.37	0.08	=
Corridor		SVP202536	872401	1085341	489.5	9/4/2018	0.0	3.0	3.5	1.66	0.41	0.06	=
Corridor		SVP202537	872401	1085341	489.5	9/4/2018	0.0	5.5	6.0	1.45	0.36	0.06	=
Corridor	SVP202542	SVP202542	872509	1085335	494.2	10/4/2018	0.0	0.0	0.5	1.27	0.34	0.08	=
Corridor		SVP202543	872509	1085335	494.2	10/4/2018	0.0	0.5	1.0	1.38	0.36	0.07	=
Corridor	SVP202544	SVP202544	872419	1085373	491.2	9/5/2018	0.0	0.0	0.5	1.50	0.38	0.07	=
Corridor		SVP202545	872419	1085373	491.2	9/5/2018	0.0	1.5	2.0	1.40	0.35	0.05	=
Corridor		SVP208532	872419	1085373	491.2	9/5/2018	0.0	2.5	3.0	1.09	0.28	0.06	=
Corridor	SVP202548	SVP202548	872488	1085372	477.7	10/8/2018	0.0	0.0	0.5	1.34	0.35	0.08	=

Table F-1. Soil Sample Results for Radium-226 (Continued)

Group	Station Name	Sample Name	Easting	Northing	Elevation	Collect Date	Cover Depth	Start Depth	End Depth	Result	Error	MDC	VQ
			(ft)		(ft amsl)		(ft bgs)			(pCi/g)			
Corridor	SVP202550	SVP202550	872523	1085373	492.5	10/4/2018	0.0	0.0	0.5	0.60	0.23	0.21	J
Corridor		SVP202551	872523	1085373	492.5	10/4/2018	0.0	1.5	2.0	1.21	0.32	0.08	=
Corridor		SVP202552	872523	1085373	492.5	10/4/2018	0.0	3.5	4.0	1.48	0.38	0.08	=
Corridor		SVP202553	872523	1085373	492.5	10/4/2018	0.0	5.0	5.5	1.34	0.35	0.08	=
Corridor	SVP202554	SVP202554	872433	1085401	488.8	9/5/2018	0.0	0.0	0.5	1.48	0.38	0.07	=
Corridor		SVP202555	872433	1085401	488.8	9/5/2018	0.0	1.5	2.0	1.66	0.41	0.06	=
Corridor		SVP202556	872433	1085401	488.8	9/5/2018	0.0	3.0	3.5	1.63	0.41	0.06	=
Corridor		SVP202557	872433	1085401	488.8	9/5/2018	0.0	4.5	5.0	1.38	0.34	0.06	=
Corridor	SVP202560	SVP202560	872505	1085398	478.8	10/8/2018	0.0	0.0	0.5	1.45	0.37	0.08	=
Corridor		SVP202561	872505	1085398	478.8	10/8/2018	0.0	0.5	1.0	1.52	0.39	0.08	=
Corridor		SVP202558	872505	1085398	478.8	8/6/2020	0.0	1.0	1.5	1.09	0.28	0.05	=
Corridor		SVP202559	872505	1085398	478.8	8/6/2020	0.0	2.0	2.5	1.19	0.30	0.06	=
Corridor		SVP229115	872505	1085398	478.8	8/6/2020	0.0	3.0	3.5	1.10	0.28	0.05	=
Corridor		SVP229116	872505	1085398	478.8	8/6/2020	0.0	5.5	6.0	1.11	0.28	0.05	=
Corridor	SVP202562	SVP202562	872538	1085400	492.0	10/8/2018	0.0	0.0	0.5	1.24	0.33	0.09	=
Corridor		SVP202563	872538	1085400	492.0	10/8/2018	0.0	1.0	1.5	1.44	0.38	0.08	=
Corridor	SVP202564	SVP202564	872449	1085431	490.5	9/5/2018	0.0	0.0	0.5	1.55	0.40	0.07	=
Corridor		SVP202565	872449	1085431	490.5	9/5/2018	0.0	1.5	2.0	1.46	0.36	0.05	=
Corridor	SVP202568	SVP202568	872523	1085433	476.8	10/8/2018	0.0	0.0	0.5	1.42	0.40	0.15	=
Corridor		SVP202569	872523	1085433	476.8	10/8/2018	0.0	1.5	2.0	1.34	0.38	0.15	=
Corridor		SVP206985	872523	1085433	476.8	10/8/2018	0.0	2.5	3.0	1.45	0.36	0.06	=
Corridor	SVP202570	SVP202570	872558	1085432	492.5	10/8/2018	0.0	0.0	0.5	1.44	0.36	0.06	=
Corridor		SVP202571	872558	1085432	492.5	10/8/2018	0.0	1.5	2.0	1.39	0.35	0.06	=
Corridor		SVP202572	872558	1085432	492.5	10/8/2018	0.0	2.5	3.0	1.57	0.40	0.07	=
Corridor		SVP202573	872558	1085432	492.5	10/8/2018	0.0	4.5	5.0	1.38	0.35	0.06	=
Corridor	SVP202574	SVP202574	872470	1085461	486.2	9/6/2018	0.0	0.0	0.5	1.51	0.39	0.08	=
Corridor		SVP202575	872470	1085461	486.2	9/6/2018	0.0	1.5	2.0	1.63	0.42	0.08	=
Corridor		SVP202576	872470	1085461	486.2	9/6/2018	0.0	2.0	2.5	1.86	0.46	0.06	=
Corridor		SVP202577	872470	1085461	486.2	9/6/2018	0.0	5.5	6.0	1.32	0.34	0.07	=

Table F-1. Soil Sample Results for Radium-226 (Continued)

Group	Station Name	Sample Name	Easting	Northing	Elevation	Collect Date	Cover Depth	Start Depth	End Depth	Result	Error	MDC	VQ
			(ft)		(ft amsl)		(ft bgs)			(pCi/g)			
Corridor	SVP202584	SVP202584	872506	1085527	484.0	8/22/2018	0.0	0.0	0.5	1.83	0.45	0.06	=
Corridor		SVP202585	872506	1085527	484.0	8/22/2018	0.0	1.5	2.0	1.75	0.44	0.07	=
Corridor	SVP202590	SVP202590	872593	1085495	488.1	5/28/2019	0.0	0.0	0.5	1.44	0.38	0.11	=
Corridor		SVP202591	872593	1085495	488.1	5/28/2019	0.0	0.5	1.0	1.40	0.36	0.07	=
Corridor		SVP211086	872593	1085495	488.1	5/28/2019	0.0	1.5	2.0	1.64	0.42	0.08	=
Corridor		SVP202592	872593	1085495	488.1	5/28/2019	0.0	2.0	2.5	1.54	0.40	0.10	=
Corridor		SVP202593	872593	1085495	488.1	5/28/2019	0.0	4.0	4.5	1.55	0.40	0.08	=
Corridor	SVP202594	SVP202594	872488	1085495	484.1	8/21/2018	0.0	0.0	0.5	1.57	0.39	0.06	=
Corridor		SVP202595	872488	1085495	484.1	8/21/2018	0.0	1.5	2.0	1.61	0.40	0.06	=
Corridor		SVP202596	872488	1085495	484.1	8/21/2018	0.0	3.5	4.0	1.56	0.39	0.07	=
Corridor		SVP202597	872488	1085495	484.1	8/21/2018	0.0	5.5	6.0	1.31	0.33	0.06	=
Corridor	SVP202604	SVP202604	872610	1085527	489.2	5/20/2019	0.0	0.0	0.5	1.41	0.38	0.12	=
Corridor		SVP202605	872610	1085527	489.2	5/20/2019	0.0	0.5	1.0	1.46	0.37	0.07	=
Corridor		SVP211079	872610	1085527	489.2	5/20/2019	0.0	2.0	2.5	1.49	0.38	0.06	=
Corridor		SVP211077	872610	1085527	489.2	5/20/2019	0.0	2.5	3.0	1.35	0.34	0.06	=
Corridor	SVP202606	SVP202606	872523	1085557	483.7	8/22/2018	0.0	0.0	0.5	1.73	0.43	0.07	=
Corridor		SVP202607	872523	1085557	483.7	8/22/2018	0.0	1.5	2.0	3.94	0.94	0.07	=
Corridor		SVP205301	872523	1085557	483.7	8/22/2018	0.0	2.0	2.5	2.57	0.65	0.10	=
Corridor		SVP206968	872523	1085557	483.7	8/22/2018	0.0	4.0	4.5	1.61	0.40	0.07	=
Corridor	SVP202612	SVP202612	872631	1085557	493.4	5/16/2019	0.0	0.0	0.5	1.28	0.34	0.10	=
Corridor		SVP202613	872631	1085557	493.4	5/16/2019	0.0	1.5	2.0	1.41	0.37	0.07	=
Corridor		SVP211074	872631	1085557	493.4	5/16/2019	0.0	2.0	2.5	1.60	0.41	0.08	=
Corridor		SVP202614	872631	1085557	493.4	5/16/2019	0.0	3.5	4.0	1.54	0.39	0.07	=
Corridor		SVP202615	872631	1085557	493.4	5/16/2019	0.0	5.5	6.0	1.56	0.40	0.07	=
Corridor	SVP202616	SVP202616	872547	1085583	481.1	8/23/2018	0.0	0.0	0.5	1.59	0.40	0.07	=
Corridor		SVP202617	872547	1085583	481.1	8/23/2018	0.0	1.5	2.0	2.31	0.56	0.07	=
Corridor		SVP202618	872547	1085583	481.1	8/23/2018	0.0	3.0	3.5	3.51	0.84	0.07	=
Corridor		SVP202619	872547	1085583	481.1	8/23/2018	0.0	4.5	5.0	3.83	0.92	0.07	=
Corridor		SVP206976	872547	1085583	481.1	8/23/2018	0.0	5.5	6.0	3.03	0.73	0.07	=

Table F-1. Soil Sample Results for Radium-226 (Continued)

Group	Station Name	Sample Name	Easting	Northing	Elevation	Collect Date	Cover Depth	Start Depth	End Depth	Result	Error	MDC	VQ
			(ft)		(ft amsl)		(ft bgs)			(pCi/g)			
Corridor	SVP202624	SVP202624	872649	1085585	489.1	5/20/2019	0.0	0.0	0.5	1.29	0.32	0.07	=
Corridor		SVP202625	872649	1085585	489.1	5/20/2019	0.0	1.0	1.5	1.49	0.37	0.06	=
Corridor		SVP211078	872649	1085585	489.1	5/20/2019	0.0	2.0	2.5	1.83	0.45	0.07	=
Corridor	SVP202626	SVP202626	872569	1085618	483.3	8/23/2018	0.0	0.0	0.5	1.44	0.36	0.06	=
Corridor		SVP202627	872569	1085618	483.3	8/23/2018	0.0	1.5	2.0	1.64	0.42	0.07	=
Corridor		SVP205302	872569	1085618	483.3	8/23/2018	0.0	3.5	4.0	2.28	0.59	0.08	=
Corridor		SVP205291	872569	1085618	483.3	8/23/2018	0.0	5.5	6.0	4.56	1.09	0.07	=
Corridor	SVP202632	SVP202632	872666	1085617	492.6	5/28/2019	0.0	0.0	0.5	1.42	0.38	0.11	=
Corridor		SVP202633	872666	1085617	492.6	5/28/2019	0.0	1.0	1.5	1.49	0.39	0.07	=
Corridor		SVP202634	872666	1085617	492.6	5/28/2019	0.0	2.5	3.0	1.43	0.37	0.08	=
Corridor		SVP202635	872666	1085617	492.6	5/28/2019	0.0	4.0	4.5	1.44	0.37	0.08	=
Corridor		SVP211085	872666	1085617	492.6	5/28/2019	0.0	5.0	5.5	1.43	0.37	0.08	=
Corridor	SVP202636	SVP202636	872573	1085654	488.4	8/27/2018	0.0	0.0	0.5	1.28	0.33	0.05	=
Corridor		SVP202637	872573	1085654	488.4	8/27/2018	0.0	1.5	2.0	1.30	0.32	0.06	=
Corridor		SVP202638	872573	1085654	488.4	8/27/2018	0.0	3.5	4.0	1.55	0.38	0.06	=
Corridor		SVP202639	872573	1085654	488.4	8/27/2018	0.0	4.0	4.5	1.86	0.46	0.06	=
Corridor		SVP207023	872573	1085654	488.4	8/27/2018	0.0	5.5	6.0	2.35	0.58	0.06	=
Corridor	SVP202644	SVP202644	872681	1085648	486.7	5/16/2019	0.0	0.0	0.5	1.41	0.36	0.07	=
Corridor		SVP202645	872681	1085648	486.7	5/16/2019	0.0	0.5	1.0	1.30	0.33	0.07	=
Corridor	SVP202646	SVP202646	872593	1085681	487.3	8/27/2018	0.0	0.0	0.5	1.34	0.34	0.05	=
Corridor		SVP202647	872593	1085681	487.3	8/27/2018	0.0	1.5	2.0	1.40	0.36	0.06	=
Corridor		SVP210124	872593	1085681	487.3	8/27/2018	0.0	2.0	2.5	1.70	0.43	0.08	=
Corridor		SVP206973	872593	1085681	487.3	8/27/2018	0.0	4.0	4.5	1.68	0.42	0.06	=
Corridor		SVP206974	872593	1085681	487.3	8/27/2018	0.0	5.5	6.0	2.33	0.58	0.07	=
Corridor	SVP202652	SVP202652	872699	1085683	491.5	5/15/2019	0.0	0.0	0.5	1.34	0.37	0.13	=
Corridor		SVP202653	872699	1085683	491.5	5/15/2019	0.0	1.0	1.5	1.34	0.34	0.06	=
Corridor		SVP202654	872699	1085683	491.5	5/15/2019	0.0	2.5	3.0	1.32	0.33	0.05	=
Corridor		SVP202655	872699	1085683	491.5	5/15/2019	0.0	5.5	6.0	1.11	0.28	0.06	=

Table F-1. Soil Sample Results for Radium-226 (Continued)

Group	Station Name	Sample Name	Easting	Northing	Elevation	Collect Date	Cover Depth	Start Depth	End Depth	Result	Error	MDC	VQ
			(ft)		(ft amsl)		(ft bgs)			(pCi/g)			
Corridor	SVP202656	SVP202656	872611	1085712	486.7	8/27/2018	0.0	0.0	0.5	1.35	0.34	0.06	=
Corridor		SVP202657	872611	1085712	486.7	8/27/2018	0.0	1.5	2.0	1.52	0.38	0.05	=
Corridor		SVP202658	872611	1085712	486.7	8/27/2018	0.0	3.0	3.5	2.64	0.65	0.07	=
Corridor		SVP202659	872611	1085712	486.7	8/27/2018	0.0	4.0	4.5	2.68	0.66	0.07	=
Corridor		SVP205303	872611	1085712	486.7	8/27/2018	0.0	5.5	6.0	2.08	0.53	0.09	=
Corridor	SVP202664	SVP202664	872720	1085712	492.7	5/15/2019	0.0	0.0	0.5	1.43	0.36	0.06	=
Corridor		SVP202665	872720	1085712	492.7	5/15/2019	0.0	1.0	1.5	1.43	0.36	0.06	=
Corridor	SVP202666	SVP202666	872628	1085746	487.3	8/27/2018	0.0	0.0	0.5	1.46	0.37	0.07	=
Corridor		SVP202667	872628	1085746	487.3	8/27/2018	0.0	1.5	2.0	1.39	0.35	0.06	=
Corridor		SVP206971	872628	1085746	487.3	8/27/2018	0.0	2.5	3.0	1.87	0.46	0.06	=
Corridor		SVP206972	872628	1085746	487.3	8/27/2018	0.0	5.5	6.0	1.82	0.45	0.08	=
Corridor	SVP202672	SVP202672	872727	1085731	487.3	5/28/2019	0.0	0.0	0.5	1.42	0.37	0.08	=
Corridor		SVP202673	872727	1085731	487.3	5/28/2019	0.0	1.5	2.0	1.54	0.39	0.07	=
Corridor		SVP202674	872727	1085731	487.3	5/28/2019	0.0	2.5	3.0	1.30	0.33	0.07	=
Corridor		SVP202675	872727	1085731	487.3	5/28/2019	0.0	5.5	6.0	1.21	0.31	0.07	=
Corridor	SVP202676	SVP202676	872647	1085779	486.2	8/27/2018	0.0	0.0	0.5	1.24	0.36	0.14	=
Corridor		SVP202677	872647	1085779	486.2	8/27/2018	0.0	1.5	2.0	1.44	0.36	0.06	=
Corridor		SVP202678	872647	1085779	486.2	8/27/2018	0.0	3.0	3.5	2.03	0.51	0.06	=
Corridor		SVP202679	872647	1085779	486.2	8/27/2018	0.0	5.0	5.5	2.41	0.60	0.08	=
Corridor		SVP205304	872647	1085779	486.2	8/27/2018	0.0	5.5	6.0	1.22	0.32	0.08	=
Corridor	SVP202684	SVP202684	872752	1085773	492.2	5/14/2019	0.0	0.0	0.5	1.46	0.36	0.06	=
Corridor		SVP211066	872752	1085773	492.2	5/14/2019	0.0	0.5	1.0	1.31	0.33	0.06	=
Corridor		SVP202685	872752	1085773	492.2	5/14/2019	0.0	1.5	2.0	1.34	0.33	0.05	=
Corridor	SVP202686	SVP202686	872664	1085803	485.2	8/27/2018	0.0	0.0	0.5	1.47	0.37	0.06	=
Corridor		SVP202687	872664	1085803	485.2	8/27/2018	0.0	1.5	2.0	1.49	0.37	0.05	=
Corridor		SVP206969	872664	1085803	485.2	8/27/2018	0.0	3.0	3.5	1.70	0.43	0.07	=
Corridor		SVP208537	872664	1085803	485.2	10/25/2018	0.0	4.0	4.5	1.97	0.48	0.06	=
Corridor		SVP208538	872664	1085803	485.2	10/25/2018	0.0	4.5	5.0	2.65	0.64	0.07	=
Corridor		SVP208539	872664	1085803	485.2	10/25/2018	0.0	5.0	5.5	2.20	0.54	0.07	=
Corridor		SVP206970	872664	1085803	485.2	8/27/2018	0.0	5.5	6.0	1.33	0.34	0.07	=

Table F-1. Soil Sample Results for Radium-226 (Continued)

Group	Station Name	Sample Name	Easting	Northing	Elevation	Collect Date	Cover Depth	Start Depth	End Depth	Result	Error	MDC	VQ
			(ft)		(ft amsl)		(ft bgs)			(pCi/g)			
Corridor	SVP202690	SVP202690	872685	1085837	483.5	8/28/2018	0.0	0.0	0.5	1.48	0.38	0.08	=
Corridor		SVP202691	872685	1085837	483.5	8/28/2018	0.0	1.5	2.0	1.44	0.36	0.05	=
Corridor		SVP202692	872685	1085837	483.5	8/28/2018	0.0	3.0	3.5	1.75	0.44	0.07	=
Corridor		SVP202693	872685	1085837	483.5	8/28/2018	0.0	4.0	4.5	2.17	0.53	0.07	=
Corridor		SVP205305	872685	1085837	483.5	8/28/2018	0.0	5.5	6.0	1.76	0.45	0.08	=
Corridor	SVP202806	SVP202806	872242	1084937	498.7	5/7/2019	0.0	0.0	0.5	1.36	0.35	0.06	=
Corridor		SVP202807	872242	1084937	498.7	5/7/2019	0.0	1.5	2.0	1.39	0.35	0.07	=
Corridor		SVP211045	872242	1084937	498.7	5/7/2019	0.0	4.5	5.0	1.51	0.39	0.07	=
Corridor	SVP202808	SVP202808	872400	1085154	491.4	10/1/2018	0.0	0.0	0.5	1.40	0.36	0.07	=
Corridor		SVP202809	872400	1085154	491.4	10/1/2018	0.0	0.5	1.0	1.34	0.34	0.07	=
Corridor		SVP206959	872400	1085154	491.4	10/1/2018	0.0	6.5	7.0	1.52	0.39	0.07	=
Corridor	SVP202810	SVP202810	872417	1085186	491.4	10/1/2018	0.0	0.0	0.5	1.54	0.40	0.07	=
Corridor		SVP202811	872417	1085186	491.4	10/1/2018	0.0	0.5	1.0	1.54	0.39	0.07	=
Corridor		SVP202812	872417	1085186	491.4	10/1/2018	0.0	2.5	3.0	1.30	0.34	0.07	=
Corridor	SVP202814	SVP202814	872436	1085217	491.1	10/2/2018	0.0	0.0	0.5	1.53	0.38	0.06	=
Corridor		SVP202815	872436	1085217	491.1	10/2/2018	0.0	0.5	1.0	1.56	0.39	0.06	=
Corridor	SVP202816	SVP202816	872452	1085247	490.6	10/2/2018	0.0	0.0	0.5	1.37	0.38	0.14	=
Corridor		SVP202817	872452	1085247	490.6	10/2/2018	0.0	1.5	2.0	1.29	0.32	0.06	=
Corridor		SVP202818	872452	1085247	490.6	10/2/2018	0.0	2.0	2.5	1.37	0.35	0.06	=
Corridor		SVP202819	872452	1085247	490.6	10/2/2018	0.0	5.5	6.0	1.50	0.38	0.06	=
Corridor		SVP206960	872452	1085247	490.6	10/2/2018	0.0	6.5	7.0	1.47	0.37	0.05	=
Corridor		SVP206961	872452	1085247	490.6	10/2/2018	0.0	8.5	9.0	1.65	0.41	0.05	=
Corridor	SVP202820	SVP202820	872473	1085276	491.4	10/2/2018	0.0	0.0	0.5	1.38	0.35	0.06	=
Corridor		SVP202821	872473	1085276	491.4	10/2/2018	0.0	1.5	2.0	1.50	0.37	0.06	=
Corridor	SVP202822	SVP202822	872470	1085525	500.2	8/21/2018	0.0	0.0	0.5	1.41	0.36	0.07	=
Corridor		SVP202823	872470	1085525	500.2	8/21/2018	0.0	1.5	2.0	1.44	0.36	0.05	=
Corridor	SVP205292	SVP205293	872469	1085414	476.3	9/6/2018	0.0	0.0	0.5	1.68	0.42	0.06	=
Corridor		SVP205293	872469	1085414	476.3	9/6/2018	0.0	0.5	1.0	1.76	0.45	0.07	=
Corridor		SVP205294	872469	1085414	476.3	9/6/2018	0.0	3.0	3.5	1.69	0.43	0.08	=
Corridor		SVP205295	872469	1085414	476.3	9/6/2018	0.0	5.0	5.5	2.64	0.65	0.06	=

Table F-1. Soil Sample Results for Radium-226 (Continued)

