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FEASIBILITY STUDY REPORT/ENVIRONMENTAL ASSESSMENT FOR OPERABLE UNIT 2 ****FINAL**** MARCH 1995 - VOL 3 OF 6 - APPENDIX C

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REMEDIAL INVESTIGATION AND FEASIBILITY STUDY

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

FEASIBILITY STUDY REPORT OPERABLE UNIT 2

Volume 3 of 6
Appendix C

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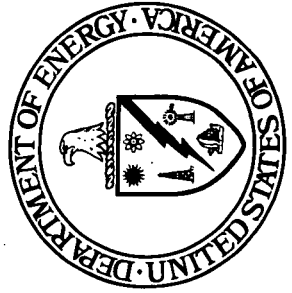

U.S. DEPARTMENT OF ENERGY
FERNALD FIELD OFFICE

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FEASIBILITY STUDY REPORT FOR OPERABLE UNIT 2

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
FERNALD, OHIO

REMEDIAL INVESTIGATION AND FEASIBILITY STUDY

VOLUME 3 OF 6
APPENDIX C

MARCH 1995

U.S. DEPARTMENT OF ENERGY
FERNALD FIELD OFFICE

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ACRONYMS

ACGIH	American Conference of Governmental and Industrial Hygienists
AWWT	advanced waste water treatment
BSL	Biodenitrification Surge Lagoon
Ca	exposure point concentration in air
CEDE	committed effective dose equivalent
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CF	conversion factor
CRARE	Comprehensive Response Action Risk Evaluation
CSF	cancer slope factor
COC	constituent of concern
CPC	constituent of potential concern
CT	central tendency
DOE	United States Department of Energy
ED	exposure duration
EPA	United States Environmental Protection Agency
FEMP	Fernald Environmental Management Project
FS	feasibility study
HEAST	Health Effects Assessment Summary Tables
HELP	Hydrogeological Evaluation of Land Performance
HEPA	high-efficiency particulate air
HI	hazard index
HQ	hazard quotient
IARC	International Agency for Research on Cancer
ICRP	International Commission of Radiological Production
ILCR	incremental lifetime cancer risk
IR	inhalation rate
IRIS	Integrated Risk Information System
LOAEL	lowest observed adverse effect level
MCL	maximum contaminant level
NA	not applicable
NCP	National Contingency Plan
ND	not detected
NE	northeast
NOAEL	no observed adverse effect level
NRC	Nuclear Regulatory Commission
NS	not selected

NW	northwest
OAC	Ohio Administrative Code
O&M	operations and maintenance
OSHA	Occupational Safety and Health Administration
PAH	polycyclic aromatic hydrocarbons
PC	personal computer
PCB	polychlorinated biphenyl
PRG	preliminary remediation goal
PRL	preliminary remediation level
RA	risk assessment
Ra	radium
RCRA	Resource Conservation and Recovery Act
RfC	reference concentration
RfD	reference dose
RI	remedial investigation
RME	reasonable maximum exposure
Rn	radon
RTS	Radon Treatment System
Ru	ruthenium
SE	southeast
SF	inhalation slope factor
SOWC	Southwest Ohio Water Company
SVOC	semi-volatile organic compounds
SW	southwest
TCLP	Toxicity Characteristic Leaching Procedure
TLV	threshold limit value
TWA	time-weighted average
U	uranium
UCL	upper confidence level
UF	uncertainty factor
UMTRA	Uranium Mill Tailing Remedial Action Program
VOC	volatile organic compounds

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C.1.0 INTRODUCTION

Operable Unit 2 of the Fernald Environmental Management Project (FEMP) site contains chemical and radiological material within stored waste inventories and environmental media that present potential risks to humans and environmental resources. The nature and magnitude of these risks have been evaluated as part of the remediation process to ensure the selection of remedial alternatives that protect human health and the environment.

As part of the Operable Unit 2 Remedial Investigation (RI), a quantitative baseline risk assessment was performed for the "No Action" alternative. The baseline risk assessment estimated potential risks associated with current conditions at Operable Unit 2 and projected future risks based on the assumption that no further cleanup actions would be taken. The results of the baseline risk assessment indicate that potential risks to human health associated with the No Action alternative are unacceptably high.

The primary objective of the Operable Unit 2 Feasibility Study (FS) is to analyze various remedial alternatives based on criteria set by the U.S. Environmental Protection Agency (EPA). Part of the analysis and ultimate selection of alternatives includes an evaluation of the short-term risks associated with implementing the alternative (remedial action risk) and an evaluation of the long-term effectiveness of the alternative in protecting human health and the environment (residual risk). This appendix presents the results of both the remedial action and residual risk evaluations associated with the four remedial alternatives selected for detailed, comparative analysis in Section 5.0 of this FS report. The four alternatives are:

- Alternative 1, No Action (Baseline Conditions)
- Alternative 2, Consolidation and Capping
- Alternative 3, Excavation and Off-Site Disposal
- Alternative 6, Excavation and On-Site Disposal with Off-site Disposal of Fraction Exceeding Waste Acceptance Criteria (WAC)

Short-term by nature, remedial action risks are associated with construction and treatment activities performed during implementation of the remedial alternatives. During remediation, the federal government is assumed to continue to own and control access on site. Those individuals or

"receptors" potentially exposed to remedial action risks are remediation workers, on-property nonremediation workers, off-property residents at the FEMP site boundary, and the general public. Receptors may become exposed to contamination in several ways, including inhalation of resuspended dust and gaseous emissions, ingestion of or dermal contact with soil, and exposure to direct radiation. They are also potentially subject to accidental injury or death.

Residual risks are potential long-term risks projected to remain following completion of all remedial actions. For the purposes of this report, a period of 1000 years was used to evaluate residual risks. It was assumed that the Fernald area would retain its rural agricultural character in the future; hence, residual risks were evaluated for two scenarios: federal ownership (with access controls such as fencing) and private ownership. Receptors for the federal ownership scenario are an off-property farmer and child who live and farm adjacent to the FEMP property, and a trespasser who bypasses the access controls. Several exposure scenarios were evaluated quantitatively for the federal ownership scenario, including exposure to residual contaminants in surface soil. Receptors for the private ownership scenario are an on-property resident farmer and child who live and farm on Operable Unit 2, an off-property farmer and child, and a user of perched groundwater. The exposure scenarios evaluated quantitatively for private ownership include the use of groundwater for switch irrigation and household purposes and exposure to residual contaminants in surface soils and air. For each receptor considered, potential residual risks were evaluated either quantitatively or qualitatively, as appropriate, based on exposure to air, groundwater, or soil.

C.1.1 OBJECTIVES OF THE FS RISK ASSESSMENT

The FS report evaluates remedial alternatives in accordance with the EPA's nine FS screening criteria from the National Oil and Hazardous Substance Pollution Contingency Plan (NCP):

✓ 1. Overall protection of human health and the environment
2. Compliance with applicable or relevant and appropriate requirements (ARARs)
✓ 3. Long-term effectiveness and permanence
4. Reduction of toxicity, mobility, or volume
✓ 5. Short-term effectiveness
6. Ability to be implemented
7. Cost
8. State acceptance
9. Community acceptance

This FS risk assessment provides information relevant to Criteria 1, 3, and 5, and each Operable Unit 2 subunit is reviewed in terms of the remedial alternatives, as shown in Figure C.1-1.

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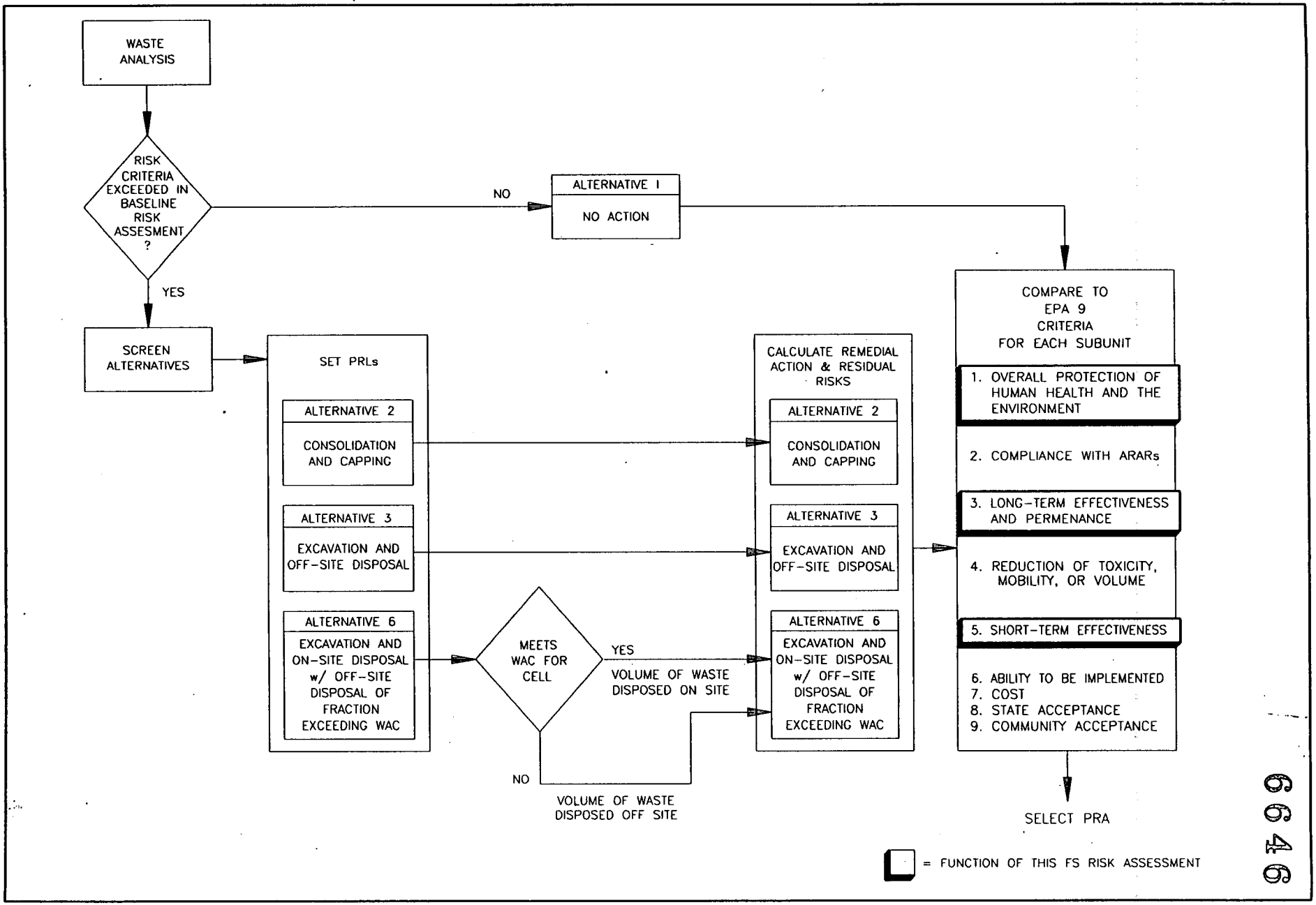

FIGURE C.1-1
OVERVIEW OF ALTERNATIVE COMPARISON PROCESS
FOR OPERABLE UNIT 2 REMEDIAL ALTERNATIVES

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This Risk Assessment follows the human-health risk assessment methodologies of the EPA Risk Assessment Guidelines for Superfund (RAGS, EPA 1989a) for Superfund, the FEMP Risk Assessment Work Plan Addendum (RAWPA, DOE 1992), and accumulated EPA comments on the RI/FS risk assessments and Comprehensive Response Action Risk Evaluations (CRAREs) performed for other operable units to date.

For determining the remedial action and residual risks from Operable Unit 2, the carcinogenic risk, noncarcinogenic hazard, risk of physical injury and fatality, and whole body radiological dose have been quantified for an array of receptors, exposure pathways, and COCs. The approach results in a matrix of risk information generated by alternative for each subunit (Figure C.1-2). This information can be used to compare the alternatives relative to the EPA's FS selection criteria.

C.1.2 FEMP SITE HISTORY

Formerly known as the Feed Materials Production Center, the FEMP site is a contractor-operated federal facility where pure uranium metals were produced for the U.S. Department of Energy (DOE) from 1951 to 1989. No isotopic separation of uranium in the starting materials was performed. After production ceased, plant resources were focused on a cleanup program. In 1991, the FEMP was officially closed as a federal production facility, but the environmental studies and cleanup activities continued. The FEMP is located on 425 hectares (1050 acres) in a rural area of Hamilton and Butler counties, approximately 29 kilometers (18 miles) northwest of Cincinnati, Ohio.

Identified environmental concerns include the potential impact to human health and the environment due to past releases of hazardous materials from the FEMP to the air, water, and surrounding soils; continuing releases of hazardous materials from the facility; and the on-site accumulation of a large inventory of uranium process materials and low-level radioactive and hazardous wastes. Operable Unit 2, the focus of this risk evaluation, consists of the following FEMP subunits, facilities, and associated environmental media:

- Solid Waste Landfill
- Lime Sludge Ponds
- Inactive Flyash Pile
- South Field

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REMEDIAL ACTION RISKS

REMEDIAL ALTERNATIVE	RECEPTOR	1. ACTIVE FLYASH PILE	2. INACTIVE FLYASH PILE	3. SOUTH FIELD	4. LIME SLUDGE POND	5. SOLID WASTE LANDFILL
1 NO ACTION	ON-SITE	← RI BASELINE RISK ASSESMENT RESULTS →				
	OFF-SITE					
2 CONSOLIDATION AND CAPPING	ON-SITE	CARCINOGENIC NONCARCINOGENIC PHYSICAL INJURY & FATALITIES	CARCINOGENIC NONCARCINOGENIC PHYSICAL INJURY & FATALITIES	CARCINOGENIC NONCARCINOGENIC PHYSICAL INJURY & FATALITIES	CARCINOGENIC NONCARCINOGENIC PHYSICAL INJURY & FATALITIES	CARCINOGENIC NONCARCINOGENIC PHYSICAL INJURY & FATALITIES
	OFF-SITE	CARCINOGENIC NONCARCINOGENIC	CARCINOGENIC NONCARCINOGENIC	CARCINOGENIC NONCARCINOGENIC	CARCINOGENIC NONCARCINOGENIC	CARCINOGENIC NONCARCINOGENIC
3 EXCAVATION AND OFF-SITE DISPOSAL	ON-SITE	CARCINOGENIC NONCARCINOGENIC PHYSICAL INJURY & FATALITIES	CARCINOGENIC NONCARCINOGENIC PHYSICAL INJURY & FATALITIES	CARCINOGENIC NONCARCINOGENIC PHYSICAL INJURY & FATALITIES	CARCINOGENIC NONCARCINOGENIC PHYSICAL INJURY & FATALITIES	CARCINOGENIC NONCARCINOGENIC PHYSICAL INJURY & FATALITIES
	OFF-SITE	CARCINOGENIC NONCARCINOGENIC PHYSICAL INJURY & FATALITIES	CARCINOGENIC NONCARCINOGENIC PHYSICAL INJURY & FATALITIES	CARCINOGENIC NONCARCINOGENIC PHYSICAL INJURY & FATALITIES	CARCINOGENIC NONCARCINOGENIC PHYSICAL INJURY & FATALITIES	CARCINOGENIC NONCARCINOGENIC PHYSICAL INJURY & FATALITIES
6 EXCAVATION AND ON-SITE DISPOSAL WITH OFF-SITE DISPOSAL OF FRACTION EXCEEDING WAC (CELL)	ON-SITE	CARCINOGENIC NONCARCINOGENIC PHYSICAL INJURY & FATALITIES	CARCINOGENIC NONCARCINOGENIC PHYSICAL INJURY & FATALITIES	CARCINOGENIC NONCARCINOGENIC PHYSICAL INJURY & FATALITIES	CARCINOGENIC NONCARCINOGENIC PHYSICAL INJURY & FATALITIES	CARCINOGENIC NONCARCINOGENIC PHYSICAL INJURY & FATALITIES
	OFF-SITE	CARCINOGENIC NONCARCINOGENIC PHYSICAL INJURY & FATALITIES	CARCINOGENIC NONCARCINOGENIC PHYSICAL INJURY & FATALITIES	CARCINOGENIC NONCARCINOGENIC PHYSICAL INJURY & FATALITIES	CARCINOGENIC NONCARCINOGENIC PHYSICAL INJURY & FATALITIES	CARCINOGENIC NONCARCINOGENIC PHYSICAL INJURY & FATALITIES

RESIDUAL RISKS

REMEDIAL ALTERNATIVE	RECEPTOR	1. ACTIVE FLYASH PILE *	2. INACTIVE FLYASH PILE *	3. SOUTH FIELD *	4. LIME SLUDGE POND	5. SOLID WASTE LANDFILL
1 NO ACTION	ON-SITE	CARCINOGENIC NONCARCINOGENIC	CARCINOGENIC NONCARCINOGENIC	CARCINOGENIC NONCARCINOGENIC	CARCINOGENIC NONCARCINOGENIC	CARCINOGENIC NONCARCINOGENIC
	OFF-SITE					
2 CONSOLIDATION AND CAPPING	ON-SITE	CARCINOGENIC NONCARCINOGENIC	CARCINOGENIC NONCARCINOGENIC	CARCINOGENIC NONCARCINOGENIC	CARCINOGENIC NONCARCINOGENIC	CARCINOGENIC NONCARCINOGENIC
	OFF-SITE	CARCINOGENIC NONCARCINOGENIC	CARCINOGENIC NONCARCINOGENIC	CARCINOGENIC NONCARCINOGENIC	CARCINOGENIC NONCARCINOGENIC	CARCINOGENIC NONCARCINOGENIC
3 EXCAVATION AND OFF-SITE DISPOSAL	ON-SITE	CARCINOGENIC NONCARCINOGENIC	CARCINOGENIC NONCARCINOGENIC	CARCINOGENIC NONCARCINOGENIC	CARCINOGENIC NONCARCINOGENIC	CARCINOGENIC NONCARCINOGENIC
	OFF-SITE	CARCINOGENIC NONCARCINOGENIC	CARCINOGENIC NONCARCINOGENIC	CARCINOGENIC NONCARCINOGENIC	CARCINOGENIC NONCARCINOGENIC	CARCINOGENIC NONCARCINOGENIC
6 EXCAVATION AND ON-SITE DISPOSAL WITH OFF-SITE DISPOSAL OF FRACTION EXCEEDING WAC (CELL)	ON-SITE	CARCINOGENIC NONCARCINOGENIC	CARCINOGENIC NONCARCINOGENIC	CARCINOGENIC NONCARCINOGENIC	CARCINOGENIC NONCARCINOGENIC	CARCINOGENIC NONCARCINOGENIC
	OFF-SITE	CARCINOGENIC NONCARCINOGENIC	CARCINOGENIC NONCARCINOGENIC	CARCINOGENIC NONCARCINOGENIC	CARCINOGENIC NONCARCINOGENIC	CARCINOGENIC NONCARCINOGENIC

LEGEND:

REMEDIAL ACTION RISK RECEPTORS

- ON-PROPERTY REMEDIATION WORKER
- ON-PROPERTY NONREMEDIATION WORKER
- OFF-PROPERTY GENERAL PUBLIC
- OFF-PROPERTY REMEDIAL WORKER (TRANSPORTATION)
- PUBLIC ALONG TRANSPORTATION ROUTE

RISKS

- CARCINOGENIC = INCREMENTAL LIFETIME CANCER RISK (ILCR) FROM CHEMICAL AND ALL RADIOLOGICAL IMPACTS.
- NONCARCINOGENIC = HAZARD INDEX (HI)
- PHYSICAL INJURY = INJURIES PREDICTED PER WORK HOUR
- FATALITIES = DEATHS PREDICTED PER WORK HOUR

RESIDUAL RISK RECEPTORS

FEDERAL OWNERSHIP

- EXPANDED TRESPASSER
- OFF-PROPERTY FARMER AND CHILD

PRIVATE OWERNERSHIP

- ON-PROPERTY RESIDENT FARMER AND CHILD
- OFF-PROPERTY FARMER AND CHILD

SOURCES:

- THE RAWPA (DOE 1992) AND PREVIOUS FS RISK ASSESSMENTS DEFINE THE SCOPE OF QUANTITATIVE ANALYSIS FOR SHORT-TERM (REMEDIAL ACTION) AND LONG-TERM (RESIDUAL) RISKS. NOTE THAT CARCINOGENIC AND NONCARCOGENIC RISKS RESULTING FROM ACCIDENTS ARE NOT INDICATED AND THEREFORE HAVE NOT BEEN CALCULATED.

* For residual risk analysis, these subunits are modeled as one combined, southern subunit, due to postremediation comingling.

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FIGURE C.1-2 RISK MATRICES FOR OU2 ALTERNATIVES AND SUBUNITS

- Active Flyash Pile
- Associated berms, liners, and soil within the operable unit boundary

Significant concerns associated with waste materials include the presence of:

- Chemical contaminants in the waste material/soil
- Radionuclides in the waste material/soil
- Emission of radon gas
- Potential for leaching waste material/soil into the underlying Great Miami Aquifer and eventually to the Great Miami River

C.1.3 OPERABLE UNIT 2 SUBUNITS

Operable Unit 2 incorporates waste subunits with relatively large volumes of waste presumed to contain small quantities of hazardous materials and radionuclides. The five subunits are presented in Figure C.1-3 and are described below. The following descriptions are derived from the Operable Unit 2 RI report (DOE 1994a).

Solid Waste Landfill

The Solid Waste Landfill is located in the northeast corner of the Waste Storage Area (Figure C.1-3). This landfill, a flat rectangular area of approximately one acre, has been inactive since 1986. A soil cover has been placed over the disposal area. A drainage ditch serving the northwest portion of the former Production Area is located in the northern portion of the landfill. This drainage ditch is a jurisdictional wetland.

The operational history of the Solid Waste Landfill is not well documented. According to design drawings, the facility was planned as a sanitary landfill for nonburnable trash with up to five cells and an evaporation pond. The landfill reportedly was used to dispose of cafeteria waste, rubbish, and other types of wastes from nonprocess areas and on-site construction/demolition activities. Materials reportedly buried there include nonburnable and nonradioactive solid wastes generated

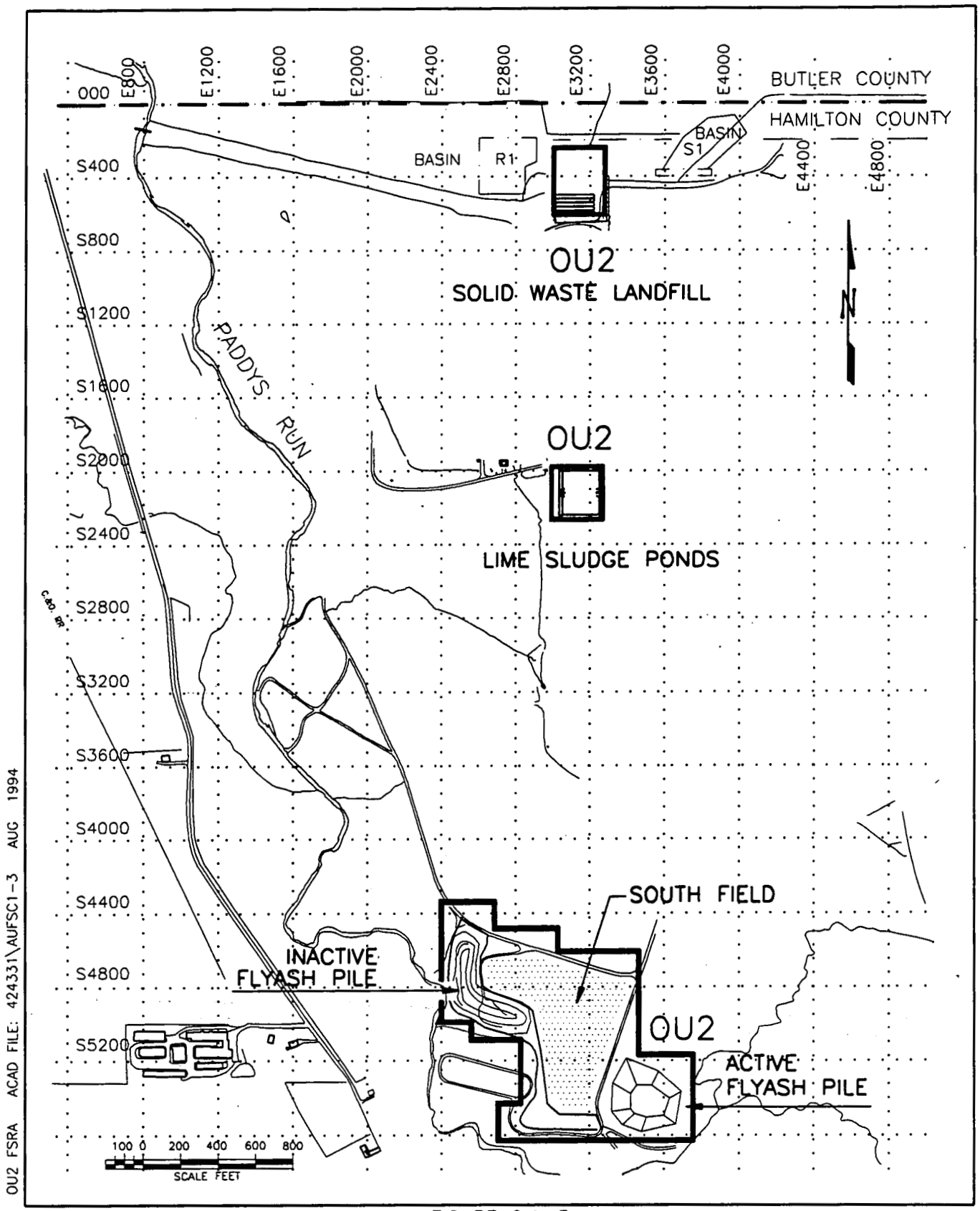

FIGURE C.1-3
EXISTING DETAIL, OPERABLE UNIT 2

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on FEMP property, nonradioactive construction-related rubble, and double-bagged and bulk quantities of nonradioactive asbestos. Field investigation results, however, indicate that some apparent process wastes have been placed in the landfill. The following wastes were encountered during a trenching investigation in 1992:

- Burnable wastes - bagged trash and wood
- Possibly burnable wastes - respirator cartridges, asphalt roofing materials, medical wastes, firehoses, and rubber hoses/belts
- Nonburnable wastes - unidentified high-activity waste, medicine vials, bagged asbestos, ceramic tiles, possible magnesium fluoride, glass acid bottles, steel cables/cans, paint cans, and copper tubing

Lime Sludge Ponds

The North and South Lime Sludge Ponds are two unlined, rectangular ponds, each measuring approximately 38 by 69 meters (125 by 225 feet), and are located in the southeast corner of the Waste Storage Area (Figure C.1-3). Wastes disposed in the North and South Lime Sludge Ponds originated from water plant operations, coal pile storm water runoff, and boiler plant blowdown. The waste from the water plant operations is generated from a water softening process, which consists of adding lime and aluminum sulfate to precipitate calcium and magnesium salts.

Inactive Flyash Pile

The Inactive Flyash Pile is located approximately 610 meters (2000 feet) southwest of the former Production Area. The pile covers roughly two acres with Paddys Run as the western boundary (Figure C.1-3). The operating history of this subunit is not well understood. The Inactive Flyash Pile and the South Field are contiguous without a clearly defined boundary between the two subunits. Based on a review of historical photos and borehole logs (Weston 1988), the northern portion of this waste area is adjacent to a presently buried drainage ditch leading to Paddys Run. Beginning in 1957, flyash appears to have been trucked to the working face of the flyash pile and dumped. Aerial photographs from September 1962 indicate that the Inactive Flyash Pile was in two working piles. The photographs indicate that flyash disposal at this location ceased by the mid-1960s. Drill cuttings and water from RI/FS borings outside the former Production Area and Waste Storage Area, including off-property wells, were disposed on the Inactive Flyash Pile until March 1990. Composite samples of the water from these borings were analyzed to ensure that total uranium was below an action limit established by the Westinghouse Environmental Management Company of Ohio (WEMCO)..

Based on information provided by WEMCO, 1361 to 1814 metric tons (1500 to 2000 tons) per year of flyash were generated during the period of disposal; however, an unknown quantity of flyash was also disposed in the Burn Pit and Pit 3 within Operable Unit 1 (Weston 1988). The Inactive Flyash Pile is currently covered with vegetation and soil of unknown origin.

Nonprocess wastes from the FEMP and building rubble such as concrete, gravel, asphalt, masonry, and steel rebar from on-site construction/demolition activities were also discarded in the Inactive Flyash Pile (DOE 1988a; Weston 1987) and are visible along embankments surrounding the subunit. Transite containing asbestos was also deposited in the Inactive Flyash Pile. Field investigation results reveal that some apparent process waste may have been placed in the subunit.

South Field

The South Field is a 4.5 hectare (11-acre) area that lies between the Active Flyash Pile and the Inactive Flyash Pile. The actual boundary with the Inactive Flyash Pile is not clearly defined (Figure C.1-3). The operational history of the South Field is neither well documented nor well understood. This area was reportedly used to bury FEMP nonprocess wastes such as flyash, on-site construction/demolition rubble, including debris from the razing of the old administration building (DOE 1988a; Weston 1987), and soils that may have contained low levels of radioactivity. Disposal in the South Field apparently was performed randomly; thus the thickness of fill and the nature of waste are variable.

The southwest border of the South Field slopes toward the west and was used as the backstop for a firing range for FEMP security personnel over a period of 35 years. Lead ammunition used during target practice is deposited along the southwest border. Currently, the South Field is covered with grasses, shrubs, and trees.

Active Flyash Pile

This waste disposal area is located just east of the South Field and is bound on the east and south by the Storm Sewer Outfall Ditch (Figure C.1-3). The Active Flyash Pile has a surface area of approximately three acres and has received flyash waste since the mid-1960s. The operational history of this unit is well understood. The flyash pile has a crusting agent sprayed upon the surface as a means of dust control. A silt fence has been constructed at the base of the pile to prevent storm water transport of the flyash off the pile.

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Flyash from the FEMP coal-fired boiler plant was disposed of at the Active Flyash Pile. Flyash waste is comprised of 70 percent bottom ash collected below the boilers; the remaining 30 percent is a combination of precipitator ash collected from pollution control devices and flyash removed from the middle levels of the boiler. Some unburned coal and rock are also present in small quantities in the active flyash material. Since December 1992, newly generated flyash has been transported off site to a licensed disposal facility.

C.1.4 BASELINE RISK ASSESSMENT

As part of the Operable Unit 2 RI, an analysis was conducted to estimate the potential human-health risks from exposure to Operable Unit 2 hazardous wastes if no remediation is performed beyond that accomplished to date. This analysis is referred to as the baseline risk assessment.

The baseline risk assessment consists of five primary steps. First, the presence of chemical and radiological constituents that could potentially cause adverse health effects is determined; this is called constituent of potential concern (CPC) determination and is discussed in Section C.1.4.1. The second step defines how the land will be used, how exposure will occur and how hypothetical inhabitants, visitors and other receptors at the site will be exposed; this is called exposure assessment and is discussed in Section C.1.4.2. In the third step, the hazardous effects of all CPCs are characterized; this is the toxicity assessment and is discussed in Section C.1.4.3. The fourth step is the risk characterization in which results of the first three steps are combined to determine carcinogenic risks and noncarcinogenic hazards for all receptors; this is summarized in Section C.1.4.4. The fifth step, a semi-quantitative analysis of uncertainties and the effect of these uncertainties on the baseline risk assessment, is presented in Section C.1.4.5. A discussion of conclusions from the RI is presented in Section C.1.4.6.

Results of the baseline risk assessment were used to represent the potential impact of the No Action alternative on human health and the environment. Section 6.0 and Appendix B of the Operable Unit 2 RI report should be reviewed for detailed information on baseline risks associated with Operable Unit 2.

C.1.4.1 Identification of Constituents of Potential Concern

As part of the Operable Unit 2 RI, CPCs were determined by performing a statistical comparison of constituent concentrations with background concentrations and then screening against conservative

toxicological criteria. Constituents which had concentration terms below background concentrations were not included as possible CPCs. Those CPCs which were shown to exceed background were subjected to toxicological screening to exclude constituents that are unlikely to have human-health risk at levels detected. CPCs were retained if they did not meet the five criteria of the toxicological screening: 1) detected only once in one medium, 2) macronutrient/micronutrient that is nontoxic, 3) ubiquitous in nature, 4) nonspecific class of compounds, and 5) representative concentrations are below the values calculated from EPA RAGS Part B (EPA 1991b), based on a hazard index of 0.1 and risk level of 1.0×10^{-7}.

Three categories of CPCs were identified: radionuclides, inorganic chemicals, and organic compounds. The identified CPCs were quantified in the baseline risk assessment. CPCs that were characterized to pose a risk greater than 1.0×10^{-6} or hazard greater than 0.2 at the end of the baseline risk assessment were identified as contaminants of concern (COCs) for evaluation in this FS report.

C.1.4.2 Exposure Assessment

The exposure assessment in the baseline risk assessment identifies current and future land use scenarios and potential receptors as well as sources and pathways of exposure. A summary is presented below. Details are presented in Appendix B of the Operable Unit 2 RI report.

Land Use Scenarios

Four land use scenarios are addressed in the Operable Unit 2 baseline risk assessment: 1) current land use with access controls, 2) current land use without access controls, 3) future land use with access controls assuming federal ownership, and 4) future land use without access controls assuming private ownership.

Assuming current land use with access controls, the site access restrictions are maintained by DOE and no further remedial actions are taken other than those completed to date. Further, it is assumed that members of the public are not allowed access to the site, and the integrity of the Operable Unit 2 subunits is maintained by inspections and repaired when necessary. The receptors evaluated under this scenario are:

- Trespassing youth
- On-property groundskeeper

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- Off-property farmers (adult and child)
- Great Miami River users
  - Recreational
  - Residential
  - Agricultural

Under the current land use without access controls scenario, it is assumed that access restrictions are eliminated thus permitting livestock grazing on the site. The receptor evaluated for this scenario is the user of meat and milk. This receptor is assumed to be exposed through the consumption of meat and milk products produced from livestock grazing within Operable Unit 2.

For the future land use with access controls, it is assumed that the federal government retains ownership of the FEMP. Land use and site access are restricted for authorized government purposes only. The receptors evaluated under this scenario are:

- Expanded trespasser
- Off-property farmers (adult and child)
- Great Miami River users
  - Recreational
  - Residential
  - Agricultural

For the future land use without access controls, it is assumed that the FEMP is available for unrestricted land uses such as residential and agricultural development within the boundaries of Operable Unit 2. Receptors considered under this scenario are:

- On-property farmer (adult and child) - Reasonable Maximum Exposure (RME)
- On-property resident farmer - Central Tendency (CT)
- Off-property farmers (adult and child)
- Homebuilder
- On-property perched water user
- Great Miami River users
  - Recreational
  - Residential
  - Agricultural

Sources and Pathways of Exposure

Sources of exposure in Operable Unit 2 consist of the waste materials in the five subunits, and the media affected by the waste materials. These media include air, soil, surface water (including water from the Great Miami River affected by surface water), sediment, perched water, and groundwater from the Great Miami Aquifer.

The pathways of exposure evaluated for each media are summarized below:

- Air:
  Inhalation of particulates, VOCs, and gases
- Soil:
  Ingestion, dermal contact, and external radiation
- Surface water:
  Ingestion and dermal contact
- Sediment:
  Ingestion, dermal contact, and external radiation
- Perched water:
  Ingestion, dermal contact and inhalation of volatiles released during household use
- Groundwater:
  Ingestion, dermal contact, and inhalation of volatiles released during household use

Additional sources of exposure include food products (fruits, vegetables, meat, and milk) affected by contaminated dust and/or groundwater (through irrigation). Receptors may be exposed to site contaminants through ingestion of these food products.

C.1.4.3 Toxicity Assessment

Two human health effects are addressed in the toxicity assessment for Operable Unit 2: carcinogenic risk and noncarcinogenic hazards. Carcinogenic risks may be due to exposure to a chemical carcinogen or from ionizing radiation from a radionuclide. Effects caused by carcinogenic exposure include lung tumors, bone sarcomas, and skin cancer. Noncarcinogenic hazard effects are numerous and range from kidney or liver damage to localized effects such as skin or eye irritation.

Carcinogenic risk is quantified by the incremental lifetime cancer risk (ILCR) and is expressed in terms of the probability that a given receptor will develop cancer due to estimated exposures. For

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example, if the receptor has an additional risk of 1 in 10,000 of developing cancer due to these exposures, the probability is expressed as a 10^{-4} (1/10,000) risk. Chemical intakes calculated in the exposure assessment are used in conjunction with the cancer slope factor (CSF) to determine the ILCR.

In the evaluation of potential exposures for the noncarcinogenic hazard, it was assumed that a dose threshold exists below which no toxic effect will occur. This threshold is used to develop an acceptable intake level, known as the reference dose (RfD). To estimate the noncarcinogenic health hazard, the estimated intake (calculated from the exposure assessment) was divided by the acceptable intake. This ratio is called the hazard quotient (HQ). When HQs for multiple CPCs are summed for a particular pathway, the resultant value is the hazard index (HI). If the ratio of estimated intake to the acceptable intake is greater than 1, the site-related intake may increase the risk of noncarcinogenic toxic effects.

C.1.4.4 Risk Characterization Results

Table C.1-1 summarize the results of the baseline risk assessment by subunit, land use scenario, and receptors. These results may be compared to the ranges of generally acceptable risk under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), which are an ILCR of 10^{-6} to 10^{-4} or an HI less than 1. Those constituents that contribute an ILCR greater than 1 in 1 million (1.0×10^{-6}) or an HQ greater than 0.2 were designated as the COCs for the FS.

C.1.4.5 Summary of Uncertainties

It is generally recognized that uncertainty is inherent in quantitative risk assessments. The objective of the uncertainty analysis is to identify key site-related variables that contribute most to uncertainty, and to characterize the nature and magnitude of impact of these uncertainties on the conclusions of the risk assessment.

Sources of uncertainty have been identified in all steps of the baseline risk assessment. These sources include: selection of CPCs, exposure assessment, toxicity assessment, and risk characterization. The majority of uncertainties tend toward increased conservatism of the risk

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TABLE C.1-1

SUMMARY OF BASELINE RISK ASSESSMENT RESULTS
OU2 REMEDIAL INVESTIGATION

Waste Subunit	Risk Type[a]	Current Land Use						Future Land Use, Federal Ownership		
		Trespassing Youth	On-Property Groundskeeper	Off-Property Farmer	Off-Property Child	User of Meat & Milk	GMR Rec User	Expanded Trespasser	Off-Property Farmer	Off-Property Child
Solid Waste Landfill	Carcinogenic	$1.5x10^{-5}$	$3.4x10^{-5}$	$6.0x10^{-8}$	$2.7x10^{-9}$	$9.0x10^{-9}$	$2.8x10^{-10}$	$2.0x10^{-5}$	$6.7x10^{-8}$	$3.5x10^{-9}$
	Noncarcinogenic	8.6	$4.3x10^{-3}$	$1.8x10^{-6}$	$6.4x10^{-6}$	$5.8x10^{-7}$	$1.1x10^{-7}$	$2.7x10^{-1}$	$1.8x10^{-6}$	$6.4x10^{-6}$
Lime Sludge Ponds	Carcinogenic	$1.1x10^{-5}$	$4.5x10^{-5}$	$1.5x10^{-7}$	$1.4x10^{-8}$	$1.4x10^{-6}$	NA[b]	$2.4x10^{-5}$	$1.7x10^{-7}$	$1.6x10^{-8}$
	Noncarcinogenic	$2.1x10^{-1}$	$1.3x10^{-1}$	$2.0x10^{-5}$	$9.3x10^{-5}$	$4.3x10^{-4}$	NA	$2.2x10^{-1}$	$2.0x10^{-5}$	$9.3x10^{-5}$
Inactive Flyash Pile	Carcinogenic	$1.5x10^{-5}$	$5.0x10^{-5}$	$6.1x10^{-7}$	$7.9x10^{-8}$	$1.1x10^{-7}$	$8.4x10^{-9}$	$3.0x10^{-5}$	$7.5x10^{-5}$	$4.0x10^{-6}$
	Noncarcinogenic	$1.0x10^{-1}$	$2.0x10^{-2}$	$5.5x10^{-5}$	$2.0x10^{-4}$	$1.4x10^{-5}$	$1.9x10^{-6}$	$1.0x10^{-1}$	1.2	2.5
South Field	Carcinogenic	$1.0x10^{-4}$	$2.2x10^{-4}$	$6.4x10^{-7}$	$2.4x10^{-7}$	$4.5x10^{-6}$	$4.2x10^{-6}$	$1.4x10^{-4}$	$8.7x10^{-5}$	$4.2x10^{-6}$
	Noncarcinogenic	$5.3x10^{-1}$	ND[c]	$2.0x10^{-5}$	$7.2x10^{-5}$	$3.0x10^{-5}$	$8.0x10^{-07}$	$8.0x10^{-2}$	1.1	3.1
Active Flyash Pile	Carcinogenic	$2.6x10^{-5}$	$8.0x10^{-5}$	$4.7x10^{-7}$	$6.6x10^{-8}$	$4.7x10^{-7}$	$1.37x10^{-9}$	$4.9x10^{-5}$	$1.1x10^{-5}$	$7.2x10^{-7}$
	Noncarcinogenic	$3.6x10^{-2}$	$5.9x10^{-2}$	$6.2x10^{-4}$	$2.1x10^{-3}$	$3.7x10^{-3}$	$6.1x10^{-6}$	$4.2x10^{-2}$	$1.9x10^{-1}$	$7.9x10^{-1}$

See footnotes at end of table

TABLE C.1-1
(Continued)

Waste Subunit	Risk Type[a]	Future Land Use, Private Ownership: On-Property Resident Farmer (RME)[b]	On-Property Resident Farmer (CT)[c]	On-Property Resident Child	Home Builder	Perched Groundwater User	GMR Recreational User	GMR Residential User	GMR Agricultural User
Solid Waste Landfill	Carcinogenic	$2.8x10^{-3}$	$2.0x10^{-4}$	$6.4x10^{-4}$	$9.0x10^{-6}$	$2.8x10^{-3}$	$2.8x10^{-10}$	$4.2x10^{-9}$	$6.5x10^{-7}$
	Noncarcinogenic	$2.9x10^{-1}$	$1.2x10^{-1}$	1.0	$4.8x10^{-1}$	ND	$1.1x10^{-7}$	$2.2x10^{-6}$	$1.1x10^{-4}$
Lime Sludge Ponds	Carcinogenic	$1.3x10^{-5}$	$9.3x10^{-7}$	$1.2x10^{-6}$	NA	$7.7x10^{-5}$	NA	NA	NA
	Noncarcinogenic	$1.7x10^{-3}$	$7.3x10^{-4}$	$7.9x10^{-3}$	NA	$3.1x10^{-3}$	NA	NA	NA
Inactive Flyash Pile	Carcinogenic	$1.5x10^{-3}$	$8.6x10^{-5}$	$7.7x10^{-5}$	NA	NA	$8.4x10^{-9}$	$3.0x10^{-9}$	$5.4x10^{-10}$
	Noncarcinogenic	22	9.8	65	NA	NA	$1.9x10^{-6}$	$4.2x10^{-6}$	$3.6x10^{-5}$
South Field	Carcinogenic	$3.4x10^{-2}$	$2.0x10^{-3}$	$9.2x10^{-3}$	$1.1x10^{-5}$	NA	$4.2x10^{-6}$	$6.3x10^{-8}$	$4.2x10^{-6}$
	Noncarcinogenic	23	11	63	$5.4x10^{-1}$	NA	$2.5x10^{-6}$	$1.4x10^{-4}$	$4.0x10^{-5}$
Active Flyash Pile	Carcinogenic	$8.4x10^{-5}$	$4.8x10^{-6}$	$5.7x10^{-6}$	NA	NA	$1.4x10^{-9}$	$7.7x10^{-9}$	$3.5x10^{-9}$
	Noncarcinogenic	$9.9x10^{-1}$	$4.5x10^{-1}$	2.8	NA	NA	$6.1x10^{-6}$	$1.5x10^{-5}$	$6.7x10^{-6}$

GMR = Great Miami River.
NA = The indicated land use is not applicable to the waste subunit.
ND = Not determined because toxicity data are not available.
[a]The carcinogenic risk value is the Incremental Lifetime Cancer Risk (ILCR), and the noncarcinogenic hazard value is the hazard index (HI).
[b]RME = Reasonable Maximum Exposure.
[c]CT = Central Tendency.

Source: OU2 RI report, Table 7-1 (DOE 1994a)

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evaluation. Taken together, the uncertainties identified with site data, exposure parameters, fate and transport, toxicity assessment and risk characterization are judged to be high and could overestimate risk by two or more orders of magnitude. Appendix B of the Operable Unit 2 RI report provides a detailed discussion of uncertainties.

C.1.4.6 Conclusion

The objective of the Operable Unit 2 baseline risk assessment was to evaluate and quantify potential risks and hazards to human health that may be posed by current and predicted future exposures to contaminants within Operable Unit 2 if no remedial action is taken. This objective was met. Results of the RI baseline risk assessment indicate that the actual or threatened release of hazardous substances from Operable Unit 2 present a potential future threat to public health if no remedial actions are taken. Therefore, remedial alternatives should be considered to reduce potential threat.

C.1.5 OPERABLE UNIT 2 CONTAMINANTS OF CONCERN

Not all constituents identified during the Operable Unit 2 baseline risk assessment pose significant health risks. The baseline risk assessment evaluated constituents and exposure pathways to ascertain their potential present and future impacts on human health. In general, constituents that resulted in risks to a receptor of greater than 10^{-6} or which yielded an HQ greater than 0.2 were designated as COCs to be considered in the selection of remedial alternatives. Those COCs and the media in which the carcinogenic risk level or HQ was greater than 10^{-6} or 0.2, respectively, are presented in Table C.1-2.

C.1.6 ORGANIZATION OF THIS APPENDIX

To accomplish the identified objectives, this FS risk assessment is organized as follows:

- C.1.0 Introduction:
  This section outlines the objectives of the FS risk assessment, presents a brief FEMP site history and subunit description and provides a summary of the RI baseline risk assessment. Operable Unit 2 COCs evaluated in this risk assessment are also identified.

- C.2.0 Overview of Technical Approach and Assumptions:
  The four FS remedial alternatives are compared, and based on these alternatives, the remedial and residual conceptual models are presented. To execute these models, several factors and assumptions are identified.

- C.3.0 Exposure Quantification Methodology:

This section presents the equations used to quantity risk through air, water, and soil exposures. Equations for calculating remedial action risks, including direct radiation, physical injury, inhalation and transportation, are also presented.

- C.4.0 Toxicity Assessment:
  In this section, a toxicity assessment is presented for a qualitative evaluation of the scientific data to determine the nature and severity of the toxic properties associated with the COCs. Toxicity profiles are included for the radionuclides and chemicals that may result in an adverse effect on a biological receptor. The relationship between the dose received by a receptor and the incidence of an adverse effect is defined.

- C.5.0 Fate and Transport Modeling:
  This section describes the methodology used to quantitatively predict COC concentrations for remedial activities and residual sources. It includes discussions of: 1) the fate and transport models used, 2) the required data and default parameter values, 3) the technical approach that determines the appropriate model for each potential exposure assessment, and 4) model results.

- C.6.0 Remedial Action Risk Characterizations:
  The methodology used and the results of the risk estimates for remedial action activities are presented.

- C.7.0 Residual Risk Characterizations:
  This section defines the methodology used in generating the residual risks to human health from exposure to residual COCs. This information is presented as qualitative and quantitative estimates of health risk for each alternative.

- C.8.0 Uncertainty Analysis:
  This section discusses the uncertainties associated with the results of the remedial and residual risks.

- C.9.0 Summary of Risk Assessment Results:
  A summary of remedial action and residual risks is presented by receptor, subunit, and remedial alternative.

- References:
  Literature cited is presented in this section.

TABLE C.1-2

OPERABLE UNIT 2 CONTAMINANTS OF CONCERN

COC	Solid Waste Landfill	Lime Sludge Ponds	Inactive Fly Ash Pile	South Field	Active Fly Ash Pile
Chemicals					
Antimony	•				
Aroclor-1254				•	
Aroclor-1260				•	
Arsenic	•		•	•	•
Benzo(a)anthracene	•			•	
Benzo(a)pyrene	•			•	
Benzo(b)fluoranthene	•			•	
Benzo(k)fluoranthene				•	
Beryllium	•			•	•
Carbazole	•				
Dibenzo(a,h)anthracene	•		•	•	
Dieldrin				•	
Indeno(1,2,3-cd)pyrene	•			•	
Uranium (Total)	•	•	•	•	•
Radionuclides					
Cs-137		•		•	•
Np-237	•	•		•	•
Pu-238	•				
Ra-226	•	•	•	•	•
Ra-228	•	•	•	•	•
Rn-222	•		•	•	•
Sr-90		•		•	•
Tc-99	•	•		•	
Th-228	•	•	•	•	•
Th-230	•	•		•	
Th-232	•	•	•	•	•
U-234	•	•	•	•	•
U-235/236	•	•	•	•	
U-238	•	•	•	•	•

Source: Operable Unit 2 RI report, Appendix B, Table 4-0 (DOE 1994a)

C.2.0 OVERVIEW OF TECHNICAL APPROACH AND ASSUMPTIONS

To evaluate feasible alternatives for the Operable Unit 2 subunits, two types of risk were assessed: short-term or "remedial action" risks, and long-term or "residual" risks. Remedial action risks are the direct result of implementing activities such as excavation and transportation of waste materials, while residual risks result from exposure to postremediation sources such as the disposal cell or covers, that is, those sources remaining on site after all remedial actions have been completed. For Operable Unit 2, four remedial alternatives have been selected for consideration (see Section 5.0 of this FS report), which implies four different sets of remedial activities and postremediation site conditions. This risk assessment is designed to evaluate the potential risks to various receptors under each alternative due to exposure during remedial activities or from residual contamination.

The methodology used in this risk assessment is consistent with the Amended Consent Agreement and follows the approach presented in the RAWPA (DOE 1992), which in turn derives much of its methodology from the EPA RAGS (EPA 1989a). The technical approach was developed within the context of the overall RI/FS process for the FEMP to determine if the Operable Unit 2 remedial alternatives protect human health and the environment or, if they do not, to provide information useful in developing the best path forward. This risk assessment has been prepared in conjunction with EPA, Ohio Environmental Protection Agency (OEPA), and DOE guidelines to assess the potential risk of exposure to radionuclides and hazardous chemicals.

Section C.2.1 summarizes the four remedial alternatives for Operable Unit 2. Sections C.2.2 and C.2.3 describe the conceptual models for remedial action risks and residual risks, respectively. The conceptual models are used to examine the potential sources, mechanisms, and pathways of contamination for receptors under each alternative. Section C.2.4 discusses the major assumptions used to estimate conditions.

After the conceptual models were developed, fate and transport computer codes were used to simulate the transport processes. A discussion of the computer codes can be found in Section C.5.0.

C.2.1 REMEDIAL ALTERNATIVES

As previously stated, the role of this FS is to analyze and select potential remedial alternatives. The elements involved in screening, evaluating, and selecting alternatives are outlined in Section 4.0 of

this FS report. The evaluations of remedial action and residual risks presented in this appendix support the selection of a final remedy by focusing on the four potential remedial alternatives identified in the FS. The four alternatives analyzed are briefly described in this section, as are the postremediation site conditions under each.

C.2.1.1 Alternative 1: No Action

Alternative 1, No Action, provides a baseline against which other alternatives can be evaluated (Figure C.2-1). Under this alternative, no remedial action would be taken and the material in the subunits would be considered left in-place, "as is," with no containment, removal, treatment, or other mitigating actions.

C.2.1.2 Alternative 2: Consolidation and Capping

Alternative 2 includes consolidation of contaminated materials within each subunit and subsequent capping with a composite capping system (Figure C.2-2). Materials would be excavated, consolidated and placed under caps in three areas: South Field, Solid Waste Landfill and the Lime Sludge Ponds. The following describes the implementation of this alternative for each of these areas.

At the Active Flyash Pile, Inactive Flyash Pile, and South Field, contaminated material directly overlying the Great Miami Aquifer (GMA) and/or down surface from the old terrace face would be excavated and moved to the northeastern side of the boundary limits, where the undisturbed till is at least 5 meters (16 feet) deep. All contaminated material within the floodplain would also be moved.

After excavation and consolidation of the materials at the Active Flyash Pile, Inactive Flyash Pile, and South Field, a subsurface drain would be constructed along the southwestern side of the consolidation area to collect groundwater from the underlying perched aquifer. The drain would discharge by gravity into a pumping station. Collected leachate and groundwater would be pumped to the Advanced Wastewater Treatment (AWWT) facility for treatment. Excavation operations along the eastern boundary of the South Field would impact an existing 15-centimeter (6-inch) water line and the 61-centimeter (24-inch) South Plume extraction system force main. These lines would be relocated.

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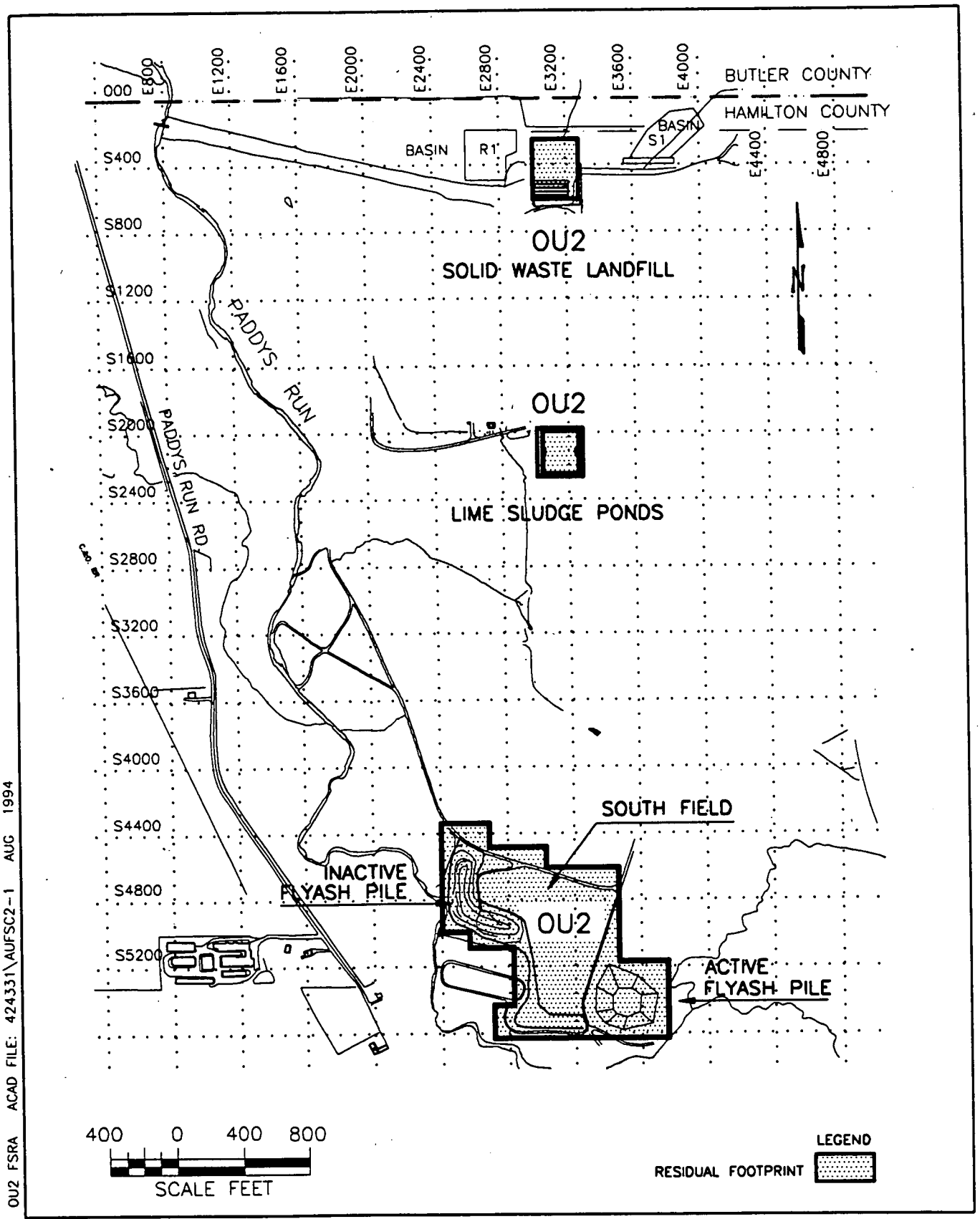

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FIGURE C.2-1
POSTREMEDIATION SITE, OU2 ALTERNATIVE 1, NO ACTION

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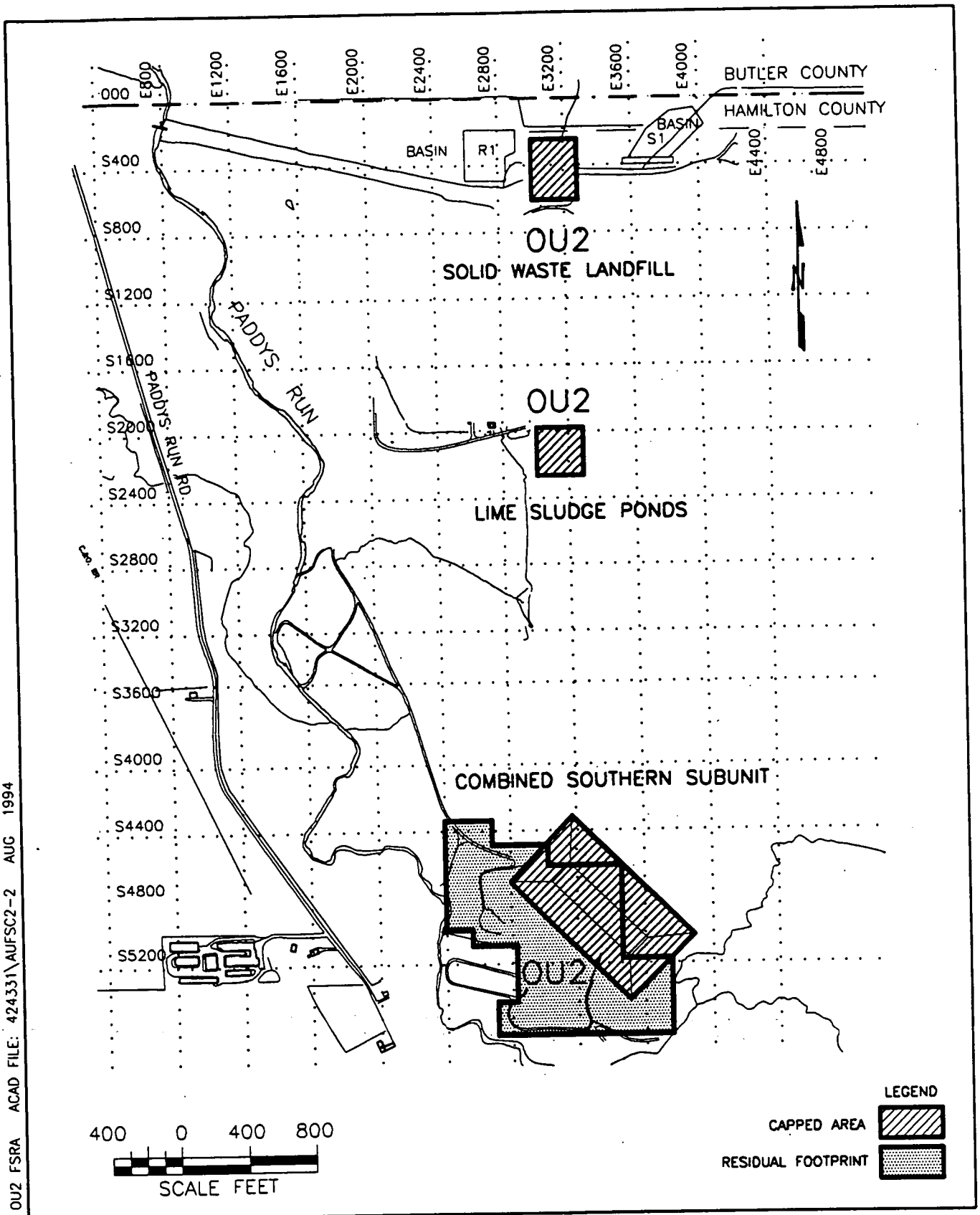

FIGURE C.2-2
POSTREMEDIATION SITE, OU2 ALTERNATIVE 2, CONSOLIDATION AND CAPPING

For the Solid Waste Landfill, material close to the interbedded sand in the southeast corner of the landfill would be excavated. This excavated material would be replaced by clean clay to retard migration of contaminants into interbedded sand. Material along the south side of the landfill would be removed to allow placement of a proper foundation for the capping system adjacent to the railroad track. Material in the northeast corner of the landfill would be consolidated under the cap in order to simplify the design geometry and subsequent construction of the composite cap. A drainage swale immediately north of the Solid Waste Landfill would be impacted. This swale was delineated as a wetland in a 1993 study (DOE 1994a). Replacement of drainage systems and/or wetlands would be required. Wetlands restoration will be addressed as part of a site-wide plan to be developed under Operable Unit 5. Monitoring wells encountered during the excavation activities would be plugged in accordance with appropriate abandonment procedures.

Following completion of consolidation activities at each subunit, excavated areas would be backfilled, and the entire consolidation area at each subunit would be regraded to match the surrounding topography. A multi-layer capping system would then be constructed over the consolidated materials.

Water generated during construction would be collected as required to maintain a dry excavation and then transferred to a holding/sedimentation tank for gravity settling of suspended solids. The overflow from the holding tank would be pumped to the AWWT facility for treatment and disposal.

Alternative 2 would include the following institutional controls at each of the consolidation areas: access restrictions, groundwater monitoring, cap maintenance, and deed restrictions to prohibit groundwater use and future development.

C.2.1.3 Alternative 3: Excavation and Off-Site Disposal

This alternative involves excavating all material contaminated above PRLs, visual segregation, staging, shredding or crushing for size reduction, drying for moisture control, packaging, and off-site disposal (Figure C.2-3). To evaluate potential off-property disposal sites and associated treatment, transportation and disposal costs, Alternative 3 would provide for disposal of contaminated material at a commercial facility, assumed to be EnviroCare in Utah.

The excavation would be completed to the required depth established by modelling. Upon reaching this predetermined depth, verification sampling and testing would be completed to confirm that all

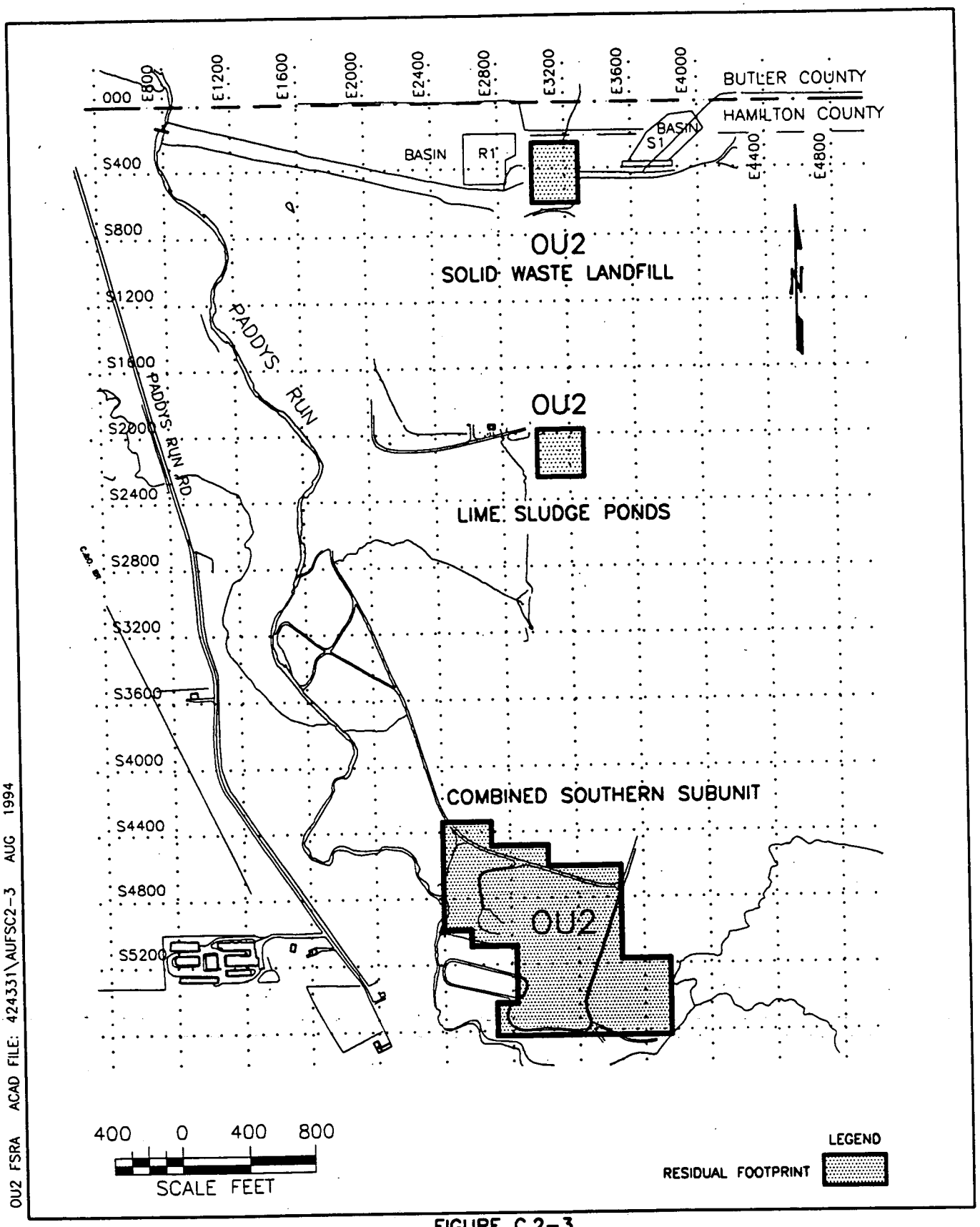

FIGURE C.2-3
POSTREMEDIATION SITE, OU2 ALTERNATIVE 3, OFF-SITE DISPOSAL

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contaminated material had been removed. If the results of the verification sampling and testing indicate that unacceptable contamination levels remain, the excavation would be extended in increments until acceptable test results are obtained. Upon verification that the required removal has been accomplished, the excavated area would be backfilled and graded to match the surrounding topography, provided with adequate runoff control, and revegetated.

All excavated material would be visually segregated into flyash, lime sludge, soil, trash, and debris. The trash or debris would be shredded or crushed, packaged, and transported off-site for disposal. Soil containing lead (from the firing range) which has been characterized using the Toxicity Characteristics Leaching Procedure (TCLP) as Resource Conservation and Recovery Act (RCRA) waste would be excavated, containerized, and transported to a RCRA approved facility for treatment and disposal. The quantity of soil requiring disposal is estimated at 230 cubic meters (300 cubic yards). The fraction of soil, sludge, flyash, and debris would be dried as required and transported off site for disposal.

The remedial activities for the following items are described in Alternative 2 (Section C.2.1.2): construction-generated water, the South Field water line and South Plume extraction system, and the Solid Waste Landfill drainage swale and monitoring wells. Since all contaminated material would be transported off-site, no long-term institutional controls would be required.

C.2.1.4 Alternative 6: Excavation and On-Site Disposal with Off-Site Disposal of Fraction Exceeding WAC

Under this alternative, material contaminated above PRLs would be excavated from each subunit and transported to an on-site, engineered disposal cell (Figure C.2-4). Waste material failing to meet the disposal cell WAC would be disposed off-site at a permitted commercial facility. As described in Alternative 3 (Section C.2.1.3), the excavation would be completed to the required depth established by modelling. Upon verification that the required removal has been accomplished, the excavated area would be backfilled and graded to match the surrounding topography, provided with adequate runoff control, and revegetated.

Contaminated material such as trash and construction or demolition debris (e.g., concrete, drums, steel, pallets) would be crushed or shredded to reduce volume and placed in the on-site disposal

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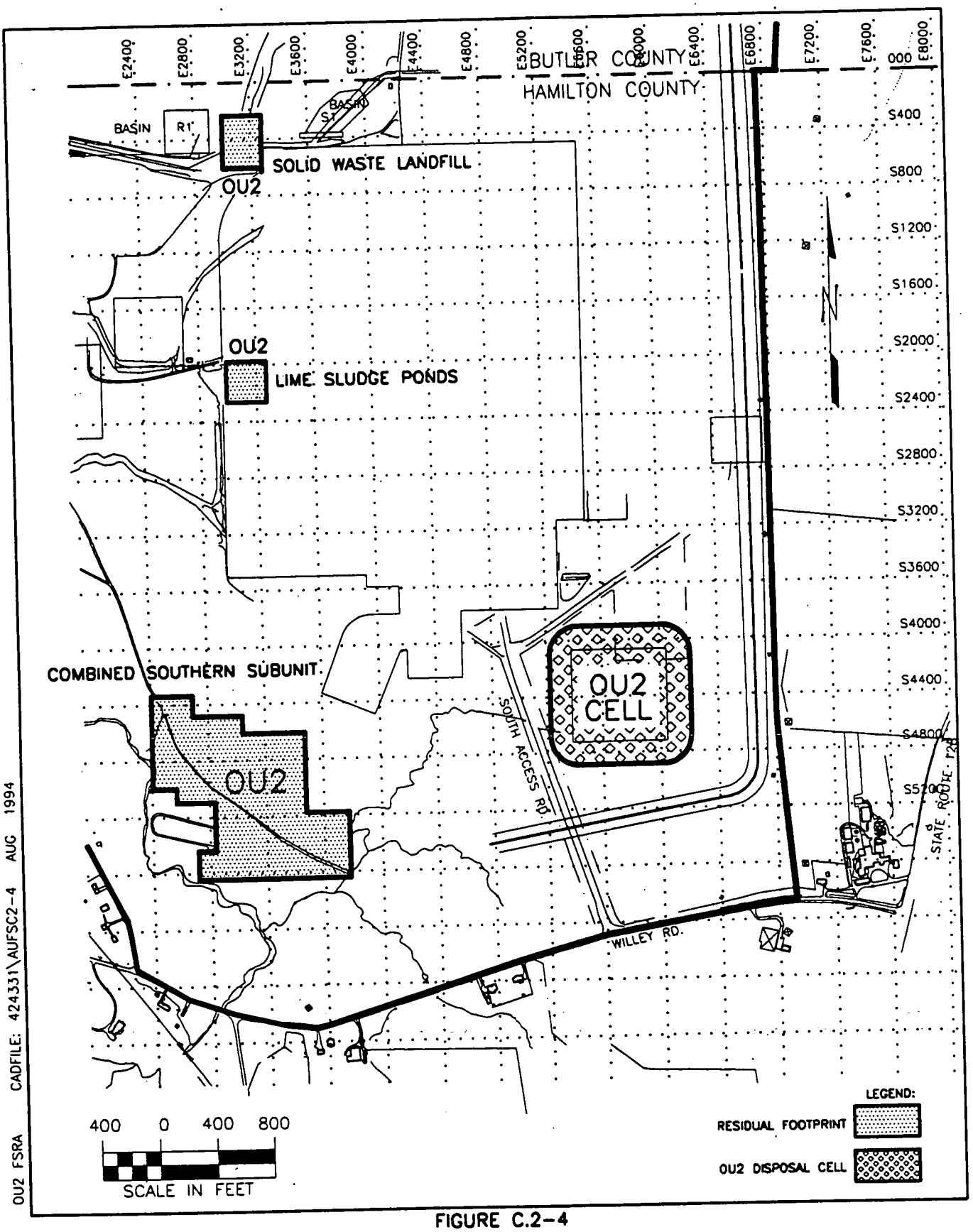


FIGURE C.2-4

POSTREMEDIATION SITE, OU2 ALTERNATIVE 6, EXCAVATION AND ON-SITE DISPOSAL

facility. As in Alternative 3 (Section C.2.1.3), lead-contaminated soil from the firing range would be analyzed by the TCLP for lead. Soils passing the TCLP for lead would not be considered a hazardous waste and would be disposed with the consolidated material in the South Field.

The remedial activities for the following items are described in Alternative 2 (Section C.2.1.2): construction-generated water, the South Field water line and South Plume extraction system, and the Solid Waste Landfill drainage swale and monitoring wells. Alternative 6 would also include the following institutional controls at the disposal cell: access restrictions, groundwater monitoring, disposal cell maintenance, and deed restrictions to prohibit groundwater use and future development.

C.2.2 DEVELOPMENT OF REMEDIAL RISK CONCEPTUAL MODELS

Conceptual models have been developed to provide a framework for identifying and evaluating the potential risk to human health during remediation of the FEMP. The models facilitate the analysis of exposure routes and receptors, focusing on those pathways and sources that drive the potential impacts to human-health risk and screening out other exposure pathways that are likely to pose minor risks. As shown in Figure C.2-5, the models trace the exposure pathways from each alternative activity through the exposure media and exposure pathways to the affected receptors. The models also indicate which exposure routes are carried through the quantitative risk assessment for each receptor.

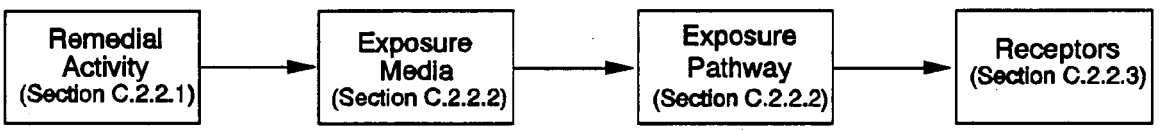


FIGURE C.2-5
FLOW OF REMEDIAL RISK CONCEPTUAL MODEL (ALL ALTERNATIVES)

Section C.2.2.1 describes the different work activities for each remedial action alternative. Section C.2.2.2 describes the alternative exposure scenarios that pose a short-term risk to the receptors discussed in Section C.2.2.3. Detailed conceptional models are presented in Section C.2.2.4.

C.2.2.1 Remedial Activities

Except for Alternative 1 (No Action), the remedial action alternatives involve a range of work activities and varying degrees of physical risk and potential exposure to Operable Unit 2 COCs. The

remedial activities for the feasible remedial alternatives identified for Operable Unit 2 (Alternatives 2, 3, and 6) are summarized in Table C.2-1 and described below for each alternative. Note that emission controls will be used to mitigate exposure due to sorting/separating and crushing/shredding activities.

- Alternative 2 - Consolidation and Capping:

  Water extraction and transfer to AWWT facility; mechanical and slurry removal of waste and associated materials; waste segregation; stockpiling materials; crushing and shredding of materials; runoff control construction; surface soil excavation; monitoring of air, groundwater, leachate, surface water, and sediment; consolidation area capping and site restoration; and administrative controls.

- Alternative 3 - Excavation and Off-Site Disposal:

  All remedial activities of Alternative 2 plus activities involved with off-site disposal. Off-site disposal involves material stockpiling, blending, and bulk loading for transport, off-site shipment and ultimate disposal.

- Alternative 6 - Excavation and On-site Disposal with Off-site Disposal of Fraction Exceeding WAC:

  In addition to the remedial activities identified in Alternative 2, this alternative involves the construction and closure of a disposal cell.

  Waste material failing to meet the disposal cell WAC would be disposed off-site at a permitted commercial facility. This includes remedial activities associated with off-site disposal as defined in Alternative 3.

C.2.2.2 Remedial Action Exposure Scenarios

To estimate remedial action risks, the phases of an alternative that may contribute to short-term risks have been identified. Figures C.2-6, C.2-7 and C.2-8 show the significant remedial activities for Alternatives 2, 3 and 6, respectively. As a result, this assessment examines seven distinct remedial alternative activities that have the potential for contributing to remedial action risks.