Group	Station Name	Sample Name	Easting	Northing	Elevation	Collect Date	Cover Depth	Start Depth	End Depth	Result	Error	MDC	VQ
			(ft)		(ft amsl)		(ft bgs)			(pCi/g)			
Corridor	SVP205296	SVP205296	872391	1085290	480.5	9/6/2018	0.0	0.0	0.5	1.62	0.41	0.06	=
Corridor		SVP205297	872391	1085290	480.5	9/6/2018	0.0	1.5	2.0	1.56	0.39	0.06	=
Corridor		SVP205298	872391	1085290	480.5	9/6/2018	0.0	3.5	4.0	2.10	0.51	0.06	=
Corridor		SVP205299	872391	1085290	480.5	9/6/2018	0.0	4.0	4.5	2.90	0.70	0.07	=
Corridor		SVP205300	872391	1085290	480.5	9/6/2018	0.0	4.5	5.0	1.92	0.47	0.06	=
Corridor	SVP205306	SVP205306	872360	1085242	475.7	9/17/2018	0.0	0.0	0.5	2.48	0.61	0.07	=
Corridor		SVP205307	872360	1085242	475.7	9/17/2018	0.0	1.5	2.0	1.85	0.46	0.06	=
Corridor		SVP205308	872360	1085242	475.7	9/17/2018	0.0	2.0	2.5	1.11	0.28	0.06	=
Corridor	SVP205322	SVP205322	872251	1085172	476.8	9/18/2018	0.0	0.0	0.5	1.56	0.40	0.07	=
Corridor	SVP206935	SVP206935	872344	1085195	474.3	9/24/2018	0.0	0.0	0.5	1.37	0.38	0.13	=
Corridor		SVP206936	872344	1085195	474.3	9/24/2018	0.0	1.5	2.0	1.47	0.37	0.06	=
Corridor		SVP206938	872344	1085195	474.3	9/24/2018	0.0	2.0	2.5	1.26	0.32	0.05	=
Corridor		SVP207011	872344	1085195	474.3	9/24/2018	0.0	2.5	3.0	1.32	0.33	0.05	=
Corridor	SVP206977	SVP206977	872544	1085413	476.5	10/8/2018	0.0	0.0	0.5	1.44	0.36	0.06	=
Corridor		SVP206978	872544	1085413	476.5	10/8/2018	0.0	1.0	1.5	1.23	0.31	0.05	=
Corridor	SVP206979	SVP206979	872193	1085127	487.5	10/9/2018	0.0	0.0	0.5	1.38	0.35	0.06	=
Corridor		SVP206980	872193	1085127	487.5	10/9/2018	0.0	1.5	2.0	1.51	0.38	0.06	=
Corridor		SVP206981	872193	1085127	487.5	10/9/2018	0.0	3.0	3.5	1.46	0.37	0.05	=
Corridor		SVP206982	872193	1085127	487.5	10/9/2018	0.0	4.5	5.0	1.45	0.37	0.06	=
Corridor		SVP206983	872193	1085127	487.5	10/9/2018	0.0	6.5	7.0	1.42	0.36	0.05	=
Corridor		SVP206984	872193	1085127	487.5	10/9/2018	0.0	8.0	8.5	1.36	0.35	0.06	=
Corridor	SVP207133	SVP207133	872257	1084978	499.7	7/14/2021	0.0	0.0	0.5	0.76	0.21	0.08	=
Corridor		SVP207134	872257	1084978	499.7	7/14/2021	0.0	1.5	2.0	1.19	0.30	0.05	=
Corridor		SVP232423	872257	1084978	499.7	7/14/2021	0.0	3.0	3.5	1.25	0.31	0.05	=
Corridor		SVP242854	872257	1084978	499.7	7/14/2021	0.0	4.5	5.0	1.32	0.33	0.05	=
Corridor		SVP242855	872257	1084978	499.7	7/14/2021	0.0	5.0	5.5	1.36	0.34	0.05	=
Corridor	SVP207137	SVP207137	872258	1085001	489.2	7/14/2021	0.0	0.0	0.5	1.21	0.30	0.05	=
Corridor		SVP207138	872258	1085001	489.2	7/14/2021	0.0	1.0	1.5	1.26	0.32	0.05	=
Corridor		SVP232421	872258	1085001	489.2	7/14/2021	0.0	3.0	3.5	1.58	0.39	0.06	=
Corridor		SVP232422	872258	1085001	489.2	7/14/2021	0.0	4.0	4.5	1.21	0.31	0.05	=

Table F-1. Soil Sample Results for Radium-226 (Continued)

Group	Station Name	Sample Name	Easting	Northing	Elevation	Collect Date	Cover Depth	Start Depth	End Depth	Result	Error	MDC	VQ
			(ft)		(ft amsl)		(ft bgs)			(pCi/g)			
Corridor	SVP208705	SVP208705	872369	1085253	475.7	6/12/2019	0.0	0.0	0.5	1.49	0.37	0.06	=
Corridor		SVP208706	872369	1085253	475.7	6/12/2019	0.0	0.5	1.0	1.37	0.35	0.05	=
Corridor		SVP208707	872369	1085253	475.7	6/12/2019	0.0	1.0	1.5	1.49	0.36	0.06	=
Corridor	SVP208708	SVP208708	872352	1085243	475.6	6/12/2019	0.0	0.0	0.5	1.35	0.34	0.05	=
Corridor		SVP208709	872352	1085243	475.6	6/12/2019	0.0	0.5	1.0	1.21	0.31	0.05	=
Corridor		SVP208710	872352	1085243	475.6	6/12/2019	0.0	1.0	1.5	1.23	0.30	0.05	=
Corridor	SVP208711	SVP208711	872359	1085246	477.6	6/11/2019	0.0	0.0	0.5	1.71	0.42	0.06	=
Corridor		SVP208712	872359	1085246	477.6	6/11/2019	0.0	0.5	1.0	1.55	0.39	0.06	=
Corridor		SVP208713	872359	1085246	477.6	6/11/2019	0.0	1.0	1.5	1.55	0.39	0.06	=
Corridor		SVP208714	872359	1085246	477.6	6/11/2019	0.0	1.5	2.0	2.09	0.51	0.06	=
Corridor	SVP208715	SVP208715	872394	1085291	480.2	6/11/2019	0.0	0.0	0.5	1.45	0.36	0.06	=
Corridor		SVP208716	872394	1085291	480.2	6/11/2019	0.0	1.0	1.5	1.41	0.35	0.06	=
Corridor		SVP208717	872394	1085291	480.2	6/11/2019	0.0	2.5	3.0	1.63	0.41	0.06	=
Corridor		SVP208718	872394	1085291	480.2	6/11/2019	0.0	3.0	3.5	2.50	0.61	0.07	=
Corridor		SVP208719	872394	1085291	480.2	6/11/2019	0.0	3.5	4.0	2.09	0.51	0.06	=
Corridor		SVP208720	872394	1085291	480.2	6/11/2019	0.0	4.0	4.5	2.22	0.54	0.06	=
Corridor	SVP208721	SVP208721	872389	1085292	481.4	6/12/2019	0.0	0.0	0.5	1.49	0.37	0.06	=
Corridor		SVP208722	872389	1085292	481.4	6/12/2019	0.0	1.0	1.5	1.72	0.43	0.06	=
Corridor		SVP208723	872389	1085292	481.4	6/12/2019	0.0	2.5	3.0	2.06	0.50	0.06	=
Corridor		SVP208724	872389	1085292	481.4	6/12/2019	0.0	3.5	4.0	1.96	0.48	0.06	=
Corridor		SVP208725	872389	1085292	481.4	6/12/2019	0.0	4.0	4.5	1.75	0.43	0.06	=
Corridor		SVP208726	872389	1085292	481.4	6/12/2019	0.0	4.5	5.0	1.42	0.35	0.05	=
Corridor		SVP208727	872389	1085292	481.4	6/12/2019	0.0	5.0	5.5	1.36	0.34	0.05	=
Corridor		SVP208728	872389	1085292	481.4	6/12/2019	0.0	5.5	6.0	1.18	0.30	0.05	=

Table F-1. Soil Sample Results for Radium-226 (Continued)

Group	Station Name	Sample Name	Easting	Northing	Elevation	Collect Date	Cover Depth	Start Depth	End Depth	Result	Error	MDC	VQ
			(ft)		(ft amsl)		(ft bgs)			(pCi/g)			
Corridor	SVP208729	SVP208729	872384	1085286	480.7	6/11/2019	0.0	0.0	0.5	1.43	0.36	0.06	=
Corridor		SVP208730	872384	1085286	480.7	6/11/2019	0.0	0.5	1.0	1.48	0.37	0.06	=
Corridor		SVP208731	872384	1085286	480.7	6/11/2019	0.0	2.0	2.5	3.01	0.73	0.07	=
Corridor		SVP212850	872384	1085286	480.7	6/11/2019	0.0	3.0	3.5	1.77	0.45	0.07	=
Corridor		SVP208732	872384	1085286	480.7	6/11/2019	0.0	3.5	4.0	1.57	0.39	0.06	=
Corridor		SVP208733	872384	1085286	480.7	6/11/2019	0.0	4.0	4.5	1.37	0.34	0.05	=
Corridor		SVP208734	872384	1085286	480.7	6/11/2019	0.0	4.5	5.0	1.26	0.32	0.05	=
Corridor	SVP211144	SVP211144	872144	1085034	484.9	6/13/2019	0.0	0.0	0.5	1.26	0.35	0.13	=
Corridor		SVP212849	872144	1085034	484.9	6/13/2019	0.0	1.0	1.5	1.37	0.35	0.05	=
Corridor	SVP211158	SVP211158	872560	1085484	474.7	6/18/2019	0.0	0.0	0.5	1.23	0.34	0.13	=
Corridor		SVP212826	872560	1085484	474.7	6/18/2019	0.0	0.5	1.0	1.22	0.34	0.13	=
Corridor		SVP212827	872560	1085484	474.7	6/18/2019	0.0	1.5	2.0	1.32	0.33	0.07	=
Corridor	SVP231817	SVP231817	872367	1085182	483.1	11/4/2020	0.0	0.0	0.5	1.20	0.30	0.05	=
Corridor		SVP231818	872367	1085182	483.1	11/4/2020	0.0	0.5	1.0	1.17	0.30	0.06	=
Corridor		SVP231819	872367	1085182	483.1	11/4/2020	0.0	2.5	3.0	1.39	0.35	0.05	=
Corridor		SVP231820	872367	1085182	483.1	11/4/2020	0.0	3.5	4.0	1.42	0.35	0.06	=
Corridor		SVP231821	872367	1085182	483.1	11/4/2020	0.0	4.0	4.5	1.45	0.37	0.05	=
Corridor		SVP231822	872367	1085182	483.1	11/4/2020	0.0	5.0	5.5	1.56	0.39	0.05	=
Corridor		SVP231823	872367	1085182	483.1	11/4/2020	0.0	7.0	7.5	2.21	0.55	0.06	=
Corridor		SVP231824	872367	1085182	483.1	11/4/2020	0.0	7.5	8.0	1.82	0.45	0.06	=
Corridor	SVP231825	SVP231825	872384	1085189	484.8	11/5/2020	0.0	0.0	0.5	1.31	0.33	0.05	=
Corridor		SVP231826	872384	1085189	484.8	11/5/2020	0.0	0.5	1.0	1.53	0.38	0.05	=
Corridor		SVP231827	872384	1085189	484.8	11/5/2020	0.0	2.5	3.0	1.62	0.40	0.05	=
Corridor		SVP231828	872384	1085189	484.8	11/5/2020	0.0	3.5	4.0	1.62	0.40	0.05	=
Corridor		SVP231829	872384	1085189	484.8	11/5/2020	0.0	5.5	6.0	2.68	0.65	0.06	=
Corridor		SVP231830	872384	1085189	484.8	11/5/2020	0.0	8.5	9.0	1.63	0.40	0.05	=
Corridor		SVP231831	872384	1085189	484.8	11/5/2020	0.0	9.0	9.5	1.61	0.40	0.07	=
Corridor		SVP231832	872384	1085189	484.8	11/5/2020	0.0	9.5	10.0	1.43	0.36	0.07	=

Table F-1. Soil Sample Results for Radium-226 (Continued)

Group	Station Name	Sample Name	Easting	Northing	Elevation	Collect Date	Cover Depth	Start Depth	End Depth	Result	Error	MDC	VQ
			(ft)		(ft amsl)		(ft bgs)			(pCi/g)			
Corridor	SVP231833	SVP231833	872372	1085196	477.6	11/5/2020	0.0	0.0	0.5	1.37	0.37	0.11	=
Corridor		SVP232374	872372	1085196	477.6	11/5/2020	0.0	1.0	1.5	1.24	0.32	0.07	=
Corridor		SVP232375	872372	1085196	477.6	11/5/2020	0.0	1.5	2.0	1.66	0.42	0.06	=
Corridor		SVP232376	872372	1085196	477.6	11/5/2020	0.0	2.0	2.5	1.60	0.40	0.06	=
Corridor		SVP232377	872372	1085196	477.6	11/5/2020	0.0	2.5	3.0	2.20	0.55	0.07	=
Corridor		SVP232378	872372	1085196	477.6	11/5/2020	0.0	3.5	4.0	1.70	0.43	0.07	=
Corridor		SVP232379	872372	1085196	477.6	11/5/2020	0.0	5.0	5.5	1.19	0.30	0.06	=
Corridor	SVP232391	SVP232391	872593	1085720	493.1	7/7/2021	0.0	0.0	0.5	1.07	0.29	0.08	=
Corridor		SVP232392	872593	1085720	493.1	7/7/2021	0.0	0.5	1.0	1.08	0.28	0.06	=
Corridor		SVP232393	872593	1085720	493.1	7/7/2021	0.0	3.0	3.5	1.04	0.27	0.06	=
Corridor		SVP232394	872593	1085720	493.1	7/7/2021	0.0	5.0	5.5	1.03	0.27	0.05	=
Corridor		SVP232395	872593	1085720	493.1	7/7/2021	0.0	6.5	7.0	1.08	0.28	0.06	=
Corridor		SVP232396	872593	1085720	493.1	7/7/2021	0.0	9.0	9.5	1.04	0.27	0.07	=
Corridor		SVP232397	872593	1085720	493.1	7/7/2021	0.0	10.0	10.5	1.07	0.28	0.07	=
Corridor		SVP232398	872593	1085720	493.1	7/7/2021	0.0	10.5	11.0	0.97	0.26	0.06	=
Corridor	SVP232399	SVP232399	872566	1085664	492.1	7/7/2021	0.0	0.0	0.5	1.04	0.27	0.07	=
Corridor		SVP232400	872566	1085664	492.1	7/7/2021	0.0	0.5	1.0	1.17	0.31	0.07	=
Corridor		SVP232401	872566	1085664	492.1	7/7/2021	0.0	3.0	3.5	1.36	0.34	0.06	=
Corridor		SVP232402	872566	1085664	492.1	7/7/2021	0.0	5.0	5.5	1.36	0.35	0.07	=
Corridor		SVP232403	872566	1085664	492.1	7/7/2021	0.0	7.5	8.0	1.22	0.32	0.07	=
Corridor		SVP232404	872566	1085664	492.1	7/7/2021	0.0	9.5	10.0	1.26	0.33	0.07	=
Corridor		SVP232405	872566	1085664	492.1	7/7/2021	0.0	10.0	10.5	1.23	0.32	0.07	=
Corridor		SVP232406	872566	1085664	492.1	7/7/2021	0.0	10.5	11.0	1.22	0.31	0.07	=

Table F-1. Soil Sample Results for Radium-226 (Continued)

Group	Station Name	Sample Name	Easting	Northing	Elevation	Collect Date	Cover Depth	Start Depth	End Depth	Result	Error	MDC	VQ
			(ft)		(ft amsl)		(ft bgs)			(pCi/g)			
Corridor	SVP232407	SVP232407	872536	1085625	501.0	7/8/2021	0.0	0.0	0.5	1.05	0.27	0.05	=
Corridor		SVP232408	872536	1085625	501.0	7/8/2021	0.0	1.5	2.0	1.05	0.27	0.05	=
Corridor		SVP232409	872536	1085625	501.0	7/8/2021	0.0	3.0	3.5	1.20	0.31	0.06	=
Corridor		SVP232410	872536	1085625	501.0	7/8/2021	0.0	4.5	5.0	1.18	0.30	0.06	=
Corridor		SVP232411	872536	1085625	501.0	7/8/2021	0.0	6.0	6.5	1.16	0.30	0.06	=
Corridor		SVP232412	872536	1085625	501.0	7/8/2021	0.0	8.0	8.5	1.28	0.33	0.06	=
Corridor		SVP232413	872536	1085625	501.0	7/8/2021	0.0	10.0	10.5	1.29	0.32	0.06	=
Corridor		SVP232414	872536	1085625	501.0	7/8/2021	0.0	11.5	12.0	1.19	0.31	0.06	=
Corridor	SVP232415	SVP232415	872510	1085578	500.4	7/8/2021	0.0	0.0	0.5	0.93	0.25	0.06	=
Corridor		SVP232416	872510	1085578	500.4	7/8/2021	0.0	1.5	2.0	1.09	0.28	0.06	=
Corridor		SVP232417	872510	1085578	500.4	7/8/2021	0.0	3.5	4.0	1.05	0.27	0.05	=
Corridor		SVP232418	872510	1085578	500.4	7/8/2021	0.0	5.0	5.5	1.05	0.27	0.06	=
Corridor		SVP232419	872510	1085578	500.4	7/8/2021	0.0	6.5	7.0	1.13	0.29	0.06	=
Corridor		SVP232420	872510	1085578	500.4	7/8/2021	0.0	8.5	9.0	1.20	0.31	0.06	=
Corridor	SVP242863	SVP242863	872653	1085828	499.5	8/3/2021	0.0	0.0	0.5	1.23	0.33	0.09	=
Corridor		SVP242864	872653	1085828	499.5	8/3/2021	0.0	0.5	1.0	1.36	0.37	0.10	=
Corridor		SVP242865	872653	1085828	499.5	8/3/2021	0.0	3.5	4.0	1.20	0.32	0.09	=
Corridor		SVP242866	872653	1085828	499.5	8/3/2021	0.0	4.5	5.0	1.18	0.32	0.08	=
Corridor		SVP242867	872653	1085828	499.5	8/3/2021	0.0	7.5	8.0	1.27	0.34	0.09	=
Corridor		SVP242868	872653	1085828	499.5	8/3/2021	0.0	8.5	9.0	1.40	0.38	0.11	=
Corridor		SVP242869	872653	1085828	499.5	8/3/2021	0.0	10.0	10.5	1.34	0.35	0.10	=
Corridor		SVP242870	872653	1085828	499.5	8/3/2021	0.0	13.0	13.5	1.34	0.36	0.09	=
Corridor		SVP242871	872653	1085828	499.5	8/3/2021	0.0	14.5	15.0	1.28	0.34	0.09	=
Corridor		SVP242872	872653	1085828	499.5	8/3/2021	0.0	17.0	17.5	1.26	0.34	0.09	=

Table F-1. Soil Sample Results for Radium-226 (Continued)

Group	Station Name	Sample Name	Easting (ft)	Northing (ft)	Elevation (ft amsl)	Collect Date	Cover Depth (ft bgs)	Start Depth (ft bgs)	End Depth (ft bgs)	Result (pCi/g)	Error (pCi/g)	MDC (pCi/g)	VQ
Corridor	SVP242873	SVP242873	872623	1085771	495.5	8/3/2021	0.0	0.0	0.5	1.27	0.34	0.09	=
Corridor		SVP242874	872623	1085771	495.5	8/3/2021	0.0	1.0	1.5	1.24	0.33	0.09	=
Corridor		SVP242875	872623	1085771	495.5	8/3/2021	0.0	3.0	3.5	1.15	0.31	0.10	=
Corridor		SVP242876	872623	1085771	495.5	8/3/2021	0.0	5.5	6.0	1.23	0.33	0.09	=
Corridor		SVP242877	872623	1085771	495.5	8/3/2021	0.0	7.0	7.5	1.18	0.31	0.08	=
Corridor		SVP242878	872623	1085771	495.5	8/3/2021	0.0	7.5	8.0	1.31	0.35	0.08	=

Notes:

VQ symbols indicate: “=” for positive results, “U” for not detected above this value, “J” for estimated quantity, “UJ” for not detected above estimated value, and “R” for unusable.

Sample SVP264145 was collected from the top 0.5 ft of the ground. Almost all the sample was mulch that was separated out, leaving a soil sample dried-total mass of 50 g. With 12 g required for alpha spectroscopy, only 38 g was available for gamma spectroscopy, which is insufficient for gamma spectroscopy and resulted in VQ of "R." This result was not used in calculations.

bgs - below ground surface

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APPENDIX G

ProUCL OUTPUT FILES FOR THE WILCOXON-MANN-WHITNEY COMPARISON TEST OF RADIUM-226 SOIL SAMPLES AGAINST BACKGROUND VALUES

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Table G-1. ProUCL Output for Wilcoxon-Mann-Whitney Test of Radium-226 Results for Clearing Soil Against Background Values

Wilcoxon-Mann-Whitney Sample 1 vs Sample 2 Comparison Test for Uncensor Full Data Sets without NDs

User Selected Options	
Date/Time of Computation	ProUCL 5.2 12/20/2022 8:37:30 AM
From File	ProUCL input MWM Ra-226 soil.xls
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0.000
Selected Null Hypothesis	Sample 1 Mean/Median >= Sample 2 Mean/Median (Form 2)
Alternative Hypothesis	Sample 1 Mean/Median < Sample 2 Mean/Median

Sample 1 Data: Bkgd
Sample 2 Data: Clearing

Raw Statistics

	Sample 1	Sample 2
Number of Valid Observations	74	458
Number of Distinct Observations	49	83
Minimum	0.56	0.62
Maximum	1.55	2.05
Mean	1.051	1.097
Median	1.085	1.06
SD	0.273	0.19
SE of Mean	0.0317	0.0088(

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Sample 1 >= Mean/Median of Sample 2

Sample 1 Rank Sum W-Stat	18880
Standardized WMW U-Stat	-0.686
Mean (U)	16946
SD(U) - Adj ties	1227
Approximate U-Stat Critical Value (0.05)	-1.645
P-Value (Adjusted for Ties)	0.246

Conclusion with Alpha = 0.05
Do Not Reject H0, Conclude Sample 1 >= Sample 2
P-Value >= alpha (0.05)

Table G-2. ProUCL Output for Wilcoxon-Mann-Whitney Test of Radium-226 Results for Woods Soil Against Background Values

Wilcoxon-Mann-Whitney Sample 1 vs Sample 2 Comparison Test for Uncensor Full Data Sets without NDs

User Selected Options	
Date/Time of Computation	ProUCL 5.2 12/20/2022 8:38:17 AM
From File	ProUCL input MWM Ra-226 soil.xls
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0.000
Selected Null Hypothesis	Sample 1 Mean/Median >= Sample 2 Mean/Median (Form 2)
Alternative Hypothesis	Sample 1 Mean/Median < Sample 2 Mean/Median

Sample 1 Data: Bkgd
Sample 2 Data: Woods

Raw Statistics

	Sample 1	Sample 2
Number of Valid Observations	74	254
Number of Distinct Observations	49	75
Minimum	0.56	0.86
Maximum	1.55	1.89
Mean	1.051	1.26
Median	1.085	1.25
SD	0.273	0.19
SE of Mean	0.0317	0.0119

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Sample 1 >= Mean/Median of Sample 2

Sample 1 Rank Sum W-Stat	8219
Standardized WMW U-Stat	-5.51
Mean (U)	9398
SD(U) - Adj ties	717.8
Approximate U-Stat Critical Value (0.05)	-1.645
P-Value (Adjusted for Ties)	1.7916E-8

Conclusion with Alpha = 0.05
Reject H0, Conclude Sample 1 < Sample 2
P-Value < alpha (0.05)

Table G-3. ProUCL Output for Wilcoxon-Mann-Whitney Test of Radium-226 Results for Corridor Soil Against Background Values

Wilcoxon-Mann-Whitney Sample 1 vs Sample 2 Comparison Test for Uncensor Full Data Sets without NDs

User Selected Options	
Date/Time of Computation	ProUCL 5.2 12/20/2022 8:44:32 AM
From File	ProUCL input MWM Ra-226 soil.xls
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0.000
Selected Null Hypothesis	Sample 1 Mean/Median >= Sample 2 Mean/Median (Form 2)
Alternative Hypothesis	Sample 1 Mean/Median < Sample 2 Mean/Median

Sample 1 Data: Bkgd
Sample 2 Data: Corridor

Raw Statistics

	Sample 1	Sample 2
Number of Valid Observations	74	499
Number of Distinct Observations	49	143
Minimum	0.56	0.6
Maximum	1.55	4.56
Mean	1.051	1.526
Median	1.085	1.44
SD	0.273	0.429
SE of Mean	0.0317	0.0192

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Sample 1 >= Mean/Median of Sample 2