Risks from individual activities comprising a remedial alternative have been combined to develop an overall estimate for the risk associated with the alternative. The following list presents the activities and the alternatives that contain the activity:

TABLE C.2-1

RELATIONSHIP BETWEEN OU2 REMEDIAL ACTIVITIES AND REMEDIAL ALTERNATIVES

	Remedial Alternative			
	1	2	3	6
Remedial Activity	No Action	Consolidation and Capping	Excavation and Off-Site Disposal	Excavation and On-Site Disposal with Off-Site Disposal of Fraction Exceeding WAC
Soil/Sediment/Waste				
Physical Barriers		o		o
Security Guards		o		o
Deed Restrictions		o		o
Composite Cap		o		o
Restoration (backfilling)		●	●	●
Surface Water Controls		o	o	o
Mechanical Excavation		●	●	●
Sorting/Separating		o	o	o
Revegetation			o	o
Crushing/Shredding*		o	o	o
Drying			●	
On-Site Disposal Facility				●
Off-Site Disposal Facility			●	●
Off-Site Hazardous Waste Disposal Facility		o	o	o
Truck Transportation (on-site)		●	●	●
Rail Transportation			●	●
Groundwater/Construction Water				
Groundwater Monitoring Wells		o		o
French Drains/Interception Trenches		o		
Excavation Dewatering		o	o	o
Sedimentation		o	o	o
AWWT Facility		o	o	o
Discharge to Great Miami River		o	o	o

Legend:
● = Remedial Activity associated with remedial action risk (see Section C.2.2.1).
o = Remedial Activity does not affect remedial action risk.
AWWT = Advanced wastewater treatment.
*Potential emissions associated with these activities will be controlled.

Remedial Activity	Alternative Containing Activity
Excavation	Alternatives 2, 3, and 6
Drying	Alternatives 3
On-Site Disposal	Alternatives 2 and 6
Off-Site Waste Transportation	Alternatives 3 and 6
Restoration	Alternatives 2, 3 and 6
On-Site Waste Transportation	Alternatives 2, 3, and 6
Waste Storage	Alternatives 3 and 6

Excavation

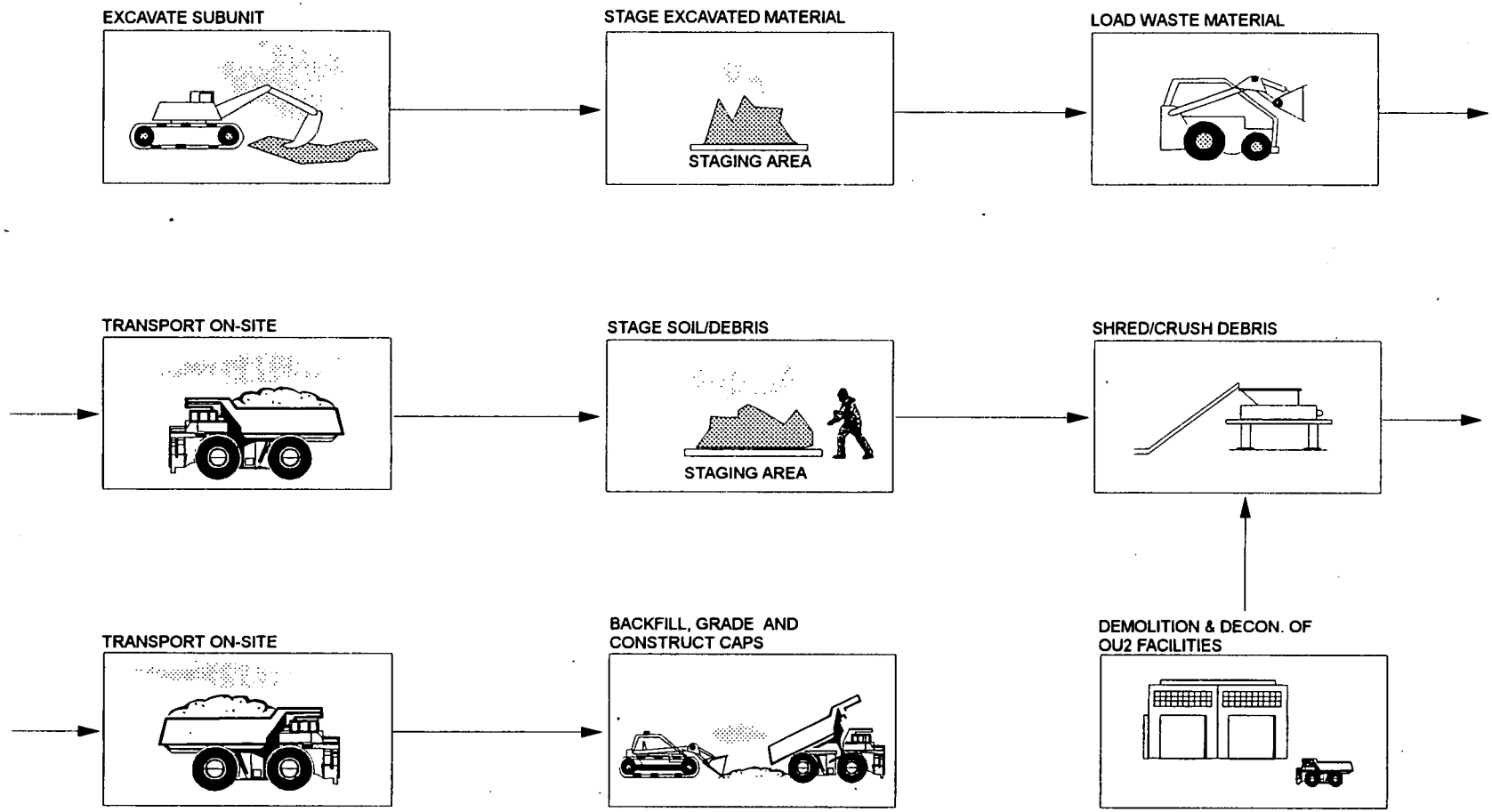
During excavation, heavy equipment would remove the contaminated surface soil, berms, liners, and underlying soil for ultimate disposal. This remedial activity has the potential to suspend dust containing COCs in the air. Remediation workers monitoring soil contamination levels would be exposed to ionizing radiation from inhalation, external radiation, and immersion in the contaminated air. Airborne COCs would be transported to nonremediation workers on property and to individuals off property. These receptors would also be exposed via inhalation and immersion. Finally, remediation workers would be subject to mechanical hazards during excavation and construction of ancillary facilities.

The number of hours and persons involved in monitoring activities would be considerably less than those for excavation activities. Exposures due to monitoring activities would constitute only a small fraction of the intakes due to excavation activities; hence, intakes and exposures of monitoring workers have not been expressly analyzed.

Drying

During drying, volatile organic compounds (VOCs) would be released through the off-gas system. The remediation workers, nonremediation workers, and off property individuals would inhale chemical COCs and be exposed from immersion in the contaminated air. Particles from drying would be controlled using the best available technology. Remediation workers would be subject to mechanical hazards during construction of the drying facility.

Remediation workers (operators) would be exposed to external radiation that constitutes only a fraction of the dose received by excavation workers because of shielding from the equipment. Also,



NOTE: FOR THE SOUTH FIELD, STABILIZE MATERIAL CONTAMINATED WITH LEAD AND DISPOSE AT ENVIROCARE.

FIGURE C.2-6
ALTERNATIVE 2 REMEDIAL ACTIVITIES
CONSOLIDATION AND CAPPING

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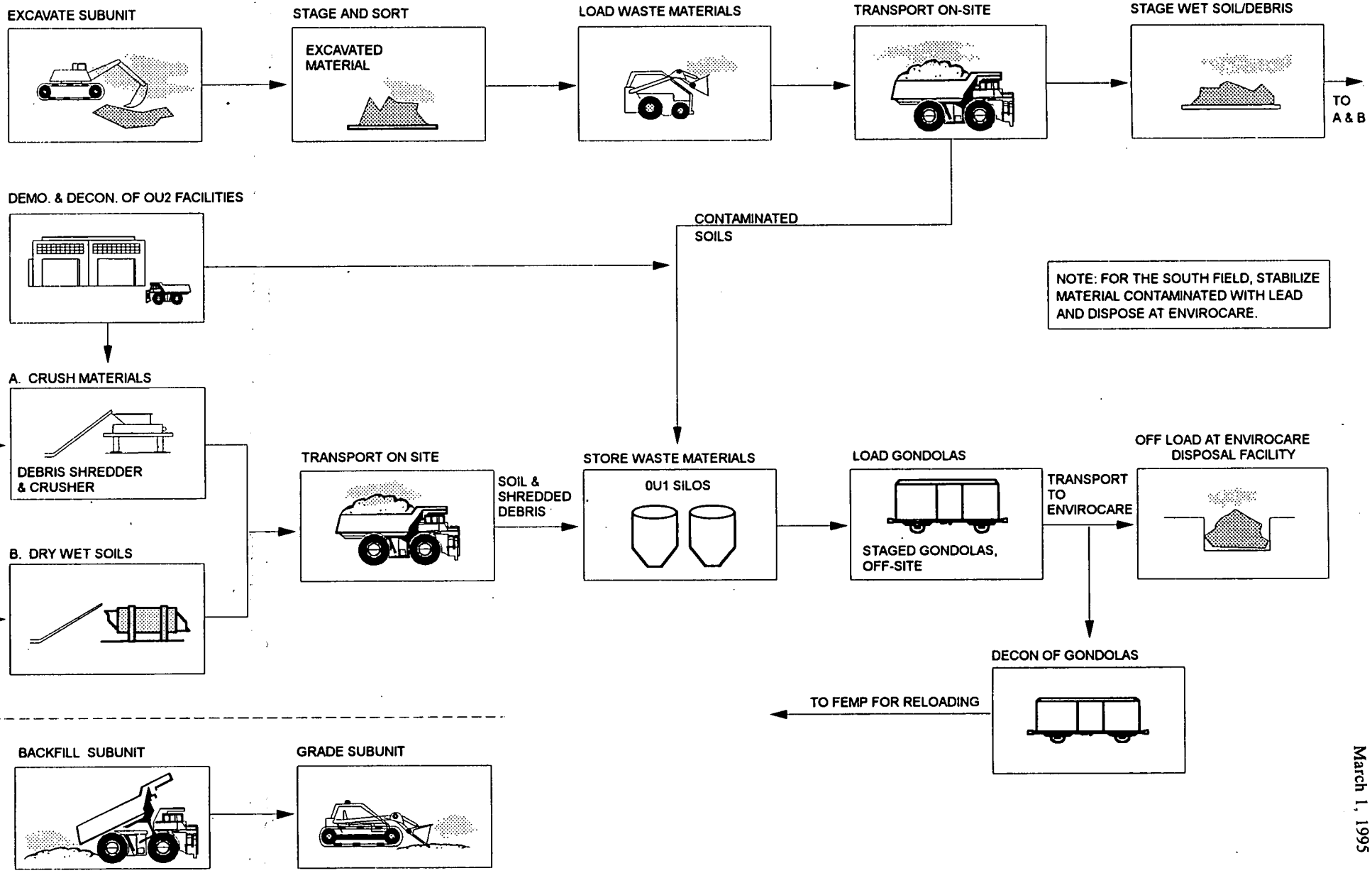

FIGURE C.2-7
ALTERNATIVE 3 REMEDIAL ACTIVITIES,
EXCAVATION AND OFF-SITE DISPOSAL

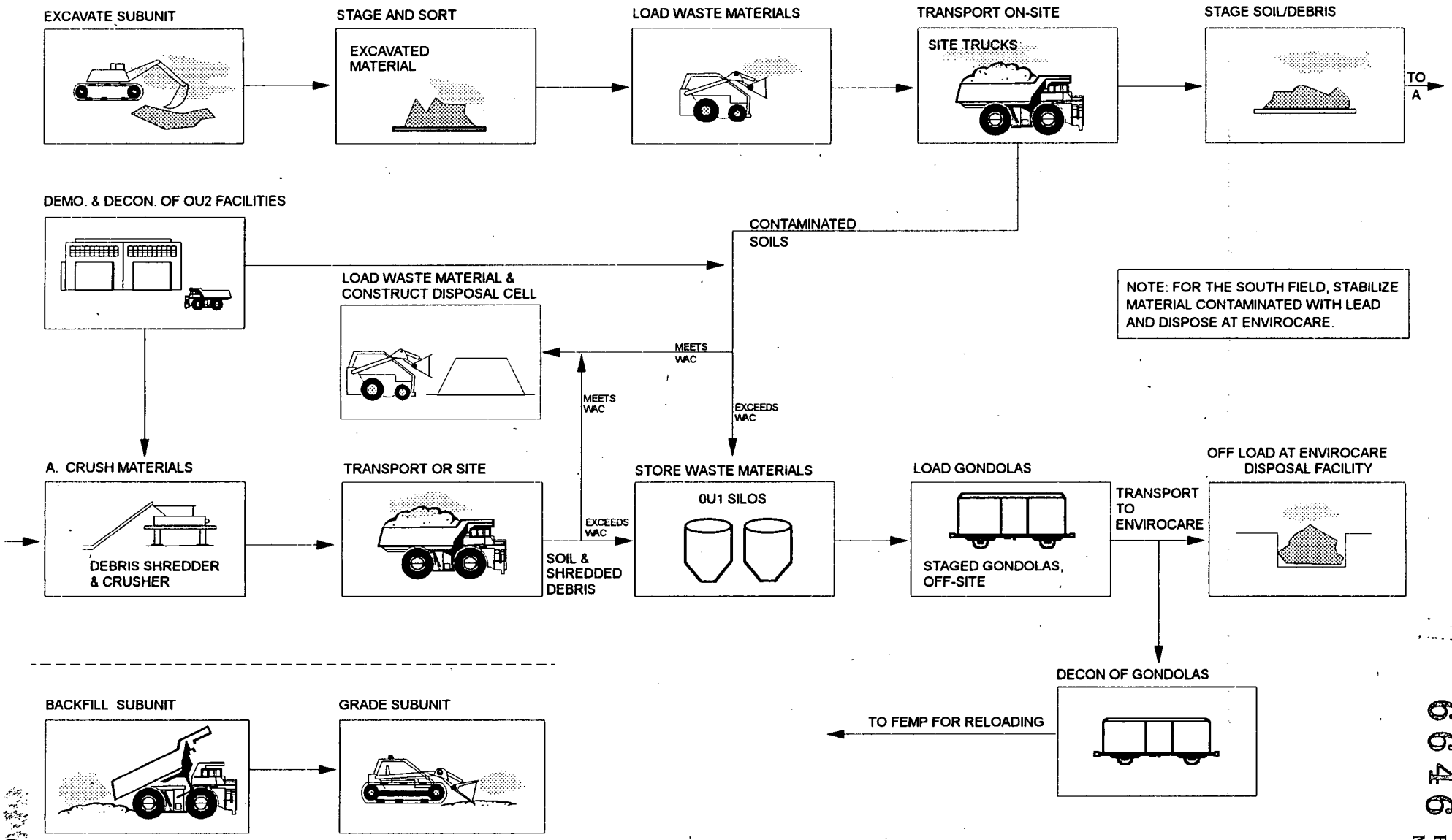

FIGURE C.2-8
ALTERNATIVE 6 REMEDIAL ACTIVITIES,
EXCAVATION AND ON-SITE DISPOSAL WITH OFF-SITE DISPOSAL
OF FRACTION EXCEEDING WAC

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FER\OU2\FSRA\NEW\FIGS\FIGC2-8.PRE

inhalation and immersion would be only a small fraction of that which the remediation workers, nonremediation workers, and public could receive from excavation activities. This is because all air COCs would be treated in the off-gas system, which removes all but a very small fraction of the particulate through the HEPA filter. Radon would not be removed by the off-gas system, but the majority would be released through soil disturbance during excavation, and the residence time in the dryer would not be sufficient to cause the further generation of substantial amounts of radon. Therefore, no intakes or exposures to radioactive materials have been assumed for any receptors.

On-Site Disposal

The on-site disposal facility would be constructed on a portion of the site that had been cleaned. Remediation workers would be subject to mechanical hazards during construction of the facility and waste emplacement. During waste emplacement, all receptors would be exposed to COCs through inhalation and immersion and to external radiation at levels equal to or less than those encountered during the excavation activities. These exposures have been estimated using ratios of person-hours of exposure and intake for the two activities.

Off-Site Waste Transportation

Following drying, the excavated material would be loaded onto rail cars (gondolas). During loading, remediation workers would be exposed to contaminated dust and external radiation from the material. The worker exposures to contaminated dust are bounded by those encountered during excavation by duration alone; therefore, this pathway has not been specifically evaluated. These workers would also be placed at risk from mechanical hazards. During transport, train crews would be exposed to external radiation from the material. Individuals living on the transportation route or sharing the transportation route would also be exposed to external radiation. Workers in the vicinity of the rail staging area would be exposed to external radiation. Finally, members of the public would potentially be exposed to external radiation from air and ground contamination and inhale COCs following a postulated transportation accident.

A contingency plan would be developed and submitted to the agencies for approval prior to the implementation of remedial activities. The plan would address on-site waste transportation.

Restoration

Following remediation of contaminated materials in Operable Unit 2, existing equipment, slabs, and roadways would be decontaminated and demolished. Excavated areas would be backfilled with clean soil and caps constructed. Remediation workers would be placed at risk from exposure to contaminated materials and mechanical hazards associated with these activities. The exposures and intakes from decontamination of equipment and materials would be only a fraction of those encountered during excavation and have therefore not been specifically evaluated.

On-Site Waste Transportation

All alternatives would require the transportation of contaminated materials by truck. Remediation workers (truck drivers) would be at risk from direct radiation and mechanical hazards (i.e., accidents) incurred when driving the truck. Note that inhalation risks have been considered as part of excavation activities.

Waste Storage

Wastes would be stored in silos pending disposition, and therefore the silos would pose a external radiation hazard to workers. Silos would be used for Alternatives 3 and 6 only.

C.2.2.3 Receptors Impacted

Remedial action risks are lifetime cancer risks associated with the exposure to chemical carcinogens and ionizing radiation, toxic effects associated with noncarcinogenic chemicals, and direct physical injuries associated with construction and transportation activities. This risk assessment estimates risks from exposures to three groups of individuals: remediation workers, nonremediation workers, and the general public. These remedial action receptors were selected for the Operable Unit 2 FS based on EPA comments on the Operable Unit 1 FS, which included the addition of a remedial worker.

On-Property Remediation Workers

On-property remediation workers would be placed at risk through their direct participation in remedial activities. They may be exposed to contaminated materials either through routine operations or accidents. Remediation workers would be subject to mechanical hazards while relocating contaminated soil and while constructing or operating the physical plant performing the remediation.

On-Property Nonremediation Workers

On-property nonremediation workers include all other workers on the FEMP. These workers include the administrative and clerical staff of the Fernald Environmental Restoration Management Company (FERMCO) and its subcontractors, and workers at sites adjacent to the remediation effort. Nonremediation workers would be at potential risk from exposure to airborne COCs released during remedial activities. They are not considered to be subject to an increased level of mechanical hazards and would be too far away from the contaminated soil to receive significant external radiation exposure from soil.

Off-Property Remediation Workers

Off-property remedial workers are envisioned to be the train crew and rail workers who would transport the FEMP waste to off-site disposal facilities. The magnitude of impact to these receptors depends on the level of COCs in the transported waste, the degree of shielding provided by the rail cars, the receptor's proximity to the rail cars, and the duration of transport, including stops.

Near-Property Public

For those scenarios in which contaminants would be dispersed in the air and carried to the FEMP site boundary, members of the public are assumed to be located at the fenceline.

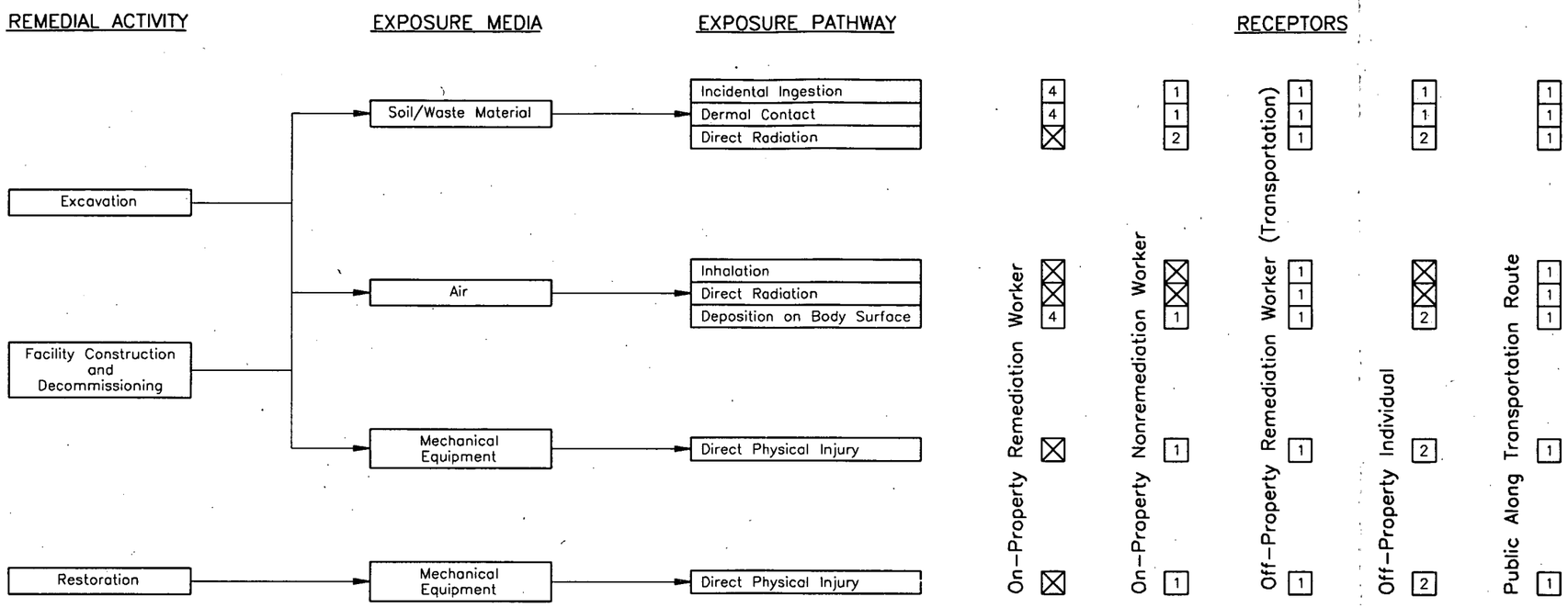
Public Along the Transportation Route

For transportation scenarios, the off-property general public are those who live along the transport route. The magnitude of impact to the off-property general public depends on the level of COCs in the transport containers, the receptor's proximity to the rail cars, the duration of transport (including stops), and the severity of potential accidents. The public along the transportation route would be exposed to direct radiation as the train passes by. Members of the public would potentially inhale radionuclides and be exposed to external radiation from air and ground contamination following a postulated transportation accident.

C.2.2.4 Remedial Risk Conceptual Models

This section presents the detailed conceptual models developed to describe the remedial risk for each of the four alternatives outlined in Section C.2.2.1. Figure C.2-9 represents the remedial exposure

REMEDIAL RISK CONCEPTUAL MODEL, ALTERNATIVE 2
CONSOLIDATION AND CAPPING



Legend:

☒ Denotes a complete pathway. Pathway-specific risk is quantified in this risk assesment.

[1] Exposure route incomplete or not applicable.

[2] Potential impact of this exposure pathway is insignificant when compared to the other exposure pathways for the same receptor.

[3] CERCLA risk assessment methodology for radionuclides does not address this exposure route.

[4] Denotes that pathway is mitigated by use of PPE and other administrative controls.

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FIGURE C.2-9 REMEDIAL RISK CONCEPTUAL MODEL FOR ALTERNATIVE 2

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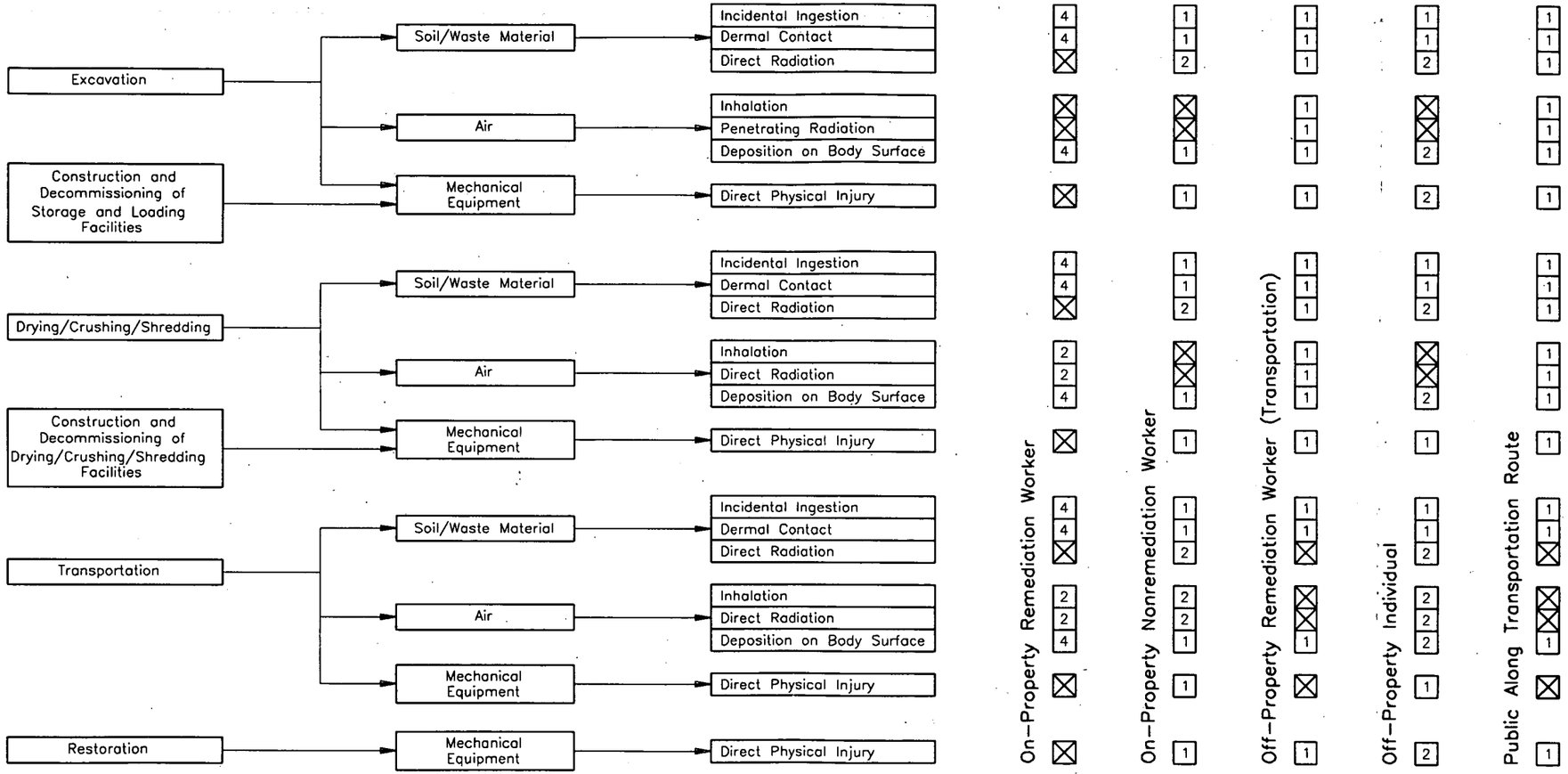
REMEDIAL RISK CONCEPTUAL MODEL, ALTERNATIVE 3
EXCAVATION AND OFF-SITE DISPOSAL



Legend:

- ☒ Denotes a complete pathway. Pathway-specific risk is quantified in this risk assesment.
- [1] Exposure route incomplete or not applicable.
- [2] Potential impact of this exposure pathway is insignificant when compared to the other exposure pathways for the same receptor.
- [3] CERCLA risk assessment methodology for radionuclides does not address this exposure route.
- [4] Denotes that pathway is mitigated by use of PPE and other administrative controls.

FIGURE C.2-10 REMEDIAL RISK CONCEPTUAL MODEL FOR ALTERNATIVE 3

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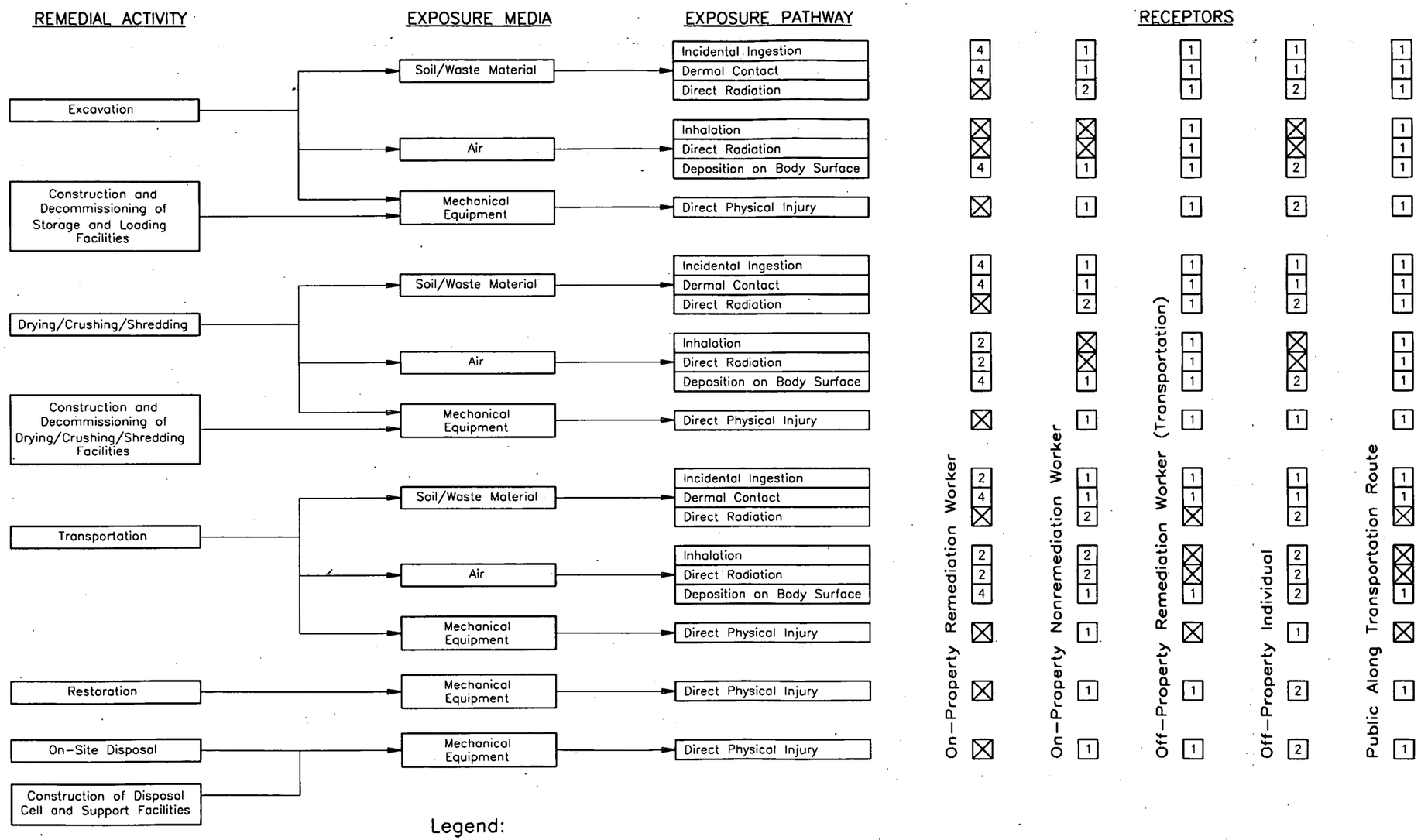
REMEDIAL RISK CONCEPTUAL MODEL, ALTERNATIVE 6
EXCAVATION AND ON-SITE DISPOSAL WITH OFF-SITE DISPOSAL OF FRACTION EXCEEDING WAC



Legend:

- ☒ Denotes a complete pathway. Pathway-specific risk is quantified in this risk assesment.
- [1] Exposure route incomplete or not applicable.
- [2] Potential impact of this exposure pathway is insignificant when compared to the other exposure pathways for the same receptor.
- [3] CERCLA risk assessment methodology for radionuclides does not address this exposure route.
- [4] Denotes that pathway is mitigated by use of PPE and other administrative controls.

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FIGURE C.2-11 REMEDIAL RISK CONCEPTUAL MODEL FOR ALTERNATIVE 6

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under Alternative 2 - Consolidation and Capping. Figure C.2-10 illustrates the remedial exposure for Alternative 3 - Excavation and Off-site Disposal. Figure C.2-11 presents Alternative 6 - Excavation and On-site Disposal with Off-site Disposal of Fraction Exceeding WAC. No conceptual model is presented for Alternative 1, which has no remedial activities.

C.2.3 DEVELOPMENT OF RESIDUAL RISK CONCEPTUAL MODELS

The conceptual models developed for residual risk have the same function and follow the same principles as the models for remedial risk (Section C.2.2). Both types are used to analyze exposure routes and receptors, focusing on those pathways and sources that drive the potential impacts to human-health risk and screening out other exposure pathways that are likely to pose minor risks. Figure C.2-12 presents the general flow of the residual risk conceptual models. As shown in the figure, the models trace the exposure pathways from the residual sources through the release mechanisms and exposure routes to the affected receptors. The models also indicate which exposure routes are carried through the quantitative risk assessment for each receptor under varying postremediation uses.

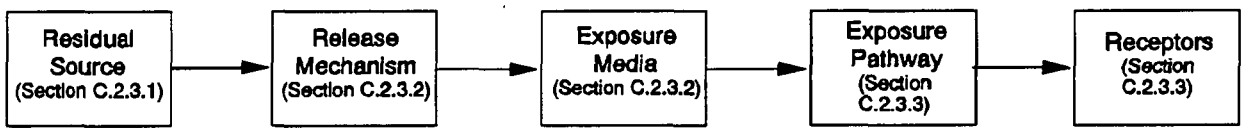

FIGURE C.2-12
FLOW OF RESIDUAL RISK CONCEPTUAL MODEL
(ALL ALTERNATIVES)

Section 2.3.1 presents a discussion of residual contaminant sources. Section 2.3.2 provides the land-use scenarios assumed for the Operable Unit 2 subunits. Section 2.3.3 gives a detailed description of each receptor and their routes of exposure used in the residual risk assessment. Section 2.3.4 presents the detailed residual risk conceptual models for each of the four alternatives.

C.2.3.1 Residual Risk Sources

This FS risk assessment evaluates the human-health risks associated with residual COCs for each of the five subunits in Operable Unit 2. The extent of this residual contamination will vary according to the selected alternative. Figures C.2-1 through C.2-4 (Section C.2.1) illustrate the postremediation

site conditions for each of the four alternatives. Based on these four alternatives, the sources of residual contaminations are limited to:

- Residual soil and groundwater contamination
- Caps/covers for on-property contaminant
- Materials deposited in any on-site disposal cell

C.2.3.2 Residual Risk Land-Use Scenarios

Two future land-use scenarios were evaluated for residual risk, federal ownership and private ownership. Section 10.0 of the RAWPA specifies the evaluation of both scenarios. A brief description of each follows.

Federal Ownership

Under this land-use scenario, the federal government would maintain ownership of the property, provide access controls, and restrict future residential, farm, and industrial use. Potential receptors include an off-property farmer and child and an expanded trespasser. This scenario assumes that a farm family lives immediately adjacent to the FEMP property boundary and is exposed through groundwater and surface soil pathways.

Private Ownership

Under this land-use scenario, there would be neither access controls nor continued federal ownership to restrict land use. Therefore, it is assumed that FEMP land use may revert to residential and farming uses. For this FS risk assessment, a family is assumed to reside on and farm the Operable Unit 2 property. Increased erosion as a result of the farming activities is accounted for by the analysis of exposures to the major runoff-receiving water body, the Great Miami River. A farm family is also assumed to be living and farming immediately adjacent to the FEMP property boundary. This scenario would include exposure routes that require development time such as establishing a home and farm operations on property.

C.2.3.3 Receptors Impacted

This section presents the human receptors on or in the vicinity of the FEMP who have been identified in the RAWPA and the Operable Unit 2 RI under future land-use conditions. These populations have been examined to determine if they have the potential for significant exposure to COCs under future site conditions. Those populations determined to present a reasonable possibility of significant

exposure based on postremediation site conditions have been retained for examination in this FS (Table C.2-2). The following paragraphs provide details on the nature of the receptors and their pertinent exposure pathways.

On-Property Resident Farmer (Ingests Great Miami Aquifer Water). Consistent with the RME concept and to ensure the estimated risk values protect human health and the environment, it was assumed that the remediated FEMP site could revert to residential and agricultural uses in the future and that an adult farmer could reside on the site after it is remediated. Potential exposures to this receptor may be caused by residual contamination from remediated subunit footprints, and/or leachate from the disposal cell.

Exposure pathways examined for this receptor include growing food, tending livestock, and performing general farm work. These activities may result in direct exposure to residual site contamination through the consumption of contaminated produce, dairy products, and meat; ingestion of contaminated water from the Great Miami Aquifer; ingestion of, dermal contact with, and direct radiation from residual contaminated soil; and inhalation of gases, vapors, and dust. The selected RME locations for this receptor are presented in Section C.5.2.

On-Property Resident Farmer (Ingests Perched Water). This receptor addresses the potential additional exposure incurred by the on-property resident farm adult if the water source is the perched water. The exposure pathways examined for this receptor are the same as those for the on-property farmer (both ingest water from the Great Miami Aquifer). The selected RME location is presented in Section C.5.2.

On-Property Resident Farm Adult (Central Tendency). This receptor addresses the potential exposure incurred by the on-property resident farm adult using slightly less conservative, central-tendency exposure parameters. Exposure pathways examined include growing food, tending livestock, and performing general farm work. These activities may result in direct exposure to

TABLE C.2-2

RECEPTORS EVALUATED FOR OU2 RESIDUAL RISK

Receptors	Federal Ownership	Private Ownership	Comments
Expanded Trespasser	Yes	No	Composite adult/child who illegally uses site
Off-Property Farmer	Yes	Yes	
Off-Property Child	Yes	Yes	
On-Property Resident Farmer (GMA)	No	Yes	Ingests groundwater from Great Miami Aquifer
On Property Resident Farmer Perched Water	No	Yes	Ingests perched water
On-Property Resident Child	No	Yes	Ingests groundwater from Great Miami Aquifer

residual site contamination through the consumption of contaminated produce, dairy products, and meat; ingestion of contaminated water from the Great Miami Aquifer; ingestion of, dermal contact with, and direct radiation from residual contaminated soil; and inhalation of gases, vapors, and dust.

The inclusion of a central-tendency analysis does not significantly reduce the overall health risks for the adult farm receptor. An examination of the impact of including central-tendency parameters in the calculation of on-property farm adult risks has indicated that a reduction of approximately a factor of 3 can be achieved. This reduction is mainly due to the slight reduction in exposure duration (350 versus 275 days) and minor reductions in the individual pathway contact rate.

Because of the postremediation setting of the residual risk assessment, all exposure parameters have been estimated. The uncertainty inherent in all FS exposure estimates makes the additional uncertainty of central tendency inappropriate. In addition, recent discussions with EPA Region V have led to requests for exposure parameters with more conservatism than those previously used to describe the FS RME receptors. Therefore, a central-tendency analysis was not evaluated for this FS risk assessment.

On-Property Resident Farm Child. Young children (age 1 through 6) living on the property would form a subpopulation of concern, because they may be more sensitive to a given exposure than are

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adults. A young child residing on the remediated FEMP could be exposed directly to residual site contaminants remaining in soils, and could inhale gases, vapors, and dust. In FS risk calculations, this hypothetical child of the on-property resident farmer is assumed to come in direct contact with residual soil, receive external radiation, drink Great Miami Aquifer water from an on-property well, and consume vegetables, fruit, meat, and dairy products produced on property. The selected RME locations of this receptor are presented in Section C.5.2.

Off-Property Resident Farmer. The inclusion of a farmer, assumed to live immediately adjacent to the remediated FEMP property boundary, was determined to be highly likely based on current conditions and has therefore been included in this risk assessment. The major concern for this receptor is the exposure received from regular use of water from the Great Miami Aquifer (for drinking and agricultural uses). This farmer could also be exposed to COCs from remote on-property residual sources, and/or COCs carried by the wind as gases, vapors, and dust. However, he would not be exposed through dermal contact or receive external radiation from on-property soil. The selected RME locations of this receptor are presented in Sections C.5.1 and C.5.2.

Off-Property Resident Farm Child. This hypothetical child (age 1 through 6) of the off-property resident farmer is assumed to have the same diet as the parent. This child could also be exposed to COCs from remote on-property residual sources, and/or COCs carried by the wind as gases, vapors, and dust. The selected RME locations are presented in Sections C.5.1 and C.5.2.

Expanded Trespasser. The expanded trespasser is a composite adult/child who illegally uses the site for recreational purposes. This hypothetical individual is assumed to roam about the operable unit despite continued government ownership. Exposure pathways include inhalation of fugitive dusts, volatile organics, and gases, dermal contact with and incidental ingestion of site soil, and exposure to direct radiation while on site.

Homebuilder. The homebuilder receptor was originally considered for evaluation based on exposure to subsurface soils during the construction of a residence. After remediation, the subsurface soil concentrations would be the same as the surface soil concentrations which impact the RME on-property resident farmer. Due to greatly reduced exposure duration and pathways (as well as the identical soil concentrations) for the homebuilder receptor, a less conservative evaluation of risk

would have been generated when compared to the resident farmer. Therefore, the homebuilder was not evaluated in this risk assessment.

Great Miami River User. This scenario was designed to evaluate surface water impacts to the Great Miami River and the exposures incurred during the activities of an off-property receptor who frequently uses the Great Miami River for recreational, residential, and agricultural purposes. Residual soil concentrations would be significantly below the level necessary to impact the Great Miami River (see Section 2.0 of this FS). Therefore, the Great Miami River was not evaluated in this risk assessment.

C.2.3.4 Residual Risk Conceptual Models

Residual conceptual models were developed for each of the four alternatives under federal and private ownership, except for Alternative 2. Under Alternative 2, no private ownership scenario is envisioned because the alternative would require upkeep and maintenance. The conceptual models present the primary source, release mechanisms, exposure media and pathways, and receptors evaluated for this FS risk assessment. Figures C.2-13 through C.2-19 present the conceptual models developed for residual risk.

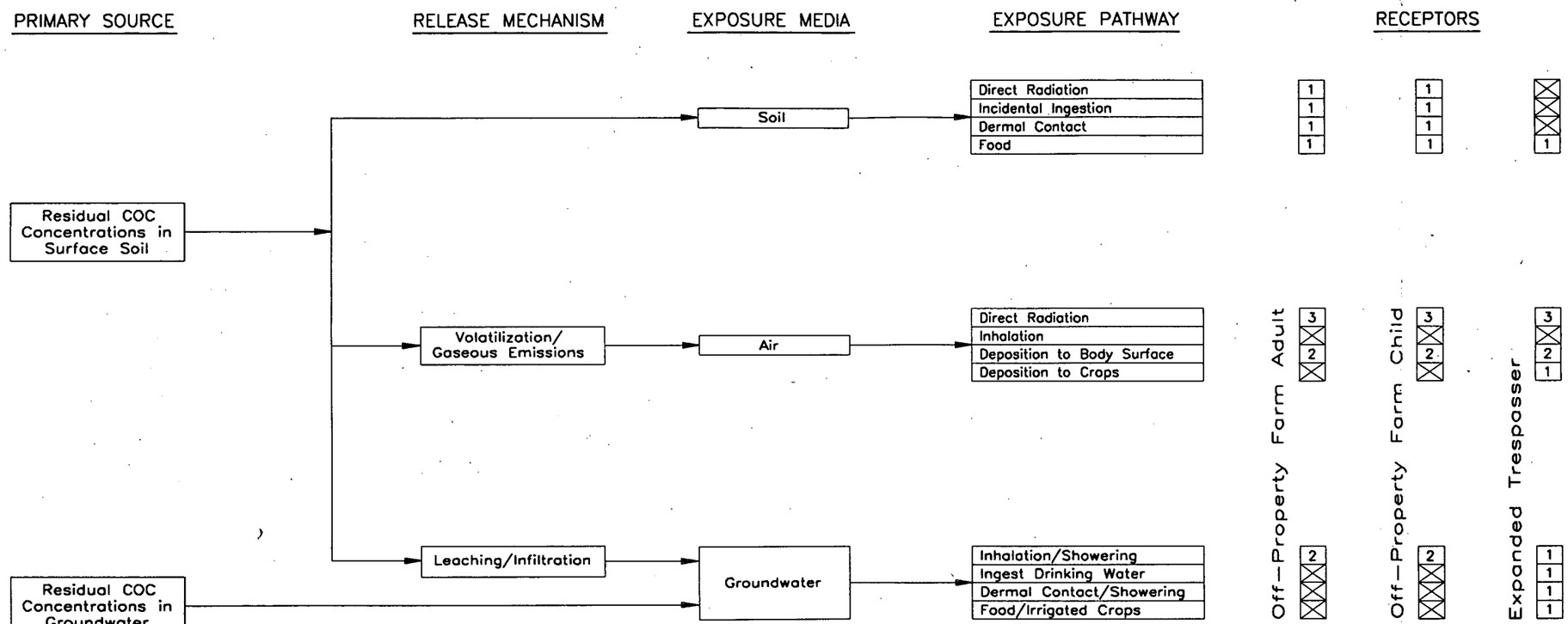
C.2.4 ASSUMPTIONS FOR ANALYSIS OF REMEDIAL ACTION AND RESIDUAL RISKS

The assumed scope of analysis, exposure parameters, pathways, and receptors, the extent and type of remedial activity, the COCs, and other factors establish the complexity and usefulness of the results of any risk evaluation. The following discussion highlights the key assumptions used to develop the risk assessment analyses.

C.2.4.1 Assumptions for Analysis of Remedial Action Risks

The assessment of remedial action risks requires numerous assumptions for each element of the assessment, including exposure scenarios, receptors, exposure models, and exposure parameters. The assumptions are listed below:

RESIDUAL RISK CONCEPTUAL MODEL, ALTERNATIVE 1
NO REMEDIAL ACTION – FEDERAL LAND USE



LEGEND:

- ☒ Denotes a complete pathway. Pathway-specific risk is quantified in this risk assesment.
- 1 Exposure route incomplete or not applicable.
- 2 Potential impact of this exposure pathway is insignificant when compared to the other exposure pathways for the same receptor.
- 3 CERCLA risk assessment methodology for radionuclides does not address this exposure route.

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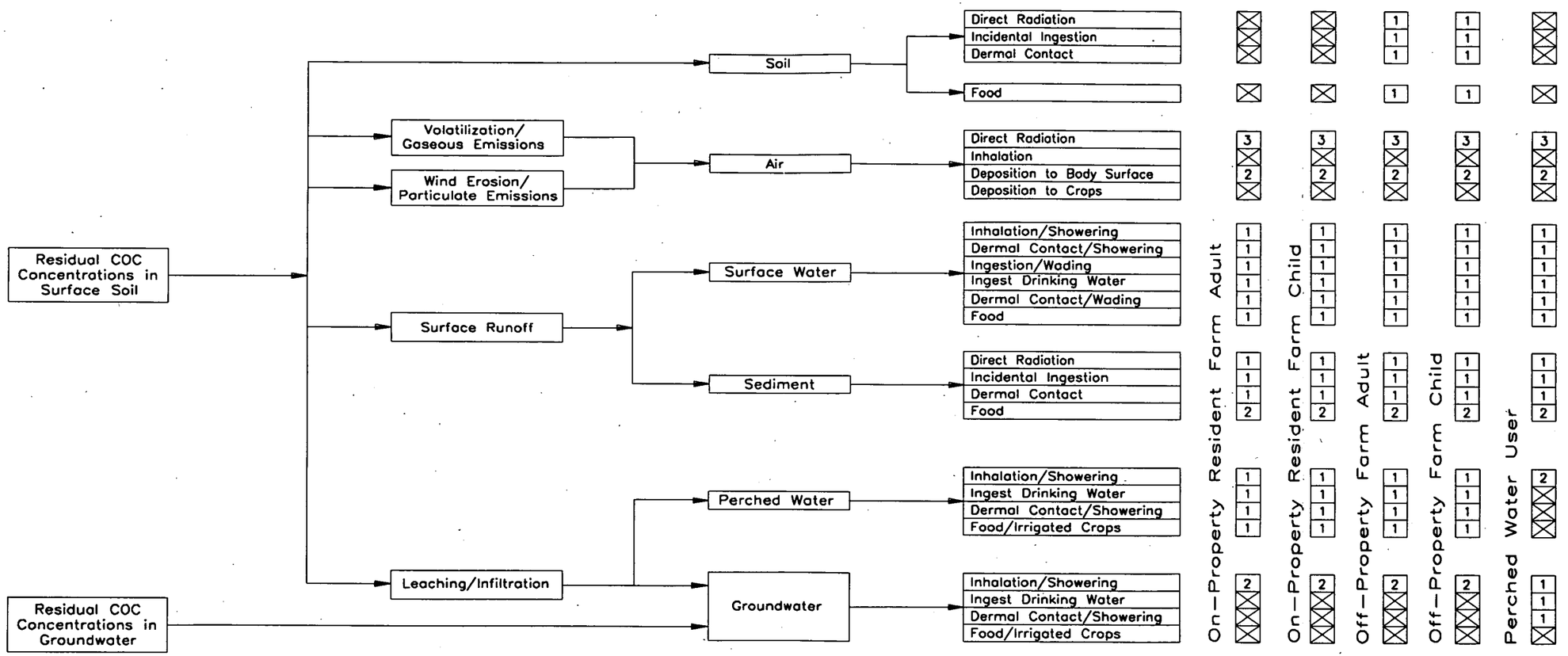
FIGURE C.2-13 RESIDUAL RISK CONCEPTUAL MODEL FOR ALTERNATIVE 1 (FEDERAL)

RESIDUAL RISK CONCEPTUAL MODEL, ALTERNATIVE 1
NO REMEDIAL ACTION – PRIVATE LAND USE



LEGEND:

- ☒ Denotes a complete pathway. Pathway-specific risk is quantified in this risk assesment.
- [1] Exposure route incomplete or not applicable.
- [2] Potential impact of this exposure pathway is insignificant when compared to the other exposure pathways for the same receptor.
- [3] CERCLA risk assessment methodology for radionuclides does not address this exposure route.

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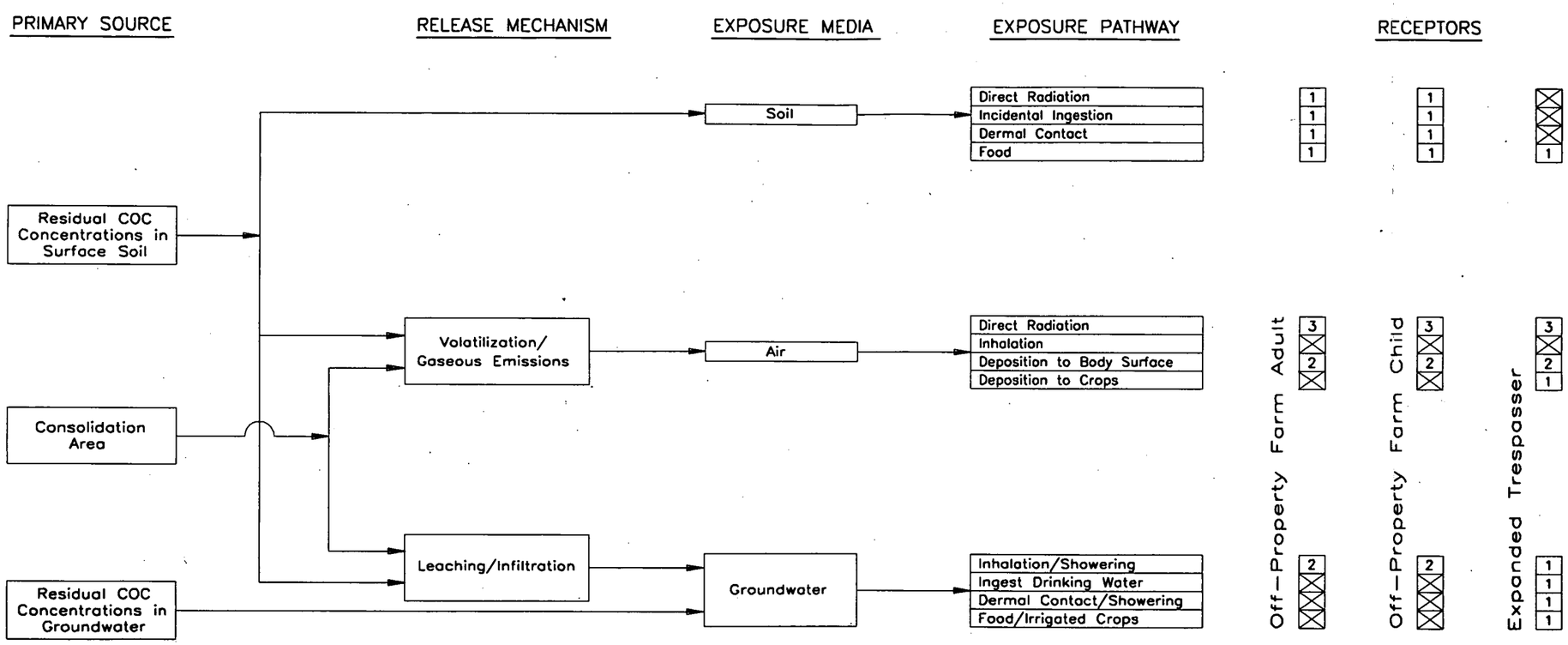
FIGURE C.2-14 RESIDUAL RISK CONCEPTUAL MODEL FOR ALTERNATIVE 1 (PRIVATE)

RESIDUAL RISK CONCEPTUAL MODEL, ALTERNATIVE 2
CONSOLIDATION AND CAPPING – FEDERAL LAND USE



LEGEND:

- ☒ Denotes a complete pathway. Pathway-specific risk is quantified in this risk assesment.
- [1] Exposure route incomplete or not applicable.
- [2] Potential impact of this exposure pathway is insignificant when compared to the other exposure pathways for the same receptor.
- [3] CERCLA risk assessment methodology for radionuclides does not address this exposure route.

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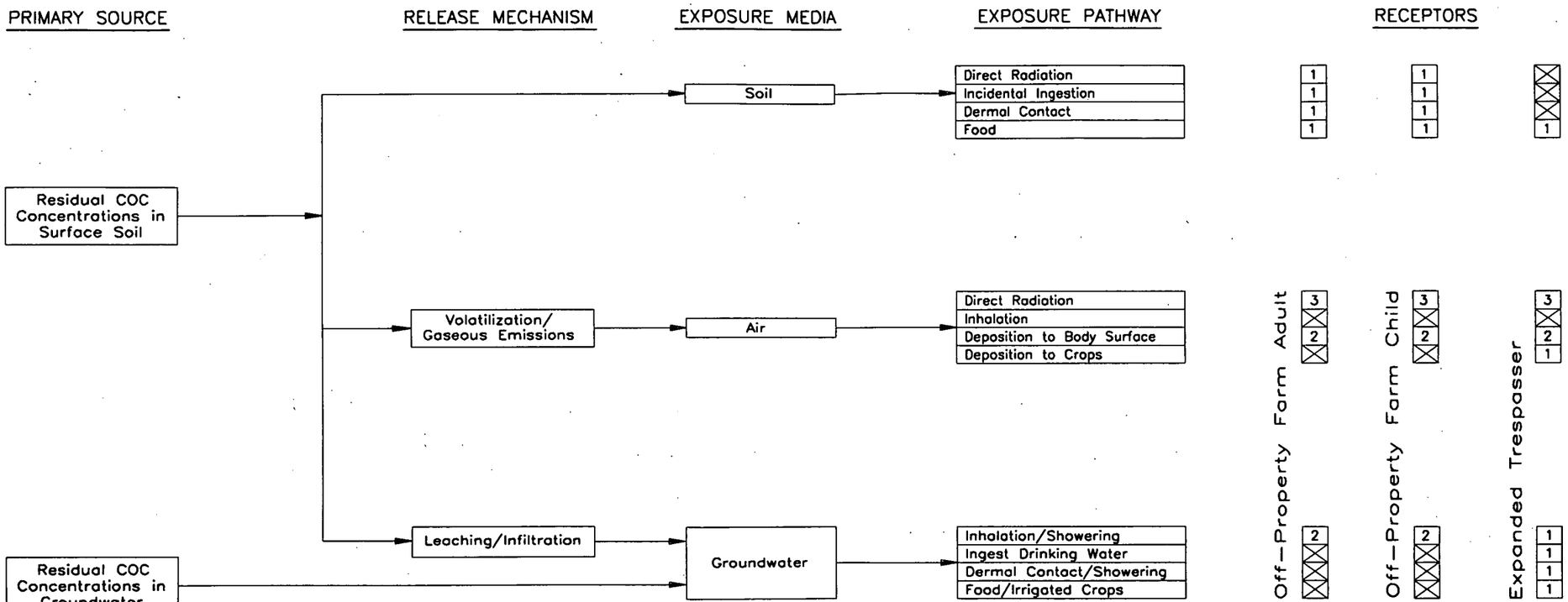
FIGURE C.2-15 RESIDUAL RISK EXPOSURE MODEL ALTERNATIVE 2 (FEDERAL)

RESIDUAL RISK CONCEPTUAL MODEL, ALTERNATIVE 3
EXCAVATION AND OFF-SITE DISPOSAL - FEDERAL LAND USE



LEGEND:

- ☒ Denotes a complete pathway. Pathway-specific risk is quantified in this risk assesment.
- [1] Exposure route incomplete or not applicable.
- [2] Potential impact of this exposure pathway is insignificant when compared to the other exposure pathways for the same receptor.
- [3] CERCLA risk assessment methodology for radionuclides does not address this exposure route.

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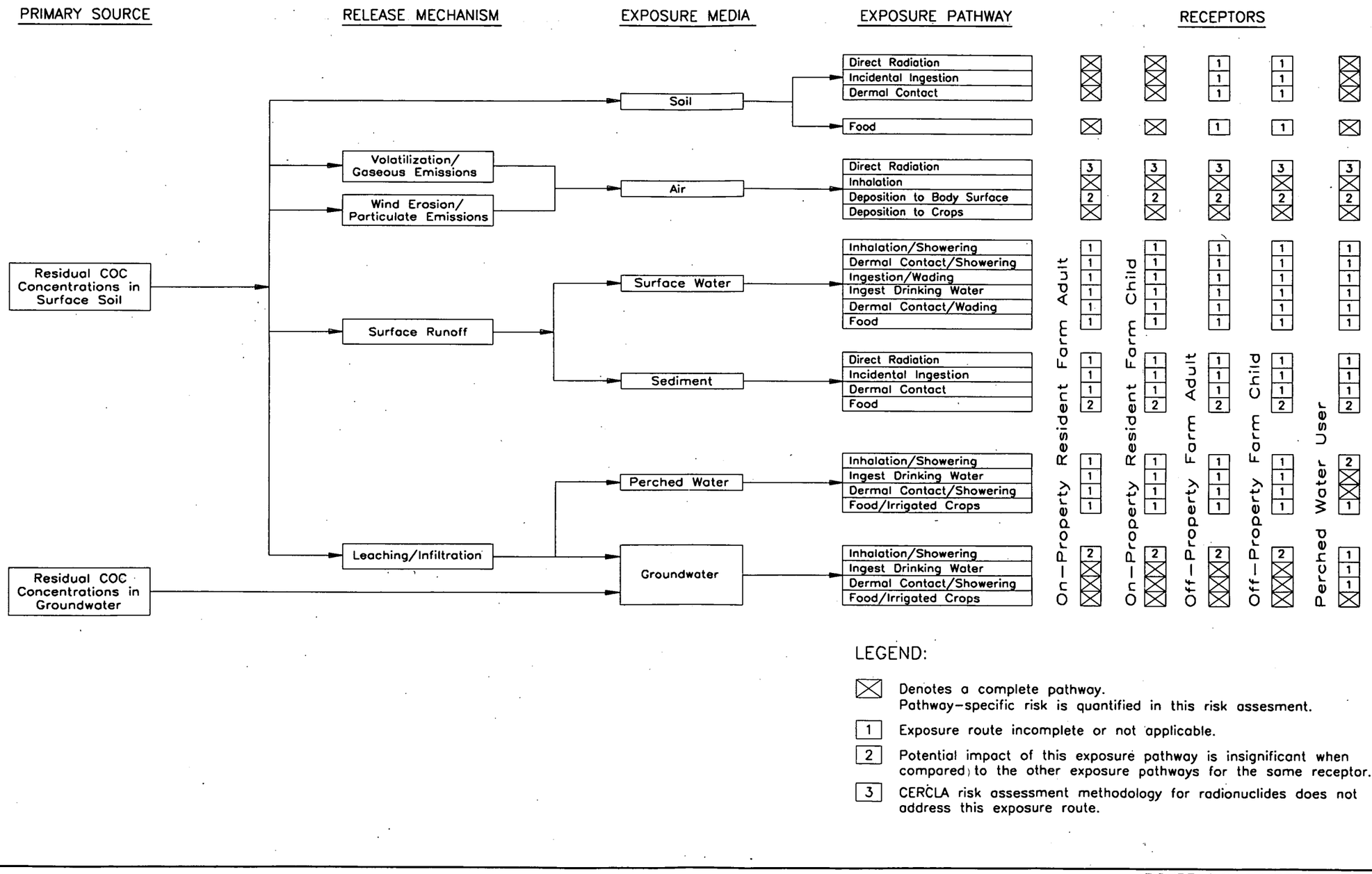
FIGURE C.2-16 RESIDUAL RISK CONCEPTUAL MODEL FOR ALTERNATIVE 3 (FEDERAL)

RESIDUAL RISK CONCEPTUAL MODEL, ALTERNATIVE 3
EXCAVATION AND OFF-SITE DISPOSAL - PRIVATE LAND USE



LEGEND:

- ☒ Denotes a complete pathway. Pathway-specific risk is quantified in this risk assesment.
- 1 Exposure route incomplete or not applicable.
- 2 Potential impact of this exposure pathway is insignificant when compared to the other exposure pathways for the same receptor.
- 3 CERCLA risk assessment methodology for radionuclides does not address this exposure route.

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FIGURE C.2-17 RESIDUAL RISK CONCEPTUAL MODEL FOR ALTERNATIVE 3 (PRIVATE)

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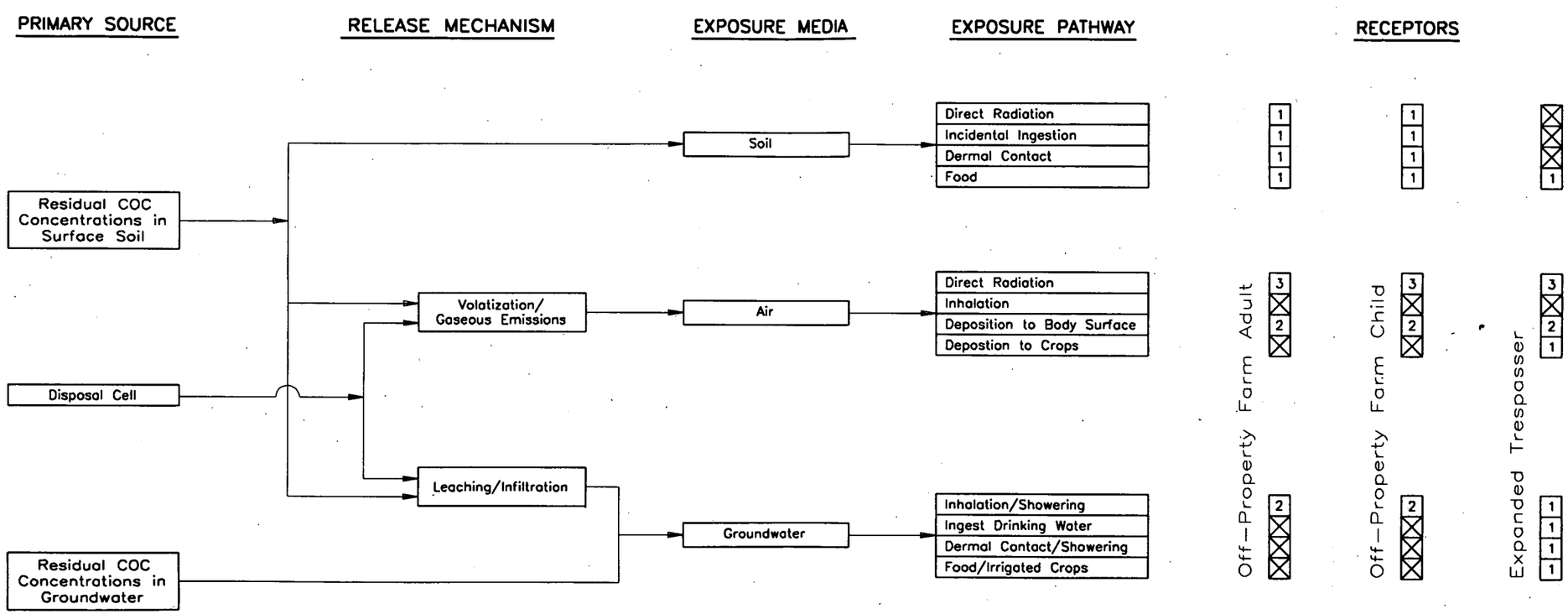
RESIDUAL RISK CONCEPTUAL MODEL, ALTERNATIVE 6
ESCAVATION AND ON-SITE DISPOSAL WITH OFF-SITE DISPOSAL OF FRACTION EXCEEDING WAC
FEDERAL LAND USE



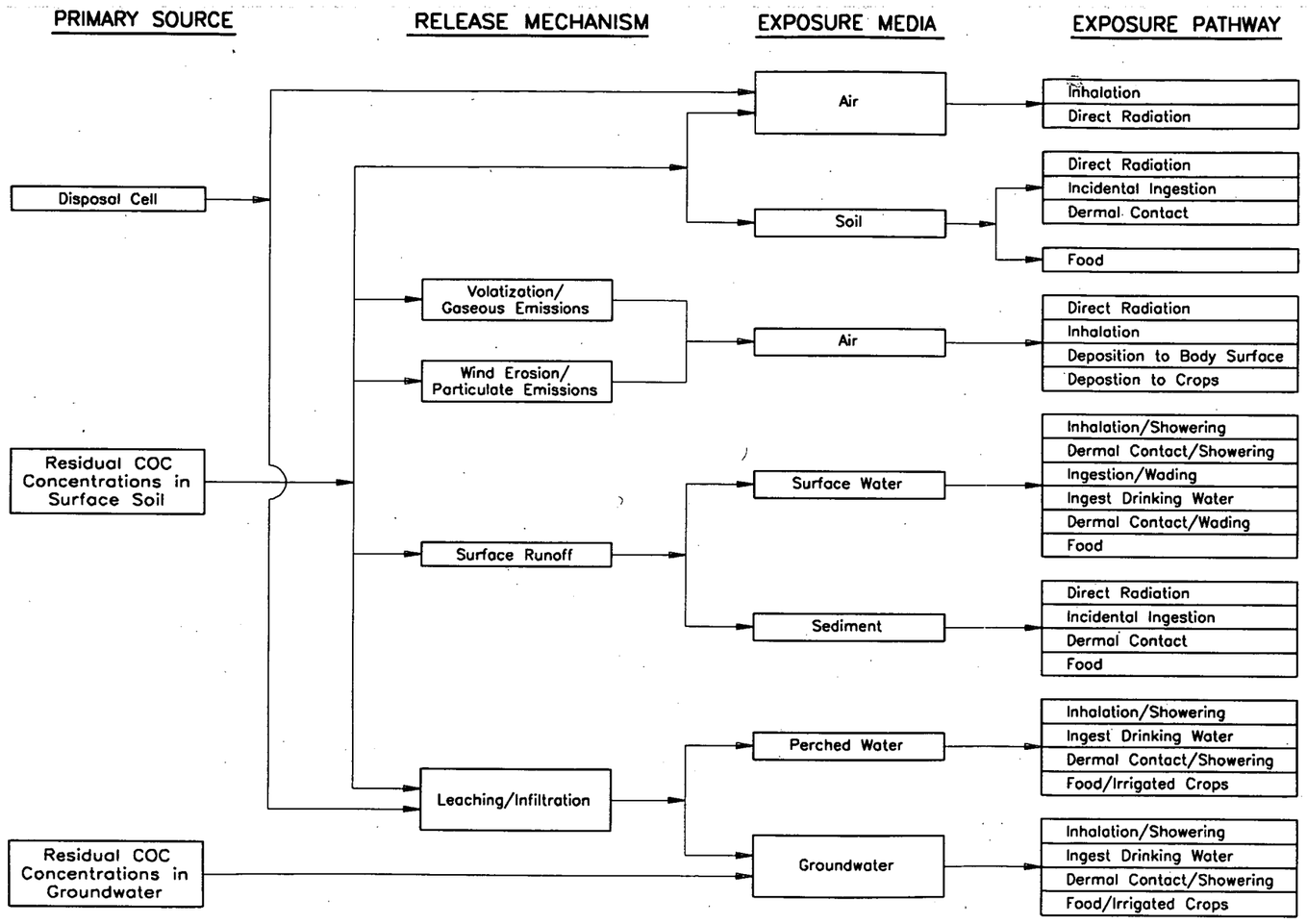
OU2 FSRA ACAD FILE: 424331\AUFSC218 AUG 1994

Legend:

- ☒ Denotes a complete pathway. Pathway-specific risk is quantified in this risk assesment.
- [1] Exposure route incomplete or not applicable.
- [2] Potential impact of this exposure pathway is insignificant when compared to the other exposure pathways for the same receptor.
- [3] CERCLA risk assessment methodology for radionuclides does not address this exposure route.

FIGURE C.2-18 RESIDUAL RISK CONCEPTUAL MODEL FOR ALTERNATIVE 6 (FEDERAL)

RESIDUAL RISK CONCEPTUAL MODEL, ALTERNATIVE 6
EXCAVATION AND ON-SITE DISPOSAL WITH OFF-SITE DISPOSAL OF FRACTION EXCEEDING WAC
PRIVATE LAND USE



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Legend:

- ☒ Denotes a complete pathway. Pathway-specific risk is quantified in this risk assesment.
- 1 Exposure route incomplete or not applicable.
- 2 Potential impact of this exposure pathway is insignificant when compared to the other exposure pathways for the same receptor.
- 3 CERCLA risk assessment methodology for radionuclides does not address this exposure route.

FIGURE C.2-19 RESIDUAL RISK CONCEPTUAL MODEL FOR ALTERNATIVE 6 (PRIVATE)

1. During excavation and other soil handling activities, remediation workers are subject to airborne contamination, both by inhalation and immersion, based on dust loading levels and soil concentrations. They are also subject to direct physical injury from, for example, a heavy-equipment accident.

2. During excavation, remediation workers monitoring soil contamination levels are exposed to a small fraction of the contaminated air or radiation. While personnel protective equipment (PPE) will be used to meet ALARA guidelines, it cannot be assumed to eliminate all exposures. For bounding purposes, no credit is assumed for PPE.

3. At the end of excavation, remediation workers monitoring soil contamination levels are exposed to contaminated soil at soil action levels. The monitoring is assumed to take place at the end of remediation when the levels are at or near the action levels. Exposures and/or intakes are only a fraction of those encountered during excavation.

4. During all activities of a given remedial alternative (i.e., excavation, drying, on-property disposal, transportation, and restoration), the mechanical injury rate is constant. The only exceptions are for truck drivers and train crews, whose injury rates are specific to their operations.

5. All radiation exposures/intakes are bounded by the excavation activities.

6. During restoration, the only risks are associated with mechanical hazards since backfilling will cover any residual contamination. Backfilling will use only clean soils. Direct radiation constitutes only a small fraction of the amount received during excavation.

7. While waste is being placed in the on-site disposal cell, remediation workers will not receive exposures in excess of those occurring during excavation activities.

8. Operators of the dryer are not subject to mechanical hazards, since most of their operations involve remote handling equipment.

9. Impacts from the on-property transport and temporary stockpiling of waste material are not specifically evaluated. It is assumed that such impacts are bounded by excavation impacts.

10. There are no ingestion pathway risks associated with transportation accidents.

11. It is assumed that for Alternative 3, segregation of wastes for on-site and off-site disposal results in a factor of 2 increase in soil concentration for off-site shipment and silo storage.

12. On-site truck drivers are assumed to be exposed to a full truck load, at a maximum concentration for 6 hours per day, for direct radiation evaluations.

13. The evaluation of exposures from materials stored in silos prior to off-site shipment were made assuming that a worker is exposed to fully loaded silos which are located 20 feet above the ground surface, for direct exposure calculations.

14. Direct radiation exposure of workers to loaded gondolas assumes that a worker is standing between two fully loaded gondolas containing the concentration as described in Assumption 12.

C.2.4.2 Assumptions for Analysis of Residual Risks

The evaluation of residual risks remaining after Operable Unit 2 remediation requires numerous assumptions regarding future land use, receptors, exposure scenarios and exposure parameters. The following assumptions have been adopted from EPA guidance documents or are the result of agreements between the FEMP and EPA.

1. Two future land-use scenarios are considered: federal ownership with access controls, and private ownership with a residential farm family on the property.

2. For the case of federal ownership with access controls, evaluated receptors include an off-property farmer and child and an expanded trespasser.

3. For the case of future private ownership, evaluated receptors include an on-property resident farmer and child, off-property farmer and child, and a perched water user.

4. The on-property farmer and child are part of a family living on the Operable Unit 2 site, growing crops and raising dairy and beef cows, and using groundwater for routine household and agricultural purposes.

5. The off-property farmer and child are part of a family living and actively farming adjacent to the FEMP site boundary. Exposure to COCs is through groundwater and resuspended surface soil pathways.

6. The expanded trespasser occasionally visits the Operable Unit 2 property for hiking, roaming, or bird watching. Activities such as jogging, biking, or ball playing are not feasible because administrative controls will prevent development of the land.

7. The adult and child exposure periods (70 years and 0 to 6 years, respectively) are included in the residual risk analysis. The FEMP has agreed with the EPA to use a 70-year exposure period for adult residential exposure because residents in the Fernald area tend to remain in the area for their lifetimes.

8. COCs were chosen based on Operable Unit 2 RI baseline risk assessment results. Constituents with a greater than 10^{-6} incremental lifetime cancer risk (ILCR) or hazard quotient (HQ) of greater than 0.2 by all combined exposure pathways are considered COCs.

9. Groundwater COC input concentrations for the residual risk assessment are based on groundwater modeling, not ambient sampling data.

10. Chronic reference doses (RfDs) are used for all risk calculations.

11. No exposure pathways are eliminated due to the presence of clean backfill.

12. The impact of Operable Unit 2 residual contaminant sources on perched groundwater in the sand lens beneath the waste pits (perched groundwater) and groundwater in the Great Miami Aquifer is included in the Operable Unit 2 residual risk evaluation. By agreement with the EPA, existing groundwater contamination is considered part of Operable Unit 5.

C.3.0 EXPOSURE QUANTIFICATION METHODOLOGY

This section presents the equations used to quantify the magnitude of exposure expected to result from all reasonable exposure pathways at Operable Unit 2. The calculations reflect changes in the risk assessment methodology resulting from revisions to the RAWPA (DOE 1992) and comments received from the EPA and OEPA on the Operable Unit 1, 2, and 4 RI/FS risk assessments.

Section C.3.1 presents the exposure models for remedial action risks, while Section C.3.2 covers residual risks. Parameters and equations are drawn from the RAWPA unless noted otherwise. The exposure parameters used to model remedial action and residual risks are presented in Section C.3.3. Source terms (e.g., soil or air concentrations) are presented in Section C.5.1 (for remedial action risks) and Section C.5-2 (for residual risks).