Sample 1 Rank Sum W-Stat	7999
Standardized WMW U-Stat	-9.963
Mean (U)	18463
SD(U) - Adj ties	1329
Approximate U-Stat Critical Value (0.05)	-1.645
P-Value (Adjusted for Ties)	1.105E-23

Conclusion with Alpha = 0.05
Reject H0, Conclude Sample 1 < Sample 2
P-Value < alpha (0.05)

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APPENDIX H

FIELD LOGBOOK ENTRIES FOR DUST/PAVEMENT SEDIMENT SAMPLES FROM STRUCTURE SURFACES

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COC No.: LE 1024 2022-02 ML

Task Team Members: M. Shuman, M. Miller

Sample ID: SVP264222 | Station ID: SVP264222

Collection Date: 10-24-22 | Collection Time: 1525

Property Name: Jana School | Sample Location: Deposited soil on NW Parking lot near swings

Northing (units): 1086167.32 | Easting (units): 871949.53

Cover Depth (ft): N/A | Elevation: 509.76

Sample Collection Method: ☒ Bowl and Trowel ☐ Auger | Sample Depth: 0-0.1'

Soil Type: Sandy Silt | Rad Screen Instrument: 44-9: H Cal Due: 1-3-23; 44-10: G Cal Due: 8-2-23

Rad Screen Bkg. (cpm): 48/3997 | Rad Screen (cpm): 70/4142

Sample Type: Homogenous grab | HTZ Area (m²): N/A HTZ Field Reading: N/A | GWS Background Reading: N/A

Sample is: ☐ in excavation wall ~~☒~~ in excavation floor (MS 10-28-22) ☐ measured from original ground surface N/A

Comments: ~~MS 11-1-22~~

Recorded by: Megan Shuman 10-24-22 | QA by: M Steiner | Date: 11-1-22

COC No.: LE 1024 2022-02 ML

Task Team Members: M. Shuman, M. Miller

Sample ID: SVP264223 | Station ID: SVP264223

Collection Date: 10-24-22 | Collection Time: 1535

Property Name: Jana School | Sample Location: Deposited soil on sidewalk in NE Parking lot

Northing (units): 1086125.30 | Easting (units): 872211.44

Cover Depth (ft): N/A | Elevation: 507.45

Sample Collection Method: ☒ Bowl and Trowel ☐ Auger | Sample Depth: 0-0.1'

Soil Type: Silt and sand | Rad Screen Instrument: 44-9: H Cal Due: 1-3-23; 44-10: G Cal Due: 8-2-23

Rad Screen Bkg. (cpm): 48/3997 | Rad Screen (cpm): 74/4063

Sample Type: Homogenous grab | HTZ Area (m²): N/A HTZ Field Reading: N/A | GWS Background Reading: N/A

Sample is: ☐ in excavation wall ☐ in excavation floor ☐ measured from original ground surface N/A

Comments: ~~MS 11-1-22~~

Recorded by: Megan Shuman 10-24-22 | QA by: M Steiner | Date: 11-1-22

COC No.: LE 10242022-02ML

Task Team Members: M. Sherman, M. Miller

Sample ID: SVP264224 | Station ID: SVP264224

Collection Date: 10-24-22 | Collection Time: 1545

Property Name: Jana School | Sample Location: Deposited Soil by drain on NE of property

Northing (units): 1086138.11 | Easting (units): 872211.96

Cover Depth (ft): N/A | Elevation: 506.63

Sample Collection Method: ☒ Bowl and Trowel ☐ Auger | Sample Depth: 0-0.1'

Soil Type: Gray brow silt w/organics | Rad Screen Instrument: 44-9: H Cal Due: 1-3-23; 44-10: G Cal Due: 8-2-23

Rad Screen Bkg. (cpm): 48/3997 | Rad Screen (cpm): 61/4108

Sample Type: Homogenous grab | HTZ Area (m²): N/A HTZ Field Reading: N/A | GWS Background Reading: N/A

Sample is: ☐ in excavation wall ☐ in excavation floor ☐ measured from original ground surface NA

Comments: MS 11-1-22

Recorded by: Megan Sherman 10-24-22 | QA by: MSlerne | Date: 11-1-22

COC No.: LE 10242022-02ML

Task Team Members: M. Sherman, M. Miller

Sample ID: SVP264225 | Station ID: SVP264225

Collection Date: 10-24-22 | Collection Time: 1548

Property Name: Jana School | Sample Location: Deposited soil on sidewalk on SE of school bldg

Northing (units): 1086026.90 | Easting (units): 872140.29

Cover Depth (ft): N/A | Elevation: 508.23

Sample Collection Method: ☒ Bowl and Trowel ☐ Auger | Sample Depth: 0-0.1'

Soil Type: Brown silt | Rad Screen Instrument: 44-9: H Cal Due: 1-3-23; 44-10: G Cal Due: 8-2-23

Rad Screen Bkg. (cpm): 48/3997 | Rad Screen (cpm): 57/4144

Sample Type: Homogenous grab | HTZ Area (m²): N/A HTZ Field Reading: N/A | GWS Background Reading: N/A

Sample is: ☐ in excavation wall ☐ in excavation floor ☐ measured from original ground surface NA

Comments: MS 11-1-22

Recorded by: Megan Sherman 10-24-22 | QA by: MSlerne | Date: 11-1-22

COC No.: LE 10252022-08TA

Task Team Members: Mark Coppotelli, Ross Obernueffemann, Mike Miller, Chuck Funkenbine

Sample ID: SVP264226 | Station ID: SVP264226 (MC 10-25-22)

Collection Date: 10-25-22 | Collection Time: 1300

Property Name: Jana School | Sample Location: UJ-1

Northing (units): N/A | Easting (units): N/A

Cover Depth (ft): N/A | Elevation: N/A

Sample Collection Method: ☐ Bowl and Trowel ☐ Auger — Used scraper (MS 11-1-22) | Sample Depth: 0.0-0.1'

Soil Type: DUST | Rad Screen Instrument: 44-9: D Cal Due: 12-27-22; 44-10: E3 Cal Due: 7-11-23

Rad Screen Bkg. (cpm): 40/5888 | Rad Screen (cpm): 63/6044

Sample Type: Homogenous grab | HTZ Area (m²): — HTZ Field Reading: — | GWS Background Reading: —

Sample is: ☐ in excavation wall ☐ in excavation floor ☐ measured from original ground surface NA

Comments: DUST COLLECTED FROM KITCHEN FAN BLADES. ~500 cm²

Recorded by: Mark Coppotelli 10-25-22 | QA by: MSlerne | Date: 11-1-22

COC No.: LE 10252022-08TA

Task Team Members: M. Coppotelli, M. Miller, R. Obernueffemann, C. Finkenbine

Sample ID: SVP264227 | Station ID: SVP264227

Collection Date: 10-25-22 | Collection Time: 1407

Property Name: Jana Elementary | Sample Location: UJ-6

Northing (units): N/A | Easting (units): N/A

Cover Depth (ft): N/A | Elevation: N/A

Sample Collection Method: ☐ Bowl and Trowel ☐ Auger — Used scraper (MS 11-1-22) | Sample Depth: 0.0-0.1'

Soil Type: DUST | Rad Screen Instrument: 44-9: D Cal Due: 12-27-22; 44-10: E3 Cal Due: 7-11-23

Rad Screen Bkg. (cpm): 40/5888 | Rad Screen (cpm): 58/6884

Sample Type: Homogenous grab | HTZ Area (m²): — HTZ Field Reading: — | GWS Background Reading: —

Sample is: ☐ in excavation wall ☐ in excavation floor ☐ measured from original ground surface NA

Comments: DUST COLLECTED FROM CAFETERIA ELECTRICAL CONDUITS. ~500 cm²

Recorded by: Mark Coppotelli 10-25-22 | QA by: MSlerne | Date: 11-1-22

COC No.: LE1025 2022-08TA

Task Team Members: C. FINKENBINE, M. Coppotelli, M. Miller, R. Obernueffemann

Sample ID: SUP264228 Station ID: SUP264228

Collection Date: 10·25·22 Collection Time: 1448

Property Name: Jana School Sample Location: UJ-11

Northing (units): N/A Easting (units): N/A

Cover Depth (ft): N/A Elevation: N/A

Sample Collection Method: ☐ Bowl and Trowel ☐ Auger — Used scraper (MS 11-1-22) Sample Depth: 0.0-0.1'

Soil Type: DUST Rad Screen Instrument: 44-9: D Cal Due: 12·27·22; 44-10: I3 Cal Due: 7·11·23

Rad Screen Bkg. (cpm): 40/5888 Rad Screen (cpm): 99/7212

Sample Type: Homogenous grab HTZ Area (m²): — HTZ Field Reading: — GWS Background Reading: —

Sample is: ☐ in excavation wall ☐ in excavation floor ☐ measured from original ground surface NA

Comments: DUST COLLECTED FROM EXHAUST/HOT WATER HEATER IN BOILER ROOM. ~2000 cm²

Recorded by: Mark Coppotelli 10·25·22 QA by: MSteiner Date: 11-1-22

COC No.: LE1025 2022-08TA

Task Team Members: M. Coppotelli, C. FINKENBINE, R. Obernueffemann, M. Miller

Sample ID: SUP264229 Station ID: SUP264229

Collection Date: 10·25·22 Collection Time: 1541

Property Name: Jana School Sample Location: UJ-14

Northing (units): N/A Easting (units): N/A

Cover Depth (ft): N/A Elevation: N/A

Sample Collection Method: ☐ Bowl and Trowel ☐ Auger — Used scraper (MS 11-1-22) Sample Depth: 0.0-0.1

Soil Type: DUST Rad Screen Instrument: 44-9: D Cal Due: 12·27·22; 44-10: I3 Cal Due: 7·11·23

Rad Screen Bkg. (cpm): 40/5888 Rad Screen (cpm): 72/7213

Sample Type: Homogenous grab HTZ Area (m²): — HTZ Field Reading: — GWS Background Reading: —

Sample is: ☐ in excavation wall ☐ in excavation floor ☐ measured from original ground surface NA

Comments: DUST COLLECTED FROM BASKETBALL HOOP FRAME IN GYM. ~1000 cm²

Recorded by: Mark Coppotelli 10·25·22 QA by: MSteiner Date: 11-1-22

COC No.: LE1025 2022-08TA

Task Team Members: M. Coppotelli, R. Obernueffemann, C. Finkenbine, M. Miller

Sample ID: SUP264230 Station ID: SUP264230

Collection Date: 10·25·22 Collection Time: 1611

Property Name: Jana School Sample Location: UJ-18

Northing (units): N/A Easting (units): N/A

Cover Depth (ft): N/A Elevation: N/A

Sample Collection Method: ☐ Bowl and Trowel ☐ Auger — Used scraper (MS 11-1-22) Sample Depth: 0.0-0.1'

Soil Type: DUST Rad Screen Instrument: 44-9: D Cal Due: 12·27·22; 44-10: I3 Cal Due: 7·11·23

Rad Screen Bkg. (cpm): 40/5888 Rad Screen (cpm): 41/7007

Sample Type: Homogenous grab HTZ Area (m²): — HTZ Field Reading: — GWS Background Reading: —

Sample is: ☐ in excavation wall ☐ in excavation floor ☐ measured from original ground surface NA

Comments: DUST COLLECTED FROM TOP OF VENT IN CUSTODIAL CLOSET. ~2500 cm²

Recorded by: Mark Coppotelli 10·25·22 QA by: MSteiner Date: 11-1-22

COC No.: LE1026 2022-04TA

Task Team Members: M. Coppotelli, K. Winkler

Sample ID: SVP264231 Station ID: SVP264231

Collection Date: 10·26·22 Collection Time: 1515

Property Name: Jana School Sample Location: Deposited soil on NW Parking Lot near swings

Northing (units): 1086167.32 Easting (units): 871949.53

Cover Depth (ft): N/A Elevation: 509.76

Sample Collection Method: ☑ Bowl and Trowel ☐ Auger Sample Depth: 0-0.1 ft

Soil Type: Black silty sand (SM) moist Rad Screen Instrument: 44-9: D Cal Due: 12·27·22; 44-10: G Cal Due: 8·2·23

Rad Screen Bkg. (cpm): 51/8948 Rad Screen (cpm): 51/8939

Sample Type: Homogenous grab HTZ Area (m²): — HTZ Field Reading: — GWS Background Reading: —

Sample is: ☐ in excavation wall ☐ in excavation floor ☐ measured from original ground surface N/A

Comments: MS 11-1-22

Recorded by: David W. Geiger 10·26·22 QA by: MSteiner Date: 11-1-22

COC No.: LE 1026 2022-04TA

Task Team Members: M. Coppotelli, K. Winkler

Sample ID: SVP264232 | Station ID: SVP264232

Collection Date: 10.26.22 | Collection Time: 1528

Property Name: Jana School | Sample Location: Deposited soil on sidewalk in NE Parking lot

Northing (units): 1086125.30 | Easting (units): 872211.44

Cover Depth (ft): N/A | Elevation: 507.45

Sample Collection Method: ☑ Bowl and Trowel ☐ Auger | Sample Depth: 0-0.1'

Soil Type: Black silty sand (SM) Sl. moist | Rad Screen Instrument: 44-9: D Cal Due: 12.27.22; 44-10: 6 Cal Due: 8.2.23

Rad Screen Bkg. (cpm): 51 / 8448 | Rad Screen (cpm): 52 / 8240

Sample Type: Homogenous grab | HTZ Area (m^2): — HTZ Field Reading: — GWS Background Reading: —

Sample is: ☐ in excavation wall ☐ in excavation floor ☐ measured from original ground surface NA

Comments: MS 11-1-22

Recorded by: David W. Geiger 10.26.22 | QA by: M Steiner | Date: 11-1-22

COC No.: LE 1026 2022-04TA

Task Team Members: M. Coppotelli, K. Winkler

Sample ID: SVP264233 | Station ID: SVP264233

Collection Date: 10.26.22 | Collection Time: 1535

Property Name: Jana School | Sample Location: Deposited soil by drain NE of Property

Northing (units): 1086138.11 | Easting (units): 872211.96

Cover Depth (ft): N/A | Elevation: 506.63

Sample Collection Method: ☑ Bowl and Trowel ☐ Auger | Sample Depth: 0-0.1'

Soil Type: Brown clayey silt, tr. sand, sl. moist (ML) | Rad Screen Instrument: 44-9: D Cal Due: 12.27.22; 44-10: 6 Cal Due: 8.2.23

Rad Screen Bkg. (cpm): 51 / 8448 | Rad Screen (cpm): 50 / 8910

Sample Type: Homogenous grab | HTZ Area (m^2): — HTZ Field Reading: — GWS Background Reading: —

Sample is: ☐ in excavation wall ☐ in excavation floor ☐ measured from original ground surface NA

Comments: MS 11-1-22

Recorded by: David W. Geiger 10.26.22 | QA by: M Steiner | Date: 11.1.22

APPENDIX I

ProUCL OUTPUT FILES FOR THE WILCOXON-MANN-WHITNEY COMPARISON TEST OF INDOOR DUST AND PAVEMENT SEDIMENT SAMPLES AGAINST BACKGROUND VALUES

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Table I-1. ProUCL Output for Wilcoxon-Mann-Whitney Test of Radium-226 Results for Dust and Pavement Sediment Against Background Values

Wilcoxon-Mann-Whitney Sample 1 vs Sample 2 Comparison Test for Uncensor Full Data Sets without NDs

User Selected Options	
Date/Time of Computation	ProUCL 5.2 12/8/2022 1:35:35 PM
From File	WorkSheet.xls
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0.000
Selected Null Hypothesis	Sample 1 Mean/Median = Sample 2 Mean/Median (Two Sided Alternative)
Alternative Hypothesis	Sample 1 Mean/Median <> Sample 2 Mean/Median

Sample 1 Data: Bkg Surface Radium-226
Sample 2 Data: Site Radium-226

Raw Statistics

	Sample 1	Sample 2
Number of Valid Observations	37	9
Number of Distinct Observations	27	9
Minimum	0.59	0.13
Maximum	1.27	1.4
Mean	0.955	0.674
Median	1.03	0.7
SD	0.192	0.496
SE of Mean	0.0316	0.165

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Sample 1 = Mean/Median of Sample 2

Sample 1 Rank Sum W-Stat	912.5
WMW U-Stat	209.5
Standardized WMW U-Stat	1.191
Mean (U)	166.5
SD(U) - Adj ties	36.1
Lower Approximate U-Stat Critical Value (0.025)	-1.96
Upper Approximate U-Stat Critical Value (0.975)	1.96
P-Value (Adjusted for Ties)	0.234

Conclusion with Alpha = 0.05

Do Not Reject H0, Conclude Sample 1 = Sample 2

P-Value >= alpha (0.05)

Table I-2. ProUCL Output for Wilcoxon-Mann-Whitney Test of Thorium-230 Results for Dust and Pavement Sediment Against Background Values

Wilcoxon-Mann-Whitney Sample 1 vs Sample 2 Comparison Test for Uncenso+A5:L44r Full Data Sets without NDs

User Selected Options	
Date/Time of Computation	ProUCL 5.2 12/8/2022 1:37:57 PM
From File	WorkSheet.xls
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0.000
Selected Null Hypothesis	Sample 1 Mean/Median >= Sample 2 Mean/Median (Form 2)
Alternative Hypothesis	Sample 1 Mean/Median < Sample 2 Mean/Median

Sample 1 Data: Bgk Surface Thorium-230
Sample 2 Data: Site Thorium-230

Raw Statistics

	Sample 1	Sample 2
Number of Valid Observations	37	9
Number of Distinct Observations	35	9
Minimum	0.94	0.34
Maximum	2.17	1.41
Mean	1.489	0.923
Median	1.41	0.9
SD	0.32	0.409
SE of Mean	0.0526	0.136

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Sample 1 >= Mean/Median of Sample 2

Sample 1 Rank Sum W-Stat	985
Standardized WMW U-Stat	3.185
Mean (U)	166.5
SD(U) - Adj ties	36.11
Approximate U-Stat Critical Value (0.05)	-1.645
P-Value (Adjusted for Ties)	0.999

Conclusion with Alpha = 0.05
Do Not Reject H0, Conclude Sample 1 >= Sample 2
P-Value >= alpha (0.05)

Table I-3. ProUCL Output for Wilcoxon-Mann-Whitney Test of Uranium-234 Results for Dust and Pavement Sediment Against Background Values

Wilcoxon-Mann-Whitney Sample 1 vs Sample 2 Comparison Test for Uncensor Full Data Sets without NDs

User Selected Options	
Date/Time of Computation	ProUCL 5.2 12/8/2022 1:39:08 PM
From File	WorkSheet.xls
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0.000
Selected Null Hypothesis	Sample 1 Mean/Median >= Sample 2 Mean/Median (Form 2)
Alternative Hypothesis	Sample 1 Mean/Median < Sample 2 Mean/Median

Sample 1 Data: Bkg Surface Uranium-234
Sample 2 Data: Site Uranium-234

Raw Statistics

	Sample 1	Sample 2
Number of Valid Observations	25	8
Number of Distinct Observations	20	8
Minimum	0.45	0.07
Maximum	1.52	1.13
Mean	0.98	0.596
Median	0.9	0.585
SD	0.257	0.368
SE of Mean	0.0513	0.13

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Sample 1 >= Mean/Median of Sample 2

Sample 1 Rank Sum W-Stat	487
Standardized WMW U-Stat	2.585
Mean (U)	100
SD(U) - Adj ties	23.79
Approximate U-Stat Critical Value (0.05)	-1.645
P-Value (Adjusted for Ties)	0.995

Conclusion with Alpha = 0.05
Do Not Reject H0, Conclude Sample 1 >= Sample 2
P-Value >= alpha (0.05)

Table I-4. ProUCL Output for Wilcoxon-Mann-Whitney Test of Uranium-238 Results for Dust and Pavement Sediment Against Background Values

Wilcoxon-Mann-Whitney Sample 1 vs Sample 2 Comparison Test for Uncensor Full Data Sets without NDs

User Selected Options	
Date/Time of Computation	ProUCL 5.2 12/8/2022 1:40:16 PM
From File	WorkSheet.xls
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0.000
Selected Null Hypothesis	Sample 1 Mean/Median >= Sample 2 Mean/Median (Form 2)
Alternative Hypothesis	Sample 1 Mean/Median < Sample 2 Mean/Median

Sample 1 Data: Bkg Surface Uranium-238
Sample 2 Data: Site Uranium-238

Raw Statistics

	Sample 1	Sample 2
Number of Valid Observations	37	8
Number of Distinct Observations	30	8
Minimum	0.65	0.07
Maximum	1.69	1.2
Mean	1.085	0.664
Median	1.06	0.76
SD	0.279	0.422
SE of Mean	0.0458	0.149

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Sample 1 >= Mean/Median of Sample 2

Sample 1 Rank Sum W-Stat	933.5
Standardized WMW U-Stat	2.435
Mean (U)	148
SD(U) - Adj ties	33.67
Approximate U-Stat Critical Value (0.05)	-1.645
P-Value (Adjusted for Ties)	0.993

Conclusion with Alpha = 0.05
Do Not Reject H0, Conclude Sample 1 >= Sample 2
P-Value >= alpha (0.05)

APPENDIX J

RESRAD-ONSITE AND CAP88 OUTPUT FILES FOR GROUND DEPOSITION ON SCHOOL PAVEMENT AND BUILDING ROOFS OF RADON DECAY PRODUCTS GENERATED FROM THE REMEDIATION AREAS IN THE COLDWATER CREEK CORRIDOR

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CAP88 OUTPUT FILE FOR GROUND DEPOSITION OF DECAY PRODUCTS FROM RADON EMISSIONS IN THE COLDWATER CREEK CORRIDOR ADJACENT TO JANA PARCELS

C A P 8 8 - P C

Version 4.1

Clean Air Act Assessment Package - 1988

C O N C E N T R A T I O N   T A B L E S

Non-Radon Individual Assessment
Tue Dec 20 12:23:29 2022

Facility: CWC Corridor near Jana
Address:
City: Hazelwood
State: MO Zip: 63031

Source Category: Area
Source Type: Area
Emission Year: 2022

Comments: Air
Air

Dataset Name: radon CWC Corrid
Dataset Date: Dec 13, 2022 08:00 AM
Wind File: C:\Users\finkenbinec\Documents\CAP88\Wind Files\13994.WND

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Conc (pCi/m3)	Dry Depo Rate (pCi/cm2-s)	Wet Depo Rate (pCi/cm2-s)	Ground Depo Rate (pCi/cm2-s)
N	255	Rn-222	1.44E-01	0.00E+00	0.00E+00	0.00E+00
N	255	Po-218	4.09E-02	7.36E-09	6.15E-10	7.97E-09
N	255	Pb-214	1.09E-03	1.95E-10	1.53E-11	2.11E-10
N	255	At-218	8.01E-06	1.44E-12	1.20E-13	1.56E-12
N	255	Bi-214	3.04E-05	5.47E-12	4.15E-13	5.89E-12
NNW	255	Rn-222	8.85E-02	0.00E+00	0.00E+00	0.00E+00
NNW	255	Po-218	2.44E-02	4.39E-09	3.75E-10	4.76E-09
NNW	255	Pb-214	6.32E-04	1.14E-10	9.27E-12	1.23E-10
NNW	255	At-218	4.77E-06	8.59E-13	7.34E-14	9.32E-13
NNW	255	Bi-214	1.76E-05	3.17E-12	2.53E-13	3.43E-12
NW	255	Rn-222	9.08E-02	0.00E+00	0.00E+00	0.00E+00
NW	255	Po-218	2.86E-02	5.14E-09	4.17E-10	5.56E-09
NW	255	Pb-214	8.51E-04	1.53E-10	1.17E-11	1.65E-10
NW	255	At-218	5.61E-06	1.01E-12	8.19E-14	1.09E-12
NW	255	Bi-214	2.57E-05	4.62E-12	3.43E-13	4.97E-12
WNW	255	Rn-222	1.05E-01	0.00E+00	0.00E+00	0.00E+00
WNW	255	Po-218	3.51E-02	6.33E-09	5.04E-10	6.83E-09
WNW	255	Pb-214	1.08E-03	1.95E-10	1.46E-11	2.10E-10
WNW	255	At-218	6.92E-06	1.25E-12	9.90E-14	1.34E-12
WNW	255	Bi-214	3.30E-05	5.94E-12	4.29E-13	6.37E-12
W	255	Rn-222	8.24E-02	0.00E+00	0.00E+00	0.00E+00
W	255	Po-218	2.82E-02	5.07E-09	4.26E-10	5.50E-09
W	255	Pb-214	8.86E-04	1.59E-10	1.25E-11	1.72E-10
W	255	At-218	5.55E-06	9.99E-13	8.37E-14	1.08E-12
W	255	Bi-214	2.77E-05	4.99E-12	3.71E-13	5.36E-12
WSW	255	Rn-222	4.50E-02	0.00E+00	0.00E+00	0.00E+00
WSW	255	Po-218	1.56E-02	2.80E-09	2.42E-10	3.04E-09
WSW	255	Pb-214	5.02E-04	9.03E-11	7.25E-12	9.75E-11
WSW	255	At-218	3.06E-06	5.52E-13	4.77E-14	5.99E-13
WSW	255	Bi-214	1.62E-05	2.91E-12	2.21E-13	3.13E-12
SW	255	Rn-222	5.46E-02	0.00E+00	0.00E+00	0.00E+00
SW	255	Po-218	2.06E-02	3.71E-09	3.06E-10	4.01E-09
SW	255	Pb-214	7.39E-04	1.33E-10	1.03E-11	1.43E-10
SW	255	At-218	4.07E-06	7.32E-13	6.02E-14	7.92E-13
SW	255	Bi-214	2.58E-05	4.64E-12	3.46E-13	4.98E-12
SSW	255	Rn-222	6.57E-02	0.00E+00	0.00E+00	0.00E+00
SSW	255	Po-218	2.45E-02	4.41E-09	3.60E-10	4.77E-09
SSW	255	Pb-214	8.52E-04	1.53E-10	1.18E-11	1.65E-10
SSW	255	At-218	4.83E-06	8.69E-13	7.10E-14	9.40E-13
SSW	255	Bi-214	2.87E-05	5.16E-12	3.82E-13	5.54E-12
S	255	Rn-222	6.41E-02	0.00E+00	0.00E+00	0.00E+00
S	255	Po-218	1.92E-02	3.46E-09	3.15E-10	3.77E-09
S	255	Pb-214	5.43E-04	9.77E-11	8.52E-12	1.06E-10
S	255	At-218	3.77E-06	6.78E-13	6.19E-14	7.40E-13
S	255	Bi-214	1.61E-05	2.89E-12	2.47E-13	3.14E-12
SSE	255	Rn-222	4.95E-02	0.00E+00	0.00E+00	0.00E+00
SSE	255	Po-218	1.39E-02	2.50E-09	2.34E-10	2.73E-09

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Conc (pCi/m3)	Dry Depo Rate (pCi/cm2-s)	Wet Depo Rate (pCi/cm2-s)	Ground Depo Rate (pCi/cm2-s)
SSE	255	Pb-214	3.68E-04	6.62E-11	5.90E-12	7.21E-11
SSE	255	At-218	2.72E-06	4.89E-13	4.57E-14	5.35E-13
SSE	255	Bi-214	1.04E-05	1.88E-12	1.62E-13	2.04E-12
SE	255	Rn-222	6.82E-02	0.00E+00	0.00E+00	0.00E+00
SE	255	Po-218	1.93E-02	3.48E-09	3.05E-10	3.79E-09
SE	255	Pb-214	5.36E-04	9.66E-11	7.89E-12	1.04E-10
SE	255	At-218	3.79E-06	6.82E-13	5.96E-14	7.42E-13
SE	255	Bi-214	1.59E-05	2.87E-12	2.24E-13	3.09E-12
ESE	255	Rn-222	1.06E-01	0.00E+00	0.00E+00	0.00E+00
ESE	255	Po-218	3.33E-02	5.99E-09	4.90E-10	6.48E-09
ESE	255	Pb-214	1.03E-03	1.86E-10	1.42E-11	2.00E-10
ESE	255	At-218	6.54E-06	1.18E-12	9.60E-14	1.27E-12
ESE	255	Bi-214	3.27E-05	5.89E-12	4.34E-13	6.32E-12
E	255	Rn-222	1.29E-01	0.00E+00	0.00E+00	0.00E+00
E	255	Po-218	4.65E-02	8.37E-09	6.53E-10	9.02E-09
E	255	Pb-214	1.68E-03	3.03E-10	2.20E-11	3.25E-10
E	255	At-218	9.16E-06	1.65E-12	1.29E-13	1.78E-12
E	255	Bi-214	5.93E-05	1.07E-11	7.47E-13	1.14E-11
ENE	255	Rn-222	1.07E-01	0.00E+00	0.00E+00	0.00E+00
ENE	255	Po-218	3.80E-02	6.84E-09	5.30E-10	7.37E-09
ENE	255	Pb-214	1.29E-03	2.32E-10	1.69E-11	2.49E-10
ENE	255	At-218	7.49E-06	1.35E-12	1.04E-13	1.45E-12
ENE	255	Bi-214	4.23E-05	7.62E-12	5.36E-13	8.16E-12
NE	255	Rn-222	7.29E-02	0.00E+00	0.00E+00	0.00E+00
NE	255	Po-218	2.32E-02	4.17E-09	3.44E-10	4.51E-09
NE	255	Pb-214	6.93E-04	1.25E-10	9.59E-12	1.34E-10
NE	255	At-218	4.55E-06	8.20E-13	6.75E-14	8.87E-13
NE	255	Bi-214	2.10E-05	3.78E-12	2.81E-13	4.06E-12
NNE	255	Rn-222	6.89E-02	0.00E+00	0.00E+00	0.00E+00
NNE	255	Po-218	2.06E-02	3.70E-09	3.13E-10	4.02E-09
NNE	255	Pb-214	5.86E-04	1.06E-10	8.32E-12	1.14E-10
NNE	255	At-218	4.04E-06	7.27E-13	6.14E-14	7.88E-13
NNE	255	Bi-214	1.75E-05	3.15E-12	2.38E-13	3.38E-12

RESRAD-ONSITE OUTPUT FILE FOR RADON EMMISSIONS FROM RADIUM-226 IN THE COLDWATER CREEK CORRIDOR ADJACENT TO JANA PARCEL

Summary : Radon Emission Rate CWC Corridor adjacent Jana School
File   : C:\USERS\DAVISKT\DOCUMENTS\PUBLIC AFFAIRS\JANA\RESRAD\RADON EMISSIONS CWC CORRIDOR BY JANA.RAD

Table of Contents

Part I: Mixture Sums and Single Radionuclide Guidelines

Dose Conversion Factor (and Related) Parameter Summary
Dose Library: DCFPAK3.02 (Adult)

0

Menu	Parameter	Current Value#	Base Case*	Parameter Name
A-1	DCF's for external ground radiation, (mrem/yr)/(pCi/g)			
A-1	At-218 (Source: DCFPAK3.02)	5.567E-05	5.567E-05	DCF1(1)
A-1	Bi-210 (Source: DCFPAK3.02)	5.473E-03	5.473E-03	DCF1(2)
A-1	Bi-214 (Source: DCFPAK3.02)	9.135E+00	9.135E+00	DCF1(3)
A-1	Hg-206 (Source: DCFPAK3.02)	6.127E-01	6.127E-01	DCF1(4)
A-1	Pb-210 (Source: DCFPAK3.02)	2.092E-03	2.092E-03	DCF1(5)
A-1	Pb-214 (Source: DCFPAK3.02)	1.257E+00	1.257E+00	DCF1(6)
A-1	Po-210 (Source: DCFPAK3.02)	5.641E-05	5.641E-05	DCF1(7)
A-1	Po-214 (Source: DCFPAK3.02)	4.801E-04	4.801E-04	DCF1(8)
A-1	Po-218 (Source: DCFPAK3.02)	9.228E-09	9.228E-09	DCF1(9)
A-1	Ra-226 (Source: DCFPAK3.02)	3.176E-02	3.176E-02	DCF1(10)
A-1	Rn-218 (Source: DCFPAK3.02)	4.259E-03	4.259E-03	DCF1(11)
A-1	Rn-222 (Source: DCFPAK3.02)	2.130E-03	2.130E-03	DCF1(12)
A-1	Tl-206 (Source: DCFPAK3.02)	1.278E-02	1.278E-02	DCF1(13)
A-1	Tl-210 (Source: DCFPAK3.02)	1.677E+01	1.677E+01	DCF1(14)
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Pb-210+D	3.708E-02	2.077E-02	DCF2(1)
B-1	Ra-226+D	3.528E-02	3.517E-02	DCF2(2)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Pb-210+D	7.057E-03	2.575E-03	DCF3(1)
D-1	Ra-226+D	1.037E-03	1.036E-03	DCF3(2)
D-34	Food transfer factors:			
D-34	Pb-210+D , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(1,1)
D-34	Pb-210+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-04	8.000E-04	RTF(1,2)
D-34	Pb-210+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.000E-04	3.000E-04	RTF(1,3)
D-34				
D-34	Ra-226+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(2,1)
D-34	Ra-226+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(2,2)
D-34	Ra-226+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(2,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Pb-210+D , fish	3.000E+02	3.000E+02	BIOFAC(1,1)
D-5	Pb-210+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(1,2)
D-5				
D-5	Ra-226+D , fish	5.000E+01	5.000E+01	BIOFAC(2,1)
D-5	Ra-226+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(2,2)

#For DCF1(xxx) only, factors are for infinite depth & area. See ETFG table in Ground Pathway of Detailed Report.
*Base Case means Default.Lib w/o Associate Nuclide contributions.

Site-Specific Parameter Summary

0 Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R011	Area of contaminated zone (m**2)	1.373E+04	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	3.000E+00	2.000E+00	---	THICK0
R011	Fraction of contamination that is submerged	0.000E+00	0.000E+00	---	SUBMFRACT
R011	Length parallel to aquifer flow (m)	1.000E+02	1.000E+02	---	LCZPAQ
R011	Basic radiation dose limit (mrem/yr)	1.900E+01	3.000E+01	---	BRDL
R011	Time since placement of material (yr)	0.000E+00	0.000E+00	---	TI
R011	Times for calculations (yr)	1.000E+00	1.000E+00	---	T(2)
R011	Times for calculations (yr)	3.000E+00	3.000E+00	---	T(3)
R011	Times for calculations (yr)	1.000E+01	1.000E+01	---	T(4)
R011	Times for calculations (yr)	3.000E+01	3.000E+01	---	T(5)
R011	Times for calculations (yr)	1.000E+02	1.000E+02	---	T(6)
R011	Times for calculations (yr)	not used	3.000E+02	---	T(7)
R011	Times for calculations (yr)	not used	1.000E+03	---	T(8)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(9)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): Ra-226	5.600E-01	0.000E+00	---	S1(2)
R012	Concentration in groundwater (pCi/L): Ra-226	not used	0.000E+00	---	W1(2)
R013	Cover depth (m)	0.000E+00	0.000E+00	---	COVER0
R013	Density of cover material (g/cm**3)	not used	1.500E+00	---	DENSCV
R013	Cover depth erosion rate (m/yr)	not used	1.000E-03	---	VCV
R013	Density of contaminated zone (g/cm**3)	1.500E+00	1.500E+00	---	DENSCZ
R013	Contaminated zone erosion rate (m/yr)	0.000E+00	1.000E-03	---	VCZ
R013	Contaminated zone total porosity	4.000E-01	4.000E-01	---	TPCZ
R013	Contaminated zone field capacity	2.000E-01	2.000E-01	---	FCCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	1.000E+01	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	5.300E+00	5.300E+00	---	BCZ
R013	Average annual wind speed (m/sec)	2.000E+00	2.000E+00	---	WIND
R013	Humidity in air (g/m**3)	not used	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	5.000E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	1.000E+00	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	2.000E-01	2.000E-01	---	RI
R013	Irrigation mode	overhead	overhead	---	IDITCH
R013	Runoff coefficient	2.000E-01	2.000E-01	---	RUNOFF
R013	Watershed area for nearby stream or pond (m**2)	1.000E+06	1.000E+06	---	WAREA
R013	Accuracy for water/soil computations	1.000E-03	1.000E-03	---	EPS
R014	Density of saturated zone (g/cm**3)	1.500E+00	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	4.000E-01	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	2.000E-01	2.000E-01	---	EPSZ
R014	Saturated zone field capacity	2.000E-01	2.000E-01	---	FCSZ
R014	Saturated zone hydraulic conductivity (m/yr)	1.000E+02	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	2.000E-02	2.000E-02	---	HGWT
R014	Saturated zone b parameter	5.300E+00	5.300E+00	---	BSZ
R014	Water table drop rate (m/yr)	1.000E-03	1.000E-03	---	VWT
R014	Well pump intake depth (m below water table)	1.000E+01	1.000E+01	---	DWIBWT
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	ND	ND	---	MODEL
R014	Well pumping rate (m**3/yr)	2.500E+02	2.500E+02	---	UW

Site-Specific Parameter Summary (continued)

0 Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R015	Number of unsaturated zone strata	1	1	---	NS
R015	Unsat. zone 1, thickness (m)	4.000E+00	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm**3)	1.500E+00	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	4.000E-01	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	2.000E-01	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, field capacity	2.000E-01	2.000E-01	---	FCUZ(1)
R015	Unsat. zone 1, soil-specific b parameter	5.300E+00	5.300E+00	---	BUZ(1)
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	1.000E+01	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for Ra-226				
R016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC(2)
R016	Unsaturated zone 1 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(2,1)
R016	Saturated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.582E-03	ALEACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
R016	Distribution coefficients for daughter Pb-210				
R016	Contaminated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.109E-03	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R017	Inhalation rate (m**3/yr)	not used	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	not used	1.000E-04	---	MLINH
R017	Exposure duration	3.000E+01	3.000E+01	---	ED
R017	Shielding factor, inhalation	not used	4.000E-01	---	SHF3
R017	Shielding factor, external gamma	not used	7.000E-01	---	SHF1
R017	Fraction of time spent indoors	0.000E+00	5.000E-01	---	FIND
R017	Fraction of time spent outdoors (on site)	0.000E+00	2.500E-01	---	FOTD
R017	Shape factor flag, external gamma	not used	1.000E+00	>0 shows circular AREA.	FS
R017	Radii of shape factor array (used if FS = -1):				
R017	Outer annular radius (m), ring 1:	not used	5.000E+01	---	RAD_SHAPE(1)
R017	Outer annular radius (m), ring 2:	not used	7.071E+01	---	RAD_SHAPE(2)
R017	Outer annular radius (m), ring 3:	not used	0.000E+00	---	RAD_SHAPE(3)
R017	Outer annular radius (m), ring 4:	not used	0.000E+00	---	RAD_SHAPE(4)
R017	Outer annular radius (m), ring 5:	not used	0.000E+00	---	RAD_SHAPE(5)
R017	Outer annular radius (m), ring 6:	not used	0.000E+00	---	RAD_SHAPE(6)
R017	Outer annular radius (m), ring 7:	not used	0.000E+00	---	RAD_SHAPE(7)
R017	Outer annular radius (m), ring 8:	not used	0.000E+00	---	RAD_SHAPE(8)
R017	Outer annular radius (m), ring 9:	not used	0.000E+00	---	RAD_SHAPE(9)
R017	Outer annular radius (m), ring 10:	not used	0.000E+00	---	RAD_SHAPE(10)
R017	Outer annular radius (m), ring 11:	not used	0.000E+00	---	RAD_SHAPE(11)
R017	Outer annular radius (m), ring 12:	not used	0.000E+00	---	RAD_SHAPE(12)

Site-Specific Parameter Summary (continued)

0 Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R017	Fractions of annular areas within AREA:				
R017	Ring 1	not used	1.000E+00	---	FRACA(1)
R017	Ring 2	not used	2.732E-01	---	FRACA(2)
R017	Ring 3	not used	0.000E+00	---	FRACA(3)
R017	Ring 4	not used	0.000E+00	---	FRACA(4)
R017	Ring 5	not used	0.000E+00	---	FRACA(5)
R017	Ring 6	not used	0.000E+00	---	FRACA(6)
R017	Ring 7	not used	0.000E+00	---	FRACA(7)
R017	Ring 8	not used	0.000E+00	---	FRACA(8)
R017	Ring 9	not used	0.000E+00	---	FRACA(9)
R017	Ring 10	not used	0.000E+00	---	FRACA(10)
R017	Ring 11	not used	0.000E+00	---	FRACA(11)
R017	Ring 12	not used	0.000E+00	---	FRACA(12)
R018	Fruits, vegetables and grain consumption (kg/yr)	not used	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	not used	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	not used	9.200E+01	---	DIET(3)
R018	Meat and poultry consumption (kg/yr)	not used	6.300E+01	---	DIET(4)
R018	Fish consumption (kg/yr)	not used	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	not used	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	not used	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	not used	5.100E+02	---	DWI
R018	Contamination fraction of drinking water	not used	1.000E+00	---	FDW
R018	Contamination fraction of household water	1.000E+00	1.000E+00	---	FHHW
R018	Contamination fraction of livestock water	not used	1.000E+00	---	FLW
R018	Contamination fraction of irrigation water	not used	1.000E+00	---	FIRW
R018	Contamination fraction of aquatic food	not used	5.000E-01	---	FR9
R018	Contamination fraction of plant food	not used	-1	---	FPLANT
R018	Contamination fraction of meat	not used	-1	---	FMEAT
R018	Contamination fraction of milk	not used	-1	---	FMILK
R019	Livestock fodder intake for meat (kg/day)	not used	6.800E+01	---	LFI5
R019	Livestock fodder intake for milk (kg/day)	not used	5.500E+01	---	LFI6
R019	Livestock water intake for meat (L/day)	not used	5.000E+01	---	LWI5
R019	Livestock water intake for milk (L/day)	not used	1.600E+02	---	LWI6
R019	Livestock soil intake (kg/day)	not used	5.000E-01	---	LSI
R019	Mass loading for foliar deposition (g/m**3)	not used	1.000E-04	---	MLFD
R019	Depth of soil mixing layer (m)	not used	1.500E-01	---	DM
R019	Depth of roots (m)	not used	9.000E-01	---	DROOT
R019	Drinking water fraction from ground water	not used	1.000E+00	---	FGWDW
R019	Household water fraction from ground water	1.000E+00	1.000E+00	---	FGWHH
R019	Livestock water fraction from ground water	not used	1.000E+00	---	FGWLW
R019	Irrigation fraction from ground water	not used	1.000E+00	---	FGWIR
R19B	Wet weight crop yield for Non-Leafy (kg/m**2)	not used	7.000E-01	---	YV(1)
R19B	Wet weight crop yield for Leafy (kg/m**2)	not used	1.500E+00	---	YV(2)
R19B	Wet weight crop yield for Fodder (kg/m**2)	not used	1.100E+00	---	YV(3)
R19B	Growing Season for Non-Leafy (years)	not used	1.700E-01	---	TE(1)
R19B	Growing Season for Leafy (years)	not used	2.500E-01	---	TE(2)
R19B	Growing Season for Fodder (years)	not used	8.000E-02	---	TE(3)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R19B	Translocation Factor for Non-Leafy	not used	1.000E-01	---	TIV(1)
R19B	Translocation Factor for Leafy	not used	1.000E+00	---	TIV(2)
R19B	Translocation Factor for Fodder	not used	1.000E+00	---	TIV(3)
R19B	Dry Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---	RDRY(1)
R19B	Dry Foliar Interception Fraction for Leafy	not used	2.500E-01	---	RDRY(2)
R19B	Dry Foliar Interception Fraction for Fodder	not used	2.500E-01	---	RDRY(3)
R19B	Wet Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---	RWET(1)
R19B	Wet Foliar Interception Fraction for Leafy	not used	2.500E-01	---	RWET(2)
R19B	Wet Foliar Interception Fraction for Fodder	not used	2.500E-01	---	RWET(3)
R19B	Weathering Removal Constant for Vegetation	not used	2.000E+01	---	WLAM
C14	C-12 concentration in water (g/cm**3)	not used	2.000E-05	---	C12WTR
C14	C-12 concentration in contaminated soil (g/g)	not used	3.000E-02	---	C12CZ
C14	Fraction of vegetation carbon from soil	not used	2.000E-02	---	CSOIL
C14	Fraction of vegetation carbon from air	not used	9.800E-01	---	CAIR
C14	C-14 evasion layer thickness in soil (m)	not used	3.000E-01	---	DMC
C14	C-14 evasion flux rate from soil (1/sec)	not used	7.000E-07	---	EVSN
C14	C-12 evasion flux rate from soil (1/sec)	not used	1.000E-10	---	REVSN
C14	Fraction of grain in beef cattle feed	not used	8.000E-01	---	AVFG4
C14	Fraction of grain in milk cow feed	not used	2.000E-01	---	AVFG5
STOR	Storage times of contaminated foodstuffs (days):				
STOR	Fruits, non-leafy vegetables, and grain	1.400E+01	1.400E+01	---	STOR_T(1)
STOR	Leafy vegetables	1.000E+00	1.000E+00	---	STOR_T(2)
STOR	Milk	1.000E+00	1.000E+00	---	STOR_T(3)
STOR	Meat and poultry	2.000E+01	2.000E+01	---	STOR_T(4)
STOR	Fish	7.000E+00	7.000E+00	---	STOR_T(5)
STOR	Crustacea and mollusks	7.000E+00	7.000E+00	---	STOR_T(6)
STOR	Well water	1.000E+00	1.000E+00	---	STOR_T(7)
STOR	Surface water	1.000E+00	1.000E+00	---	STOR_T(8)
STOR	Livestock fodder	4.500E+01	4.500E+01	---	STOR_T(9)
R021	Thickness of building foundation (m)	not used	1.500E-01	---	FLOOR1
R021	Bulk density of building foundation (g/cm**3)	not used	2.400E+00	---	DENSFL
R021	Total porosity of the cover material	not used	4.000E-01	---	TPCV
R021	Total porosity of the building foundation	not used	1.000E-01	---	TPFL
R021	Volumetric water content of the cover material	not used	5.000E-02	---	PH2OCV
R021	Volumetric water content of the foundation	not used	3.000E-02	---	PH2OFL
R021	Diffusion coefficient for radon gas (m/sec):				
R021	in cover material	not used	2.000E-06	---	DIFCV
R021	in foundation material	not used	3.000E-07	---	DIFFL
R021	in contaminated zone soil	2.000E-06	2.000E-06	---	DIFCZ
R021	Radon vertical dimension of mixing (m)	2.000E+00	2.000E+00	---	HMIX
R021	Average building air exchange rate (1/hr)	not used	5.000E-01	---	REXG
R021	Height of the building (room) (m)	not used	2.500E+00	---	HRM
R021	Building interior area factor	not used	0.000E+00	code computed (time dependent)	FAI
R021	Building depth below ground surface (m)	not used	-1.000E+00	code computed (time dependent)	DMFL
R021	Emanating power of Rn-222 gas	2.500E-01	2.500E-01	---	EMANA(1)
R021	Emanating power of Rn-220 gas	not used	1.500E-01	---	EMANA(2)
TITL	Number of graphical time points	32	---	---	NPTS

Site-Specific Parameter Summary (continued)

0 Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
TITL	Maximum number of integration points for dose	17	---	---	LYMAX
TITL	Maximum number of integration points for risk	257	---	---	KYMAX

Summary of Pathway Selections

Pathway	User Selection
1 -- external gamma	suppressed
2 -- inhalation (w/o radon)	suppressed
3 -- plant ingestion	suppressed
4 -- meat ingestion	suppressed
5 -- milk ingestion	suppressed
6 -- aquatic foods	suppressed
7 -- drinking water	suppressed
8 -- soil ingestion	suppressed
9 -- radon	active
Find peak pathway doses	suppressed

```
      Contaminated Zone Dimensions           Initial Soil Concentrations, pCi/g
      ____________________________           __________________________________

        Area:  13727.00 square meters               Ra-226     5.600E-01
   Thickness:      3.00 meters
 Cover Depth:      0.00 meters
0
                          Total Dose TDOSE(t), mrem/yr
                    Basic Radiation Dose Limit = 1.900E+01 mrem/yr
   Total Mixture Sum M(t) = Fraction of Basic Dose Limit Received at Time (t)
   __________________________________________________________________________

    t (years):  0.000E+00  1.000E+00  3.000E+00  1.000E+01  3.000E+01  1.000E+02
     TDOSE(t):  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
         M(t):  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0Maximum TDOSE(t):  0.000E+00 mrem/yr   at t = 0.000E+00 years
```

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years
0
Water Independent Pathways (Inhalation excludes radon)
0

Radio-Nuclide	Ground mrem/yr	Ground fract.	Inhalation mrem/yr	Inhalation fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	Milk mrem/yr	Milk fract.	Soil mrem/yr	Soil fract.
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

0

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years
0
Water Dependent Pathways
0

Radio-Nuclide	Water mrem/yr	Water fract.	Fish mrem/yr	Fish fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	Milk mrem/yr	Milk fract.	All Pathways* mrem/yr	All Pathways* fract.
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

0*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years
0 Water Independent Pathways (Inhalation excludes radon)

0 Radio-Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

0

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years
0 Water Dependent Pathways

0 Radio-Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

0*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+00 years
0 Water Independent Pathways (Inhalation excludes radon)

0 Radio-Nuclide	Ground mrem/yr	Ground fract.	Inhalation mrem/yr	Inhalation fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	Milk mrem/yr	Milk fract.	Soil mrem/yr	Soil fract.
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

0

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+00 years
0 Water Dependent Pathways

0 Radio-Nuclide	Water mrem/yr	Water fract.	Fish mrem/yr	Fish fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	Milk mrem/yr	Milk fract.	All Pathways* mrem/yr	All Pathways* fract.
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

0*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years
0 Water Independent Pathways (Inhalation excludes radon)

0 Radio-Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

0

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years
0 Water Dependent Pathways

0 Radio-Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

0*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+01 years

0
Water Independent Pathways (Inhalation excludes radon)

0

Radio-Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

0

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+01 years

0
Water Dependent Pathways

0

Radio-Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

0*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years
0
Water Independent Pathways (Inhalation excludes radon)
0

Radio-Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

0

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years
0
Water Dependent Pathways
0

Radio-Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

0*Sum of all water independent and dependent pathways.