C.3.1 EXPOSURE MODELS FOR REMEDIAL ACTION RISKS

This section presents the exposure models used to estimate the Operable Unit 2 remedial action risks. The section has been divided into subsections for each remedial/action exposure mode combination described in the remedial action conceptual models (Section C.2.2).

C.3.1.1 Excavation/Direct Radiation

During excavation, the remediation worker would be exposed to direct radiation from radionuclides in the soil. The 95 percent UCL subsurface soil COC concentrations, as defined in the Operable Unit 2 RI report (DOE 1994a), were used to calculate exposure doses. The majority of excavated material consists of subsurface soil. Direct radiation were calculated using the MICROSHIELD computer code (see Section C.5.1.2 for details). Direct radiation exposure is a function of the soil concentration, effective soil depth, exposure duration, and soil density. The code accounts for both buildup and self-shielding. Output is an effective dose equivalent in mrem, for each radionuclide identified as a COC.

C.3.1.2 Excavation/Direct Physical Injury

The hazards from direct physical injury are calculated using risk factors from the DOT database, in terms of injuries and fatalities per hour or mile. These are discussed in detail in Section C.6.1.

C.3.1.3 Excavation/Immersion

Immersion dose rates were evaluated using the MICROSHIELD computer code (see Section C.5.1.2 for details). The immersion dose is a function of the soil concentration, the dust loading, and the radionuclides. The output is a dose rate in mrem/hr for each activity, which is multiplied by the number of hours of exposure.

The concentration of a radionuclide in air is based on a dust-loading factor for soil and the concentration of the radionuclide in the soil. The following equation provides the expression for the air concentration of the ith radionuclide. This concentration in soil is the 95 percent UCL of subsurface soils.

$$C_{a,i} = (DL)(C_{s,i}) \qquad \text{(C.3-3)}$$

where

$C_{a,i}$	=	air concentration for radionuclide i (pCi/m^3),
DL	=	dust-loading factor for construction (g of soil/m^3 of air)(Table C.3-1), and
$C_{s,i}$	=	concentration of contaminant in soil (Table C.5-4).

C.3.1.4 Excavation/Inhalation

The intake of radionuclides by a remediation worker is given by: (C.3-5)

$$I_{a,i} = (C_{a,i})(IR)(ED)(EF)(ET)$$

where

$I_{a,i}$	=	intake from inhalation for radionuclide i, pCi
$C_{a,i}$	=	Concentration in air of radionuclide i (pCi/m^3),
IR	=	Inhalation rate, (m^3/hr)
ET	=	Exposure time, (hr/day)
EF	=	Exposure frequency, (day/yr)
ED	=	Exposure duration, (yr)

The concentration of a radionuclide is given in Equation C.3-3. The intake from inhalation as a result of exposures to airborne chemical contaminants is calculated as follows:

$$I_{a,n} = (C_{a,n})(IR)(T_3)/(BW)(AT) \qquad \text{(C.3-6)}$$

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where

$I_{a,n}$ = intake from air of chemical contaminant n (mg/kg/day),
IR = receptor specific inhalation rate (m^3/h)(Table C.II-1 through 12),
$C_{a,n}$ = concentration of chemical contaminant n in air (mg/m^3)(Table C.5-5),
T_3 = receptor specific exposure at time (h)(Table C.II-1 through 12),
BW = body weight (kg)(Table C.3-1), and
AT = average time (d); for noncarcinogens, AT equals (ED)(365 d/y); for chemical carcinogens, AT equals (70y)(365 d/y)(Table C.3-1).

C.3.1.5 Drying/Direct Physical Injury

Mechanical hazard impacts were calculated identically to the impacts for the Excavation/Direct Physical Injury pathway. The only difference is the total person hours for constructing the drying facility.

C.3.1.6 Drying/Inhalation and/or Immersion

A Gaussian plume dispersion model was used to estimate the concentration at the receptor location. The concentrations in air as a result of dryer activities are located in Table C.5-10. Immersion doses for remedial workers are provided in Table C.5-12. Dose equivalent intake from VOCs were calculated as described for the Excavation/Inhalation Equation C.3-6.

C.3.1.7 Transportation

The magnitude of the transportation impacts was calculated by the RADTRAN 4 computer code (see Section C.5.2).

A detailed discussion of the transportation impacts, including the risk factors used, is contained in Section C.6.1.

Mechanical hazards are based on miles traveled.

Risks to package handlers were assessed similarly to other remediation workers. Dose rates were calculated by MICROSHIELD, and for mechanical hazards, time variables were used for the person hours worked loading trains.

C.3.1.8 On-Property Disposal/Direct Physical Injury

Mechanical hazard impacts were calculated identically to the impacts for the Excavation/Direct Physical Injury pathway (Section C.3.1.2). The only difference is the total person hours worked.

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Restoration/Direct Physical Injury

Mechanical hazard impacts were calculated identically to the impacts for the Excavation/Direct Physical Injury pathway (Section C.3.1.2). The only difference is the total person hours worked.

C.3.2 EXPOSURE MODELS FOR RESIDUAL RISKS

To quantify risk as a result of residual COCs, several equations were used. This section presents the equations used according to exposure media. All parameters and equations were taken from the RAWPA and the Supplemental Guidance to RAWPA unless otherwise noted. The exposure media considered for residual risks are groundwater, air, and soil. Exposures from sediment are included in the group detailing the soil exposure pathways. Exposure to surface water is not a viable pathway to potential Operable Unit 2 receptors and is therefore not provided for discussion in this section. Equations for quantifying risk through the food pathway (e.g., ingestion of vegetables, fruit, milk, and meat) are provided. The development of concentration terms for air, groundwater, soil, and food products are presented in Section C.5.2. These concentrations were used to quantify intake. The parameters used in the following equations are provided in Tables C.3-2 and 3 or the Tables in C.III.

C.3.2.1 Air Exposure from Inhalation

The amount of a COC a receptor takes in as a result of respiration is determined using the concentration of the chemical in the air. Equations 7-5 and 7-6 from the RAWPA were used to quantify intake from the inhalation pathway. These equations are as follows:

$$\text{(radionuclides)}\quad I_{ai} = (C_{ai})(IR)(EF)(ED) \qquad \text{(C.3-10)}$$

$$\text{(chemicals)}\quad I_{ai} = (C_{ai})(IR)(EF)(ED)/(BW)(AT) \qquad \text{(C.3-11)}$$

where

I_{ai} = intake from inhalation (pCi or mg/kg/d),
C_{ai} = concentration in air (pCi/m^3 or mg/m^3),
IR = inhalation rate (m^3/d),
EF = exposure frequency (d/y),
ED = exposure duration (y),
BW = body weight (kg), and
AT = averaging time (d); for noncarcinogens, AT equals (ED)(365 d/y); for chemical carcinogens, AT equals (70)(365 d/y).

C.3.2.2 Groundwater Exposures

This section discusses the quantification methodologies used to evaluate groundwater exposures. Exposure routes for exposure to groundwater include ingestion, inhalation, and dermal contact.

Ingestion of Drinking Water

Ingestion of contaminated drinking water can be a major contributor to environmental intake of COCs. An estimate of intake from drinking water was calculated from Equations 7-3 and 7-4 of the RAWPA. The intake equations are:

$$\text{(radionuclides)} \quad I_{wi} = (C_{wi})(IR)(EF)(ED) \qquad \text{(C.3-12)}$$

$$\text{(chemicals)} \quad I_{wi} = (C_{wi})(IR)(EF)(ED)/(BW)(AT) \qquad \text{(C.3-13)}$$

where

I_{wi} = intake of ith contaminant from drinking water (pCi or mg/kg/d),
C_{wi} = i^{th} concentration in water (pCi/l or mg/l),
IR = ingestion rate (l/d),
EF = exposure frequency (d/y),
ED = exposure duration (y),
BW = body weight (kg), and
AT = averaging time (d); for noncarcinogens, AT equals (ED)(365 d/y) [EPA 1991a]); for chemical carcinogens, AT equals (70 y) (365 d/y).

Dermal Contact

The estimation intake of total uranium in water via absorption though the skin was estimated using the concentration of the chemical in the water source evaluated. The dermal absorption pathway was evaluated for adults and children. The amount of a chemical taken into the body upon exposure via dermal contact is referred to as an absorbed dose. The absorbed dose for total uranium can be calculated using EPA's dermal guidance (EPA 1989a, EPA 1992b, and EPA 1993d):

$$I_{ws} = (DA_{event})(EF)(ED)(SA)/(BW)(AT) \qquad \text{(C.3-14)}$$

where

I_{ws} = intake though skin from showering (mg/kg/d),
DA_{event} = absorbed dose per event (mg/cm^2/event),
SA = surface area (cm^2),
EF = exposure frequency (d/y),
ED = exposure duration (y),

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BW = body weight (kg), and
AT = averaging time (d); for carcinogens, AT equals (ED)(365 d/y) [EPA 1989a]; for chemical carcinogens, AT equals (70y)(365 d/y).

DA_{event} can be calculated for inorganics as:

$$DA_{event} = (C_v)(K_p)(CF)(ET) \quad \text{(C.3-15)}$$

where

C_v = concentration of COC in the source (mg/l),
K_p = COC-specific permeability constant 10^{-3} (cm/h),
CF = unit conversion factor 10^{-3} (L/cm^3)
ET = exposure time (h/d)

C.3.2.3 Soil and Sediment Exposures

The following sections discuss the quantification methodologies used to evaluate soil and sediment exposures.

Incidental Ingestion of Soil or Sediment

Evaluation of the soil/sediment ingestion pathway was performed using Equations 7-7 and 7-8 from the RAWPA:

$$\text{(radionuclides) } I_{si} = (C_{si})(IR)(FI)(EF)(ED) \quad \text{(C.3-16)}$$

$$\text{(chemicals) } I_{si} = (C_{si})(IR)(CF)(FI)(EF)(ED)/(BW)(AT) \quad \text{(C.3-17)}$$

where

I_{si} = intake from soil or sediment for COC i (pCi or mg/kg/d),
C_{si} = concentration of COC i in soil or sediment (pCi/kg or mg/kg),
IR = ingestion rate (kg/d) (mg/d),
CF = conversion factor 10^{-6} kg/mg,
FI = fraction ingested from contaminated source (unitless),
EF = exposure frequency (d/y),
ED = exposure duration (y),
BW = body weight (kg), and
AT = averaging time (d); for noncarcinogens, AT equals (ED)(365 d/y); for chemical carcinogens, AT equals (70 y)(365 d/y).

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Dermal Contact with Soil or Sediment

Dermal absorption may also occur upon contact with contaminated soil and sediment and was calculated using Equation 7-25 of the RAWPA:

$$AB_{si} = (C_{si})(CF)(SA)(AF)(ABS)(ED)(EF)/(BW)(AT) \quad \text{(C.3-18)}$$

where

AB_{si}	=	amount of ith COC absorbed during contact with soil or sediment (mg/kg/d),
C_{si}	=	concentration of ith COC in soil or sediment (mg/kg),
SA	=	skin surface area available for contact (cm^2/event),
AF	=	skin adherence factor (mg/cm^2),
ABS	=	absorption factor (unitless),
CF	=	conversion factor (10^{-6} kg/mg),
ED	=	exposure duration (y),
EF	=	exposure frequency (event/y),
BW	=	body weight (kg), and
AT	=	averaging time (d); for noncarcinogens, AT equals (ED)(365 d/y); for chemical carcinogens, AT equals (70 y/lifetime)(365 d/y).

Dermal absorption is not a significant pathway for radionuclides because penetration through the skin is minimal (EPA 1992b). Therefore, radionuclides were not quantified under this exposure pathway.

Direct Radiation Exposure

Since the publication of the RAWPA, the EPA has published a new set of slope factors. Changes in these slope factors require the use of a different equation to calculate risks resulting from direct radiation exposures from soils than the one originally presented in the RAWPA. The new equation is:

$$DE = (C_s)(ED)(EF)(CF)[(ET_{in})(1-S_i) + (ET_{out})(1-S_o)] \quad \text{(C.3-19)}$$

where

DE	=	direct radiation exposure (pCi-y/g),
C_s	=	concentration in surface soil (pCi/g),
ED	=	exposure duration (y),
EF	=	exposure frequency (d/y),
ET_{in}	=	exposure time indoors on-property (h/d),
ET_{out}	=	exposure time outdoors on-property (h/d),
S_i	=	indoor shielding factor (0.5, from RAWPA),
S_o	=	outdoor shielding factor outdoors (0, assumes no shielding), and
CF	=	1/8760 y/h.

C.3.2.4 Food Products Exposure

This section presents the methodologies used to quantify intake through the food pathways (ingestion of vegetables, meat, and milk).

Ingestion of Vegetables

Evaluation of the vegetable ingestion pathway was performed using Equations 7-15 and 7-16 from the RAWPA:

$$\text{(radionuclides) } I_{iv} = (C_{iv})(IR)(ED)(EF)(FI) \quad \text{(C.3-20)}$$

$$\text{(chemicals) } I_{iv} = (C_{iv})(IR)(FI)(EF)(ED)/(BW)(AT) \quad \text{(C.3-21)}$$

where

I_{iv} = intake from vegetation (pCi or mg/kg/d),
C_{iv} = total concentration of COCs in vegetables or fruit (pCi/kg or mg/kg),
IR = ingestion rate (kg/day)
FI = fraction ingested from contaminated source (unitless),
EF = exposure frequency (d/y),
ED = exposure duration (y),
BW = body weight (kg)
AT = averaging time (d); for noncarcinogens, AT equals (ED)(365 d/y); for carcinogens, AT equals (70-year lifetime)(365 d/y).

Ingestion of Meat and Milk

Evaluation of the meat and milk ingestion pathway was performed using Equations 7-19 and 7-20 from the RAWPA:

$$\text{(radionuclides) } I_{Ai} = (C_{Ai})(IR)(ED)(EF)(FI) \quad \text{(C.3-22)}$$

$$\text{(chemicals) } I_{Ai} = (C_{Ai})(FI)(EF)(ED)(BW)(AT) \quad \text{(C.3-23)}$$

where

I_{Ai} = intake from COC in animal product (pCi or mg/kg/d),
C_{Ai} = concentration of ith COC in the animal product (pCi/l or mg/l for milk, pCi/kg or mg/kg for beef)
IR = ingestion rate (l/d for milk; kg/d for beef)
EF = exposure frequency(d/y)

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ED = exposure duration (y),
FI = fraction ingested from contaminated source (unitless)
BW = body weight (kg),
AT = averaging time (d); for noncarcinogens, AT equals (ED) (365 d/y); for carcinogens, AT equals (70-year lifetime)(365 d/y).

C.3.3 EXPOSURE PARAMETERS

Exposure parameters used in the remedial action and residual exposure models are summarized in the following sections. The RAWPA is the primary source for these values; other values were used in accordance with EPA and/or DOE guidance.

C.3.3.1 Exposure Parameters for Remedial Action Risks

This section presents parameter values for the remedial action risk models (Section C.3.1). Each presentation includes the parameter, its value or values, units, and reference. Many of the parameter values are from the RAWPA.

Table C.3-1 presents most of the noncontaminant-specific parameters. Toxicity values are presented in Section C.4.0. Exposure point concentrations are presented by receptor in Section C.5.1.

TABLE C.3-1

NONCONTAMINANT-SPECIFIC EXPOSURE PARAMETERS FOR REMEDIAL ACTION RISK

Parameter	Value	Unit	Reference
Effective Soil Depth - ESD	1	m	DOE 1988a
Dust Loading (Remediation Worker) - DL	6×10^{-4}	g/m^3	RAWPA
Average Soil Density for FEMP - ρ	1.7×10^6	g/m^3	RAWPA
Soil Density For Shielding	1.5×10^6	g/m^3	
Inhalation Rate - IR (Remediation)[a]	2	m^3/hr	RAWPA
Inhalation Rate - IR (Off-property Individual)	0.83	m^3/hr	RAWPA
Body Weight - BW	70	kg	RAWPA
Averaging Time - AT (Carcinogens)	25550	days	RAWPA
Mean wind speed - U_m	4.6	m/sec	RAWPA

C.3.3.2 Exposure Parameters for Residual Risks

This section presents parameter values for the residual risk models (Section C.3.2). Each presentation includes the parameter, its value or values, units, and reference. Many of the parameter values are from the RAWPA.

Table C.3-2 presents the exposure parameters for potential receptors of residual risk under the federal ownership scenario. Table C.3-3 presents the exposure parameters for potential receptors of residual risk under private ownership. Table C.3-4 presents the chemical-specific calculated dermal absorbed dose values for dermal soil exposures.

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TABLE C.3-2

PARAMETERS USED FOR RESIDUAL RISK WITH FEDERAL OWNERSHIP[a,b]

	RME Receptor			
	Off-Property Resident Farm		Expanded Trespasser[b]	
Exposure Pathway	Adult	Child	Childhood Years	Adulthood Years
Inhalation of Particulates				
IR (m^3/hr)	0.83	0.5	0.5	0.83
ET (hr/d)	24	24	2	1
EF (d/yr)	350	350	110	40
ED (yr)	70	6	12	30
BW (kg)	70	15	43	70
AT Noncancer (d)	25550	2190	4380	10950
AT Cancer (d)	25550	25550	25550	25550
C_a (mg/m^3 or pCi/m^3)	CSV	CSV	CSV	CSV
Drinking Water Ingestion				
IR (l/d)	2	1	NA	NA
FI (unitless)	1	1	1	1
EF (d/yr)	350	350	NA	NA
ED (yr)	70	6	NA	NA
BW (kg)	70	15	NA	NA
AT Noncancer (d)	25550	2190	NA	NA
AT Cancer (d)	25550	25550	NA	NA
C_w (pCi/l or mg/l)	CSV	CSV	NA	NA
Incidental Ingestion of Soil				
IR (mg/d)	NA	NA	100	100
FI (unitless)	NA	NA	.125	.125
EF (d/yr)	NA	NA	110	40
ED (yr)	NA	NA	12	30
BW (kg)	NA	NA	43	70
AT Noncancer (d)	NA	NA	4380	10950
AT Cancer (d)	NA	NA	25550	25550
CF-Chem (kg/mg)	NA	NA	1×10^{-6}	1×10^{-6}
C_s (mg/kg or pCi/g)	NA	NA	CSV	CSV
Dermal Contact with Soil				
SA (cm^2)	NA	NA		5750
AF (mg/cm^2/d)	NA	NA	1	1
ABS (unitless)	NA	NA	CSV	CSV
EF (d/yr)	NA	NA	110	40
ED (yr)	NA	NA	12	30
BW (kg)	NA	NA	43	70
AT Noncancer (d)	NA	NA	4380	10950
AT Cancer (d)	NA	NA	25550	25550
CF-Chem (kg/mg)	NA	NA	1×10^{-6}	1×10^{-6}
C_s (mg/kg)	NA	NA	CSV	CSV

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TABLE C.3-2
(Continued)

Exposure Pathway	RME Receptor			
	Off-Property Resident Farm		Expanded Trespasser[b]	
	Adult	Child	Childhood Years	Adulthood Years
Direct Radiation Exposure				
ET Indoors (hr/d)	NA	NA	NA	NA
ET Outdoors(hr/d)	NA	NA	2	1
EF (d/yr)	NA	NA	110	40
ED (yr)	NA	NA	12	30
SH Indoors (unitless)	NA	NA	NA	NA
SH Outdoors (unitless)	NA	NA	0	0
CF (yr/hr)	NA	NA	1.14 x 10-4A	1.14×10^{-4}
C_r (pCi/g)	NA	NA	CSV	CSV
Ingestion of Home Produced Meat				
IR (kg/d)	0.101	0.039	NA	NA
FI (unitless)	0.75	0.75	NA	NA
EF (d/yr)	350	350	NA	NA
ED (yr)	70	6	NA	NA
BW (kg)	70	15	NA	NA
AT Noncancer (d)	25550	2190	NA	NA
AT Cancer (d)	25550	25550	NA	NA
C_{ia} (mg/kg or pCi/kg)	CSV	CSV	NA	NA
Ingestion of Milk				
IR (l/d)	0.4	0.9	NA	NA
FI (unitless)	0.75	0.75	NA	NA
EF (d/yr)	350	350	NA	NA
ED (yr)	70	6	NA	NA
BW (kg)	70	15	NA	NA
AT Noncancer (d)	25550	2190	NA	NA
AT Cancer (d)	25550	25550	NA	NA
C_{im} (mg/l or pCi/l)	CSV	CSV	NA	NA
Dermal Contact While Wading				
DA ($mg/cm^2/d$)	NA	NA	CSV	NA
EF (d/yr)	NA	NA	110	NA
ED (yr)	NA	NA	12	NA
BW (kg)	NA	NA	43	NA
AT Noncancer (d)	NA	NA	4380	NA
AT Cancer (d)	NA	NA	25550	NA
SA (cm^2)	NA	NA	8000	NA

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TABLE C.3-2
(Continued)

Exposure Pathway	RME Receptor			
	Off-Property Resident Farm		Expanded Trespasser[b]	
	Adult	Child	Childhood Years	Adulthood Years
Incidental Ingestion While Wading				
IR (l/d)	NA	NA	0.035	NA
EF (d/yr)	NA	NA	110	NA
ED (yr)	NA	NA	12	NA
BW (kg)	NA	NA	43	NA
AT Noncancer (d)	NA	NA	4380	NA
AT Cancer (d)	NA	NA	25550	NA
C_w (mg/l or pCi/l)	NA	NA	CSV	NA
Dermal Contact while Bathing				
SA (cm^2)	23000	8000	NA	NA
EF (d/yr)	350	350	NA	NA
ED (yr)	70	6	NA	NA
BW (kg)	70	15	NA	NA
AT Noncancer (d)	25550	2190	NA	NA
AT Cancer (d)	25550	25550	NA	NA
DA ($mg/cm^2/d$)	CSV	CSV	NA	NA
Ingestion of Vegetables				
IR (kg/d)	.122	.106	NA	NA
FI (unitless)	0.5	0.5	NA	NA
EF (d/yr)	350	350	NA	NA
ED (yr)	70	70	NA	NA
BW (kg)	70	70	NA	NA
AT Noncancer (d)	25550	2190	NA	NA
AT Cancer (d)	25550	25550	NA	NA
C^s (mg/kg or pCi/kg)	CSV	CSV	NA	NA

Acronyms used in this table:

ABS = Absorption factor
AF = Soil-to-skin adherence factor
AT = Averaging time
BW = Body weight
CF = Conversion factor
CSV = Chemical specific value
ED = Exposure duration
EF = Exposure frequency
ET = Exposure time
FI = Fraction ingested from contaminated source
IR = Average inhalation rate or average ingestion rate based on pathway
NA = Not applicable
SA = Skin surface area available for contact
SH = Building shielding factor

[a]Except where qualified by other footnotes, the values in this table are from the OU2 RI report (DOE 1994a).
[b]Justification and clarification for this scenario and receptors are provided in the OU4 FS report (DOE 1993a).
[c]The CSVs for concentrations are presented in Section C.5.0.

TABLE C.3-3

PARAMETERS USED FOR RESIDUAL RISK WITH PRIVATE OWNERSHIP[a,b]

	RME Receptor				
	On-Property Resident Farm			Off-Property Resident Farm	
Exposure Pathway	Adult(GMA)	Adult(P)	Child	Adult	Child
Inhalation of Particulates					
IR (m^3/hr)	0.83	0.83	0.5	0.83	0.5
ET (hr/d)	24	24	24	24	24
EF (d/yr)	350	350	350	350	350
ED (yr)	70	70	6	70	6
BW (kg)	70	70	15	70	15
AT Noncancer (d)	25550	25550	2190	25550	2190
AT Cancer (d)	25550	25550	25550	25550	25550
C_a (mg/m^3 or pCi/m^3)	CSV	CSV	CSV	CSV	CSV
Drinking Water Ingestion					
IR (l/d)	2	2	1	2	1
FI (unitless)	1	1	1	1	1
EF (d/yr)	350	350	350	350	350
ED (yr)	70	70	6	70	6
BW (kg)	70	70	15	70	15
AT Noncancer (d)	25550	25550	2190	25550	2190
AT Cancer (d)	25550	25550	25550	25550	25550
C_w (pCi/l or mg/l)	CSV	CSV	CSV	CSV	CSV
Incidental Ingestion of Soil					
IR (mg/d)	180	180	200	NA	NA
FI (unitless)	1	1	1	NA	NA
EF (d/yr)	350	350	350	NA	NA
ED (yr)	70	70	6	NA	NA
BW (kg)	70	70	15	NA	NA
AT Noncancer (d)	25550	25550	2190	NA	NA
AT Cancer (d)	25550	25550	25550	NA	NA
CF-Chem (kg/mg)	1×10^{-6}	1×10^{-6}	1×10^{-6}	NA	NA
C_s (mg/kg or pCi/g)	CSV	CSV	CSV	NA	NA
Dermal Contact with Soil					
SA (cm^2)	5750	5750	2000	NA	NA
AF ($mg/cm^2/d$)	1.0	1.0	1.0	NA	NA
ABS (unitless)	CSV	CSV	CSV	NA	NA
EF (d/yr)	350	350	350	NA	NA
ED (yr)	70	70	6	NA	NA
BW (kg)	70	70	15	NA	NA
AT Noncancer (d)	25550	25550	2190	NA	NA
AT Cancer (d)	25550	25550	25550	NA	NA
CF-Chem (kg/mg)	1×10^{-6}	1×10^{-6}	1×10^{-6}	NA	NA
C_s (mg/kg)	CSV	CSV	CSV	NA	NA

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TABLE C.3-3
(Continued)

Exposure Pathway	RME Receptor				
	On-Property Resident Farm			Off-Property Resident Farm	
	Adult(GMA)	Adult(P)	Child	Adult	Child
Direct Radiation Exposure					
ET Indoors (hr/d)	18.3	18.3	22	NA	NA
ET Outdoors(hr/d)	5.7	5.7	2	NA	NA
EF (d/yr)	350	350	350	NA	NA
ED (yr)	70	70	6	NA	NA
SH Indoors (unitless)	0.5	0.5	0.5	NA	NA
SH Outdoors (unitless)	0	0	0	NA	NA
CF (yr/hr)	1.14×10^{-4}	1.14×10^{-4}	1.14×10^{-4}	NA	NA
C_r (pCi/g)	CSV	CSV	CSV	NA	NA
Ingestion of Home Produced Meat					
IR (kg/d)	0.101	0.101	0.039	0.101	0.039
FI (unitless)	0.75	0.75	0.75	0.75	0.75
EF (d/yr)	350	350	350	350	350
ED (yr)	70	70	6	70	6
BW (kg)	70	70	15	70	15
AT Noncancer (d)	25550	25550	2190	25550	2190
AT Cancer (d)	25550	25550	25550	25550	25550
C_{ia} (mg/kg or pCi/kg)	CSV	CSV	CSV	CSV	CSV
Ingestion of Milk					
IR (l/d)	0.4	0.4	0.9	0.4	0.9
FI (unitless)	0.75	0.75	0.75	0.75	0.75
EF (d/yr)	350	350	350	350	350
ED (yr)	70	70	6	70	6
BW (kg)	70	70	15	70	15
AT Noncancer (d)	25550	25550	2190	25550	2190
AT Cancer (d)	25550	25550	25550	25550	25550
C_{im} (mg/l or pCi/l)	CSV	CSV	CSV	CSV	CSV
Dermal Contact While Wading					
DA ($mg/cm^2/d$)	NA	NA	NA	NA	NA
EF (d/yr)	NA	NA	NA	NA	NA
ED (yr)	NA	NA	NA	NA	NA
BW (kg)	NA	NA	NA	NA	NA
AT Noncancer (d)	NA	NA	NA	NA	NA
AT Cancer (d)	NA	NA	NA	NA	NA
SA (cm^2)	NA	NA	NA	NA	NA

TABLE C.3-3
(Continued)

Exposure Pathway	RME Receptor				
	On-Property Resident Farm			Off-Property Resident Farm	
	Adult(GMA)	Adult(P)	Child	Adult	Child
Incidental Ingestion While Wading					
IR (l/d)	NA	NA	NA	NA	NA
EF (d/yr)	NA	NA	NA	NA	NA
ED (yr)	NA	NA	NA	NA	NA
BW (kg)	NA	NA	NA	NA	NA
AT Noncancer (d)	NA	NA	NA	NA	NA
AT Cancer (d)	NA	NA	NA	NA	NA
C_w (mg/l or pCi/l)	NA	NA	NA	NA	NA
Dermal Contact while Bathing					
SA (cm^2)	23000	23000	8000	23000	8000
EF (d/yr)	350	350	350	350	350
ED (yr)	70	70	6	70	6
BW (kg)	70	70	15	70	15
AT Noncancer (d)	25550	25550	2190	25550	2190
AT Cancer (d)	25550	25550	25550	25550	25550
DA ($mg/cm^2/d$)	CSV	CSV	CSV	NA	NA
Ingestion of Vegetables					
IR (kg/d)	.122	.122	.106	.122	.106
FI (unitless)	0.5	0.5	0.5	0.5	0.5
EF (d/yr)	350	350	350	350	350
ED (yr)	70	70	6	70	6
BW (kg)	70	70	15	70	15
AT Noncancer (d)	25550	25550	2190	25550	2190
AT Cancer (d)	25550	25550	25550	25550	25550
C^s (mg/kg or pCi/kg)	CSV	CSV	CSV	CSV	CSV

Acronyms used in this table:

ABS = Absorption factor
AF = Soil-to-skin adherence factor
AT = Averaging time
BW = Body weight
CF = Conversion factor
CSV = Chemical specific value
ED = Exposure duration
EF = Exposure frequency
ET = Exposure time
FI = Fraction ingested from contaminated source
GMA = Great Miami Aquifer (ingestion of water)
IR = Average inhalation rate or average ingestion rate based on pathway
NA = Not applicable
P = Perched groundwater (ingestion of)
SA = Skin surface area available for contact
SH = Building shielding factor

[a] Except where qualified by other footnotes, the values in this table are from the OU2 RI report (DOE 1994a)
[b] Justification for this scenario and receptors is provided in the OU4 FS report (DOE 1993a)
[c] The CSVs for concentrations are presented in Section C.5.0.

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TABLE C.3-4

DERMAL SOIL ABSORPTION COEFFICIENTS USED IN EXPOSURE MODEL

COC	ABS
Antimony	1.00×10^{-2}
Aroclor-1254	6.00×10^{-2}
Aroclor-1260	6.00×10^{-2}
Arsenic	1.00×10^{-3}
Benzo(a)pyrene	N/A[a]
Beryllium	1.00×10^{-2}
Carbazole	3.00×10^{-1}
Dieldrin	3.00×10^{-1}
Uranium-Total	1.00×10^{-3}

SOURCE: OU2 RI report (DOE 1994a)

[a]Dermal Exposure to PAHs: Current policy indicates it is inappropriate to extrapolate dermal slope factors from oral slope factors for PAHs. Also, extrapolation from other routes of exposure is inappropriate due to varied absorption, metabolic transformations, and target organ end point responses. However, PAHs are potent skin carcinogens. Current information on the contribution to cancer risk from dermal exposure to PAHs indicates the toxicity from the dermal pathway may be as toxic as from oral route of exposure. To estimate the risk contribution from PAHs via dermal exposure for all direct contact pathways, the risk posed for dermal exposure was assumed equal to the risk from oral exposure.

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TABLE C.3-5

DOSE EQUIVALENT FACTORS

Radionuclide	Direct Radiation from Soil Dose Factor, mrem/yr per $\mu Ci/m^2$	Inhalation Dose Factor, rem/μCi (Solubility Class)[a]	Immersion Dose Factor, mrem/yr per $\mu Ci/m^3$
Sr-90	6.75×10^{1} [b]	1.3 (Y)	0.0
Tc-99	6.26×10^{-5}	7.5×10^{-3} (W)	2.65×10^{-3}
Cs-137	6.11×10^{1} [c]	3.2×10^{-2} (D)	3.06×10^{3} [c]
Rn-220	5.38×10^{-2}	0.0	1.95
Ra-226	7.6×10^{-1}	7.9 (W)	3.43×10^{1}
Th-228	2.77×10^{-1}	2.5×10^{2} (W)	9.89
Th-230	9.07×10^{-2}	3.2×10^{2} (W)	1.96
Th-232	6.66×10^{-2}	1.6×10^{3} (W)	9.33×10^{-1}
U-234	8.07×10^{-2}	1.3×10^{2} (Y)	7.65×10^{-1}
U-235	1.71×10^{1}	1.2×10^{2} (Y)	7.70×10^{2}
U-238	6.46×10^{-2}	1.2×10^{2} (Y)	6.19×10^{-1}
Np-237	3.24	4.9×10^{2} (W)	1.15×10^{2}
Pu-238	8.58×10^{-2}	4.6×10^{2} (W)	4.41×10^{-1}
Pu-239/240	8.20×10^{-2} [d]	5.1×10^{2} (W)	4.32×10^{-1} [c]

[a] D = Day, W = Week, Y = Year
[b] Includes Y-90 and Y-90m
[c] Includes Ba-137m
[d] Based on Pu-240

SOURCE:U.S. Dept. of Energy, 1988a, "Internal Dose Conversion Factors," DOE/EH-0071, Washington, DC (for inhalation).

U.S. Dept. of Energy, 1988b, "External Dose Conversion Factors," DOE/EH-0070, DOE, Washington, DC (for direct soil and immersion).

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C.4.0 TOXICITY ASSESSMENT

This section examines information concerning the potential effects of exposure to Operable Unit 2 COCs. For this toxicity assessment, the goal was to quantitatively estimate the relationship between COC exposure and the severity or probability of human biological effect. Throughout this assessment, potential health effects caused by concurrent exposure to multiple COCs were assumed to be additive in nature. This assumption ignores possible synergisms or antagonisms among chemicals. However, data to assess interactions are lacking. In the absence of adequate information, EPA guidelines indicate that carcinogenic risks should be treated as additive and that noncancer hazard indices should also be treated as additive. These assumptions help prevent an underestimation of cancer risk or potential noncancer health effects (EPA 1989a).

This section contains a compilation of chronic noncarcinogenic and carcinogenic risk parameters followed by detailed toxicity profiles of the COCs. The toxicity profiles emphasize chronic noncarcinogenic and carcinogenic health effects. Subchronic health effects as a result of short-term exposures during remedial action were assessed in this FS using chronic risk parameters. This assumption was made because the duration of on-property exposures during remediation could potentially exceed the two-week to seven-year exposure period defined for subchronic exposures. In addition, chronic risk parameters provide a more conservative approximation of health effects with less uncertainty. Therefore, the toxicity parameters presented below have been used for both the remedial action and residual risk assessments.

C.4.1 NONCARCINOGENS

For noncarcinogens, it is assumed that a dose exists below which no adverse health effects will be seen. Below this "threshold" dose, exposure to a chemical can be tolerated without adverse effects. The potential for noncarcinogenic health effects resulting from exposure to chemical contaminants is assessed by comparing an exposure estimate (intake) to a reference dose (RfD).

The RfD is expressed in units of milligrams per kilograms per day (mg/kg/day) and represents a daily intake of the contaminant, per kilogram of body weight, that is, not sufficient to cause the threshold effect of concern.

An RfD is specific to the chemical, the route of exposure, and exposure duration. To derive an RfD, the EPA reviews all relevant human and animal studies for each compound and selects the study (or studies) pertinent to the derivation of the specific RfD. Each study is evaluated to determine the no-observed-adverse-effect level (NOAEL) or, if data are inadequate for such a determination, the lowest-observed-adverse-effect level (LOAEL). The NOAEL corresponds to the dose, in mg/kg/day, that can be administered over a lifetime without inducing observable adverse effects. The LOAEL corresponds to the lowest daily dose, in mg/kg/day, that induces an observable adverse effect when administered over a lifetime. The toxic effect characterized by the LOAEL is referred to as the "critical effect."

To derive an RfD, the NOAEL (or LOAEL) is divided by uncertainty factors to ensure that the RfD will protect human health. Uncertainty factors are applied to account for:

- Extrapolation of data from laboratory animals to humans (interspecies extrapolation)
- Variation in human sensitivity to the toxic effects of a compound (intraspecies differences)
- Derivation of a chronic RfD based on a subchronic rather than a chronic study
- Derivation of an RfD from the LOAEL rather than the NOAEL.

In addition to these uncertainty factors, modifying factors between 0 and 10 may be applied to reflect additional qualitative considerations in evaluating the data. For most compounds, the modifying factor is 1.

Separate RfDs are needed for ingestion and inhalation pathways. EPA (1992b) presents reference concentrations (RfC) for the inhalation route. Inhalation noncancer toxicity values are usually expressed as inhalation RfCs in units of mg/m^3. Because noncancer risk characterization requires an estimate of dose in units of mg/kg/day, the inhalation RfC must be converted to an inhalation RfD. This conversion is performed by assuming humans weigh 70 kilograms and inhale 20 cubic meters of air per day; that is, the inhalation RfC (mg/m^3) multiplied by 20 m^3/day and divided by 70 kilograms yields an inhalation RfD (mg/kg/day).

The primary sources of values for RfDs are the Integrated Risk Information System (IRIS) and the Health Effects Assessment Summary Tables (HEAST), which are compiled and maintained by the

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EPA (EPA 1994a and 1994b). IRIS was used as the primary source for toxicity information. HEAST was used only if IRIS values were unavailable (RAGS). Since dermal RfDs are derived from oral RfDs, the oral target organ is adopted as the dermal target organ. RfDs for noncarcinogenic COCs in Operable Unit 2 are presented in Table C.4-1.

C.4.2 CHEMICAL CARCINOGENS

The toxicity information considered in the assessment of potential carcinogenic risks includes a weight-of-evidence classification and a slope factor. The weight-of-evidence classification qualitatively describes the likelihood that a chemical is a human carcinogen and is based on an evaluation of available data from human and animal studies. A chemical may be placed in one of five groups in EPA's classification system to indicate its potential for carcinogenic effects: Group A, human carcinogen; Group B1 or B2, probable human carcinogen; Group C, possible human carcinogen; Group D, not classifiable as a human carcinogen because of a lack of data; or Group E, noncarcinogen based on evidence of noncarcinogenicity in humans.

The cancer slope factor is the toxicity value used to quantitatively express the carcinogenic risk of cancer-causing constituents. It is defined as the upper-bound estimate of the probability of cancer incidence per unit dose averaged over a lifetime. Slope factors are derived from studies of carcinogenicity in humans and/or laboratory animals and are typically calculated for compounds in Groups A, B1, and B2.

In developing the cancer slope factors, the EPA gives preference to human epidemiology studies; however, the slope factors for most chemicals were derived from animal exposure studies. An inherent assumption in the EPA's approach is that there is no threshold for a carcinogenic effect. That is, smaller doses result in a lower risk, but any dose, no matter how small, carries some risk. The dose-related number of tumors and the time of incidence of tumors were fitted using a linear multi-stage model. A slope factor describing the linear relationship of lifetime risk to dose was computed using the 95 percent upper confidence unit (UCL) of this slope. This approach is inherently conservative because of the no-threshold assumption and the use of the 95 percent UCL.

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TABLE C.4-1

REFERENCE DOSES[a]

Chemical	Chronic Oral Reference Dose (mg/kg/day)	Chronic Inhalation Reference Dose (mg/kg/day)	Reference Concentration (mg/m^3)	Target Organ (Critical Effect)		Uncertainty Factor	
				Oral	Inhalation	Oral	Inhalation
Inorganics							
Antimony	4×10^{-4}	ND	ND	Whole body (Increased Mortality); Blood (Altered Chemistries)	ND	1000	ND
Arsenic	3×10^{-4}	ND	ND	Skin (Keratosis; Hyperpigmentation)	ND	3	ND
Beryllium	5×10^{-3}	ND	ND	None (None Observed)	ND	100	ND
Uranium (Soluble Salts)	3×10^{-3}	ND	ND	Kidney (Nephritis)	ND	1000	ND
Semivolatiles							
Carbazole	ND	ND	ND	ND	ND	ND	ND
Benzo(a)pyrene	ND	ND	ND	ND	ND	ND	ND
Pesticides/PCBs							
Aroclors	ND	ND	ND	ND	ND	ND	ND
Dieldrin	5×10^{-5}	ND	ND	Liver (Lesions)	ND	100	ND

[a]The values in this table, except if noted in other footnotes, are from the IRIS or HEAST.

ND=No data available

Slope factors are specific to a chemical and route of exposure and expressed in units of $(mg/kg/day)^{-1}$ for both oral and inhalation routes. The induction of cancer by dermal absorption is evaluated using oral slope factors. Inhalation cancer toxicity values are usually expressed as inhalation unit risks in units of reciprocal $\mu g/m^3$ ($1/\mu g/m^3$). Because cancer risk characterization requires an estimate of reciprocal dose in units of 1/mg/kg/day, the inhalation unit risk must be converted to the mathematical equivalent of an inhalation cancer slope factor, or risk per unit dose (mg/kg/day). This conversion is performed by assuming humans weigh 70 kilograms and inhale 20 cubic meters of air per day; that is, the inhalation unit risk ($1/\mu g/m^3$) divided by 20 m^3/day, multiplied by 70 kilograms and multiplied by 1000 $\mu g/mg$ yields the mathematical equivalent of an inhalation slope factor (1/mg/kg/day).

Slope factors for COCs are presented in Table C.4-2. The primary sources of these toxicity values are EPA's IRIS and the quarterly updated HEAST. Other EPA sources of cancer slope factors were also consulted when available. Surrogate chemicals were not used for cancer slope factor derivation unless the chemical similarity was close and the derivation was highly defensible.

The following exceptions, where information from one chemical was used to model a compound class, are noted:

- The carcinogenicity of all polychlorinated biphenyl (PCB) isomers is assumed to be equal to the carcinogenicity of Aroclor-1260.
- The carcinogenicity of polycyclic aromatic hydrocarbons (PAHs) is determined using a relative potency approach (Clement International 1988, 1990).

Carcinogenic risks associated with PAHs are evaluated using the relative potency approach described by Clement International (1988 and 1990). This approach, approved by EPA Region V, in comments on the OU1 FS Risk Assessment, considers the relative potency of the individual PAHs and allows site-specific relative concentrations to be expressed in the risk assessment. The relative potency factors for PAHs are presented in Table C.4-3.

TABLE C.4-2

CANCER SLOPE FACTORS FOR CHEMICALS[a]

Chemical	Oral Cancer Slope Factor [(mg/kg/day)$^{-1}$]	Inhalation Cancer Slope Factor [(mg/kg/day)$^{-1}$]	Unit Risk (μg/m^3)$^{-1}$	Tumor Site: Oral	Tumor Site: Inhalation	Cancer Classification
Inorganics						
Antimony	ND	ND	ND	ND	ND	ND
Arsenic	1.8×10^0	1.5×10^1	4.3×10^{-3}	Skin, Lung	Respiratory System	A
Beryllium	4.3×10^0	8.4×10^0	2.4×10^{-3}	Total Tumors	Lung	B2
Uranium Soluble Salts	ND	ND	ND	ND	ND	ND
Semivolatiles						
Carbazole	2.0×10^{-2}	ND	ND	Liver	ND	B2
Benzo(a)pyrene[b]	7.3×10^0	6.1×10^0	ND	Forestomach	ND	B2
Pesticides / PCBs						
Aroclors	7.7×10^0	ND	ND	Liver	ND	B2
Dieldrin	1.6×10^1	1.6×10^1	4.6×10^{-3}	Liver	Liver	B2

ND = No data available

[a]Except where qualified by other footnotes, the values in this table are from IRIS or HEAST.
[b]Toxicity equivalency factors (TEFs) and corresponding oral and inhalation slope factors for the Group B2 PAHs are presented in Table C.4-3.

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TABLE C.4-3

TOXICITY EQUIVALENCY FACTORS AND CORRESPONDING ORAL AND INHALATION SLOPE FACTORS FOR THE GROUP B2 PAHs

PAH	Relative Potency	Oral Slope Factor $(mg/kg/day)^{-1}$	Inhalation Slope Factor $(mg/kg/day)^{-1}$
Benzo(a)pyrene	1.0	7.3	6.1
Benzo(a)anthracene	0.145	1.1	0.89
Benzo(b)fluoranthene	0.1228	0.90	0.75
Benzo(k)fluoranthene	0.0523	0.38	0.32
Dibenzo(a,h)anthracene	1.11	8.1	6.8
Indeno(1,2,3-cd)pyrene	0.278	2.0	1.7

SOURCE: Clement International 1990.

Dermal Reference Doses and Cancer Slope Factors

For this FS, dermal RfD values and cancer slope factors were calculated from the corresponding oral values. To calculate a dermal RfD, the oral RfD was multiplied by the gastrointestinal (GI) absorption efficiency factor, expressed as a fraction. The resulting dermal RfD is based on absorbed dose. This is the appropriate value with which to compare dermal doses, because they are expressed as absorbed rather than exposed doses. In a similar manner, and for the same reasons, to calculate a dermal cancer slope factor, the oral slope factor was divided by the GI adsorption efficiency because cancer slope factors are expressed as reciprocal doses. Dermal RfD values and cancer slope factors for the COCs in Operable Unit 2 are presented in Table C.4-4.

The most important aspect in calculating a dermal RfD or cancer slope factor is the accuracy of the GI absorption efficiency factor. For this reason, the toxicity profiles contain pharmacokinetics discussions in which the oral absorption data were evaluated. Where appropriate, the low (i.e., most conservative) end of the range of available GI absorption data for humans was used to derive the dermal RfD or cancer slope factor. When the human data were insufficient, animal data were used. Data from high-dose experiments were not used if more suitable data were available and it appeared the GI absorption process could have been saturated. When adequate quantitative data were not available, a default GI absorption factor was used.

TABLE C.4-4

DERMAL REFERENCE DOSES AND CANCER SLOPE FACTORS FOR COCs

Chemical	Gastrointestinal Absorption Fraction	Dermal Reference Dose (mg/kg/day)	Dermal Slope Factor $(mg/kg/day)^{-1}$
Inorganics			
Antimony	0.15[a]	6.00×10^{-5}	ND
Arsenic	0.95[b]	2.85×10^{-4}	1.90×10^{0}
Beryllium	1.00[c]	5.00×10^{-3}	4.30×10^{0}
Uranium	0.05[d]	1.50×10^{-4}	ND
Semivolatiles			
Carbazole	0.90	ND	2.22×10^{-2}
Polycyclic aromatic hydrocarbons (PAHs)[f]	NA	NA	NA
Pesticides/PCBs			
Aroclors	0.75[a]	NA	1.03×10^{1}
Dieldrin	0.90	4.50×10^{-5}	1.78×10^{1}

ND = Not derived
NA = Not applicable

[a] See the Toxicity Profile for this chemical in Section C.4.5.
[b] EPA 1993f
[c] Region 5 suggested that a review of the IRIS database showed no evidence that the administered dose was adjusted for absorption in the calculation of the RfD and Cancer Slope Factors for beryllium, and therefore, a value of 1.0 should be used in calculating the dermal toxicity values (Comment #19 on Operable Unit 2 CRARE, USEPA Region V, Pat Van Leeuwen, Toxicologist, October 3, 1994).
[d] RAGS, pp. A-2 to A-3: Recommended default Gastrointestinal Absorption Fraction for inorganic chemicals = 0.05.
[e] Jones and Owen 1989
[f] Dermal Exposures to PAHs: Reliable cancer slope factors for dermal exposure to PAHs are currently unavailable. Current policy indicates it is inappropriate to extrapolate dermal slope factors from oral slope factors for PAHs. Also, extrapolation from other routes of exposure is inappropriate due to varied absorption, metabolic transformations, and target organ end point responses. However, PAHs are potent skin carcinogens. Current information on the contribution to cancer risk from dermal exposure to PAHs indicates the toxicity from the dermal pathway may be as toxic as from oral route of exposure. To estimate the risk contribution from PAHs via dermal exposure for all direct contact pathways, the risk posed for dermal exposure was assumed equal to the risk from oral exposure (OU2 RI report, DOE 1994a).

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As noted by EPA (1989f), the GI absorption of many metals from the GI tract is limited, and 0.05 is a reasonable default value for metals and inorganic substances. The EPA (1989f) did not recommend a separate default value for organic chemicals. A compilation of data for 19 organic chemicals presented GI absorption efficiencies of at least 0.9, indicating that organic chemicals generally are readily absorbed. The arithmetic average of the efficiencies for the 19 organic chemicals, 0.91368 (equivalent to 0.9 when rounded to one significant figure), appears to be a reasonable default GI absorption efficiency factor for organic chemicals. The default value of 0.9 was used for organic chemicals for which quantitative data were not adequate.

C.4.3 RADIONUCLIDES

Radionuclides found at contaminated sites interact in the environment in the same manner as their nonradioactive isotopes. Consequently, the types of data needed for a radiation risk assessment are similar to those required for a chemical risk assessment. The primary differences lie in the procedures used to characterize the radionuclide contaminants. Exposure pathways for radionuclides include both internal and external pathways. Intakes by inhalation, ingestion, and dermal absorption are the important internal pathways.

The qualification of the amount of energy deposited in living tissue due to internal and external exposure to ionizing radiation is termed "radiation dosimetry." The amount of energy deposited in living tissue is of concern because the potential adverse effects of radiation are proportional to energy deposition. Therefore, the term "dose," used regarding radiation exposure, is defined as the energy imparted to a unit mass of tissue, whereas chemical dose means the mass of a chemical absorbed into an organism.

Despite the fundamental difference between the way exposures are expressed for radionuclides and chemicals, the approach to exposure assessment is the same. An exposure assessment for radionuclides involves three steps: 1) characterization of the exposure setting, 2) identification of the exposure pathways, and 3) quantification of exposure. The primary differences in conducting exposure assessments for radionuclides as compared to chemicals are: 1) consideration of external exposures, 2) conversion of radiation exposures to dose equivalents, and 3) modification of fate and transport models for radiation exposure.

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Toxicity assessment for radionuclides generally follows a two-step process. The first step, hazard identification, is used to determine whether exposure can increase the incidence of an adverse health effect. The second step, dose response assessment, is used to quantify the toxicity information and characterize the relationship between the dose of the contaminant administered or received and the incidence of adverse health effects in the exposed population.

Estimates of human health effects are based primarily on single, acute, high doses of radiation. The current model used to describe these effects as a function of dose is called the linear quadratic model. This model assumes that there is no threshold for the induction of cancer or genetic effects. It is assumed that any radiation dose could give rise to a cancer or genetic effect. This is a conservative assumption and a conservative model. There is very little data on the effects of radiation at low doses or on the effects of chronic, long-term exposure in humans.

Two major international groups have been responsible for collecting and evaluating data on the human health effects of ionizing radiation, the Committee on the Biological Effects of Ionizing Radiations (BEIR) of the National Research Council, and the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR). These groups have issued a series of reports presenting the data and recommendations on risk values. The EPA is responsible for developing guidelines for radiation risk assessment in the United States and has relied on the published evaluations of these groups, along with those of the International Commission on Radiological Protection (ICRP) and the National Council on Radiation Protection and Measurements (NCRP). The following discussion contains a brief overview of effects of ionizing radiation on human health, and the relative risks associated with these effects.

The principal adverse biological effects associated with ionizing radiation from radioactive substances in the environment are mutagenicity, teratogenicity, and carcinogenicity:

- Mutagenicity is the ability to induce genetic mutations in the nuclei of either somatic or reproductive cells.
- Teratogenicity is the ability to induce or increase the incidence of congenital malformations, which are permanent structural or functional deviations produced during embryonic growth and development.
- Carcinogenicity is the ability to produce neoplastic changes which result in tumors.

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Carcinogenic Effects

The guidance for EPA Superfund risk assessments clearly states that carcinogenicity is considered to be the limiting deleterious effect at the radiation dose levels expected at the remediated FEMP. The carcinogenic effects may then be used as the sole basis for assessing the radiation-related human health risks of a site contaminated with radionuclides (RAGS).

Each radionuclide produces a unique radiation spectrum and can affect different organs in the human body. The EPA has calculated the annual radiation dose equivalent from each radionuclide to each organ in each year of life, per unit intake or external exposure, over a lifetime. The average excess number of all types of radiation-induced fatal cancers that occur in a year can then be estimated for the corresponding dose equivalents received during that year and relevant preceding years. The excess number of radiation-induced fatal cancers is derived from epidemiological data, extrapolation from high radiation doses to low doses, and mathematical models for projecting risk over a lifetime. Because the EPA is concerned with assessing cancer incidence, each radionuclide slope factor has been calculated by dividing the excess fatal cancer risk for that radionuclide by the mortality-to-incidence risk ratio (RAGS) for the types of cancer induced by that radionuclide. This mortality-to-incidence risk ratio is not incorporated into the cancer potency factors derived by EPA for chemical carcinogens; therefore, the basis for cancer risk estimates for radionuclides and chemical carcinogens is not the same.

The relationship between cancer incidence and exposure to radioactive materials is quantified by using mathematical extrapolation models, which estimate the largest possible linear slope (within the 95 percent UCL) at low extrapolated doses consistent with the data. This "radiocarcino-genicity slope factor" is characterized as the "maximum likelihood estimate of the age-averaged lifetime total excess cancer risk per unit intake or exposure" (EPA 1991b). For this reason, the true risk to humans, although not identifiable, is not likely to be the upper-bound estimate. It may be lower.

The EPA Office of Radiation Programs (ORP) has calculated cancer slope factors for radionuclides of potential concern at Superfund sites. These values are listed in the HEAST (not IRIS) and are subject to revision. The slope factors are presented in Table C.4-5.

TABLE C.4-5

CANCER SLOPE FACTORS FOR RADIONUCLIDES

Radionuclide	ICRP Lung Class[a]	Inhalation Risk/(pCi)	Ingestion Risk/(pCi)	External Exposure (Risk/year per pCi/g soil)
Cs-137 + Progeny	D	1.9×10^{-11}	2.8×10^{-11}	2.0×10^{-6}
Np-237 + Progeny	W	2.9×10^{-8}	2.2×10^{-10}	4.3×10^{-7}
Pu-238	Y	3.9×10^{-8}	2.2×10^{-10}	2.8×10^{-11}
Ra-226	W	3.0×10^{-9}	1.2×10^{-10}	1.2×10^{-8}
Ra-226 + Progeny[b]	W	3×10^{-9}	1.2×10^{-10}	6.0×10^{-6}
Ra-228 + Progeny	W	6.9×10^{-10}	1.0×10^{-10}	2.9×10^{-6}
Rn-222 + Progeny[b]	Gas	7.7×10^{-12}	1.7×10^{-12}	5.9×10^{-6}
Sr-90 + Progeny	D	6.2×10^{-11}	3.6×10^{-11}	0.0×10^{0}
Tc-99	W	8.3×10^{-12}	1.3×10^{-12}	6.0×10^{-13}
Th-228 + Progeny	Y	7.8×10^{-8}	5.5×10^{-11}	5.6×10^{-6}
Th-230	Y	2.9×10^{-8}	1.3×10^{-11}	5.4×10^{-11}
Th-232	Y	2.8×10^{-8}	1.2×10^{-11}	2.6×10^{-11}
U-234	Y	2.6×10^{-8}	1.6×10^{-11}	3.0×10^{-11}
U-235 + Progeny	Y	2.5×10^{-8}	1.6×10^{-11}	2.4×10^{-7}
U-238 + Progeny	Y	2.4×10^{-8}	2.0×10^{-11}	5.1×10^{-8}

[a]Classification recommended by the ICRP for half-time of clearance from the lung:
Y = years, W = weeks, D = days.
[b]A Ra-222 decay subchain, Rn-222+D, is also included in the HEAST tables, comprised of ingestion, inhalation and external exposure slope factors for Rn-222 plus the corresponding slope factors for each of its decay products (Po-218, Pb-214, Bi-214 and Po-214). For the ingestion and external exposure slope factors for Rn-222+D, decay products are assumed to be in secular equilibrium. For the inhalation slope factor, decay products are assumed to be in 50% equilibrium.

SOURCE: HEAST (EPA 1994c)

Genetic Effects. Genetic effects have been studied extensively using animal models and in the Japanese atomic-bomb survivors. A comparison of the survivor data has consistently led to estimates of genetic effects that imply lower risks in humans than in animals (NAS 1990). Taking into account the confidence intervals associated with the various data, the difference between humans and animals remains, indicating that humans are less sensitive to radiation induction of mutations in germ cells, and that risks derived from animal data will be conservative if applied to humans. Therefore, BEIR V and UNSCEAR have based their evaluation of genetic risk on the lower 95 percent confidence limit for Japanese atomic-bomb survivor data, which is also consistent with the range of doubling doses observed in mice. A doubling dose is the dose required to double the incidence of genetic defects in a population.

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The doubling dose for humans is currently estimated to be 100 rem (NAS 1990). Genetic effects expected per rem per 30-year generation, based on this doubling dose, fall into the range of less than 1 to about 100 per million liveborn offspring for multi-generations. The natural incidence for genetic anomalies ranges from 400 to 30,000 per million liveborn offspring (AS 1990).

The EPA has recommended (1989d) a genetic risk of 2600 effects per rad per 30-year generation for low Linear Energy Transfer (LET) radiation where 1 rad equals approximately 1 rem, and 6900 per rad per 30-year generation for high LET radiation (alpha and beta radiation) where 1 rad equals approximately 0.05 to 1 rem (depending on energy, LET, etc). These risks are based on the older BEIR III report. This approach is slightly more restrictive than the current BEIR V estimates.

Teratogenic Effects. Teratogenic effects are somatic effects resulting from exposure in utero to ionizing radiation. These effects, which are not passed on to other generations, can include severe mental retardation, microcephaly, and structural or limb abnormalities. Extrapolating the results of animal studies to humans has proved difficult because of the significant differences in fetal development rates. The EPA (1989d) uses an estimate of 4000 effects per rad of exposure during weeks 8 to 15 of gestation for low LET radiation (primarily gamma radiation).

C.4.4 TOXICITY PROFILES: RADIONUCLIDES

This section presents toxicity information for radionuclide compounds. It was assumed that all radionuclides are present in the soils as oxides or carbonates. This represents a conservative assumption because radionuclides clear slowly from environmental media.

The varying level of discussion among the contaminant profiles reflects both the amount of information accessible in the literature about these substances and professional judgement concerning the appropriate level of detail necessary to adequately discuss the toxicity of each substance.

C.4.4.1 Cesium-137

Biological Distribution and Retention/Pharmacokinetics

The GI uptake of cesium is rapid, and its absorption coefficient is approximately 85 percent in mammals. The cesium body burden decreases with a half-life of approximately 80 days. The EPA (1993b) has derived a GI absorption factor for cesium of 1.0, equivalent to 100 percent.

The physiological properties of cesium resemble those of potassium, although quantitative differences arise in transport by cell membranes; cesium can displace potassium from muscle and red blood cells. Potassium enters the cells via sodium-potassium-dependent ATPase. Cesium ions are effective in activating this enzyme and compete with potassium for carrier sites (Davie and Coleman 1988).

Noncarcinogenic Toxicity

Cesium salts can be regarded as being virtually nontoxic. Acute toxicity, which was observed only at very high cesium concentrations (10 to 20 mmol Cs/kg) in mice, is characterized by dysautonomic upset with parasympathetic predominance and a multi-phasic excitation/depression action on the central nervous system. The organs most affected appear to be the liver, intestine, heart, and kidneys.

In beagles injected with massive doses of Cs-137, early deaths occurred as a result of bone marrow destruction (Davie and Coleman 1988).

Carcinogenicity

In beagles injected with massive doses of Cs-137, neurofibrosarcomas occurred in the survivors (Davie and Coleman 1988). The EPA has derived cancer slope factors for cesium and its progeny, and were previously presented in Table C.4-5.

C.4.4.2 Neptunium-237

Biological Distribution and Retention/Pharmacokinetics

The fraction of ingested neptunium absorbed from the GI tract into blood (f_1) is assumed to be approximately 1 percent. This value was based on experimental data involving a large group of rats fed with doses of neptunium exceeding 1 mg/kg. When the dietary dose was lower than 1 mg/kg, the fraction F_1 was 0.1 percent or less. Data on distribution and retention of neptunium in rats indicate that its metabolic behavior is similar to that of plutonium. However, there are some indications that neptunium may distribute more like calcium than plutonium in the skeleton. Forty-five percent of the neptunium leaving the transfer compartment will be translocated to mineral bone. Another 45 percent will be transported to the liver, and 0.035 percent to the testes or 0.011 percent to the ovaries. The remaining neptunium leaving the transfer compartment is assumed to directly enter the excreta. The biological half-life of neptunium is about 100 years in mineral bone, about 40 years in the liver, and it is assumed that neptunium is permanently retained in the gonads. These retention and translocation

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data were based on the ICRP common model for systemic distribution and retention of all transuranic elements. The model was largely based on plutonium data.

Noncarcinogenic Toxicity

The presence of neptunium in high-level nuclear waste and its presumed environmental mobility have made it an isotope of special environmental concern. It has been estimated that Np-237 may be the most hazardous remaining constituent of high-level nuclear waste during the interval from 10,000 to 30,000 years following disposal.

All animal toxicity studies with neptunium have employed Np-237. Because of its low specific activity (0.76 mCi/g), the chemical toxicity effects of Np-237 are often observed to the exclusion of radiation effects. Soviet data in this area were studied by Moskalev et al. (NCRP 1988). Although the chemical toxicity effects might be a controlling factor in an acute exposure to Np-237, they would not be an important factor at the usual levels concerning radiation protection, and certainly not at the very low levels of potential environmental exposure. In this presentation, therefore, the health effects of Np-237 are assessed only with respect to carcinogenicity, as described below.

Carcinogenicity

The effects of neptunium exposure have not been studied in humans. For radiation protection purposes, it has been assumed that radiation doses resulting from neptunium deposition in organs and tissues will result in biomedical effects similar to those observed following the exposure of humans to other sources of ionizing radiation. The very limited data on neptunium effects in animals provide no direct useful estimates of risk to humans. Although these data play no direct role in establishing neptunium standards, they can nevertheless help to validate these standards through comparisons with other animal studies employing other radionuclides.

The long-term radiation effects of Np-237 have been studied only in rats. Genetic effects have not been studied. Bone cancer has been the predominant long-term effect of low-level injections of Np-237. Both lung and bone cancer incidences are elevated following inhalation exposure. There is no indication that neptunium at low exposure levels constitutes a unique health risk unpredictable from its general radiological characteristics.

The 1987 NCRP recommendations for annual limits on Np-237 intake are as follows:

• Oral ingestion	0.6 μCi	Based on nonstochastic limits
	2.0 μCi	Based on stochastic limits
• Inhalation	0.005 μCi	Based on nonstochastic limits
	0.010 μCi	Based on stochastic limits

The nonstochastic limit or dose equivalent applies to bone surface.

The EPA has derived cancer slope factors for neptunium, and they are presented in Table C.4-5.

C.4.4.3 Plutonium

Biological Distribution and Retention/Pharmacokinetics

Regarding distribution and retention, inhaled plutonium is retained in the lungs with an effective half-life that varies from hundreds of days for plutonium oxides to tens of days for more soluble forms. A significant portion of the plutonium oxide that leaves the lungs is translocated to the tracheobronchial lymph nodes. Plutonium solubilized within the lungs is translocated to the liver and skeleton where it is tenaciously retained (Klaassen 1986).

Noncarcinogenic Toxicity

Among the plutonium isotopes, the short-lived Pu-241 is especially toxic because of its short half-life. The toxicity of plutonium compounds is based primarily on the very high radiotoxicity of the plutonium atom and secondarily upon the atoms or combinations of atoms contained (Sax 1984). There are no reports on the chemical toxicity of plutonium; however, the fibrosis observed in the lungs of exposed animals and humans could be due to chemical interactions. The radiologic toxicity of plutonium involves bone necrosis, bone and lung cancer, and detrimental effects on the reproductive system. Also, toxic effects are observed in offspring of pregnant animals exposed to plutonium. No ingestion data specific to plutonium are available.

In a classic long-term toxicity study performed by Bair et al., the effects of inhaled plutonium oxide were studied in beagles for up to 10 years following inhalation exposure. At the highest levels of deposited activity, the dogs died within several hundred days with radiation pneumonitis and pulmonary fibrosis. At later times, death was related to severe pulmonary fibrosis. Beyond 1000 days, although pulmonary fibrosis was still prominent, death was due to primary pulmonary

neoplasia. The most common neoplasm was bronchioloalveolar carcinoma (Klaassen 1986). Hahn et al. (1983), using data reported by Bair and Thomas (1976), calculated the risk factor for Pu-239 alpha irradiation of the lungs to be 600 lung tumors per million rad to lung, or, assuming an RBE of 20, 30 lung tumors per millirem to lung.

Human data for plutonium exposure are available. Among workers contaminated, the case histories have been documented of 26 men who worked with plutonium during World War II. The initial body burden of these workers was between 540 and 229,500 pCi (reported as between 20 and 8500 Becquerel), and 11 of them received doses exceeding the maximum allowed by the International Commission for Radiological Protection. After a medical follow-up of 37 years, 2 members of this group died of myocardial infarction and accidental trauma, respectively, compared to the 6.6 deaths expected on the basis of the adjusted rates for white males. Their 1982 exam provided no evidence that 37 years of exposure to internally deposited plutonium had adverse effects on their health (Seiler 1988).

Less toxicity data are available on trans-plutonium radionuclides such as americium and curium; however, the data that are available indicate a qualitative similarity to the toxicity of plutonium. McClellan, et al. (1972) noted that inhaled americium and curium, even as oxides, appeared more soluble than inhaled plutonium and rapidly translocated to the liver and skeleton. (Klaassen 1986)

Carcinogenicity

The EPA classifies all radionuclides as weight-of-evidence Group A substances (human carcinogens), based on their characteristic of emitting ionizing radiation and on the extensive epidemiologic data associating exposure with radiogenic cancers in humans (EPA 1992d). The carcinogenicity of Pu-238 (the predominant plutonium isotope at the FEMP) from internal exposure is due to alpha particles. The EPA (1992d) has reported cancer potency slope factors for the plutonium isotopes, and these are presented in Table C.4-5.

C.4.4.4 Radium

Biological Distribution and Retention/Pharmacokinetics

Four isotopes of radium occur naturally, Ra-223 (actinium series), Ra-224 and Ra-228 (thorium series), and Ra-226 (uranium series); radium is ubiquitous in the earth's crust and common in groundwater, mineral deposits, soil, food products, and common building materials. Ra-226 has the

longest half-life (1600 years) of the radium isotopes and decays by alpha particle emission. Ra-223 and Ra-224 are also alpha-particle emitters, and Ra-228 is a beta-particle emitter. The primary uses of radium are for manufacturing luminous dials and instrument faces and for internal radiation therapy; thus, the bulk of human data on the effects of radium intake are available from studies of radium-dial painters and medical patients who have been administered therapeutic doses of radium.

Radium introduced into the body generates decay products, including gaseous isotopes of radon. Rn-222 generated in the body persists long enough that it easily diffuses into the bloodstream and accumulates in the sinuses, significantly reducing the alpha dose to the radium accumulating tissues but increasing the dose in the sinuses. Ultimately, the bone tissues are the principal site of radium accumulation because of the similar chemistry of radium and calcium (NAS 1988). In the bone tissues, radium is initially deposited in endosteal bone surface tissue. There is, then, a redistribution to the bone volume, where the radium resides with a long retention time.

Noncarcinogenic Toxicity

No chemical toxic effects of exposure to radium have been documented, and the EPA has not developed an RfD for radium; therefore, the health hazard for radium is associated with potential radiocarcinogenic effects.

Carcinogenicity

Although epidemiological investigations have documented the association between radium exposure and carcinogenic effects, there has been considerable debate over the dose-response relationship involved. Bone cancer incidence has been evaluated as a function of a variety of parameters that represent a measure of radium exposure, such as absorbed dose to the skeleton, pure radium equivalents, and cumulative rad-years (Evans 1966).

Cancers of the paranasal sinuses and the mastoid air cells have been associated with exposure to Ra-226 and Ra-228 since the 1930s (Martland 1939). These effects were initially seen in radium-dial painters, who received high absorbed doses from the quantities of radium they ingested. Excess incidence is evident when compared to the natural incidence, which is very low. After exposure to radium, these types of cancers were expressed later than bone cancers (Evans et al. 1969; Finkel et al. 1969; Rowland et al. 1971; Rundo et al. 1986).

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As discussed above, Rn-222 generated in the body persists long enough that it easily diffuses into the bloodstream and accumulates in the sinuses, significantly increasing the dose in the sinuses. Studies of cancers of the sinuses and mastoid cells conducted in beagles injected with a variety of alpha-emitting radionuclides revealed excess incidence of these cancers (Schlenker 1980). Not all of the tumors were induced by alpha emitters that produce a gaseous decay product; therefore, a gaseous decay product was not essential to induction. Nevertheless, the risk of these cancers from Ra-226 and its decay products (including Rn-222) is considered significantly greater than from other alpha-emitting radionuclides.

The accumulation of very high levels of radium is associated with severe anemias and leukemia (NAS 1988). However, at lower levels of accumulation (such as those experienced by the majority of U.S. radium-dial painters, especially in later years) the accumulated radium does not appear to significantly increase the risk of leukemia (NAS 1988). The BEIR IV Committee presented a cancer risk factor of 200 x 10^{-6} per rad for bone sarcomas from protracted exposure to radium in its report on radon and other alpha emitters (NAS 1988). The HEAST has reported cancer slope factors for the radium isotopes, and these are presented in Table C.4-5.

C.4.4.5 Radon and Progeny

Biological Distribution and Retention/Pharmacokinetics

The health risk accompanying radon exposure can be attributed to inhalation of the short-lived progeny of radon. The daughter atoms of concern are attached to particulates which then lodge in the lung passages and produce a radiation dose which may causes lung cancer. Radon progeny that do not lodge in the lung passages are exhaled, and do not deliver a radiation dose. Lung cancer results when the bronchial epithelium of the lung passages is exposed to alpha particles emitted from decaying radon progeny (i.e., Po-214 and Po-218) lodged in the lung passages.

Short-lived radon progeny will decay to lead. Because lead is a chemical toxicant, significant accumulations of radon pose a potential source of lead exposure.

Noncarcinogenic Toxicity

There are no known toxic effects of direct exposure to radon gas or its short-lived progeny.

Carcinogenicity

Radon gas and associated progeny have been linked to an increase in incidence of lung cancer in individuals exposed via inhalation.

The following discussion regarding the health effects of exposure to radon and radon progeny is summarized from the report of the BEIR IV Committee on radon and other alpha emitters (NAS 1988). The radiological effect of concern from exposure to radon and radon progeny is lung cancer.

The lung cancer mortality risk estimates for radon progeny exposure published by the BEIR IV Committee (NAS 1988) were based on an epidemiological study of underground miner populations. The assessment of the risk from exposure to radon progeny by the BEIR IV Committee represents the most recent comprehensive examination of estimated health risks associated with exposure.

In its study of the human epidemiological data, the BEIR IV Committee reevaluated the primary data (i.e., exposure histories and mortality) for the four principal epidemiological study groups of underground miners exposed to radon progeny. From this reevaluation, the committee estimated the risk of developing fatal lung cancer. The risk from lifetime exposure to radon progeny was estimated at 350 x 10^{-6} excess fatal lung cancers per cumulative working level month (WLM) as exposure. The WLM is defined as the cumulative exposure to an airborne concentration of short-lived radon progeny (equal to one working level) for a period of one working month. It must be noted that this estimate, quantified as fatal lung cancer risk, was based primarily on epidemiological studies of humans and is expressed per unit cumulative exposure to progeny (WLM^{-1}). The EPA slope factors addressing cancer incidence were based on calculated radiation doses to organs and tissues and are expressed per unit radioactivity intake (pCi^{-1}). Thus, the EPA and BEIR IV risk estimates are not directly comparable. The EPA cancer slope factors were used to assess risk attributable to radon and radon progeny exposure. It is also noted that EPA has adopted a nominal risk estimate of 360 x 10^{-6} per WLM for use in NESHAPS (RAGS). This estimate was based primarily on EPA's consideration of the BEIR IV assessment; however, EPA did average radon risk estimates derived from BEIR IV and ICRP models to calculate the estimate of 360 x 10^{-6} per WLM.

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Although the carcinogenicity of radon progeny is established and the hazards of exposure during mining are well recognized, the hazards of exposure in other environments have not yet been adequately quantified (NAS 1988).

Using the BEIR IV risk factor (NAS 1988) of 350 x 10^{-6} WLM^{-1} for lung cancer mortality from inhalation of Rn-222 and progeny, and by assuming 51.5 working months per year (8760 hours per year divided by 170 hours worked per month), 100 pCi Rn/liter air, short-lived Rn-222 progeny present in 50 percent equilibrium, and an inhalation rate of 20 m^3/day for 365 days/year, one can derive a lung cancer mortality risk factor of 1.2 x 10^{-11} per pCi. The EPA cancer slope factor from HEAST for inhalation of Rn-222 plus progeny is 7.7 x 10^{-12} per pCi. The cancer slope factors for radon plus progeny are presented in Table C.4-5. It must be noted that the BEIR IV risk estimate pertains to lung cancer mortality, while the EPA cancer slope factors all pertain to cancer induction rather than cancer fatality.

C.4.4.6 Strontium

Biological Distribution and Retention/Pharmacokinetics

Wenning and Kirsch (1988) reported that the GI absorption of soluble strontium compounds ranges from 5 to 25 percent of the ingested dose and the EPA (1992d) has derived a GI absorption efficiency factor of 0.3. Insoluble strontium compounds are absorbed to about 5 percent. Data regarding inhalation or dermal absorption have not been located.

Strontium is an alkaline earth metal similar in chemical behavior to calcium (Wenning and Kirsch 1988). About 99 percent of the body burden is in the skeleton. Excretion is principally in the urine.

Noncarcinogenic Toxicity

Stable strontium has induced rachitic changes in the bones, particularly of the young (EPA 1992d). Presumably, Sr-90 would also induce rachitic changes in bone. The concern at the FEMP, however, is with the radiological effects (carcinogenicity) of Sr-90, rather than the noncarcinogenic toxicity.

Carcinogenicity

The EPA (1992d) has assigned stable strontium to cancer weight-of-evidence Group D, indicating it is not classifiable as to human carcinogenicity. Quantitative cancer risk estimates were not derived for Group D substances. The EPA classifies all radionuclides as Group A substances (human

carcinogens), based on their characteristic of emitting ionizing radiation and on the extensive epidemiologic data associating exposure with radiogenic cancers in humans (EPA 1992d). The EPA (1992d) has derived cancer potency slope factors for Sr-90, and its radioactive decay product of 3.6 x 10^{-11} per pCi for ingestion and 6.2 x 10^{-11} per pCi for inhalation exposure, and these are presented in Table C.4-5. There is no slope factor for external exposure to Sr-90, which does not emit penetrating radiation (gamma- or x-rays).

C.4.4.7 Technetium

Biological Distribution and Retention/Pharmacokinetics

No isotopes of technetium are stable (Clarke and Podbielski 1988). Lethality due to radiation toxicity usually occurs before the nonradiologic effects of technetium become manifest; hence, little is known of the absorption, distribution or pharmacokinetics of the element.

Noncarcinogenic Toxicity

No isotopes of technetium are stable (Clarke and Podbielski 1988). Lethality due to radiation toxicity usually occurs before the nonradiologic effects of technetium become manifest; hence, little is known of the metabolic effects of the element.

Carcinogenicity

The EPA classifies all radionuclides as weight-of-evidence Group A substances (human carcinogens), based on their characteristic of emitting ionizing radiation and on the extensive epidemiologic data associating exposure with radiogenic cancers in humans (EPA 1992d). The internal carcinogenicity of Tc-99 is due to its emission of beta particles (Clarke and Podbielski 1988). The EPA (1992d) has derived cancer potency slope factors for Tc-99 of 1.3 x 10^{-12} per pCi for ingestion, 8.3 x 10^{-12} per pCi for inhalation, and 6.0 x 10^{-13} per pCi yr/g for external exposure, and these are presented in Table C.4-5.