Dose/Source Ratios Summed Over All Pathways
Parent and Progeny Principal Radionuclide Contributions Indicated

0 Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	ΣDSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 180 days) daughters.
0

Single Radionuclide Soil Guidelines G(i,t) in pCi/g
Basic Radiation Dose Limit = 1.900E+01 mrem/yr

0Nuclide (i)	t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226	*9.885E+11	*9.885E+11	*9.885E+11	*9.885E+11	*9.885E+11	*9.885E+11

*At specific activity limit
0

Summed Dose/Source Ratios DSR(i,t) in (mrem/yr)/(pCi/g)
and Single Radionuclide Soil Guidelines G(i,t) in pCi/g
at tmin = time of minimum single radionuclide soil guideline
and at tmax = time of maximum total dose = 0.000E+00 years

0Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Ra-226	5.600E-01	0.000E+00	0.000E+00	*9.885E+11	0.000E+00	*9.885E+11

*At specific activity limit

Individual Nuclide Dose Summed Over All Pathways
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	DOSE(j,t), mrem/yr t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226	Ra-226	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210	Ra-226	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

THF(i) is the thread fraction of the parent nuclide.

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	S(j,t), pCi/g t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226	Ra-226	1.000E+00	5.600E-01	5.589E-01	5.566E-01	5.488E-01	5.271E-01	4.578E-01
Pb-210	Ra-226	1.000E+00	0.000E+00	1.719E-02	4.984E-02	1.478E-01	3.243E-01	4.487E-01

THF(i) is the thread fraction of the parent nuclide.

0RESCALC.EXE execution time =   4.16 seconds

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Part II: Source Terms, Factors, and Parameters for Individual Pathways

Source Factors for Ingrowth and Decay
Radioactivity Factors Only
Parent and Progeny Principal Radionuclide Contributions Indicated

0

Parent (i)	Product (j)	Thread Fraction	ID(j,t) = THF(j)*S1(j,t)/S1(i,0) At Time in Years 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.000E+00	1.000E+00	9.996E-01	9.987E-01	9.957E-01	9.871E-01	9.576E-01
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	3.073E-02	8.936E-02	2.676E-01	6.035E-01	9.264E-01

0

Source Factors for Ingrowth and Decay
Combined Radioactivity and Leaching Factors
Parent and Progeny Principal Radionuclide Contributions Indicated

0

Parent (i)	Product (j)	Thread Fraction	SF(j,t) = THF(j)*S1(j,t)/S1(i,0) At Time in Years 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.000E+00	1.000E+00	9.980E-01	9.940E-01	9.800E-01	9.413E-01	8.174E-01
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	3.069E-02	8.900E-02	2.640E-01	5.790E-01	8.013E-01

The effect of volatilization was also considered when computing the source factors for H-3 and C-14.

Parameters Used for Calculating Cover Depth and Contaminated Zone Thicknesses

0 Cover Erosion rate (vcv): 0.001000 m/yr
Contaminated Zone Erosion rate (vcz): 0.000000 m/yr
Water Table Drop rate (vwt): 0.001000 m/yr
Precipitation rate (Pr): 1.000000 m/yr
Cover Removal Time (Tc): 0.000E+00 yr
Overhead irrigation rate (Irr): 0.200 m/yr Runoff coefficient (Cr): 0.200
Evapotranspiration coeff. (Ce): 0.500 Infiltration rate (In): 0.500 m/yr
Bulk soil density (rhob): 1.500 g/cm**3 Effective porosity (pe): 0.000

0Radio- nuclide (i)	Distribution Coefficient Kd(i),cm**3/g	Leaching Ratio q(i)
Pb-210	1.000000E+02	2.135E-03
Ra-226	7.000000E+01	3.047E-03

0

Time Dependence of Source Geometry

Time Dependence of Cover Depth [Cd(i,t)]

Nuclide (i)	Cd(i,t) (meters) t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Pb-210	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
Ra-226	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

0

Time Dependence of Contaminated Zone Thicknesses [T(i,t)]

Nuclide (i)	T(i,t) (meters) t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Pb-210	3.0000E+00	3.0000E+00	3.0000E+00	3.0000E+00	3.0000E+00	3.0000E+00
Ra-226	3.0000E+00	3.0000E+00	3.0000E+00	3.0000E+00	3.0000E+00	3.0000E+00

Occupancy, Cover/Depth, and Area Factors for Ground Pathway

Occupancy Factor (FO1):	0.000
Area (A):	13727. sq. meters
Initial cover depth (Cd):	0.000 meters
Initial contaminated zone thickness (T):	3.000 meters

Time Dependence of Cover/Depth Factor [FCTR_COV_DEPTH(i,t)]

Nuclide	FCTR_COV_DEPTH(i,t) (dimensionless)					
(i)	t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
At-218	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Bi-210	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Bi-214	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Hg-206	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-214	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Po-210	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Po-214	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Po-218	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Rn-218	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Rn-222	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Tl-206	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Tl-210	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

0

Time Dependence of Area Factor [FCTR_AREA(i,t)]

Nuclide	FCTR_AREA(i,t) (dimensionless)					
(i)	t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
At-218	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Bi-210	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Bi-214	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Hg-206	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-214	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Po-210	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Po-214	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Po-218	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Rn-218	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Rn-222	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Tl-206	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Tl-210	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Dose Conversion and Environmental Transport Factors for the Ground Pathway (p=1)

0Nuclide (i)	DCF(i,1)*	ETFG(i,t) At Time in Years (dimensionless) t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
At-218	5.567E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Bi-210	5.473E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Bi-214	9.135E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Hg-206	6.127E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210	2.092E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-214	1.257E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Po-210	5.641E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Po-214	4.801E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Po-218	9.228E-09	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226	3.176E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Rn-218	4.259E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Rn-222	2.130E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Tl-206	1.278E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Tl-210	1.677E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

* - Units are (mrem/yr)/(pCi/g) at infinite depth and area. Multiplication by ETFG(i,t) converts to site conditions.

0

Dose/Source Ratios for External Radiation from the Ground (p=1)
Parent and Progeny Principal Radionuclide Contributions Indicated

0 Parent (i)	Product (j)	Thread Fraction	DSR(j,1,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	ΣDSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 180 days) daughters.

Dose/Source Ratios for Inhalation Pathway, Excluding Radon (p=2)
Parent and Progeny Principal Radionuclide Contributions Indicated

Parent (i)	Product (j)	Thread Fraction	DSR(j,2,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	ΣDSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 180 days) daughters.

0

Pathway Factors for the Inhalation Pathway (radon excluded)

Area (A):	1.3727E+04 m**2	Occupancy Factor (FO2):	0.0000E+00
Area Factor (FA2):	1.7487E-01	Annual Air Intake (F12):	8.4000E+03 m**3/yr
Cover Depth [Cd(0)]:	0.0000E+00 m	Mass Loading (ASR2):	1.0000E-04 g/m**3
Contaminated Zone Thickness [T(0)]:	3.0000E+00 m	FA2 * FO2 * F12 * ASR2:	0.0000E+00 g/yr

Nuclide (i)	Depth Factor [FD(i,2,t)] (dimensionless) t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00

0

Dose Conversion and Environmental Transport Factors for the Inhalation Pathway, Excluding Radon (p=2)

Parent (i)	Product (j)	DCF(j,2)*	ETF(j,2,t) At Time in Years (g/yr) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	3.528E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	3.708E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

* - The dose conversion factor units are mrem/pCi.

Parameters Used for Calculating Indoor and Outdoor Radon Flux

0	*Floor Material	Cover Material	Contaminated Zone
Radon Diffusion Coefficient (m**2/s)	3.000E-07	2.000E-06	2.000E-06
Total Porosity	1.000E-01	4.000E-01	4.000E-01
Volumetric Water Content	3.000E-02	5.000E-02	3.209E-01
Bulk Density (g/cm**3)	2.400E+00	1.500E+00	1.500E+00
Rn-222 Emanation Coefficient	2.500E-01	2.500E-01	2.500E-01
Initial Thickness (m)	1.500E-01	0.000E+00	3.000E+00

Building Depth Below Ground Surface *(DMFL): -1.000E+00 (m)
Negative DMFL shows building depth adjusted (if necessary) for no penetration
of contaminated zone. Actual values used *(DMFLACT), m:

t=	0.0000E+00	1.0000E+00	3.0000E+00	1.0000E+01	3.0000E+01	1.0000E+02
DMFLACT=	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Building indoor area factor *(FAI):   0.000E+00
FAI <= 0.0 shows calculated time-dependent value based on amount of wall area
extending into the contaminated zone. Actual values used *(FAIACT):

t=	0.0000E+00	1.0000E+00	3.0000E+00	1.0000E+01	3.0000E+01	1.0000E+02
FAIACT =	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00

0* - Parameters are used only for indoor radon flux

0

Time Dependence of Outdoor Radon Flux [FLUXO(i,t)]

0Nuclide FLUXO(i,t) (pCi/m**2/s)

(i) t=	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226	4.2806E-01	4.2720E-01	4.2548E-01	4.1952E-01	4.0294E-01	3.4992E-01

0

Time Dependence of Indoor Radon Flux [FLUXI(i,t)]

0Nuclide FLUXI(i,t) (pCi/m**2/s)

(i) t=	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226	8.1304E-02	8.1140E-02	8.0814E-02	7.9681E-02	7.6533E-02	6.6462E-02

Parameters Used for Calculating Indoor and Outdoor Radon Concentration

Radon Vertical Dimension of Mixing (HMIX):	2.000E+00	(m)
Average Annual Wind Speed (WIND):	2.000E+00	(m/sec)
Building Room Height (HRM):	2.500E+00	(m)
Building Air Exchange Rate (REXG):	5.000E-01	(1/hr)

0 Time Dependence of Outdoor Radon Concentration [CRNO(i,t)]

CRNO(i,t) (pCi/m**3)

0Nuclide (i) t=	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226	6.2689E+00	6.2563E+00	6.2311E+00	6.1438E+00	5.9010E+00	5.1245E+00

0

0 Time Dependence of Indoor Radon Concentration [HCONC(i,r)]

HCONC(i,t) (pCi/m**3)

0Nuclide (i) t=	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226	2.3684E+02	2.3637E+02	2.3541E+02	2.3212E+02	2.2295E+02	1.9361E+02

Outdoor Working Levels of Radon [WLOTD(i,t)]

0Nuclide	WLOTD(i,t) (WL)					
(i) t=	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226	3.5251E-07	3.5180E-07	3.5038E-07	3.4548E-07	3.3182E-07	2.8816E-07

0

Indoor Working Levels of Radon [WLIND(i,t)]

0Nuclide	WLIND(i,t) (WL)					
(i) t=	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226	1.6333E-03	1.6300E-03	1.6234E-03	1.6007E-03	1.5374E-03	1.3351E-03

0

0 Fraction of Time Spent Outdoors (FOTD): 0.000E+00
Fraction of Time Spent Indoors (FIND): 0.000E+00

Dose/Source Ratios for Radon Pathway (p=9)
Subpathway: Outdoor and Indoor Radon Flux
Parent and Progeny Principal Radionuclide Contributions Indicated

0 Parent (i)	Product (j)	Thread Fraction	DSR(j,9,t) - DSRRNW(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	ΣDSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 180 days) daughters.

0

Dose/Source Ratios for Radon Pathway (p=9)
Subpathway: Indoor Radon from Water Usage
Parent and Progeny Principal Radionuclide Contributions Indicated

0 Parent (i)	Product (j)	Thread Fraction	DSRRNW(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	ΣDSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 180 days) daughters.

Transport Time Parameters for Unsaturated Zone Stratum No. 1

```
            Stratum thickness [h(1)]:      4.000000 m
Bulk soil material density [rhob(1)]:      1.500000 g/cm**3
        Effective porosity [peuz(1)]:      0.200000
    Hydraulic conductivity [Khuz(1)]:     10.000000 m/yr
            Total porosity [ptuz(1)]:      0.400000
  Soil specific b parameter [buz(1)]:      5.300000
          Saturation ratio [sruz(1)]:      0.802299
```

Radio-nuclide (i)	Distribution Coefficient Kduz(i,1), cm**3/g	Retardation Factor Rduz(i,1)	Transport Time Dtuz(i,1), yr
Pb-210	1.0000E+02	4.6841E+02	6.0128E+02
Ra-226	7.0000E+01	3.2818E+02	4.2128E+02

0

Transport Time Parameters for Unsaturated Zone created by the Falling Water Table

```
        Water table drop rate [vwt]:      0.001000 m/yr
Bulk soil material density [rhobaq]:      1.500000 g/cm**3
          Effective porosity [peaq]:      0.200000
      Hydraulic conductivity [Khaq]:    100.000000 m/yr
              Total porosity [ptaq]:      0.400000
    Soil specific b parameter [baq]:      5.300000
           Saturation ratio [sruaq]:      0.677340
```

Radio-nuclide (i)	Distribution Coefficient Kdaq(i), cm**3/g	Retardation Factor Rduaq(i)	Minimum Transport Time Dtuaq(i), yr
Pb-210	1.0000E+02	5.5464E+02	1.0633E+02
Ra-226	7.0000E+01	3.8855E+02	4.9567E+01

Dilution Factor and Rise Time Parameters for Nondispersion (ND) Model

0 Aquifer contamination depth at well (z): 2.50000E+01 m
Depth of water intake below water table (dw): 1.00000E+01 m
Infiltration rate (In): 5.00000E-01 m/yr
Aquifer water flow rate (Vwfr): 2.00000E+00 m/yr
Hydraulic gradient (J): 2.00000E-02
Hydraulic conductivity of aquifer (Kszh): 1.00000E+02 m/yr
Contaminated zone extent parallel to gradient (l): 1.00000E+02 m
Distance below contaminated zone to water table (h): 0.40000E+01 m
Initial thickness of uncontaminated cover (Cd): 0.00000E+00 m
Initial thickness of contaminated zone (T): 0.30000E+01 m
Effective porosity of saturated zone (pesz): 0.20000E+00

0 Radio-nuclide (i)	Dilution Factor f(i)	Retardation Factor Rdsz(i)	Horizontal Transport Time	Onsite Tauh(i), yr	Rise Time dt(i), yr	Decay Time Parameter 1/lamda(i),yr
Pb-210	1.000E+00	3.760E+02		3.760E+03	1.504E+03	3.203E+01
Ra-226	1.000E+00	2.635E+02		2.635E+03	1.054E+03	2.308E+03

0

Primary Parameters Used for Calculating Water/Soil
Concentration Ratios for Groundwater Pathway Segment

0 Model used: Nondispersion (ND)

Bulk soil density in contaminated zone (rhob): 1.500 g/cm**3

0 Radio-nuclide (i)	Dilution Factor f(i)	Retardation Factor Rdcz(i)	Breakthrough Time Chain year	Single Nuclide Dt(i), yr	Rise Time dt(i), yr
Pb-210	1.000E+00	4.684E+02	4.709E+02	7.076E+02	1.504E+03
Ra-226	1.000E+00	3.282E+02	4.709E+02	4.709E+02	1.054E+03

Water/Soil Concentration Ratios [WSR(j,1,t)] for Groundwater Pathway Segment

Parent (i)	Product (j)	Thread Fraction	WSR(j,1,t) At Time in Years (pCi/L)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

0

Water/Soil Concentration Ratios [WSR(j,2,t)] for Surface Water Pathway Segment

0 Watershed Area (Aw) = 1.0000E+06 m**2
Contaminated Zone Area (A) = 1.3727E+04 m**2
Dilution Factor (f') = 1.3727E-02
Soil Density (rhob) = 1.5000E+00 kg/m**3

Parent (i)	Product (j)	Thread Fraction	WSR(j,2,t) At Time in Years (pCi/L)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Storage Times For Contaminated Foodstuffs

k	Food Item	STOR_T(k), days
1	non-leafy plants	14.
2	leafy plants	1.
3	milk	1.
4	meat	20.
5	fish	7.
6	crustacea	7.
7	well water	1.
8	surface water	1.
9	livestock fodder	45.

0

Storage Time Ingrowth and Decay Factors
Storage Time for k'th Foodstuff: t = STOR_T(k), days

Parent (i)	Product (j)	Thread Fraction	STOR_ID(i,j,t) = CONCE(i,j,t)/CONCE(i,i,0) t= 1.400E+01	1.000E+00	1.000E+00	2.000E+01	7.000E+00	7.000E+00	1.000E+00	1.000E+00	4.500E+01
Pb-210	Pb-210	1.000E+00	9.988E-01	9.999E-01	9.999E-01	9.983E-01	9.994E-01	9.994E-01	9.999E-01	9.999E-01	9.962E-01
Ra-226	Ra-226	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	9.999E-01
Ra-226	Pb-210	1.000E+00	1.196E-03	8.548E-05	8.548E-05	1.708E-03	5.982E-04	5.982E-04	8.548E-05	8.548E-05	3.839E-03

CONCE(i,j,t)/CONCE(i,i,0) is the concentration ratio of Product(j) at time t to Parent(i) at start of storage time.

Storage Time Correction Factors
Drinking Water from Well and/or Surface
Harvest Time = t - 2.74E-03 yr; Consumption Time = t yr

0 Parent (i)	Product (j)	Thread Fraction	CFWW(j,t,1)# At Time in Years 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Ra-226+D	Pb-210+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00

#Correction factor = (concentration in media at consumption time)/(concentration at harvest time).

Storage Time Correction Factors
Irrigation Water for Nonleafy Plants from Well and/or Surface
Harvest Time = t - 4.11E-02 yr; Consumption Time = t - 3.83E-02 yr

0 Parent (i)	Product (j)	Thread Fraction	CFWW(j,t,2)# At Time in Years 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Ra-226+D	Pb-210+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00

#Correction factor = (concentration in media at consumption time)/(concentration at harvest time).

Storage Time Correction Factors
Irrigation Water for Leafy Plants from Well and/or Surface
Harvest Time = t - 5.48E-03 yr; Consumption Time = t - 2.74E-03 yr

0 Parent (i)	Product (j)	Thread Fraction	CFWW(j,t,3)# At Time in Years 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Ra-226+D	Pb-210+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00

#Correction factor = (concentration in media at consumption time)/(concentration at harvest time).

Storage Time Correction Factors
Irrigation Water for Livestock (Milk) Fodder from Well and/or Surface
Harvest Time = t - 1.29E-01 yr; Consumption Time = t - 1.26E-01 yr

0 Parent (i)	Product (j)	Thread Fraction	CFWW(j,t,5)# At Time in Years 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Ra-226+D	Pb-210+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00

#Correction factor = (concentration in media at consumption time)/(concentration at harvest time).

Storage Time Correction Factors
Irrigation Water for Livestock (Meat) Fodder from Well and/or Surface
Harvest Time = t - 1.81E-01 yr; Consumption Time = t - 1.78E-01 yr

0 Parent (i)	Product (j)	Thread Fraction	CFWW(j,t,7)# At Time in Years 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Ra-226+D	Pb-210+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00

#Correction factor = (concentration in media at consumption time)/(concentration at harvest time).

Storage Time Correction Factors
Livestock (Milk) Water from Well and/or Surface
Harvest Time = t - 5.48E-03 yr; Consumption Time = t - 2.74E-03 yr

0 Parent (i)	Product (j)	Thread Fraction	CFWW(j,t,4)# At Time in Years 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Ra-226+D	Pb-210+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00

#Correction factor = (concentration in media at consumption time)/(concentration at harvest time).

Storage Time Correction Factors
Livestock (Meat) Water from Well and/or Surface
Harvest Time = t - 5.75E-02 yr; Consumption Time = t - 5.48E-02 yr

0 Parent (i)	Product (j)	Thread Fraction	CFWW(j,t,6)# At Time in Years 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Ra-226+D	Pb-210+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00

#Correction factor = (concentration in media at consumption time)/(concentration at harvest time).

Storage Time Correction Factors for Nonleafy Plants
Harvest Time = t - 3.83E-02 yr; Consumption Time = t yr

0 Parent (i)	Product (j)	Thread Fraction	CF3(j,1,t)# At Time in Years 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Ra-226+D	Pb-210+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00

#Correction factor = (concentration in media at consumption time)/(concentration at harvest time).

Storage Time Correction Factors for Leafy Plants
Harvest Time = t - 2.74E-03 yr; Consumption Time = t yr

0 Parent (i)	Product (j)	Thread Fraction	CF3(j,2,t)# At Time in Years 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Ra-226+D	Pb-210+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00

#Correction factor = (concentration in media at consumption time)/(concentration at harvest time).

Storage Time Correction Factors for Livestock (Meat) Fodder
Harvest Time = t - 1.78E-01 yr; Consumption Time = t - 5.48E-02 yr

0 Parent (i)	Product (j)	Thread Fraction	CFLF(j,1,t)# At Time in Years 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.000E+00	1.000E+00	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01
Ra-226+D	Pb-210+D	1.000E+00	1.000E+00	1.602E+00	1.178E+00	1.054E+00	1.021E+00	1.012E+00

#Correction factor = (concentration in media at consumption time)/(concentration at harvest time).