C.4.4.8 Thorium

Biological Distribution and Retention/Pharmacokinetics

Thorium is a naturally occurring radionuclide. Oxides and hydroxides of thorium are assigned to inhalation Class Y, while all other chemical forms are assigned Class W. It is deposited primarily in bone with a very long half-life (8000 days), and to a lesser extent in the liver and other soft tissues (ICRP 1978).

Noncarcinogenic Toxicity

No toxic effects of exposure to thorium have been documented, and the EPA has not developed an RfD for thorium; therefore, the health hazard for thorium is associated with its potential radiocarcinogenic effects.

Carcinogenicity

The half-life of Th-232 is approximately 10 billion years; thus, the specific activity is relatively low and the rate of decay is slow. Th-232 decays by alpha particle emission, as do most of the progeny in the thorium natural decay series.

Thorium has historically been used as a medical imaging agent, because it is a heavy atom that provides contrast in radiographic imaging. In this role, thorium has been used commercially as Thorotrast, a 25-percent colloidal solution of thorium dioxide. The following discussion of the health effects from thorium exposure is summarized from the report of the BEIR IV Committee on radon and other alpha emitters (NAS 1988).

Thorotrast has been used extensively in the United States, Europe, and Japan as an intravascular contrast agent for cerebral and limb angiography. The human epidemiological evidence from the studies of Thorotrast patients represents the primary source of data from which estimates of risk have been derived (NAS 1988). These data can be used to derive estimates of risk for liver cancer and leukemia; however, such estimates strictly apply only to conditions of intravascular Thorotrast injection. The BEIR IV committee derived a risk estimate of up to 300 x 10^{-6} per rad of alpha particle radiation to the liver. They emphasized that these estimates are for Thorotrast, not thorium, because the dosimetry of other isotopes of thorium differs from that of Th-232 in the Thorotrast colloid form. BEIR IV also derived a risk estimate of up to 60 x 10^{-6} per rad of alpha radiation to bone marrow for leukemia, and a value of up to 120 x 10^{-6} per rad of alpha radiation to the skeleton without marrow for bone cancer (NAS 1988).

In summary, the animal experimental evidence indicates that Thorotrast induces cancers as a result of the radiation dose delivered by the solution. The physical presence of particles in the colloid solution and the chemical effect of the thorium are not likely to influence the induction of cancer (NAS 1988). The EPA derived slope factors are presented in Table C.4-5.

C.4.4.9 Uranium

Biological Distribution and Retention/Pharmacokinetics

In general, uranium compounds are not easily absorbed across the human GI tract. Soluble uranium compounds demonstrate the best absorption. In a study in which patients drank a solution of uranyl nitrate hexahydrate, a water-soluble compound, only 0.5 to 5 percent of the dose was absorbed (Hursh et al. 1969). Recent uranium metabolic models estimated absorption from the GI tract to the blood to be 0.6 percent (Wrenn et al. 1987). Although human data concerning absorption by dermal exposure are sparse, water-insoluble uranium compounds were not absorbed in significant quantities across the skin (Yuile 1973) and are not believed to pose a significant risk to humans by this exposure route.

Once absorbed into the bloodstream, uranium compounds are metabolically converted to uranyl ions. The uranyl ion acts as a ligand in the systemic circulation, binding to the plasma proteins and bicarbonate. Although this uranyl-bicarbonate complex is stable at the pH of the plasma, the pH of urine favors dissociation of the complex. This leaves the uranyl ion free to bind to the tissues in the proximal tubule wall of the nephrons of the kidneys, resulting in cellular necrosis (Leggett 1989).

The kidneys are the only soft tissue that stores uranium in any appreciable quantity and are the main organs of excretion (Hursh and Spoor 1973). Approximately 70 percent of an intake of uranium has been estimated to be excreted by the kidneys within 24 hours of intake (Berlin and Rudell 1979). Uranium that is not excreted is stored in the kidneys and bones. Binding to the bone is believed to be caused by the affinity of uranium for the phosphate groups in the bone structure. The bone surface is the most probable target tissue for exposure to uranium, and bone sarcoma as the carcinogenic effect of concern. Radiocarcinogenic effects, including bone sarcoma and head carcinoma, have also been observed in animals and humans from exposure to isotopes of radium, and studies involving exposure of mice to high specific activity U-232 and U-233 have also revealed an increase in bone sarcomas.

Noncarcinogenic Toxicity

In humans, exposure to uranium leads to nephritis in the kidneys. Data on human exposure to uranium compounds were collected from 1940 to 1960 in acute studies on terminal and volunteer patients. Single injections of 70 to 100 μg/kg of uranium nitrate to terminally ill patients resulted in proteinuria and increased levels of catalase in the urine (Berlin and Rudell 1979; Luessenhop et al. 1958). In another study, patients were given uranyl nitrate injections ranging from 6.3 to 71 μg/kg.

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One of the early signs of renal damage, the appearance of the enzyme catalase in the urine, occurred in patients receiving 55 to 71 μg/kg (Hursh and Spoor 1973; Leggett 1989).

The EPA (1991b) has established an RfD for uranium of 3 x 10^{-3} mg/kg/day. In lieu of a NOAEL, the RfD was based on the LOAEL of 2.8 mg/kg/day (Maynard and Hodge 1949) and an uncertainty factor of 1000. The uncertainty factor accounts for intraspecies and interspecies variability in toxicological response and for the use of the LOAEL rather than an NOAEL. No factor was included for the short duration of the exposure (30 days), because it has been shown that chronic nephrotoxic effects can be adequately characterized with experiments of acute/subacute duration (RAGS Part B). The RfD for uranium is presented in Table C.4-1.

Carcinogenicity

Uranium can induce cancer as a result of intake into the body through inhalation or ingestion pathways. The induction of cancer results when organs and tissues of the body are exposed to alpha particles emitted from decaying uranium atoms. Alpha particles are energetic emissions that cause molecular ionizations in a very dense pattern along a short path through matter. The effect of an alpha particle is highly localized due to the short path length traveled (low penetrability) and the ability of the particle to produce many ionizations. The ionization events cause biological damage believed to be responsible for inducing cells to become cancerous. Although other energetic emissions from radioactive decay of atoms (such as beta particles and gamma rays) also cause molecular ionizations, these radiations do not produce the density of ionizations that alpha particles produce. The dense pattern of ionizations caused by alpha particles and the low penetrability of alpha particles are the factors that determine uranium to be an internal exposure hazard. Alpha particles are not an external exposure hazard because they do not penetrate sensitive tissues from outside the body. The outer layers of the skin stop the alpha particles before they can penetrate and damage sensitive tissues of inner layers.

The type of uranium (i.e., natural, enriched, or depleted) under consideration is important because different types of uranium have different specific activities (the amount of radioactivity per unit mass). The value of the specific activity of the uranium reflects the number of alpha particles emitted per unit mass. This has a direct impact on the magnitude of the radiological dose delivered internally after the uranium enters the body. Naturally occurring uranium and uranium processed from natural uranium is a mixture of U-234, U-235, and U-238. The difference between natural, enriched, and

depleted uranium is defined by the percent U-235 mass enrichment: the higher the U-235 enrichment, the higher the specific activity of the mixture.

Convincing epidemiological evidence of uranium-induced radiocarcinogenic effects in humans is difficult to obtain. Available epidemiological evidence has come from studies of workers involved in uranium mining and milling operations. It has been noted for some time that uranium workers are at risk of increased cancer mortality; however, inhalation of airborne radon progeny rather than uranium particulates is considered the predominant source of radiation damage to the respiratory tract in uranium miners. Simultaneous exposures to radon progeny and other elements present in uranium ore are considered confounding factors in those studies of uranium miners intended specifically to examine the radiological effects of exposure to uranium.

Risk estimation for exposure to uranium is based heavily on the carcinogenic effects of other alpha-emitting radionuclides and on animal experiments involving exposure to uranium. Chronic exposure to uranium should be controlled on the basis of nephrotoxicity more than by radiocarcinogenicity from alpha particle emissions (NAS 1988). Quantification of the risk from chronic exposure to uranium alpha particles cannot be determined from published epidemiological studies because of confounding factors and the limited power of the studies to detect increased rates of cancer incidence or mortality (NAS 1988). Therefore, the BEIR IV Committee's risk estimate for uranium was based on the carcinogenic effects of other alpha emitting radionuclides and animal experiments involving exposure to uranium. The most probable radiogenic effect is an increase in bone sarcomas. The likelihood of sarcomas from exposure to naturally occurring uranium is considered low and demonstrable only if a linear dose-response relationship is assumed (Mays et al. 1985). If the dose-response relationship is quadratic, then virtually no effect would be expected from naturally occurring uranium. Assuming a linear dose-response relationship and a constant nonoccupational uranium intake of 1 pCi/day, then the risk of bone sarcoma induction over a lifetime is estimated to be 1.5×10^{-6} or 1.5 bone sarcomas per million persons (Mays et al. 1985). This is compared to a natural incidence of 750 bone sarcomas in the absence of excess exposure.

Assuming a constant nonoccupational uranium intake rate of 1 pCi/day, an exposure frequency of 365 days/year, and a lifetime of 70 years, then a lifetime uranium intake of nearly 26,000 pCi is calculated. Using the risk factor from Mays (Mays et al. 1985) and dividing by the calculated lifetime intake, a risk factor of 5.9×10^{-11} per pCi can be derived. A comparison of this risk factor

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with the cancer slope factors from HEAST for ingestion of U-234, U-235, and U-238 indicates that the ratios of the HEAST values to the former value are 2.4, 2.2, and 2.2, respectively. The EPA derived cancer slope factors for uranium isotopes are presented in Table C.4-5.

C.4.5 TOXICITY PROFILES: CHEMICALS

The following is a presentation of toxicity information for chemical COCs. The varying level of discussion among the contaminant profiles reflects both the amount of information accessible in the literature about these substances and professional judgement concerning the appropriate level of detail necessary to adequately discuss the toxicity of each substance.

C.4.5.1 Antimony

Pharmacokinetics

Antimony exists in the tri- and pentavalent states (Budavari 1989). The pharmacokinetics of antimony appear to be strongly valence- and species-dependent. Elinger and Friberg (1986a) estimated GI absorption to be at least 15 percent in mice given a single oral dose of labeled trivalent antimony potassium tartrate. This estimate was based on the recovery of labeled antimony in urine and tissues. Actual absorption may have been considerably higher, because GI excretion starts immediately after absorption following an oral dose. The 15 percent absorption efficiency is considered sufficiently conservative and well documented for use in estimating a dermal RfD from the oral RfD.

Although quantitative data were not provided, Elinger and Friberg (1986a) stated that the pulmonary absorption of inhaled trivalent antimony is substantial.

Patterns of tissue distribution of absorbed antimony appear to be largely species-dependent. In humans injected with labeled sodium antimony dimercaptosuccinate, highest amounts of antimony are located in the liver, thyroid, and heart (Elinger and Friberg 1986a). Smelter workers exposed to inhaled antimony compounds retain antimony in their lungs for several years. Single or repeated injections of trivalent or pentavalent antimony in monkeys, dogs, and mice result in highest levels in the kidney, liver, and thyroid. Rats appear to retain higher levels in the blood than do other laboratory animals. In rats, trivalent antimony is retained principally in the erythrocytes (at least 95 percent), but pentavalent antimony is retained principally in the plasma (about 90 percent).

In humans, pentavalent antimony appears to be cleared from the body more efficiently than trivalent antimony (Elinger and Friberg 1986a). Urinary excretion predominates over fecal excretion for both penta- and trivalent antimony, but particularly for pentavalent antimony. In rats and hamsters, urinary excretion predominates for pentavalent antimony and fecal excretion predominates for trivalent antimony.

Noncarcinogenic Toxicity

Chronic oral exposure studies in animal models include two briefly reported lifetime drinking water studies with potassium antimony tartrate in rats and mice that reported reduced longevity in both species and reduced mean heart weight and altered blood chemistry in the rats (EPA 1992d). A verified chronic oral RfD of 0.0004 mg/kg/day was based on the rat study and an uncertainty factor of 1000 (Table C.4-1).

Chronic effects from occupational exposure include irritation of the respiratory tract, pneumoconiosis, pustular eruptions of the skin called "antimony spots," allergic contact dermatitis, and cardiac effects, including abnormalities of the ECG and myocardial changes (Elinger and Friberg 1986a). Cardiac effects were also observed in rats and rabbits exposed by inhalation for six weeks, and in animals (dogs and possibly other species) treated by intravenous injection. Inhalation RfC values are not available from the EPA. The heart, respiratory tract, and skin are the principal target organs for antimony.

Carcinogenicity

Data were not located regarding the human carcinogenicity of antimony. Antimony fed to rats did not produce excess tumors (Goyer 1991), but a high frequency of lung tumors was observed in rats exposed by inhalation to antimony trioxide for one year (Elinger and Friberg 1986a). The EPA (1991c) has not evaluated the carcinogenicity of antimony.

C.4.5.2 Aroclors

Pharmacokinetics

Aroclor-1016, -1221, -1242, -1248, -1254, and -1260 are marketed commercially as PCBs. PCBs were detected in the serum and breast milk of women who consumed PCB-contaminated fish from Lake Michigan, and in the blood of volunteers who ingested PCB mixtures. These detections provide qualitative evidence of GI absorption in humans (ATSDR 1991). In volunteers who ingested PCBs in

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fish, blood levels peaked in approximately 5 hours after the meal and returned to baseline levels 17 hours later, suggesting that absorption is rapid. Quantitative GI absorption studies with rats, monkeys, and ferrets dosed with individual PCB congeners revealed retention of 75 to 95 percent of the administered dose, with some evidence that absorption efficiency may be inversely related to the extent of chlorination. The 75 percent GI absorption efficiency is considered sufficiently conservative and well documented for use in estimating a dermal RfD and cancer slope factor from the respective oral values.

Quantitative inhalation absorption data were not located for humans or animals. ATSDR (1991) reviewed the occupational exposure data presented by Wolff (1985) and concluded that inhalation uptake contributed up to 80 percent of the concentration measured in the adipose tissue of exposed workers. Dermal uptake accounted for the remainder of the concentration. Dermal application studies with PCBs containing 42 and 54 percent chlorine in animals revealed uptakes of 15 to 34 percent of the applied dose in monkeys and 56 percent in guinea pigs (ATSDR 1991). The dosing vehicle appeared to influence absorption; uptake in monkeys was 29 percent from mineral oil and 15 percent from trichlorobenzene.

In humans, PCBs distribute preferentially to adipose tissue (ATSDR 1991). In occupationally exposed workers, the adipose/plasma partition ratio ranged from 185/1 to 210/1. Inhalation and oral exposure data in animals revealed that distribution is biphasic, first to liver and muscle followed by redistribution to adipose tissue. PCB residues were detected in human breast milk and in umbilical cord blood, indicating transfer to the fetus and offspring. Studies conducted on several species suggested that transfer to the offspring is greater through nursing than through placental transfer (ATSDR 1991).

PCB residues in human fat consisted largely of the more highly chlorinated congeners that were substituted in the meta-para vicinal positions, probably because these congeners are relatively more resistant to metabolism (ATSDR 1991). In vitro studies with human microsomes and animal studies indicate that metabolism involves hydroxylation, preferentially at the para position in the least chlorinated phenyl ring. Some PCB congeners were transformed to dihydrodiols, probably through a pathway involving formation of an arene oxide intermediate. The hydroxy derivatives may be conjugated with glucuronide or sulfate for excretion. Considerable interspecies variation was noted in the rate of metabolism of specific PCB congeners.

Animal studies indicate that both fecal and urinary excretion are important in the elimination of PCBs and their metabolites (ATSDR 1991). Lactation represented a major excretory pathway in nursing women, resulting in higher concentrations of PCB residues in infant's blood than in maternal blood. In humans who had consumed PCB-contaminated rice, elimination half-lives from blood for individual PCB congeners ranged from 4 to 24 months, with longer half-lives estimated for those congeners that were more resistant to metabolism.

Noncarcinogenic Toxicity

Targets for PCBs include the skin, liver, fetus, and neonate. Epidemiologic studies of women in the United States have associated oral PCB exposure with low birth weight or retarded musculoskeletal or neurobehavioral development of their infants (ATSDR 1991). Occupational exposure to PCBs has been associated with upper respiratory tract and ocular irritation, loss of appetite, liver enlargement, increased serum concentrations of liver enzymes, skin irritation, rashes and chloracne, and in heavily exposed female workers, decreased birth weight of their infants (ATSDR 1991). However, concurrent exposure to contaminants has confounded the interpretation of the occupational exposure studies. Animal models exposed to Aroclor-1254 vapors by inhalation exhibited moderate liver degeneration, decreased body weight gain, and slight renal tubular degeneration. Neither verified nor provisional chronic inhalation RfC values are available.

Oral studies in animals have established the liver as the target organ in all species, and the thyroid as an additional target organ in the rat. Effects observed in monkeys included gastritis, anemia, chloracne-like dermatitis, and immunosuppression. Oral exposure in animal models induced developmental effects, including retarded neurobehavioral and learning development in monkeys. Neither verified nor provisional chronic oral RfD values were located for any of the Aroclors.

Carcinogenicity

The EPA (1991c) has classified the PCBs as cancer weight-of-evidence Group B2 substances (probable human carcinogens), based on inadequate data for humans but sufficient data for animals. The human data consist of several epidemiologic occupational and accidental oral exposure studies with serious limitations, including poorly quantified concentrations of PCBs and durations of exposure, and probable exposures to other potential carcinogens (EPA 1992d).

PCB congeners vary greatly as to their potency in producing biological effects. There is some evidence that mixtures containing more highly chlorinated biphenyls are more potent inducers of hepatocellular carcinoma in rats than mixtures containing less chlorine by weight (EPA 1993a).

The animal data consist of several oral studies in rats and mice with various Aroclors, Kanechlors or Clophens (commercial PCB mixtures manufactured in the United States, Japan, and Germany, respectively) that reported increased incidence of liver tumors in both species (EPA 1992d). The EPA (1991c) has presented a verified oral slope factor of 7.7 per mg/kg/day for all PCBs, based on liver tumors in rats treated with Aroclor-1260 (Table C.4-2).

C.4.5.3 Arsenic

Pharmacokinetics

Arsenic occurs in compounds in the trivalent and pentavalent forms (Budavari 1989). The extent of the GI absorption of arsenic depends on the particular arsenic compound ingested. Several studies with humans and laboratory animals indicate that the GI absorption of dissolved trivalent or pentavalent arsenic exceeds 90 percent (Ishinishi et al. 1986). Hamsters appear to have somewhat lower (50 to 75 percent) GI absorption of soluble arsenic compounds (ATSDR 1989d). Organic arsenic compounds, which may occur in seafood, are also readily absorbed (70 to 99.7 percent). The GI absorption of less soluble compounds (e.g., arsanilic acid, arsenic trioxide) is determined by particle size, and pH of the gastric juice. An estimate of 95 percent GI absorption efficiency is considered to be sufficiently conservative and well documented for use in estimating a dermal RfD and cancer slope factor from the respective oral values (EPA 1993d).

The extent of absorption of arsenic from the lungs depends on the solubility of the inhaled compound and particle size (ATSDR 1989d; Ishinishi et al. 1986). In a study with arsenite in cigarettes and with arsenic aerosols in lung cancer patients, deposition was estimated at approximately 40 percent, and 75 to 85 percent of the deposited arsenic was absorbed from the lungs within 4 days.

The occurrence of systemic toxic effects following dermal exposure to arsenic acid or arsenic trichloride (Ishinishi et al. 1986) indicates qualitatively that dermal absorption of some arsenic compounds occurs.

In most animals, all but a small fraction of systemic arsenic is rapidly cleared from the blood and other tissues (ATSDR 1989d). Residual arsenic is located in tissues (liver, kidney, spleen, heart, skin, hair, epithelium of the upper GI tract) containing a high concentration of sulfhydryl groups, to which arsenic preferentially binds (Arnold 1988; Ishinishi et al. 1986). In rats, more than in the other laboratory animals and in humans, arsenic binds to the erythrocytes with high affinity and clearance from the blood is slow (ATSDR 1989d).

Arsenic is extensively metabolized, principally in the liver, in humans and animals (ATSDR 1989d). Metabolism involves methylation of trivalent arsenic (arsenite) to dimethylarsinic acid, or, to a lesser extent, to monomethylarsonic acid. Both methylation products, as well as inorganic arsenic, are excreted principally and rapidly through the urine.

Noncarcinogenic Toxicity

The only noncarcinogenic effects in humans clearly attributable to chronic oral exposure to arsenic are dermal hyperpigmentation and keratosis, as revealed by studies of several hundred Chinese exposed to naturally occurring arsenic in well water (EPA 1992d). Similar effects were observed in persons exposed to high levels of arsenic in water in the western hemisphere. Occupational (predominantly inhalation) exposure was also associated with neurological deficits, anemia, and cardiovascular effects (Ishinishi et al. 1986). The EPA (1991c) has presented an RfD of 0.0003 mg/kg/day for chronic oral exposure, based on a NOAEL from the Chinese data and an uncertainty factor of 1 (Table C.4-1). The principal target organs for arsenic are the skin, nervous system, blood and cardiovascular system.

Carcinogenicity

Inorganic arsenic is clearly a carcinogen in humans (EPA 1992d). Inhalation exposure was associated with increased risk of lung cancer in persons employed as smelter workers, in arsenical pesticide applicators, and in a population residing near a pesticide manufacturing plant. Oral exposure to high levels in well water was associated with increased risk of skin cancer. The EPA (1991c) has classified inorganic arsenic in cancer weight-of-evidence Group A (human carcinogen). An inhalation slope factor of 50 per mg/kg/day, based on absorbed arsenic, was derived from occupational data. Applying an absorption factor of 0.3 yielded an inhalation slope factor of 15 per mg/kg/day, based on an ambient or inhaled dose. The slope factor based on the inhaled, rather than absorbed, dose is the correct parameter to use in risk assessments. Assuming a human inhales 20 m^3 of air per day and weighs 70 kilograms, the EPA (1991c) estimated an inhalation unit risk of 0.0043 $\mu g/m^3$. EPA

(1993c) proposed an inorganic arsenic ingestion unit risk of 5.0×10^{-5} per mg/l. The equivalent oral slope factor is 1.8 per mg/kg/day assuming a 70 kg adult ingests 2 liters per day (Table C.4-2). "The uncertainties associated with ingested inorganic arsenic are such that estimates could be revised downward as much as an order of magnitude, relative to the risk estimates associated with most other carcinogens" (EPA 1993c).

C.4.5.4 Beryllium

Pharmacokinetics

Absorption of beryllium from the GI tract is low, probably not exceeding 20 percent of an ingested dose, because the metal forms insoluble precipitates with phosphate and is eliminated in the feces (Reeves 1986).

Clearance of inhaled beryllium is multiphasic; small quantities of beryllium compounds may remain encapsulated in the lung parenchyma for several years (Reeves 1986). Water-soluble forms of beryllium with a pH of 3 are absorbed through the skin of animals (Zorn et al. 1988), but the extent of absorption is probably minimal, because most beryllium salts are insoluble at physiologic pH, and ionized beryllium is readily bound to epidermal contaminants (Reeves 1986).

Most beryllium in the circulation probably exists as a colloidal phosphate adsorbed to serum protein; minor amounts exist as the citrate or hydroxide (Reeves 1986). Distribution of small doses is primarily to the skeleton; for larger doses, distribution is primarily to the liver. Secondary distribution results in movement of beryllium from the liver to the skeleton. The primary route of excretion is through the urine.

Noncarcinogenic Toxicity

Beryllium has a low order of toxicity when ingested because it is poorly absorbed from the GI tract (Reeves 1986). Occupational exposure has induced dermatitis, acute pneumonitis, and chronic pulmonary granulomatosis (berylliosis). Berylliosis was also observed in humans living in the vicinity of a beryllium plant. Pulmonary effects also occurred in laboratory animals subjected to inhalation exposure. A verified chronic oral RfD value of 0.005 mg/kg/day (Table C.4-1) was based on a NOAEL of 0.54 mg/kg/day in a lifetime drinking water study with beryllium sulfate in the rat, and on an uncertainty factor of 100 (EPA 1991c). The target organs for inhalation exposure appear to be the lungs; target organs for oral exposure are not identified.

Carcinogenicity

The EPA (1991c) has classified beryllium in cancer weight-of-evidence Group B2 (probable human carcinogen), based on inadequate human data but sufficient animal data. The human data consist of occupational studies that weakly associate exposure with increased risk of lung cancer, but confounding variables were not controlled and the studies lacked sensitivity. A significant increase in lung tumors occurred in three strains of rats and in rhesus monkeys subjected to inhalation exposure or intratracheal instillation of a variety of beryllium compounds. Osteogenic sarcomas were induced in rabbits and mice, but not in rats or guinea pigs injected intravenously with various beryllium compounds. Oral studies in animal models yielded inconclusive results. The EPA (1991c) derived an oral slope factor of 4.3 per mg/kg/day from a slight but statistically nonsignificant increase in total tumors in a lifetime drinking water study with beryllium sulfate in the rat. An inhalation unit risk of 0.0024 per $\mu g/m^3$, equivalent to 8.4 per mg/kg/day (assuming humans inhale 20 m^3 of air per day and weigh 70 kilograms), was derived from a human occupational study (Table C.4-2).

C.4.5.5 Carbazole

Noncarcinogenic Toxicity

Only the oral LD_{50} in rats for carbazole has been located. The oral LD_{50} in rats is reported to be greater than 5000 mg/kg (EPA 1993d).

The EPA has not derived chronic oral and chronic inhalation reference doses for carbazole.

Carcinogenicity

The EPA has classified carbazole as a cancer weight-of-evidence Group B2 substance (probable human carcinogen) based on the presence of liver tumors in mice that were administered carbazole in their diets. The EPA (1993c) has derived an oral cancer slope factor of 2.0×10^{-2} $(mg/kg/day)^{-1}$ (Table C.4-2).

C.4.5.6 Dieldrin

Toxicity

Dieldrin is toxic to both humans and animals. Clinical observations in humans indicate that the primary symptoms resulting from acute exposure to dieldrin are manifested as neurological and respiratory effects. Dieldrin exposures result in neurological effects which may include central nervous system excitation, convulsions, tremors, ataxia, agitation, nervousness and amnesia.

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Disturbances of sleep, memory and behavior may persist for several days or weeks after the acute phase of poisoning. In extreme overdoses, central nervous system depression may result in death which arises from respiratory depression. Repeated exposures to commercial dieldrin applicators resulted in a syndrome indistinguishable from idiopathic epilepsy which ceased when exposure was terminated (EPA 1994b). In addition, exposure via ingestion may cause nausea, vomiting, and diarrhea. Hematological changes include blood dyscrasia, anemia and leukemia. Dermal exposures result in irritation. Deaths associated with acute dieldrin toxic exposures were not reported. The EPA chronic oral RfD of 5×10^{-5} mg/kg/day is presented in Table C.4-1.

Carcinogenicity

Dieldrin has been classified as a probable human carcinogen (Weight-of-evidence Group B2) based on inadequate human carcinogenicity data and sufficient animal carcinogenicity data (EPA 1994a). Animal carcinogenicity data demonstrate that dieldrin is carcinogenic in both sexes of different strains of mice. Dose response data support these effects as ranging from being liver tumors, to hepatocarcinomas with transplantation confirmation, to pulmonary metastases. In studies in which tumors resulted, hepatocellular tumors were identified most frequently. Human carcinogenicity data are limited to one retrospective study which reported no statistically significant increases in cancer deaths among 1155 organochlorine pesticide manufacturing workers (EPA 1994a). In addition, two studies of workers exposed to aldrin and dieldrin reported no increase in the incidence of cancer. Van Raalte (EPA, 1994a) observed two cases of cancer (gastric and lymphosarcoma) among 166 pesticide manufacturing workers exposed between 4 and 19 years and with additional follow-up from 15 to 20 years. However, exposure was not quantified and workers were exposed to other pesticides (endrin and telodrin). In addition, the population of workers studied was small and the age of the cohort was young and the number of expected deaths was not calculated. Finally, the durations of exposure and latency were relatively short. The EPA oral and inhalation cancer slope factors for dieldrin are 1.6×10^{1} $(mg/kg/day)^{-1}$ and are presented in Table C.4-2.

C.4.5.7 Polycyclic Aromatic Hydrocarbons

Pharmacokinetics

Several rat studies indicate considerable chemical-specific variation in PAH pharmacokinetics (ATSDR 1989c). GI absorption is enhanced by solubilizing the chemical in a readily absorbed vehicle such as oil. Jones and Owen (1989) reported a range of 43 to 58 percent for the GI absorption of benzo(a)pyrene. The lower end of this range, 43 percent, is considered sufficiently

conservative and well documented to use in estimating dermal RfDs and cancer slope factors from the respective oral values for all the EPA Group B PAHs.

The identification of metabolites of PAHs in the urine of occupationally exposed humans is qualitative evidence that respiratory tract uptake occurs, although quantitative uptake data were not located (ATSDR 1989c). Studies in rats indicate that pulmonary absorption of benzo(a)pyrene is rapid. PAHs carried by insoluble particulate matter, however, would be retained in the lung longer than pure PAHs. Human and animal studies suggest considerable chemical-specific variation in dermal absorption. Quantitative estimates in animals treated with radiolabeled compounds range from 33 percent for dibenzo(a,h)anthracene to 93 percent for benzo(a)pyrene.

Inhalation and oral studies in animals with radiolabeled benzo(a)pyrene indicate that distribution of absorbed material is primarily to the lipid fractions of the liver, lung, kidney, and GI tract, with redistribution to the protein fractions of these organs (ATSDR 1989c). Once absorbed, benzo(a)anthracene, dibenzo(a,h)anthracene, and chrysene are rapidly and widely distributed in orally treated rats. There is considerable chemical-specific variability in the distribution of the PAHs to the fetuses of pregnant rats.

Studies of the metabolism of benzo(a)pyrene provide information relevant to other PAHs, because of the structural similarities of all members of the class. Metabolism involves microsomal mixed function oxidase hydroxylation of one or more of the phenyl rings with the formation of phenols and dihydrodiols, probably via formation of arene oxide intermediates (ATSDR 1989c). The dihydrodiols may be further oxidized to diol epoxides, which, for certain members of the class, are known to be the ultimate carcinogens (EPA 1992c). Conjugation with glutathione or glucuronic acid and reduction to tetrahydrotetrols are important detoxification pathways. Metabolism of naphthalene results in the formation of 1,2-naphthoquinone, which induces cataract formation and retinal damage in rats and rabbits.

Excretion of benzo(a)pyrene is principally through the bile, although there seems to be considerable species variation in the pattern (biliary versus urinary) and rate of excretion (ATSDR 1989c). Urinary excretion predominates slightly in rats treated dermally with anthracene.

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Noncarcinogenic Toxicity

A single exposure to PAHs has been associated with a number of toxic effects. The acute lethal toxicity of PAHs ranges from 250 mg/kg for the most potent to 700 mg/kg for the least potent. However, most exposure situations will involve a mixture of PAHs; it is impossible to determine whether the acute lethal toxicity for a mixture will lie between these values of whether toxicity will be additive. In addition, these data were obtained following parenteral administration, a step which bypasses metabolism in the liver; therefore, their relevance to human exposure is questionable.

Carboxylesterase activity of the intestinal mucosa was decreased in rats following intragastic administration of 50 or 150 mg/kg/day benzo(a)anthracene or benzo(a)pyrene for 4 days; enzyme activity was increased following oral exposure to 100 mg/kg/day of anthracene or phenanthrene (ATSDR 1990).

Bone marrow depression (aplastic anemia and pancytopenia) leading to death was observed in mice whose AHH enzyme was not inducible following oral administration of 120 mg benzo(a)pyrene/kg/day for 180 days (ATSDR 1990).

Several hepatic effects (enzyme and foci induction, liver regeneration and increased weights) have been observed in animals administered PAHs. These effects are not life-threatening but may precede the onset of more serious effects. A single intragastric administration of 200 mg/kg of benzo(a)pyrene, benzo(a)anthracene or dibenz(a,h)anthracene induced the formation of preneoplastic hepatocytes in a promotion/initiation bioassay in partially hepatectomized rats fed 2-acetylaminofluorene (ATSDR 1990). PAHs stimulate liver regeneration in partially hepatectomized rats following administration in the diet for 10 days. Noncarcinogenic PAHs required higher doses (ATSDR 1990).

Immunotoxic effects have been observed following dermal and parenteral administration in animals. PAHs that are carcinogenic are also immunosuppressive with the same rank order of potency (ATSDR 1990). Effects observed have included inhibition of t-cell dependent and independent antibody production and inhibition of lymphocyte mediated immunity (ATSDR 1990).

There is no information on the developmental effects of exposure to PAHs in humans (ATSDR 1990).

In animals, in utero exposure to benzo(a)pyrene (10, 40, or 160 mg/kg/day orally during gestation) was associated with reduced mean postnatal pup weight and increased incidence of sterility associated with alterations in gonadal morphology and germ-cell development in male mice (ATSDR 1990). An observed increased incidence of stillborns, resorptions and malformations following dietary administration of 120 mg benzo(a)pyrene/kg/day to the dam was associated with the metabolic responsiveness of the offspring and the dams (ATSDR 1990). Parental administration of a number of PAHs has been associated with a number of development effects: stillbirths, increased fetal resorptions, malformations, adverse gonadal histology, and decreased fetal survival.

There is no information on the effect of PAH on reproduction in humans (ATSDR 1990).

Benzo(a)pyrene decreased the percentage of pregnant females at parturition in pregnant CD-1 mice (ATSDR 1990) and reduced the incidence of pregnancy in rats (ATSDR 1990) but had no effect on fertility of Swiss mice (ATSDR 1990). Decreased numbers of corpora lutea, uterine weights and fetal survival and increased resorptions were observed following parenteral administration of benzo(a)pyrene (ATSDR 1990). The implications of the results obtained following parenteral administration, which bypasses first-pass metabolism of the liver, to human exposure are that adverse effects on reproduction are possible.

Numerous PAHs have been tested in numerous in vitro and in vivo genotoxicity studies (ATSDR 1990). In general, several PAHs demonstrated genotoxic potential that required metabolic activation. Benzo(a)pyrene produced several genotoxic effects: DNA binding/damage, sister chromatic exchange, chromosomal aberration, cell transformation; effects were observed in bacteria and mammalian (both somatic and germ) cells. DNA damage was also observed in human cells. Acenaphthene, acenaphtylene or fluorene were negative for genotoxic effects and anthracene, phenanthrene and pyrene were negative in all but one in vitro test.

Carcinogenicity

Dermal exposure to benzo(a)pyrene in humans was associated with epidermal changes indicative of neoplastic proliferation, chronic dermatitis and hyperkeratosis or exacerbation of pre-existing skin lesions (ATSDR 1990). Topical application of PAHs have been associated with adverse effects in animals, including skin cancer, and on sebaceous glands, increased skin melanocytes, dermal inflammation, allergic contact hypersensitivity and photosensitization (ATSDR 1990).

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Epidemiologic studies of humans exposed to coke-oven and roofing-tar emissions and cigarette smoke have demonstrated an increase in mortality due to lung cancer (ATSDR 1990). Skin tumors have been reported among individuals exposed to mixtures containing PAHs: scrotal cancer among chimney sweeps and skin cancer following exposure to shade oils (ATSDR 1990). These mixtures contain PAHs and several other potentially carcinogenic chemicals, tumor promoters, initiators and cocarcinogens. This concomitant exposure prevents a direct causal relationship to PAHs.

Inhalation, oral and dermal exposure to PAHs have been associated with carcinogenic effects in animals (ATSDR 1990). These studies suggest that the site of tumor induction is influenced by the route of administration. Following inhalation exposure, an increased incidence of respiratory tract tumors was observed. Benign and malignant tumors, adenomas, papillomas, neoplasms, and carcinomas of the lung, alimentary tract (particularly the forestomach), and mammary glands were observed following ingestion of benzo(a)pyrene, benzo(a)anthracene and dibenz(a,h)anthracene by rodents. A dose-responsive increase in the incidence of forestomach papillomas and carcinomas was observed in mice following dietary administration of 33.3 mg/kg/day benzo(a)pyrene for 30 to 197 days (ATSDR 1990). The overall evidence suggests that exposure to PAHs is associated with an increased risk of cancer.

Benzo(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene, chrysene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene have been demonstrated to induce skin tumors in mice following dermal exposure (ATSDR 1990). Benzo(a)pyrene, in particular, is a potent experimental skin carcinogen. It is often used as a positive control in carcinogenesis bioassays. The dose-response relationship of benzo(a)pyrene and skin tumors has been investigated in a number of studies (ATSDR 1990). Benzo(a)pyrene has been demonstrated to induce malignant skin tumor at exposures as low as 0.0054 mg/kg/day; however, the solvent and strain of mouse tested will influence the tumorigenic dose (ATSDR 1990).

Recent reevaluations of the carcinogenity and mutagenicity of the Group B2 PAHs suggest that there are large differences between individual PAHs in cancer potency (Krewski et al. 1989). A recent toxicity equivalency factor (TEF) approach for the weight-of-evidence Group B2 PAHs was based on the induction of lung epidermoid carcinomas in female Osborne-Mendel rats in lung-implantation experiments (Clement International 1990). The TEFs and the associated oral and inhalation slope factors are presented in Table C.4-3.

The following subsections present profiles of individual PAHs.

Benzo(k)fluoranthene

In a lifetime study in female rats, lung implants of 0.65, 3.4, or 17 mg/kg benzo(k)fluoranthene exhibited a dose-related increase in the incidence of epidermoid carcinomas in the lung and thorax. Equivocal incidences of lung adenomas and hepatic adenomas and hepatomas were reported in mice administered intraperitoneal injections of 120 μg benzo(k)fluoranthene/mouse on days 1, 8, 15 of age (EPA 1993a). Benzo(k)fluoranthene was positive in mouse skin-painting assays (EPA 1993a). Based on these data, the EPA has classified benzo(k)fluoranthene as a weight-of-evidence probable human carcinogen (Class B2).

Benzo(b)fluoranthene

In a lifetime study using female rats, lung implants of 0.4, 1.2, or 4.1 mg/kg benzo(b)fluoranthene exhibited a dose-related increase in the incidence of epidermoid carcinomas and pleomorphic sarcoma in the lung and thorax. Equivocal incidences of lung adenomas and hepatic adenomas and hepatomas were reported in mice administered intraperitoneal injections of 126 μg benzo(b)fluoranthene/mouse on days 1, 8 , 15 of age (EPA 1993a). Injection site sarcomas were observed in mice administered subcutaneous injections of benzo(b)fluoranthene (2.6 mg total dose) over 2 months (ATSDR 1990). Benzo(b)fluoranthene was positive for complete carcinogenesis and initiation in mouse skin-painting assays (EPA 1993a). Based on these data, EPA has classified benzo(k)fluoranthene as weight-of-evidence B2 probable human carcinogen.

Benzo(a)pyrene

There are multiple animal studies demonstrating increased incidence of carcinogenic effects following oral, intratracheal, inhalation and dermal administration of benzo(a)pyrene. Benzo(a)pyrene has been shown to be an initiator and a complete carcinogen following dermal application (EPA 1993a). A dose-responsive increase in squamous cell papillomas and carcinomas of the forestomach was observed following oral administration of 1 to 250 ppm benzo(a)pyrene to rats and hamsters for 197 days (EPA 1993a). The incidences of respiratory tract and upper digestive tract tumors were increased following intratracheal instillation or inhalation of benzo(a)pyrene by guinea pigs, hamsters and rats (EPA 1993a). Inhalation exposure of hamsters to benzo(a)pyrene at 9.5 mg/m^3/day for 10 weeks was associated with development of tumors of the nasal cavity, larynx, trachea and pharynx. At the next highest dose, 45 mg/m^3/day, neoplasms were also observed in the upper digestive tract.

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The lowest dosed, 2.2 mg/m^3/day, animals did not develop tumors (EPA 1993a). Intraperitoneal and subcutaneous injection of benzo(a)pyrene is associated with injection site tumors (EPA 1993a). The EPA has classified benzo(a)pyrene as a probable human carcinogen, based on the existence of sufficient animal data, but the absence of human data. The EPA has calculated an oral slope factor of 7.3 (mg/kg/day)$^{-1}$ and an inhalation slope factor of 6.1 (mg/kg/day)$^{-1}$.

Benzo(a)anthracene

Increased incidence of pulmonary tumors and hepatomas was observed in mice following oral gavage with 500 mg/kg/day benzo(a)anthracene 3 times/week for 5 weeks (EPA 1993a). A single gavage dose of 0.5 mg benzo(a)anthracene was not tumorigenic while multiple gavage treatments (8 or 16 over 16 months) resulted in forestomach papillomas (EPA 1993a). Following intraperitoneal injection of benzo(a)anthracene on days 1, 8, and 15 of age (638 μg/mouse total dose), the incidence of liver adenomas or carcinomas was increased in treated male mice while the incidence of pulmonary adenomas or carcinomas was increased in treated females (EPA 1993a). Benzo(a)anthracene was positive as a complete carcinogen and as an initiator in mouse skin painting bioassays (EPA 1993a). Injection site sarcomas were observed following subcutaneous or intramuscular injection of benzo(a)anthracene (EPA 1993a). EPA has classified benzo(a)anthracene as a weight-of-evidence B2 probable human carcinogen.

C.5.0 FATE AND TRANSPORT MODELING

For this FS risk assessment, human-health risks were estimated for remedial action and postremedial action (residual) conditions. Prior to completing these risk estimates, the COC concentrations at receptor locations were predicted using computer models. These models begin with emission sources and then simulate the transport of COCs through the various environmental media, such as air, soil, and groundwater, to the receptor end points. The objective of these modeling efforts is to predict the concentrations of each COC during a specific activity and for a specified duration at selected receptor locations. The results are termed "exposure point concentrations" and are used in the risk equations shown in Section C.3.0 (risks are shown in Sections C.6.0 and C.7.0).

Section C.5.1 describes the modeling efforts conducted for COC transport during the implementation of remedial activities. Section C.5.2 discusses the postremediation modeling of Operable Unit 2 for residual sources.

C.5.1 REMEDIAL ACTION MODELING

The mechanisms modeled for COC transport during remedial activities include air dispersion, direct radiation from soil or waste material, and transportation scenarios for soil and waste. All steps (i.e., remedial activities) required for each remedial alternative were identified. Activities were evaluated for their potential to cause worker and/or public exposure. The activities involving the highest potential for risk were then selected to represent the bounding conditions to which receptors would be exposed. Activities not specifically evaluated represent risks that constitute only a small fraction of the risk represented by the evaluated activities. Figure C.5-1 presents the various potential health hazards by remedial activity and alternative. Shading indicates which emissions were quantified as part of this FS. The assumptions presented in Tables C.5-1 and C.5-2 were used as a basis for the modeling. Each activity was conservatively modeled to include reasonable variations. The computer codes used are all industry-standard models:

- MICROSHIELD, for direct radiation
- RADTRAN 4, for transportation
- ISCLT2, Dust Loading and Resuspension Rate Equation, RAECOM, Near Field Box Model, and a VOC model, for airborne concentrations

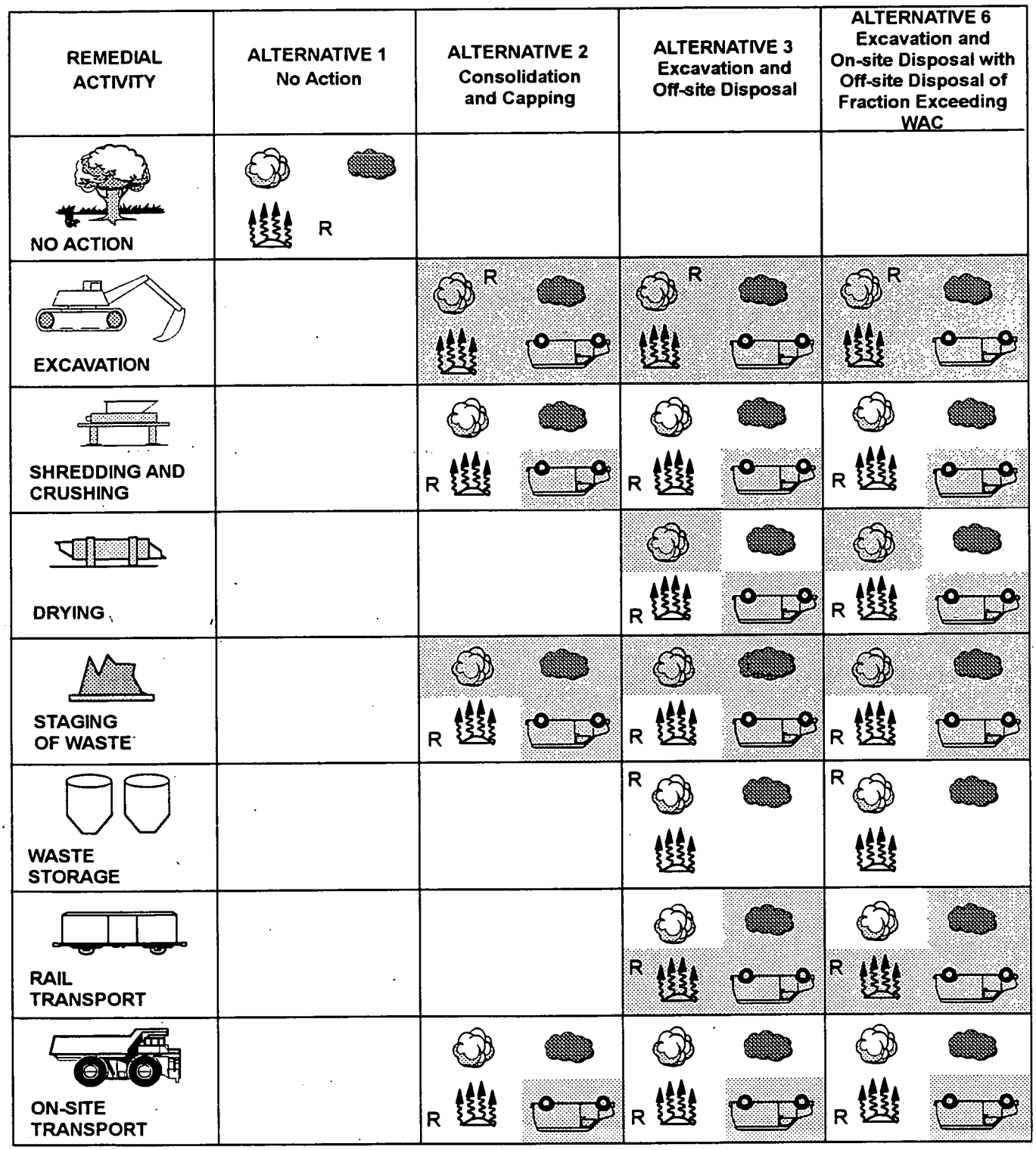

FIGURE C.5-1
POTENTIAL IMPACTS FROM REMEDIAL ACTIVITIES

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TABLE C.5-1

SUMMARY OF AIR MODELING ASSUMPTIONS

SCENARIO	ASSUMPTION/ASSUMED VALUE
Excavation	
Receptors	Remediation workers Nonremediation worker Public
Exposure Duration	10 hr/day (All receptors)
Exposure Pathways and Sources	
Direct Radiation	Remediation worker: immersion, direct
Airborne	Remediation worker: inhalation from air loading at 600 $\mu g/m^3$
Soil Composition	
Density	Source strength - 1.7 gm/cm^3 Self-shielding - 1.5 gm/cm^3
COC Concentration	Actual by subunit (see Table C.5-4)
Shielding for Receptors	
Remed. worker (Equip. operators	Equipment cab
Other workers, Public	NA
On-Site Transport (Truck)	
Receptor	Remediation worker
Exposure Duration	60% of 10 hr/day
Shielding for Receptor	None
Source Volume	Fully loaded truck 15.3 m^3 (540 ft^3)
Soil Composition, COC concentration	See excavation scenario (above)
Staging of Waste, Shredding and Crushing	
Exposure not quantified	Remediation worker would be exposed to COC concentration 2 orders of magnitude less than excavation air concentrations.
Drying	
Receptor	VOC exposure for the nonremediation worker and public
Source Volume	All vaccine feed material is released
Waste Storage	
Receptor	Remediation worker
Source volume	Maximum volume of single silo: 602m^3 (21260 ft^3)
Exposure pathways	Direct radiation
Shielding to receptor	None
Location of silos to receptor	Silo location 6.1m (20 ft) above work area
Source Term	To account for segregation, 2 x 95% UCL values (see Table C.5-4)
Exposure Duration	See excavation scenario (above)

TABLE C.5-2
SUMMARY OF ASSUMPTIONS
USED IN RAIL TRANSPORTATION MODELING

SCENARIO	ASSUMPTION/ASSUMED VALUE
Source Term	To account for segregation, 2 x 95% UCL values (see Table C.5-4)
Receptors	Remediation worker Railroad worker Public
Source Volume	100 tons, 54.3 m^3/Gondola
Number of Gondolas	159 Gondolas
Gondola Shielding	.64 cm (1/4") steel including covers
Miles Traveled	1913 miles

C.5.1.1 Air Fate and Transport Modeling

The primary mode of COC exposure during the implementation of remedial alternatives is through air. COCs are disturbed and/or emitted from various sources and transported through the air, eventually reaching the receptor. Airborne COCs can affect receptors through inhalation or radiation exposure from immersion in air. This section presents the major emission sources that would exist during remedial activities, the technical approach to quantifying the impact of these sources on the ambient air concentrations, and the subsequent exposure point concentrations for each receptor. Figure C.5-2 presents a sequential block diagram of the methodology used to calculate ambient air concentrations and receptor exposure concentrations. Table C.5-3 describes the air models used.

Air Modeling Technical Approach

Releases to the air include particulate emission (radionuclide, organics, and inorganics) and gaseous emissions (VOCs and radon). As shown in the remedial action conceptual models (Section C.2.2), airborne COCs would be generated during the remedial activities of soil excavation, soil drying, and staging-area soil handling and moving activities. The following discussion describes the models used to quantify receptor exposure concentrations.

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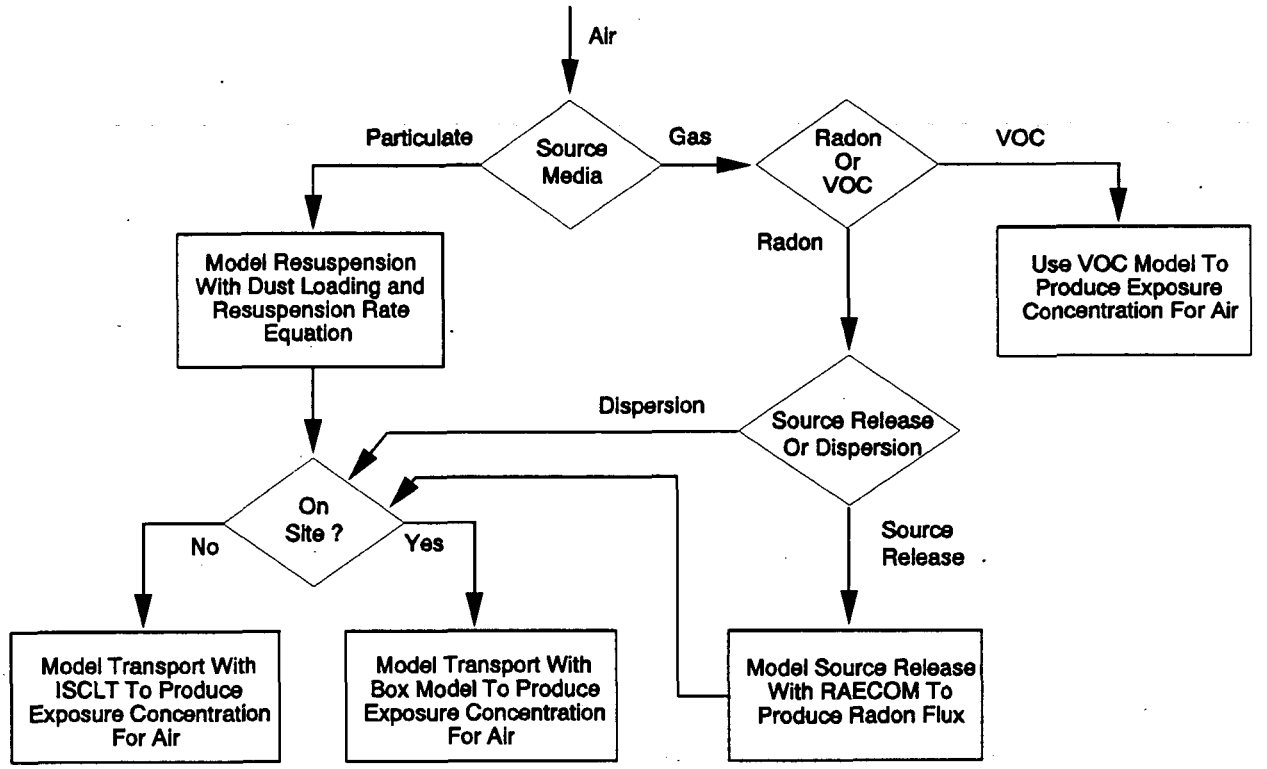

VOC = Volatile Organic Compound

FIGURE C.5-2
REMEDIAL RISK AIR MODELING METHODOLOGY

The air concentrations to which these receptors would be exposed were used in the equations presented in Section C.3.1 to determine the effective dose equivalent of radionuclides or chemical intake for the receptor. The calculated intakes and doses were then used to determine carcinogenic risk and noncarcinogenic HIs (see Section C.6.0).

TABLE C.5-3
SUMMARY OF AIR MODELS USED TO DETERMINE AIR CONCENTRATIONS AND RECEPTOR EXPOSURE CONCENTRATIONS

Model	Description
Dust Loading and Resuspension Rate Equation	Used to estimate exposure concentrations of COC in air for workers involved in remediation activities at the COC release point. A dust loading factor of 600 mg/m^3 was used for all OU2 excavation and soil moving/handling activities.
RAECOM	Computer model developed by the NRC (NRC 1984) to simulate the emission of Rn-222 gas from soil and material containing Ra-226. RAECOM was used in this modeling effort to estimate the Rn-222 emission rate.
ISCLT2	Computer model developed by the EPA (EPA 1992e) to simulate the dispersion of gas-phase and particulate-phase COCs emitted to the atmosphere. ISCLT2 was used in this modeling effort to predict the airborne concentrations of COCs emitted during remedial activities.
Near Field Box Model	Used to calculate air concentrations on site adjacent to the release point.
VOC Model	Used to estimate an average emission rate of a VOC based on the total mass of a given COC on site and the duration of the clean up.

SOURCES:

EPA 1992e for ISCLT2.
NRC 1984 for RAECOM.

PM_{10} Sources and Emission Rates

PM_{10} releases would be generated during soil excavation, and soil handling and moving at staging areas: Two staging areas would be operating simultaneously during the remediation of Operable Unit 2. This would result in PM_{10} emissions being generated from two excavation areas, and the dumping of excavated soil into two staging area piles (one pile for each staging area).

Using a dust loading factor, correlation can be made between the concentration of COCs in the soil to the concentration of COCs in the air. This factor is a measure of the mass of soil in a unit volume of air. Dust loading factors for various activities are presented in the RAWPA (DOE 1992). A dust loading factor of 600 μg/m^3 was used to calculate a COC concentration in air. Subunit-specific

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subsurface soil concentrations (as opposed to surface concentrations) were used in this analysis since a majority of excavated volumes would consist of subsurface soil. COC soil concentrations are based on the 95 percent UCL values. These concentrations are listed in Table C.5-4. Table C.5-5 lists the COC concentrations in air for each subunit.

The equations used to calculate a COC air concentration from its soil concentration are given below:

$$\text{(radionuclides) } C_a = (D_1)(C_S) \quad \text{(C.5-1)}$$

$$\text{(chemicals) } C_a = (D_1)(C_S)(CF) \quad \text{(C.5-2)}$$

where

C_a = COC concentration in air (pCi/m^3 or mg/m^3),
D_1 = dust load factor (g of soil/m^3 of air = 600 mg/m^3),
C_s = COC concentration in soil (pCi/g or $\mu g/g$), and
CF = conversion factor (10^{-3} $mg/\mu g$).

VOC Emission Rates

The following discussion and equations are taken from the *Air/Superfund National Technical Guidance Study Series: Estimation of Air Impacts for the Excavation of Contaminant Soil* (EPA 1992f).

Gaseous emissions from soil handling operations result from the exchange of COC-laden soil-pore gas with the atmosphere when soil is disturbed and from diffusion of COCs through the soil. There are multiple potential emission points for various soil handling operations. For excavation, the main emission points of concern would be emissions from:

- Exposed waste in the excavation pit
- Material as it is dumped from the excavation bucket
- Waste/soil in short-term storage piles

The average emission rate (ER) from excavation is equal to the sum of emission rates from the soil pore space (ER_{PS}) and from diffusion (ER_{DIFF}):

$$ER = ER_{PS} + ER_{diff} \quad \text{(C.5-3)}$$

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TABLE C.5-4

COCs SUBSURFACE SOIL CONCENTRATIONS (95% UCL)

COC	Solid Waste Landfill	Lime Sludge Ponds[a]	South Field/ Inactive Flyash Pile[a]	Active Flyash Pile
Chemicals (mg/kg)				
Antimony	22.000	23.200	18.700	2.000
Aroclor-1254	0.048	0.043	0.430	NA
Aroclor-1260	0.077	NA	0.089	NA
Arsenic	13.800	6.777	12.060	64.27
Benzo(a)pyrene[b]	10.72	0.190	0.180	NA
Beryllium	1.075	1.267	1.438	3.375
Carbazole	4.200	NA	0.001	NA
Dieldrin	NA	NA	0.016	NA
Radionuclides (pCi/g)				
Cs-137	0.250	0.168	0.237	NA
Np-237	0.351	0.323	0.300	0.450
Pu-238	0.328	0.199	0.040	0.123
Ra-226	1.550	1.562	2.919	5.240
Ra-228	2.560	1.800	1.656	4.336
Sr-90	1.580	0.841	1.360	0.964
Tc-99	0.754	1.050	0.900	NA
Th-228	3.390	1.540	1.704	5.790
Th-230	12.300	8.381	4.263	5.717
Th-232	3.590	1.070	1.531	3.866
U-234	97.000	6.176	30.19	8.903
U-235	9.93	0.435	18.460	4.720
U-238	170.000	7.468	32.300	6.911
U-Total	446.000	22.198	104.400	29.960

NA = Not Applicable

[a]Values for South Field and Inactive Flyash Pile are identical.

[b]PAH COCs have been expressed as benzo(a)pyrene equivalents using the toxicity equivalency factor approach (Clement International, 1990). In this approach, benzo(a)pyrene has a relative potency of 1.0 and other PAHs are expressed as benzo(a)pyrene equivalents.

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TABLE C.5-5
COC AIR CONCENTRATIONS FOR EACH SUBUNIT

COC	Solid Waste Landfill	Lime Sludge Ponds	South Field/ Inactive Flyash Pile[a]	Active Flyash Pile
Chemicals ($\mu g/m^3$)				
Antimony	1.32×10^{-2}	1.39×10^{-2}	1.12×10^{-2}	1.20×10^{-3}
Aroclor-1254	2.88×10^{-5}	2.58×10^{-5}	2.58×10^{-5}	---
Aroclor-1260	4.62×10^{-5}	---	5.34×10^{-5}	---
Arsenic	8.28×10^{-3}	4.02×10^{-3}	7.24×10^{-3}	3.86×10^{-2}
Benzo(a)pyrene[b]	6.43×10^{-3}	1.13×10^{-4}	1.10×10^{-4}	---
Beryllium	6.45×10^{-4}	7.60×10^{-4}	8.63×10^{-4}	2.03×10^{-3}
Carbazole	2.52×10^{-3}	0.00×10^{0}	6.00×10^{-7}	---
Dieldrin	---	---	9.60×10^{-6}	---
Radionuclides (pCi/m^3)				
Cs-137	1.50×10^{-4}	1.01×10^{-4}	1.42×10^{-4}	---
Np-237	2.11×10^{-4}	1.94×10^{-4}	1.80×10^{-4}	2.70×10^{-4}
Pu-238	1.97×10^{-4}	1.19×10^{-4}	2.40×10^{-5}	7.38×10^{-5}
Ra-226	9.30×10^{-4}	9.37×10^{-4}	1.75×10^{-3}	3.14×10^{-3}
Ra-228	1.54×10^{-3}	1.08×10^{-3}	9.94×10^{-4}	2.60×10^{-3}
Sr-90	9.48×10^{-4}	5.05×10^{-4}	8.16×10^{-4}	5.78×10^{-4}
Tc-99	4.52×10^{-4}	6.30×10^{-4}	5.40×10^{-4}	---
Th-228	2.03×10^{-3}	9.24×10^{-4}	1.02×10^{-3}	3.47×10^{-3}
Th-230	7.38×10^{-3}	5.03×10^{-3}	2.56×10^{-3}	3.43×10^{-3}
Th-232	2.15×10^{-3}	6.42×10^{-4}	9.19×10^{-4}	2.32×10^{-3}
U-234	5.82×10^{-2}	3.71×10^{-3}	1.81×10^{-2}	5.34×10^{-3}
U-235	5.96×10^{-3}	2.61×10^{-4}	1.11×10^{-2}	2.83×10^{-3}
U-238	1.02×10^{-1}	4.48×10^{-3}	1.94×10^{-2}	4.15×10^{-3}
U-Total	2.68×10^{-1}	1.33×10^{-2}	6.26×10^{-2}	1.80×10^{-2}

[a]Values for South Field and Inactive Flyash Pile are identical.
[b]PAH COCs have been expressed as benzo(a)pyrene equivalents using the toxicity equivalency factor approach (Clement International, 1990). In this approach, benzo(a)pyrene has a relative potency of 1.0 and other PAHs are expressed as benzo(a)pyrene equivalents.

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The variables ER_{PS} and ER_{DIFF} were calculated using the following equations:

$$ER_{PS} = \frac{(P)(MW)(10^6)(E_a)(Q)(ExC)}{(R)(T)} \quad \text{(C.5-4)}$$

$$E_a = 1 - \left[\frac{B-(B)(M_{FRAC})}{P}\right] \quad \text{(C.5-5)}$$

$$K_{eg} = \frac{1}{COC_T} \quad \text{(C.5-6)}$$

where

COC_T = number of VOCs + radon
= 4 Solid Waste Landfill
= 3 Lime Sludge Ponds
= 5 South Field/Inactive Flyash Pile

$$D_e = \frac{D_a(E_a)^{3.33}}{(E_T)^2} \quad \text{(C.5-7)}$$

The term ExC in Equation C.5-4 is the fraction of the VOC in the pore space that is emitted to the atmosphere during excavation. All variables are defined in Table C.5-6. Values of molecular weight, vapor pressure at 25°C, and diffusivity in air at 25°C are given in Table C.5-7. Equation C.5-4 is based on the assumption that the soil pore gas is saturated with the COC of interest.

The results of the calculations to determine VOC emissions are presented in Table C.5-8. After the total VOC emission rates due to excavation and soil handling were calculated, the Nearfield Box Model was used to estimate the air exposure concentration for the remedial worker. The calculation is shown in Table C.5-9.

Dryer VOC Emission Rates

Gaseous emissions from the dryer would be very low because of the high boiling temperatures and low vapor pressures of PAHs, Aroclors (PCBs), and the insecticide dieldrin. To quantify gaseous emissions from the dryer, it was assumed that soil agitation by the rotary kiln dryer (assumed operating temperature of 120 to 150°C) would release the contaminant-laden soil pore gas to the off-

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gas system and then to the atmosphere. The off-gas system would have dust controls which reduce particulate emissions to an insignificant rate. Gaseous emissions would be released in a submit-specific ratio of pore space emissions to total quantity of COC available for release. This ratio was multiplied by the COC soil concentration and the dryer process rate to determine the gaseous emission rate of the COC. The maximum receptor unit concentrations (based on a unit emission rate of 1 g/s, from ISCLT2 modeling) for each dryer were added and multiplied by the COC gaseous emission rate to determine a maximum receptor exposure concentration for a COC. Table C.5-10 lists the calculations used to determine receptor concentrations. COC properties are listed below. Values were taken from the Hazardous Chemicals Desk Reference Lewis 1991).

COC	Boiling Point	Melting Point	Miscellaneous
Aroclor-1254, -1260	340-375°C	---	---
Benzo(a)pyrene	310-312°C @10mm Hg	179°C	Insoluble in water
Carbazole	354.8°C	244.8°C	Vapor pressure: 400 mm Hg @323.0°C
Dieldrin	---	150°C	Insoluble in water

Radon Emission Rates

The emission rate of Rn-222 from diffusion was determined from Ra-226 soil concentrations using the RAECOM model developed for the NRC (NRC 1984). The model accounts for the half-lives of Rn-222 and Ra-226 as well as the density, porosity, moisture content, and depth of contaminated layers and over layers in estimating a Rn-222 exit flux. Multiplying the exit flux by the diffusion area results in an emission rate. Calculated exit fluxes are summarized below. RAECOM input files and a sample output are presented in Attachment C.I. The diffusion area was assumed to be 150m^2. Table C.5-8 lists the Rn-222 diffusion emission rate for all subunits.

Subunit	RAECOM Exit Flux (pCi/m^2/s)
Solid Waste Landfill	.7209
Lime Sludge Ponds	.7209
South Field/Inactive Flyash Pile	1.352
Active Flyash Pile	2.433

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TABLE C.5-6
INPUT VARIABLES FOR EMISSIONS EQUATIONS

Variable	Definition	Units	Value
P	Vapor pressure	mm Hg	COC-specific
MW	Molecular weight	g/g-mol	COC-specific
R	Gas constant	mm Hg-cm^3/g-mol °K	62,361
T	Temperature	°K	298
E_a	Air-filled porosity	Dimensionless	0.440
S_v	Volume of soil moved	m^3	Area-specific
Q	Excavation rate	m^3/sec	0.01
10^6	Conversion factor	cm^3/m^3	—
ExC	Soil-gas to atmosphere exchange constant	Dimensionless	0.1
C	Concentration in soil	g/cm^3	COC-specific
10,000	Conversion factor	cm^2/m^2	—
SA	Emitting surface area	m^2	Assumed 150 m^2
K_{eq}	Equilibrium coefficient	Dimensionless	COC-specific
k_g	Gas-phase mass transfer coefficient	cm/sec	0.15
π	Pi	Dimensionless	3.14
E_T	Total porosity	Dimensionless	0.43
t	Time[a]	sec	-
D_e	Effective diffusivity in air	cm^2/sec	COC-specific
M	Total mass of COC	g	COC-specific
Other Variables Required to Calculate Certain Variables Listed Above			
t_{sv}	Time to excavate a given volume of soil	sec	—
β	Bulk density	g/cm^3	1.5
ρ	Particle density	g/cm^3	2.65
D_a	Diffusivity in air	cm^2/sec	COC-specific
U	Wind speed	m/sec	2.0
μ_a	Viscosity of air	g/cm-sec	1.81×10^{-4}
d_e	Diameter of excavation	m	Area-specific

[a]See Page 11 of Appendix A for discussion of time term.

SOURCE: EPA (1992f), RAWPA, standard chemical reference manuals, and EPA review comments of other Operable Unit RAs.

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TABLE C.5-7
INPUT VARIABLES FOR EMISSIONS CALCULATIONS

COC[a]	Molecular Weight (g/g mole)	Vapor Pressure at 25°C (mm Hg)	Diffusivity In Air (cm^2/s)
Aroclor-1254	327.00	6.00×10^{-5}	1.04×-10^{-1b}
Aroclor-1260	370.00	4.05×10^{-5}	1.04×10^{-1}
Benzo(a)pyrene	252.32	5.68×10^{-4}	4.30×10^{-2}
Dieldrin	380.91	1.78×10^{-7}	1.04×10^{-1b}

[a]Since vapor pressure is 400mm Hg at 323.0°C, Carbazole is assumed to be nonvolatile during OU2 remedial activities.

[b]COC-specific value could not be found. The diffusivity of Aroclor (PCB), CAS No. 1336-36-3, was used.

TABLE C.5-8
EXCAVATION GASEOUS EMISSIONS[a]

	Solid Waste Landfill		Lime Sludge Ponds		Active Flyash Pile		South Field/Inactive Flyash Pile	
COC	Diffusion	Soil Pore Space	Diffusion	Soil Pore Space	Diffusion	Soil Pore Space	Diffusion	Soil Pore Space
Aroclor 1254 (g/s)	1.78×10^{-5}	$1.5x\ 10^{-11}$	1.83×10^{-5}	$1.47 \times 10^{-}$	--	--	$1.42 \times 10^{-}$	1.47×10^{-7}
Aroclor 1260 (g/s)	2.78×10^{-5}	1.14×10^{-7}	--	--	--	--	$3.06 \times 10^{-}$	1.14×10^{-7}
Benzo(a)pyrene (g/s)	2.58×10^{-3}	9.4×10^{-12}	5.3×10^{-6}	9.4×10^{-12}	--	--	$3.89 \times 10^{-}$	9.44×10^{-12}
Dieldrin (g/s)	--	--	--	--	--	--	$5.28 \times 10^{-}$	5.0×10^{-10}
Radon (pCi/s)	108.1	1,278.8	108.1	1,701.0	365.0	17,292	202.8	1,926.5

[a]Since vapor pressure is 400 mm H_2O at 323.0°C, carbazole is assumed to be nonvolatile during OU2 remediation.

TABLE C.5-9

RADON AND VOC AIR CONCENTRATIONS (Ca) FOR THE REMEDIAL WORKER

Near Field Box Model (RAWPA Section 6.3.1.3):

$$Ca = Q/(Hb)(Wb)(Um) \qquad \text{(C.5-8)}$$

Ca = concentration of COC in ambient air on site (pCi/m^3)(mg/m^3),
Q = emission rate of COC (pCi/s or mg/s),
H_b = downwind exposure height (1.83 m),
W_b = width of crosswind dimension of contaminated area (assumed to be 45m), and
U_m = average wind speed, 4.61 m/s (RAWPA Table 6-7).

COC/Subunit	Q (g/s)	Ca (g/m^3)
Solid Waste Landfill		
Benzo(a)pyrene	2.58×10^{-3}	6.80×10^{-6}
Aroclor-1254	1.78×10^{-5}	4.69×10^{-8}
Aroclor-1260	2.78×10^{-5}	7.32×10^{-8}
Carbazole	0.00×10^{0}	0.00×10^{0}
Dieldrin	---	---
Rn-222 (pCi/s)	1.39×10^{-3}	3.65×10^{0} pCi/m3
Lime Sludge Ponds		
Benzo(a)pyrene	5.28×10^{-6}	1.39×10^{-8}
Aroclor-1254	1.83×10^{-5}	4.82×10^{-8}
Aroclor-1260	---	---
Carbazole	---	---
Dieldrin	---	---
Rn-222 (pCi/s)	1.81×10^{3}	4.77×10^{0} pCi/m3
South Field/Inactive Flyash Pile		
Benzo(a)pyrene	3.89×10^{-5}	1.02×10^{-7}
Aroclor-1254	1.42×10^{-5}	3.74×10^{-8}
Aroclor-1260	3.06×10^{-5}	8.06×10^{-8}
Carbazole	0.00×10^{0}	0.00×10^{0}
Dieldrin	5.28×10^{-6}	1.39×10^{-8}
Rn-222 (pCi/s)	2.13×10^{3}	5.61×10^{0} pCi/m3
Active Flyash Pile		
Benzo(a)pyrene	---	---
Aroclor-1254	---	---
Aroclor-1260	---	---
Carbazole	---	---
Dieldrin	---	---
Rn-222 (pCi/s)	1.77×10^{4}	4.65×10^{1} pCi/m3

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TABLE C.5-10

AIR EXPOSURE CONCENTRATIONS FOR THE OFF-PROPERTY RECEPTOR DUE TO DRYER EMISSIONS

Subunit	Volume (Dried-yd^3)	Volume (Dried-m^3)	Remedial Time (Months)	Dryer Operation (Months)	Dryer Operation (Sec)	Soil Density (g/cm^3)	Dryer Process Rate (g Soil/s)
Solid Waste Landfill	7000	5352.5	14	13	$8.05 \times 10^{+6}$	1.5	997.4
Lime Sludge Ponds	7100	5428.9	16	15	$9.29 \times 10^{+6}$	1.5	876.8
Inactive Flyash Pile	6900	5276.0	34	33	$2.04 \times 10^{+7}$	1.5	387.3
South Field	11000	8411.0	23	22	$1.36 \times 10^{+7}$	1.5	926.2
South Field/Inactive Flyash Pile	17900	13687.1	57	55	$3.41 \times 10^{+7}$	1.5	602.8
Active Flyash Pile	700	535.2	24	23	$1.42 \times 10^{+7}$	1.5	56.4

COC	Soil Conc (ug/g)	Max Stack Emission Rate (g/s)	Total Available (g/hr)	Pore Space Release (g/hr)	Fraction of (Pore Space/ Total Available)	Total Max Receptor Conc (g/m^3)
Solid Waste Landfill[b]						
Benzo(a)pyrene	10.72	$1.07 \times 10^{+2}$	7.30×10^{-2}	3.40×10^{-8}	4.66×10^{-11}	1.49×10^{-14}
Aroclor-1254	0.048	4.79×10^{-5}	3.30×10^{0}	5.30×10^{-4}	1.61×10^{-4}	2.31×10^{-10}
Aroclor-1260	0.077	7.68×10^{-5}	5.30×10^{0}	4.10×10^{-4}	7.74×10^{-5}	1.78×10^{-10}
Carbazole	4.2	- - -	- - -	- - -	- - -	- - -
Dieldrin	- - -	- - -	- - -	- - -	- - -	- - -
Lime Sludge Ponds[b]						
Benzo(a)pyrene	0.19	1.67×10^{-4}	1.30×10^{0}	3.40×10^{-8}	2.62×10^{-8}	1.31×10^{-13}
Aroclor-1254	0.043	3.77×10^{-5}	2.90×10^{0}	5.30×10^{-4}	1.83×10^{-4}	2.07×10^{-10}
Aroclor-1260	- - -	- - -	- - -	- - -	- - -	- - -
Carbazole	- - -	- - -	- - -	- - -	- - -	- - -
Dieldrin	- - -	- - -	- - -	- - -	- - -	- - -
South Field/Inactive Flyash Pile[b]						
Benzo(a)pyrene	0.18	1.09×10^{-4}	1.20×10^{0}	3.40×10^{-8}	2.83×10^{-8}	9.22×10^{-14}
Aroclor-1254	0.043	2.59×10^{-5}	2.90×10^{0}	5.30×10^{-4}	1.83×10^{-4}	1.42×10^{-10}
Aroclor-1260	0.089	5.37×10^{-5}	6.10×10^{0}	4.10×10^{-4}	6.72×10^{-5}	1.08×10^{-10}
Carbazole	0.001	- - -	- - -	- - -	- - -	- - -
Dieldrin	0.016	9.65×10^{-6}	1.10×10^{0}	1.80×10^{-6}	1.64×10^{-6}	4.73×10^{-13}

[a]AFP soil is not contaminated with any of the above listed COCs.
[b]Total maximum receptor unit concentration = 3.00×10^{-12} (g/m^3)/(g/s).

The calculation of Rn-222 emissions due to soil pole space is based on the assumption that the soil concentration of Rn-222 is equal to the soil concentration of Ra-226. An emanation factor of one-fifth was used to quantify how much Rn-222 was present in the pore space. However, pore space is shared with VOCs. The presence of VOCs limits the pore space available to Rn-222 and it was assumed that Rn-222 and VOCs would occupy the pore space equally. It was also assumed that during excavation all pore space Rn-222 would be released when soil is dropped onto a storage pile. This emission rate was calculated using the following equation:

$$ER_{PSR} = (C_S)(E_F)(PS_F)(D_S)(Q)(CF) \quad \text{(C.5-9)}$$

ER_{PSR}	=	pore space emission rate of Rn-222 (pCi/s),
C_S	=	Ra-226 soil concentration (see Table C.5-4),
E_F	=	Emanation factor (.2),
PS_F	=	pore space factor (1/[total number of gaseous COC present in soil including Rn-222),
D_S	=	soil density (1.5 g/cm^3),
Q	=	excavation rate (.01 m^3/s), and
CF	=	conversion factor (10^6 cm^3/m^3).

Table C.5-8 lists the Rn-222 pore space emission rate for all subunits. As with VOC emissions resulting from excavation and soil handling, the total Rn-222 emission rate was used in the Near Field Box Model to estimate the air exposure concentration for the remedial worker. The calculation is shown in Table C.5-9.

C.5.1.2 Direct Radiation Fate and Transport Modeling

Direct radiation exposure can be quantitatively modeled when measurement data are not available. This section describes the modeling used to estimate penetrating gamma radiation dose rates to remediation workers during phases of cleanup that involve excavation or removal of waste material that is a source of significant gamma radiation. Section C.5.1.3 discusses the dose rates received during remedial alternatives involving the transportation of waste to a disposal facility.

C.5.1.2.1 Direct Radiation Modeling Technical Approach

Remedial workers are receptors impacted by direct radiation. Direct exposure doses were calculated for an excavation-area remedial worker, an on-site dump truck driver, and a worker at the loading/staging area for gondola railcars. To model direct radiation exposure, the following items were

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considered: source geometries, the presence of shielding between the radiation source and the receptor, and the distance between the source and receptor.

Radiation dose rates for planar source geometries (which may or may not involve shielding materials) and for nonplanar source geometries were modeled using the MICROSHIELD 4.1 code. MICROSHIELD was developed for use on personal computers by Grove Engineering (Grove 1988) and uses the same algorithms as ISOSHIELD, a mainframe code developed by Battelle Northwest Laboratories (Engle 1966). MICROSHIELD contains a variety of source geometries used in RI/FS risk assessments and is suitable for operable-unit-specific modeling.

MICROSHIELD presents the estimated dose rate from a given configuration in three forms: activity (photons/sec), gamma flux energy density (MeV/cm^2/sec), and dose rate (mrad/hr). Basic information requirements can be grouped into three categories: source term configuration, shielding arrangement, and receptor/detector placement.

The composition of the source is characterized by information on the types and densities of the source materials and the types and concentrations of nuclides in the source. Information on materials located between the source and the receptor (including air) allows the code to calculate the degree to which the gamma rays emitted by the source are attenuated. In addition, the code can use information on the chemical and physical properties of the shielding and source materials to estimate any additional exposure caused by scattering (buildup).

Receptor location determines the thickness of the air gap between the receptor and the source. The air gap provides additional shielding since gamma exposures decrease as a function of distance from the source.

C.5.1.2.2 Direct Radiation Modeling Results

Workers at the excavating and staging areas of the site may be exposed to direct radiation from contaminated soil and from resuspended dust resulting from remedial activities. The input parameters used in MICROSHIELD to calculate exposure are shown in Table C.5-11. MICROSHIELD results are summarized in Table C.5-12.

TABLE C.5-11

MICROSHIELD INPUT PARAMETERS

Source volume of direct exposure to remedial worker during excavation:
Diameter = 20 m; Depth = 2 m; Volume = 6.28×10^8 cc;
Mass = 1.07×10^9g (1.7 g/cc for source strength);
Density = 1.5 g/cc (for self shielding).

Roll-off Truck:
Length = 4.57 m; Width = 2.44 m; Height = 1.37 m;
Volume = 1.53×10^7 cc;
Mass = 2.60×10^7 g (1.7 g/cc for source strength);
Density = 1.5 g/cc (for self shielding).

Train Gondola Car:
Length = 16.0 m; Width = 2.90 m; Height = 1.37 m;
Volume = 6.36×10^7 cc;
Mass = 8.85×10^7 g;
Density = 1.5 g/cc (for self shielding only).

Remediation crews work 10 hours/day, 4 days/week.

Remedial activities produce mechanical suspension of soil particles in air at a concentration of 600 $\mu g/m^3$.

Note: COC soil concentrations are presented in Table C.5-4.

TABLE C.5-12

MICROSHIELD OUTPUT (mrem/hr)

	Direct Exposure			Immersion
Subunit	On-property Rail Remedial Worker	On-property Transportation	Excavation Remedial Worker	Excavation Remedial Worker
Solid Waste Landfill	5.16×10^{-3}	1.11×10^{-2}	1.59×10^{-2}	7.10×10^{-10}
Lime Sludge Ponds	2.65×10^{-3}	5.66×10^{-3}	8.18×10^{-3}	3.52×10^{-10}
South Field/Inactive Flyash Pile	4.48×10^{-3}	9.63×10^{-3}	1.38×10^{-2}	6.51×10^{-10}
Active Flyash Pile	8.48×10^{-3}	1.82×10^{-2}	2.63×10^{-2}	1.13×10^{-9}

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C.5.1.3 Transportation Modeling

The analysis of potential impacts in this FS requires consideration of the radiation dose and risk to potential receptors as a result of transporting radioactive waste to an off-site disposal facility via gondola railcar. Potential receptors include on-property remediation workers, rail crewmen, and the public along the transportation route. The proposed off-site disposal facility is EnviroCare in Utah. Off-site disposal would be used for Alternative 3, under which all contaminated soils are transported off-site, or for Alternative 6, under which only the waste exceeding the WAC is transported off-site.

This transportation analysis includes two distinct cases: incident-free transportation and transportation involving vehicular accidents. One waste configuration was used in the analysis of both cases.

C.5.1.3.1 Transportation Modeling Technical Approach

Transportation of radioactive material involves a wide range of events with potential for environmental impact. For the remediation of Operable Unit 2, material to be disposed would be loaded into a gondola railcar and covered. The radiation exposure levels would be noted, railcars labeled with the appropriate information, and a shipping bill prepared. The railcar would then be put aside until transportation actually begins. After at least 159 railcars are accumulated, the covered gondolas would be taken to EnviroCare for final disposal of the radioactive material.

RADTRAN 4 (version 4.0.16, April 12, 1994) was used to evaluate the radiological consequences of both incident-free transportation and transportation involving vehicular accidents. Sandia National Laboratories developed the original RADTRAN code in 1977. The analytical capabilities of the code have been expanded and refined in subsequent versions.

The current version of RADTRAN 4 contains advances in the handling of route-related data and in the treatment of multiple-isotope materials. It can perform route-specific analysis, model the risk from transportation of multiple-isotope materials, analyze multiple-package shipments made up of dissimilar packages, and calculate the maximum individual in-transit dose. RADTRAN 4 contains idealized mathematical models of transportation environments; these models have been

formulated to yield conservative estimates of integrated population dose in a way that can be supported by available data. These models neglect features of the transportation environment that either do not affect the calculated risk values or reduce conservatism (e.g., the "divider width" of divided highways).

C.5.1.3.2 RADTRAN Incident-Free Transportation Model

In RADTRAN, the general population is divided into eight exposable population subgroups: crewmen, flight attendants, warehouse personnel (at EnviroCare), passengers on railcars, public along storage depots, public along transportation route, people in the vicinity of the transporting vehicle while it is stopped, people surrounding the transport link on which the vehicle is moving, and people sharing the transport link with the vehicle. Of these eight population subgroups, only six were computed for this analysis (Figure C.5-3). The dose to flight attendants was not computed because the method of transportation is railcar. The dose to passengers on railcars was not computed because the railcar will be restricted to transportation personnel only. Total doses (in person-rem) were computed for each of the six subgroups relevant to Operable Unit 2.

Table C.5-13 identifies the common input parameters used in the incident-free model. The amount of soil shipped to the disposal facility varies by alternative and final residual risk level. Table C.5-14 presents the results for the single shipment RADTRAN run.

C.5.1.3.3 Transportation Accident Model

Two factors were considered when evaluating impacts of accidents that involve vehicles carrying radioactive shipments: probability and consequence. The probability that an accident releasing radioactive material will occur can be described in terms of the expected number of accidents of a given severity for each transport mode, together with the package response to such an accident. The consequences of an accident are expressed in terms of the potential effects of the release of a specified quantity of radioactive material to the environment or the increased direct exposure of persons to ionizing radiation resulting from damaged package shielding.

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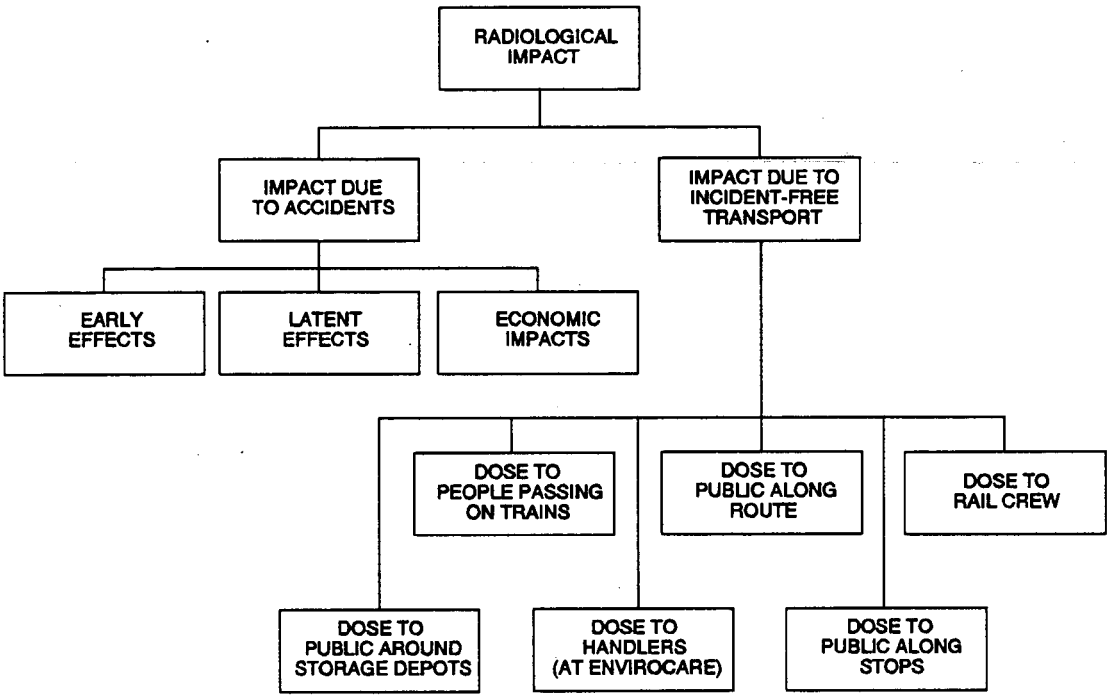

FIGURE C.5-3
COMPONENTS OF RADIOLOGICAL IMPACT EVALUATED BY RADTRAN FOR OU2 REMEDIAL ACTIVITIES

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TABLE C.5-13
COMMON INPUT PARAMETERS FOR INCIDENT-FREE RADTRAN MODEL

Parameter	Value	Units
Gondola Rail Cars Per Shipment	159*	Rail Cars
Number of Shipments	1	Trains
Dose Rate at 1m (Transport Index)	8.5×10^{-3}	mrem/hr
Travel in Rural Population Zone	82	% of total
Travel in Suburban Population Zone	14	% of total
Travel in Urban Population Zone	4	% of total
Velocity in Rural Population Zone	64	km/hr
Velocity in Suburban Population Zone	40	km/hr
Velocity in Urban Population Zone	24	km/hr
Number of Crewmen	5	People
Distance from source to crew	64	m
Number of Handlings	1	Trains
Stop Time per Kilometer	3.3×10^{-2}	hr/km
Minimum Stop Time per Trip	10	hr
Zero Stop Time per Trip	60	hr
Minimum Number of Rail Inspections	2	Insp.
Persons Exposed While Stopped	100	People
Average Exposure Distance While Stopped	20	m
Storage Time per Shipment	8	hr
Number of Exposed Persons During Storage	20	hr
Average Exposure Distance While In Storage	100	m
Number of People per Vehicle on Link	3	People
Fraction of Urban Travel During Rush Hour	0	Unitless
Fraction of Urban Travel on City Streets	1	Unitless
Fraction of Rural-Suburban Travel on Freeways	0	Unitless
Traffic Count Passing a Specific Point-Rural Zone	1	Cars/Time
Traffic Count Passing a Specific Point-Suburban Zone	5	Cars/Time
Traffic Count Passing a Specific Point-Urban Zone	5	Cars/Time

*The number of packages for determining the dose to crew members was reduced to 1 rail car. The contribution from the trailing 158 cars would be negligible due to self-shielding. RADTRAN 4 does not take self-shielding into consideration in calculating dose.

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TABLE C.5-14

RADTRAN INCIDENT-FREE SUMMARY FOR ONE SHIPMENT

Population Subgroup	Person-rem
Rail Crew	4.2×10^{-6}
Handlers (at EnviroCare)	2.22×10^{-2}
Public Along Route	4.94×10^{-3}
Public Passing On Trains	5.59×10^{-4}
Public Along Stops	8.16×10^{-3}
Public Around Storage Depots	9.3×10^{-4}
Total to Public	3.74×10^{-2}
Total for All Population Subgroups	3.74×10^{-2}

Accidents were assigned a severity category based upon the duration and temperature of fire occurring during the accident, and either impact speed (air transport), crush forces (for truck and van transport), or puncture impact speed (for rail transport). Eight severity categories were considered for this case (Table C.5-15).

RADTRAN uses four quantities which depend on severity category: accident severity fraction (n), release fraction (RF), aerosolization fraction (AER), and respirable fraction (RESP). The severity fraction is a three-dimensional array which defines the probability that transport accidents for each of the allowable-modes will occur in each of three population zones and each of the eight severity categories. Table C.5-15 identifies the default RADTRAN accident severity fractions used in the accident model. Table C.5-16 identifies the release fractions by severity group.

TABLE C.5-15

RADTRAN ACCIDENT SEVERITY FRACTIONS BY POPULATION DISTRIBUTION AND SEVERITY GROUP

Severity Group	Rural	Suburban	Urban
1	3.56×10^{-1}	3.13×10^{-1}	5.72×10^{-1}
2	2.14×10^{-1}	1.88×10^{-1}	3.43×10^{-1}
3	3.85×10^{-1}	4.51×10^{-1}	7.72×10^{-2}
4	3.85×10^{-1}	4.51×10^{-1}	7.72×10^{-2}
5	6.41×10^{-3}	3.38×10^{-3}	5.14×10^{-4}
6	6.48×10^{-4}	1.63×10^{-4}	1.86×10^{-5}
7	3.42×10^{-4}	3.76×10^{-5}	8.57×10^{-6}
8	6.41×10^{-5}	3.13×10^{-6}	7.15×10^{-7}

TABLE C.5-16
RADTRAN RELEASE FRACTIONS BY SEVERITY GROUP

Severity Group	Release Fraction
1	0
2	0.1
3	0.2
4	0.3
5	0.4
6	0.5
7	0.6
8	1

Consideration of packaging strength of a train gondola car as a function of severity is included in the release fraction. This parameter varies from 0 to 1, depending on the relative damage done to the gondola car in the accident. If RF is 1, the gondola car is totally destroyed from a material containment point of view. If RF is 8, the gondola car is unbreached (although not necessarily undamaged) and the material is fully contained. Intermediate values describe conditions of increasing gondola car failure ranging from microfractures to catastrophic failure.

Transported materials are classified according to their dispersibility based on the shipment size and the chemical/physical properties of the material. The dispersion category in turn determines the fractions aerosolized and respirable. Figure C.5-4 shows the decision tree structure used to make this classification. The Operable Unit 2 soil was modeled as Category V, Small Loose Powder.

The aerosol fraction specifies the fraction of material released from a package in aerosol form. The aerosol fraction used in the accident model was 0.1 and was based on material dispersibility of 5 (small base powder). Only those particles less than approximately 10 microns in aerodynamic diameter pose an inhalation hazard. The respirable fraction was introduced to quantify this respirability fraction as a function of material dispersibility class and accident severity.

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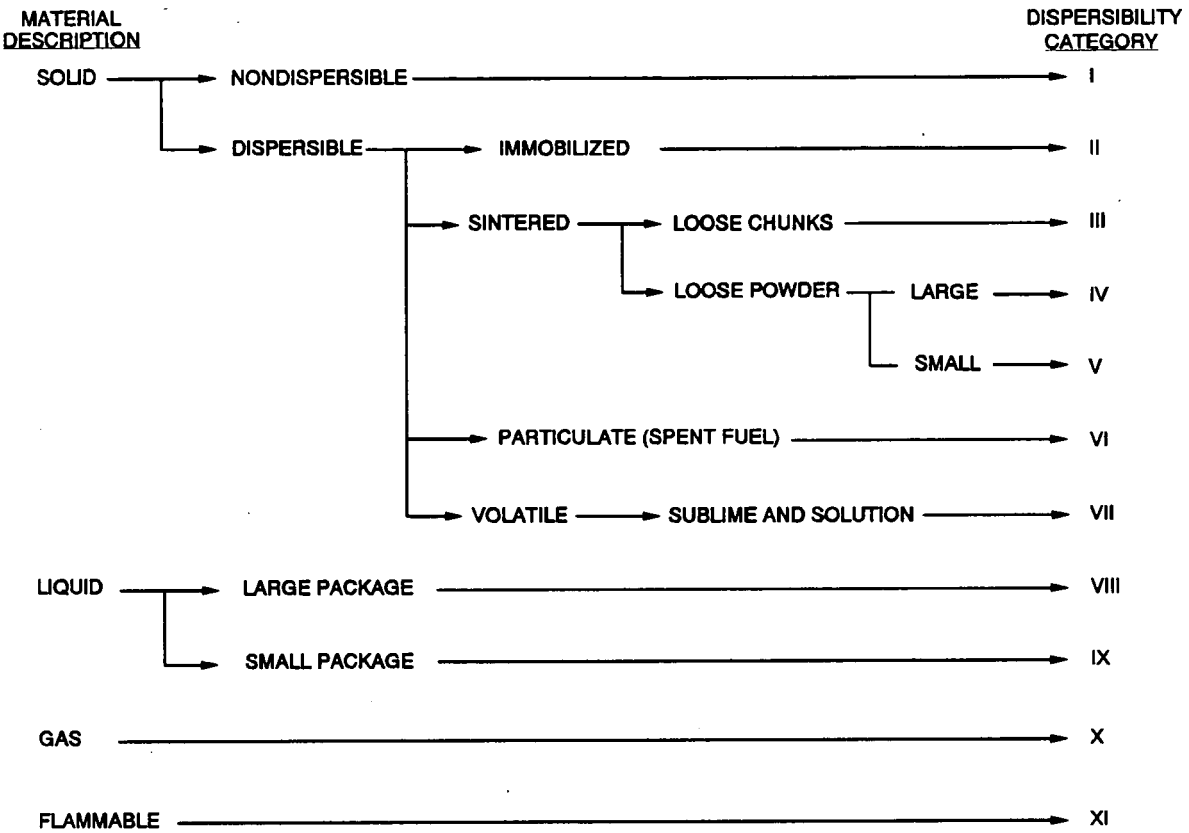

FIGURE C.5-4
MATERIAL DISPERSIBILITY CATEGORIES

The respirability fraction used in the accident model was 0.05 and based on the same material dispersibility of 5. In terms of ground contamination, all airborne particles are significant so the respirability fraction was not included. Table C.5-17 lists the accident results for one shipment.

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TABLE C.5-17

RADTRAN ACCIDENT SUMMARY FOR ONE SHIPMENT

Population Density	Severity Group	Expected No. of Accidents Per Shipment	Consequences of One Shipment (person-rem)
Urban	1	1.07×10^{-3}	0×10^{0}
	2	6.41×10^{-4}	2.84×10^{1}
	3	1.44×10^{-4}	5.68×10^{1}
	4	1.44×10^{-4}	8.51×10^{1}
	5	9.61×10^{-7}	1.13×10^{2}
	6	3.48×10^{-8}	1.42×10^{2}
	7	1.6×10^{-8}	1.70×10^{2}
	8	1.34×10^{-9}	2.84×10^{2}
Urban Total		(2×10^{-3})	NA
Suburban	1	2.59×10^{-4}	0×10^{0}
	2	1.56×10^{-4}	6.60×10^{0}
	3	3.74×10^{-4}	1.32×10^{1}
	4	3.74×10^{-5}	1.98×10^{1}
	5	2.8×10^{-6}	2.6×10^{1}
	6	1.35×10^{-7}	3.29×10^{1}
	7	3.12×10^{-8}	3.95×10^{1}
	8	2.59×10^{-9}	6.59×10^{1}
Suburban Total		(8.29×10^{-4})	NA
Rural	1	9.1×10^{-5}	0×10^{0}
	2	5.47×10^{-5}	1.23×10^{-1}
	3	9.84×10^{-5}	2.46×10^{-1}
	4	9.184×10^{-6}	3.69×10^{-1}
	5	1.64×10^{-6}	4.92×10^{-1}
	6	1.66×10^{-7}	6.15×10^{-1}
	7	8.74×10^{-8}	7.38×10^{-1}
	8	1.64×10^{-8}	1.23×10^{0}
Rural Total		2.56×10^{-4}	(NA)
Overall Totals		3.1×10^{-3}	NA

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C.5.2 RESIDUAL RISK MODELING

Fate and transport modeling was conducted to determine the impacts from the movement of COCs remaining in residual (postremediation) soil. Transport mechanisms modeled include groundwater, air, and farm products. The objective of this effort is to predict the future concentrations of residual COCs at receptor locations, under assumed conditions. The following sections summarize the fate and transport modeling conducted for groundwater and air transport, as well as the transport of COCs through food products. For a detailed discussion of the groundwater and air modeling effort, see Appendix D of the FS report.

C.5.2.1 Groundwater Fate and Transport Modeling

Groundwater fate and transport modeling was used to simulate residual COC movement from the Operable Unit 2 subunits to potential human receptors. Different exposure scenarios were modeled, but all of the source terms can be identified as residual soils, in situ containment of waste with a cap, or waste deposited in an engineered disposal cell. Fate and transport models provide the only means of predicting potential groundwater concentrations at receptor locations in the future under assumed conditions. The following models were used:

- The Universal Soil Loss Equation (USLE) was used to estimate erosion potential in 1000 years
- Hydrological Evaluation of Landfill Performance (HELP) was used to estimate exfiltration and infiltration rates
- ODAST/SWIFTLOAD was used to predict COC movement through the vadose zone and prepare input files for the SWIFT III model
- SWIFT III was used to predict contaminant movement through the Great Miami Aquifer

Only a brief description of the methodology used to quantitatively predict COC concentrations is presented here. For a more complete description of the methods and parameters used for the Operable Unit 2 modeling, refer to Appendix A of the Operable Unit 2 RI report.

C.5.2.1.1 Groundwater Conceptual Model

The geology of the FEMP site is dominated by glacial sediments. Well sorted sand and gravel glacial outwash forms the regional Great Miami Aquifer. A sequence of fine-grained till deposits interbedded with sand and gravel glaciofluvial stringers (the glacial overburden) overlie the

glaciofluvial material of the Great Miami Aquifer. The migration of COCs from sources to the groundwater begins with the infiltration of rainwater (Figure C.5-5). Fluid and/or leachate entering from the waste areas migrates first through the glacial overburden (if present), then through the unsaturated outwash deposits, and finally into the Great Miami Aquifer.

Based on characteristics of the geology underlying the Operable Unit 2 subunits and the on-site disposal facility, a conceptual model was developed for the pathways between the disposal areas and receptor locations. Three active pathways for COC migration from the Operable Unit 2 source areas to the Great Miami Aquifer were identified for future conditions in Appendix D.1:

- Vadose zone pathway:
  Migration of COCs from the waste unit laterally and vertically through the vadose zone to the aquifer is designated as the vadose zone pathway.

- Perched water infiltration pathway:
  Vertical migration of perched water through the glacial till to the Great Miami Aquifer is designated as the perched water infiltration pathway.

- Perched water subsurface seep pathway:
  Lateral migration of COCs occurs when perched water in sand and gravel layers within the glacial overburden come in contact with waste material. Perched water moves laterally in the sand layer until it is intercepted at the sand/gravel and waste interface. At that point, perched water moves along the slope of waste and till interface until it comes in contact with the unsaturated Great Miami Aquifer. This water containing COCs then vertically infiltrates to the aquifer.

C.5.2.1.2 Groundwater Modeling Technical Approach

This section presents a summary of the modeling procedures and assumptions that were used for Operable Unit 2 risk assessment modeling. Additional information is provided in Appendix D of this FS report and Appendix B of the RI report.

The groundwater COCs identified in the Operable Unit 2 RI report are the uranium isotopes. Of these isotopes, only U-238 was modeled, to more efficiently use computation time. All of the uranium isotopes are assumed to have the same flow and transport properties; thus, modeling results for U-238 were used to predict concentrations of U-234, U-235/236, and total uranium.

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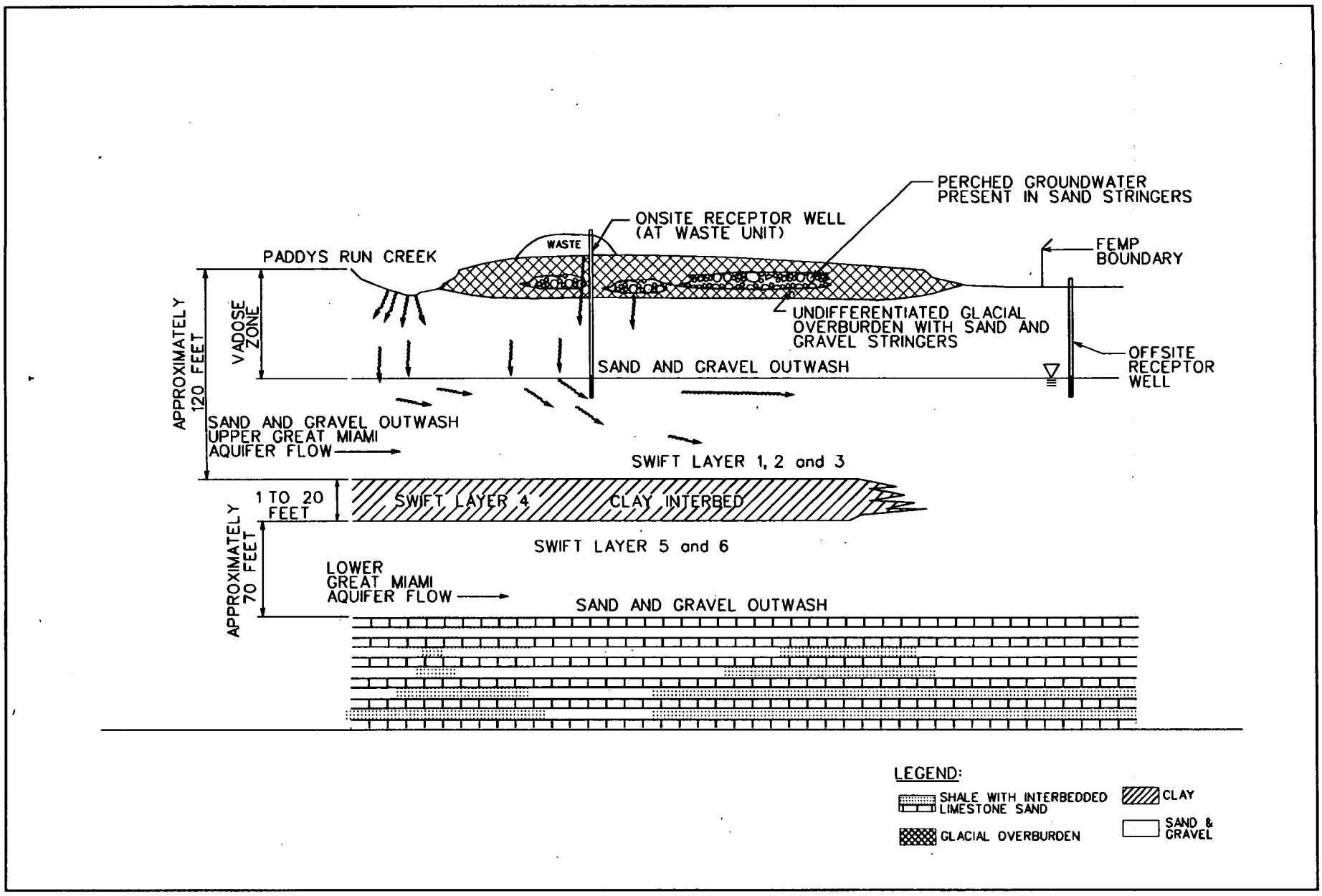

FIGURE C.5-5
CONCEPTUAL MODEL OF LOADING TO THE GREAT MIAMI AQUIFER
AND CONTAMINANT TRANSPORT BY GROUNDWATER

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U-238 concentrations in 7.6 x 7.6 x 0.76 meter (25 x 25 x 2.5 foot) blocks were estimated using three-dimensional kriging for each media type. Average waste concentrations in each 38 x 38 meter (125 x 125 foot) SWIFT III grid cell were then calculated from all blocks within each cell. Source terms for residual soils were determined by evaluating the U-238 concentration isopleths on a block-by-block basis against the cleanup criteria selected for the alternative. The source term for fate and transport modeling for consolidation and placement under a cap was based on maximum detected U-238 concentration in each media type.

Vadose zone modeling was performed by using the leachate concentrations as input into a one-dimensional unsaturated flow model to simulate transport through the vadose zone to the Great Miami Aquifer. The One-Dimensional Analytical Solute Transport (ODAST) model was used to simulate dispersion, retardation, and decay through unsaturated materials. The HELP model was used to estimate infiltration rates.

The improved and calibrated SWIFT groundwater flow model was then used to simulate the solute transport of COCs in the Great Miami Aquifer. First, the vadose zone modeling results (for the vadose zone and perched water infiltration pathways) were incorporated into SWIFT as the loading rates to the Great Miami Aquifer from the subunits or disposal areas. The model then simulated the transport of COCs away from these source areas. Dispersion, retardation, and decay were factored into the COC transport process. SWIFT III simulations of COC transport in the Great Miami Aquifer were run for up to 1000 years.

The loading from each grid cell impacted by the subunit was entered into the SWIFT III model as a discrete source, making multiple sources for each COC. Due to the proximity of the Inactive Flyash Pile to the South Field (and their similar geologies), sources from these two subunits were combined in one SWIFT III run. The modeling runs produced simulations of the aggregate effects of loading from these two subunits for the COCs.

C.5.2.1.3 Results of Residual Groundwater Modeling

Groundwater modeling was used for this risk assessment to estimate the maximum groundwater concentrations at specific receptor locations. For the on-property resident farmer, receptor locations were selected at the points where the highest U-238 concentrations were predicted to occur in groundwater, beneath each subunit, over the 1000-year modeling period. The South Field and

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Inactive Flyash Pile as previously stated, were modeled together and have a common receptor location.

The on-property resident farmer scenario also includes the use of perched water from beneath the Solid Waste Landfill and Lime Sludge Ponds. For these two subunits, the assumption was made that the current perched water contamination would be completely remediated by Operable Unit 5. For future contamination, the leachate concentrations from the residual waste were conservatively assumed to be representative of perched water concentrations. This approach does not incorporate the effects of dilution or dispersion in the perched zone. Therefore, the perched water receptor could be considered to be located at any point in the Solid Waste Landfill or Lime Sludge Ponds where perched water is directly beneath the subunit. The COCs for perched water are identified in the Operable Unit 2 RI report as carbazole, Tc-99, and the uranium isotopes for the Solid Waste Landfill, and Tc-99, Np-237, Sr-90, and the uranium isotopes for the Lime Sludge Ponds.

For the off-property farmer, the closest point to each area at which a hypothetical farmer could install a well would be along the FEMP fenceline. Groundwater modeling was used to identify the specific point along the fenceline at which the plume of contaminated groundwater from each area would reach the highest concentration over the 1000-year modeling period. This point was then used as the receptor location for its associated source area.

As with the on-property resident farmer, the South Field and Inactive Flyash Pile were modeled together, and also have a common off-property receptor. In addition, the Active Flyash Pile was modeled separately for most alternatives, but was combined with the South Field and Inactive Flyash Pile for Alternative 2 (Consolidation and Capping). This was done because wastes from all three areas will be consolidated together. The single location identified by the model at the fenceline that had the highest U-238 concentration over the 1000 years was selected as the receptor location for all three sources areas.

Additional information on the groundwater modeling procedures and assumptions is presented in Appendix D. The predicted maximum concentrations of the COCs in groundwater at each receptor location for the alternatives under each land-use scenario are listed in Table C.5-18.

TABLE C.5-18

RESULTS OF RESIDUAL GROUNDWATER MODELING: EXPOSURE POINT CONCENTRATIONS

	Alternative 2		Alternative 3&6 (Federal)		Alternative 3&6 (Private)	
COCs	On-Property	Off-Property	On-Property	Off-Property	On-Property	Off-Property
Lime Sludge Ponds						
GMA						
U-234	$1x10^{-4}$	$1x10^{-5}$	NA	$3.7x10^{-2}$	$1.9x10^{-3}$	$7.1x10^{-5}$
U-235	$1x10^{-4}$	$1x10^{-5}$	NA	$2.0x10^{-3}$	$1.0x10^{-4}$	$3.7x10^{-6}$
U-238	$1x10^{-4}$	$1x10^{-5}$	NA	$4.1x10^{-2}$	$2.0x10^{-3}$	$7.8x10^{-5}$
Uranium-Total	$1x10^{-7}$	$1x10^{-8}$	NA	$1.2x10^{-4}$	$6.0x10^{-6}$	$2.3x10^{-7}$
Perched Groundwater						
Np-237					$9.3x10^{-5}$	
Tc-99					$1.6x10^{-2}$	
Sr-90					$5.6x10^{-4}$	
U-234					$6.4x10^{-1}$	
U-235					$3.4x10^{-2}$	
U-238					$7.0x10^{-1}$	
Carbazole					NA	
Solid Waste Landfill						
GMA						
U-234	$7x10^{-4}$	$7x10^{-4}$	NA	$2.1x10^{-1}$	$2.4x10^{-2}$	$8.0x10^{-4}$
U-235	$7x10^{-4}$	$7x10^{-4}$	NA	$1.1x10^{-2}$	$1.2x10^{-3}$	$4.0x10^{-5}$
U-238	$7x10^{-4}$	$7x10^{-4}$	NA	$2.3x10^{-1}$	$2.6x10^{-2}$	$9.0x10^{-4}$
Uranium-Total	$2x10^{-6}$	$2x10^{-6}$	NA	$6.9x10^{-4}$	$8.0x10^{-2}$	$2.7x10^{-6}$
Perched Groundwater						
Np-237					NA	
Te-99					$1.6x10^{-2}$	
Sr-90					NA	
U-234					$6.1x10^{-1}$	
U-235					$3.2x10^{-2}$	
U-238					$6.7x10^{-1}$	
Carbazole					$4.7x10^{-4}$	
South Field Area						
GMA						
U-234	$3.2x10^{0}$	$4.5x10^{-}$	$5.6x10^{0}$	$6.6x10^{-1}$	$1.8x10^{-1}$	$3.1x10^{-2}$
U-235	$1.7x10^{-1}$	$2.4x10^{-2}$	$2.9x10^{-1}$	$3.5x10^{-2}$	$1.0x10^{-2}$	$2x10^{-3}$
U-238	$3.6x10^{0}$	$5.0x10^{-1}$	$6.1x10^{0}$	$7.2x10^{-1}$	$2.0x10^{-1}$	$3.4x10^{-2}$
Uranium-Total	$1.1x10^{-2}$	$1.5x10^{-3}$	$1.8x10^{-2}$	$2.2x10^{-3}$	$6.1x10^{-4}$	$1.0x10^{-1}$
Disposal Cell (Alternative 6 Only)						
GMA						
U-234				$6.3x10^{-1}$		$6.3x10^{-1}$
U-235				$3.3x10^{-2}$		$3.3x10^{-2}$
U-238				$7.0x10^{-1}$		$7.0x10^{-1}$
Uranium-Total				$2.1x10^{-3}$		$2.1x10^{-3}$

*Modeling results are presented in pCi/l for radionuclides and mg/l for all other COCs.
GMA = Great Miami Aquifer
NA = Not applicable

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These exposure point concentrations are used in the risk assessment equations shown in Section C.3.2. Results from these calculations are presented in Section C.7.0. The uranium isotopes were not all modeled separately, but instead were calculated as a ratio of the U-238 modeling results. Appendix D provides a detailed description of this process.

C.5.2.2 Air Fate and Transport Modeling

The following discussion briefly describes the conceptual model and technical approach used to conduct air pathway fate and transport modeling for the FS residual risk assessment. The objective of this analysis was to determine the on and off-property annual average air-contaminant concentrations from the remediated Operable Unit 2.

C.5.2.2.1 Air Modeling Conceptual Model

Wind erosion and resuspension of particulate matter represents a viable transport pathway for all contaminated surface soil in Operable Unit 2. Under windy conditions, surface soil particles can be resuspended and dispersed in the atmosphere. The particulate matter emission rate from the surface depends on the ambient wind speed, representative size of surface soil particles, moisture content and crustiness of the soil, and quantity of vegetative cover on the surface.

Emission and dispersion of Rn-222 gas from surface soil containing Ra-226 represents another viable COC transport pathway. The emission rate of Rn-222 depends on the concentration of Ra-226 in the soil, the soil moisture content and porosity, the depth of Ra-226 contamination, and the presence or absence of cover layers over the contaminated soil layer.

The subsequent dispersion of contaminated particulate matter or Rn-222 gas was determined from statistical summaries of wind speed, wind direction, atmospheric stability, ambient temperature, and mixing height.

C.5.2.2.2 Air Modeling Technical Approach

Six major steps were required to achieve the objective of the air modeling:

1. Potential air quality impacts for each land use were qualitatively defined.
2. Sources of air emissions and COCs released were identified based on site-specific information.

3. The RAECOM model was used to determine the radon emission rates form each of the identified source areas.

4. The particulate emission model was used to determine particulate emission rates from Operable Unit 2 sources areas. Site-specific soil concentration data were used to determine the COC-specific emission rate from each identified source area.

5. Additional inputs to the air dispersion model, such as meteorological data and receptor locations, were obtained or developed.

6. The air dispersion model (ISCLT2) was used to determine COC air concentrations.

Figure C.5-6 presents the sequence and interactions of these steps. Table C.5-19 summarizes the major air pathway fate and transport modeling components. The results from this modeling were used as exposure point concentrations in the residual risk assessment (Section C.7.0).

Source Term Assumptions for Air Transport Analysis

The residual risks from Operable Unit 2 were evaluated for Alternatives 2, 3, and 6 (see Section C.2.1 for a summary of the alternatives). Air fate and transport analysis for Alternative 2 was conducted only for the federal ownership land-use scenario. Therefore, the PRGs for the expanded trespasser and/or off-property farmer were assumed to set the upper limit on residual surface soil contamination levels (see Section 2.0 of this FS for a discussion of PRGs). The air analysis for Alternatives 3 and 6 were conducted for both land-use scenarios. The PRGs for the expanded trespasser and/or off-property farmer were assumed to set the upper limit on residual surface soil contamination levels for the federal ownership scenario while the PRGs for the on-property resident farmer were assumed to set the upper limit on residual surface soil contamination levels for the private ownership scenario.

Air Emission Sources and Air Contaminants

A total of 373 areas sources were used to analyze Operable Unit 2 residual air concentrations. These sources were combined into 13 source groups such that each source group contained sources with identical emission rates. The COC concentrations in soil used to develop emission rates are presented in Appendix D.2 of this FS report.

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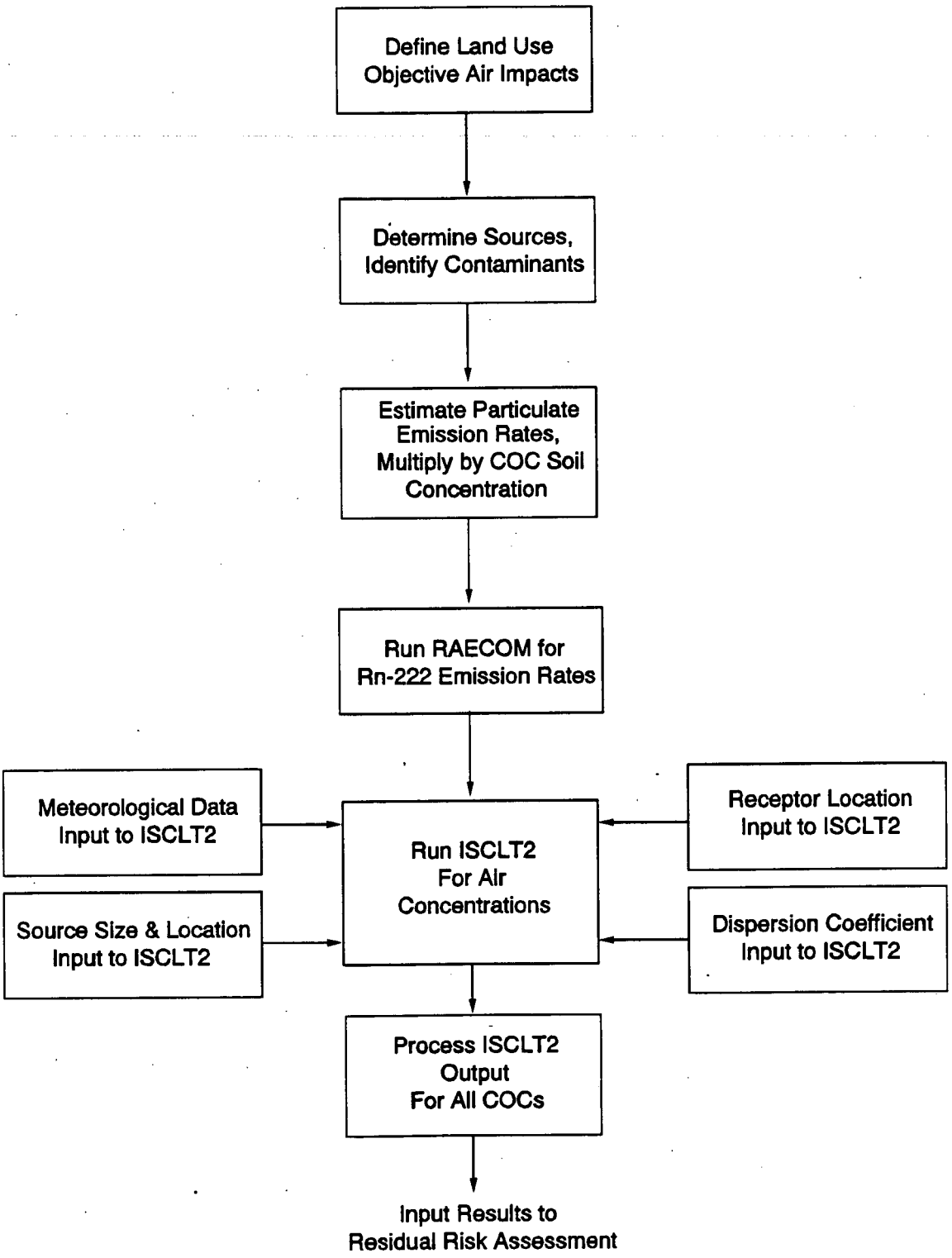

FIGURE C.5-6
SEQUENCE OF AIR FATE AND TRANSPORT MODELING TASKS

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TABLE C.5-19

MAJOR COMPONENTS OF THE AIR EMISSION AND DISPERSION MODELS

Model	Description and Use
RAECOM	Computer model developed by the NRC (NRC 1984) to simulate the emission of Rn-222 gas from soil and material containing Ra-226. RAECOM was used in this modeling effort to estimate the Rn-222 emission rate from FEMP surface soils and through cover soils placed over on-property consolidation areas. The output from RAECOM was used as input to ISCLT2.
Particulate Matter Emission Equations	Presented in *Rapid Assessment of Exposure to Particulate Emissions from Surface Contamination Sites* (EPA 1985), these equations were used in this modeling effort to estimate particulate matter emissions from surface soil caused by wind erosion. The results from these equations were used as input to ISCLT2.
ISCLT2	Computer model developed by the EPA (EPA 1992e) to simulate the dispersion of gas-phase and particulate-phase COCs emitted to the atmosphere. ISCLT2 was used in this modeling effort to predict the airborne concentrations and deposition rates of COCs emitted from the FEMP surface soils. The output from RAECOM and particulate matter emission models were used as input to ISCLT2.

SOURCES:

NRC 1984 for RAECOM.
EPA 1985 for emission equations.
EPA 1992e for ISCLT2.

Gaseous Contaminant Emission Rates

Emissions of Rn-222 were assumed to be the only gas-phase COC dispersed in the atmosphere. Volatile organics were assumed to have decayed to negligible levels prior to the time period studied by this residual risk analysis. Radionuclides, semivolatile and nonvolatile organics, and inorganics were assumed to be transported with the particulate emitted from the site.

Rn-222 emissions were determined from the Ra-226 concentrations in surface soil using the RAECOM model developed for the NRC (NRC 1984). The model accounts for the half-lives of Rn-222 and Ra-226 as well as the density, porosity, moisture content, and depth of contaminated layers and cover layers in estimating Rn-222 emission rates.

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Particulate Matter Emission Rates

Radionuclide, inorganic, and organic COCs were assumed to be present in the suspended particulate matter emitted from the site. The emission rate for each COC in this particulate matter was calculated from the concentration of the COC in the exposed soil and from the estimated site-wide annual particulate matter emission rate. For concentration calculations, the emission rate of particulate matter less than 10 micrometers in diameter (PM_{10}) was used. For deposition rate calculations, the emission rate of total suspended particulate (TSP) was used. The modeled PM_{10} concentrations were multiplied by 2 to obtain the TSP concentrations (EPA 1993e).

The method used to estimate PM_{10} emission rates for the FEMP is based on EPA guidance for estimating wind erosion rates from flat soil surfaces at hazardous waste sites (EPA 1985). This guidance has been adopted by the EPA for Superfund sites (EPA 1992e). The EPA methodology assumes that a minimum wind speed is required for the suspension of respirable dust, and that the emission rate is a nonlinear function of the "threshold friction velocity" (TFV) and the erosion potential of the site, which depends on the modal diameter of the soil particles. Very fine soils (those with small modal diameters) have low TFVs and high potential for erosion by wind.

In addition to modal diameter, other factors such as the amount of nonerodible elements (gravel and pebbles with diameters greater than approximately 1 centimeter), the crustiness of the surface soil, and the amount of vegetative cover effect the quantity of soil that can be resuspended by the wind.

Meteorological Data

Meteorological data characterizing the transport and dispersion conditions of an area are needed as input to the ISCLT2 model. These data include wind speed, wind direction, atmospheric stability, ambient air temperature, and mixing height. Measurements for all of these meteorological parameters, except mixing height, have been recorded at the FEMP site as part of a comprehensive environmental monitoring program since August 1986. Mixing heights were determined from atmospheric soundings made twice daily by the National Weather Service. The nearest National Weather Service station is in Dayton, Ohio.

Receptor Locations

Two receptor grid systems were used in the ISCLT2 model to determine on-property air concentrations. Each grid system includes receptor points on 121 x 121 meter (400 x 400 foot)

intervals. The second system is offset 60.5 meters (200 feet) north and 60.5 meters east from the first, resulting in an effective 83 x 83 meter (283 x 283 foot) grid system over the center of the FEMP. These grid systems include 985 points located across the FEMP. An additional 36 receptor points were located on the property line around the FEMP to determine the off-property air concentrations.

Dispersion Coefficients

U.S. Geological Survey (USGS) maps and a site survey of the area indicate that industrial, commercial, and compact residential land use comprise no more than 10 percent of the area within a 3-kilometer (1.9-mile) radius of the site. Therefore, the area was classified as rural for the purposes of air dispersion modeling, indicating the use of rural dispersion coefficients would be appropriate.

Air Dispersion Model

The ISCLT2 model (EPA 1992e) was designed by the EPA to assess the air quality impact of emissions from a wide variety of sources. It incorporates a steady-state gaussian plume equation that is applicable in flat or gently rolling terrain, for multiple-point, area, and volume sources. The ISCLT2 model calculates the annual average concentration due to airborne emissions at user-selected receptor locations, based on sector-averaged statistical wind summaries. Data required for input to the model include source emissions rates, the locations and configurations of sources, statistical summaries of wind speed, wind direction, atmospheric stability, and mixing height, and the locations of the selected receptors.

This model is recommended by the EPA for air pathway analysis of Superfund sites (EPA 1989a). It is also identified as an acceptable air transport model in the RAWPA (DOE 1992).

Model Output Processing

The air dispersion modeling analysis was simplified by running the ISCLT2 model with an assumed emission rate of 1.0 $g/s/m^2$ for each area source. Options of the ISCLT2 program were used to group sources and write the grouped results to a plot file. The ISCLT2 source group results were multiplied by the product of the PM_{10} emission rate and the surface soil concentrations in Appendix D (Attachment D.2.I) to determine the COC-specific annual concentrations presented in Appendix D (Section D.2-V) of this FS. Spreadsheets were used to calculate the COC concentrations from the ISCLT2 model output and emissions data.

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C.5.2.2.3 Air Modeling Results

The modeled maximum annual average COC air concentrations are presented in Tables C.5-20 through C.5-28. The tables present a summary of subunit-specific projected air concentrations per alternative. The values presented are the maximum on-property concentrations and maximum off-property (FEMP fenceline) concentrations. Maximum on-property values represent the exposure point concentrations for the on-property farm receptors. Maximum off-property numbers represent the exposure point concentrations for the off-property farm receptors. Based on a comparison of the maximum off-property and average on-property concentrations, the maximum off-property concentrations were also used to represent conservative concentrations for receptors that were assumed to roam or wander over the operable unit (i.e., the expanded trespasser).

C.5.2.3 Farm Product Fate Modeling

This section describes the equations used to estimate residual exposure to chemicals and radionuclides from ingestion of contaminated farm products.

C.5.2.3.1 Ingestion of Vegetables

The equations used to estimate exposure to chemicals and radionuclides via ingestion of vegetables irrigated with contaminated water are from the NRC (NRC 1977) and the EPA (EPA 1989b). This process involves estimating the concentration of the COC on and in the plant as a result of foliar deposition and root uptake. The model used to estimate the concentration in and on vegetation irrigated with contaminated water is (NRC 1977):

$$C_{ivw} = d_w \left[\frac{r_w (1 - e^{-\lambda_{Ei} t_e})}{Y \lambda_{Ei}} + \frac{f_w B_{iv} (1 - e^{-\lambda_{di} t_{bw}})}{\rho \lambda_{di}} \right] e^{-\lambda_{ri} t_h} \qquad \text{(C.5-10)}$$

For vegetation exposed to atmospheric fallout of dust, the equation becomes (NRC 1977):

$$C_{ivd} = d_d \left[\frac{r_d (1 - e^{-\lambda_{Ei} t_e})}{Y \lambda_{Ei}} + \frac{f_d B_{iv} (1 - e^{-\lambda_{di} t_{bd}})}{\rho \lambda_{di}} \right] e^{-\lambda_{ri} t_h} \qquad \text{(C.5-11)}$$

TABLE C.5.20

PARTICULATE-PHASE CONTAMINANT CONCENTRATIONS IN AIR (ABOVE BACKGROUND) FOR CONSOLIDATION AND CAPPING WITH FEDERAL OWNERSHIP: SOUTH FIELD AREA (SF/AFP/IFP)

	Maximum On-Property		Maximum Off-Property	
COC	Concentration	Deposition Rate	Concentration	Deposition Rate
Radionuclides (pCi/m^3 or $pCi/m^2/s$)				
Cs-137	0.00	0.00	0.00	0.00
Np-237	2.84×10^{-6}	1.02×10^{-8}	1.75×10^{-7}	6.29×10^{-10}
Pu-238	0.00	0.00	0.00	0.00
Ra-226	3.65×10^{-6}	1.32×10^{-8}	1.90×10^{-7}	6.84×10^{-10}
Ra-228	1.16×10^{-6}	4.16×10^{-9}	6.12×10^{-8}	2.20×10^{-10}
Sr-90	2.29×10^{-5}	8.24×10^{-8}	1.12×10^{-6}	4.02×10^{-9}
Tc-99	5.06×10^{-6}	1.82×10^{-8}	2.34×10^{-7}	8.41×10^{-10}
Th-228	0.00	0.00	0.00	0.00
Th-230	1.67×10^{-5}	6.02×10^{-8}	8.64×10^{-7}	3.11×10^{-9}
Th-232	0.00	0.00	0.00	0.00
U-234	9.12×10^{-5}	3.28×10^{-7}	4.24×10^{-6}	1.53×10^{-8}
U-235/236	1.45×10^{-5}	5.22×10^{-8}	6.69×10^{-7}	2.41×10^{-9}
U-238	9.47×10^{-5}	3.41×10^{-7}	4.55×10^{-6}	1.64×10^{-8}
Inorganics and Organics (ug/m^3 or $ug/m^2/s$)				
Antimony	0.00	0.00	0.00	0.00
Aroclor 1254	2.31×10^{-7}	8.30×10^{-10}	1.06×10^{-8}	3.83×10^{-11}
Aroclor 1260	0.00	0.00	0.00	0.00
Arsenic	6.09×10^{-5}	2.19×10^{-7}	2.84×10^{-6}	1.02×10^{-8}
Benzo(a)anthracene	0.00	0.00	0.00	0.00
Benzo(a)pyrene	0.00	0.00	0.00	0.00
Benzo(b)fluoranthene	0.00	0.00	0.00	0.00
Benzo(k)fluoranthene	0.00	0.00	0.00	0.00
Beryllium	4.59×10^{-6}	1.65×10^{-8}	2.12×10^{-7}	7.62×10^{-10}
Carbazole	0.00	0.00	0.00	0.00
Dibenzo(a,h)anthracene	0.00	0.00	0.00	0.00
Dieldrin	0.00	0.00	0.00	0.00
Indeno(1,2,3-cd)pyrene	0.00	0.00	0.00	0.00
Uranium (total)	1.06×10^{-3}	3.83×10^{-6}	5.15×10^{-5}	1.85×10^{-7}

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TABLE C.5-21

PARTICULATE-PHASE CONTAMINANT CONCENTRATIONS IN AIR (ABOVE BACKGROUND) FOR ON-SITE OR OFF-SITE DISPOSAL WITH FEDERAL OWNERSHIP: SOLID WASTE LANDFILL

	Maximum On-Property		Maximum Off-Property	
COC	Concentration	Deposition Rate	Concentration	Deposition Rate
Radionuclides (pCi/m^3 or $pCi/m^2/s$)				
Cs-137	0.00	0.00	0.00	0.00
Np-237	9.36×10^{-7}	3.37×10^{-9}	2.55×10^{-8}	9.19×10^{-11}
Pu-238	4.68×10^{-7}	1.68×10^{-9}	1.28×10^{-8}	4.59×10^{-11}
Ra-226	0.00	0.00	0.00	0.00
Ra-228	0.00	0.00	0.00	0.00
Sr-90	1.71×10^{-6}	6.15×10^{-9}	4.66×10^{-8}	1.68×10^{-10}
Tc-99	0.00	0.00	0.00	0.00
Th-228	0.00	0.00	0.00	0.00
Th-230	2.64×10^{-6}	9.52×10^{-9}	7.21×10^{-8}	2.59×10^{-10}
Th-232	0.00	0.00	0.00	0.00
U-234	6.08×10^{-7}	2.19×10^{-9}	1.66×10^{-8}	5.97×10^{-11}
U-235/236	0.00	0.00	0.00	0.00
U-238	5.57×10^{-6}	2.00×10^{-8}	1.52×10^{-7}	5.47×10^{-10}
Inorganics and Organics (ug/m^3 or $ug/m^2/s$)				
Antimony	5.29×10^{-5}	1.90×10^{-7}	1.44×10^{-6}	5.19×10^{-9}
Aroclor 1254	0.00	0.00	0.00	0.00
Aroclor 1260	0.00	0.00	0.00	0.00
Arsenic	0.00	0.00	0.00	0.00
Benzo(a)anthracene	6.78×10^{-7}	2.44×10^{-9}	1.85×10^{-8}	6.66×10^{-11}
Benzo(a)pyrene	6.78×10^{-7}	2.44×10^{-9}	1.85×10^{-8}	6.66×10^{-11}
Benzo(b)fluoranthene	6.08×10^{-7}	2.19×10^{-9}	1.66×10^{-8}	5.97×10^{-11}
Benzo(k)fluoranthene	0.00	0.00	0.00	0.00
Beryllium	9.36×10^{-7}	3.37×10^{-9}	2.55×10^{-8}	9.19×10^{-11}
Carbazole	4.91×10^{-7}	1.77×10^{-9}	1.34×10^{-8}	4.82×10^{-11}
Dibenzo(a,h)anthracene	2.57×10^{-7}	9.26×10^{-10}	7.02×10^{-9}	2.53×10^{-11}
Dieldrin	0.00	0.00	0.00	0.00
Indeno(1,2,3-cd)pyrene	4.91×10^{-7}	1.77×10^{-9}	1.34×10^{-8}	4.82×10^{-11}
Uranium (total)	1.01×10^{-5}	3.62×10^{-8}	2.74×10^{-7}	9.87×10^{-10}

000171

TABLE C.5-22

PARTICULATE-PHASE CONTAMINANT CONCENTRATIONS IN AIR (ABOVE BACKGROUND) FOR ON-SITE OR OFF-SITE DISPOSAL WITH FEDERAL OWNERSHIP: LIME SLUDGE PONDS

	Maximum On-Property		Maximum Off-Property	
COC	Concentration	Deposition Rate	Concentration	Deposition Rate
Radionuclides (pCi/m^3 or $pCi/m^2/s$)				
Cs-137	0.00	0.00	0.00	0.00
Np-237	4.33×10^{-7}	1.56×10^{-9}	6.19×10^{-9}	2.23×10^{-10}
Pu-238	0.00	0.00	0.00	0.00
Ra-226	0.00	0.00	0.00	0.00
Ra-228	0.00	0.00	0.00	0.00
Sr-90	1.80×10^{-6}	6.48×10^{-9}	2.57×10^{-8}	9.26×10^{-11}
Tc-99	0.00	0.00	0.00	0.00
Th-228	0.00	0.00	0.00	0.00
Th-230	1.73×10^{-6}	6.24×10^{-9}	2.48×10^{-8}	8.91×10^{-11}
Th-232	0.00	0.00	0.00	0.00
U-234	0.00	0.00	0.00	0.00
U-235/236	0.00	0.00	0.00	0.00
U-238	0.00	0.00	0.00	0.00
Inorganics and Organics (ug/m^3 or $ug/m^2/s$)				
Antimony	0.00	0.00	0.00	0.00
Aroclor 1254	0.00	0.00	0.00	0.00
Aroclor 1260	0.00	0.00	0.00	0.00
Arsenic	2.23×10^{-5}	8.02×10^{-8}	3.19×10^{-7}	1.15×10^{-9}
Benzo(a)anthracene	0.00	0.00	0.00	0.00
Benzo(a)pyrene	0.00	0.00	0.00	0.00
Benzo(b)fluoranthene	0.00	0.00	0.00	0.00
Benzo(k)fluoranthene	0.00	0.00	0.00	0.00
Beryllium	0.00	0.00	0.00	0.00
Carbazole	0.00	0.00	0.00	0.00
Dibenzo(a,h)anthracene	0.00	0.00	0.00	0.00
Dieldrin	0.00	0.00	0.00	0.00
Indeno(1,2,3-cd)pyrene	0.00	0.00	0.00	0.00
Uranium (total)	3.63×10^{-5}	1.31×10^{-7}	5.19×10^{-7}	1.87×10^{-9}

000172

TABLE C.5.23

PARTICULATE-PHASE CONTAMINANT CONCENTRATIONS IN AIR (ABOVE BACKGROUND) FOR ON-SITE OR OFF-SITE DISPOSAL WITH FEDERAL OWNERSHIP: SOUTH FIELD AREA (SF/AFP/IFP)

	Maximum On-Property		Maximum Off-Property	
COC	Concentration	Deposition Rate	Concentration	Deposition Rate
Radionuclides (pCi/m^3 or $pCi/m^2/s$)				
Cs-137	0.00	0.00	0.00	0.00
Np-237	3.62×10^{-6}	1.30×10^{-8}	2.50×10^{-7}	9.01×10^{-10}
Pu-238	0.00	0.00	0.00	0.00
Ra-226	3.67×10^{-6}	1.32×10^{-8}	1.89×10^{-7}	6.79×10^{-10}
Ra-228	5.93×10^{-6}	2.13×10^{-8}	2.44×10^{-7}	8.80×10^{-10}
Sr-90	2.99×10^{-5}	1.08×10^{-7}	1.62×10^{-6}	5.85×10^{-9}
Tc-99	8.67×10^{-6}	3.12×10^{-8}	4.44×10^{-7}	1.60×10^{-9}
Th-228	2.73×10^{-6}	9.84×10^{-9}	9.82×10^{-8}	3.54×10^{-10}
Th-230	9.28×10^{-5}	3.34×10^{-7}	3.89×10^{-6}	1.40×10^{-8}
Th-232	1.03×10^{-6}	3.72×10^{-9}	3.72×10^{-8}	1.34×10^{-10}
Ur-234	3.10×10^{-5}	1.12×10^{-7}	1.66×10^{-6}	5.97×10^{-9}
Ur-235/236	2.93×10^{-5}	1.06×10^{-7}	1.44×10^{-6}	5.18×10^{-9}
Ur-238	1.97×10^{-5}	7.08×10^{-8}	1.08×10^{-6}	3.89×10^{-9}
Inorganics and Organics (ug/m^3 or $ug/m^2/s$)				
Antimony	0.00	0.00	0.00	0.00
Aroclor 1254	3.26×10^{-6}	1.17×10^{-8}	1.23×10^{-7}	4.45×10^{-10}
Aroclor 1260	2.81×10^{-7}	1.01×10^{-9}	1.01×10^{-8}	3.63×10^{-11}
Arsenic	8.22×10^{-5}	2.96×10^{-7}	4.26×10^{-6}	1.53×10^{-8}
Benzo(a)anthracene	8.13×10^{-6}	2.93×10^{-8}	2.92×10^{-7}	1.05×10^{-9}
Benzo(a)pyrene	1.33×10^{-5}	4.79×10^{-8}	4.78×10^{-7}	1.72×10^{-9}
Benzo(b)fluoranthene	1.18×10^{-5}	4.26×10^{-8}	4.25×10^{-7}	1.53×10^{-9}
Benzo(k)fluoranthene	1.18×10^{-5}	4.26×10^{-8}	4.25×10^{-7}	1.53×10^{-9}
Beryllium	6.31×10^{-6}	2.27×10^{-8}	3.21×10^{-7}	1.15×10^{-9}
Carbazole	0.00	0.00	0.00	0.00
Dibenzo(a,h)anthracene	3.25×10^{-6}	1.17×10^{-8}	1.17×10^{-7}	4.20×10^{-10}
Dieldrin	7.17×10^{-8}	2.58×10^{-10}	2.57×10^{-9}	9.27×10^{-12}
Indeno(1,2,3-cd)pyrene	4.58×10^{-6}	1.65×10^{-8}	1.65×10^{-7}	5.92×10^{-10}
Uranium (total)	7.00×10^{-5}	2.52×10^{-7}	5.73×10^{-6}	2.06×10^{-8}

000173

TABLE C.5-24

PARTICULATE-PHASE CONTAMINANT CONCENTRATIONS IN AIR (ABOVE BACKGROUND) FOR ON-SITE OR OFF-SITE DISPOSAL WITH PRIVATE OWNERSHIP: SOUTH FIELD AREA (SF/AFP/IFP)

	Maximum On-Property		Maximum Off-Property	
COC	Concentration	Deposition Rate	Concentration	Deposition Rate
Radionuclides (pCi/m^3 or $pCi/m^2/s$)				
Cs-137	0.00	0.00	0.00	0.00
Np-237	1.22×10^{-5}	4.38×10^{-8}	1.13×10^{-6}	4.06×10^{-9}
Pu-238	0.00	0.00	0.00	0.00
Ra-226	0.00	0.00	0.00	0.00
Ra-228	0.00	0.00	0.00	0.00
Sr-90	1.21×10^{-4}	4.35×10^{-7}	5.57×10^{-6}	2.01×10^{-8}
Tc-99	0.00	0.00	0.00	0.00
Th-228	0.00	0.00	0.00	0.00
Th-230	6.59×10^{-5}	2.37×10^{-7}	2.76×10^{-6}	9.92×10^{-9}
Th-232	0.00	0.00	0.00	0.00
U-234	1.30×10^{-5}	4.67×10^{-8}	1.00×10^{-6}	3.61×10^{-9}
U-235/236	0.00	0.00	0.00	0.00
U-238	1.14×10^{-5}	4.11×10^{-8}	8.83×10^{-7}	3.18×10^{-9}
Inorganics and Organics (ug/m^3 or $ug/m^2/s$)				
Antimony	0.00	0.00	0.00	0.00
Aroclor 1254	0.00	0.00	0.00	0.00
Aroclor 1260	0.00	0.00	0.00	0.00
Arsenic	0.00	0.00	0.00	0.00
Benzo(a)anthracene	0.00	0.00	0.00	0.00
Benzo(a)pyrene	0.00	0.00	0.00	0.00
Benzo(b)fluoranthene	0.00	0.00	0.00	0.00
Benzo(k)fluoranthene	0.00	0.00	0.00	0.00
Beryllium	0.00	0.00	0.00	0.00
Carbazole	0.00	0.00	0.00	0.00
Dibenzo(a,h)anthracene	0.00	0.00	0.00	0.00
Dieldrin	0.00	0.00	0.00	0.00
Indeno(1,2,3-cd)pyrene	0.00	0.00	0.00	0.00
Uranium (total)	2.48×10^{-4}	8.94×10^{-7}	1.52×10^{-5}	5.48×10^{-8}

000174

TABLE C.5-25

PARTICULATE-PHASE CONTAMINANT CONCENTRATIONS IN AIR (ABOVE BACKGROUND) FOR ON-SITE OR OFF-SITE DISPOSAL WITH PRIVATE OWNERSHIP: LIME SLUDGE PONDS

	Maximum On-Property		Maximum Off-Property	
COC	Concentration	Deposition Rate	Concentration	Deposition Rate
Radionuclides (pCi/m^3 or $pCi/m^2/s$)				
Cs-137	0.00	0.00	0.00	0.00
Np-237	2.23×10^{-7}	8.04×10^{-10}	3.19×10^{-9}	1.15×10^{-11}
Pu-238	0.00	0.00	0.00	0.00
Ra-226	0.00	0.00	0.00	0.00
Ra-228	0.00	0.00	0.00	0.00
Sr-90	2.45×10^{-7}	8.83×10^{-10}	3.50×10^{-9}	1.26×10^{-11}
Tc-99	0.00	0.00	0.00	0.00
Th-228	0.00	0.00	0.00	0.00
Th-230	2.28×10^{-5}	8.20×10^{-8}	3.25×10^{-7}	1.17×10^{-9}
Th-232	0.00	0.00	0.00	0.00
U-234	0.00	0.00	0.00	0.00
U-235/236	0.00	0.00	0.00	0.00
U-238	0.00	0.00	0.00	0.00
Inorganics and Organics (ug/m^3 or $ug/m^2/s$)				
Antimony	0.00	0.00	0.00	0.00
Aroclor 1254	0.00	0.00	0.00	0.00
Aroclor 1260	0.00	0.00	0.00	0.00
Arsenic	2.93×10^{-4}	1.05×10^{-6}	4.19×10^{-6}	1.51×10^{-8}
Benzo(a)anthracene	0.00	0.00	0.00	0.00
Benzo(a)pyrene	0.00	0.00	0.00	0.00
Benzo(b)fluoranthene	0.00	0.00	0.00	0.00
Benzo(k)fluoranthene	0.00	0.00	0.00	0.00
Beryllium	0.00	0.00	0.00	0.00
Carbazole	0.00	0.00	0.00	0.00
Dibenzo(a,h)anthracene	0.00	0.00	0.00	0.00
Dieldrin	0.00	0.00	0.00	0.00
Indeno(1,2,3-cd)pyrene	0.00	0.00	0.00	0.00
Uranium (total)	0.00	0.00	0.00	0.00

000175

TABLE C.5-26

PARTICULATE-PHASE CONTAMINANT CONCENTRATIONS IN AIR (ABOVE BACKGROUND) FOR ON-SITE OR OFF-SITE DISPOSAL WITH PRIVATE OWNERSHIP: SOLID WASTE LANDFILL

	Maximum On-Property		Maximum Off-Property	
COC	Concentration	Deposition Rate	Concentration	Deposition Rate
Radionuclides (pCi/m^3 or $pCi/m^2/s$)				
Cs-137	0.00	0.00	0.00	0.00
Np-237	1.32×10^{-6}	4.76×10^{-9}	3.60×10^{-8}	1.30×10^{-10}
Pu-238	6.15×10^{-6}	2.21×10^{-8}	1.68×10^{-7}	6.03×10^{-10}
Ra-226	0.00	0.00	0.00	0.00
Ra-228	0.00	0.00	0.00	0.00
Sr-90	4.92×10^{-7}	1.77×10^{-9}	1.34×10^{-8}	4.83×10^{-11}
Tc-99	0.00	0.00	0.00	0.00
Th-228	0.00	0.00	0.00	0.00
Th-230	2.37×10^{-5}	8.52×10^{-8}	6.45×10^{-7}	2.32×10^{-9}
Th-232	0.00	0.00	0.00	0.00
U-234	2.46×10^{-6}	8.85×10^{-9}	6.71×10^{-8}	2.41×10^{-10}
U-235/236	0.00	0.00	0.00	0.00
U-238	0.00	0.00	0.00	0.00
Inorganics and Organics (ug/m^3 or $ug/m^2/s$)				
Antimony	4.09×10^{-5}	1.47×10^{-7}	1.11×10^{-6}	4.01×10^{-9}
Aroclor 1254	0.00	0.00	0.00	0.00
Aroclor 1260	0.00	0.00	0.00	0.00
Arsenic	0.00	0.00	0.00	0.00
Benzo(a)anthracene	7.07×10^{-7}	2.55×10^{-9}	1.93×10^{-8}	6.94×10^{-11}
Benzo(a)pyrene	4.61×10^{-8}	1.66×10^{-10}	1.26×10^{-9}	4.53×10^{-12}
Benzo(b)fluoranthene	4.30×10^{-7}	1.55×10^{-9}	1.17×10^{-8}	4.22×10^{-11}
Benzo(k)fluoranthene	0.00	0.00	0.00	0.00
Beryllium	0.00	0.00	0.00	0.00
Carbazole	1.98×10^{-7}	7.12×10^{-10}	5.39×10^{-9}	1.94×10^{-11}
Dibenzo(a,h)anthracene	1.41×10^{-8}	5.09×10^{-11}	3.86×10^{-10}	1.39×10^{-12}
Dieldrin	0.00	0.00	0.00	0.00
Indeno(1,2,3-cd)pyrene	2.24×10^{-7}	8.08×10^{-10}	6.12×10^{-9}	2.20×10^{-11}
Uranium (total)	0.00	0.00	0.00	0.00

000176

TABLE C.5-27

RADON-222 CONCENTRATION IN AIR FOR ON-SITE OR OFF-SITE DISPOSAL

Subunit or Source	Maximum On-Property Concentration (pCi/m^3)	Maximum Off-Property Concentration (pCi/m^3)
Private Ownership, On-Property Farmer		
Disposal Cell (On-Site Disposal Alternative Only)	2.90×10^{-6}	1.05×10^{-6}
Federal Ownership, Expanded Trespasser		
Disposal Cell (On-Site Disposal Alternative Only)	5.62×10^{-6}	2.03×10^{-6}
South Field Area (SF/AFP/IFP)	1.68×10^{0}	8.70×10^{-2}

TABLE C.5-28

RADON-222 CONCENTRATION IN AIR FOR CONSOLIDATION AND CAPPING

Subunit or Source	Maximum On-Property Concentration (pCi/m^3)	Maximum Off-Property Concentration (pCi/m^3)
Federal Ownership, Expanded Trespasser		
South Field Area (SF/AFP/IFP/Consolidation Area)	1.55×10^{0}	8.00×10^{-2}
Solid Waste Landfill	4.07×10^{-7}	1.12×10^{-8}
Lime Sludge Ponds	2.37×10^{-7}	3.42×10^{-9}

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where

λ_{Ei} = effective depletion constant of ith COC on the plant surface (hr^{-1}),

λ_{di} = effective depletion constant from root zone of soil (hr^{-1}),

λ_{ri} = radioactive or chemical decay constant of ith COC (hr^{-1}), from Howard 1991,

B_{iv} = dry soil to wet plant (vegetables, forage, and fruit) transfer coefficient of ith COC,

C_{ivd} = concentration of ith COC in plants as a result of deposition of contaminated dust on plants (pCi/kg or mg/kg),

C_{ivw} = concentration of ith COC in plants as a result of irrigating plants with contaminated water (pCi/kg or mg/kg),

d_d = dust deposition rate ($pCi/m^2/hr$ or $mg/m^2/hr$),

d_w = irrigation deposition rate ($pCi/m^2/hr$ or $mg/m^2/hr$),

f_w = fraction of year plant is irrigated (unitless),

f_d = fraction of year plant is downwind (unitless),

ρ = effective dry surface density of the soil (kg/m^2),

r_d = fraction of deposited dust retained on plant surface (unitless),

r_w = fraction of water borne material retained on plant surface (unitless),

t_{bd} = period soil is exposed to airborne emissions (hr),

t_{bw} = period soil is exposed to contaminated water (hr),

t_e = growing season (hr),

t_h = duration of period between harvest and consumption (hr), and

Y = agricultural yield (kg/m^2),

where

$$\lambda_{di} = \lambda_{ri} + \lambda_{Li} \qquad \text{(C.5-12)}$$

$$\lambda_{Li} = \frac{V_w}{Z\theta\left[1 + \sigma\,\frac{K_d}{\theta}\right]} \qquad \text{(C.5-13)}$$

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where

$$d_w = (C_{iw})(I) \quad \text{(C.5-14)}$$

$$d_d = (C_{id})(V_d) \quad \text{(C.5-15)}$$

where

C_{iw} = concentration of ith COC in irrigation water (pCi/l or mg/l),
I = irrigation rate ($l/m^2/hr$),
C_{id} = concentration of ith COC in dust (pCi/g or mg/g),
K_d = water to soil partitioning coefficient of COC (cm^3/g),
λ_{Li} = leachate removal constant (hr^{-1})
θ = moisture fraction of soil in root zone (unitless),
σ = density of soil in root zone (g/cm^3),
v_d = deposition velocity for dust ($g/m^2/hr$),
V_w = percolation rate (cm/hr), and
Z = depth of root zone (cm).

In addition to exposure to contaminated dust and irrigation water, vegetables and livestock feed may be contaminated by root uptake from contaminated soil. The contribution by this pathway was estimated by the irrigation model; however, this pathway was also considered for areas that are not irrigated with contaminated water but that exhibit surface soil contamination from historical deposition on the soil by other means. The following equation was used to estimate the COC concentration in the plant from root uptake of COCs in the soil:

$$C_{ivs} = (C_s)(B_{iv})(e^{-\lambda_{di} t_h}) \quad \text{(C.5-16)}$$

where

C_{ivs} = concentration of ith COC in plants as a result of root uptake from contaminated soil (pCi/kg or mg/kg), and
C_s = concentration of ith COC in dry soil at harvest time (pCi/kg or mg/kg).

The total concentration of COCs in vegetables (C_{iv}) was estimated using the following equation:

$$C_{iv} = C_{ivw} + C_{ivd} + C_{ivs} \quad \text{(C.5-17)}$$

Equations of the same form were used to estimate the COC concentration in livestock feed, substituting concentration factors for livestock feed in place of those for vegetables ingested by humans.

A summary of parameters used in the vegetable and forage uptake models is presented in Table C.5-29. Radioactive or chemical decay constants are presented in Table C.5-30. Transfer coefficients of COCs from dry soil to wet plant material are presented in Table C.5-31. Source concentrations for farm product fate modeling are presented in Tables C.5-20 through C.5-26 (Section C.5.2.2.3).