Storage Time Correction Factors for Livestock (Milk) Fodder
Harvest Time = t - 1.26E-01 yr; Consumption Time = t - 2.74E-03 yr

0 Parent (i)	Product (j)	Thread Fraction	CFLF(j,2,t)# At Time in Years 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.000E+00	1.000E+00	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01
Ra-226+D	Pb-210+D	1.000E+00	1.000E+00	1.566E+00	1.175E+00	1.054E+00	1.021E+00	1.012E+00

#Correction factor = (concentration in media at consumption time)/(concentration at harvest time).

Storage Time Correction Factors for Meat
Harvest Time = t - 5.48E-02 yr; Consumption Time = t yr

0 Parent (i)	Product (j)	Thread Fraction	CF45(j,1,t)# At Time in Years 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Ra-226+D	Pb-210+D	1.000E+00	1.000E+00	1.161E+00	1.060E+00	1.019E+00	1.008E+00	1.004E+00

#Correction factor = (concentration in media at consumption time)/(concentration at harvest time).

Storage Time Correction Factors for Milk

Harvest Time = t - 2.74E-03 yr; Consumption Time = t yr

0 Parent (i)	Product (j)	Thread Fraction	CF45(j,2,t)# At Time in Years 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Ra-226+D	Pb-210+D	1.000E+00	1.000E+00	1.020E+00	1.008E+00	1.003E+00	1.001E+00	1.001E+00

#Correction factor = (concentration in media at consumption time)/(concentration at harvest time).

Storage Time Correction Factors for Fish & Crustacea

Harvest Time = t - 1.92E-02 yr; Consumption Time = t yr

0 Parent (i)	Product (j)	Thread Fraction	CFF(j,1,t)# At Time in Years 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Ra-226+D	Pb-210+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00

#Correction factor = (concentration in media at consumption time)/(concentration at harvest time).

Area and Depth Factors for Plant (p=3), Meat (p=4), and Milk (p=5) Pathways
Root Uptake from Contaminated Soil (q=1)

Area Factor for Plant Foods [FA(3)] = 0.50

Nuclide (i)	Depth Factor FD(i,1,t) (dimensionless) t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Pb-210	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00
Ra-226	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00

0
Area and Depth Factors for Plant (p=3), Meat (p=4), and Milk (p=5) Pathways
Foliar Uptake from Contaminated Dust (q=2)

Area Factor for Plant Foods [FA(3)] = 0.50

Nuclide (i)	Depth Factor FD(i,2,t) (dimensionless) t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Pb-210	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00
Ra-226	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00

0
Area and Depth Factors for Plant (p=3), Meat (p=4), and Milk (p=5) Pathways
Ditch Irrigation (q=3)

Area Factor for Plant Foods [FA(3)] = 0.50

Nuclide (i)	Depth Factor FD(i,3,t) (dimensionless) t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Pb-210	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00
Ra-226	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00

```
    Area and Depth Factors for Plant (p=3), Meat (p=4), and Milk (p=5) Pathways
                             Overhead Irrigation (q=4)

                     Area Factor for Plant Foods [FA(3)] = 0.50

                              The Depth Factor Value
                             FD(i,p,q,t) = 1.0000E+00
             is applicable for all radionuclides(i) and times(t).
0
           Area and Depth Factors for Meat (p=4) and Milk (p=5) Pathways
             Transfer from Livestock Water (q=5) and Soil (q=6) Intake

             Area Factor for Meat and Milk [FA(p),p=4,5] = 0.69

 The livestock water subpathway (q=5) and livestock soil intake subpathway (q=6)
            occur only for the meat (p=4) and milk (p=5) pathways.
```

Dose Conversion and Environmental Transport Factors for the Plant Food Pathway (p=3)
Subpathway: Root Uptake from Contaminated Soil (q=1)

0 Parent (i)	Product (j)	DCF(j,3)*	ETF(j,3,1,t) At Time in Years (g/yr) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.037E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	7.057E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

* - The dose conversion factor units are mrem/pCi.
0

Dose Conversion and Environmental Transport Factors for the Plant Food Pathway (p=3)
Subpathway: Foliar Uptake from Contaminated Dust (q=2)

0 Parent (i)	Product (j)	DCF(j,3)*	ETF(j,3,2,t) At Time in Years (g/yr) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.037E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	7.057E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

* - The dose conversion factor units are mrem/pCi.
0

Dose Conversion and Environmental Transport Factors for the Plant Food Pathway (p=3)
Subpathway: Ditch Irrigation (q=3)

0 Parent (i)	Product (j)	DCF(j,3)*	ETF(j,3,3,t) * SF(j,t) At Time in Years (g/yr) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.037E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	7.057E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

* - The dose conversion factor units are mrem/pCi.
0

Dose Conversion and Environmental Transport Factors for the Plant Food Pathway (p=3)
Subpathway: Overhead Irrigation (q=4)

0 Parent (i)	Product (j)	DCF(j,3)*	ETF(j,3,4,t) * SF(j,t) At Time in Years (g/yr) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.037E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	7.057E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

* - The dose conversion factor units are mrem/pCi.

Dose Conversion and Environmental Transport Factors for the Meat Pathway (p=4)
Subpathway: Fodder Root Uptake from Contaminated Soil (q=1)

0 Parent (i)	Product (j)	DCF(j,4)*	ETF(j,4,1,t) At Time in Years (g/yr) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.037E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	7.057E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

* - The dose conversion factor units are mrem/pCi.
0

Dose Conversion and Environmental Transport Factors for the Meat Pathway (p=4)
Subpathway: Fodder Foliar Uptake from Contaminated Dust (q=2)

0 Parent (i)	Product (j)	DCF(j,4)*	ETF(j,4,2,t) At Time in Years (g/yr) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.037E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	7.057E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

* - The dose conversion factor units are mrem/pCi.
0

Dose Conversion and Environmental Transport Factors for the Meat Pathway (p=4)
Subpathway: Ditch Irrigation (q=3)

0 Parent (i)	Product (j)	DCF(j,4)*	ETF(j,4,3,t) * SF(j,t) At Time in Years (g/yr) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.037E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	7.057E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

* - The dose conversion factor units are mrem/pCi.
0

Dose Conversion and Environmental Transport Factors for the Meat Pathway (p=4)
Subpathway: Overhead Irrigation (q=4)

0 Parent (i)	Product (j)	DCF(j,4)*	ETF(j,4,4,t) * SF(j,t) At Time in Years (g/yr) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.037E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	7.057E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

* - The dose conversion factor units are mrem/pCi.

Dose Conversion and Environmental Transport Factors for the Meat Pathway (p=4)
Subpathway: Livestock Water (q=5)

0 Parent (i)	Product (j)	DCF(j,4)*	ETF(j,4,5,t) * SF(j,t) At Time in Years (g/yr) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.037E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	7.057E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

* - The dose conversion factor units are mrem/pCi.

Dose Conversion and Environmental Transport Factors for the Milk Pathway (p=5)
Subpathway: Fodder Root Uptake from Contaminated Soil (q=1)

0 Parent (i)	Product (j)	DCF(j,5)*	ETF(j,5,1,t) At Time in Years (g/yr) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.037E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	7.057E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

* - The dose conversion factor units are mrem/pCi.
0

Dose Conversion and Environmental Transport Factors for the Milk Pathway (p=5)
Subpathway: Fodder Foliar Uptake from Contaminated Dust (q=2)

0 Parent (i)	Product (j)	DCF(j,5)*	ETF(j,5,2,t) At Time in Years (g/yr) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.037E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	7.057E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

* - The dose conversion factor units are mrem/pCi.
0

Dose Conversion and Environmental Transport Factors for the Milk Pathway (p=5)
Subpathway: Ditch Irrigation (q=3)

0 Parent (i)	Product (j)	DCF(j,5)*	ETF(j,5,3,t) * SF(j,t) At Time in Years (g/yr) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.037E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	7.057E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

* - The dose conversion factor units are mrem/pCi.
0

Dose Conversion and Environmental Transport Factors for the Milk Pathway (p=5)
Subpathway: Overhead Irrigation (q=4)

0 Parent (i)	Product (j)	DCF(j,5)*	ETF(j,5,4,t) * SF(j,t) At Time in Years (g/yr) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.037E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	7.057E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

* - The dose conversion factor units are mrem/pCi.

Dose Conversion and Environmental Transport Factors for the Milk Pathway (p=5)
Subpathway: Livestock Water (q=5)

0 Parent (i)	Product (j)	DCF(j,5)*	ETF(j,5,5,t) * SF(j,t) At Time in Years (g/yr) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.037E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	7.057E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

* - The dose conversion factor units are mrem/pCi.

Dose Conversion and Environmental Transport Factors for the Fish Pathway (p=6)

0 Parent (i)	Product (j)	DCF(j,6)*	ETF(j,6,t) * SF(j,t) At Time in Years (g/yr) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.037E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	7.057E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

* - The dose conversion factor units are mrem/pCi.

0

Dose Conversion and Environmental Transport Factors for the Drinking Water Pathway (p=7)

0 Parent (i)	Product (j)	DCF(j,7)*	ETF(j,7,t) * SF(j,t) At Time in Years (g/yr) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.037E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	7.057E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

* - The dose conversion factor units are mrem/pCi.

Dose/Source Ratios for Internal Radiation from Ingestion of Plant Foods (p=3)
Subpathway: Root Uptake from Contaminated Soil (q=1)
Parent and Progeny Principal Radionuclide Contributions Indicated

0 Parent (i)	Product (j)	Thread Fraction	DSR(j,3,1t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	ΣDSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 180 days) daughters.
0
Dose/Source Ratios for Internal Radiation from Ingestion of Plant Foods (p=3)
Subpathway: Foliar Uptake from Contaminated Dust (q=2)
Parent and Progeny Principal Radionuclide Contributions Indicated

0 Parent (i)	Product (j)	Thread Fraction	DSR(j,3,2t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	ΣDSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 180 days) daughters.
0
Dose/Source Ratios for Internal Radiation from Ingestion of Plant Foods (p=3)
Subpathway: Ditch Irrigation (q=3)
Parent and Progeny Principal Radionuclide Contributions Indicated

0 Parent (i)	Product (j)	Thread Fraction	DSR(j,3,3t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	ΣDSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 180 days) daughters.
0
Dose/Source Ratios for Internal Radiation from Ingestion of Plant Foods (p=3)
Subpathway: Overhead Irrigation (q=4)
Parent and Progeny Principal Radionuclide Contributions Indicated

0 Parent (i)	Product (j)	Thread Fraction	DSR(j,3,4t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	ΣDSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 180 days) daughters.

Dose/Source Ratios for Internal Radiation from Ingestion of Plant Foods (p=3)
Total for All Subpathways
Parent and Progeny Principal Radionuclide Contributions Indicated

0 Parent (i)	Product (j)	Thread Fraction	DSR(j,3,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	ΣDSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 180 days) daughters.

Dose/Source Ratios for Internal Radiation from Ingestion of Meat (p=4)
Subpathway: Fodder Root Uptake from Contaminated Soil (q=1)
Parent and Progeny Principal Radionuclide Contributions Indicated

Parent (i)	Product (j)	Thread Fraction	DSR(j,4,1t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	ΣDSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 180 days) daughters.

Dose/Source Ratios for Internal Radiation from Ingestion of Meat (p=4)
Subpathway: Fodder Foliar Uptake from Contaminated Dust (q=2)
Parent and Progeny Principal Radionuclide Contributions Indicated

Parent (i)	Product (j)	Thread Fraction	DSR(j,4,2t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	ΣDSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 180 days) daughters.

Dose/Source Ratios for Internal Radiation from Ingestion of Meat (p=4)
Subpathway: Ditch Irrigation (q=3)
Parent and Progeny Principal Radionuclide Contributions Indicated

Parent (i)	Product (j)	Thread Fraction	DSR(j,4,3t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	ΣDSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 180 days) daughters.

Dose/Source Ratios for Internal Radiation from Ingestion of Meat (p=4)
Subpathway: Overhead Irrigation (q=4)
Parent and Progeny Principal Radionuclide Contributions Indicated

Parent (i)	Product (j)	Thread Fraction	DSR(j,4,4t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	ΣDSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 180 days) daughters.

Dose/Source Ratios for Internal Radiation from Ingestion of Meat (p=4)
Subpathway: Livestock Water (q=5)
Parent and Progeny Principal Radionuclide Contributions Indicated

0 Parent (i)	Product (j)	Thread Fraction	DSR(j,4,5t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	ΣDSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 180 days) daughters.

0

Dose/Source Ratios for Internal Radiation from Ingestion of Meat (p=4)
Total for All Subpathways
Parent and Progeny Principal Radionuclide Contributions Indicated

0 Parent (i)	Product (j)	Thread Fraction	DSR(j,4,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	ΣDSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 180 days) daughters.

Dose/Source Ratios for Internal Radiation from Ingestion of Milk (p=5)
Subpathway: Fodder Root Uptake from Contaminated Soil (q=1)
Parent and Progeny Principal Radionuclide Contributions Indicated

0 Parent (i)	Product (j)	Thread Fraction	DSR(j,5,1t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	ΣDSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 180 days) daughters.
0
Dose/Source Ratios for Internal Radiation from Ingestion of Milk (p=5)
Subpathway: Fodder Foliar Uptake from Contaminated Dust (q=2)
Parent and Progeny Principal Radionuclide Contributions Indicated

0 Parent (i)	Product (j)	Thread Fraction	DSR(j,5,2t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	ΣDSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 180 days) daughters.
0
Dose/Source Ratios for Internal Radiation from Ingestion of Milk (p=5)
Subpathway: Ditch Irrigation (q=3)
Parent and Progeny Principal Radionuclide Contributions Indicated

0 Parent (i)	Product (j)	Thread Fraction	DSR(j,5,3t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	ΣDSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 180 days) daughters.
0
Dose/Source Ratios for Internal Radiation from Ingestion of Milk (p=5)
Subpathway: Overhead Irrigation (q=4)
Parent and Progeny Principal Radionuclide Contributions Indicated

0 Parent (i)	Product (j)	Thread Fraction	DSR(j,5,4t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	ΣDSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 180 days) daughters.

Dose/Source Ratios for Internal Radiation from Ingestion of Milk (p=5)
Subpathway: Livestock Water (q=5)
Parent and Progeny Principal Radionuclide Contributions Indicated

0 Parent (i)	Product (j)	Thread Fraction	DSR(j,5,5t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	ΣDSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 180 days) daughters.
0

Dose/Source Ratios for Internal Radiation from Ingestion of Milk (p=5)
Total for All Subpathways
Parent and Progeny Principal Radionuclide Contributions Indicated

0 Parent (i)	Product (j)	Thread Fraction	DSR(j,5,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	ΣDSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 180 days) daughters.

Dose/Source Ratios for Internal Radiation from the Ingestion of Fish (p=6)
Parent and Progeny Principal Radionuclide Contributions Indicated

0 Parent (i)	Product (j)	Thread Fraction	DSR(j,6,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	ΣDSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 180 days) daughters.

Dose/Source Ratios for Internal Radiation from the Ingestion of Drinking Water (p=7)
Parent and Progeny Principal Radionuclide Contributions Indicated

0 Parent (i)	Product (j)	Thread Fraction	DSR(j,7,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	ΣDSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 180 days) daughters.

Plant/Air and Plant/Water Concentration Ratios
0 Mass loading [ASR(3)]: 1.000E-04 g/m**3
Area Factor for Mass Loading [FA(2)]: 1.749E-01

0Nuclide (i)	FAR(i,3,2,1) m**3/g	FAR(i,3,2,2) m**3/g	FWR(i,3,3,1) L/g	FWR(i,3,3,2) L/g	FWR(i,3,4,1) L/g	FWR(i,3,4,2) L/g
Pb-210	5.4545E-02	2.6156E-01	1.1332E-06	1.6665E-06	3.4522E-04	1.6554E-03
Ra-226	5.4545E-02	2.6156E-01	4.5329E-06	6.6653E-06	3.4522E-04	1.6554E-03

FAR(i,p,q,k) is the plant/air concentration ratio for airborne contaminated dust, and FWR(i,p,q,k) is the plant/water concentration ratio. See groundwater displays for water/soil concentration ratios.
0

Plant/Soil Concentration Ratios, FSR(i,3,q,k,t)
0 Root Uptake (q=1) and Foliar Dust Deposition (q=2)
Nonleafy (k=1) and/or Leafy (k=2) Vegetables
0 Nuclide(i)

Parent	Product	FSR(i,3,1,k)	FSR(i,3,2,1)	FSR(i,3,2,2)
Ra-226+D	Ra-226+D	4.0000E-02	9.5385E-07	4.5739E-06
Ra-226+D	Pb-210+D	1.0000E-02	9.5385E-07	4.5739E-06

0

Plant/Soil Concentration Ratio, FSR(j,3,q,k,t)
Ditch Irrigation (q=3)

0 Parent (i)	Product (j)	Thread Fraction	FSR(j,3,3,k,t) At Time in Years 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

0

Plant/Soil Concentration Ratio, FSR(j,3,q,k,t)
Overhead Irrigation (q=4) and Nonleafy Vegetables (k=1)

0 Parent (i)	Product (j)	Thread Fraction	FSR(j,3,4,1,t) * SF(j,t) At Time in Years 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Plant/Soil Concentration Ratio, FSR(j,3,q,k,t)
Overhead Irrigation (q=4) and Leafy Vegetables (k=2)

0 Parent (i)	Product (j)	Thread Fraction	FSR(j,3,4,2,t) * SF(j,t) At Time in Years 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Meat/Fodder, Milk/Fodder, Fodder/Air and Fodder/Water Concentration Ratios

```
0     FI(4,q):   68.0 kg/day     FI(5,q):   55.0 kg/day   q=1,2,3,4
      FI(4,q):   50.0  L/day     FI(5,q):  160.0  L/day   q=5
      FI(4,q):    0.5 kg/day     FI(5,q):
```

0Nuclide (i)	FQR(i,4) d/kg	FQR(i,5) d/kg	FAR(i,3,2,3) m**3/g	FWR(i,3,3,3) L/g	FWR(i,3,4,3) L/g
Pb-210	8.0000E-04	3.0000E-04	2.8659E-01	5.3329E-07	1.8139E-03
Ra-226	1.0000E-03	1.0000E-03	2.8659E-01	2.1334E-06	1.8139E-03

FI(p,q) are the fodder (q=1,2,3,4), livestock water (q=5) and soil (q=6) intake rates; FQR(i,p) are the transfer coefficients from contaminated fodder of livestock water to meat (p=4) or milk (p=5). FAR(i,3,2,3) are the fodder/air concentration ratios, and FWR(i,3,3,3) and FWR(i,3,4,3) are the fodder/water concentration ratios for ditch and overhead irrigation, respectively.

Fodder/Soil Concentration Ratios, QSR(i,p,q,t), for Meat and Milk Pathways
Root Uptake (q=1) and Foliar Dust Deposition (q=2)

Nuclide(i) Parent	Product	QSR(i,p,1)	QSR(i,p,2)
Ra-226+D	Ra-226+D	4.0000E-02	5.0117E-06
Ra-226+D	Pb-210+D	1.0000E-02	5.0117E-06

0

Fodder/Soil Concentration Ratio, QSR(j,p,q,t),for Meat and Milk Pathways
Ditch Irrigation (q=3)

0 Parent (i)	Product (j)	Thread Fraction	QSR(j,p,3,t) * SF(j,t) At Time in Years 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

0

Fodder/Soil Concentration Ratio, QSR(j,p,q,t),for Meat and Milk Pathways
Overhead Irrigation (q=4)

0 Parent (i)	Product (j)	Thread Fraction	QSR(j,p,4,t) * SF(j,t) At Time in Years 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

0

Fodder/Soil Concentration Ratio, QSR(j,p,q,t),for Meat and Milk Pathways
Livestock Water (q=5)

0 Parent (i)	Product (j)	Thread Fraction	QSR(j,p,5,t) * SF(j,t) At Time in Years 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Meat/Soil Concentration Ratios, FSR(i,4,q,t)
Root Uptake (q=1) and Foliar Dust Deposition (q=2)

Nuclide(i) Parent	Product	FSR(i,4,1)	FSR(i,4,2)
Ra-226+D	Ra-226+D	2.7200E-03	3.4080E-07
Ra-226+D	Pb-210+D	0.0000E+00	0.0000E+00

0

Meat/Soil Concentration Ratio, FSR(j,4,q,t)
Ditch Irrigation (q=3)

0 Parent (i)	Product (j)	Thread Fraction	FSR(j,4,3,t) * SF(j,t) At Time in Years 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

0

Meat/Soil Concentration Ratio, FSR(j,4,q,t)
Overhead Irrigation (q=4)

0 Parent (i)	Product (j)	Thread Fraction	FSR(j,4,4,t) * SF(j,t) At Time in Years 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

0

Meat/Soil Concentration Ratio, FSR(j,4,q,t)
Livestock Water (q=5)

0 Parent (i)	Product (j)	Thread Fraction	FSR(j,4,5,t) * SF(j,t) At Time in Years 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Milk/Soil Concentration Ratios, FSR(i,5,q,t)
Root Uptake (q=1) and Foliar Dust Deposition (q=2)

Nuclide(i) Parent	Product	FSR(i,5,1)	FSR(i,5,2)
Ra-226+D	Ra-226+D	2.2000E-03	2.7564E-07
Ra-226+D	Pb-210+D	0.0000E+00	0.0000E+00

0

Milk/Soil Concentration Ratio, FSR(j,5,q,t)
Ditch Irrigation (q=3)

0 Parent (i)	Product (j)	Thread Fraction	FSR(j,5,3,t) * SF(j,t) At Time in Years 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

0

Milk/Soil Concentration Ratio, FSR(j,5,q,t)
Overhead Irrigation (q=4)

0 Parent (i)	Product (j)	Thread Fraction	FSR(j,5,4,t) * SF(j,t) At Time in Years 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

0

Milk/Soil Concentration Ratio, FSR(j,5,q,t)
Livestock Water (q=5)

0 Parent (i)	Product (j)	Thread Fraction	FSR(j,5,5,t) * SF(j,t) At Time in Years 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Dose/Source Ratios for Soil Ingestion Pathway (p=8)
Parent and Progeny Principal Radionuclide Contributions Indicated

Parent (i)	Product (j)	Thread Fraction	DSR(j,8,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	ΣDSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 180 days) daughters.

Dose Conversion and Environmental Transport Factors for the Soil Ingestion Pathway (p=8)

Parent (i)	Product (j)	DCF(j,8)*	ETF(j,8,t) At Time in Years (g/yr) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02
Ra-226+D	Ra-226+D	1.037E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	7.057E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

* - The dose conversion factor units are mrem/pCi.

APPENDIX K

RESPONSIVENESS SUMMARY

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RESPONSIVENESS SUMMARY

This Responsiveness Summary has been prepared to provide the USACE responses to agency comments received on a draft of this report.

MDNR Comments and USACE Responses

1. General, Clarifying the Conservative Approach and Conclusions. As previously mentioned in regulator meetings and in the EPA's comments on the Jana Structures FSSE, it is important to clarify that the risk calculated is for radiation consistent with background levels rather than contamination found over background. In relation to this, the conservative estimates and assumptions made to reach such conclusions should also be clearly stated so a general reader can understand that the actual risk is likely lower than what is reported.

   Response 1: The following sentence is added to Section 2.2, "Although the evaluations in Sections 2.3 through 2.5 of this report identified no evidence that lead-210 from historical MED/AEC operations has been relocated from areas with MED/AEC radioactivity to the HSD-JES, the following health assessments for lead-210 have been performed." Section 2.2 is expanded to discuss the health-conservative nature of the parameters used in the health assessments.

2. General, Clarifying Terms. The concept of DCGLs might remain vague to general audiences as there is no explanation of their significance to remediation or evaluation within this or any other recent reports. It might be useful to generate a separate explanatory factsheet/placemat/poster to adequately describe some of this and other critical concepts that determine remedial actions.

   Response 2: Because this report is not an FSSE, the concept of derive concentration guideline levels is not required. Therefore, the use of "DCGL" has been removed from this report. While the USACE appreciates the suggestion regarding documents other than this lead-210 report, these responses are limited to the scope of this report.