C.5.2.3.2 Ingestion of Meat and Dairy Products

Prior to the determination of intake following ingestion of animal products by humans, the concentration of chemicals and radionuclides in animal products must be estimated. The concentration of a COC in animal products, such as beef or milk, was estimated using the following equation (NRC 1977):

$$C_{iA} = F_{iA}[(C_{if})(Q_f) + (C_{iAw})(Q_{Aw})]\ e^{(-\lambda_{ri} t_{iA})} \quad \text{(C.5-18)}$$

where

C_{iA} = concentration of ith COC in the animal product (pCi/l or mg/l for milk, pCi/kg or mg/kg for beef,
F_{iA} = element (stable) transfer coefficient that relates the daily intake by an animal to the concentration of ith COC in an edible portion of the animal product (day/l for milk, day/kg for beef),
C_{if} = concentration of ith COC in forage (pCi/kg or mg/kg),
Q_f = consumption rate of contaminated forage by an animal (kg/day),
C_{iAw} = concentration of ith COC in livestock water (pCi/l or mg/l),
Q_{Aw} = consumption rate of contaminated water by an animal (l/day),
λ_{ri} = decay constant of ith COC (hr^{-1}), and
t_{iA} = delay between harvest of animal product (milk or meat) and consumption (hr).

Transfer coefficients of COCs to milk or beef (F_{iA}) are presented in Table C.5-31.

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TABLE C.5-29

SUMMARY OF PARAMETERS FOR VEGETABLE/FORAGE UPTAKE MODELS

Parameter[a]	Value	Units	Reference
Irrigation Rate (I)	0.081	$l/m^2/hr$	USDA 1970
Typical Settling Velocity (V_d)	6.48	m/hr	EPA 1991
Percolation Rate (Vw)	0.00177	cm/hr	DOE 1994a
Depth to Root Zone (Z)	15	cm	DOE 1994a
Density of Soil (σ)	1.5	g/cm^3	DOE 1994a
Moisture Fraction in Root Zone (θ)	0.17	unitless	DOE 1994a
Fraction of Deposited Dust Retained on Crops (r_d)	0.25	unitless	NRC 1977
Fraction of Water Borne Material Retained on Crops (r_w)	0.20	unitless	NRC 1977
Effective Depletion Constant of Contaminant on Plant Surface (λ_{Ei})	0.0021	hr^{-1}	NRC 1977
Growing Season for Vegetables and Fruit Crops (t_{ec})	1440	hr	NRC 1977
Growing Season for Forage (t_{eg})	720	hr	NRC 1977
Agricultural Yield of Vegetables and Fruit Crop (Y)	1.5	kg/m^2	USDA 1979
Agricultural Yield of Forage (Y)	0.8	kg/m^2	USDA 1979
Fraction of Year Plants are Downwind (f_d)	LD[b]	unitless	—
Fraction of Year Plans are Irrigated (f_w)	1.0[c]	unitless	NRC 1977
Period Soil is Exposed to Contaminated Water (t_{bw})	8,760,000	hr	Assumed
Period Soil is Exposed to Airborne Emissions (t_{bd})	8,760,000	hr	Assumed
Effective Dry Surface Density of the Soil (ρ)	150[d]	kg/m^2	USDA 1982
Delay between Harvest and Consumption of Vegetables (t_{hv})	24	hr	NRC 1977
Delay between Harvest and Consumption of Vegetables and Fruit (t_{hc})	720	hr	Assumed
Delay between Harvest and Consumption of Forage (t_{hg})	0	hr	NRC 1977
Delay between Milking and Consumption (t_{iA})	48	hr	NRC 1977
Delay between Slaughter and Consumption(t_g)	48	hr	NRC 1977

[a] See the uncertainty analysis (Section C.8.0) for more information on these parameters.
[b] Location dependent.
[c] The fraction of time plants are irrigated is implicitly included in the irrigation rate. To avoid using this parameter twice in Equation 7-9 (RAWPA), f_d has been set to 1.0.
[d] Corresponds to a density of 1.5 g/cm^3 and a depth of 10 cm. Moist bulk densities of surface soil range from 1.4 to 1.55 g/cm^3 at the FEMP (USDA 1982).

TABLE C.5-30
CHEMICAL AND RADIOACTIVE COC DECAY CONSTANTS

COC	K_d (cm^3/g)	Λ_{Li} (hr^{-1})	Λ_{ri} (hr^{-1})	Λ_{di} (hr^{-1})
Chemical				
Antimony	4.50×10^{1}	1.26×10^{-6}	1×10^{-14}	1.26×10^{-6}
Aroclor-1254	8.86×10^{3}	6.42×10^{-9}	0	6.42×10^{-9}
Aroclor-1260	1.07×10^{4}	5.32×10^{-9}	0	5.32×10^{-9}
Arsenic	2.0×10^{2}	2.84×10^{-7}	1×10^{-14}	2.84×10^{-7}
Beryllium	2.5×10^{2}	2.27×10^{-7}	1×10^{-14}	2.27×10^{-7}
Carbazole	ND	5.02×10^{-4}	1×10^{-14}	5.02×10^{-4}
Dieldrin	ND	5.28×10^{-4}	2.64×10^{-5}	5.02×10^{-4}
Uranium (total)	ND	5.02×10^{-4}	1×10^{-14}	5.02×10^{-4}
Radionuclides				
Cs-137	1.37×10^{3}	2.66×10^{-6}	2.62×10^{-6}	4.15×10^{-8}
Np-237	5.0×10^{0}	1.11×10^{-5}	3.70×10^{-11}	1.11×10^{-5}
Pu-238	1.0×10^{2}	1.47×10^{-6}	9.02×10^{-7}	5.68×10^{-7}
Ra-226	1.06×10^{2}	5.86×10^{-7}	4.95×10^{-8}	5.36×10^{-7}
Ra-228	1.06×10^{2}	1.43×10^{-5}	1.37×10^{-5}	5.36×10^{-7}
Rn-222		8.06×10^{-3}	7.55×10^{-3}	5.02×10^{-4}
Sr-90	2.50×10^{0}	2.45×10^{-5}	2.77×10^{-6}	2.18×10^{-5}
Tc-99	7.0×10^{-2}	3.10×10^{-4}	3.71×10^{-10}	3.10×10^{-4}
Th-228	3.2×10^{3}	4.44×10^{-5}	4.14×10^{-5}	1.78×10^{-8}
Th-230	3.2×10^{3}	1.88×10^{-8}	1.03×10^{-9}	1.78×10^{-8}
Th-232	3.2×10^{3}	1.78×10^{-8}	5.63×10^{-5}	1.78×10^{-8}
U-234	1.48×10^{0}	3.57×10^{-5}	3.25×10^{-10}	3.57×10^{-5}
U-235	1.48×10^{0}	3.57×10^{-5}	1.12×10^{-13}	3.57×10^{-5}
U-238	1.48×10^{0}	3.57×10^{-5}	1.77×10^{-14}	3.57×10^{-5}

ND = No data
OU1 FS Report (DOE 1994c)

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TABLE C.5-31

K_d AND TRANSFER COEFFICIENTS

COC	$K_d(cm^3/g)$	Beef $_{FIA}$	Milk $_{FIA}$	Vegetable $B_{iv(2)}$	Forage $B_{iv(1)}$
Chemical					
Antimony	4.50×10^{1}	1×10^{-3}	1.0×10^{-4}	1.28×10^{-2}	3.0×10^{-2}
Aroclor-1254	8.86×10^{3}	2.69×10^{-2}	8.5×10^{-3}	3.04×10^{-3}	7.1×10^{-3}
Aroclor-1260	1.07×10^{4}	3.52×10^{-1}	1.11×10^{-1}	4.71×10^{-3}	1.1×10^{-2}
Arsenic	2.0×10^{2}	2.0×10^{-3}	6.0×10^{-5}	1.71×10^{-2}	4.0×10^{-2}
Beryllium	2.5×10^{2}	1.0×10^{-3}	9.0×10^{-7}	4.28×10^{-3}	1.0×10^{-1}
Carbazole	ND	8.14×10^{-5}	2.57×10^{-5}	1.55×10^{-1}	3.62×10^{-1}
Dieldrin	ND	9.12×10^{-4}	2.88×10^{-4}	3.83×10^{-2}	8.96×10^{-2}
Uranium (total)	ND	2.0×10^{-4}	6.0×10^{-4}	3.64×10^{-3}	8.50×10^{-3}
Radionuclides					
Cs-137	1.37×10^{3}	2.0×10^{-2}	7.0×10^{-3}	3.42×10^{-2}	8.0×10^{-2}
Np-237	5.0×10^{0}	5.0×10^{-5}	5.0×10^{-6}	4.28×10^{-3}	1.0×10^{-2}
Pu-238	1.0×10^{2}	5.0×10^{-7}	1.0×10^{-7}	1.93×10^{-4}	4.50×10^{-4}
Ra-226	1.06×10^{2}	2.50×10^{-4}	4.50×10^{-4}	6.42×10^{-3}	1.50×10^{-2}
Ra-228	1.06×10^{2}	2.50×10^{-4}	4.50×10^{-4}	6.42×10^{-3}	1.50×10^{-2}
Rn-222					
Sr-90	2.50×10^{0}	3.0×10^{-4}	1.50×10^{-3}	1.07×10^{0}	2.50×10^{0}
Tc-99	7.0×10^{-2}	8.50×10^{-3}	1.0×10^{-2}	4.07×10^{0}	9.50×10^{0}
Th-228	3.2×10^{3}	6.0×10^{-6}	5.0×10^{-6}	3.64×10^{-4}	8.50×10^{-4}
Th-230	3.2×10^{3}	6.0×10^{-6}	5.0×10^{-6}	3.64×10^{-4}	8.50×10^{-4}
Th-232	3.2×10^{3}	6.0×10^{-6}	5.0×10^{-6}	3.64×10^{-4}	8.50×10^{-4}
U-234	1.48×10^{0}	2.0×10^{-4}	6.0×10^{-4}	3.64×10^{-3}	8.50×10^{-3}
U-235	1.48×10^{0}	2.0×10^{-4}	6.0×10^{-4}	3.64×10^{-3}	8.50×10^{-3}
U-236	1.48×10^{0}	2.0×10^{-4}	6.0×10^{-4}	3.64×10^{-3}	8.50×10^{-3}
U-238	1.48×10^{0}	2.0×10^{-4}	6.0×10^{-4}	3.64×10^{-3}	8.50×10^{-3}

In addition to receiving intake from irrigated forage and water, cows may receive a significant intake from soil ingestion if the soil is also a source of contamination (Zach and Mayoh 1984). The following equation was used to estimate the concentration in the animal product from soil ingestion (EPA 1989b):

$$C_{iA} = F_{iA}[(C_s)(Q_s)]e^{(-\lambda_e t_A)} \quad \text{(C.5-19)}$$

where

C_s = concentration of COC in soil (pCi/kg or mg/kg), and
Q_s = consumption rate of soil by livestock (kg/day).

Animal Consumption Rates

The following parameters were used to quantify the intake of COCs in food and water by beef and milk cattle at or near the FEMP:

Animal	Q_f Feed or Forage[a] (kg wet weight/day)	Q_{Aw} Water[a] (l/day)	Q_s Soil[b] (kg/day)
Milk cow	50	60	0.5
Beef cattle	50	50	0.5

[a]NRC 1977
[b]Zach and Mayoh (1984)

Radionuclide and Nonradioactive Transfer Coefficients

Transfer coefficients for radioelements and nonradioactive metals were taken from Baes et al. (1984), Till and Meyer (1983) and EPA (1989d). The radiological properties of atoms do not effect their elemental transfer in the environment. The soil-to-plant transfer coefficient for edible plants ingested by humans and forage ingested by cattle used for intake models, in the absence of site-specific information, are listed in Table C.5-31. These factors are the ratios of the dry-weight concentration of an element in the reproductive or vegetative portions of the plant to the dry-weight concentration of the element in soil. Edible portions of the plant include grain kernels, fruits, and tubers. These portions are most representative of the plant foods ingested by humans. The list of elements is not all inclusive. The cited references were used to obtain values for additional COCs in individual risk assessments as needed.

Transfer coefficients for organic chemicals were taken from Travis and Arms (1988). If a transfer coefficient was not readily available, the following regression equations based on the relationship between

transfer and the octanol-water partition coefficient (K_{ow}) were used to estimate transfer coefficients (Travis and Arms 1988):

$B_{iv(2)}$ (vegetables)	$\log B_{iv} = 1.588 - 0.578 \log K_{ow}$	(C.5-20)
F_{iA} (milk)	$\log F_{iA} = -8.10 + \log K_{ow}$	(C.5-21)
F_{iA} (beef)	$\log F_{iA} = -7.6 + \log K_{ow}$	(C.5-22)

Chemical-specific K_{ow} values are available from several sources. The major source used for K_{ow} values was Hansch and Leo (1979).

Concentrations in the aboveground vegetative part of plants were estimated using the following equation (Baes et al. 1984):

$$C_{iv} = (C_s)(B_{iv(1)}) \quad \text{(C.5-23)}$$

where

C_{iv} = concentration of the ith COC in vegetation (mg/kg dry wt),
C_s = maximum concentration in soil (mg/kg dry wt), and
$B_{iv(1)}$ = soil-to-plant transfer factor of the ith COC (mg/kg dry wt plant per mg/kg dry wt soil).

C.5.2.3.3 Results of Farm Product Fate Modeling

The resulting COC concentrations in farm products, as modeled by alternative and by subunit, are presented in the risk calculation worksheets in Attachment C.III. These values have been incorporated into the intake equations presented in Section C.3.2. The risk results are presented in Section C.7.0.

C.6.0 REMEDIAL ACTION RISK ASSESSMENT

Each remedial alternative involves a set of work activities. These activities incur varying degrees of physical hazards and human-health risks. This section presents the results of the risk estimates calculated for remedial action activities.

C.6.1 REMEDIAL ACTION RISK CHARACTERIZATION METHODOLOGY

The methods established in the RAWPA (DOE 1992) were employed to estimate potential physical hazards and human-health impacts from carcinogens and noncarcinogens to remediation workers, on-property nonremediation workers, off-property workers and individuals, and the public along the transportation route (for off-site disposal). The remedial action risk assessment evaluated receptor exposures via pathways from media impacted by remedial activities. Construction risks and transportation risks were evaluated for each remedial alternative.

Construction risks are the risks associated with the industrial hazards posed by construction operations during the implementation of remedial activities, except those related the transportation of waste material off-site (i.e., by rail). Construction risks include risks related to excavation, waste processing, and waste packaging. The following equation was used to calculate risks due to construction:

$$\text{Risk} = (\text{PH})(\text{RC}) \qquad \text{(C.6-1)}$$

where

Risk	=	risk of injury or fatality expressed as a probability,
PH	=	person-hours of construction work, (see Attachment II, See page C-62) and
RC	=	injury or fatality risk coefficient (risk/person/hr).

Risk factors (RCs) used are from the RAWPA:

- Injuries per man-hour = 3.4×10^{-5}
- Fatalities per man-hour = 5.0×10^{-7}

Construction risks from on-site trucking accidents were calculated separately, using the formula and risk factors presented in the RAWPA:

$$\text{Risk} = (\text{TM})(\text{AC}) \qquad \text{(C.6-2)}$$

where

Risk	=	risk of injury or fatality expressed as a probability,
TM	=	truck miles for construction work, (see Attachment II), and
AC	=	injury or fatality risk coefficient (risk/mile).

Risk (ACs) factors are:

- Injuries per mile = 2.1×10^{-9}
- Fatalities per 4.1×10^{-8}

Transportation risks were evaluated separately for the rail transportation activities. These risks include exposure of the train crew to direct radiation, exposure of the public living along or using the transportation route to direct radiation, exposure of the public to material released from a transportation accident, and exposure of train crews and the public to nonradiological hazards from accidents. The RADTRAN model (Section C.5.1.3), which was used to quantify transportation risks, takes into account emergency response activities. The following equation was used to calculate risks due to transportation of waste to an off-site disposal facility:

$$\text{Risk} = (N)(CF)(RC) \qquad \text{(C.6-3)}$$

where

Risk	=	risk of injury or fatality expressed as a unitless probability,
N	=	number of roundtrips made,
CF	=	mileage per round trip, and
RC	=	injury or fatality risk coefficient (risk/mile).

See Attachment C.II, Tables C.II-23 and 24 for CF values. Risk factors (RCs) are:

- Public injuries per mile = 6.8×10^{-6}
- Public fatalities per mile = 1.8×10^{-6}
- Rail Worker injuries per mile = 4.6×10^{-6}
- Rail Worker fatalities per mile = 4.6×10^{-8}

The sections below present the remedial action risks quantified for construction and transportation activities for each alternative.

Exposure durations for the calculations were determined using the total hours estimated for each work activity. These total hours correspond to the product of ET, ED, and EF in Equation C.3-5. However because of the duration of the remediation activity (a few years) and the duration of the

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various activities, the specific values for ET, ED, and EF did not need to be evaluated; therefore, the product of those values, which represent total project hours for each activity, has been used.

C.6.2 REMEDIAL ACTION RISKS

Remedial action risks were evaluated for impacts to potential human receptors from implementation of each remedial alternative. This section presents the remedial action risks quantified for the four remedial alternatives. For each alternative, construction risks are presented first, then transportation risks. Tables summarizing risk and hazards to potential receptors are provided by alternative. Complete calculation sheets of the risk values are presented in Attachment C.II. Note that Alternative 1, No Action, has no short-term impacts and was not evaluated in this section.

Evaluations for on-site activities are discussed in order of airborne pathways, dermal pathways, direct radiation, and industrial hazards for each alternative. Transportation risks were evaluated for incident-free transportation (i.e., no accidents) and for accidents during rail transport. The risks from activities conducted in the South Field and Inactive Flyash Pile have been combined because the analytical information on COC concentrations was combined in the RI.

Estimates of excavation duration were developed from engineering estimates for each phase of the remediation activities. The time spent at actual physical remediation was the longest time period for any direct exposure to contaminated materials by airborne pathways, dermal pathways or direct radiation exposure. This activity was evaluated in most cases, as the bounding remediation activity for each alternative. Workers may be involved in more than one remediation activity, but because this activity will be occurring over a long period of time, workers may be limited to only this activity. Risks at the majority of other activities will be considerably less because of factors such as shielding, limited volumes, limited activity duration, etc. In those cases where a possibility existed for significant risks, the other activities were also evaluated.

Evaluations for Alternative 2 have been made for the Federal Ownership Scenario, since it is the only scenario under evaluation. For the other alternatives, based on assessment of South Field data, it would require 3 to 4 times less volumes and hours required to remediate under federal ownership land use, than under private ownership. Therefore, only the Private Ownership land use has been evaluated for risks from COCs. It can be expected that risks under the Federal Ownership land use will be only a fraction of the Private Ownership land use risks.

C.6.2.1 Alternative 2: Consolidation and Capping

For Alternative 2, risks are calculated for on-site activities. No transportation activities are envisioned.

On-Site Activities

Airborne Pathways. Inhalation pathways were evaluated for excavation activities for each subunit. Calculations are detailed in Tables C.II-1 through C.II-4, in Attachment C.II. Results are summarized in Table C.6-1.

TABLE C.6-1

ALTERNATIVE 2, FEDERAL OWNERSHIP, INHALATION RISK RESULTS FROM EXCAVATION ACTIVITIES

Subunit	Risk Source	Risk[a]
Solid Waste Landfill	Chemical COCs	2.1×10^{-7}
	Radionuclides	1.0×10^{-5}
Lime Sludge Pond	Chemical COCs	7.6×10^{-8}
	Radionuclides	9.1×10^{-7}
South Field/Inactive Flyash Pile	Chemical COCs	1.6×10^{-6}
	Radionuclides	7.6×10^{-6}
Active Flyash Pile	Chemical COCs	1.7×10^{-6}
	Radionuclides	4.0×10^{-6}

[a]Risks calculated assuming no PPE or shielding

These risks were calculated using the dust loading factor (600 $\mu g/m^3$) and the soil concentrations for the various COCs. The worker was assumed to inhale the entire available concentration of dust (i.e., given by soil concentration x dust loading) regardless of particle size. The dispersion of particulate matter from excavation activities was based on EPA guidance for superfund sites (EPA 1993f, Figure C). It was assumed that the active excavation area was approximately 0.5 acres and that the side of the excavation area was approximately 50 m. The distance to the nonremediation worker was assumed to be 300 m (1000 ft.) and the distance to the nearest fenceline was measured from the approximate center of each subunit. The remedial worker was assumed to be immersed in air laden with a dust concentration of 6.0×10^{-4} g/m^3 (DOE, 1992). The ratio of the dispersion factor for each

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fenceline distance to the factor for 50 m was multiplied by the remedial worker dust concentration to obtain off-site dust concentration. The dust concentrations are presented in the Table C.6-1A.

TABLE C.6-1A

GENERAL PUBLIC AND NONREMEDIATION WORKER EXPOSURE DUST CONCENTRATION CALCULATIONS

Subunit	Distance to Fence		Dispersion Factors		Ratio of dispersion factors	Dust Concentrations
	feet	meter	50 meter	Fenceline		g/m^3
			Public			
South Field/ Inactive Flyash Pile	1100	335	19,000	2100	9.05	$6.6x10^{-5}$
Active Flyash Pile	1300	396	19,000	1900	10.00	$6.0x10^{-5}$
Solid Waste Landfill	1700	518	19,000	1400	13.58	$4.4x10^{-5}$
Lime Sludge Ponds	2300	701	19,000	850	22.35	$2.7x10^{-5}$
			Nonremediation Worker			
All	1000	305	19,000	2500	7.6	$7.89x10^{-5}$

A summary of the inhalation risks for the receptors is included in Table C.6-2.

The chemical COCs responsible for the majority of the risk from inhalation are based solely on the relative soil concentration of each COC; no single COC determines the risk. For radionuclides, the risks are driven by the thorium and uranium concentrations, which are in the highest concentrations. Risks from radon emissions during excavation were calculated separately for a remediation worker, using calculations more appropriate to radon, in Table C.II-13, (Attachment C.II) and the results indicate risks in the 9.1×10^{-8} (for the Lime Sludge Pond) to 2.3×10^{-6} (for the Active Flyash Pile). The radon exposures to the nonremediation workers and the public would be reduced in the same fashion as the particulate inhalation.

TABLE C.6-2
ALTERNATIVE 2, FEDERAL OWNERSHIP
SUMMARY OF INHALATION RISKS FROM EXCAVATION

Subunit	Receptor[a]	Total Risk[b]
Solid Waste Landfill	Remediation Workers	1.0×10^{-5}
	Nonremediation Workers	1.3×10^{-6}
	Public	7.4×10^{-7}
Lime Sludge Pond	Remediation Workers	9.9×10^{-7}
	Nonremediation Workers	1.3×10^{-7}
	Public	4.4×10^{-8}
South Field/ Inactive Flyash Pile	Remediation Workers	9.2×10^{-6}
	Nonremediation Workers	1.2×10^{-6}
	Public	1.0×10^{-6}
Active Flyash Pile	Remediation Workers	5.7×10^{-6}
	Nonremediation Workers	7.5×10^{-7}
	Public	5.7×10^{-7}

[a]For public receptor, see Tables C.II-1, 2, 3, and 4, (Attachment C.II), Footnote 1.
[b]Risks calculated assuming no PPE or shielding

Dermal exposure routes include contact with contaminated soils and airborne dust. Risks are both carcinogenic and noncarcinogenic. These risks are presented in Table C.II-14 (Attachment C.II) and are summarized in Table C.6-3. Risks from dermal exposure to PAHs were not calculated. The EPA *currently recommends using the oral exposure assessment to determine dermal exposure risk since it is currently inappropriate to extrapolate dermal slope factors from the oral slope factors for PAHs. There is no oral exposure route associated with the short-term risks from the remediation activities. This does not imply that there is no risk from dermal exposure to PAHs for this activity. Since all risks are very low, it may be expected that the risk from PAHs would also be minimal.

TABLE C.6-3
REMEDIATION WORKER RISKS FROM DERMAL EXPOSURES FOR ALTERNATIVE 2

Subunit	Cancer Risk[a]	HI
Solid Waste Landfill	6.0×10^{-8}	2.3×10^{-3}
Lime Sludge Pond	2.9×10^{-8}	1.3×10^{-3}
South Field/ Inactive Flyash Pile	2.1×10^{-7}	3.4×10^{-3}
Active Flyash Pile	1.0×10^{-7}	2.9×10^{-4}

[a]Risks calculated assuming no PPE or shielding

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Direct Radiation. Direct radiation risks were calculated for excavation activities for each subunit. Calculations are shown in Table C.II-28 (Attachment II) and summarized in Table C.6-4. Risks to the public from direct radiation were estimated using the same calculation for the nonremediation worker, that is by apportioning the risk at 1 m (i.e., the remediation worker) to that at 300 m (1000 ft) using the inverse square law applicable to direct penetrating radiation. Since the risks calculated at this distance were less than 10^{-8}, this is a reasonable approach. This yields a conservative approximation; risks from the air transport pathways were calculated using actual distances to the fence line (i.e., 335 to 701 m), since the risks were higher than those from direct radiation. The risks presented have been calculated using this methodology and values presented in HEAST, as opposed to MICROSHIELD. Risks calculated using MICROSHIELD were in the same order of magnitude as those presented.

TABLE C.6-4

DIRECT RADIATION RISKS FOR ALTERNATIVE 2

Subunit	Receptors	Cancer Risk[a]
Solid Waste Landfill	Remediation Worker	5.9×10^{-6}
	Public	2.7×10^{-10}
Lime Sludge Pond	Remediation Worker	2.7×10^{-6}
	Public	1.2×10^{-10}
South Field/ Inactive Flyash Pile	Remediation Worker	1.8×10^{-5}
	Public	5.3×10^{-10}
Active Flyash Pile	Remediation Worker	2.3×10^{-5}
	Public	1.1×10^{-9}

[a]Risks calculated assuming no PPE or shielding

Immersion doses from exposure to direct radiation of radionuclides suspended in a cloud were calculated by subunit using MICROSHIELD. The results are shown in Table C.II-18 (Attachment C.II) and are summarized in Table C.6-5. Dose rates shown for the public and nonremediation workers are the same as those calculated for a remediation worker during excavation activities and would be expected to be lower in reality, but were not specifically performed for the public or nonremediation workers because of the very low dose levels.

TABLE C.6-5

RISKS FROM IMMERSION IN A CONTAMINATED CLOUD, ALTERNATIVE 2

Subunit	Receptors	Dose (mrem)	Fatal Cancer Risk[a]
Solid Waste Landfill	Remediation Worker	2.9×10^{-6}	1.8×10^{-12}
	Nonremediation Worker/Public	7.8×10^{-7}	4.8×10^{-12}
Lime Sludge Pond	Remediation Worker	1.2×10^{-6}	7.4×10^{-13}
	Nonremediation Worker/Public	3.5×10^{-7}	2.2×10^{-13}
South Field/ Inactive Flyash Pile	Remediation Worker	4.8×10^{-6}	3.0×10^{-12}
	Nonremediation Worker/Public	1.8×10^{-6}	1.1×10^{-12}
Active Flyash Pile	Remediation Worker	8.8×10^{-6}	5.5×10^{-12}
	Nonremediation Worker/Public	3.0×10^{-6}	1.9×10^{-12}

[a]Risks calculated assuming no PPE or shielding

Industrial and Mechanical Hazards. Injury and fatality rates for standard industrial hazards associated with construction activities were used to estimate these risks for remediation activities. Table C.II-21 and C.II-22 (Attachment C.II) show the calculations for on-the-job construction accidents, and for those associated with on-site trucking activities in support of remediation. Calculations were made for volumes estimated from the PRLs for both land-use scenarios federal and private ownership. Table C.6-6 contains a summary of these results. These risks have been summed for all subunits and all remediation activities. The general accident risk rates may include a contribution from trucking accidents, but this information was not specified in the RAWPA.

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TABLE C.6-6

RISKS FROM ON-SITE INDUSTRIAL HAZARDS, ALTERNATIVE 2

Source	Injury Risk		Fatality Risk	
	Private	Federal	Private	Federal
General Accidents	NC	4.0	NC	5.8×10^{-2}
Trucking Accidents	0	3.0×10^{-4}	0	1.5×10^{-5}

NC = Not calculated

C.6.2.2 Alternative 3: Excavation and Off-Site Disposal

For Alternative 3, risks were calculated for on-site activities and transportation.

Airborne Pathways. Inhalation pathways were evaluated for excavation activities for each subunit. Calculations are detailed in Tables C.II-5 through C.II-8 (Attachment C.II). Results are summarized in Table C.6-7.

TABLE C.6-7

ALTERNATIVE 3 INHALATION RESULTS FROM EXCAVATION ACTIVITIES

Subunit	Risk Source	Risk[a]
Solid Waste Landfill	Chemical COCs	3.3×10^{-7}
	Radionuclides	1.6×10^{-5}
Lime Sludge Pond	Chemical COCs	1.7×10^{-7}
	Radionuclides	1.9×10^{-6}
South Field/Inactive Flyash Pile	Chemical COCs	5.0×10^{-7}
	Radionuclides	1.1×10^{-5}
Active Flyash Pile	Chemical COCs	4.1×10^{-7}
	Radionuclides	2.0×10^{-5}

[a]Risks calculated assuming no PPE or shielding

These risks were calculated using the dust loading factor (600 $\mu g/m^3$) and the soil concentrations for the various COCs. The worker was assumed to inhale the entire available concentration of dust (i.e., given by soil concentration x dust loading) regardless of particle size. These risks to the nonremediation worker and the general public were calculated by applying a linear downwind

dispersion factor (EPA 1993f). A summary of the inhalation risks for the receptors is included in Table C.6-8.

TABLE C.6-8

SUMMARY OF INHALATION RISKS FROM EXCAVATION, ALTERNATIVE 3

Subunit	Receptor	Total Risk[a]
Solid Waste Landfill	Remediation	1.6×10^{-5}
	Nonremediation Workers	2.1×10^{-6}
	Public	1.2×10^{-6}
Lime Sludge Pond	Remediation	2.6×10^{-6}
	Nonremediation Workers	3.4×10^{-7}
	Public	1.2×10^{-7}
South Field/ Inactive Flyash Pile	Remediation	1.2×10^{-5}
	Nonremediation Workers	1.6×10^{-6}
	Public	1.3×10^{-6}
Active Flyash Pile	Remediation	2.0×10^{-5}
	Nonremediation Workers	2.6×10^{-6}
	Public	2.0×10^{-6}

[a]Risks calculated assuming no PPE or shielding

The chemical COCs responsible for the majority of the risk from inhalation are based solely on the relative soil concentration of each COC; no single COC determines the risk. For radionuclides, the risks are driven by the thorium and uranium concentrations, which also are in the highest concentrations. Doses from radon emissions during excavation were calculated separately for a remediation worker, using calculations more appropriate to radon, in Table C.II-13 (Attachment C.II) and the results indicate risks in the 3.1 x 10-6 to 1.9×10^{-7} range. The risk to the nonremediation worker and the general public are reduced by dispersion of radon concentrations in the same way as the particulate concentrations.

Dermal exposure routes include contact with contaminated soils and airborne dust. Risks are from carcinogens and noncarcinogens. These risks are presented in Table C.II-15 (Attachment C.II) and summarized Table C.6-9. Risks from dermal exposure to PAHs were not calculated. The EPA currently recommends using the oral exposure assessment to determine dermal exposure risk since it is currently inappropriate to extrapolate dermal slope factors from the oral slope factors for PAHs.

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There is no oral exposure route associated with the short-term risks from the remediation activities. This does not imply that there is no risk from dermal exposure to PAHs for this activity.

TABLE C.6-9

REMEDIATION WORKER RISKS FROM DERMAL EXPOSURES FOR ALTERNATIVE 3

Subunit	Cancer Risk[a]	HI
Solid Waste Landfill	1.2×10^{-7}	4.6×10^{-3}
South Field/ Inactive Flyash Pile	5.4×10^{-7}	8.9×10^{-3}
Lime Sludge Pond	6.1×10^{-8}	2.7×10^{-3}
Active Flyash Pile	2.8×10^{-7}	8.1×10^{-4}

[a]Risks calculated assuming no PPE or shielding

Calculations for VOC emissions from the dryer are shown in Table C.II-17 (Attachment C.II) and the results are summarized in Table C.6-10. Because of the very low risks, the off-site public was conservatively assumed to receive the same dose as the nonremediation worker, even though the public's dose would be much lower.

TABLE C.6-10

CANCER RISKS FROM VOCS EMITTED FROM THE DRYER, ALTERNATIVE 3

Subunit	Receptor	Inhalation Risk[a]	Dermal Risk
Solid Waste Landfill	Nonremediation Worker/ Public	7.5×10^{-14}	3.5×10^{-9}
Lime Sludge Pond	Nonremediation Worker/ Public	1.5×10^{-12}	4.0×10^{-9}
South Field/ Inactive Flyash Pile	Nonremediation Worker/ Public	3.2×10^{-11}	1.0×10^{-8}
Active Flyash Pile	Nonremediation Worker/ Public	0	0

[a]Risks calculated assuming no PPE or shielding

TABLE C.6-11

DIRECT RADIATION RISKS FOR ALTERNATIVE 3

Subunit	Receptors	Risk[a]
Solid Waste Landfill	Remediation Worker	1.2×10^{-5}
	Nonremediation Worker/ Public	5.4×10^{-10}
Lime Sludge Pond	Remediation Worker	5.8×10^{-6}
	Nonremediation Worker/ Public	2.6×10^{-10}
South Field/ Inactive Flyash Pile	Remediation Worker	1.7×10^{-5}
	Nonremediation Worker/ Public	7.6×10^{-10}
Active Flyash Pile	Remediation Worker	3.1×10^{-5}
	Nonremediation Worker/Public	1.4×10^{-9}

[a]Risks calculated assuming no PPE or shielding

Direct Radiation. Direct radiation risks were calculated for excavation activities for each subunit. Calculations are shown in Table C.II-29 (Attachment II) and summarized in Table C.6-11. Risks to nonremediation workers were calculated by apportioning the risk at 1 m (i.e., the remediation worker) to that at 300 m using the inverse square law applicable to direct penetrating radiation. Risks have been calculated using the methodology and values presented in HEAST, as opposed to MICROSHIELD. Risks calculated using MICROSHIELD were in the same order of magnitude as those presented.

Immersion doses from exposure to direct radiation of radionuclides suspended in a cloud were calculated by subunit using MICROSHIELD. The results are shown in Table C.II-19 (Attachment C.II) and are summarized in Table C.6-12. Dose rates shown for the public and nonremediation workers are the same as those calculated for a remediation worker during excavation activities and would be expected to be lower in reality, but were not specifically performed for the public or nonremediation workers because of the very low dose levels.

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TABLE C.6-12

RISKS FROM IMMERSION IN A CONTAMINATED CLOUD, ALTERNATIVE 3

Subunit	Receptors	Dose (mrem)	Fatal Cancer Risk[a]
Solid Waste Landfill	Remediation Worker	4.4×10^{-6}	2.7×10^{-12}
	Nonremediation Worker	1.6×10^{-6}	9.9×10^{-13}
	Public		
Lime Sludge Pond	Remediation Worker	2.3×10^{-6}	1.4×10^{-12}
	Nonremediation Worker	7.4×10^{-7}	4.6×10^{-13}
	Public		
South Field/Inactive Flyash Pile	All Receptors	2.5×10^{-6}	1.5×10^{-12}
Active Flyash Pile	All Receptors	3.9×10^{-6}	2.4×10^{-12}

[a]Risks calculated assuming no PPE or shielding

Industrial and Mechanical Hazards. Injury and fatality rates for standard industrial hazards associated with construction activities were used to estimate these risks for remediation activities. Table C.II-21 and C.II-22 (Attachment C.II) show the calculations for on-the-job construction accidents, and for those associated with on-site trucking activities in support of remediation. Calculations were made for volumes estimated from the PRLs for both land-use scenarios federal and private ownership. Table C.6-13 contains a summary of these results. These risks have been summed for all subunits and all remediation activities. The general accident risk rates may include a contribution from trucking accidents, but this information was not specified in the RAWPA.

TABLE C.6-13

RISKS FROM ON-SITE INDUSTRIAL HAZARDS, ALTERNATIVE 3

Source	Injury Risk[a]		Fatality Risk[a]	
	Private	Federal	Private	Federal
General Accidents	NC	11.0	NC	1.6×10^{-1}
Trucking Accidents	2.4×10^{-3}	1.1×10^{-3}	1.25×10^{-4}	5.8×10^{-5}

NC = Not calculated
[a]Risks calculated assuming no PPE or shielding

Transportation Risks

Transportation risks are those associated with the shipment of contaminated materials off-site by rail. Risks presented include those based on standard accident rates for the rail transport industry, doses to

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workers and the public along the route from normal shipping conditions, and doses to workers and the public from accidents along the route. Impacts from accidents were calculated using the RADTRAN code and include direct radiation, inhalation, ingestion and immersion exposure routes. These results have been left in terms of doses rather than risks because of the complexity of the combined exposure routes.

Risks from accidents expected in the normal operation of a rail system are presented in Table C.II-23 (Attachment C.II) and summarized in Table C.6-14. Calculations were made for volumes estimated from the PRLs for both land-use scenarios, federal and private ownership and are based on the number of trips required to transport the minimum number of railcars (159) at one time. Since rates are based on mileage, these risks would decrease as the number of cars increase in a train.

TABLE C.6-14

RISKS FROM EXPECTED ACCIDENTS FROM RAIL TRANSPORT, ALTERNATIVE 3

Receptor	Injury Risk[a]		Fatality Risk[a]	
	Private	Federal	Private	Federal
Rail Workers	1.2	5.0×10^{-1}	1.2×10^{-2}	5.0×10^{-3}
Public	1.8	7.3×10^{-1}	4.8×10^{-1}	1.9×10^{-1}

[a]Risks calculated assuming no PPE or shielding

Doses received by the public from rail transportation are presented in Table C.II-25 (Attachment C.II) for incident-free transportation (i.e., no accidents) and in Table C.II-26 (Attachment C.II) for accidents. Table C.6-15 summarizes the risks for various receptors for the incident-free transportation. Two worker-receptors were calculated using RADTRAN. These workers are associated with the train and are not considered remediation workers. The public consists of four groups, as calculated with the built-in code assumptions described in Section C.5.1. All doses are based on 159 cars per shipment. As the number of railcars increases, the number of shipments would decrease, causing a net increase in dose per shipment, but no change in the total dose per subunit. The RADTRAN estimated maximum individual dose per shipment is 2.2×10^{-7} rem (based on 159 cars per shipment).

The calculations for incident-free transportation used the soil concentration levels found in the Active Flyash Pile as a source term for all subunit calculations, since this provided the maximum individual

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railcar dose rate. Other subunit source terms may be lower by a factor of 3 or more, which would have no significant impact on the total risks. The population total for the calculation was 549,760 persons encountered in the various RADTRAN scenarios.

TABLE C.6-15

RISKS FROM INCIDENT-FREE RAIL TRANSPORTATION, ALTERNATIVE 3

Receptors[a]		Person-rem	Rem per person
Rail Workers	Rail Crew	0.00029	NC
	Handlers	1.53	NC
Public	Along route	0.34	NC
	On other trains	0.04	NC
	At stops	0.6	NC
	At storage depots	0.06	NC
Total		2.5	4.6×10^{-6}

NC = Not calculated
[a]Risks calculated assuming no PPE or shielding

Accident analyses performed with RADTRAN calculated the expected accident frequencies per severity group, which is described in Section C.5.1. Frequencies per shipment range from 10^{-3} to 10^{-8} according to the severity of the postulated accident and associated release. The most frequently expected accident occurs in the frequency range of 10^{-3} but has no associated release (i.e., railcars are not breach). The next severity category has a postulated 0.1 fraction release and so on, up to a 100 percent release for the highest category. Accidents are calculated for urban, suburban, and rural populations. Table C.II-26 (Attachment C.II) contains the calculations for resulting doses from the postulated accidents. The highest dose levels result from the lowest frequency accidents.

Table C.6-16 summarizes the results of the postulated accidents along with the expected frequency per shipment from Table C.5-17 for those accidents with an expected per shipment frequency of greater than 10^{-6}. For Alternate 3, the total number of train trips is estimated at 70, based on 159 railcar trains. The total number of accidents that would be expected based on a frequency of 10^{-6} accident per shipment, for 70 shipments, is 7.0×10^{-5} for the entire waste disposal process. Results were calculated for both the federal and private PRL waste volumes. The federal ownership doses are approximately 2 orders of magnitude lower than those for the private ownership scenarios.

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C.6.2.3 Alternative 6: Excavation and On-Site Disposal With Off-Site Disposal of Fraction Exceeding WAC

For Alternative 6, risks were calculated for on-site activities and transportation.

TABLE C.6-16

SUMMARY OF ACCIDENT RESULTS FOR TRAIN SHIPMENT FOR PRIVATE OWNERSHIP VOLUMES, ALTERNATIVE 3

Population[a]	Severity Group	Expected Frequency per Shipment	Total Dose for All Shipments (person-rem)	Total Dose per Member of the Public (rem).
Urban	1	1.1×10^{-3}	0	0
	2	6.4×10^{-4}	2.0×10^{3}	4.1×10^{-3}
	3	1.4×10^{-4}	4.0×10^{3}	8.2×10^{-3}
	4	1.4×10^{-4}	5.9×10^{3}	1.2×10^{-2}
Suburban	1	2.0×10^{-3}	0	0
	2	1.6×10^{-4}	4.6×10^{2}	6.8×10^{-3}
	3	3.7×10^{-4}	9.2×10^{2}	1.4×10^{-2}
	4	3.7×10^{-5}	1.4×10^{3}	2.0×10^{-2}
	5	2.8×10^{-6}	1.8×10^{3}	2.7×10^{-2}
Rural	1	9.1×10^{-5}	0	0
	2	5.5×10^{-5}	8.5×10^{0}	6.8×10^{-3}
	3	9.8×10^{-5}	1.7×10^{1}	1.4×10^{-2}
	4	9.8×10^{-6}	2.6×10^{1}	2.0×10^{-2}
	5	1.6×10^{-6}	3.4×10^{1}	2.7×10^{-2}

[a]Risks calculated assuming no PPE or shielding

C.6.2.3.1 On-Site Activities

Airborne Pathways. Inhalation pathways were evaluated for excavation activities for each subunit. Calculations are detailed in Tables C.II-9 through C.II-12 (Attachment C.II). Results are summarized in Table C.6-17.

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TABLE C.6-17

ALTERNATIVE 6 INHALATION RESULTS FROM EXCAVATION ACTIVITIES

Subunit	Risk Source	Risk[a]
Solid Waste Landfill	Chemical COCs	3.8×10^{-7}
	Radionuclides	1.8×10^{-5}
Lime Sludge Pond	Chemical COCs	1.8×10^{-7}
	Radionuclides	2.2×10^{-6}
South Field/Inactive Flyash Pile	Chemical COCs	4.6×10^{-7}
	Radionuclides	9.9×10^{-6}
Active Flyash Pile	Chemical COCs	1.2×10^{-6}
	Radionuclides	2.8×10^{-6}

[a]Risks calculated assuming no PPE or shielding

These risks were calculated using the dust loading factor (600 $\mu g/m^3$) and the soil concentrations for the various COCs. The worker was assumed to inhale the entire available concentration of dust (i.e., given by soil concentration x dust loading) regardless of particle size. The risks to the nonremediation worker and the general public were calculated by applying a linear downwind dispersion factor (EPA 1993f). A summary of inhalation risks for the receptors is included in Table C.6-18.

TABLE C.6-18

SUMMARY OF INHALATION RISKS FROM EXCAVATION, ALTERNATIVE 6

Subunit	Receptor	Total Risk[a]
Solid Waste Landfill	Remediation Worker	1.8×10^{-5}
	Nonremediation Worker	2.4×10^{-6}
	Public	1.3×10^{-6}
Lime Sludge Pond	Remediation Worker	2.6×10^{-6}
	Nonremediation Worker	3.4×10^{-7}
	Public	1.2×10^{-7}
South Field/ Inactive Flyash Pile	Remediation Worker	1.4×10^{-5}
	Nonremediation Worker	1.8×10^{-6}
	Public	1.5×10^{-6}
Active Flyash Pile	Remediation Worker	4.0×10^{-6}
	Nonremediation Worker	5.3×10^{-7}
	Public	4.0×10^{-7}

[a]Risks calculated assuming no PPE or shielding

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The chemical COCs responsible for the majority of the risk from inhalation are based solely on the relative soil concentration of each COC; no single COC determines the risk. For radionuclides, the risks are driven by the thorium and uranium concentrations, which also are in the highest concentrations. Doses from radon emissions during excavation were calculated separately for a remediation worker, using calculations more appropriate to radon, in Table C.II-13 (Attachment C.II) and the results indicate risks in the 2.2×10^{-7} to 1.8×10^{-6} range. The risk to the nonremediation worker and general public are reduced by dispersion of radon concentrations in the same way as the particulate concentrations.

Dermal exposure routes include contact with contaminated soils and airborne dust. Risks are from carcinogens and noncarcinogens. These risks are presented in Table C.II-16 (Attachment C.II) and summarized in Table C.6-19. Risks from dermal exposures to PAHs were not calculated. The EPA currently recommends using the oral exposure assessment to determine dermal exposure risk since it is currently inappropriate to extrapolate dermal slope factors from the oral slope factors for PAHs. There is no oral exposure route associated with the short-term risks from the remediation activities. This does not imply that there is no risk from dermal exposure to PAHs for this activity. Since all risks are so very low, it may be expected that the risk from PAHs will also be minimal.

TABLE C.6-19

REMEDIATION WORKER RISKS FROM DERMAL EXPOSURES FOR ALTERNATIVE 6

Subunit	Cancer Risk[a]	HI
Solid Waste Landfill	1.0×10^{-7}	3.8×10^{-3}
Lime Sludge Pond	2.9×10^{-8}	1.3×10^{-3}
South Field/ Inactive Flyash Pile	1.9×10^{-7}	3.0×10^{-3}
Active Flyash Pile	1.0×10^{-7}	2.9×10^{-4}

[a]Risks calculated assuming no PPE or shielding

Direct Radiation. Direct radiation risks were calculated for excavation activities for each subunit. Calculations are shown in Table C.II-30 (Attachment II) and summarized in Table C.6-20. Risks to public were calculated by apportioning the risk at 1 m (i.e., the remediation worker) to that at 305m (1000 ft) using the inverse square law applicable to direct penetrating radiation. Risks have been calculated using the methodology and values presented in HEAST, as opposed to MICROSHIELD. Risks calculated using MICROSHIELD were in the same order of magnitude as those presented. Immersion doses from exposure to direct radiation of radionuclides suspended in a cloud were

calculated using MICROSHIELD by subunit. The results are shown in Table C.II-20 (Attachment II) and are summarized in Table C.6-21. Dose rates shown for the public and nonremediation workers

TABLE C.6-20

DIRECT RADIATION RISKS FOR ALTERNATIVE 6

Subunit	Receptors	Risk[a]
Solid Waste Landfill	Remediation Worker	1.1×10^{-5}
	Nonremediation Worker	4.9×10^{-10}
Lime Sludge Pond	Remediation Worker	6.6×10^{-6}
	Nonremediation Worker	3.0×10^{-10}
South Field/ Inactive Flyash Pile	Remediation Worker	1.6×10^{-5}
	Nonremediation Worker	7.0×10^{-10}
Active Flyash Pile	Remediation Worker	1.6×10^{-5}
	Nonremediation Worker	7.3×10^{-10}

[a]Risks calculated assuming no PPE or shielding

are the same as those calculated for a remediation worker during excavation activities and would be expected to be lower in reality, but were not specifically performed for the public or nonremediation workers because of the very low dose levels.

TABLE C.6-21

RISKS FROM IMMERSION IN A CONTAMINATED CLOUD, ALTERNATIVE 6

Subunit	Receptors	Dose (mrem)	Fatal Cancer Risk[a]
Solid Waste Landfill	Remediation Worker	2.4×10^{-6}	1.5×10^{-12}
	Nonremediation Worker Public	1.4×10^{-6}	8.7×10^{-13}
Lime Sludge Pond	All Receptors	8.4×10^{-7}	5.2×10^{-13}
South Field/ Inactive Flyash Pile	Remediation Worker	5.3×10^{-6}	3.3×10^{-12}
	Nonremediation Worker Public	2.3×10^{-6}	1.4×10^{-12}
Active Flyash Pile	Remediation Worker	6.0×10^{-6}	3.7×10^{-12}
	Nonremediation Worker Public	2.0×10^{-6}	1.2×10^{-12}

[a]Risks calculated assuming no PPE or shielding

Industrial and Mechanical Hazards. Injury and fatality rates for standard industrial hazards associated with construction activities were used to estimate these risks for remediation activities. Table C.II-21 and C.II-22 (Attachment C.II) show the calculations for on-the-job construction accidents, and for those associated with on-site trucking activities in support of remediation. Calculations were made for volumes estimated from the PRLs for both land-use scenarios federal and private ownership. Table C.6-22 contains a summary of these results. These risks have been summed for all subunits and all remediation activities. The general accident risk rates may include a contribution from trucking accidents, but this information was not specified in the RAWPA.

TABLE C.6-22

RISKS FROM ON-SITE INDUSTRIAL HAZARDS, ALTERNATIVE 6

Source	Injury Risk[a]		Fatality Risk[a]	
	Private	Federal	Private	Federal
General Accidents	11.5	NC	0.17	NC
Trucking Accidents	2.8×10^{-3}	1.1×10^{-3}	1.4×10^{-4}	5.5×10^{-5}

NC = Not calculated
[a]Risks calculated assuming no PPE or shielding

materials off-site by rail. Risks presented include those based on standard accident rates for the rail transport industry, doses to workers and the public along the route from normal shipping conditions, and doses to workers and the public from accidents along the route. Impacts from accidents were calculated using the radtran code and include direct radiation, inhalation, ingestion and immersion exposure routes. These results have been left in terms of doses rather than risks because of the complexity of the combined exposure routes.

Risks from accidents expected in the normal operation of a rail system are calculated in Table C.II-24 (Attachment C.II) and summarized in Table C.6-23. Calculations were made for volumes estimated from the federal and private land-use PRLs and are based on the number of trips required to transport the minimum number of railcars (159) at one time. Results for the federal ownership scenario were not specifically calculated, but would be approximately 2 orders of magnitude less. Incidence rates are based on mileage. These risks would decrease as the number of cars increases in a train.

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TABLE C.6-23

RISKS FROM EXPECTED ACCIDENTS FROM RAIL TRANSPORT, ALTERNATIVE 6

Receptor	Injury Risk	Fatality Risk
	Private	Private
Rail Workers	1.7×10^{-2}	1.7×10^{-4}
Public	2.6×10^{-2}	6.9×10^{-3}

Doses from rail transport are presented in Table C.II-25 (Attachment C.II) for incident-free transportation (i.e., no accidents) and in Table C.II-26 (Attachment C.II) for accidents. Table C.6-24 summarizes the risks for various receptors for the incident-free transportation. Two worker-receptors were calculated by RADTRAN. These workers are associated with the train and are not considered remediation workers. The public consists of four groups, as calculated with the built-in code assumptions described in Section C.5.1. All doses are based on 159 cars per shipment. As the number of railcars increases, the number of shipments would decrease, causing a net increase in dose per shipment, but no change in the total dose per subunit. The RADTRAN estimated maximum individual dose per shipment is 2.2×10^{-7} rem (based on 159 cars per shipment).

The calculations for incident-free transportation used the soil concentration levels found in the Active Flyash Pile as a source term for all subunit calculations, since this provided the maximum individual railcar dose rate. Other subunit source terms may be lower by a factor of 3 or more, which would have no significant impact on the total risks. The population total for the calculation was 549,760 persons encountered in the various RADTRAN scenarios.

TABLE C.6-24

RISKS FROM INCIDENT-FREE RAIL TRANSPORTATION, ALTERNATIVE 6

Receptors		Person-rem	Rem per person
Rail Workers	Rail Crew	1.3×10^{-6}	NC
Public	Along route	1.5×10^{-3}	NC
	On other trains	1.7×10^{-4}	NC
	At stops	2.5×10^{-3}	NC
	At storage depots	2.8×10^{-4}	NC
TOTAL		4.4×10^{-3}	8.0×10^{-9}

NC = Not calculated

Accident analyses performed with RADTRAN calculated the expected accident frequencies per severity group, which is described in Section C.5.2. Frequencies per shipment range from 10^{-3} to 10^{-8} according to the severity of the postulated accident and associated release. The most frequently expected accident occurs in the frequency range of 10^{-3} but has no associated release (i.e., railcars are not breach). The next severity category has a postulated 0.1 fraction release and so on, up to a 100 percent release for the highest category. Accidents are calculated for urban, suburban, and rural populations. Table C.II-27 (Attachment C.II) contains the calculations for resulting doses from the postulated accidents. The highest dose levels result from the lowest frequency accidents.

Table C.6-25 summarizes the results of the postulated accidents along with the expected frequency per shipment from Table C.5-17 for those accidents with an expected per shipment frequency of greater than 10^{-6}. For Alternate 6, the total number of train trips is estimated at 48, based on 159 railcar trains. Results were calculated for the federal and private PRL waste volumes. The federal ownership doses would be approximately 2 orders of magnitude lower than those for the private ownership scenarios.

TABLE C.6-25

SUMMARY OF ACCIDENT RESULTS FOR TRAIN SHIPMENT FOR RESIDENT FARMER VOLUMES, ALTERNATIVE 6

Population	Severity Group	Expected Frequency per Shipment	Total Dose for All Shipments (person-rem)	Total Dose per Member of the Public (rem)
Urban	1	1.1×10^{-3}	0	0
	2	6.4×10^{-4}	8.55	1.8×10^{-5}
	3	1.4×10^{-4}	17.1	3.6×10^{-5}
	4	1.4×10^{-4}	25.6	5.3×10^{-5}
Suburban	1	2.0×10^{-3}	0	0
	2	1.6×10^{-4}	2.0	3.0×10^{-5}
	3	3.7×10^{-4}	4.0	5.9×10^{-5}
	4	3.7×10^{-5}	6.0	8.8×10^{-5}
	5	2.8×10^{-6}	7.9	1.2×10^{-4}
Rural	1	9.1×10^{-5}	0	0
	2	5.5×10^{-5}	0.037	2.9×10^{-5}
	3	9.8×10^{-5}	0.074	5.9×10^{-5}
	4	9.8×10^{-6}	0.11	8.8×10^{-5}
	5	1.6×10^{-6}	0.15	1.2×10^{-4}

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C.7.0 RESIDUAL RISK ASSESSMENT

This section presents the results of residual risks calculated for potential human receptors for each remedial alternative and each land-use scenario (i.e., private ownership and federal ownership).

C.7.1 RISK CHARACTERIZATION METHODOLOGY

Potential residual risks to human health from exposure to residual COCs (chemical and radionuclides) following implementation of remedial alternatives for Operable Unit 2 were estimated using the methods described in the RAWPA (DOE 1992), and the Operable Unit 2 RI baseline risk assessment (DOE 1994a). The methods used to characterize residual risks are the same as those used in the baseline risk assessment for the corresponding exposure pathway and receptor combinations. Exposure pathway and receptor combinations quantitatively evaluated in the residual risk assessment are defined in the discussion of the conceptual model in Section C.2.5.2. Unless otherwise noted, all of the following equations are from RAGS (EPA 1989a).

C.7.1.1 Hazardous Chemical Exposures

Risks from nonradionuclide COCs were estimated for carcinogenic and noncarcinogenic effects. Risk values were calculated for all COCs known to have a published SF (see Section C.4.0). Those COCs that have an RfD available, the noncarcinogenic HQ was calculated. Some carcinogens may also pose a noncarcinogenic toxic hazard. Effects due to exposures from these chemicals were characterized for both types of health effects.

C.7.1.1.1 Risk Characterization Methodology for Carcinogens

The risk attributed to a carcinogen was estimated as the ILCR of an individual as a result of exposure to the substance. At low doses, the risk of developing cancer was estimated as follows:

$$\text{Risk} = (\text{CDI})(\text{SF}) \qquad \text{(C.7-1)}$$

where

Risk	=	risk of cancer incidence, expressed as a unitless probability,
CDI	=	chronic daily intake averaged over 70 years (mg/kg/day) (equivalent to the I values from Section C.3), and
SF	=	slope factor $(\text{mg/kg/day})^{-1}$ (see Section C.4, Tables 4-2, 4-4 and 4-5).

For dermal exposure, cancer risks were calculated using adjusted toxicity factors based on absorbed doses of COCs rather than COC intakes. For a given pathway with simultaneous exposure of a receptor to several carcinogens, the following equation was used to sum cancer risks:

$$Risk_p = Risk\ (chem_1) + Risk\ (chem_2) + \ldots Risk\ (chem_i) \qquad (C.7\text{-}2)$$

where

$Risk_p$	=	total pathway risk of cancer incidence, and
$Risk\ (chem_i)$	=	risk associated with an individual carcinogenic chemical.

C.7.1.1.2 Risk Characterization Methodology for Noncarcinogens

The risk associated with exposure to noncarcinogenic hazardous COCs was evaluated by comparing an exposure level or intake to a reference dose (RfD (see Section C.4.0). It is recognized that this methodology for assessing the human-health effect for noncarcinogens does not give a measure of risk as is calculated for the carcinogens. Even so, for convenience the term "risk" will continue to be used when discussing these evaluations. The ratio of intake/RfD for a single COC is the HQ and is defined as:

$$HQ = I/RfD \qquad (C.7\text{-}3)$$

where

HQ	=	hazard quotient (unitless),
I	=	intake of a chemical (mg/kg/day) (see Section C.3), and
RfD	=	reference dose (mg/kg/day) (see Section 4.0, Tables C.4-1 and C.4-4).

When using this equation to estimate potential noncarcinogenic risk, the intake and RfD must be derived from exposures of equivalent duration (e.g., subchronic, chronic, or fewer than two weeks). For residual risk, COC exposures were evaluated in all cases on a chronic basis, using chronic RfD values. Analogous to cancer risks, dermal noncancer risks were assessed using absorbed dose rather than intake.

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In the case of simultaneous exposure of a receptor to several chemicals, an HI was calculated as the sum of the HQs by:

$$HI = I_i/RfD_1 + I_2/RfD_2 + \ldots I_i/RfD_i \qquad \text{(C.7-4)}$$

where

HI	=	hazard index (unitless),
I_i	=	intake for the ith toxicant, and
RfD_i	=	reference dose for the ith toxicant.

An HI is an indicator of the potential for adverse effects associated with chronic exposures to multiple chemicals. In effect, HIs assume dose additivity for all COCs (RAGS).

C.7.1.2 Radiological Exposures

The procedures for estimating the total lifetime excess cancer risks due to exposure to radionuclides are described in this section.

Risk Characterization Methodology for Internal and External Exposures

Risk characterization for internal exposures to radionuclides (intake via inhalation or ingestion) was calculated as follows:

$$Risk = (I)(SF) \qquad \text{(C.7-5)}$$

where

Risk	=	risk of cancer incidence, expressed as a unitless probability,
I	=	lifetime radionuclide intake (pCi) defined in Section C.3, and
SF	=	slope factor $(pCi)^{-1}$.

For residual risk, risk characterization for external exposure to gamma-emitting radionuclides in contaminated surface soil was calculated as follows (RAWPA):

$$Risk = (DE)(SF) \qquad (C.7\text{-}6)$$

where

Risk = risk of cancer incidence, expressed as a unitless probability,
DE = direct exposure defined in equation C.3-19 in Section C.3.0, and
SF = slope factor $(pCi)^{-1}$.

The slope factor is either a HEAST value for a particular radionuclide or the sum of the HEAST slope factors for that radionuclide and its short-lived progeny to account for ingrowth during storage and/or environmental transport.

C.7.2 Residual Risks

Residual risks were evaluated for potential impacts to human receptors based on postremediation conditions. This section presents the residual risks quantified for each receptor, pathway, and land-use scenario for Alternatives 2, 3, and 6 (Alternative 1, No Action, is summarized in Section C.1.4; for details, see the RI baseline risk assessment). Tables are provided to summarize the ILCR and hazards calculated. Complete calculation sheets of the risk values are presented in Attachment C.III.

Residual risks at the Lime Sludge Ponds are quantified in Tables C.7-1 through C.7-19, below. Under Alternative 2 for this subunit the risks for all receptors are well below the 1.0 level of concern for HI, and less than the ILCR target risk range of 10^{-4} to 10^{-6}. For Alternative 3 the HI for all receptors are similarly well below the 1.0 level of concern. The ILCR for most receptors is also less than the target risk range. For the perched groundwater user (Table C.7-9), the ILCR is within the lower end of this range (4.6×10^{-6}). Similarly, the on-property adult farmer (Table C.7-10) has an ILCR of 3.4×10^{-6}. The same pattern can be seen under Alternative 6 as under Alternative 3. The HI for all receptors are well below the 1.0 level of concern. The ILCR is less than the target risk range, except for the perched groundwater user (Table C.7-17) at 4.6×10^{-6}, and the on-property adult farmer (Table C.7-18) at 3.4×10^{-6}.

Tables C.7-20 through C.7-38 present the residual risks at the Solid Waste Landfill for Alternatives 2, 3, and 6. Under Alternative 2 the risks for all receptors are well below the 1.0 level of concern for HI, and less than the ILCR target risk range of 10^{-4} to 10^{-6}. Alternative 3 has HI levels less than the 1.0 level of concern, with the highest level being 7.6×10^{-1} for the on-property child (Table C.7-30). This level is primarily due to the ingestion of vegetables and fruit. ILCR levels are generally less

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than the target risk range of 10^{-4} to 10^{-6}. The exceptions are ILCR levels of 4.8×10^{-6} for the perched groundwater user (Table C.7-28) and 3.4×10^{-6} for the on-property adult farmer (Table C.7-29). These levels are due to the combined effects of several pathways. Alternative 6 presents similar risk levels to those calculated for Alternative 3. HI levels are also less than the 1.0 level of concern, with the highest level being 7.6×10^{-1} for the on-property child (Table C.7-38). This level is primarily due to the ingestion of vegetables and fruit. ILCR levels are also less than the target risk range of 10^{-4} to 10^{-6}, with the exception of 4.8×10^{-6} for the perched groundwater user (Table C.7-36) and 3.4×10^{-6} for the on-property adult farmer (Table C.7-37). These levels are due to the combined effects of several pathways.

The three southern subunits of Operable Unit 2 (South Field, Active Flyash Pile, and Inactive Flyash Pile) have been combined into one area for risk assessment purposes, due to their proximity. This combined area is identified as the South Field Area in the Tables C.7-39 through C.7-55 below. For Alternative 2 the HI levels are all less than the 1.0 level of concern, with the highest level being 1.3×10^{-1} for the expanded trespasser (Table C.7-39). Dermal contact is the only significant pathway for determining this value. ILCR values range from 9.3×10^{-8} for the off-property child (Table C.7-41) to 1.6×10^{-6} for the off-property adult farmer (Table C.7-40). HI values under Alternative 3 are all less than the 1.0 standard, with the highest level being 7.2×10^{-2} for the off-property child with federal ownership (Table C.7-44). The ingestion of vegetables, fruit and drinking water are the principal contributors to this risk. ILCR levels are all in the 10^{-6} range or less. The highest ILCR value for Alternative 3 is 6.4×10^{-6} for the on-property adult farmer (Table C.7-47). The ingestion of particulates, vegetables, and fruit are the principal pathways for this receptor.

Alternative 6 for the South Field area has uniformly low HI values. The highest HI is only 7.2×10^{-2} for the off-property child with federal ownership (Table C.7-51). The ingestion of vegetables, fruit, and drinking water are the principal contributors to this risk. Similar to Alternative 3, the highest ILCR for Alternative 6 is 6.4×10^{-6} for the on-property adult farmer (Table C.7-54). The ingestion of particulates, vegetables, and fruit are the principal pathways for this receptor.

The final source area included in this risk assessment is the proposed disposal cell. Tables C.7-56 through C.7-61 present the risks for this area, which was only evaluated under Alternative 6. HI values are all well below the 1.0 level of concern, with the maximum value of 6.9×10^{-2} being calculated for both the off-property child with federal ownership (Table C.7-58), and the off-property

child with private ownership (Table C.7-61). The ingestion of vegetables, fruit, and drinking water are the principal pathways for both these receptors. ILCR values are less than 10^{-6}, with the exception of 1.6×10^{-6} being calculated for both the off-property adult farmer with federal ownership (Table C.7-57), and the off-property adult farmer with private ownership (Table C.7-60). The ingestion of drinking water is the primary contributor to risk for both of these receptors.

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TABLE C.7-1
SUMMARY OF POTENTIAL RESIDUAL RISKS: LIME SLUDGE PONDS WITH FEDERAL OWNERSHIP, ALTERNATIVE 2, EXPANDED TRESPASSER

Exposure Pathway	Pathway HI
Inhalation of Particulates (Chemicals)	NA
Incidental Ingestion of Residual Soils (Chemicals)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Meat (Chemicals)	NA
Ingestion of Dairy Products (Chemicals)	NA
Ingestion of Vegetables and Fruit (Chemicals)	NA
Ingestion of Drinking Water (Chemicals)	NA
Dermal Contact While Bathing (Chemicals)	NA
Total Receptor HI =	NA

Exposure Pathway	Pathway ILCR
Inhalation of Particulates (Chemicals)	NA
Inhalation of Particulates (Radionuclides)	5.9×10^{-15}
Incidental Ingestion of Residual Soils (Chemicals)	NA
Incidental Ingestion of Residual Soils (Radionuclides)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Drinking Water (Chemicals)	NA
Ingestion of Drinking Water (Radionuclides)	NA
Dermal Contact While Bathing (Chemicals)	NA
Ingestion of Meat (Chemicals)	NA
Ingestion of Meat (Radionuclides)	NA
Ingestion of Dairy Products (Chemicals)	NA
Ingestion of Dairy Products (Radionuclides)	NA
Ingestion of Vegetables and Fruit (Chemicals)	NA
Ingestion of Vegetables and Fruit (Radionuclides)	NA
Direct Radiation	NA
Total Receptor ILCR =	5.9×10^{-15}

HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk
NA = Not applicable. Exposure route is incomplete (see Section C.2.3.4)

TABLE C.7-2
SUMMARY OF POTENTIAL RESIDUAL RISKS: LIME SLUDGE PONDS WITH FEDERAL OWNERSHIP, ALTERNATIVE 2, OFF PROPERTY FARMER (ADULT)

Exposure Pathway	Pathway HI
Inhalation of Particulates (Chemicals)	NA
Incidental Ingestion of Residual Soils (Chemicals)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Meat (Chemicals)	3.5×10^{-11}
Ingestion of Dairy Products (Chemicals)	4.9×10^{-10}
Ingestion of Vegetables and Fruit (Chemicals)	2.7×10^{-8}
Ingestion of Drinking Water (Chemicals)	9.1×10^{-8}
Dermal Contact While Bathing (Chemicals)	5.3×10^{-9}
Total Receptor HI =	1.2×10^{-7}

Exposure Pathway	Pathway ILCR
Inhalation of Particulates (Chemicals)	NA
Inhalation of Particulates (Radionuclides)	1.3×10^{-14}
Incidental Ingestion of Residual Soils (Chemicals)	NA
Incidental Ingestion of Residual Soils (Radionuclides)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Drinking Water (Chemicals)	NA
Ingestion of Drinking Water (Radionuclides)	2.5×10^{-11}
Dermal Contact While Bathing (Chemicals)	NA
Ingestion of Meat (Chemicals)	NA
Ingestion of Meat (Radionuclides)	9.7×10^{-15}
Ingestion of Dairy Products (Chemicals)	NA
Ingestion of Dairy Products (Radionuclides)	1.4×10^{-13}
Ingestion of Vegetables and Fruit (Chemicals)	NA
Ingestion of Vegetables and Fruit (Radionuclides)	7.6×10^{-12}
Direct Radiation	
Total Receptor ILCR =	3.3×10^{-11}

HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk
NA = Not applicable. Exposure route is incomplete (see Section C.2.3.4)

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TABLE C.7-3
SUMMARY OF POTENTIAL RESIDUAL RISKS: LIME SLUDGE PONDS WITH FEDERAL OWNERSHIP, ALTERNATIVE 2, OFF-PROPERTY FARMER CHILD

Exposure Pathway	Pathway HI
Inhalation of Particulates (Chemicals)	NA
Incidental Ingestion of Residual Soils (Chemicals)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Meat (Chemicals)	6.2×10^{-11}
Ingestion of Dairy Products (Chemicals)	5.2×10^{-9}
Ingestion of Vegetables and Fruit (Chemicals)	1.0×10^{-7}
Ingestion of Drinking Water (Chemicals)	2.1×10^{-7}
Dermal Contact While Bathing (Chemicals)	8.5×10^{-9}
Total Receptor HI =	3.3×10^{-7}

Exposure Pathway	Pathway ILCR
Inhalation of Particulates (Chemicals)	NA
Inhalation of Particulates (Radionuclides)	6.6×10^{-16}
Incidental Ingestion of Residual Soils (Chemicals)	NA
Incidental Ingestion of Residual Soils (Radionuclides)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Drinking Water (Chemicals)	NA
Ingestion of Drinking Water (Radionuclides)	1.1×10^{-12}
Dermal Contact While Bathing (Chemicals)	NA
Ingestion of Meat (Chemicals)	NA
Ingestion of Meat (Radionuclides)	3.2×10^{-16}
Ingestion of Dairy Products (Chemicals)	NA
Ingestion of Dairy Products (Radionuclides)	2.7×10^{-14}
Ingestion of Vegetables and Fruit (Chemicals)	NA
Ingestion of Vegetables and Fruit (Radionuclides)	5.3×10^{-13}
Direct Radiation	
Total Receptor ILCR =	1.7×10^{-12}

HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk
NA = Not applicable. Exposure route is incomplete (see Section C.2.3.4)

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TABLE C.7-4
SUMMARY OF POTENTIAL RESIDUAL RISKS: LIME SLUDGE POND WITH FEDERAL OWNERSHIP, ALTERNATIVE 3, EXPANDED TRESPASSER

Exposure Pathway	Pathway HI
Inhalation of Particulates (Chemicals)	NA
Incidental Ingestion of Residual Soils (Chemicals)	3.9×10^{-4}
Dermal Contact with Residual Soils (Chemicals)	2.8×10^{-2}
Ingestion of Meat (Chemicals)	NA
Ingestion of Dairy Products (Chemicals)	NA
Ingestion of Vegetables and Fruit (Chemicals)	NA
Ingestion of Drinking Water (Chemicals)	NA
Dermal Contact While Bathing (Chemicals)	NA
Total Receptor HI =	2.8×10^{-2}

Exposure Pathway	Pathway ILCR
Inhalation of Particulates (Chemicals)	NA
Inhalation of Particulates (Radionuclides)	2.0×10^{-10}
Incidental Ingestion of Residual Soils (Chemicals)	NA
Incidental Ingestion of Residual Soils (Radionuclides)	1.8×10^{-9}
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Drinking Water (Chemicals)	NA
Ingestion of Drinking Water (Radionuclides)	NA
Dermal Contact While Bathing (Chemicals)	NA
Ingestion of Meat (Chemicals)	NA
Ingestion of Meat (Radionuclides)	NA
Ingestion of Dairy Products (Chemicals)	NA
Ingestion of Dairy Products (Radionuclides)	NA
Ingestion of Vegetables and Fruit (Chemicals)	NA
Ingestion of Vegetables and Fruit (Radionuclides)	NA
Direct Radiation	2.4×10^{-8}
Total Receptor ILCR =	2.6×10^{-8}

HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk
NA = Not applicable. Exposure route is incomplete (see Section C.2.3.4)

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TABLE C.7-5
SUMMARY OF POTENTIAL RESIDUAL RISKS: LIME SLUDGE POND WITH FEDERAL OWNERSHIP, ALTERNATIVE 3, OFF-PROPERTY FARMER (ADULT)

Exposure Pathway	Pathway HI
Inhalation of Particulates (Chemicals)	NA
Incidental Ingestion of Residual Soils (Chemicals)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Meat (Chemicals)	4.3×10^{-7}
Ingestion of Dairy Products (Chemicals)	6.1×10^{-6}
Ingestion of Vegetables and Fruit (Chemicals)	3.4×10^{-4}
Ingestion of Drinking Water (Chemicals)	1.1×10^{-3}
Dermal Contact While Bathing (Chemicals)	6.5×10^{-5}
Total Receptor HI =	1.5×10^{-3}

Exposure Pathway	Pathway ILCR
Inhalation of Particulates (Chemicals)	NA
Inhalation of Particulates (Radionuclides)	4.4×10^{-10}
Incidental Ingestion of Residual Soils (Chemicals)	NA
Incidental Ingestion of Residual Soils (Radionuclides)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Drinking Water (Chemicals)	NA
Ingestion of Drinking Water (Radionuclides)	7.1×10^{-8}
Dermal Contact While Bathing (Chemicals)	NA
Ingestion of Meat (Chemicals)	NA
Ingestion of Meat (Radionuclides)	2.7×10^{-11}
Ingestion of Dairy Products (Chemicals)	NA
Ingestion of Dairy Products (Radionuclides)	3.9×10^{-10}
Ingestion of Vegetables and Fruit (Chemicals)	NA
Ingestion of Vegetables and Fruit (Radionuclides)	2.1×10^{-8}
Direct Radiation	
Total Receptor ILCR =	9.3×10^{-8}

HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk
NA = Not applicable. Exposure route is incomplete (see Section C.2.3.4)

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TABLE C.7-6
SUMMARY OF POTENTIAL RESIDUAL RISKS: LIME SLUDGE POND WITH FEDERAL OWNERSHIP, ALTERNATIVE 3, OFF-PROPERTY FARMER (CHILD)

Exposure Pathway	Pathway HI
Inhalation of Particulates (Chemicals)	NA
Incidental Ingestion of Residual Soils (Chemicals)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Meat (Chemicals)	7.7×10^{-7}
Ingestion of Dairy Products (Chemicals)	6.4×10^{-5}
Ingestion of Vegetables and Fruit (Chemicals)	1.3×10^{-3}
Ingestion of Drinking Water (Chemicals)	2.6×10^{-3}
Dermal Contact While Bathing (Chemicals)	1.0×10^{-4}
Total Receptor HI =	4.1×10^{-3}

Exposure Pathway	Pathway ILCR
Inhalation of Particulates (Chemicals)	NA
Inhalation of Particulates (Radionuclides)	2.3×10^{-11}
Incidental Ingestion of Residual Soils (Chemicals)	NA
Incidental Ingestion of Residual Soils (Radionuclides)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Drinking Water (Chemicals)	NA
Ingestion of Drinking Water (Radionuclides)	3.0×10^{-9}
Dermal Contact While Bathing (Chemicals)	NA
Ingestion of Meat (Chemicals)	NA
Ingestion of Meat (Radionuclides)	8.9×10^{-13}
Ingestion of Dairy Products (Chemicals)	NA
Ingestion of Dairy Products (Radionuclides)	7.4×10^{-11}
Ingestion of Vegetables and Fruit (Chemicals)	NA
Ingestion of Vegetables and Fruit (Radionuclides)	1.5×10^{-9}
Direct Radiation	NA
Total Receptor ILCR =	4.6×10^{-9}

HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk
NA = Not applicable. Exposure route is incomplete (see Section C.2.3.4)

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TABLE C.7-7
SUMMARY OF POTENTIAL RESIDUAL RISKS: LIME SLUDGE POND WITH PRIVATE OWNERSHIP, ALTERNATIVE 3, OFF-PROPERTY FARMER (ADULT)

Exposure Pathway	Pathway HI
Inhalation of Particulates (Chemicals)	NA
Incidental Ingestion of Residual Soils (Chemicals)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Meat (Chemicals)	8.0×10^{-10}
Ingestion of Dairy Products (Chemicals)	1.1×10^{-8}
Ingestion of Vegetables and Fruit (Chemicals)	6.3×10^{-7}
Ingestion of Drinking Water (Chemicals)	2.1×10^{-6}
Dermal Contact While Bathing (Chemicals)	1.2×10^{-7}
Total Receptor HI =	2.9×10^{-6}