3. General, Pb-210 and Po-210. The Kaltofen report asserted that Pb-210 is in "secular equilibrium" with Po-210 within the school, and thus doubles the total effective radioactivity compared to what is solely contributed by Pb-210. This claim has not been addressed by any document related to Jana, including the Savannah River National Labs letter to the USACE regarding the Kaltofen report. While the initial claim missuses the concept of secular equilibrium, the "effectively doubled" radiological impact claimed might still be a point of confusion and interest for the public on the actual risk of radiation associated with Pb-210. To ensure a thorough evaluation of Pb-210 related to Jana, this point should be discussed in this report.

   Response 3: Inclusion of this response in this report is sufficient change to the report for this comment. The laboratory analysis results of the pavement sediment include both lead-210 and polonium-210. In keeping with our CERCLA mission, health risk is the paramount consideration. Although the evaluations in Sections 2.3 through 2.5 of this report identified no evidence that lead-210 from historical MED/AEC operations has been relocated from areas with MED/AEC radioactivity to the HSD-JES, Section 2.2 contains health assessments using the highest lead-210 and polonium-210 results. All the estimated health risks are very small fractions of the corresponding standard. The entirety of this report is the result of USACE efforts to provide clear, factual information so people can determine on their own whether words are being twisted to provoke fear. The USACE has every motivation to be diligent in finding and removing MED/AEC radioactivity that exceeds the risk established by CERCLA standards and no motivation to overlook it.

4. Section 1.2, Page 1, Pb-210 Characterized Risk. This report lacks a description of the baseline risk associated with Pb-210 at any of the North County sites. The Kaltofen report cites the 1993 Background Risk Assessment, stating the 90% of the risk associated with the site is from Pb-210. In actuality, this is the risk of consuming homegrown produce from the HISS/Futura sites, not the general risk of Pb-210 found in the BRA or any estimates of Coldwater Creek. This report document is for the public, who might have not heard of Pb-210 until the Kaltofen report, so it is important to accurately characterize the historical estimated risk of Pb-210 to help provide context for this and related Jana reports. It should also be made clear if high levels of Pb-210 are associated with FUSRAP and Coldwater Creek beyond the Jana evaluations.

   Response 4: Inclusion of this response in this report is sufficient change to the report for this comment. The entirety of the text from the BRA section D.4.1 is provided (DOE 1993): "The estimated risks associated with the produce ingestion pathway from exposure to radioactive contaminants range from 2.2 x 10^{-4} for the residential vicinity property (current or future resident) to 2.6 x 10^{-2} for the HISS future resident (Tables D.5 and D.6). An additional risk of 1.7 x 10^{-2} would be incurred by the HISS future resident from exposure to contaminants in the waste pile (Table D.6). These risks all exceed the target risk range of 1 x 10^{-6} to 1 x 10^{-4}. For each property, approximately 90% of the risk is contributed by lead-210, with most of the remaining risk attributable to actinium-227 and protactinium-231 (Table D.5)."

   The quoted statement is about a hypothetical gardener living at the HISS and eating produce grown there before remediation. This quote is valid for only hypothetically growing produce on HISS soil or HISS storage piles, radioactivity being uptaken by the roots into the produce, and the produce eaten, all before remediation of the HISS. Remediation of the HISS and the storage piles was completed in 2011. Before remediation, no one grew produce at the HISS.

   Neither the BRA (DOE 1993) nor any other document contains a baseline risk assessment for lead-210 for the subject area of this report. The available baseline risk assessment for CWC in general is for a recreational user within the creek banks. This baseline risk assessment is contained in the BRA, and the results are reported for individual radionuclides, including lead-210. Summing lead-210 risk values from BRA Tables 5.1, 5.5, and 5.7, the total carcinogenic risk for a CWC recreational user is 2.8 x 10^{-7}. This is approximately 1/350 of the CERCLA risk standard and is 100 times less likely than the everyday risk of an electric transmission line causing death.

5. Section 2.2, Page 6, Line 6, Sediment or Soils Representation. Why was pavement sediment treated as soil area rather than sediment on pavement when neither is said to be representative? No clear reasoning is given to prefer one over the other. Please clarify why soil is the best analogue for the pavement sediment in this instance and clarify this decision's ramifications on results.

   Response 5: The subject sentence is deleted. Most pavement sediment washes off the pavement to become part of soil. Pavement sediment that is not yet washed off the pavement is future soil.

6. Section 2.2, Page 6, Dust-Lead Hazard. The cited CFR 745.65 includes regulation on the dust-lead hazards in section (b), "*a dust-lead hazard is surface dust in a residential dwelling or child-occupied facility that contains a mass-per-area concentration of lead equal to or exceeding 10 µg/ft^2 on floors or 100 µg/ft^2 on interior window sills based on wipe samples*." The Kaltofen report specifically mentions Pb-210 was found dust within the school and this report also looks at dust samples. Despite this, there is no evaluation of this hazard is found in

this report. To have a thorough review of Pb-210's hazard within the school and to satisfy the reference to CFR 745.65, the dust-lead hazard should be evaluated.

Response 6: Section 2.3.1 [now Section 2.5] is revised to provide more explanation that the amount of dust available for collection was too small to allow for analysis for lead-210. The maximum result for lead-210 of 46.9 pCi/g in *Radioactive Contamination at the Jana Elementary School, Hazelwood, MO* (Brustowicz, Thompson, and Kaltofen 2022) was in pavement sediment, not dust. The USACE sampling of pavement sediment identified a maximum result for lead-210 of 44.9 pCi/g. The highest result from either sampling event, 46.9 pCi/g, is used for the health assessments as if that is the average. The area assumed to have lead-210 at this concentration is sufficiently large to include the limited areas with indoor dust accumulation. This approach for the affected area and average concentration encompasses dust in the health assessments. During the USACE survey, the school was found to have a high standard of cleanliness—very little dust was available even in remote rooms.

7. Section 2.5, Questions Origins. Where did the questions in this section originate from? It should be clarified if these were public questions or questions synthesized from existing dialogues for the purpose of this report.

   Response 7: The questions were created as a vehicle for presenting investigation results. Because that format is unclear, the questions are removed and traditional headings are used.

8. Section 2.5.3, Page 13, Transport Mechanism for Contamination. The answer to this question does not answer whether a mechanism for people to transport contamination into the school is possible. While it is unlikely that a school child would get down to the creek, this possibility should still be discussed as it has been mentioned to happen by the community. The depth of the contamination, the amount of contamination, and likelihood of such contamination to be spread to the school through a child reaching the banks should be mentioned to fully answer this question.

   Response 8: The scenario described in the comment is possible only if school staff are indifferent the physical safety of 5- to 10-year-olds by allowing them to descend and climb the steep and brushy bank to access CWC where drowning could occur. Images 13 and 14 in the report show the banks; these images replaced Images 7 and 8. Section 2.5.3 is revised to explain why student access within the CWC banks is not a plausible scenario given the effort put forth by school staff to provide for the physical safety of students and the area and depth of the MED/AEC radioactivity within the creek banks.

9. Table D-8, Page D-23: Why are indoor dust samples labeled not applicable/not available for Pb-210 and Po-210? This relates to comment 6. Also, please specify the units that are used for Average/Maximum Area Surface Soil Value.

   Response 9: For the first question, please see the response to MDNR comment 6. The units were described in footnotes but have now been added as rows within the table, and the footnotes have been removed.

MDHSS Comments and USACE Responses

1. Page 2, second bullet of the key observations within the Savanah River National Laboratory report incorrectly implies that DHSS has "consistently" assessed Jana Elementary school for radon. DHSS only sampled Jana Elementary once, in 2014, as part of a state-wide radon-in-schools program. The results were below the U.S. Environmental Protection Agency (EPA) 4 pCi/L criteria. A copy of the results was provided to the USACE in October, 2022.

   Response 1: This comment was provided to SRNL, who issued Revision 1 of their review.

2. The Lead-210 Health Assessment section compares lead in units of mass to soil-lead hazard thresholds contained in Toxic Substances Control Act (TSCA). In addition to the TSCA standard, DHSS recommends including information on the Centers of Disease Control (CDCs) updated blood lead reference value (BLRV) of 3.5 µg/dL, and employing EPA's Integrated Exposure Uptake Biokinetic Model for Lead in Children (IEUBK) for comparing the mass-based lead findings in the report to a BLRV-based comparison value.

   Response 2: The health assessment in Section 2.2 is revised to include an assessment using IEUBK to estimate a blood lead concentration for comparison against the CDC BLRV. Section 2.2 now has three subsections—one for each assessment.

3. Table 2 [now Table 3], Non-Default Input Parameters for RESRAD ONSITE, provides an indoor inhalation rate of 0.552 m^3/hr, based upon the U.S. Environmental Protection Agency's (EPA's) *Exposure Factors Handbook*, 1997. Because each of the risk assessments (indoor and outdoor) are to be protective of both child and adult receptors, DHSS suggests referencing EPA's updated *Exposure Factor Handbook*, 2011. Table 6-1, Recommended Long-Term Exposure Values for Inhalation (males and females combined). This document provides average inhalation rates for age groups within the 21 to 61 years of age that are equal to or approach 16 m^3/day. This equates to 0.666 m^3/hr. While 13.2 m^3/day is protective of a child within the 6 to eleven years of age, use of the higher value will align better with the staff inhalation exposure rates, while continuing to be conservatively protective of children.

   Response 3: Consistent with the 2011 EFH (USEPA 2011), the breathing rate for the staff will be 16 m^3/day, and the breathing rate for the student will be 12 m^3/day.

4. This report employs RESRAD-On-site for risk calculation. Please consider reviewing the default slope factors against EPA's Dose and Risk Calculation Software (DCAL)-based slope factors. Although it is not anticipated that the risk assessment would significantly differ, such a review would show consistency across other regional sites addressed under different authorities.

   Response 4: Inclusion of this response in this report is sufficient change to the report for this comment. RESRAD-ONSITE Version 7.2 was used for the risk calculation. This version includes risk slope factors based on ICRP Publication 107 (ICRP 2008) and *Federal Guidance Report No. 13: Cancer Risk Coefficients for Environmental Exposure to Radionuclides* (USEPA 1999) in the form of DCFPAK 3.02. DCFPAK 3.02 has been used in RESRAD-ONSITE since 2014 when Oak Ridge National Laboratory (ORNL) updated slope factors as presented in *Calculation of Slope Factors and Dose Coefficients* (ORNL 2014). This ORNL document states, "The majority of the risk factors and dose coefficients were calculated using ORNL's DCAL software in the manner of Federal Guidance Report 12 and Federal Guidance Report 13 for internal intakes and for external exposure respectively. The only exceptions are for the nursing infant. Dose coefficients for the nursing infant were extracted from ICRP Publication 95." The slope factors in DCFPAK 3.02 have been previously reviewed during the five-year review process and found to be acceptable. The USEPA website https://www.epa.gov/radiation/tools-calculating-radiation-dose-and-risk contains discussions of DCFPAK 3.02. The USACE considers this history of review to be sufficient.

USEPA Comments and USACE Responses

1. **Abstract, page i, Conclusions Box.**

   a. For consistency with the Jana Elementary Structures Final Status Survey Evaluation Report, the EPA recommends that additional description be provided of the 3,096 data points referenced in the first sentence. For example, the structures report describes the data points evaluated in that report as "*922 radiological survey results, 9 dust/pavement sediment samples results….*"

   b. The second sentence states, "*Even if the lead-210 concentration for the highest sample results was present throughout the top 2 inches of soil at the Jana parcels, the health risk would be less than 1/200th of the Comprehensive Environmental Response, Compensations, and Liability Act (CERLCA) risk standard for protection of human health.*" This statement is lacking some key details necessary to evaluate this conclusion.

      i. For example, the EPA recommends specifying the activity concentration for the highest sample result that was considered for this risk evaluation. No explanation is provided for why the top two inches of soil was chosen to assume contamination within for this risk evaluation. The EPA recommends a footnote be added to provide a rationale or explanation for why this depth was selected.

      ii. Similar to comments we provided to the Jana Elementary Structures Final Status Survey Evaluation Report, it is not clear what is being referred to as the CERCLA "*risk standard for protection of human health.*" If the intent of the statement is to describe requirements in the National Contingency Plan (NCP) that relate to establishing protective remediation goals, please revise the sentence for consistency with 40 C.F.R. § 300.430(e)(2)(i)(A)(2). It states, "*For known or suspected carcinogens, acceptable exposure levels are generally concentration levels that represent an excess upper bound lifetime cancer risk to an individual between* 10^{-4} *and* 10^{-6} *using information on the relationship between dose and response.*" In any case, the EPA recommends specifying the actual risk that was estimated from this evaluation for increased transparency.

      iii. The statement does not provide any information about what type of user risk was evaluated for, e.g., indoor worker, outdoor worker, or residential. Please specify the type of user/exposure scenario for which risks were evaluated. In addition, the EPA recommends a reference or footnote be added to where the details of this evaluation can be found.

   c. The third sentence compares the highest lead-210 result to the Toxic Substances Control Act (TSCA) standard in 40 C.F.R. § 745.65. For clarity, please specify the highest result and the numerical standard it is being compared to. Given the standards in TSCA are provided in parts per million (µg/g), the EPA requests a footnote be added to reference Section 2.2 for the details of the conversion of lead-210 results from activity concentrations to mass concentrations.

d. The last sentence states, "*No pathway exists for MED/AEC radioactivity to be deposited where the higher lead-210 sample results occurred, and no method exists for deposition at only those locations.*"

    i. It's not clear if the intent of this statement is to specify migration pathway conclusions only for the locations with "*higher lead-210 sample results*" or the entire investigation area. The EPA requests this be revised for clarity.

    ii. The EPA notes that Section 2.5.4 estimates the airborne release of radon from MED/AEC-impacted soil and the potential for additional radon and airborne decay products (which would include lead-210) to reach Jana Elementary. It does not appear that this statement is consistent with those evaluations. The EPA recommends USACE consider revising this statement to be consistent with the last sentence of Section 2.5.4.

Response 1: Consistency in the numbers of data points is being ensured.

This comment reflects the difficulty of addressing multiple audiences in the same document. The audiences for this report are the property owners, regulators, public, and technical experts. The USACE has worked to improve its documents for both reader-friendliness for owners and the public and the quality and rigor expected by regulators and technical experts. For this document, the USACE has revised the Abstract to be a summary that is more owner- and public-facing, including removing details that prompted portions of this comment from the Abstract. Thus, the Abstract does not contain the details that a regulator or technical expert may desire. Those details, including input parameters for risk and dose calculations, are now provided in the body of the report.

The portion of the NCP quoted by the USEPA in the comment does not contain all the relevant text necessary for context and understanding of the regulation regarding CERCLA protectiveness. The USACE writes documents to be focused on the information unique to that document. The USACE does not copy large of amounts of referenced material into its documents and does not consider repeating all this regulatory text to be necessary for the documents. For this stage of the project, summarizing that the effect of the NCP is to restrict risk to generally 10^{-4} is appropriate.

Scenario parameters are removed from these bullets. Please see the responses to USEPA comments 24 and 25.

The TSCA health assessment results are sufficient for the summary in the Abstract. The details of the unit conversions from pCi/g to mg/kg are in Section 2.2 [now Section 2.2.1].

The last sentence is deleted as part of revising the Abstract to be a summary that is more owner- and public-facing.

2. **Abstract, page i, Radionuclides of Interest box.** This box states that the report is specific to lead-210 but also includes a sentence about radon-222, which is a noble gas. In addition, the box does not include any mention of polonium-210 even though the report includes both sample results and risk evaluation for this radionuclide. The EPA recommends the box be revised to state that the report is primarily focused on evaluating lead-210, but also includes consideration of other radionuclides, such as polonium-210, which is produced from the decay of lead-210 and emits alpha radiation. The EPA also recommends a sentence be added to clarify that the production of noble gas radon-222 from the decay of radium-226 and the movement of radon

in the environment is also evaluated because it eventually decays to lead-210 and informs the evaluation of those sample results.

Response 2: The text in the subject box is revised to state, "This report is specific to lead-210 and its progeny, but the uranium-238 decay chain is discussed."

3. **Abstract, Page ii**, **Possible Reasons for Lead-210 Concentrations box.** Please include a sentence that acknowledges the pathway that results from the generation of noble gas radon-222 from radium-226 contamination within the banks of Coldwater Creek. This could theoretically result in lead-210 being deposited in sediment on school pavement, which is evaluated in Section 2.5.4 of this report. The EPA also recommends a statement be added in the box to make clear that these are only possible pathways that could potentially affect lead-210 concentrations in sample results evaluated in this document, and evaluations of each pathway are presented in this report. The EPA acknowledges that page 16 of Section 2.5.4 states the following on lines 5 through 7, "*The additional radon that could be contributing radon decay products to the school pavement and building roofs is less than 1/1,500th of normal radon.*"

   Response 3: A new introductory sentence is added that states, "The following reasons are the only ones that could cause the higher lead-210 concentrations identified at two locations on pavement." Third and fourth reasons are added to this box that state:

   3. "Soil transfer by human activities from locations within the banks of CWC that are contaminated with MED/AEC radioactivity."
   4. "Radon gas transport from locations within the banks of CWC that are contaminated with MED/AEC radioactivity."

4. **Abstract, page ii, Regulatory Requirements box, first paragraph.** The EPA previously provided a comment to this language in the abstract to the Jana Structures Final Status Survey Evaluation Report (See comment 3 from March 13, 2023, comment letter). Please revise the sentence for consistency with the NCP.

   Response 4: Please see the response to USEPA comment 1.

5. **Abstract, page ii, Regulatory Requirements box, second paragraph.** The EPA notes that the regulations in 40 C.F.R. § 745.65 are applicable to lead-based paint hazards and were not identified as ARARs in the 2005 Record of Decision (ROD) for the North St. Louis County FUSRAP sites. Further, as is the case for all contaminants of concern at a CERCLA site, remediation goals are established site-specifically. However, because the carcinogenic effects of the radiation emitted from lead-210 and its decay products are significantly greater than the toxic effects of metallic lead, the EPA acknowledges that remediation goals established in the 2005 ROD for lead-210 are also protective of the toxicological effects of metallic lead. Therefore, the text in this paragraph should be revised to make clear that the regulations in 40 C.F.R. § 745.65 were not identified in the 2005 ROD as either applicable or relevant and appropriate for the North St. Louis County FUSRAP sites but are only being used as a comparison to explain the relative hazard associated with the toxicological 2 effects of metallic lead.

   Response 5: This second paragraph is deleted. Please see the response to USEPA comment 9.

6. **Abstract, page ii, Data Collection Method and Dates box, Structures paragraph.**

   a. The first sentence states that "*instrumentation with capabilities to detect very low amounts of radioactivity were used*" without explaining what is considered "very low." For clarity, revise the sentence by specifying whether the detection capabilities were sufficiently low to evaluate the selected comparison values and then reference or include a footnote to where the details of this determination can be found.

b. The last sentence states that "*pavement sediment samples underwent laboratory analysis for lead-210 and polonium-210.*" Again, for clarity the EPA suggests revising the text to note that polonium-210 results from the decay of lead-210.

Response 6: Inclusion of this response in this report is sufficient change to the report for this comment. The intention of the Abstract is to summarize the report using language that is reader-friendly to property owners and the general public. Scientific and technical details are reserved to the body of the report.

7. **Abstract, page iii, Results box, first primary bullet.** The term "environs" is not defined geographically in the report. The EPA requests that the text be revised to convey the specific geographic bounds that this statement in meant to apply.

Response 7: The term "environs" is removed from the report. The property is identified by ownership using "Hazelwood School District property for the Jana Elementary School (HSD-JES)."

8. **Abstract, page iii, Results box, second primary bullet, first sub-bullet [now first and second bullets].** For clarity and consistency with CERCLA, the EPA requests that the bullet specify the estimated risks based on the data evaluated in the report, the risk that is being used to determine the fraction ($1/200^{th}$) listed, and how this relates to the CERCLA risk range (e.g. "*4.1×10^{-7}, which is less than $1/200^{th}$ of the upper end of the CERCLA risk range of 10^{-6} to 10^{-4}.*", or "*4.1×10^{-7}, which is below the risk range of 10^{-6} to 10^{-4} established under CERCLA*").

Response 8: Inclusion of this response in this report is sufficient change to the report for this comment. This comment reflects the difficulty of addressing multiple audiences in the same document. The audiences for this document are the property owners, regulators, public, and technical experts. The USACE has worked to improve its documents for both reader-friendliness for owners and public and the quality and rigor expected by regulators and technical experts. For this document, the USACE has revised the Abstract to be more owner- and public-facing. Because scientific notation may not be understood by all, the results are reported as a fraction of the protectiveness level. For those more familiar with scientific notation, the values are provided in other sections of this report.

9. **Abstract, page iii, Results box, second primary bullet, second sub-bullet [now third bullet].** Because protection of human health and the environment is a requirement under CERCLA, the EPA is concerned that this bullet could lead to confusion about the CERCLA requirements established in the 2005 ROD for the North St. Louis County FUSRAP sites. Revise this bullet to clarify that TSCA specifies a health-based standard applicable to lead-based paint hazards and it is utilized in this report for comparison purposes only.

Response 9: Rather than inserting multiple disclaimers, new sentences are added at the beginning of the third paragraph of Section 1.1 that states, "This screening report is not a final status survey evaluation (FSSE). As a screening report, information from regulations and standards not specified in the *Record of Decision for the North St. Louis County Sites* (ROD) (USACE 2005a) are referenced."

10. **Abstract, page iii, Results box, third primary bullet [now ninth bullet].** These sub-bullets specify the reasons why USACE concluded that lead-210 on structure surfaces is consistent with background radioactivity. However, neither sub-bullet discusses the results of the

"*19 swipes from dustier locations*" that *"underwent laboratory analysis for lead-210*" described in the "Data Collection Method and Dates" box on the previous page. For completeness, the EPA requests that a sub-bullet be added to describe the lead-210 results from laboratory analysis of select swipe samples.

Response 10: The bullet is extended to include a summary of the laboratory analytical results for removable lead-210 on the 19 swipes.

11. **Abstract, page iii, Results box, fourth primary bullet [now ninth bullet].** This bullet states, "*Radium-226 is an appropriate comparison because lead-210 is a decay product produced within 4 days of radium-226 undergoing decay.*" This explanation is not consistent with the discussion in Section 2.4. The EPA acknowledges that Section 2.4 discusses a contaminant source term analysis that was completed previously to establish a relationship between radium-226 and lead-210, which has a half-life of approximately 22 years. This relationship can therefore be used to infer concentrations of lead-210 in contamination that would be expected from concentrations of radium-226. Thus, if radium-226 concentrations in soil appear to be consistent with background, the source term analysis relationship provides evidence that lead-210 contamination is unlikely. However, the report also describes the mechanisms and characteristics that can lead to naturally occurring lead-210 concentrations that are not equal to naturally occurring radium-226 concentrations in co-located soils or sediments. Please revise this statement for consistency with the rest of the report.

    Response 11: The subject bullet is revised to be consistent with the penultimate paragraph in Section 2.4 of this report. Please see the response to USEPA comment 31 for additional information on related changes.

12. **Abstract, page iii, Results box, fifth primary bullet [now sixth bullet].** This bullet states, "*Higher levels of lead-210 in pavement sediment is caused by a natural process involving natural background radon and its decay products being biased by the weather and pavement. The evidence refutes the possibility of MED/AEC radioactivity being transported from CWC to pavement sediment.*" The EPA suggests that the statement in this bullet be revised for clarity and consistency with the rest of the document. The EPA acknowledges that USACE has conservatively estimated that concentrations of radium-226 in the Coldwater Creek corridor adjacent to Jana Elementary produce "*less than 1/1,500th of normal radon.*" The EPA also acknowledges that USACE has evaluated whether or not Coldwater Creek flooding deposition has ever impacted the pavement areas and the potential for inadvertent tracking by property users of lead-210 contamination from the Coldwater Creek corridor and banks to the pavement areas. USACE also reviewed subsurface sampling data for evidence of fill soil or flooding sediment. Lastly, USACE evaluated the expected ranges of naturally occurring lead-210 on pavement areas due to well established radon migration mechanisms caused in part by weather patterns and the construction of improved surfaces over existing soils. Therefore, the EPA recommends that USACE specify in this bullet which source likely accounts for the overwhelming majority, if not all, of the lead-210 concentrations in the pavement sediment samples.