Exposure Pathway	Pathway ILCR
Inhalation of Particulates (Chemicals)	NA
Inhalation of Particulates (Radionuclides)	4.7×10^{-9}
Incidental Ingestion of Residual Soils (Chemicals)	NA
Incidental Ingestion of Residual Soils (Radionuclides)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Drinking Water (Chemicals)	NA
Ingestion of Drinking Water (Radionuclides)	1.4×10^{-10}
Dermal Contact While Bathing (Chemicals)	NA
Ingestion of Meat (Chemicals)	NA
Ingestion of Meat (Radionuclides)	8.2×10^{-14}
Ingestion of Dairy Products (Chemicals)	NA
Ingestion of Dairy Products (Radionuclides)	1.2×10^{-12}
Ingestion of Vegetables and Fruit (Chemicals)	NA
Ingestion of Vegetables and Fruit (Radionuclides)	5.7×10^{-11}
Direct Radiation	NA
Total Receptor ILCR =	4.9×10^{-9}

HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk
NA = Not applicable. Exposure route is incomplete (see Section C.2.3.4)

TABLE C.7-8
SUMMARY OF POTENTIAL RESIDUAL RISKS: LIME SLUDGE POND WITH PRIVATE OWNERSHIP, ALTERNATIVE 3, OFF-PROPERTY FARMER (CHILD)

Exposure Pathway	Pathway HI
Inhalation of Particulates (Chemicals)	NA
Incidental Ingestion of Residual Soils (Chemicals)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Meat (Chemicals)	1.4×10^{-9}
Ingestion of Dairy Products (Chemicals)	1.2×10^{-7}
Ingestion of Vegetables and Fruit (Chemicals)	2.4×10^{-6}
Ingestion of Drinking Water (Chemicals)	4.9×10^{-6}
Dermal Contact While Bathing (Chemicals)	2.0×10^{-7}
Total Receptor HI =	7.6×10^{-6}

Exposure Pathway	Pathway ILCR
Inhalation of Particulates (Chemicals)	NA
Inhalation of Particulates (Radionuclides)	2.4×10^{-10}
Incidental Ingestion of Residual Soils (Chemicals)	NA
Incidental Ingestion of Residual Soils (Radionuclides)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Drinking Water (Chemicals)	NA
Ingestion of Drinking Water (Radionuclides)	5.8×10^{-12}
Dermal Contact While Bathing (Chemicals)	NA
Ingestion of Meat (Chemicals)	NA
Ingestion of Meat (Radionuclides)	2.7×10^{-15}
Ingestion of Dairy Products (Chemicals)	NA
Ingestion of Dairy Products (Radionuclides)	2.2×10^{-13}
Ingestion of Vegetables and Fruit (Chemicals)	NA
Ingestion of Vegetables and Fruit (Radionuclides)	4.0×10^{-12}
Direct Radiation	NA
Total Receptor ILCR =	2.5×10^{-10}

HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk
NA = Not applicable. Exposure route is incomplete (see Section C.2.3.4)

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TABLE C.7-9
SUMMARY OF POTENTIAL RESIDUAL RISKS: LIME SLUDGE POND WITH PRIVATE OWNERSHIP, ALTERNATIVE 3, PERCHED GROUNDWATER USER

Exposure Pathway	Pathway HI
Inhalation of Particulates (Chemicals)	NA
Incidental Ingestion of Residual Soils (Chemicals)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Meat (Chemicals)	2.1×10^{-8}
Ingestion of Dairy Products (Chemicals)	3.0×10^{7}
Ingestion of Vegetables and Fruit (Chemicals)	1.6×10^{-5}
Ingestion of Drinking Water (Chemicals)	NA
Dermal Contact While Bathing (Chemicals)	NA
Total Receptor HI =	1.7×10^{-5}

Exposure Pathway	Pathway ILCR
Inhalation of Particulates (Chemicals)	NA
Inhalation of Particulates (Radionuclides)	3.3×10^{-7}
Incidental Ingestion of Residual Soils (Chemicals)	NA
Incidental Ingestion of Residual Soils (Radionuclides)	5.8×10^{-8}
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Drinking Water (Chemicals)	NA
Ingestion of Drinking Water (Radionuclides)	1.2×10^{-6}
Dermal Contact While Bathing (Chemicals)	NA
Ingestion of Meat (Chemicals)	NA
Ingestion of Meat (Radionuclides)	1.6×10^{-8}
Ingestion of Dairy Products (Chemicals)	NA
Ingestion of Dairy Products (Radionuclides)	3.0×10^{-7}
Ingestion of Vegetables and Fruit (Chemicals)	NA
Ingestion of Vegetables and Fruit (Radionuclides)	1.7×10^{-6}
Direct Radiation	9.9×10^{-7}
Total Receptor ILCR =	4.6×10^{-6}

HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk
NA = Not applicable. Exposure route is incomplete (see Section C.2.3.4)

TABLE C.7-10
SUMMARY OF POTENTIAL RESIDUAL RISKS: LIME SLUDGE POND WITH PRIVATE OWNERSHIP, ALTERNATIVE 3, ON-PROPERTY FARMER (ADULT)

Exposure Pathway	Pathway HI
Inhalation of Particulates (Chemicals)	NA
Incidental Ingestion of Residual Soils (Chemicals)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Meat (Chemicals)	2.1×10^{-8}
Ingestion of Dairy Products (Chemicals)	3.0×10^{-7}
Ingestion of Vegetables and Fruit (Chemicals)	1.6×10^{-5}
Ingestion of Drinking Water (Chemicals)	5.5×10^{-5}
Dermal Contact While Bathing (Chemicals)	3.2×10^{-6}
Total Receptor HI =	7.5×10^{-5}

Exposure Pathway	Pathway ILCR
Inhalation of Particulates (Chemicals)	NA
Inhalation of Particulates (Radionuclides)	3.3×10^{-7}
Incidental Ingestion of Residual Soils (Chemicals)	NA
Incidental Ingestion of Residual Soils (Radionuclides)	5.8×10^{-8}
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Drinking Water (Chemicals)	NA
Ingestion of Drinking Water (Radionuclides)	3.5×10^{-9}
Dermal Contact While Bathing (Chemicals)	NA
Ingestion of Meat (Chemicals)	NA
Ingestion of Meat (Radionuclides)	1.6×10^{-8}
Ingestion of Dairy Products (Chemicals)	NA
Ingestion of Dairy Products (Radionuclides)	3.0×10^{-7}
Ingestion of Vegetables and Fruit (Chemicals)	NA
Ingestion of Vegetables and Fruit (Radionuclides)	1.7×10^{-6}
Direct Radiation	9.9×10^{-7}
Total Receptor ILCR =	3.4×10^{-6}

HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk
NA = Not applicable. Exposure route is incomplete (see Section C.2.3.4)

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TABLE C.7-11
SUMMARY OF POTENTIAL RESIDUAL RISKS: LIME SLUDGE POND WITH PRIVATE OWNERSHIP, ALTERNATIVE 3, ON-PROPERTY FARMER (CHILD)

Exposure Pathway	Pathway HI
Inhalation of Particulates (Chemicals)	NA
Incidental Ingestion of Residual Soils (Chemicals)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Meat (Chemicals)	3.7×10^{-8}
Ingestion of Dairy Products (Chemicals)	3.1×10^{-6}
Ingestion of Vegetables and Fruit (Chemicals)	6.3×10^{-5}
Ingestion of Drinking Water (Chemicals)	1.3×10^{-4}
Dermal Contact While Bathing (Chemicals)	5.1×10^{-6}
Total Receptor HI =	2.0×10^{-4}

Exposure Pathway	Pathway ILCR
Inhalation of Particulates (Chemicals)	NA
Inhalation of Particulates (Radionuclides)	1.7×10^{-8}
Incidental Ingestion of Residual Soils (Chemicals)	NA
Incidental Ingestion of Residual Soils (Radionuclides)	5.5×10^{-9}
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Drinking Water (Chemicals)	NA
Ingestion of Drinking Water (Radionuclides)	1.5×10^{-10}
Dermal Contact While Bathing (Chemicals)	NA
Ingestion of Meat (Chemicals)	NA
Ingestion of Meat (Radionuclides)	5.3×10^{-10}
Ingestion of Dairy Products (Chemicals)	NA
Ingestion of Dairy Products (Radionuclides)	5.8×10^{-8}
Ingestion of Vegetables and Fruit (Chemicals)	NA
Ingestion of Vegetables and Fruit (Radionuclides)	1.2×10^{-7}
Direct Radiation	7.4×10^{-8}
Total Receptor ILCR =	2.7×10^{-7}

HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk
NA = Not applicable. Exposure route is incomplete (see Section C.2.3.4)

TABLE C.7-12
SUMMARY OF POTENTIAL RESIDUAL RISKS: LIME SLUDGE POND WITH FEDERAL OWNERSHIP, ALTERNATIVE 6, EXPANDED TRESPASSER

Exposure Pathway	Pathway HI
Inhalation of Particulates (Chemicals)	NA
Incidental Ingestion of Residual Soils (Chemicals)	3.9×10^{-4}
Dermal Contact with Residual Soils (Chemicals)	2.8×10^{-2}
Ingestion of Meat (Chemicals)	NA
Ingestion of Dairy Products (Chemicals)	NA
Ingestion of Vegetables and Fruit (Chemicals)	NA
Ingestion of Drinking Water (Chemicals)	NA
Dermal Contact While Bathing (Chemicals)	NA
Total Receptor HI =	2.8×10^{-2}

Exposure Pathway	Pathway ILCR
Inhalation of Particulates (Chemicals)	NA
Inhalation of Particulates (Radionuclides)	2.0×10^{-10}
Incidental Ingestion of Residual Soils (Chemicals)	NA
Incidental Ingestion of Residual Soils (Radionuclides)	1.8×10^{-9}
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Drinking Water (Chemicals)	NA
Ingestion of Drinking Water (Radionuclides)	NA
Dermal Contact While Bathing (Chemicals)	NA
Ingestion of Meat (Chemicals)	NA
Ingestion of Meat (Radionuclides)	NA
Ingestion of Dairy Products (Chemicals)	NA
Ingestion of Dairy Products (Radionuclides)	NA
Ingestion of Vegetables and Fruit (Chemicals)	NA
Ingestion of Vegetables and Fruit (Radionuclides)	NA
Direct Radiation	2.4×10^{-8}
Total Receptor ILCR =	2.6×10^{-8}

HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk
NA = Not applicable. Exposure route is incomplete (see Section C.2.3.4)

000225

TABLE C.7-13
SUMMARY OF POTENTIAL RESIDUAL RISKS: LIME SLUDGE POND WITH FEDERAL OWNERSHIP, ALTERNATIVE 6, OFF-PROPERTY FARMER (ADULT)

Exposure Pathway	Pathway HI
Inhalation of Particulates (Chemicals)	NA
Incidental Ingestion of Residual Soils (Chemicals)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Meat (Chemicals)	4.3×10^{-7}
Ingestion of Dairy Products (Chemicals)	6.1×10^{-6}
Ingestion of Vegetables and Fruit (Chemicals)	3.4×10^{-4}
Ingestion of Drinking Water (Chemicals)	1.1×10^{-3}
Dermal Contact While Bathing (Chemicals)	6.5×10^{-5}
Total Receptor HI =	1.5×10^{-3}

Exposure Pathway	Pathway ILCR
Inhalation of Particulates (Chemicals)	NA
Inhalation of Particulates (Radionuclides)	4.4×10^{-10}
Incidental Ingestion of Residual Soils (Chemicals)	NA
Incidental Ingestion of Residual Soils (Radionuclides)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Drinking Water (Chemicals)	NA
Ingestion of Drinking Water (Radionuclides)	7.1×10^{-8}
Dermal Contact While Bathing (Chemicals)	NA
Ingestion of Meat (Chemicals)	NA
Ingestion of Meat (Radionuclides)	2.7×10^{-11}
Ingestion of Dairy Products (Chemicals)	NA
Ingestion of Dairy Products (Radionuclides)	3.9×10^{-10}
Ingestion of Vegetables and Fruit (Chemicals)	NA
Ingestion of Vegetables and Fruit (Radionuclides)	2.1×10^{-8}
Direct Radiation	NA
Total Receptor ILCR =	9.3×10^{-8}

HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk
NA = Not applicable. Exposure route is incomplete (see Section C.2.3.4)

TABLE C.7-14
SUMMARY OF POTENTIAL RESIDUAL RISKS: LIME SLUDGE POND WITH FEDERAL OWNERSHIP, ALTERNATIVE 6, OFF-PROPERTY FARMER (CHILD)

Exposure Pathway	Pathway HI
Inhalation of Particulates (Chemicals)	NA
Incidental Ingestion of Residual Soils (Chemicals)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Meat (Chemicals)	7.7×10^{-7}
Ingestion of Dairy Products (Chemicals)	6.4×10^{-5}
Ingestion of Vegetables and Fruit (Chemicals)	1.3×10^{-3}
Ingestion of Drinking Water (Chemicals)	2.6×10^{-3}
Dermal Contact While Bathing (Chemicals)	1.0×10^{-4}
Total Receptor HI =	4.1×10^{-3}

Exposure Pathway	Pathway ILCR
Inhalation of Particulates (Chemicals)	NA
Inhalation of Particulates (Radionuclides)	2.3×10^{-11}
Incidental Ingestion of Residual Soils (Chemicals)	NA
Incidental Ingestion of Residual Soils (Radionuclides)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Drinking Water (Chemicals)	NA
Ingestion of Drinking Water (Radionuclides)	3.0×10^{-9}
Dermal Contact While Bathing (Chemicals)	NA
Ingestion of Meat (Chemicals)	NA
Ingestion of Meat (Radionuclides)	8.9×10^{-13}
Ingestion of Dairy Products (Chemicals)	NA
Ingestion of Dairy Products (Radionuclides)	7.4×10^{-11}
Ingestion of Vegetables and Fruit (Chemicals)	NA
Ingestion of Vegetables and Fruit (Radionuclides)	1.5×10^{-9}
Direct Radiation	NA
Total Receptor ILCR =	4.6×10^{-9}

HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk
NA = Not applicable. Exposure route is incomplete (see Section C.2.3.4)

000227

TABLE C.7-15
SUMMARY OF POTENTIAL RESIDUAL RISKS: LIME SLUDGE POND WITH PRIVATE OWNERSHIP, ALTERNATIVE 6, OFF-PROPERTY FARMER (ADULT)

Exposure Pathway	Pathway HI
Inhalation of Particulates (Chemicals)	NA
Incidental Ingestion of Residual Soils (Chemicals)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Meat (Chemicals)	8.0×10^{-10}
Ingestion of Dairy Products (Chemicals)	1.1×10^{-8}
Ingestion of Vegetables and Fruit (Chemicals)	6.3×10^{-7}
Ingestion of Drinking Water (Chemicals)	2.1×10^{-6}
Dermal Contact While Bathing (Chemicals)	1.2×10^{-7}
Total Receptor HI =	2.9×10^{-6}

Exposure Pathway	Pathway ILCR
Inhalation of Particulates (Chemicals)	NA
Inhalation of Particulates (Radionuclides)	4.7×10^{-9}
Incidental Ingestion of Residual Soils (Chemicals)	NA
Incidental Ingestion of Residual Soils (Radionuclides)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Drinking Water (Chemicals)	NA
Ingestion of Drinking Water (Radionuclides)	1.4×10^{-10}
Dermal Contact While Bathing (Chemicals)	NA
Ingestion of Meat (Chemicals)	NA
Ingestion of Meat (Radionuclides)	8.2×10^{-14}
Ingestion of Dairy Products (Chemicals)	NA
Ingestion of Dairy Products (Radionuclides)	1.2×10^{-12}
Ingestion of Vegetables and Fruit (Chemicals)	NA
Ingestion of Vegetables and Fruit (Radionuclides)	5.7×10^{-11}
Direct Radiation	NA
Total Receptor ILCR =	4.9×10^{-9}

HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk
NA = Not applicable. Exposure route is incomplete (see Section C.2.3.4)

000228

TABLE C.7-16
SUMMARY OF POTENTIAL RESIDUAL RISKS: LIME SLUDGE POND WITH PRIVATE OWNERSHIP, ALTERNATIVE 6, OFF-PROPERTY FARMER (CHILD)

Exposure Pathway	Pathway HI
Inhalation of Particulates (Chemicals)	NA
Incidental Ingestion of Residual Soils (Chemicals)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Meat (Chemicals)	1.4×10^{-9}
Ingestion of Dairy Products (Chemicals)	1.2×10^{-7}
Ingestion of Vegetables and Fruit (Chemicals)	2.4×10^{-6}
Ingestion of Drinking Water (Chemicals)	4.9×10^{-6}
Dermal Contact While Bathing (Chemicals)	2.0×10^{-7}
Total Receptor HI =	7.6×10^{-6}

Exposure Pathway	Pathway ILCR
Inhalation of Particulates (Chemicals)	NA
Inhalation of Particulates (Radionuclides)	2.4×10^{-10}
Incidental Ingestion of Residual Soils (Chemicals)	NA
Incidental Ingestion of Residual Soils (Radionuclides)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Drinking Water (Chemicals)	NA
Ingestion of Drinking Water (Radionuclides)	5.8×10^{-12}
Dermal Contact While Bathing (Chemicals)	NA
Ingestion of Meat (Chemicals)	NA
Ingestion of Meat (Radionuclides)	2.7×10^{-15}
Ingestion of Dairy Products (Chemicals)	NA
Ingestion of Dairy Products (Radionuclides)	2.2×10^{-13}
Ingestion of Vegetables and Fruit (Chemicals)	NA
Ingestion of Vegetables and Fruit (Radionuclides)	4.0×10^{-12}
Direct Radiation	NA
Total Receptor ILCR =	2.5×10^{-10}

HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk
NA = Not applicable. Exposure route is incomplete (see Section C.2.3.4)

000229

TABLE C.7-17
SUMMARY OF POTENTIAL RESIDUAL RISKS: LIME SLUDGE POND WITH PRIVATE OWNERSHIP, ALTERNATIVE 6, PERCHED GROUNDWATER USER

Exposure Pathway	Pathway HI
Inhalation of Particulates (Chemicals)	NA
Incidental Ingestion of Residual Soils (Chemicals)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Meat (Chemicals)	2.1×10^{-8}
Ingestion of Dairy Products (Chemicals)	3.0×10^{-7}
Ingestion of Vegetables and Fruit (Chemicals)	1.6×10^{-5}
Ingestion of Drinking Water (Chemicals)	NA
Dermal Contact While Bathing (Chemicals)	NA
Total Receptor HI =	1.7×10^{-5}

Exposure Pathway	Pathway ILCR
Inhalation of Particulates (Chemicals)	NA
Inhalation of Particulates (Radionuclides)	3.3×10^{-7}
Incidental Ingestion of Residual Soils (Chemicals)	NA
Incidental Ingestion of Residual Soils (Radionuclides)	5.8×10^{-8}
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Drinking Water (Chemicals)	NA
Ingestion of Drinking Water (Radionuclides)	1.2×10^{-6}
Dermal Contact While Bathing (Chemicals)	NA
Ingestion of Meat (Chemicals)	NA
Ingestion of Meat (Radionuclides)	1.6×10^{-8}
Ingestion of Dairy Products (Chemicals)	NA
Ingestion of Dairy Products (Radionuclides)	3.0×10^{-7}
Ingestion of Vegetables and Fruit (Chemicals)	NA
Ingestion of Vegetables and Fruit (Radionuclides)	1.7×10^{-6}
Direct Radiation	9.9×10^{-7}
Total Receptor ILCR =	4.6×10^{-6}

HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk
NA = Not applicable. Exposure route is incomplete (see Section C.2.3.4)

000230

TABLE C.7-18
SUMMARY OF POTENTIAL RESIDUAL RISKS: LIME SLUDGE POND WITH PRIVATE OWNERSHIP, ALTERNATIVE 6, ON-PROPERTY FARMER (ADULT)

Exposure Pathway	Pathway HI
Inhalation of Particulates (Chemicals)	NA
Incidental Ingestion of Residual Soils (Chemicals)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Meat (Chemicals)	2.1×10^{-8}
Ingestion of Dairy Products (Chemicals)	3.0×10^{-7}
Ingestion of Vegetables and Fruit (Chemicals)	1.6×10^{-5}
Ingestion of Drinking Water (Chemicals)	5.5×10^{-5}
Dermal Contact While Bathing (Chemicals)	3.2×10^{-6}
Total Receptor HI =	7.5×10^{-5}

Exposure Pathway	Pathway ILCR
Inhalation of Particulates (Chemicals)	NA
Inhalation of Particulates (Radionuclides)	3.3×10^{-7}
Incidental Ingestion of Residual Soils (Chemicals)	NA
Incidental Ingestion of Residual Soils (Radionuclides)	5.8×10^{-8}
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Drinking Water (Chemicals)	NA
Ingestion of Drinking Water (Radionuclides)	3.5×10^{-9}
Dermal Contact While Bathing (Chemicals)	NA
Ingestion of Meat (Chemicals)	NA
Ingestion of Meat (Radionuclides)	1.6×10^{-8}
Ingestion of Dairy Products (Chemicals)	NA
Ingestion of Dairy Products (Radionuclides)	3.0×10^{-7}
Ingestion of Vegetables and Fruit (Chemicals)	NA
Ingestion of Vegetables and Fruit (Radionuclides)	1.7×10^{-6}
Direct Radiation	9.9×10^{-7}
Total Receptor ILCR =	3.4×10^{-6}

HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk
NA = Not applicable. Exposure route is incomplete (see Section C.2.3.4)

000231

TABLE C.7-19
SUMMARY OF POTENTIAL RESIDUAL RISKS: LIME SLUDGE POND WITH PRIVATE OWNERSHIP, ALTERNATIVE 6, ON-PROPERTY FARMER (CHILD)

Exposure Pathway	Pathway HI
Inhalation of Particulates (Chemicals)	NA
Incidental Ingestion of Residual Soils (Chemicals)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Meat (Chemicals)	3.7×10^{-8}
Ingestion of Dairy Products (Chemicals)	3.1×10^{-6}
Ingestion of Vegetables and Fruit (Chemicals)	6.3×10^{-5}
Ingestion of Drinking Water (Chemicals)	1.3×10^{-4}
Dermal Contact While Bathing (Chemicals)	5.1×10^{-6}
Total Receptor HI =	2.0×10^{-4}

Exposure Pathway	Pathway ILCR
Inhalation of Particulates (Chemicals)	NA
Inhalation of Particulates (Radionuclides)	1.7×10^{-8}
Incidental Ingestion of Residual Soils (Chemicals)	NA
Incidental Ingestion of Residual Soils (Radionuclides)	5.5×10^{-9}
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Drinking Water (Chemicals)	NA
Ingestion of Drinking Water (Radionuclides)	1.5×10^{-10}
Dermal Contact While Bathing (Chemicals)	NA
Ingestion of Meat (Chemicals)	NA
Ingestion of Meat (Radionuclides)	5.3×10^{-10}
Ingestion of Dairy Products (Chemicals)	NA
Ingestion of Dairy Products (Radionuclides)	5.8×10^{-8}
Ingestion of Vegetables and Fruit (Chemicals)	NA
Ingestion of Vegetables and Fruit (Radionuclides)	1.2×10^{-7}
Direct Radiation	7.4×10^{-7}
Total Receptor ILCR =	2.7×10^{-7}

HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk
NA = Not applicable. Exposure route is incomplete (see Section C.2.3.4)

TABLE C.7-20
SUMMARY OF POTENTIAL RESIDUAL RISKS: SOLID WASTE LANDFILL WITH FEDERAL OWNERSHIP, ALTERNATIVE 2, EXPANDED TRESPASSER

Exposure Pathway	Pathway HI
Inhalation of Particulates (Chemicals)	NA
Incidental Ingestion of Residual Soils (Chemicals)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Meat (Chemicals)	NA
Ingestion of Dairy Products (Chemicals)	NA
Ingestion of Vegetables and Fruit (Chemicals)	NA
Ingestion of Drinking Water (Chemicals)	NA
Dermal Contact While Bathing (Chemicals)	NA
Total Receptor HI =	NA

Exposure Pathway	Pathway ILCR
Inhalation of Particulates (Chemicals)	NA
Inhalation of Particulates (Radionuclides)	1.0×10^{-14}
Incidental Ingestion of Residual Soils (Chemicals)	NA
Incidental Ingestion of Residual Soils (Radionuclides)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Drinking Water (Chemicals)	NA
Ingestion of Drinking Water (Radionuclides)	NA
Dermal Contact While Bathing (Chemicals)	NA
Ingestion of Meat (Chemicals)	NA
Ingestion of Meat (Radionuclides)	NA
Ingestion of Dairy Products (Chemicals)	NA
Ingestion of Dairy Products (Radionuclides)	NA
Ingestion of Vegetables and Fruit (Chemicals)	NA
Ingestion of Vegetables and Fruit (Radionuclides)	NA
Direct Radiation	NA
Total Receptor ILCR =	1.0×10^{-14}

HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk
NA = Not applicable. Exposure route is incomplete (see Section C.2.3.4)

000233

TABLE C.7-21
SUMMARY OF POTENTIAL RESIDUAL RISKS: SOLID WASTE LANDFILL WITH FEDERAL OWNERSHIP, ALTERNATIVE 2, OFF-PROPERTY FARMER (ADULT)

Exposure Pathway	Pathway HI
Inhalation of Particulates (Chemicals)	NA
Incidental Ingestion of Residual Soils (Chemicals)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Meat (Chemicals)	6.9×10^{-9}
Ingestion of Dairy Products (Chemicals)	9.9×10^{-8}
Ingestion of Vegetables and Fruit (Chemicals)	5.5×10^{-6}
Ingestion of Drinking Water (Chemicals)	1.8×10^{-5}
Dermal Contact While Bathing (Chemicals)	1.1×10^{-6}
Total Receptor HI =	2.5×10^{-5}

Exposure Pathway	Pathway ILCR
Inhalation of Particulates (Chemicals)	NA
Inhalation of Particulates (Radionuclides)	4.2×10^{-14}
Incidental Ingestion of Residual Soils (Chemicals)	NA
Incidental Ingestion of Residual Soils (Radionuclides)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Drinking Water (Chemicals)	NA
Ingestion of Drinking Water (Radionuclides)	1.8×10^{-9}
Dermal Contact While Bathing (Chemicals)	NA
Ingestion of Meat (Chemicals)	NA
Ingestion of Meat (Radionuclides)	6.8×10^{-13}
Ingestion of Dairy Products (Chemicals)	NA
Ingestion of Dairy Products (Radionuclides)	9.6×10^{-12}
Ingestion of Vegetables and Fruit (Chemicals)	NA
Ingestion of Vegetables and Fruit (Radionuclides)	5.3×10^{-10}
Direct Radiation	NA
Total Receptor ILCR =	2.3×10^{-9}

HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk
NA = Not applicable. Exposure route is incomplete (see Section C.2.3.4)

TABLE C.7-22
SUMMARY OF POTENTIAL RESIDUAL RISKS: SOLID WASTE LANDFILL WITH FEDERAL OWNERSHIP, ALTERNATIVE 2, OFF-PROPERTY FARMER (CHILD)

Exposure Pathway	Pathway HI
Inhalation of Particulates (Chemicals)	NA
Incidental Ingestion of Residual Soils (Chemicals)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Meat (Chemicals)	1.2×10^{-8}
Ingestion of Dairy Products (Chemicals)	1.0×10^{-6}
Ingestion of Vegetables and Fruit (Chemicals)	2.1×10^{-5}
Ingestion of Drinking Water (Chemicals)	4.3×10^{-5}
Dermal Contact While Bathing (Chemicals)	1.7×10^{-6}
Total Receptor HI =	6.6×10^{-5}

Exposure Pathway	Pathway ILCR
Inhalation of Particulates (Chemicals)	NA
Inhalation of Particulates (Radionuclides)	2.2×10^{-15}
Incidental Ingestion of Residual Soils (Chemicals)	NA
Incidental Ingestion of Residual Soils (Radionuclides)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Drinking Water (Chemicals)	NA
Ingestion of Drinking Water (Radionuclides)	7.6×10^{-11}
Dermal Contact While Bathing (Chemicals)	NA
Ingestion of Meat (Chemicals)	NA
Ingestion of Meat (Radionuclides)	2.2×10^{-14}
Ingestion of Dairy Products (Chemicals)	NA
Ingestion of Dairy Products (Radionuclides)	1.9×10^{-12}
Ingestion of Vegetables and Fruit (Chemicals)	NA
Ingestion of Vegetables and Fruit (Radionuclides)	3.7×10^{-11}
Direct Radiation	NA
Total Receptor ILCR =	1.2×10^{-10}

HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk
NA = Not applicable. Exposure route is incomplete (see Section C.2.3.4)

000235

TABLE C.7-23
SUMMARY OF POTENTIAL RESIDUAL RISKS: SOLID WASTE LANDFILL WITH FEDERAL OWNERSHIP, ALTERNATIVE 3, EXPANDED TRESPASSER

Exposure Pathway	Pathway HI
Inhalation of Particulates (Chemicals)	NA
Incidental Ingestion of Residual Soils (Chemicals)	5.2×10^{-4}
Dermal Contact with Residual Soils (Chemicals)	2.0×10^{-2}
Ingestion of Meat (Chemicals)	NA
Ingestion of Dairy Products (Chemicals)	NA
Ingestion of Vegetables and Fruit (Chemicals)	NA
Ingestion of Drinking Water (Chemicals)	NA
Dermal Contact While Bathing (Chemicals)	NA
Total Receptor HI =	2.0×10^{-2}

Exposure Pathway	Pathway ILCR
Inhalation of Particulates (Chemicals)	3.1×10^{-11}
Inhalation of Particulates (Radionuclides)	8.8×10^{-10}
Incidental Ingestion of Residual Soils (Chemicals)	9.2×10^{-8}
Incidental Ingestion of Residual Soils (Radionuclides)	6.4×10^{-9}
Dermal Contact with Residual Soils (Chemicals)	1.7×10^{-7}
Ingestion of Drinking Water (Chemicals)	NA
Ingestion of Drinking Water (Radionuclides)	NA
Dermal Contact While Bathing (Chemicals)	NA
Ingestion of Meat (Chemicals)	NA
Ingestion of Meat (Radionuclides)	NA
Ingestion of Dairy Products (Chemicals)	NA
Ingestion of Dairy Products (Radionuclides)	NA
Ingestion of Vegetables and Fruit (Chemicals)	NA
Ingestion of Vegetables and Fruit (Radionuclides)	NA
Direct Radiation	1.3×10^{-7}
Total Receptor ILCR =	4.0×10^{-7}

HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk
NA = Not applicable. Exposure route is incomplete (see Section C.2.3.4)

000236

TABLE C.7-24
SUMMARY OF POTENTIAL RESIDUAL RISKS: SOLID WASTE LANDFILL WITH FEDERAL OWNERSHIP, ALTERNATIVE 3, OFF-PROPERTY FARMER (ADULT)

Exposure Pathway	Pathway HI
Inhalation of Particulates (Chemicals)	NA
Incidental Ingestion of Residual Soils (Chemicals)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Meat (Chemicals)	2.4×10^{-6}
Ingestion of Dairy Products (Chemicals)	3.4×10^{-5}
Ingestion of Vegetables and Fruit (Chemicals)	1.9×10^{-3}
Ingestion of Drinking Water (Chemicals)	6.3×10^{-3}
Dermal Contact While Bathing (Chemicals)	3.6×10^{-4}
Total Receptor HI =	8.6×10^{-3}

Exposure Pathway	Pathway ILCR
Inhalation of Particulates (Chemicals)	9.0×10^{-11}
Inhalation of Particulates (Radionuclides)	3.6×10^{-9}
Incidental Ingestion of Residual Soils (Chemicals)	NA
Incidental Ingestion of Residual Soils (Radionuclides)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Drinking Water (Chemicals)	NA
Ingestion of Drinking Water (Radionuclides)	4.0×10^{-7}
Dermal Contact While Bathing (Chemicals)	NA
Ingestion of Meat (Chemicals)	3.6×10^{-10}
Ingestion of Meat (Radionuclides)	1.5×10^{-10}
Ingestion of Dairy Products (Chemicals)	4.3×10^{-10}
Ingestion of Dairy Products (Radionuclides)	2.2×10^{-9}
Ingestion of Vegetables and Fruit (Chemicals)	5.3×10^{-10}
Ingestion of Vegetables and Fruit (Radionuclides)	1.2×10^{-7}
Direct Radiation	NA
Total Receptor ILCR =	5.3×10^{-7}

HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk
NA = Not applicable. Exposure route is incomplete (see Section C.2.3.4)

000217

TABLE C.7-25
SUMMARY OF POTENTIAL RESIDUAL RISKS: SOLID WASTE LANDFILL WITH FEDERAL OWNERSHIP, ALTERNATIVE 3, OFF-PROPERTY FARMER (CHILD)

Exposure Pathway	Pathway HI
Inhalation of Particulates (Chemicals)	NA
Incidental Ingestion of Residual Soils (Chemicals)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Meat (Chemicals)	4.3×10^{-6}
Ingestion of Dairy Products (Chemicals)	3.6×10^{-4}
Ingestion of Vegetables and Fruit (Chemicals)	7.2×10^{-3}
Ingestion of Drinking Water (Chemicals)	1.5×10^{-2}
Dermal Contact While Bathing (Chemicals)	5.9×10^{-4}
Total Receptor HI =	2.3×10^{-2}

Exposure Pathway	Pathway ILCR
Inhalation of Particulates (Chemicals)	2.2×10^{-11}
Inhalation of Particulates (Radionuclides)	1.9×10^{-10}
Incidental Ingestion of Residual Soils (Chemicals)	NA
Incidental Ingestion of Residual Soils (Radionuclides)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Drinking Water (Chemicals)	NA
Ingestion of Drinking Water (Radionuclides)	1.7×10^{-8}
Dermal Contact While Bathing (Chemicals)	NA
Ingestion of Meat (Chemicals)	5.6×10^{-11}
Ingestion of Meat (Radionuclides)	5.0×10^{-12}
Ingestion of Dairy Products (Chemicals)	3.9×10^{-10}
Ingestion of Dairy Products (Radionuclides)	4.2×10^{-10}
Ingestion of Vegetables and Fruit (Chemicals)	1.8×10^{-10}
Ingestion of Vegetables and Fruit (Radionuclides)	8.4×10^{-9}
Direct Radiation	NA
Total Receptor ILCR =	2.7×10^{-8}

HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk
NA = Not applicable. Exposure route is incomplete (see Section C.2.3.4)

000438

TABLE C.7-26
SUMMARY OF POTENTIAL RESIDUAL RISKS: SOLID WASTE LANDFILL WITH PRIVATE OWNERSHIP, ALTERNATIVE 3, OFF-PROPERTY FARMER (ADULT)

Exposure Pathway	Pathway HI
Inhalation of Particulates (Chemicals)	NA
Incidental Ingestion of Residual Soils (Chemicals)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Meat (Chemicals)	3.2×10^{-7}
Ingestion of Dairy Products (Chemicals)	1.0×10^{-4}
Ingestion of Vegetables and Fruit (Chemicals)	1.3×10^{-5}
Ingestion of Drinking Water (Chemicals)	2.5×10^{-5}
Dermal Contact While Bathing (Chemicals)	1.4×10^{-6}
Total Receptor HI =	1.4×10^{-4}

Exposure Pathway	Pathway ILCR
Inhalation of Particulates (Chemicals)	2.1×10^{-12}
Inhalation of Particulates (Radionuclides)	1.4×10^{-8}
Incidental Ingestion of Residual Soils (Chemicals)	NA
Incidental Ingestion of Residual Soils (Radionuclides)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Drinking Water (Chemicals)	NA
Ingestion of Drinking Water (Radionuclides)	1.5×10^{-9}
Dermal Contact While Bathing (Chemicals)	NA
Ingestion of Meat (Chemicals)	2.3×10^{-11}
Ingestion of Meat (Radionuclides)	6.9×10^{-13}
Ingestion of Dairy Products (Chemicals)	NA
Ingestion of Dairy Products (Radionuclides)	6.5×10^{-9}
Ingestion of Vegetables and Fruit (Chemicals)	1.6×10^{-11}
Ingestion of Vegetables and Fruit (Radionuclides)	6.2×10^{-19}
Direct Radiation	NA
Total Receptor ILCR =	2.2×10^{-8}

HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk
NA = Not applicable. Exposure route is incomplete (see Section C.2.3.4)

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TABLE C.7-27
SUMMARY OF POTENTIAL RESIDUAL RISKS: SOLID WASTE LANDFILL WITH PRIVATE OWNERSHIP, ALTERNATIVE 3, OFF-PROPERTY FARMER (CHILD)

Exposure Pathway	Pathway HI
Inhalation of Particulates (Chemicals)	NA
Incidental Ingestion of Residual Soils (Chemicals)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Meat (Chemicals)	5.8×10^{-7}
Ingestion of Dairy Products (Chemicals)	1.1×10^{-3}
Ingestion of Vegetables and Fruit (Chemicals)	5.0×10^{-5}
Ingestion of Drinking Water (Chemicals)	5.8×10^{-5}
Dermal Contact While Bathing (Chemicals)	2.3×10^{-6}
Total Receptor HI =	1.2×10^{-3}

Exposure Pathway	Pathway ILCR
Inhalation of Particulates (Chemicals)	5.1×10^{-13}
Inhalation of Particulates (Radionuclides)	7.1×10^{-10}
Incidental Ingestion of Residual Soils (Chemicals)	NA
Incidental Ingestion of Residual Soils (Radionuclides)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Drinking Water (Chemicals)	NA
Ingestion of Drinking Water (Radionuclides)	6.6×10^{-11}
Dermal Contact While Bathing (Chemicals)	NA
Ingestion of Meat (Chemicals)	3.6×10^{-12}
Ingestion of Meat (Radionuclides)	2.3×10^{-14}
Ingestion of Dairy Products (Chemicals)	NA
Ingestion of Dairy Products (Radionuclides)	1.3×10^{-9}
Ingestion of Vegetables and Fruit (Chemicals)	5.1×10^{-12}
Ingestion of Vegetables and Fruit (Radionuclides)	4.4×10^{-11}
Direct Radiation	NA
Total Receptor ILCR =	2.1×10^{-9}

HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk
NA = Not applicable. Exposure route is incomplete (see Section C.2.3.4)

TABLE C.7-28
SUMMARY OF POTENTIAL RESIDUAL RISKS: SOLID WASTE LANDFILL WITH PRIVATE OWNERSHIP, ALTERNATIVE 3, PERCHED GROUNDWATER USER

Exposure Pathway	Pathway HI
Inhalation of Particulates (Chemicals)	NA
Incidental Ingestion of Residual Soils (Chemicals)	8.2×10^{-3}
Dermal Contact with Residual Soils (Chemicals)	1.7×10^{-2}
Ingestion of Meat (Chemicals)	6.9×10^{-3}
Ingestion of Dairy Products (Chemicals)	3.4×10^{-3}
Ingestion of Vegetables and Fruit (Chemicals)	1.7×10^{-1}
Ingestion of Drinking Water (Chemicals)	NA
Dermal Contact While Bathing (Chemicals)	NA
Total Receptor HI =	2.0×10^{-1}

Exposure Pathway	Pathway ILCR
Inhalation of Particulates (Chemicals)	7.7×10^{-11}
Inhalation of Particulates (Radionuclides)	5.0×10^{-7}
Incidental Ingestion of Residual Soils (Chemicals)	2.7×10^{-8}
Incidental Ingestion of Residual Soils (Radionuclides)	2.9×10^{-7}
Dermal Contact with Residual Soils (Chemicals)	3.4×10^{-9}
Ingestion of Drinking Water (Chemicals)	2.6×10^{-7}
Ingestion of Drinking Water (Radionuclides)	1.2×10^{-6}
Dermal Contact While Bathing (Chemicals)	8.2×10^{-9}
Ingestion of Meat (Chemicals)	3.9×10^{-7}
Ingestion of Meat (Radionuclides)	1.5×10^{-9}
Ingestion of Dairy Products (Chemicals)	NA
Ingestion of Dairy Products (Radionuclides)	6.4×10^{-7}
Ingestion of Vegetables and Fruit (Chemicals)	2.9×10^{-7}
Ingestion of Vegetables and Fruit (Radionuclides)	4.2×10^{-7}
Direct Radiation	7.7×10^{-7}
Total Receptor ILCR =	4.8×10^{-6}

HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk
NA = Not applicable. Exposure route is incomplete (see Section C.2.3.4)

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TABLE C.7-29
SUMMARY OF POTENTIAL RESIDUAL RISKS: SOLID WASTE LANDFILL WITH PRIVATE OWNERSHIP, ALTERNATIVE 3, ON-PROPERTY FARMER (ADULT)

Exposure Pathway	Pathway HI
Inhalation of Particulates (Chemicals)	NA
Incidental Ingestion of Residual Soils (Chemicals)	8.2×10^{-3}
Dermal Contact with Residual Soils (Chemicals)	1.7×10^{-2}
Ingestion of Meat (Chemicals)	6.9×10^{-3}
Ingestion of Dairy Products (Chemicals)	3.4×10^{-3}
Ingestion of Vegetables and Fruit (Chemicals)	1.7×10^{-1}
Ingestion of Drinking Water (Chemicals)	7.3×10^{-4}
Dermal Contact While Bathing (Chemicals)	4.2×10^{-5}
Total Receptor HI =	2.0×10^{-1}

Exposure Pathway	Pathway ILCR
Inhalation of Particulates (Chemicals)	7.7×10^{-11}
Inhalation of Particulates (Radionuclides)	5.0×10^{-7}
Incidental Ingestion of Residual Soils (Chemicals)	2.7×10^{-8}
Incidental Ingestion of Residual Soils (Radionuclides)	2.9×10^{-7}
Dermal Contact with Residual Soils (Chemicals)	3.4×10^{-9}
Ingestion of Drinking Water (Chemicals)	NA
Ingestion of Drinking Water (Radionuclides)	4.5×10^{-8}
Dermal Contact While Bathing (Chemicals)	NA
Ingestion of Meat (Chemicals)	3.9×10^{-7}
Ingestion of Meat (Radionuclides)	1.5×10^{-9}
Ingestion of Dairy Products (Chemicals)	NA
Ingestion of Dairy Products (Radionuclides)	6.4×10^{-7}
Ingestion of Vegetables and Fruit (Chemicals)	2.9×10^{-7}
Ingestion of Vegetables and Fruit (Radionuclides)	4.2×10^{-7}
Direct Radiation	7.7×10^{-7}
Total Receptor ILCR =	3.4×10^{-6}

HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk
NA = Not applicable. Exposure route is incomplete (see Section C.2.3.4)

000242

TABLE C.7-30
SUMMARY OF POTENTIAL RESIDUAL RISKS: SOLID WASTE LANDFILL WITH PRIVATE OWNERSHIP, ALTERNATIVE 3, ON-PROPERTY FARMER (CHILD)

Exposure Pathway	Pathway HI
Inhalation of Particulates (Chemicals)	NA
Incidental Ingestion of Residual Soils (Chemicals)	4.3×10^{-2}
Dermal Contact with Residual Soils (Chemicals)	2.8×10^{-2}
Ingestion of Meat (Chemicals)	1.2×10^{-2}
Ingestion of Dairy Products (Chemicals)	3.6×10^{-2}
Ingestion of Vegetables and Fruit (Chemicals)	6.4×10^{-1}
Ingestion of Drinking Water (Chemicals)	1.7×10^{-3}
Dermal Contact While Bathing (Chemicals)	6.8×10^{-5}
Total Receptor HI =	7.6×10^{-1}

Exposure Pathway	Pathway ILCR
Inhalation of Particulates (Chemicals)	1.8×10^{-11}
Inhalation of Particulates (Radionuclides)	2.6×10^{-8}
Incidental Ingestion of Residual Soils (Chemicals)	1.2×10^{-8}
Incidental Ingestion of Residual Soils (Radionuclides)	2.7×10^{-8}
Dermal Contact with Residual Soils (Chemicals)	4.7×10^{-10}
Ingestion of Drinking Water (Chemicals)	NA
Ingestion of Drinking Water (Radionuclides)	1.9×10^{-9}
Dermal Contact While Bathing (Chemicals)	NA
Ingestion of Meat (Chemicals)	6.0×10^{-8}
Ingestion of Meat (Radionuclides)	5.0×10^{-11}
Ingestion of Dairy Products (Chemicals)	NA
Ingestion of Dairy Products (Radionuclides)	1.2×10^{-7}
Ingestion of Vegetables and Fruit (Chemicals)	9.5×10^{-8}
Ingestion of Vegetables and Fruit (Radionuclides)	2.9×10^{-8}
Direct Radiation	5.8×10^{-8}
Total Receptor ILCR =	4.3×10^{-7}

HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk
NA = Not applicable. Exposure route is incomplete (see Section C.2.3.4)

000243

TABLE C.7-31
SUMMARY OF POTENTIAL RESIDUAL RISKS: SOLID WASTE LANDFILL WITH PRIVATE OWNERSHIP, ALTERNATIVE 6, EXPANDED TRESPASSER

Exposure Pathway	Pathway HI
Inhalation of Particulates (Chemicals)	NA
Incidental Ingestion of Residual Soils (Chemicals)	5.2×10^{-4}
Dermal Contact with Residual Soils (Chemicals)	2.0×10^{-2}
Ingestion of Meat (Chemicals)	NA
Ingestion of Dairy Products (Chemicals)	NA
Ingestion of Vegetables and Fruit (Chemicals)	NA
Ingestion of Drinking Water (Chemicals)	NA
Dermal Contact While Bathing (Chemicals)	NA
Total Receptor HI =	2.0×10^{-2}

Exposure Pathway	Pathway ILCR
Inhalation of Particulates (Chemicals)	3.1×10^{-11}
Inhalation of Particulates (Radionuclides)	8.8×10^{-10}
Incidental Ingestion of Residual Soils (Chemicals)	9.2×10^{-8}
Incidental Ingestion of Residual Soils (Radionuclides)	6.4×10^{-9}
Dermal Contact with Residual Soils (Chemicals)	1.7×10^{-7}
Ingestion of Drinking Water (Chemicals)	NA
Ingestion of Drinking Water (Radionuclides)	NA
Dermal Contact While Bathing (Chemicals)	NA
Ingestion of Meat (Chemicals)	NA
Ingestion of Meat (Radionuclides)	NA
Ingestion of Dairy Products (Chemicals)	NA
Ingestion of Dairy Products (Radionuclides)	NA
Ingestion of Vegetables and Fruit (Chemicals)	NA
Ingestion of Vegetables and Fruit (Radionuclides)	NA
Direct Radiation	1.3×10^{-7}
Total Receptor ILCR =	4.0×10^{-7}

HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk
NA = Not applicable. Exposure route is incomplete (see Section C.2.3.4)

TABLE C.7-32
SUMMARY OF POTENTIAL RESIDUAL RISKS: SOLID WASTE LANDFILL WITH FEDERAL OWNERSHIP, ALTERNATIVE 6, OFF-PROPERTY FARMER (ADULT)

Exposure Pathway	Pathway HI
Inhalation of Particulates (Chemicals)	NA
Incidental Ingestion of Residual Soils (Chemicals)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Meat (Chemicals)	2.4×10^{-6}
Ingestion of Dairy Products (Chemicals)	3.4×10^{-5}
Ingestion of Vegetables and Fruit (Chemicals)	1.9×10^{-3}
Ingestion of Drinking Water (Chemicals)	6.3×10^{-3}
Dermal Contact While Bathing (Chemicals)	3.6×10^{-4}
Total Receptor HI =	8.6×10^{-3}

Exposure Pathway	Pathway ILCR
Inhalation of Particulates (Chemicals)	9.0×10^{-11}
Inhalation of Particulates (Radionuclides)	3.6×10^{-9}
Incidental Ingestion of Residual Soils (Chemicals)	NA
Incidental Ingestion of Residual Soils (Radionuclides)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Drinking Water (Chemicals)	NA
Ingestion of Drinking Water (Radionuclides)	4.0×10^{-7}
Dermal Contact While Bathing (Chemicals)	NA
Ingestion of Meat (Chemicals)	3.6×10^{-10}
Ingestion of Meat (Radionuclides)	1.5×10^{-10}
Ingestion of Dairy Products (Chemicals)	4.3×10^{-10}
Ingestion of Dairy Products (Radionuclides)	2.2×10^{-9}
Ingestion of Vegetables and Fruit (Chemicals)	5.3×10^{-10}
Ingestion of Vegetables and Fruit (Radionuclides)	1.2×10^{-7}
Direct Radiation	NA
Total Receptor ILCR =	5.3×10^{-7}

HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk
NA = Not applicable. Exposure route is incomplete (see Section C.2.3.4)

000245

TABLE C.7-33
SUMMARY OF POTENTIAL RESIDUAL RISKS: SOLID WASTE LANDFILL WITH FEDERAL OWNERSHIP, ALTERNATIVE 6, OFF-PROPERTY FARMER (CHILD)

Exposure Pathway	Pathway HI
Inhalation of Particulates (Chemicals)	NA
Incidental Ingestion of Residual Soils (Chemicals)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Meat (Chemicals)	4.3×10^{-6}
Ingestion of Dairy Products (Chemicals)	3.6×10^{-4}
Ingestion of Vegetables and Fruit (Chemicals)	7.2×10^{-3}
Ingestion of Drinking Water (Chemicals)	1.5×10^{-2}
Dermal Contact While Bathing (Chemicals)	5.9×10^{-4}
Total Receptor HI =	2.3×10^{-2}

Exposure Pathway	Pathway ILCR
Inhalation of Particulates (Chemicals)	2.2×10^{-11}
Inhalation of Particulates (Radionuclides)	1.9×10^{-10}
Incidental Ingestion of Residual Soils (Chemicals)	NA
Incidental Ingestion of Residual Soils (Radionuclides)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Drinking Water (Chemicals)	NA
Ingestion of Drinking Water (Radionuclides)	1.7×10^{-8}
Dermal Contact While Bathing (Chemicals)	NA
Ingestion of Meat (Chemicals)	5.6×10^{-11}
Ingestion of Meat (Radionuclides)	5.0×10^{-12}
Ingestion of Dairy Products (Chemicals)	3.9×10^{-10}
Ingestion of Dairy Products (Radionuclides)	4.2×10^{-10}
Ingestion of Vegetables and Fruit (Chemicals)	1.8×10^{-10}
Ingestion of Vegetables and Fruit (Radionuclides)	8.4×10^{-9}
Direct Radiation	NA
Total Receptor ILCR =	2.7×10^{-8}

HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk
NA = Not applicable. Exposure route is incomplete (see Section C.2.3.4)

TABLE C.7-34
SUMMARY OF POTENTIAL RESIDUAL RISKS: SOLID WASTE LANDFILL WITH PRIVATE OWNERSHIP, ALTERNATIVE 6, OFF-PROPERTY FARMER (ADULT)

Exposure Pathway	Pathway HI
Inhalation of Particulates (Chemicals)	NA
Incidental Ingestion of Residual Soils (Chemicals)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Meat (Chemicals)	3.2×10^{-7}
Ingestion of Dairy Products (Chemicals)	1.0×10^{-4}
Ingestion of Vegetables and Fruit (Chemicals)	1.3×10^{-5}
Ingestion of Drinking Water (Chemicals)	2.5×10^{-5}
Dermal Contact While Bathing (Chemicals)	1.4×10^{-6}
Total Receptor HI =	1.4×10^{-4}

Exposure Pathway	Pathway ILCR
Inhalation of Particulates (Chemicals)	2.1×10^{-12}
Inhalation of Particulates (Radionuclides)	1.4×10^{-8}
Incidental Ingestion of Residual Soils (Chemicals)	NA
Incidental Ingestion of Residual Soils (Radionuclides)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Drinking Water (Chemicals)	NA
Ingestion of Drinking Water (Radionuclides)	1.5×10^{-9}
Dermal Contact While Bathing (Chemicals)	NA
Ingestion of Meat (Chemicals)	2.3×10^{-11}
Ingestion of Meat (Radionuclides)	6.9×10^{-13}
Ingestion of Dairy Products (Chemicals)	NA
Ingestion of Dairy Products (Radionuclides)	6.5×10^{-9}
Ingestion of Vegetables and Fruit (Chemicals)	1.6×10^{-11}
Ingestion of Vegetables and Fruit (Radionuclides)	6.2×10^{-10}
Direct Radiation	NA
Total Receptor ILCR =	2.2×10^{-8}

HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk
NA = Not applicable. Exposure route is incomplete (see Section C.2.3.4)

000247

TABLE C.7-35
SUMMARY OF POTENTIAL RESIDUAL RISKS: SOLID WASTE LANDFILL WITH PRIVATE OWNERSHIP, ALTERNATIVE 6, OFF-PROPERTY FARMER (CHILD)

Exposure Pathway	Pathway HI
Inhalation of Particulates (Chemicals)	NA
Incidental Ingestion of Residual Soils (Chemicals)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Meat (Chemicals)	5.8×10^{-7}
Ingestion of Dairy Products (Chemicals)	1.1×10^{-3}
Ingestion of Vegetables and Fruit (Chemicals)	5.0×10^{-5}
Ingestion of Drinking Water (Chemicals)	5.8×10^{-5}
Dermal Contact While Bathing (Chemicals)	2.3×10^{-6}
Total Receptor HI =	1.2×10^{-3}

Exposure Pathway	Pathway ILCR
Inhalation of Particulates (Chemicals)	5.1×10^{-13}
Inhalation of Particulates (Radionuclides)	7.1×10^{-10}
Incidental Ingestion of Residual Soils (Chemicals)	NA
Incidental Ingestion of Residual Soils (Radionuclides)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Drinking Water (Chemicals)	NA
Ingestion of Drinking Water (Radionuclides)	6.6×10^{-11}
Dermal Contact While Bathing (Chemicals)	NA
Ingestion of Meat (Chemicals)	3.6×10^{-12}
Ingestion of Meat (Radionuclides)	2.3×10^{-14}
Ingestion of Dairy Products (Chemicals)	NA
Ingestion of Dairy Products (Radionuclides)	1.3×10^{-9}
Ingestion of Vegetables and Fruit (Chemicals)	5.1×10^{-12}
Ingestion of Vegetables and Fruit (Radionuclides)	4.4×10^{-11}
Direct Radiation	NA
Total Receptor ILCR =	2.1×10^{-9}

HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk
NA = Not applicable. Exposure route is incomplete (see Section C.2.3.4)

TABLE C.7-36
SUMMARY OF POTENTIAL RESIDUAL RISKS: SOLID WASTE LANDFILL WITH PRIVATE OWNERSHIP, ALTERNATIVE 6, PERCHED GROUNDWATER USER

Exposure Pathway	Pathway HI
Inhalation of Particulates (Chemicals)	NA
Incidental Ingestion of Residual Soils (Chemicals)	8.2×10^{-3}
Dermal Contact with Residual Soils (Chemicals)	1.7×10^{-2}
Ingestion of Meat (Chemicals)	6.9×10^{-3}
Ingestion of Dairy Products (Chemicals)	3.4×10^{-3}
Ingestion of Vegetables and Fruit (Chemicals)	1.7×10^{-1}
Ingestion of Drinking Water (Chemicals)	NA
Dermal Contact While Bathing (Chemicals)	NA
Total Receptor HI =	2.0×10^{-1}

Exposure Pathway	Pathway ILCR
Inhalation of Particulates (Chemicals)	7.7×10^{-11}
Inhalation of Particulates (Radionuclides)	5.0×10^{-7}
Incidental Ingestion of Residual Soils (Chemicals)	2.7×10^{-8}
Incidental Ingestion of Residual Soils (Radionuclides)	2.9×10^{-7}
Dermal Contact with Residual Soils (Chemicals)	3.4×10^{-7}
Ingestion of Drinking Water (Chemicals)	2.6×10^{-7}
Ingestion of Drinking Water (Radionuclides)	1.2×10^{-6}
Dermal Contact While Bathing (Chemicals)	8.2×10^{-9}
Ingestion of Meat (Chemicals)	3.9×10^{-7}
Ingestion of Meat (Radionuclides)	1.5×10^{-9}
Ingestion of Dairy Products (Chemicals)	NA
Ingestion of Dairy Products (Radionuclides)	6.4×10^{-7}
Ingestion of Vegetables and Fruit (Chemicals)	2.9×10^{-7}
Ingestion of Vegetables and Fruit (Radionuclides)	4.2×10^{-7}
Direct Radiation	7.7×10^{-7}
Total Receptor ILCR =	4.8×10^{-6}

HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk
NA = Not applicable. Exposure route is incomplete (see Section C.2.3.4)

000249

TABLE C.7-37
SUMMARY OF POTENTIAL RESIDUAL RISKS: SOLID WASTE LANDFILL WITH PRIVATE OWNERSHIP, ALTERNATIVE 6 ON-PROPERTY FARMER (ADULT)

Exposure Pathway	Pathway HI
Inhalation of Particulates (Chemicals)	NA
Incidental Ingestion of Residual Soils (Chemicals)	8.2×10^{-3}
Dermal Contact with Residual Soils (Chemicals)	1.7×10^{-2}
Ingestion of Meat (Chemicals)	6.9×10^{-3}
Ingestion of Dairy Products (Chemicals)	3.4×10^{-3}
Ingestion of Vegetables and Fruit (Chemicals)	1.7×10^{-1}
Ingestion of Drinking Water (Chemicals)	7.3×10^{-4}
Dermal Contact While Bathing (Chemicals)	4.2×10^{-5}
Total Receptor HI =	2.0×10^{-1}

Exposure Pathway	Pathway ILCR
Inhalation of Particulates (Chemicals)	7.7×10^{-11}
Inhalation of Particulates (Radionuclides)	5.0×10^{-7}
Incidental Ingestion of Residual Soils (Chemicals)	2.7×10^{-8}
Incidental Ingestion of Residual Soils (Radionuclides)	2.9×10^{-7}
Dermal Contact with Residual Soils (Chemicals)	3.4×10^{-9}
Ingestion of Drinking Water (Chemicals)	NA
Ingestion of Drinking Water (Radionuclides)	4.5×10^{-8}
Dermal Contact While Bathing (Chemicals)	NA
Ingestion of Meat (Chemicals)	3.9×10^{-7}
Ingestion of Meat (Radionuclides)	1.5×10^{-9}
Ingestion of Dairy Products (Chemicals)	NA
Ingestion of Dairy Products (Radionuclides)	6.4×10^{-7}
Ingestion of Vegetables and Fruit (Chemicals)	2.9×10^{-7}
Ingestion of Vegetables and Fruit (Radionuclides)	4.2×10^{-7}
Direct Radiation	7.7×10^{-7}
Total Receptor ILCR =	3.4×10^{-6}

HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk
NA = Not applicable. Exposure route is incomplete (see Section C.2.3.4)

TABLE C.7-38
SUMMARY OF POTENTIAL RESIDUAL RISKS:
SOLID WASTE LANDFILL WITH PRIVATE OWNERSHIP, ALTERNATIVE 6
ON-PROPERTY FARMER (CHILD)

Exposure Pathway	Pathway HI
Inhalation of Particulates (Chemicals)	NA
Incidental Ingestion of Residual Soils (Chemicals)	4.3×10^{-2}
Dermal Contact with Residual Soils (Chemicals)	2.8×10^{-2}
Ingestion of Meat (Chemicals)	1.2×10^{-2}
Ingestion of Dairy Products (Chemicals)	3.6×10^{-2}
Ingestion of Vegetables and Fruit (Chemicals)	6.4×10^{-1}
Ingestion of Drinking Water (Chemicals)	1.7×10^{-3}
Dermal Contact While Bathing (Chemicals)	6.8×10^{-5}
Total Receptor HI =	7.6×10^{-1}

Exposure Pathway	Pathway ILCR
Inhalation of Particulates (Chemicals)	1.8×10^{-11}
Inhalation of Particulates (Radionuclides)	2.6×10^{-8}
Incidental Ingestion of Residual Soils (Chemicals)	1.2×10^{-8}
Incidental Ingestion of Residual Soils (Radionuclides)	2.7×10^{-8}
Dermal Contact with Residual Soils (Chemicals)	4.7×10^{-10}
Ingestion of Drinking Water (Chemicals)	NA
Ingestion of Drinking Water (Radionuclides)	1.9×10^{-9}
Dermal Contact While Bathing (Chemicals)	NA
Ingestion of Meat (Chemicals)	6.0×10^{-8}
Ingestion of Meat (Radionuclides)	5.0×10^{-11}
Ingestion of Dairy Products (Chemicals)	NA
Ingestion of Dairy Products (Radionuclides)	1.2×10^{-7}
Ingestion of Vegetables and Fruit (Chemicals)	9.5×10^{-8}
Ingestion of Vegetables and Fruit (Radionuclides)	2.9×10^{-8}
Direct Radiation	5.8×10^{-8}
Total Receptor ILCR =	4.3×10^{-7}

HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk
NA = Not applicable. Exposure route is incomplete (see Section C.2.3.4)

000251

TABLE C.7-39
SUMMARY OF POTENTIAL RESIDUAL RISKS: SOUTH FIELD AREA WITH FEDERAL OWNERSHIP, ALTERNATIVE 2, EXPANDED TRESPASSER

Exposure Pathway	Pathway HI
Inhalation of Particulates (Chemicals)	NA
Incidental Ingestion of Residual Soils (Chemicals)	2.9×10^{-3}
Dermal Contact with Residual Soils (Chemicals)	1.3×10^{-1}
Ingestion of Meat (Chemicals)	NA
Ingestion of Dairy Products (Chemicals)	NA
Ingestion of Vegetables and Fruit (Chemicals)	NA
Ingestion of Drinking Water (Chemicals)	NA
Dermal Contact While Bathing (Chemicals)	NA
Total Receptor HI =	1.3×10^{-1}

Exposure Pathway	Pathway ILCR
Inhalation of Particulates (Chemicals)	2.5×10^{-9}
Inhalation of Particulates (Radionuclides)	5.7×10^{-8}
Incidental Ingestion of Residual Soils (Chemicals)	1.5×10^{-7}
Incidental Ingestion of Residual Soils (Radionuclides)	1.4×10^{-8}
Dermal Contact with Residual Soils (Chemicals)	2.0×10^{-7}
Ingestion of Drinking Water (Chemicals)	NA
Ingestion of Drinking Water (Radionuclides)	NA
Dermal Contact While Bathing (Chemicals)	NA
Ingestion of Meat (Chemicals)	NA
Ingestion of Meat (Radionuclides)	NA
Ingestion of Dairy Products (Chemicals)	NA
Ingestion of Dairy Products (Radionuclides)	NA
Ingestion of Vegetables and Fruit (Chemicals)	NA
Ingestion of Vegetables and Fruit (Radionuclides)	NA
Direct Radiation	8.2×10^{-7}
Total Receptor ILCR =	1.2×10^{-6}

HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk
NA = Not applicable. Exposure route is incomplete (see Section C.2.3.4)

000252

TABLE C.7-40
SUMMARY OF POTENTIAL RESIDUAL RISKS: SOUTH FIELD AREA WITH FEDERAL OWNERSHIP, ALTERNATIVE 2, OFF-PROPERTY FARMER (ADULT)

Exposure Pathway	Pathway HI
Inhalation of Particulates (Chemicals)	NA
Incidental Ingestion of Residual Soils (Chemicals)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Meat (Chemicals)	1.2×10^{-5}
Ingestion of Dairy Products (Chemicals)	7.7×10^{-5}
Ingestion of Vegetables and Fruit (Chemicals)	4.1×10^{-3}
Ingestion of Drinking Water (Chemicals)	1.4×10^{-2}
Dermal Contact While Bathing (Chemicals)	7.8×10^{-4}
Total Receptor HI =	1.8×10^{-2}

Exposure Pathway	Pathway ILCR
Inhalation of Particulates (Chemicals)	1.2×10^{-8}
Inhalation of Particulates (Radionuclides)	4.3×10^{-7}
Incidental Ingestion of Residual Soils (Chemicals)	NA
Incidental Ingestion of Residual Soils (Radionuclides)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Drinking Water (Chemicals)	NA
Ingestion of Drinking Water (Radionuclides)	8.6×10^{-7}
Dermal Contact While Bathing (Chemicals)	NA
Ingestion of Meat (Chemicals)	4.3×10^{-9}
Ingestion of Meat (Radionuclides)	3.5×10^{-10}
Ingestion of Dairy Products (Chemicals)	1.0×10^{-9}
Ingestion of Dairy Products (Radionuclides)	4.9×10^{-9}
Ingestion of Vegetables and Fruit (Chemicals)	3.1×10^{-8}
Ingestion of Vegetables and Fruit (Radionuclides)	2.6×10^{-7}
Direct Radiation	NA
Total Receptor ILCR =	1.6×10^{-6}

HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk
NA = Not applicable. Exposure route is incomplete (see Section C.2.3.4)

000253

TABLE C.7-41
SUMMARY OF POTENTIAL RESIDUAL RISKS: SOUTH FIELD AREA WITH FEDERAL OWNERSHIP, ALTERNATIVE 2, OFF-PROPERTY FARMER (CHILD)

Exposure Pathway	Pathway HI
Inhalation of Particulates (Chemicals)	NA
Incidental Ingestion of Residual Soils (Chemicals)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Meat (Chemicals)	2.2×10^{-5}
Ingestion of Dairy Products (Chemicals)	8.1×10^{-4}
Ingestion of Vegetables and Fruit (Chemicals)	1.6×10^{-2}
Ingestion of Drinking Water (Chemicals)	3.2×10^{-2}
Dermal Contact While Bathing (Chemicals)	1.3×10^{-3}
Total Receptor HI =	4.9×10^{-2}

Exposure Pathway	Pathway ILCR
Inhalation of Particulates (Chemicals)	2.9×10^{-9}
Inhalation of Particulates (Radionuclides)	2.2×10^{-8}
Incidental Ingestion of Residual Soils (Chemicals)	NA
Incidental Ingestion of Residual Soils (Radionuclides)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Drinking Water (Chemicals)	NA
Ingestion of Drinking Water (Radionuclides)	3.7×10^{-8}
Dermal Contact While Bathing (Chemicals)	NA
Ingestion of Meat (Chemicals)	6.6×10^{-10}
Ingestion of Meat (Radionuclides)	1.1×10^{-11}
Ingestion of Dairy Products (Chemicals)	9.2×10^{-10}
Ingestion of Dairy Products (Radionuclides)	9.4×10^{-10}
Ingestion of Vegetables and Fruit (Chemicals)	1.0×10^{-8}
Ingestion of Vegetables and Fruit (Radionuclides)	1.8×10^{-8}
Direct Radiation	NA
Total Receptor ILCR =	9.3×10^{-8}

HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk
NA = Not applicable. Exposure route is incomplete (see Section C.2.3.4)

000254

TABLE C.7-42
SUMMARY OF POTENTIAL RESIDUAL RISKS: SOUTH FIELD AREA WITH FEDERAL OWNERSHIP, ALTERNATIVE 3, EXPANDED TRESPASSER

Exposure Pathway	Pathway HI
Inhalation of Particulates (Chemicals)	NA
Incidental Ingestion of Residual Soils (Chemicals)	1.1×10^{-3}
Dermal Contact with Residual Soils (Chemicals)	1.2×10^{-2}
Ingestion of Meat (Chemicals)	NA
Ingestion of Dairy Products (Chemicals)	NA
Ingestion of Vegetables and Fruit (Chemicals)	NA
Ingestion of Drinking Water (Chemicals)	NA
Dermal Contact While Bathing (Chemicals)	NA
Total Receptor HI =	1.3×10^{-2}

Exposure Pathway	Pathway ILCR
Inhalation of Particulates (Chemicals)	3.5×10^{-9}
Inhalation of Particulates (Radionuclides)	5.9×19^{-8}
Incidental Ingestion of Residual Soils (Chemicals)	2.3×10^{-7}
Incidental Ingestion of Residual Soils (Radionuclides)	1.2×10^{-8}
Dermal Contact with Residual Soils (Chemicals)	9.5×10^{-7}
Ingestion of Drinking Water (Chemicals)	NA
Ingestion of Drinking Water (Radionuclides)	NA
Dermal Contact While Bathing (Chemicals)	NA
Ingestion of Meat (Chemicals)	MA
Ingestion of Meat (Radionuclides)	MA
Ingestion of Dairy Products (Chemicals)	NA
Ingestion of Dairy Products (Radionuclides)	NA
Ingestion of Vegetables and Fruit (Chemicals)	NA
Ingestion of Vegetables and Fruit (Radionuclides)	NA
Direct Radiation	1.2×10^{-6}
Total Receptor ILCR =	2.5×10^{-6}

HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk
NA = Not applicable. Exposure route is incomplete (see Section C.2.3.4)

000255

TABLE C.7-43
SUMMARY OF POTENTIAL RESIDUAL RISKS: SOUTH FIELD AREA WITH FEDERAL OWNERSHIP, ALTERNATIVE 3, OFF-PROPERTY FARMER (ADULT)

Exposure Pathway	Pathway HI
Inhalation of Particulates (Chemicals)	NA
Incidental Ingestion of Residual Soils (Chemicals)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Meat (Chemicals)	1.8×10^{-5}
Ingestion of Dairy Products (Chemicals)	1.1×10^{-4}
Ingestion of Vegetables and Fruit (Chemicals)	6.0×10^{-3}
Ingestion of Drinking Water (Chemicals)	2.0×10^{-2}
Dermal Contact While Bathing (Chemicals)	1.1×10^{-3}
Total Receptor HI =	2.7×10^{-2}

Exposure Pathway	Pathway ILCR
Inhalation of Particulates (Chemicals)	1.9×10^{-8}
Inhalation of Particulates (Radionuclides)	4.5×10^{-7}
Incidental Ingestion of Residual Soils (Chemicals)	NA
Incidental Ingestion of Residual Soils (Radionuclides)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Drinking Water (Chemicals)	NA
Ingestion of Drinking Water (Radionuclides)	1.2×10^{-6}
Dermal Contact While Bathing (Chemicals)	NA
Ingestion of Meat (Chemicals)	3.3×10^{-8}
Ingestion of Meat (Radionuclides)	5.0×10^{-10}
Ingestion of Dairy Products (Chemicals)	3.5×10^{-8}
Ingestion of Dairy Products (Radionuclides)	7.0×10^{-9}
Ingestion of Vegetables and Fruit (Chemicals)	5.9×10^{-8}
Ingestion of Vegetables and Fruit (Radionuclides)	3.7×10^{-7}
Direct Radiation	NA
Total Receptor ILCR =	2.2×10^{-6}

HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk
NA = Not applicable. Exposure route is incomplete (see Section C.2.3.4)

000256

TABLE C.7-44
SUMMARY OF POTENTIAL RESIDUAL RISKS: SOUTH FIELD AREA WITH FEDERAL OWNERSHIP, ALTERNATIVE 3, OFF-PROPERTY FARMER (CHILD)

Exposure Pathway	Pathway HI
Inhalation of Particulates (Chemicals)	NA
Incidental Ingestion of Residual Soils (Chemicals)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Meat (Chemicals)	3.2×10^{-5}
Ingestion of Dairy Products (Chemicals)	1.1×10^{-3}
Ingestion of Vegetables and Fruit (Chemicals)	2.3×10^{-2}
Ingestion of Drinking Water (Chemicals)	4.6×10^{-2}
Dermal Contact While Bathing (Chemicals)	1.8×10^{-3}
Total Receptor HI =	7.2×10^{-2}

Exposure Pathway	Pathway ILCR
Inhalation of Particulates (Chemicals)	4.6×10^{-9}
Inhalation of Particulates (Radionuclides)	2.3×10^{-8}
Incidental Ingestion of Residual Soils (Chemicals)	NA
Incidental Ingestion of Residual Soils (Radionuclides)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Drinking Water (Chemicals)	NA
Ingestion of Drinking Water (Radionuclides)	5.3×10^{-8}
Dermal Contact While Bathing (Chemicals)	NA
Ingestion of Meat (Chemicals)	4.3×10^{-9}
Ingestion of Meat (Radionuclides)	1.6×10^{-11}
Ingestion of Dairy Products (Chemicals)	2.6×10^{-8}
Ingestion of Dairy Products (Radionuclides)	1.4×10^{-9}
Ingestion of Vegetables and Fruit (Chemicals)	1.8×10^{-8}
Ingestion of Vegetables and Fruit (Radionuclides)	2.6×10^{-8}
Direct Radiation	NA
Total Receptor ILCR =	1.6×10^{-7}

HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk
NA = Not applicable. Exposure route is incomplete (see Section C.2.3.4)

000257

TABLE C.7-45
SUMMARY OF POTENTIAL RESIDUAL RISKS: SOUTH FIELD AREA WITH PRIVATE OWNERSHIP, ALTERNATIVE 3, OFF-PROPERTY FARMER (ADULT)

Exposure Pathway	Pathway HI
Inhalation of Particulates (Chemicals)	NA
Incidental Ingestion of Residual Soils (Chemicals)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Meat (Chemicals)	4.4×10^{-7}
Ingestion of Dairy Products (Chemicals)	6.0×10^{-6}
Ingestion of Vegetables and Fruit (Chemicals)	2.9×10^{-4}
Ingestion of Drinking Water (Chemicals)	9.4×10^{-4}
Dermal Contact While Bathing (Chemicals)	5.4×10^{-5}
Total Receptor HI =	1.3×10^{-3}

Exposure Pathway	Pathway ILCR
Inhalation of Particulates (Chemicals)	NA
Inhalation of Particulates (Radionuclides)	6.7×10^{-8}
Incidental Ingestion of Residual Soils (Chemicals)	NA
Incidental Ingestion of Residual Soils (Radionuclides)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Drinking Water (Chemicals)	NA
Ingestion of Drinking Water (Radionuclides)	5.9×10^{-8}
Dermal Contact While Bathing (Chemicals)	NA
Ingestion of Meat (Chemicals)	NA
Ingestion of Meat (Radionuclides)	2.5×10^{-11}
Ingestion of Dairy Products (Chemicals)	NA
Ingestion of Dairy Products (Radionuclides)	3.6×10^{-10}
Ingestion of Vegetables and Fruit (Chemicals)	NA
Ingestion of Vegetables and Fruit (Radionuclides)	1.8×10^{-8}
Direct Radiation	NA
Total Receptor ILCR =	1.4×10^{-7}

HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk
NA = Not applicable. Exposure route is incomplete (see Section C.2.3.4)

000258

TABLE C.7-46
SUMMARY OF POTENTIAL RESIDUAL RISKS: SOUTH FIELD AREA WITH PRIVATE OWNERSHIP, ALTERNATIVE 3, OFF-PROPERTY FARMER (CHILD)

Exposure Pathway	Pathway HI
Inhalation of Particulates (Chemicals)	NA
Incidental Ingestion of Residual Soils (Chemicals)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Meat (Chemicals)	7.8×10^{-7}
Ingestion of Dairy Products (Chemicals)	6.3×10^{-5}
Ingestion of Vegetables and Fruit (Chemicals)	1.1×10^{-3}
Ingestion of Drinking Water (Chemicals)	2.2×10^{-3}
Dermal Contact While Bathing (Chemicals)	8.8×10^{-5}
Total Receptor HI =	3.5×10^{-3}

Exposure Pathway	Pathway ILCR
Inhalation of Particulates (Chemicals)	NA
Inhalation of Particulates (Radionuclides)	3.4×10^{-9}
Incidental Ingestion of Residual Soils (Chemicals)	NA
Incidental Ingestion of Residual Soils (Radionuclides)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Drinking Water (Chemicals)	NA
Ingestion of Drinking Water (Radionuclides)	2.5×10^{-9}
Dermal Contact While Bathing (Chemicals)	NA
Ingestion of Meat (Chemicals)	NA
Ingestion of Meat (Radionuclides)	8.4×10^{-13}
Ingestion of Dairy Products (Chemicals)	NA
Ingestion of Dairy Products (Radionuclides)	6.9×10^{-11}
Ingestion of Vegetables and Fruit (Chemicals)	NA
Ingestion of Vegetables and Fruit (Radionuclides)	1.3×10^{-9}
Direct Radiation	NA
Total Receptor ILCR =	7.3×10^{-9}

HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk
NA = Not applicable. Exposure route is incomplete (see Section C.2.3.4)