    Response 12: The first sentence of the Results box is deleted. An introductory sentence for the sixth and seventh bullets states, "All possible causes of the 2 locations of higher concentrations of lead-210 at the HSD-JES where evaluated. The only possible cause for those results at only those locations is natural background conditions for radon and its progeny." The subject bullet is revised to state, "These higher lead-210 concentrations in pavement sediment are consistent with scientifically known variations in natural background conditions. Independent studies at other locations demonstrate the occurrence of higher lead-210 concentrations in pavement sediment from natural background conditions from radon and its progeny."

13. **Unit Abbreviations, page x.** It appears "SOR^{N}" should be changed to "SOR_{N}."

    Response 13: The subject change is made.

14. **Section 1.1, page 1, first bullet.** It's not clear what levels USACE considers "*unacceptable*" in this bullet. The EPA recommends USACE specify if this is in reference to remedial goals specified in the 2005 ROD, a certain level of risk, or both.

    Response 14: Based on MDNR comment 7, the subject bullet is revised to not be a question. The revision no longer uses the word "unacceptable."

15. **Section 1.3, page 2, lines 31-32.** It's not clear if this statement is describing in general that the pre-design investigation process includes an evaluation of whether or not the investigation should extend beyond the 10-year floodplain, or if a pre-design investigation was completed for these Jana Elementary parcels. In general, the discussion in the second paragraph of this section seems unrelated to the description of the property. The EPA requests that the specified statement be revised for clarity and for USACE to consider whether the second paragraph and associated three bullets would be more appropriate in another section of the report.

    Response 15: The subject paragraph is revised to add a new third sentence that states, "The extent of the floodplain determines the extent of the property description." The first sentence of the next paragraph after the bullets is revised to state, "During 2018, USACE's PDI activities in the CWC corridor[1] and 10-year floodplain[2] progressed to include the HSD-JES (Figure 2). As a result of community concerns, the PDI area was extended to include the part of the HSD-JES that was outside the 10-year floodplain."

16. **Section 2.1, page 5, general comment.** It appears the purpose of this section is to provide some pertinent facts on naturally occurring lead, as well as stable and radioactive lead isotopes that are useful for understanding the subsequent evaluations presented in the report. The EPA strongly recommends this section be expanded to include descriptions of the sources of lead-210 in the environment that would include the following: the natural release of radon from soil; the production of radon decay products which include lead-210 in the atmosphere that subsequently adhere to aerosols/dust; the natural fall-out to the ground of these radon decay products, especially with regard to precipitation; and the transport, deposition, and concentration of these decay products following fallout from the atmosphere. The EPA acknowledges that a brief discussion of some of these topics is included in Section 2.5.1. The EPA believes USACE may find some useful information in the August 5, 2014, technical memorandum titled, "*A Discussion of Naturally Occurring Pb-210 Levels in Soils, PRG Applicability and Clarification of USACE Activities at the Dayton, Ohio FUSRAP Sites.*" This memo was written by USACE Kansas City District for EPA Region 7 and is publicly available at the following EPA Web site: https://semspub.epa.gov/work/07/30337707.pdf. Please note that this memo includes discussion of default residential PRGs for lead-210 produced from EPA's PRG calculator in 2014. These PRGs are no longer current as several updates to the PRG calculator have been made since the memo was written. However, the section titled, "Explanation of Occurrences of Elevated Pb-210" contains detailed descriptions of naturally occurring sources of lead-210.

    Response 16: The subject section is expanded to include more information on the variability of background levels of radon progeny, including lead-210 and its use in dating sediment.

17. **Section 2.1, page 5, lines 10-11.** This sentence discusses 'decay branches' but does not define the term. The EPA is concerned that this concept is not commonly understood outside of associated technical fields. The EPA suggests the paragraph be expanded to explain that some radionuclides in the uranium-238 decay chain may decay into more than one radionuclide which are often referred to as decay branches. USACE should consider whether inclusion of an example such as the following would be appropriate: Bismuth-214 can decay and emit a beta particle to become polonium-214 or it can decay and emit an alpha particle to become thallium-210; however, it will only decay to thallium-210 approximately 0.02 percent of the time. Because this radionuclide has a decay branch of less than 0.1 percent, thallium-210 is not depicted on Image 1.

    Response 17: The subject sentence is revised to state, "While alternate decay methods (e.g., alpha decay instead of beta decay), can occur for radionuclides in this decay chain, they occur 0.1 percent of the time or less; therefore, they are not included on Image 1."

18. **Section 2.1, page 5, Image 1.** This image lists the half-life of polonium-214 as 0.16 seconds, however, the actual half-life of polonium-214 is 163 microseconds or 0.00016 seconds. Please revise the report for accuracy regarding this point.

    Response 18: This number is revised to 0.00016 seconds.

19. **Section 2.2, page 6, lines 2-3.** This sentence states that both the toxicity of lead and the cancer risk of the radioactivity must be assessed to evaluate the potential health hazard from lead-210. However, this toxicological evaluation of lead-210 is not included in final status survey reports for the North St. Louis County FUSRAP Sites. The EPA suggests that this statement be revised and an explanation be added to explain why the toxicological effects of metallic lead are not typically evaluated along with the carcinogenic effects of the radiation produced from lead-210 and its decay products for this Site. The EPA acknowledges that this is supported by USACE conclusions at the end of this section, which states that the highest lead-210 concentration found at the site was 1/600,000,000th of the 400 mg/kg standard for lead-based paints hazards established in TSCA.

    Response 19: This sentence is replaced with, "The FS documents the investigation of various chemicals to determine the contaminants of concern (COCs). As a chemical, lead was evaluated, was determined to be too low to be a COC, and was not carried forward in the ROD as a COC requiring remediation. However, in response to community concerns about lead-210, the chemical toxicity of lead-210 is addressed in addition to the cancer risk from the radioactivity. Although the evaluations in Sections 2.3 through 2.5 of this report identified no evidence that lead-210 from historical MED/AEC operations has been relocated from areas with MED/AEC radioactivity to the HSD-JES, the following health assessments for lead-210 have been performed."

20. **Section 2.2, page 6, lines 3-6.** It seems that these sentences intend to explain how sediment can migrate and accumulate on pavement and that this process can result in differences between the sediment and the soil from which it originated. However, these sentences are not clear and do not provide an explanation for why differences are expected between pavement sediment and soil or what those differences might be. If Section 2.1 is revised by including additional information about the migration of naturally occurring radon and the mechanisms that can result in accumulation of radon decay products, this section could build on those explanations. Combining an explanation of how sediment will tend to accumulate in low spots and cracks rather than uniformly over the entire surface with the radon migration discussion will be helpful to explain why naturally occurring radionuclide concentrations in pavement sediment are expected in certain instances to be different from the background soil samples collected for the North St. Louis County FUSRAP sites. The

EPA recommends that this paragraph be expanded to provide additional explanation and support for why pavement sediment is not representative of soil.

Response 20: The subject sentences are removed. Section 2.1 is revised to provide more discussion about the unevenness in the settling of radon progeny on surfaces.

21. **Section 2.2 [now Section 2.2.1], page 6, Toxicity Assessment, general comment.** Similar to the comment provided in this letter for the regulatory requirements portion of the abstract, the regulations in 40 C.F.R. § 745.65 are applicable to lead-based paint hazards and were not identified as either applicable or relevant and appropriate requirements in the 2005 ROD. The EPA requests that this paragraph be revised to make clear that the standard in TSCA is not a remediation goal that has been established for the North St. Louis County FUSRAP sites.

    Response 21: Please see the response to USEPA comment 9 in this report.

22. **Section 2.2 [now Section 2.2.1], page 6, line 14-15.** To add clarity to the sentence that precedes the equations presented in this section, the EPA suggests adding "*from pCi/g to mg/kg*" to the end of the sentence.

    Response 22: The subject sentence is revised as suggested.

23. **Section 2.2 [now Section 2.2.3], page 6, line 25.** The EPA suggests revising the text to clarify that the risks from both decay products of lead-210, bismuth-210 and polonium-210 were included in the health assessment.

    Response 22: The text "lead-210 and polonium-210" is replaced with "lead-210 and its progeny."

24. **Section 2.2 [now Section 2.2.3], page 6 and 7, Table 2. General comment.** The EPA acknowledges that USACE has selected several non-default inputs to RESRAD for this risk assessment that incorporate significant conservatism into the risk results. However, to fully describe the exposure scenario being evaluated and to increase transparency, the EPA requests that USACE include acknowledgment of two input factors that affect the risk results but have apparently not been altered from the default value.

    a. The first input factor is the "Depth of Soil Mixing Layer" which has a default of 0.15 meters or approximately 6 inches. The EPA recommends this factor be acknowledged so that it's clear that the exposure scenario being evaluated does not assume potential exposure from a constant and confined 2-inch surficial contaminated zone at the maximum concentration of 44.9 pCi/g and 60.1 pCi/g for lead-210 and polonium-210, respectively. The EPA understands that this factor effects the evaluation of the ingestion pathway in that it changes the concentration of radionuclides in the ingested soil for the hypothetical property user when the assumed contaminated soil layer is less than the assumed depth of soil mixing.

    b. The second factor relates to the calculation of the environmental transport factor, or ETF, for soil ingestion. Specifically, this calculation includes an area factor (FA8) which is defined in the RESRAD user manual as the fraction of the play or work area that might be contaminated. The manual includes the following:

       $FA_8 = A/1{,}000$ when $0 < A < 1{,}000$ m^2, or $FA_8 = 0$ when $A > 1{,}000$ m^2,

       where A is the area of the contaminated zone and 1,000 m^2 is the assumed play or work area, which is approximately the size of a single house lot.

       Because the Area of the Contaminated Zone listed in the first row of Table 2 is 100 m^2 which is less than 1,000 m^2, the EPA recommends this factor be acknowledged so that it is clear that the assumed time spent on the contaminated zone by the hypothetical property user is not the full 9 year, 250 days per year, 5 hours per day listed on the Exposure Duration and Outdoor Time Fraction rows of Table 2.

Response 24: (a) The parameter for depth of soil mixing layer is revised to be 0.00635 m (i.e., a quarter-inch) to be consistent with the depth of the pavement sediment and dust that are the contaminated zone. This parameter is added to Table 2 [now Table 3].

(b) The document mentioned in the comment appears to be the *User's Manual for RESRAD Version 6* (ANL/EAD-4). Although the other text in the comment was found in this reference, this portion of the text was stated as "FA_8 = 1 when A > 1,000 m^2." This area factor has no relationship to time or exposure duration. This factor is described in *White Paper: Using RESRAD in a CERCLA Radiological Risk Assessment* (USACE 2002) as follows.

> The ETF includes an area factor (FA) that impacts the ingestion pathways…. In general, soil ingestion intake (and risk) are related to area (A) using the following relationship (also see Appendices F of ANL 2001):
>
> FA (soil) = A/1,000 for A < 1,000 m^2 or 1 for A> 1,000 m^2
>
> Therefore, FA for soil is linearly dependent on area up 1,000 m^2. Once the area reaches 1,000 m^2 the receptor is assumed to ingest all soil from the contaminated zone.

In other words, the foraging area associated with a full year of soil ingestion is 1,000 m^2. When the contamination zone is smaller than 1,000 m^2, some of the ingested soil comes from areas outside the contamination zone. The surface area with pavement sediment and indoor dust routinely encountered by students or staff is estimated to be 35 m^2. For this analysis, that area was increased to 100 m^2 to ensure the risk was not underestimated.

The hours per day used in the model have been updated based on Table 16-20 of the 2011 EFH. The exposure durations have been updated based on the student and staff scenarios (USEPA 2014a).

25. **Section 2.2 [now Section 2.2.3], page 7, Table 2 [now Table 3].** In the row "*Risk Factors,"* the table states, "*Use of the morbidity factors (risk of getting cancer) instead of mortality factors (risk of dying from cancer) compensates these factors being based on adults.*" Risk assessment conducted for CERCLA purposes for adult and child receptors utilizes cancer slope factors that are based on the probability of developing cancer (morbidity factors) as a default (see RAGS Part A, Section 8.2.1 Calculate Risks for Individual Substances, page 95 [sic]). These types of factors are also utilized in EPA's online Regional Screening Level and radiological Preliminary Remediation Goal calculators. As such, the EPA would not consider the use of morbidity factors an additional conservatism to potentially compensate for the use of adult-based factors over child-based factors in a CERCLA risk assessment. In addition, the report does not provide information on which type of user would result in more risk (adult or child). The EPA notes that Table 2 [now Table 3] discusses other differences between hypothetical adult and children property users for several input parameters, including exposure duration, inhalation rate, and soil ingestion. The EPA recommends that USACE further evaluate and specify in the report the life stage group (child or adult) that results in the greatest estimate of risk and include the results of the risk evaluation for that group.

Response 25: The quoted sentence is removed from Table 2 [now Table 3]. The parameters and resulting estimates are being separately identified for students and staff.

26. **Section 2.3.1 [now Section 2.5], page 8, lines 16-18.** This sentences states that a split sample was collected for lead-210 and polonium-210 analysis from three of the four pavement sediment samples. However, the text does not specify why split samples were collected from these three pavement sediment samples nor explain why split samples were not collected with the five indoor dust samples. To increase transparency, please provide these explanations in this paragraph.

    Response 26: This text is extended to explain that sufficient material was present at only 3 pavement sediment locations for a second sample that could undergo analysis for lead-210 and polonium-210. Analyses for these two radionuclides are different and require more material in the form of a second sample.

27. **Section 2.3.1 [now Section 2.5], page 9, lines 9-13.** The EPA strongly recommends this paragraph be expanded to provide additional clarification and support for the stated conclusions. For example, the first sentence states that data for background values for pavement sediment samples are not available for the North St. Louis County FUSRAP sites. The EPA suggests that USACE discuss whether or not, due to the variability inherent in the transport and accumulation of pavement sediment, a site-specific background for pavement sediment is reasonable to establish. The second sentence states that pavement sediment samples are not consistent with literature reports of background concentrations in soil. The EPA recommends USACE include at least one reference to these literature reports of background. The EPA also recommends that the paragraph be expanded to list some of the reasons pavement sediment is not the same as soil, and which differences are important for drawing conclusions in this report. Lastly, there appears to be an error in the reference to Section 3.4 of this report in the last sentence.

    Response 27: The subject sentences are removed. The revised Section 2.1 and Section 2.5.1 provide evidence to show the wide variability in background lead-210. No attempt is made to define a singular lead-210 background value. Additional literature reports are referenced in Section 2.1. The reference to Section 3.4 is removed.

28. **Section 2.3.2 [now Section 2.3], page 9, lines 16-19.** Regarding the interpretation of the total alpha and beta surface measurements, the text states that "*[a]ll the radionuclides in the decay chain can contribute to those results. If any one of them, such as lead-210, is present at levels greater than background, then the scans, readings, and swipes will identify that condition but not which radionuclide(s) is the cause.*" These statements do not acknowledge that the radiological instrumentation has sensitivity limits that correspond to the minimum response above background that can be detected. The EPA requests that this statement be revised and qualified as necessary based on any radionuclide-specific minimum detectable activities (MDA) and comparison of those MDAs to concentrations of interest.

    Response 28: The intent of the subject sentence was different than the intent assumed in this comment. The subject sentence is revised to state, "Results exceeding the general area background do not identify which radionuclide(s) in the decay chain is the cause."

29. **Section 2.3.2 [now Section 2.3], page 10, lines 32 and 33.** This sentence states that "*[n]o swipe measurement result exceeded its minimum detectable activities (MDAs), which were less than health protectiveness criteria values.*" It is not clear what is meant by "*health protectiveness criteria values.*" The EPA requests that the sentence be revised for clarity.

    Response 29: The subject phrase is removed from the sentence.

30. **Section 2.4, page 10 and 11, lines 41-44 and 1-4.** The EPA recommends this paragraph be revised for clarity. It appears that this paragraph is intended to convey four things: (1) Describe

the radioactive contaminants of concerns; (2) Explain an analysis of radiological data from the main contaminant source areas that was used to establish relationships between individual radionuclides; (3) Describe a sampling protocol that was established as a result of that analysis to perform laboratory analysis of only the primary radionuclides (uranium-238, thorium-230, and radium-226); and (4) Explain how concentrations of lead-210 in contamination can be inferred from concentrations of radium-226 in contamination based on the relationship established from the prior source areas data analysis. The EPA suggests that the specific relationship between radium-226 and lead-210 determined from the analysis be listed in the paragraph so that it is clear how one informs the other. However, the last sentence states that if radium-226 concentrations are found to be consistent with background soil concentrations, then the lead-210 concentrations must necessarily be consistent with their background soil concentrations. The EPA acknowledges that USACE infers lead-210 concentrations typical of contaminant source areas from radium-226 contamination present in impacted soils. It's unclear how background lead-210 concentrations in soil can be inferred from background radium-226 concentrations in soil, especially given that the relationship between the two radionuclides can vary as a result of the migration of radon and accumulation of radon decay products discussed elsewhere in the report. The EPA suggests USACE consider whether it would be more appropriate to conclude that if radium-226 results for the dataset for these Jana Elementary parcels are consistent with soil background, then there is no indication of MED/AEC-related lead-210 in the soil based on the prior source area data analysis.

Response 30: The subject paragraph is revised consistent with the recommendation.

31. **Section 2.4, page 11, lines 5-24.** The final sentence of this discussion states that "*lead-210 present in the soil actively used and accessed on these Jana parcels is consistent with background values.*" It is not clear how this statement is supported by the three conclusion bullets that precede it. First, the EPA requests that USACE define "*soil actively used and accessed*" and specify which of the listed soil data sets (clearing soil, woods soil, or corridor soil) are considered actively used and accessed. Second, it's not clear which background values are being referenced for comparison. If background values in this context have been established for lead-210, please specify it in this section. If background values have not been established for lead-210, the EPA recommends USACE consider whether the following conclusion is appropriate, "*Based on these conclusions for radium-226, the lead-210 in soil actively used and accessed on these Jana parcels is expected to be naturally occurring as there is no evidence of MED/AEC-related contamination.*"

    Response 31: The penultimate sentence of the subject section is revised to state, "Based on the information in the first bullet, the radium-226 data for the clearing soil indicates no MED/AEC-related lead-210 is in the soil. The radium-226 data for the woods soil and corridor soil indicates some of the soil may have MED/AEC-related radioactivity, and the significance of that will be assessed separately. As discussed in Section 2.5.3, approximately 6 percent of the area with the creek banks that is owned by the Hazelwood School District requires remediation. The woods area will be part of the construction zone for that remediation. The health risk associated with the soil for the woods and corridor areas will be documented in an FSSE after remediation is completed."

32. **Section 2.5.1, page 11, last paragraph.**
    a. The paragraph begins by stating *"lead-210 is used as a natural tracer to characterize sedimentation and erosion rates,"* but the next sentence begins discussing how radionuclides attach to pavement sediment. It does not appear that any additional information is provided about how lead-210 is used a natural tracer and why that is relevant

to understand how lead-210 collects in sediment on pavement. The EPA suggests USACE consider whether this first sentence is useful in this paragraph. If the sentence will remain, the EPA requests that USACE provide additional context to connect these studies to expected values of lead-210 in sediment on school pavement.

b. The second sentence refers to "*these radionuclides*," but the question being answered only mentions lead-210. The EPA suggests USACE specify whether the radionuclides being referred to here are radon decay products, which include lead-210.

c. To improve clarity, the EPA also suggests the information be presented in the order that the radionuclides are produced and as they move within the environment until they are collected as pavement sediment samples. For example, radium-226 in soil produces radon gas. Radon gas which has a relatively short half-life of 3.8 days migrates into the air and decays into various radionuclides including lead-210. The decay products of radon are not gases and tend to attach to other particulates in the air. These particulates eventually settle out on the ground particularly when it rains. The rain carries these particulates along with other soil and solid particles to low spots, cracks with grass, or other similar features. This results in the concentration of pavement sediment in select locations on paved surfaces rather than a uniform distribution over the entire surface.

Response 32: Subparts "a" and "c" of this comment are addressed by revising the first sentence to refer back to Section 2.1, which is expanded based on USEPA comment 16 that contains additional information discussed in this comment. For subpart "b" of this comment, the title of the subject section is revised to state, "…Lead-210 and its Progeny…."

33. **Section 2.5.3, pages 13 and 14, general comment.**

a. The EPA recommends USACE discuss the significance, if any, of contamination on the creek bank surface and whether there is potential for any individual who might gain access to the creek banks to spread contamination.
b. Lines 7 and 8 refer to "whitish material" visible on Image 8. This appears to be snow based what can be seen on Image 7. The EPA suggests clarifying if this material is snow or otherwise unrelated to MED/AEC contamination.
c. The EPA also request that a clearer visible indicator be overlayed on top of the photos around the areas that are planned for remediation.

Response 33: Please see the response to MDNR comment 8. Arrows are added to new Image 15 to identify the areas requiring remediation.

34. **Section 2.5.4, page 14, line 5.** The EPA suggests that USACE rephrase the question or change the answer to recognize the theoretical but relatively insignificant contribution of lead-210 from radon decay of MED/AEC contamination in the creek banks. The EPA acknowledges that the conservative estimate and modeling that USACE performed indicates that the additional radon that could be contributing radon decay products is less than 1/1,500th of normal radon and therefore the additional lead-210 in sediment is potentially a miniscule fraction of the naturally occurring lead-210, if any.

Response 34: Please see the response to MDNR comment 7.

35. **Section 2.5.4, page 16, lines 5-7.** The last sentence states that the estimated "*additional radon…is less than 1/1,500th of normal radon.*" However, the previous two sentences discuss the average outdoor background radon for North St. Louis County FUSRAP sites and the national average outdoor background radon. For clarity, the EPA suggests revising the last sentence so that it is clear which of these two values is being referred to as "*normal radon.*"

Response 35: The phrase "normal radon" is replaced with "background radon for the North St. Louis County Sites." This phrase is similarly replaced in the Abstract.

36. **Section 2.5.5, page 16, lines 17-18.** The intent of this last sentence is not clear. It seems that the paragraph is intending to describe the evaluations and data analysis that USACE performed to determine whether any contaminated fill soil or underlying flooding sediment is present on the Jana Elementary parcels. Further, that those efforts did identify some fill soil but radium-226 results for samples collected from this fill soil were consistent with background and so the fill soil was determined not to be contaminated. Therefore, because no contaminated fill soil or underlying flood sediment was identified, no additional radon is being produced in this area. The EPA suggests USACE consider whether the last sentence is needed and, if so, revise for clarity.

    Response 36: The last sentence of the subject paragraph is removed.

37. **Section 3.0, page 17, lines 4-12.** The EPA suggests USACE consider adding a bullet listing the number and types of samples that were analyzed for lead-210.

    Response 37: The first paragraph of the subject section is revised to include the requested information along with other numbers for types of data collected by the USACE.

38. **Section 3.0, page 17, lines 30-37.** The EPA provided comments in this letter on other sections of the report that include this same language. The EPA requests these bullets be revised to be consistent with any revisions made to this language in response to those comments.

    Response 29: The subject bullets are revised consistent with responses to other USEPA comments.

39. **Appendix A, General Comment.** The EPA previously provided comments to this appendix, which was included in the Jana Elementary Structures Final Status Survey Evaluation Report. Those comments are incorporated by reference into this letter.

    Response 39: Those comments were provided to SRNL, who issued Revision 1 of their review.

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