000259

TABLE C.7-47
SUMMARY OF POTENTIAL RESIDUAL RISKS: SOUTH FIELD AREA WITH PRIVATE OWNERSHIP, ALTERNATIVE 3, ON-PROPERTY FARMER (ADULT)

Exposure Pathway	Pathway HI
Inhalation of Particulates (Chemicals)	NA
Incidental Ingestion of Residual Soils (Chemicals)	6.5×10^{-4}
Dermal Contact with Residual Soils (Chemicals)	4.2×10^{-3}
Ingestion of Meat (Chemicals)	5.4×10^{-5}
Ingestion of Dairy Products (Chemicals)	6.5×10^{-4}
Ingestion of Vegetables and Fruit (Chemicals)	5.5×10^{-3}
Ingestion of Drinking Water (Chemicals)	5.5×10^{-3}
Dermal Contact While Bathing (Chemicals)	3.2×10^{-4}
Total Receptor HI =	1.7×10^{-2}

Exposure Pathway	Pathway ILCR
Inhalation of Particulates (Chemicals)	NA
Inhalation of Particulates (Radionuclides)	1.3×10^{-6}
Incidental Ingestion of Residual Soils (Chemicals)	NA
Incidental Ingestion of Residual Soils (Radionuclides)	2.8×10^{-8}
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Drinking Water (Chemicals)	NA
Ingestion of Drinking Water (Radionuclides)	3.5×10^{-7}
Dermal Contact While Bathing (Chemicals)	NA
Ingestion of Meat (Chemicals)	NA
Ingestion of Meat (Radionuclides)	3.3×10^{-8}
Ingestion of Dairy Products (Chemicals)	NA
Ingestion of Dairy Products (Radionuclides)	6.4×10^{-7}
Ingestion of Vegetables and Fruit (Chemicals)	NA
Ingestion of Vegetables and Fruit (Radionuclides)	3.7×10^{-6}
Direct Radiation	3.4×10^{-7}
Total Receptor ILCR =	6.4×10^{-6}

HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk
NA = Not applicable. Exposure route is incomplete (see Section C.2.3.4)

000260

TABLE C.7-48
SUMMARY OF POTENTIAL RESIDUAL RISKS: SOUTH FIELD AREA WITH PRIVATE OWNERSHIP, ALTERNATIVE 3, ON-PROPERTY FARMER (CHILD)

Exposure Pathway	Pathway HI
Inhalation of Particulates (Chemicals)	NA
Incidental Ingestion of Residual Soils (Chemicals)	3.4×10^{-3}
Dermal Contact with Residual Soils (Chemicals)	6.8×10^{-3}
Ingestion of Meat (Chemicals)	9.8×10^{-5}
Ingestion of Dairy Products (Chemicals)	6.8×10^{-3}
Ingestion of Vegetables and Fruit (Chemicals)	2.1×10^{-2}
Ingestion of Drinking Water (Chemicals)	1.3×10^{-2}
Dermal Contact While Bathing (Chemicals)	5.2×10^{-4}
Total Receptor HI =	5.2×10^{-2}

Exposure Pathway	Pathway ILCR
Inhalation of Particulates (Chemicals)	NA
Inhalation of Particulates (Radionuclides)	6.7×10^{-8}
Incidental Ingestion of Residual Soils (Chemicals)	NA
Incidental Ingestion of Residual Soils (Radionuclides)	2.7×10^{-9}
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Drinking Water (Chemicals)	NA
Ingestion of Drinking Water (Radionuclides)	1.5×10^{-8}
Dermal Contact While Bathing (Chemicals)	NA
Ingestion of Meat (Chemicals)	NA
Ingestion of Meat (Radionuclides)	1.1×10^{-9}
Ingestion of Dairy Products (Chemicals)	NA
Ingestion of Dairy Products (Radionuclides)	1.2×10^{-7}
Ingestion of Vegetables and Fruit (Chemicals)	NA
Ingestion of Vegetables and Fruit (Radionuclides)	2.6×10^{-7}
Direct Radiation	2.5×10^{-8}
Total Receptor ILCR =	4.9×10^{-7}

HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk
NA = Not applicable. Exposure route is incomplete (see Section C.2.3.4)

000261

TABLE C.7-49
SUMMARY OF POTENTIAL RESIDUAL RISKS: SOUTH FIELD AREA WITH FEDERAL OWNERSHIP, ALTERNATIVE 6, EXPANDED TRESPASSER

Exposure Pathway	Pathway HI
Inhalation of Particulates (Chemicals)	NA
Incidental Ingestion of Residual Soils (Chemicals)	1.1×10^{-3}
Dermal Contact with Residual Soils (Chemicals)	1.2×10^{-2}
Ingestion of Meat (Chemicals)	NA
Ingestion of Dairy Products (Chemicals)	NA
Ingestion of Vegetables and Fruit (Chemicals)	NA
Ingestion of Drinking Water (Chemicals)	NA
Dermal Contact While Bathing (Chemicals)	NA
Total Receptor HI =	1.3×10^{-2}

Exposure Pathway	Pathway ILCR
Inhalation of Particulates (Chemicals)	3.5×10^{-9}
Inhalation of Particulates (Radionuclides)	5.9×10^{-8}
Incidental Ingestion of Residual Soils (Chemicals)	2.3×10^{-7}
Incidental Ingestion of Residual Soils (Radionuclides)	1.2×10^{-8}
Dermal Contact with Residual Soils (Chemicals)	9.5×10^{-7}
Ingestion of Drinking Water (Chemicals)	NA
Ingestion of Drinking Water (Radionuclides)	NA
Dermal Contact While Bathing (Chemicals)	NA
Ingestion of Meat (Chemicals)	NA
Ingestion of Meat (Radionuclides)	NA
Ingestion of Dairy Products (Chemicals)	NA
Ingestion of Dairy Products (Radionuclides)	NA
Ingestion of Vegetables and Fruit (Chemicals)	MA
Ingestion of Vegetables and Fruit (Radionuclides)	NA
Direct Radiation	1.2×10^{-6}
Total Receptor ILCR =	2.5×10^{-6}

HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk
NA = Not applicable. Exposure route is incomplete (see Section C.2.3.4)

000262

TABLE C.7-50
SUMMARY OF POTENTIAL RESIDUAL RISKS: SOUTH FIELD AREA WITH FEDERAL OWNERSHIP, ALTERNATIVE 6, OFF-PROPERTY FARMER (ADULT)

Exposure Pathway	Pathway HI
Inhalation of Particulates (Chemicals)	NA
Incidental Ingestion of Residual Soils (Chemicals)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Meat (Chemicals)	1.8×10^{-5}
Ingestion of Dairy Products (Chemicals)	1.1×10^{-4}
Ingestion of Vegetables and Fruit (Chemicals)	6.0×10^{-3}
Ingestion of Drinking Water (Chemicals)	2.0×10^{-2}
Dermal Contact While Bathing (Chemicals)	1.1×10^{-3}
Total Receptor HI =	2.7×10^{-2}

Exposure Pathway	Pathway ILCR
Inhalation of Particulates (Chemicals)	1.9×10^{-8}
Inhalation of Particulates (Radionuclides)	4.5×10^{-7}
Incidental Ingestion of Residual Soils (Chemicals)	NA
Incidental Ingestion of Residual Soils (Radionuclides)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Drinking Water (Chemicals)	NA
Ingestion of Drinking Water (Radionuclides)	1.2×10^{-6}
Dermal Contact While Bathing (Chemicals)	NA
Ingestion of Meat (Chemicals)	3.3×10^{-8}
Ingestion of Meat (Radionuclides)	5.0×10^{-10}
Ingestion of Dairy Products (Chemicals)	3.5×10^{-8}
Ingestion of Dairy Products (Radionuclides)	7.0×10^{-9}
Ingestion of Vegetables and Fruit (Chemicals)	5.9×10^{-8}
Ingestion of Vegetables and Fruit (Radionuclides)	3.7×10^{-9}
Direct Radiation	NA
Total Receptor ILCR =	2.2×10^{-6}

HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk
NA = Not applicable. Exposure route is incomplete (see Section C.2.3.4)

000263

TABLE C.7-51
SUMMARY OF POTENTIAL RESIDUAL RISKS: SOUTH FIELD AREA WITH FEDERAL OWNERSHIP, ALTERNATIVE 6, OFF-PROPERTY FARMER (CHILD)

Exposure Pathway	Pathway HI
Inhalation of Particulates (Chemicals)	NA
Incidental Ingestion of Residual Soils (Chemicals)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Meat (Chemicals)	3.2×10^{-5}
Ingestion of Dairy Products (Chemicals)	1.1×10^{-3}
Ingestion of Vegetables and Fruit (Chemicals)	2.3×10^{-2}
Ingestion of Drinking Water (Chemicals)	4.6×10^{-2}
Dermal Contact While Bathing (Chemicals)	1.8×10^{-3}
Total Receptor HI =	7.2×10^{-2}

Exposure Pathway	Pathway ILCR
Inhalation of Particulates (Chemicals)	4.6×10^{-9}
Inhalation of Particulates (Radionuclides)	2.3×10^{-8}
Incidental Ingestion of Residual Soils (Chemicals)	NA
Incidental Ingestion of Residual Soils (Radionuclides)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Drinking Water (Chemicals)	NA
Ingestion of Drinking Water (Radionuclides)	5.3×10^{-8}
Dermal Contact While Bathing (Chemicals)	NA
Ingestion of Meat (Chemicals)	4.3×10^{-9}
Ingestion of Meat (Radionuclides)	1.6×10^{-11}
Ingestion of Dairy Products (Chemicals)	2.6×10^{-8}
Ingestion of Dairy Products (Radionuclides)	1.4×10^{-9}
Ingestion of Vegetables and Fruit (Chemicals)	1.8×10^{-8}
Ingestion of Vegetables and Fruit (Radionuclides)	2.6×10^{-8}
Direct Radiation	NA
Total Receptor ILCR =	1.6×10^{-7}

HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk
NA = Not applicable. Exposure route is incomplete (see Section C.2.3.4)

TABLE C.7-52
SUMMARY OF POTENTIAL RESIDUAL RISKS: SOUTH FIELD AREA WITH PRIVATE OWNERSHIP, ALTERNATIVE 6, OFF-PROPERTY FARMER (ADULT)

Exposure Pathway	Pathway HI
Inhalation of Particulates (Chemicals)	NA
Incidental Ingestion of Residual Soils (Chemicals)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Meat (Chemicals)	4.4×10^{-7}
Ingestion of Dairy Products (Chemicals)	6.0×10^{-6}
Ingestion of Vegetables and Fruit (Chemicals)	2.9×10^{-4}
Ingestion of Drinking Water (Chemicals)	9.4×10^{-4}
Dermal Contact While Bathing (Chemicals)	5.4×10^{-5}
Total Receptor HI =	1.3×10^{-3}

Exposure Pathway	Pathway ILCR
Inhalation of Particulates (Chemicals)	NA
Inhalation of Particulates (Radionuclides)	6.7×10^{-8}
Incidental Ingestion of Residual Soils (Chemicals)	NA
Incidental Ingestion of Residual Soils (Radionuclides)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Drinking Water (Chemicals)	NA
Ingestion of Drinking Water (Radionuclides)	5.9×10^{-8}
Dermal Contact While Bathing (Chemicals)	NA
Ingestion of Meat (Chemicals)	NA
Ingestion of Meat (Radionuclides)	2.5×10^{-11}
Ingestion of Dairy Products (Chemicals)	NA
Ingestion of Dairy Products (Radionuclides)	3.6×10^{-10}
Ingestion of Vegetables and Fruit (Chemicals)	NA
Ingestion of Vegetables and Fruit (Radionuclides)	1.8×10^{-8}
Direct Radiation	NA
Total Receptor ILCR =	1.4×10^{-7}

HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk
NA = Not applicable. Exposure route is incomplete (see Section C.2.3.4)

000265

TABLE C.7-53
SUMMARY OF POTENTIAL RESIDUAL RISKS: SOUTH FIELD AREA WITH PRIVATE OWNERSHIP, ALTERNATIVE 6, OFF-PROPERTY FARMER (CHILD)

Exposure Pathway	Pathway HI
Inhalation of Particulates (Chemicals)	NA
Incidental Ingestion of Residual Soils (Chemicals)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Meat (Chemicals)	7.8×10^{-7}
Ingestion of Dairy Products (Chemicals)	6.3×10^{-5}
Ingestion of Vegetables and Fruit (Chemicals)	1.1×10^{-3}
Ingestion of Drinking Water (Chemicals)	2.2×10^{-3}
Dermal Contact While Bathing (Chemicals)	8.8×10^{-5}
Total Receptor HI =	3.5×10^{-3}

Exposure Pathway	Pathway ILCR
Inhalation of Particulates (Chemicals)	NA
Inhalation of Particulates (Radionuclides)	3.4×10^{-9}
Incidental Ingestion of Residual Soils (Chemicals)	NA
Incidental Ingestion of Residual Soils (Radionuclides)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Drinking Water (Chemicals)	NA
Ingestion of Drinking Water (Radionuclides)	2.5×10^{-9}
Dermal Contact While Bathing (Chemicals)	NA
Ingestion of Meat (Chemicals)	NA
Ingestion of Meat (Radionuclides)	8.4×10^{-13}
Ingestion of Dairy Products (Chemicals)	NA
Ingestion of Dairy Products (Radionuclides)	6.9×10^{-11}
Ingestion of Vegetables and Fruit (Chemicals)	NA
Ingestion of Vegetables and Fruit (Radionuclides)	1.3×10^{-9}
Direct Radiation	NA
Total Receptor ILCR =	7.3×10^{-9}

HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk
NA = Not applicable. Exposure route is incomplete (see Section C.2.3.4)

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TABLE C.7-54
SUMMARY OF POTENTIAL RESIDUAL RISKS: SOUTH FIELD AREA WITH PRIVATE OWNERSHIP, ALTERNATIVE 6, ON-PROPERTY FARMER (ADULT)

Exposure Pathway	Pathway HI
Inhalation of Particulates (Chemicals)	NA
Incidental Ingestion of Residual Soils (Chemicals)	6.5×10^{-4}
Dermal Contact with Residual Soils (Chemicals)	4.2×10^{-3}
Ingestion of Meat (Chemicals)	5.4×10^{-5}
Ingestion of Dairy Products (Chemicals)	6.5×10^{-4}
Ingestion of Vegetables and Fruit (Chemicals)	5.5×10^{-3}
Ingestion of Drinking Water (Chemicals)	5.5×10^{-3}
Dermal Contact While Bathing (Chemicals)	3.2×10^{-4}
Total Receptor HI =	1.7×10^{-2}

Exposure Pathway	Pathway ILCR
Inhalation of Particulates (Chemicals)	NA
Inhalation of Particulates (Radionuclides)	1.3×10^{-6}
Incidental Ingestion of Residual Soils (Chemicals)	NA
Incidental Ingestion of Residual Soils (Radionuclides)	2.8×10^{-8}
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Drinking Water (Chemicals)	NA
Ingestion of Drinking Water (Radionuclides)	3.5×10^{-7}
Dermal Contact While Bathing (Chemicals)	NA
Ingestion of Meat (Chemicals)	NA
Ingestion of Meat (Radionuclides)	3.3×10^{-8}
Ingestion of Dairy Products (Chemicals)	NA
Ingestion of Dairy Products (Radionuclides)	6.4×10^{-7}
Ingestion of Vegetables and Fruit (Chemicals)	NA
Ingestion of Vegetables and Fruit (Radionuclides)	3.7×10^{-6}
Direct Radiation	3.4×10^{-7}
Total Receptor ILCR =	6.4×10^{-6}

HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk
NA = Not applicable. Exposure route is incomplete (see Section C.2.3.4)

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TABLE C.7-55
SUMMARY OF POTENTIAL RESIDUAL RISKS:
SOUTH FIELD AREA WITH PRIVATE OWNERSHIP, ALTERNATIVE 6,
ON-PROPERTY FARMER (CHILD)

Exposure Pathway	Pathway HI
Inhalation of Particulates (Chemicals)	NA
Incidental Ingestion of Residual Soils (Chemicals)	3.4×10^{-3}
Dermal Contact with Residual Soils (Chemicals)	6.8×10^{-3}
Ingestion of Meat (Chemicals)	9.8×10^{-5}
Ingestion of Dairy Products (Chemicals)	6.8×10^{-3}
Ingestion of Vegetables and Fruit (Chemicals)	2.1×10^{-2}
Ingestion of Drinking Water (Chemicals)	1.3×10^{-2}
Dermal Contact While Bathing (Chemicals)	5.2×10^{-4}
Total Receptor HI =	5.2×10^{-2}

Exposure Pathway	Pathway ILCR
Inhalation of Particulates (Chemicals)	NA
Inhalation of Particulates (Radionuclides)	6.7×10^{-8}
Incidental Ingestion of Residual Soils (Chemicals)	NA
Incidental Ingestion of Residual Soils (Radionuclides)	2.7×10^{-9}
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Drinking Water (Chemicals)	NA
Ingestion of Drinking Water (Radionuclides)	1.5×10^{-8}
Dermal Contact While Bathing (Chemicals)	NA
Ingestion of Meat (Chemicals)	NA
Ingestion of Meat (Radionuclides)	1.1×10^{-9}
Ingestion of Dairy Products (Chemicals)	NA
Ingestion of Dairy Products (Radionuclides)	1.2×10^{-7}
Ingestion of Vegetables and Fruit (Chemicals)	NA
Ingestion of Vegetables and Fruit (Radionuclides)	2.6×10^{-7}
Direct Radiation	2.5×10^{-8}
Total Receptor ILCR =	4.9×10^{-7}

HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk
NA = Not applicable. Exposure route is incomplete (see Section C.2.3.4)

TABLE C.7-56
SUMMARY OF POTENTIAL RESIDUAL RISKS: DISPOSAL CELL WITH FEDERAL OWNERSHIP*, ALTERNATIVE 6, EXPANDED TRESPASSER

Exposure Pathway	Pathway HI
Inhalation of Particulates (Chemicals)	NA
Incidental Ingestion of Residual Soils (Chemicals)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Meat (Chemicals)	NA
Ingestion of Dairy Products (Chemicals)	NA
Ingestion of Vegetables and Fruit (Chemicals)	NA
Ingestion of Drinking Water (Chemicals)	NA
Dermal Contact While Bathing (Chemicals)	NA
Total Receptor HI =	NA

Exposure Pathway	Pathway ILCR
Inhalation of Particulates (Chemicals)	NA
Inhalation of Particulates (Radionuclides)	1.4×10^{-13}
Incidental Ingestion of Residual Soils (Chemicals)	NA
Incidental Ingestion of Residual Soils (Radionuclides)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Drinking Water (Chemicals)	NA
Ingestion of Drinking Water (Radionuclides)	NA
Dermal Contact While Bathing (Chemicals)	NA
Ingestion of Meat (Chemicals)	NA
Ingestion of Meat (Radionuclides)	NA
Ingestion of Dairy Products (Chemicals)	NA
Ingestion of Dairy Products (Radionuclides)	NA
Ingestion of Vegetables and Fruit (Chemicals)	NA
Ingestion of Vegetables and Fruit (Radionuclides)	NA
Direct Radiation	NA
Total Receptor ILCR =	1.4×10^{-13}

HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk
NA = Not applicable. Exposure route is incomplete (see Section C.2.3.4)

* Assumes federal ownership of FEMP, with federal ownership of disposal cell.

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TABLE C.7-57
SUMMARY OF POTENTIAL RESIDUAL RISKS: DISPOSAL CELL WITH FEDERAL OWNERSHIP*, ALTERNATIVE 6, OFF-PROPERTY FARMER (ADULT)

Exposure Pathway	Pathway HI
Inhalation of Particulates (Chemicals)	NA
Incidental Ingestion of Residual Soils (Chemicals)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Meat (Chemicals)	7.2×10^{-6}
Ingestion of Dairy Products (Chemicals)	1.0×10^{-4}
Ingestion of Vegetables and Fruit (Chemicals)	5.7×10^{-3}
Ingestion of Drinking Water (Chemicals)	1.9×10^{-2}
Dermal Contact While Bathing (Chemicals)	1.1×10^{-3}
Total Receptor HI =	2.6×10^{-2}

Exposure Pathway	Pathway ILCR
Inhalation of Particulates (Chemicals)	NA
Inhalation of Particulates (Radionuclides)	7.7×10^{-12}
Incidental Ingestion of Residual Soils (Chemicals)	NA
Incidental Ingestion of Residual Soils (Radionuclides)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Drinking Water (Chemicals)	NA
Ingestion of Drinking Water (Radionuclides)	1.2×10^{-6}
Dermal Contact While Bathing (Chemicals)	NA
Ingestion of Meat (Chemicals)	NA
Ingestion of Meat (Radionuclides)	4.6×10^{-10}
Ingestion of Dairy Products (Chemicals)	NA
Ingestion of Dairy Products (Radionuclides)	6.5×10^{-9}
Ingestion of Vegetables and Fruit (Chemicals)	NA
Ingestion of Vegetables and Fruit (Radionuclides)	3.6×10^{-7}
Direct Radiation	NA
Total Receptor ILCR =	1.6×10^{-6}

HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk
NA = Not applicable. Exposure route is incomplete (see Section C.2.3.4)

* Assumes federal ownership of FEMP, with federal ownership of disposal cell.

TABLE C.7-58
SUMMARY OF POTENTIAL RESIDUAL RISKS: DISPOSAL CELL WITH FEDERAL OWNERSHIP*, ALTERNATIVE 6, OFF-PROPERTY (CHILD)

Exposure Pathway	Pathway HI
Inhalation of Particulates (Chemicals)	NA
Incidental Ingestion of Residual Soils (Chemicals)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Meat (Chemicals)	1.3×10^{-5}
Ingestion of Dairy Products (Chemicals)	1.1×10^{-3}
Ingestion of Vegetables and Fruit (Chemicals)	2.2×10^{-2}
Ingestion of Drinking Water (Chemicals)	4.4×10^{-2}
Dermal Contact While Bathing (Chemicals)	1.8×10^{-3}
Total Receptor HI =	6.9×10^{-2}

Exposure Pathway	Pathway ILCR
Inhalation of Particulates (Chemicals)	NA
Inhalation of Particulates (Radionuclides)	3.9×10^{-13}
Incidental Ingestion of Residual Soils (Chemicals)	NA
Incidental Ingestion of Residual Soils (Radionuclides)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Drinking Water (Chemicals)	NA
Ingestion of Drinking Water (Radionuclides)	5.2×10^{-8}
Dermal Contact While Bathing (Chemicals)	NA
Ingestion of Meat (Chemicals)	NA
Ingestion of Meat (Radionuclides)	1.5×10^{-11}
Ingestion of Dairy Products (Chemicals)	NA
Ingestion of Dairy Products (Radionuclides)	1.3×10^{-9}
Ingestion of Vegetables and Fruit (Chemicals)	NA
Ingestion of Vegetables and Fruit (Radionuclides)	2.5×10^{-8}
Direct Radiation	NA
Total Receptor ILCR =	7.8×10^{-8}

HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk
NA = Not applicable. Exposure route is incomplete (see Section C.2.3.4)

* Assumes federal ownership of FEMP, with federal ownership of disposal cell.

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TABLE C.7-59
SUMMARY OF POTENTIAL RESIDUAL RISKS:
DISPOSAL CELL WITH PRIVATE OWNERSHIP*, ALTERNATIVE 6,
EXPANDED TRESPASSER

Exposure Pathway	Pathway HI
Inhalation of Particulates (Chemicals)	NA
Incidental Ingestion of Residual Soils (Chemicals)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Meat (Chemicals)	NA
Ingestion of Dairy Products (Chemicals)	NA
Ingestion of Vegetables and Fruit (Chemicals)	NA
Ingestion of Drinking Water (Chemicals)	NA
Dermal Contact While Bathing (Chemicals)	NA
Total Receptor HI =	NA

Exposure Pathway	Pathway ILCR
Inhalation of Particulates (Chemicals)	NA
Inhalation of Particulates (Radionuclides)	7.3×10^{-14}
Incidental Ingestion of Residual Soils (Chemicals)	NA
Incidental Ingestion of Residual Soils (Radionuclides)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Drinking Water (Chemicals)	NA
Ingestion of Drinking Water (Radionuclides)	NA
Dermal Contact While Bathing (Chemicals)	NA
Ingestion of Meat (Chemicals)	NA
Ingestion of Meat (Radionuclides)	NA
Ingestion of Dairy Products (Chemicals)	NA
Ingestion of Dairy Products (Radionuclides)	NA
Ingestion of Vegetables and Fruit (Chemicals)	NA
Ingestion of Vegetables and Fruit (Radionuclides)	NA
Direct Radiation	
Total Receptor ILCR =	7.3×10^{-14}

HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk
NA = Not applicable. Exposure route is incomplete (see Section C.2.3.4)

* Assumes private ownership of FEMP, with federal ownership of disposal cell.

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TABLE C.7-60
SUMMARY OF POTENTIAL RESIDUAL RISKS: DISPOSAL CELL WITH PRIVATE OWNERSHIP*, ALTERNATIVE 6, OFF-PROPERTY FARMER (ADULT)

Exposure Pathway	Pathway HI
Inhalation of Particulates (Chemicals)	NA
Incidental Ingestion of Residual Soils (Chemicals)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Meat (Chemicals)	7.2×10^{-6}
Ingestion of Dairy Products (Chemicals)	1.0×10^{-4}
Ingestion of Vegetables and Fruit (Chemicals)	5.7×10^{-3}
Ingestion of Drinking Water (Chemicals)	1.9×10^{-2}
Dermal Contact While Bathing (Chemicals)	1.1×10^{-3}
Total Receptor HI =	2.6×10^{-2}

Exposure Pathway	Pathway ILCR
Inhalation of Particulates (Chemicals)	NA
Inhalation of Particulates (Radionuclides)	4.0×10^{-12}
Incidental Ingestion of Residual Soils (Chemicals)	NA
Incidental Ingestion of Residual Soils (Radionuclides)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Drinking Water (Chemicals)	NA
Ingestion of Drinking Water (Radionuclides)	1.2×10^{-6}
Dermal Contact While Bathing (Chemicals)	NA
Ingestion of Meat (Chemicals)	NA
Ingestion of Meat (Radionuclides)	4.6×10^{-10}
Ingestion of Dairy Products (Chemicals)	NA
Ingestion of Dairy Products (Radionuclides)	6.5×10^{-9}
Ingestion of Vegetables and Fruit (Chemicals)	NA
Ingestion of Vegetables and Fruit (Radionuclides)	3.6×10^{-7}
Direct Radiation	NA
Total Receptor ILCR =	1.6×10^{-6}

HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk
NA = Not applicable. Exposure route is incomplete (see Section C.2.3.4)

* Assumes private ownership of FEMP, with federal ownership of disposal cell.

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TABLE C.7-61
SUMMARY OF POTENTIAL RESIDUAL RISKS: DISPOSAL CELL WITH PRIVATE OWNERSHIP*, ALTERNATIVE 6, OFF-PROPERTY FARMER (CHILD)

Exposure Pathway	Pathway HI
Inhalation of Particulates (Chemicals)	NA
Incidental Ingestion of Residual Soils (Chemicals)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Meat (Chemicals)	1.3×10^{-5}
Ingestion of Dairy Products (Chemicals)	1.1×10^{-3}
Ingestion of Vegetables and Fruit (Chemicals)	2.2×10^{-2}
Ingestion of Drinking Water (Chemicals)	4.4×10^{-2}
Dermal Contact While Bathing (Chemicals)	1.8×10^{-3}
Total Receptor HI =	6.9×10^{-2}

Exposure Pathway	Pathway ILCR
Inhalation of Particulates (Chemicals)	NA
Inhalation of Particulates (Radionuclides)	2.0×10^{-13}
Incidental Ingestion of Residual Soils (Chemicals)	NA
Incidental Ingestion of Residual Soils (Radionuclides)	NA
Dermal Contact with Residual Soils (Chemicals)	NA
Ingestion of Drinking Water (Chemicals)	NA
Ingestion of Drinking Water (Radionuclides)	5.2×10^{-8}
Dermal Contact While Bathing (Chemicals)	NA
Ingestion of Meat (Chemicals)	NA
Ingestion of Meat (Radionuclides)	1.5×10^{-11}
Ingestion of Dairy Products (Chemicals)	NA
Ingestion of Dairy Products (Radionuclides)	1.3×10^{-9}
Ingestion of Vegetables and Fruit (Chemicals)	NA
Ingestion of Vegetables and Fruit (Radionuclides)	2.5×10^{-8}
Direct Radiation	NA
Total Receptor ILCR =	7.8×10^{-8}

HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk
NA = Not applicable. Exposure route is incomplete (see Section C.2.3.4)

* Assumes private ownership of FEMP with federal ownership of disposal cell.

C.8.0 UNCERTAINTY ANALYSIS

Risk assessments contain various elements of uncertainty. The purpose of identifying and reviewing those uncertainties is to gauge the accuracy of the risk estimates and thus aid in the formation of risk management decisions. For the major categories of uncertainty relevant to remedial and residual risks, questions were posed to evaluate the contributors to uncertainty:

- COC Selection:
  Are all COCs identified and their concentrations adequately quantified?
- Toxicity Information and Models:
  How complete is current information concerning toxic properties and dose-response characteristics of the COCs?
- Exposure Pathways and Parameters:
  Are all potential pathways for transporting COCs from site environmental media to receptors identified?
- Receptor Characterization:
  Are land use scenarios conservative, and are all potential receptors identified? Are exposure factors reasonable?
- Exposure Point Concentrations:
  Are models for estimating COC transport from site media to the receptor, and for estimating COC exposures and intakes, realistic and reasonable? Are the assumptions used for developing risks reasonable and bounding of potential exposure ranges?
- Risk Characterization:
  What uncertainties are associated with cancer risks or HIs for multiple COCs?

At the FEMP site, the approach taken on an FS risk assessment differs from that of a baseline risk assessment. FS risk assessments estimate exposure point concentrations using models and assumptions about site conditions both during and following remedial actions. Baseline risk assessments use existing data to evaluate current risks. The results of FS risk assessments have much more inherent uncertainty with regard to exposure patterns, exposed populations, and exposure concentrations than do the results of baseline risk assessments. One purpose of this uncertainty analysis is to characterize the sources of uncertainty which contribute most to the overall uncertainty in the FS risk assessment.

C.8.1 COC SELECTION

A major concern of this FS risk assessment is the reliability of COC identification, both in terms of ensuring that all chemicals or radionuclides have been correctly identified as COCs and that their potential concentrations are adequately quantified. The accuracy of COC identification is directly related to the quality of COC characterization data, including information on contaminant identification, location, and concentrations. Characterization was controlled by the CERCLA sampling and analysis plan, which identified sampling locations and analytical protocols.

The source of COC data for this risk assessment was the Operable Unit 2 RI report (DOE 1994a), particularly the baseline risk assessment. The RI report was prepared according to CERCLA guidelines, and the data were validated. Whenever possible, COC identification was based on risk results in the baseline risk assessment from data collected according to the CERCLA sampling plan. However, uncertainty is inherently high in the Solid Waste Landfill data due to the heterogeneity of the waste forms. Uncertainty of soil data is inherently higher than groundwater data because soils are heterogeneous.

It is unlikely that major COC contributors to risk for Operable Unit 2 have been overlooked. Any shortcomings in the chemical data that have been gathered at the FEMP site are compensated for by a large database of contaminant type and concentration data. Evaluation of these data have identified a large number of COCs which are present in Operable Unit 2 wastes and associated materials, and confirm general contamination patterns indicated by past site operations. There is a high degree of certainty that the major COCs (uranium and other radionuclides, arsenic and other metals, and organics) which could credibly contribute to site risks have been identified.

According to RAGS (EPA 1989a), the UCLs are used for all exposure concentrations. This means that 95 percent of the time, the actual mean concentration can be less than the value used in the exposure assessment. Conversely, 5 percent of the time the actual mean concentration can be greater than the value used in the exposure assessment.

Uncertainty in Laboratory Detection Limits

The use of Contract Required Detection Limits (CRDL) and Contract Detection Limits (CDL), instead of Sample Quantitation Limits (SQL) and Minimum Detectable Activities (MDA), can cause the following uncertainties:

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- One half the CRDL/CDL could be as much as an order of magnitude greater than one half the SQL/MDA. This may affect the statistical distribution (normal or lognormal) causing a potential for overestimation or underestimation of the concentration term (and the risk). This could affect the estimated risk by up to an order of magnitude.

- High detection limits could mask the existence of contaminants present at low levels. When non-parametric tests are performed on a data set, the ranking methodology lists the detections above the non-detects even if the numerical value of the detection limit is higher. The potential exists for a non-detected result to actually have a concentration higher than the detected values in the ranking and thus results in an underestimate of the risk by up to an order of magnitude. However, this potential is low as shown by the fact that laboratories could and did report detected values at levels well below the CRDL.

The statistical analysis reported in Appendix A contains these uncertainties. However, the remedial alternatives remove a significant portion of the COCs through remediation and post remedial concentrations will be lower than those currently present. All constituents, except for a few COCs (for example, see Table C.II-1) will be reduced to background concentrations. An assessment of the COCs remaining after remediation indicates that these data sets contain relatively few non-detects, and this will limit the impact of the above uncertainties on the residual risk assessment. The majority of risk comes from uranium, radium, and thorium, and these contaminants have relatively few non-detects. The overall impact of these uncertainties on the residual risk assessment is considered to be less than an order of magnitude.

C.8.2 TOXICITY INFORMATION AND MODELS

EPA-supplied RfDs and cancer slope factors were used throughout the residual risk evaluation. Because of this, toxicological evaluations (upon which the residual risk evaluation is based) contribute no more uncertainty than in comparable CERCLA documents.As described in the Operable Unit 2 RI report, considerable uncertainty is associated with qualitative (hazard assessment) and quantitative (dose-response) evaluations of Superfund risk assessments. The hazard assessment characterizes the nature and strength of the evidence of causation, or the likelihood that a chemical that induces adverse effects in animals will induce adverse effects in humans. The hazard assessment of carcinogenicity is evaluated as a weight-of-evidence determination, using criteria from EPA (1986). Positive results in animal cancer tests suggest humans may also manifest a carcinogenic response, but the animal data cannot necessarily be used to predict the target tissue in humans. In the hazard assessment of noncarcinogenic effects, positive animal test results may suggest the nature of the human effects, i.e., the target tissues and type of effects (EPA 1989a).

There are many sources of uncertainty in dose-response evaluation of carcinogenic (i.e., slope factor or unit risk calculations) and noncarcinogenic effects (i.e., RfD or RfC calculations). The three major sources are:

1. Interspecies extrapolations:

   Animal-to-human extrapolation, commonly used in the absence of quantitative pharmacokinetics, dosimetric, or mechanistic data, is usually based on a consideration of interspecies differences in body weight, surface area, or basal metabolic rate.

2. Intraspecies or individual variation:

   Most toxicity experiments are performed with animals that are similar in age and genotype so that intragroup biological variation is minimal. The human population of concern may reflect a great deal of heterogeneity, however, including unusual sensitivity to specific toxic effects or contaminants.

   Toxicity data from human occupational studies reflect a bias because only those individuals sufficiently healthy to attend work regularly and those not unusually sensitive to the COCs are likely to be occupationally exposed.

3. Key study and database quality:

   The quality of key studies (from which the quantitative data are derived) and the quality of the literature databases add to the uncertainty. For carcinogenic effects, the uncertainty associated with some quality factors (i.e., group size) is incorporated into the 95 percent upper bound estimate of the slope factor. For noncarcinogenic effects, additional uncertainty factors may be applied in the derivation of the RfD or RfC to reflect gaps in the database.

Another source of uncertainty in the quantitative risk estimation for carcinogenicity is the method by which data from high doses in animal studies are extrapolated to the dose range expected for environmentally exposed humans. The linear multi-stage model, which is used in almost all quantitative estimations of human risk from animal data, is based on the nonthreshold assumption of carcinogenesis. A large body of evidence, however, suggests that epigenetic carcinogens (carcinogens, which do not induce mutations), as well as many genotoxic carcinogens may have a threshold dose level below which they are noncarcinogenic (Williams and Weisberger 1991). The linear multi-stage model is therefore regarded as being conservative for many chemicals.

Adding to this uncertainty is the fact that the EPA-derived slope factors found in IRIS (EPA 1994a) are set at the 95 percent UCL of the linear slope of the multi-stage model. Thus, risks evaluated using the slope factors may be overestimated. This consideration applies to both radiological and

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chemical estimates of carcinogenic risk. The slope factors derived by EPA for the evaluation of risks due to external exposure to radiation are of particular concern in this regard. These values were derived using conservative assumptions about exposure conditions and are likely to provide conservative risk estimates.

The methods used to define RfD values for chemical contaminants also incorporate a large degree of conservatism. Sets of multiplicative uncertainty factors (UFs) are used to adjust the results of animal and human toxicologic studies to take into account the nature of the endpoint No Observed Adverse Effect Level (NOAEL) to Lowest Observed Adverse Effect Level (LOAEL) seen in the studies, differences in response to different dose schedules, the presence of especially sensitive populations, and the possible differences between human and animal sensitivity to contaminant exposures. Each UF may have a value as high as ten; thus, RfD values typically are set between 100 and 1000 times lower than the lowest dose seen to cause any adverse effects in animal studies. If the human and animal responses to contaminant exposures are not as dissimilar as reflected in the UFs (or if humans are less, rather than more, sensitive to contaminants), it is possible that the use of RfDs overstates the potential for adverse health effects in humans.

The level of uncertainty in the toxicologic data for different chemicals varies because information concerning some constituents and their associated health effects is comparatively scarce, whereas for others much more information is available from health effects studies. Also, different amounts of data may be available concerning the different types of effects for a given COC. For example, uranium (a key COC at Operable Unit 2) has been established as a chemical toxicant (mainly affecting the kidneys) based on human and animal studies. The RfD for uranium was based on the results of animal studies and was calculated by applying an uncertainty factor of 1000 to a LOAEL for nephrotoxicity in rabbits to provide a margin of safety for extrapolation to humans. The uncertainty factor consists of three factors of 10 each for: 1) estimation of a NOAEL from a LOAEL, 2) extrapolation from animals to humans, and 3) the range of sensitivities among exposed humans.

There is even greater uncertainty regarding the carcinogenicity of uranium. As an alpha-particle emitter, uranium is also considered a carcinogen; however, epidemiological evidence of uranium-induced excess cancers is difficult to obtain. This is largely because the human data available on the radiocarcinogenic effects of uranium exposure are for underground miners who were simultaneously exposed to radon and radon progeny, which are known carcinogens. The studies of humans

sometimes lack quantitative information concerning uranium exposure, including potential uranium exposure through previous employment, concurrent smoking patterns, or concurrent radon exposure levels, all of which are needed to definitively determine the risk attributable to uranium exposure. These facts weaken the power of the human studies to detect excess risk, if any, above natural risk. These uncertainties are not well known or easily quantified.

Uncertainties in the interpretation of toxicologic data also affect risk assessment results for inhalation exposures to metals. Hazard index values associated with particulate inhalation exposures exceed one for several receptors at Operable Unit 2. Almost all of the HI values are contributed by exposures to antimony.

Subchronic health effects as a result of short-term exposures during remedial actions were assessed in this FS using chronic risk parameters. This assumption was made because the duration of on-property exposures during remediation could potentially exceed the two-week to seven-year exposure period defined for subchronic exposures. The use of the more conservative chronic risk parameters provide a more conservative approximation of health effects with less uncertainty.

Uncertainty in the derivation of reference doses in mitigated by the use of uncertainty and modifying factors that normally range between three and ten. Uncertainty factors (UF) and modifying factors (MF) are assigned as follows:

- A UF of ten is used to account for sensitive subpopulations.
- A UF of ten is used when extrapolating from animals to humans to account for interspecies variability.
- A UF of ten is applied to a NOAEL (no observed adverse effect level) derived from a subchronic study rather than a chronic study.
- A UF of ten is applied to a LOAEL (lowest observed adverse effect level) to estimate a NOAEL.
- An MF from zero to ten is applied to data to reflect the quality of the data from the critical study used to derive the reference does.

As a result, a combination of uncertainty and modifying factors may exceed 100, 1000, or more for a particular compound. Other toxicity information used in the Operable Unit 2 risk assessment that introduces uncertainty include (DOE 1994a):

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- The EPA inhalation slope factor of 7.7×10^{-12} pCi^{-1} for Rn-222 plus its daughters is used to calculate risks resulting from indoor inhalation of radon gases. The EPA bases this slope factor on a 50% equilibrium ratio between Rn-222 and its short-lived daughters. Studies cited in NCRP Report No. 78 (NCRP 1984) report a lower value for this equilibrium ratio in indoor air (i.e.: 100/50/30/20/20 for Ra-222, Po-218, Pb-214, Bi-214, and Po-214, respectively). Since the concentration of daughters expected in indoor air is lower than the EPA assumption, the slope factor is probably conservative in this respect.

- PAHs that are classified as B2 probable human carcinogens for which no toxicity data were available are evaluated using benzo(a)pyrene toxicity data. This assumption likely leads to an overestimation of the carcinogenicity of those PAHs because conservative assumptions were used to relate their carcinogenicity to that of benzo(a)pyrene. However, when toxicity equivalency factors were used in this assessment to evaluate their carcinogenicity, this may either underestimate or overestimate the carcinogenic risks. Overall, this increased conservatism does not significantly impact the overall risks from Operable Unit 2 since the majority of risks are posed by other COCs.

- The only PCB with positive carcinogenicity results is Aroclor-1260. The carcinogenicity of all PCB isomers were assumed to be equal to the carcinogenicity of Aroclor-1260 because the dose-response data for other isomers are inconclusive. Statistically significant cancer results were not seen for Aroclors with lower percentages of chlorine atoms. The conservatism introduced in the evaluation of PCBs is not anticipated to impact the selection of COCs for final risks because they did not exceed the concentration-toxicity screen.

- As with PAHs, the carcinogenicity of dioxins and furans other than the 2,3,7,8-isomer were determined using EPA's revised Toxicity Equivalency Factors (TEFs) in the absence of toxicity values for the different isomers. The TEFs are based on the assumption that all dioxin and furan congeners are carcinogenic. This may introduce a large positive bias to the results of the assessment.

A significant source of uncertainty for calculating risks from radionuclides in surface soil is the use of EPA slope factors for external radiation exposure. In deriving these slope factors, EPA has assumed that an individual stands continuously on an infinitely thick slab of soil with a uniform radionuclide concentration. To manage complicated calculations for photon attenuation and scattering in soil, EPA has assumed that the activity in the slab source is present on an infinite plane with uniform surface concentration. The slope factors for external radiation exposure are, therefore, based on calculated exposures (and associated risks of cancer incidence) from the hypothetical plane source. In addition, EPA calculates slope factors for ingestion of many radionuclides using the maximum value for the GI absorption factor. The actual chemical form(s) that influence the magnitude of the GI absorption factor have not been considered.

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DESIGNATION

C.8.3 EXPOSURE PATHWAYS AND PARAMETERS

Both remedial and residual exposure pathways are derived from EPA guidance (EPA 1989a) and the RAWPA (DOE 1992). As such, the components for each pathway are based on information derived from literature or scientific hypothesis. The associated uncertainties are reviewed below.

C.8.3.1 Remedial Action Exposure Pathways

In general, estimates of remedial action risks in this assessment are conservative. The estimates tend to overestimate the risks likely to be experienced by potential receptors during remedial activities. Conservative analyses are necessary to compensate for uncertainties inherent in the assessment and to insure that potential risks are not missed. These uncertainties are examined by exposure mode below.

Direct Radiation

Excavation. Direct radiation exposure to a remediation worker during excavation requires an individual standing on contaminated ground during the last phase of excavation. The magnitude of his exposure is directly related to the time he spends standing on the ground. The exposure time is very uncertain. It is likely that a person will spend very little time on contaminated ground, since excavation through the liner will take place without monitoring (and therefore without the presence of monitoring personnel) and contaminated ground should exist only in areas where the liner has been breached.

If a heavy-equipment accident should occur, protection from direct radiation afforded the remediation worker inside the cab could be greatly diminished. Exposure parameters for this scenario are difficult to quantify and the results uncertain. Qualitatively, it can be stated that impacts would be small since exposure time would be short and radiation fields would be low.

Drying. Direct radiation exposure to an operator from drying depends on the proximity of the operator to the dryer containing soil material and on the shielding afforded by the dryer. Given the low radiation dose rates associated with the material and the "hands-off" nature of the drying process, it is likely that radiation exposure would be unmeasurable using personnel dosimetry devices. Impacts predicted in the assessment, though small, likely overestimate the dose equivalent that would occur.

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Gondola Handling. Direct radiation exposure impact to a gondola handler depends on the proximity of the handler to the gondolas. Handlers will need to perform radiation surveys of each gondola. The estimate of the duration of these operations represents the primary uncertainty in this assessment. However, these operations comprise only a small fraction of the total time needed to load a gondola.

Immersion and Inhalation

Excavation. Similar to direct radiation from discrete sources, exposure via ionizing radiation from immersion in and inhalation of airborne contaminants depends on source strength (air concentration) and exposure duration. For assessment of excavation risks, it is uncertain where the receptors will be with respect to the excavation. This assessment assumes the receptors are located as near as possible to the excavation site. It is likely that nonremediation workers and off-site individuals would be exposed to greatly reduced concentrations, thus reducing their overall exposure.

For remediation workers, inhalation impacts were ignored since the workers would use respirators. However, respirators do not completely eliminate intake of COCs in the air. Respirators afford a protection factor on the order of a factor of 50 (per 10 CFR Part 20) to the worker. This means that the worker wearing a respirator is exposed to a COC concentration 50 times less than is in the air. However, in spite of the anticipated low risk from inhalation to nonremediation workers, and the lower exposure time than for nonremediation workers (a factor of 5), to be conservative, this risk was quantified.

As with direct radiation, if a heavy equipment accident should occur, the protection from inhalation of contaminated soil afforded the remediation worker inside the cab could be greatly diminished. Exposure parameters for this scenario are difficult to quantify and the results uncertain. Qualitatively, it can be stated that impacts would be small since the exposure time would be short and COC concentrations low.

The remedial action risk assessment assumes that subsurface waste materials and underlying liners (when present) are unavailable for transport to receptors due to the high amount of moisture in these materials. Although a reasonable assumption, concentrations of arsenic in waste material would result in cancer risk of 10^{-3} if resuspended. Any uncertainty regarding the resuspension of waste material must be eliminated to reduce the resuspension risks; that is, engineering controls must be in place to ensure that waste materials and liner will not be resuspended during excavation.

Drying, Shredding, and Crushing

To evaluate releases during waste processing operations, receptors were placed close to the release point (200 meters for nonremediation workers and 400 meters for off-site individuals), thus exposing them to a higher-than-expected concentration of COCs. Waste processing is assumed to be released from ground level, although any such release will likely be elevated (from a stack vent). Elevated releases result in greater dispersion and lower COC exposure point concentrations.

Finally, the off-gas system will likely remove a fraction of the COCs assumed to be released. No credit was taken for off-gas contaminant removal in the assessment.

For nonremediation workers, a breathing rate of 3 cubic meters per hour is used. This assumes the worker is doing heavy labor continually for the 8 hours per day he is working and is exposed. A nominal value of approximately 1 cubic meter, or one third as great, is probably a more reasonable estimate.

Mechanical Hazards

Mechanical hazard risk coefficients are based on general construction activities. Remedial activities considered in this FS generally involve less "hands-on" work. It is likely that actual risk to workers from mechanical hazards will be less than that calculated in this assessment, due to the use of remote operations. Also, the man-hour estimates used in the cost estimate do not have a fine distinction of worker type. Many of the hours could be attributable to nonlaborers.

Transportation

Transportation impacts were assessed with the RADTRAN 4 computer code. The exposure scenario was defined based on many of the code default parameter values. These defaults are designed to give upperbound estimates of impacts.

Risk Perspectives for Risks to Remediation Workers

Remediation worker inhalation and direct radiation doses, as calculated in Tables C.II-1 through 13, 18-21, and 28-30 were in range of 10^{-5} to 10^{-6} for the various subunits for the total duration of the project, approximately 4 years. These doses were calculated assuming:

- No worker protective equipment (PPE)
- The 95% UCL soil concentration

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- Worst-case exposure durations
- Assumes that one worker receives the maximum exposure in each subunit for all Remediation activities
- Inhalation and uptake (i.e., is taken into the lungs) of 100% of the soil which is airborne at the maximum dust loading (600 $\mu g/m^3$) for the entire exposure duration
- Worst-case soil volumes.

The assumptions used in these calculations must be considered as bounding, and in many cases, far exceed even worst-case scenarios. The method of evaluating worker inhalation doses based on dust loading ignores the following critical "dose-lowering" considerations:

- Only a fraction of the soil is respirable. Dust must be of a respirable fraction to be taken into the lungs. This respirable fraction is in the size range of 0.2 - 10 μm (AMAD), with the most likely intake size at 1 μm.

- Of the respirable fraction, only 60% of the amount inhaled will be taken in by the body.

- Only a fraction of the soil will contain contamination at the 95% UCL level.

- Because of the duration of some of the activities, workers will not be exposed to the maximum hours for any subunit.

Any one of these considerations could be responsible for an order of magnitude over-estimation of actual doses. Many of these considerations are "built-in" to the EPA methodology (assumptions) in order to ensure conservatism in the estimations, but they do not represent "real" risks to a worker, and were developed to ensure the safety of the public exposed to chronic releases of contaminants over long (e.g., lifetime) exposures. A lifetime is currently defined as 70 years. The exposure duration of this project is approximately 4 years. While it is assumed that carcinogens, once taken into the body, continue to pose a cancer risk for the rest of an individual's life, these calculational methods are based on continuous intakes (i.e., new carcinogen exposure) over the 70 years.

The total doses over the life of the project as calculated in Tables C.II-1 to -12, that are responsible for the largest part of these risks are (given approximately):

- 200 mrem maximum for direct radiation
- 50 mrem inhalation

The dust loading for construction activities is 600 $\mu g/m^3$ (RAWPA). For the most limiting uranium isotopes (U-234, -235, and -236), DOE has calculated a derived air concentration (DAC), i.e., the air

concentration that will give a dose of 5 rem is breathed by a worker for 2000 hr/year, of 2 x 10^{-11} μCi/ml (10 CFR 835). Using a uranium soil concentration of 500 pCi/gm (based on the solid waste landfill U-total listed in Table C.II-4), the following estimate can be made:

$$[500\frac{pCi}{gm}][6x10^{-4}\frac{gm}{m^3}] = 0.3\frac{pCi}{m^3} = 3x10^{-13}\frac{\mu Ci}{cm^3} \qquad \text{Eq. C.8-1}$$

When compared to the DAC of 2 x 10^{-11} μCi/ml, this estimate is two orders of magnitude lower, giving an approximate, but conservative dose of 50 mrem/year.

TABLE C.8-1

SUMMARY OF CURRENT REGULATORY STANDARDS FOR PROTECTION OF RADIATION WORKERS

Regulatory Standard	Regulatory Agency	Limit Value (rem)	Conditions
10 CFR 20, 835	US NRC, DOE	5 rem/yr	External + internal
10 CFR 20, 835	US NRC, DOE	25 rem	Lifetime special exposure
10 CFR 20, 835	US NRC, DOE	0.5	To a declared pregnant worker
10 CFR 20, 835	US NRC, DOE	0.05	Maximum per year without consideration of respiratory protection
10 CFR 20, 835	US NRC, DOE	0.1	Maximum per year in a controlled area
10 CFR 20, 835	US NRC, DOE	0.005 rem/hr	Areas which must be designated as radiation areas
29 CFR 1910.96	OSHA	1.25 rem/quarter	Worker whole body limit
29 CFR 1910.96	OSHA	7.5 rem/quarter	Skin

Since the project is on a four year basis, the annual doses would be about 50 mrem/yr for direct radiation and 15 mrem/year for inhalation.

The risks presented may be put into perspective for remediation workers by comparing the dose used to calculate this risk to current regulatory standards for exposure. These are summarized in Table C.8-1.

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As shown in Table C.8-1, the doses estimated are in the range that is considered acceptable for workers in controlled areas, but these activities may not even require respiratory protection. Estimates of direct radiation performed using the MICROSHIELD code predicted dose rates up to a maximum of 0.00003 rem/hr (for excavation of the Active Flyash Pile). And the areas may not need to be declared as radiation areas. These doses are well within the acceptable current standard for exposures to members of the public from licensed sources, 100 mrem/yr.

These risks are more commensurate with those that would be acceptable for risks to members of the public (10^{-4} to 10^{-6}), than those deemed acceptable to workers. Workers are assumed to voluntarily be exposed to risks that are higher than those to which the public should be exposed. The key is in risks assumed voluntarily as opposed to "public" risks which are assumed to be involuntary risks. This can be seen in the regulatory limits for workers (Table C.8-1) that include OSHA, NRC, and DOE limits at 5 rem/yr as opposed to the public dose limit of 100 mrem/yr. OSHA is charged with setting safe worker levels for various work hazards while EPA has been tasked with ensuring public and environmental safety to hazardous materials.

Members of the public are currently exposed to background radiation of 100 mrem (New York) to 125 mrem (Denver) yearly based on their place of residence. Public risks which can be considered voluntary include those shown in Table C.8-2. The risks to workers from radiation are orders of magnitude below those posed by industrial hazards, as shown in Tables C.II-21 and -22.

TABLE C.8-2

ACTIVITIES CAUSING A RISK OF DEATH OF 10^{-6} PER YEAR

Activity per year	Nature of Risk
Smoking 3 cigarettes	Cancer, heart disease
Drinking 1/2 liter of wine	Cirrhosis of the liver
Spending 1 hour in a coal mine	Black lung disease
Traveling 300 miles by car	Accident
Flying 6,000 miles by jet	Cancer caused by cosmic radiation
One chest X-ray	Cancer caused by radiation

Source: Jacobson, A.P. and G.P. Sakalosky, 1980. *Radiation in Medicine & Industry*, Public Information Committee of the Health Physics Society, Bethesda, Maryland.

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C.8.3.2 Residual Exposure Pathways

Receptors considered in the FS residual risk assessment are the off-property farmer (adult and child), on-property resident farmer (adult and child), on-property perched water user, and expanded trespasser. Other receptors may be exposed to FEMP COCs; however, the conservative exposure scenarios used in this report provide a high degree of assurance that no actual exposed population will receive levels of exposure greater than those estimated in the FS risk assessment.

Potential exposure pathways were evaluated for each exposed receptor. All pathways which could be complete under either land use scenario (federal or private ownership) were evaluated quantitatively for their potential to be associated with adverse health effects. Each specific receptor population was assumed to be exposed through all pathways which might be complete under minimally plausible conditions. There is a high degree of assurance that total exposures are not underestimated for any actual exposed populations.

Default exposure factor values for characterizing exposures to FEMP receptors are presented in the RAWPA. For this FS risk assessment, receptor scenarios were selected to represent the highest potential exposures. Exposure factors in the risk assessment are based on surveys of physiological characteristics and behavioral profiles across the United States. Attributes and activities studied in these surveys generally have a broad distribution. To account for most of this distribution, this risk assessment follows the EPA's recommendation in RAGS to use the 95th percentile values for most exposure factors (EPA 1989a).

Exposure Duration

In accordance with EPA guidance (EPA 1989a), it was assumed that farm families occupy the land for a full lifetime (70-year) exposure period. This is a conservative approach. The exposure durations for all individuals within an age bracket are realistic, because of the historic stability of communities in the FEMP area.

Exposure Frequency

It was assumed on-property and off-property families would occupy the property for 350 days per year, a conservative but realistic assumption for farm families.

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Exposure Time

Farming family members were assumed to spend 24 hours a day on the farm property, whether it is assumed to be on or off the FEMP property. This is a conservative assumption as it does not take into account school time, shopping time, off-farm work, and other activities.

Body Weight

Body weights used in the evaluation of residual risks were derived from standard tables for United States body weight distributions. Values were selected from distribution midpoints because of the certainty regarding those distributions. The actual variation for adults is likely to be less than a factor of two. Although children have a wide range of body weights, the uncertainty is, at most, a factor of two or three (plus or minus for a given age group). Selection of the midpoint (rather than the 95th percentile) for this variable adds conservatism to the risk estimates because this quantity appears in the denominator of the intake equations (i.e., risk is inversely proportional to body weight).

Ingestion of Soil, Food, and Water

There has been considerable discussion in the scientific literature concerning the appropriate oral ingestion rate of soil and dust for adults and children. Current EPA guidance recommends 100 mg/day for adults and 200 mg/day for children under the age of six. Since the evaluation of residual risk considered farmers who would be exposed to quantities of dust through farming activities, a weighted value of 180 mg/day was used for the on- and off-property farmers. These values are realistic as a multi-year average, but soil ingestion rates could potentially be higher for short-term exposures.

The rate and type of food consumption vary greatly from locality to locality and individual to individual. Estimates of food consumption used in the residual risk assessment are national averages and may not be appropriate for some individuals exposed to FEMP COCs. It should be noted that it was assumed that the majority of food consumed will be from local farm products. This is a very conservative assumption. The values presented represent conservative estimates and are not likely to vary by more than a factor of two for the average individual. The greatest uncertainty is in the consumption of specific foods (e.g., vegetables) by children. The direction and magnitude of this uncertainty are unknown.

Consumption of drinking water was set to EPA Region V default values, which are conservative estimates. Over multi-year exposures, these values are not likely to vary widely and may be overestimated by a factor of less than two. Most likely, drinking water consumed will be less than the default values.

Dermal Exposure Factors

Four critical assumptions have been made relating to the assessment of dermal exposure to soils: 1) amount of exposed skin surface area, 2) quantity of soil adhering to the skin, 3) length of time the soil adheres to the skin, and 4) partitioning rate of the COC from soil across the skin barrier. In addition, intake of contaminants associated with dermal contact to water is controlled by dermal permeability to specific waterborne contaminants. These factors vary widely and may contribute substantially to uncertainty in the risk assessment by these pathways. In general, assumptions used to estimate dermal absorption are consistent with the conservative default values defined in EPA guidance (EPA 1989a). The average extent of uncertainty in dermal exposure factors is quite large (an order of magnitude or more). In addition, the adjustment of toxicity values for use in the dermal pathway risk assessment, particularly in the case of inorganic contaminants, was performed using conservative assumptions about contaminant intake and likely contributes a further, unknown degree of conservatism to the characterization of dermal pathway risks.

C.8.4 RECEPTOR CHARACTERIZATION

Receptor characterizations were developed primarily from the RAWPA and EPA comments dated June 27, 1994 (EPA 1994d) on the Operable Unit 2 FS risk assessment. For this FS, receptor scenarios for the two future land uses, government and private ownership, were selected to represent the reasonable maximum potential exposure.

As described in Section C.8.3.2, exposure factors were based on surveys of physiological and lifestyle profiles across the Untied States and attributes and activities studies generally have a broad distribution. To account for most of this distribution, this risk assessment follows EPA's recommendation in RAGS to use the 95th percentile for most exposure factors (EPA 1989a). In addition, the exposure factors are consistent with EPA Region V guidance. This introduces a conservative bias into the results.

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The following RME receptors were chosen for the FS remedial action risk assessment:

- Remediation workers
- Nonremediation workers
- Off-property residents at the FEMP boundary
- General public

Exposure pathways for these receptors include inhalation of resuspended dust and gaseous emissions, ingestion of and dermal contact with soil, direct radiation effects, and physical injury.

The following receptors were selected for the residual risk assessment:

Federal Ownership with Access Controls	Private Ownership
Off-property farmer (adult)	On-property resident farmer (adult using water from GMA)
Off-property farmer (child)	On-property resident farmer (child using water from GMA)
Expanded trespasser	Off-property farmer (adult)
	Off-property farmer (child)
	On-property farmer (adult using perched water)

As previously stated, other receptors may be exposed to FEMP COCs; however, the conservative exposure scenarios addressed in this report make it likely that no actual exposed population will receive greater exposures than those estimated in the FS risk assessment.

A major uncertainly associated with predicting future exposures at the FEMP is the future disposition of the property itself. Because it is not possible to accurately predict what the future uses of the land may be, the most conservative (rather than the most likely) land use was evaluated, as stipulated by the NCP. The receptors evaluated in this assessment have been generally selected to reflect and encompass those types of activities that would produce the reasonable maximum exposure. The uncertainty associated with receptors identified in the two future land use scenarios is high (i.e., potential to overestimate risk by 2 or more orders of magnitude) due to the low probability of the site being used as a residence or for agricultural purposes (DOE 1994c).

C.8.5 EXPOSURE POINT CONCENTRATIONS

Predicted concentrations were used as exposure point concentrations since measured data are not available (e.g., the future. These predictions were made using mathematical representations (models) of the natural systems found or suspected to exist in the study area. Due to the complexity of natural environments, conservative assumptions were often used in these models to calculate exposure point concentrations. Uncertainties associated with modeled exposure point concentrations in Operable Unit 2 can be attributed to the following sources:

- Use of Toxicity Characteristic Leaching Procedure (TCLP) data to characterize leachate concentrations in the natural environment adds conservatism to the groundwater fate and transport modeling process because TCLP leaching is performed with an acidic solution. This tends to overestimate the leachate concentration of inorganics over natural (more neutral) leaching conditions.

- The selection of parameters related to the attenuation and retardation of constituents is a major uncertainty in the analysis. The attenuation and retardation factors of every constituent except uranium were determined after an extensive literature search. The use of site-specific values are assumed to result in lower uncertainty than using literature values.

- The organic decay rates at the FEMP were determined after an extensive literature search. The actual decay rates may or may not follow the assumed literature values because of site-specific conditions. The use of site data to determine organic decay rates is assumed to result in lower uncertainty than that resulting from the use of literature values.

- Transport through the vadose zone is approximated by using a one-dimensional model and assuming the zone is homogeneous. The unsaturated seepage flow rate is a function of several parameters, such as porosity, residual saturation, and pore size distribution index. Due to the heterogeneous nature of the till, these parameters change from location to location and from depth to depth.

- The total mass of each contaminant is calculated by multiplying the UCL by the volume of the entire waste area, except for U238 which was kriged, thus assuming the UCL concentration is uniformly distributed through the entire source.

- The fate and transport modeling uses a "70-year rule" for these constituents where no or inadequate leachate data exist. This "rule" assumes all the chemical leaches from a particular waste unit in 70 years. This method is considered very conservative for compounds that are insoluble but may underestimate the maximum exposure for soluble compounds.

- Air modeling is based on a number of conservative assumptions. In combination these assumptions appear to overestimate the exposure point concentrations for air based on site air monitoring data and according to a literature search for typical ambient air PM_{10} measurements for EPA Region V. The long-term average PM_{10}

concentrations calculated are comparable to measured dust concentrations on constructions. This uncertainty is expected to moderately overestimate risk (i.e., overestimate risks by 1 to 2 orders-of-magnitude).

- The future configuration of the OU2 subunits is uncertain at this time; thus, a reasonable worst-case configuration is used to determine source concentrations for both air and surface water modeling. If the actual configuration differs from that used in this evaluation, the future source concentrations may change and the models will have incorrectly estimated the exposure point concentrations.

- The transport models individually made assumptions regarding the fate of individual constituents within source media. However, these models were not combined or linked to consider assumptions made regarding depletion of chemicals from one model and the effect of that assumption on another model (i.e., the leaching models did not consider source depletion from volatilization or fugitive emissions and the air emissions models did not consider losses via leaching). Further, the direct exposure pathways to a particular source (i.e., incidental ingestion of surface soil) did not consider source depletion by leaching, surface water transport, or air emissions. Consequently, this assumption is considered very conservative.

These uncertainties for modeling collectively are assumed to moderately overestimate the concentrations expected in groundwater and for aerial deposition (i.e., overestimate concentration and risk by a factor of one to two orders of magnitude) based on the above discussion. Models were also used to calculate chemical concentrations in plants and animals. Each time concentrations at one level in the food chain are extrapolated from a lower level, uncertainty is introduced into the result. For example, soil-to-plant transfer factors (B_{iv} values) generally represent the maximum amount of contaminant transfer that may occur. In reality, the contaminant transfer is quite dependent on the form of the constituent (e.g., metal specifies) and other site-related physical conditions (e.g., soil type). Thus actual site transfer factors are unknown. The values chosen are intended to be conservative and they are likely to overestimate risk.

Each exposure factor selected for use in this risk assessment has some uncertainty associated with it. Generally these factors are based on surveys of physiological and lifestyle profiles across the Unite States. The attributes and activities studied in these surveys generally have a broad distribution. To avoid the underestimation of exposure, this risk assessment followed EPA's recommendation and used the 96th percentile for most of the exposure parameters used in this risk assessment. In other words, the values selected represent the observed or expected habits of a small percentage of the population (usually the upper 5 or 10 percent). For example, the resident farmer scenarios were assumed to inhale air at the location of the highest annual average concentration for 350 days per year for

70 years. Seventy years represents the maximum exposure duration and is not based on a statistical assessment of local or regional residence time for farm families. This factor tends to overestimate risk.

Few intake parameters have high uncertainty associated with them. In the risk assessment for Operable Unit 2, the particular exposure parameters with the greatest uncertainty are judged to be those associated with time (combination of frequency and duration on the site). The particular exposure pathway with the combination of exposure parameters with the highest uncertainty is dermal contact, which is assumed to result in moderate uncertainty (over- or underestimate actual exposure by one to two orders of magnitude) for exposure.

Values used to represent exposure point concentrations were defined to provide conservative estimates of exposure, thus ensuring a conservative evaluation of risks. All residual risk assessment exposure point groundwater concentrations are projected or modeled values. Uncertainties associated with exposure point concentrations estimated by models are additive or multiplicative and include uncertainties associated with each input parameter (diffusion coefficients, groundwater flow rates, etc.), model characteristics, release mechanisms, and source terms. Residual risk evaluation input parameters were based on site information and professional judgment and were designed to be conservative. Input parameters and models were selected and used in a manner consistent with the RAWPA. Further, representation of future conditions such as the three southern operable units are modeled as one unit for post remediation conditions. This is a result of the mixing and co-location of the remediated units.

C.8.6 RISK CHARACTERIZATION

Throughout this risk assessment, potential health effects caused by the simultaneous exposure to multiple on-site COCs were assumed to be additive in nature. Uncertainties associated with summing cancer risks or HIs for multiple substances are of particular concern in the risk characterization step. The assumption of dose additivity ignores possible synergism or antagonism among chemicals and assumes similarity in mechanisms of action. However, data to quantitatively assess chemical interactions are generally lacking. In the absence of adequate information on chemical interactions, EPA guidelines indicate that carcinogenic risks should be treated as additive, and noncancer HIs should also be treated as additive. These assumptions are made to help prevent an underestimation of

cancer risk or potential noncancer health effects at a site (EPA 1989a). Table C.8-3 provides on overview of the boundary of uncertainty for risk.

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TABLE C.8-3

SUMMARY OF UNCERTAINTIES, AND RISK BOUNDING

Uncertainty Problem	Specification of Problem	Direction and Extent of Uncertainty	Effects on the Reported Risks
COC Selection			
1. Species of Contaminants	Not all COCs have been identified.	Low order of uncertainty. Probably localized in small areas:	Probably underestimates risks by a factor less than 10.
2. Quality of COC Information	Not all quantities are known and validated in various media.	Moderate order of uncertainty involving material volumes.	Varied. Can overestimate or underestimate risk by more than 1 order of magnitude.
Toxicological Information and Models	Extrapolation of data missing RfDs or slope factors.	Underestimates COCs not quantified.	Varied. Can range from less than a factor of 10 to 1 order of magnitude.
	Conservative derivation of slope factors and RfDs.	Overestimates risks for all COCs.	May overestimate risk by 2 to 3 orders of magnitude.
	Linear dose-response modeling.	Overestimates risks for some contaminants.	May overestimate risks by several orders of magnitude.
	EPA slope factor for external radiation	Assumes infinitely thick slab of soil and external source	May overestimates risk by severe orders of magnitude
Exposure Pathways	Improbable pathways to receptors; lack of institutional controls after 70 years.	Depending on the land use, the receptors may represent an overestimate.	Moderate. Possibly 1 order of magnitude.
Receptor Characterization			
1. Expanded Trespasser	Exposure of 110 days per year may be excessive.	Mild overestimate for drinking water exposures by using a maximum concentration and swimming in Paddys Run, etc.	Overestimates by less than a factor of 3.
2. Resident Farm Receptors	Assumption that 50 percent of fruit and vegetables and 100 percent of meat and milk is derived from the farm.	Overestimate.	Possibly a factor of 3.
	Estimation of exposure parameters.	In general, the exposure parameters are mild overestimates.	Mild. Less than 1 order of magnitude.
3. 70-year Exposure	Seventy years of exposure for farmer receptor represents the maximum duration and not statistical assessment	Overestimates risk.	Moderate current EPA RAGs recommends a 30-year exposure.

TABLE C.8-3
(Continued)

Uncertainty Problem	Specification of Problem	Direction and Extent of Uncertainty	Effects on the Reported Risks
Exposure Point Concentration			
1. Air Concentrations	Surface soil concentrations.	Unknown due to lack of data.	Unknown.
	Dust emission rate relating to vegetative cover and particle size.	Vegetative cover assumptions may cause underestimate, particularly relating to farming activities. May be offset if particle size distribution shows low potential for particulate generation.	Mild. Less than 1 order of magnitude.
	Temporal correlation between particulate generation and dispersion not accounted for.	Overestimate of air particulate expansion.	Probably moderate. 1 order of magnitude or less.
2. Groundwater Concentration	Migration rate.	Overestimate due to selecting small K_d values. This affects both concentrations and time of peak.	Moderate. 1 to 2 orders of magnitude.
	Leachate concentrations.	Overestimate due to conservative assumptions, also availability of contaminants.	Moderate. 1 to 2 orders of magnitude.
	Source term.	Direction is unknown due to the overall uncertainty in the extent of contamination. Could be an underestimate.	Moderate. Could vary both plus and minus 1 order of magnitude.
3. Farm Product Concentrations	Toxicity of COC on Farm Product.	Could be an overestimate.	Unknown.

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C.9.0 SUMMARY OF RISK ASSESSMENT RESULTS

This section summarizes the calculated remedial action and residual risks for each receptor under the four FS remedial alternatives. Six COC sources were modeled including the five subunits and Disposal Cell. As such, the remedial action and residual risks are presented side by side for consolidation of information. The remedial action and residual risks are not additive, due to the differing time spans in which they are likely to occur. For example, remedial action is assumed to occur within the next 10 to 20 years. In contrast, residual risks are considered to occur over a 1000-year time span, likely peaking at least a century after remediation is complete. Therefore, these categories of potential risk should be and are considered separately in the FS.

Within the following summary tables, the potential carcinogenic and noncarcinogenic human-health risks, the risk of injury, and the risk of fatality are presented. For the no-action risk scenarios (Alternative 1), the baseline risk assessment from the Operable Unit 2 RI report (DOE 1994a) was used. These matrices present the complete combination of land uses, receptors remedial and residual risks, subunits, sources and alternatives. This information is provided to risk managers and stakeholders so they can select the preferred remedial alternative based on the EPA's criteria for the feasibility study. Specifically, the matrices can be compared to the EPA criteria for the overall protection of human health and the environment, long-term effectiveness, and short-term effectiveness.

C.9.1 REMEDIAL ACTION RISKS

Remedial action risks were calculated for carcinogenic and noncarcinogenic risks to remediation workers, on-property nonremediation workers, off-site public, off-property workers, and the public along the transportation route. Both construction and transportation risks were evaluated. Transportation risks were evaluated for rail transportation. On-site trucking risks were evaluated as part of the on-site industrial hazards. A summary of the results is presented in Tables C.9-1 through C.9-14. The following provides a brief discussion of the result.

For all alternatives, risks due to inhalation exceed the 10^{-6} target risk value for remediation and on-site nonremediation workers except for risk associated with the lime sludge pond for alternative two. Risks to the public range from less than 10^{-7} to less than 10^{-5}.

For dermal exposure, all alternatives show cancer risks less than 10^{-6} and HIs less than 1. For direct radiation, risks for the remediation worker exceed the 10^{-6} target for all alternatives. The risks for nonremediation workers and the public are below the target value. Risks from VOCs and immersion in a contaminated cloud are well below the targeted risk value for all alternatives. Risk from on-site industrial hazards are less for Alternative 2, increasing for Alternatives 3 and 6 respectively.

Remedial risks were calculated based on volumes and remediation hours developed from the public ownership land use. For the South Field, Solid Waste Landfill, and Lime Sludge Ponds, the volumes and remediation hours are approximately 2 to 5 times less than the volume and hours for the federal ownership scenario. For the Inactive and Active Flyash Piles, the volume and hours are a fraction of those calculated for the federal ownership scenario. Associated risks for the federal ownership scenario would be less than the risk presented in this section, for the public ownership scenario.

C.9.2 SUMMARY OF ESTIMATED RISKS

Table C.9-15 summarizes the highest (of the four subunit areas) remedial action and residual risks and hazards estimated to potential receptors resulting from the implementation of Alternatives 2, 3, and 6. The subunits contributing these risks and hazards are denoted by a footnote. The highest risks and hazards estimated for the No Action alternative are also presented to provide a comparison of potential risks in the event that no remedial actions are taken.

Risks posed by the implementation of remedial actions under Alternatives 2, 3, and 6 are generally on the order of 10^{-5} for the remedial worker and 10^{-6} for the nonremedial worker and general public. The greatest risk and hazard is to the remedial worker (5.1×10^{-5} and 8.9×10^{-3}, respectively) from the implementation of Alternative 3. The risks to the remedial worker are developed without the benefit of personnel protective equipment per Section 10 of the RAWPA. As such, the level of protection provided by personnel protective equipment would further reduce risk.

The greatest residual risks and hazards posed to any potential receptors, under either federal or private ownership, are from Alternative 1 (No Action). Total ILCRs are in the range of 10^{-2} to 10^{-6} while total HIs range from below 1.0 to 65.

The next greatest residual risks and hazards posed result from the implementation of remedial alternatives (i.e., Alternatives 2, 3, and 6). For the federal ownership scenario, the greatest risk is to

the expanded trespasser (2.5×10^{-6}) under Alternatives 3 and 6. The greatest hazard for this scenario is to this same receptor (0.13) under Alternative 3. For the private ownership scenario, the greatest risk is to the on-property resident farmer (6.4×10^{-6}) under Alternatives 3 and 6. The greatest hazards for this scenario are to the on-property resident child (0.76), also under Alternatives 3 and 6.

REMEDIAL ACTION RISKS*

REMEDIAL ALTERNATIVE	RISK	1. ACTIVE FLYASH PILE	2. INACTIVE FLYASH PILE**	3. SOUTH FIELD**	4. LIME SLUDGE POND	5. SOLID WASTE LANDFILL
1 NO ACTION	ILCR					
	HI					
	PI/F					
	p-rem					
2 CONSOLIDATION AND CAPPING	ILCR	$2.09x10^{-5}$	$2.7x10^{-5}$	$2.7x10^{-5}$	$3.7x10^{-6}$	$1.6x10^{-5}$
	HI	$2.9x10^{-4}$	$3.4x10^{-3}$	$3.4x10^{-3}$	$1.3x10^{-3}$	$2.3x10^{-3}$
	PI/F	$1.77/2.6x10^{-2}$	$1.27/1.9x10^{-2}$	$0.38/5.5x10^{-3}$	$0.14/2.0x10^{-3}$	$0.41/6.0x10^{-3}$
	p-rem					
3 EXCAVATION AND OFF-SITE DISPOSAL	ILCR	$5.1x10^{-5}$	$2.9x10^{-5}$	$2.9x10^{-5}$	$8.4x10^{-6}$	$2.7x10^{-5}$
	HI	$8.1x10^{-4}$	$8.9x10^{-3}$	$8.9x10^{-3}$	$2.7x10^{-3}$	$4.6x10^{-3}$
	PI/F	$1.4/2.1x10^{-2}$	$1.8/2.6x10^{-2}$	$4.9/7.1x10^{-2}$	$1.4/2.1x10^{-2}$	$1.5/2.2x10^{-2}$
	p-rem					
6 EXCAVATION AND ON-SITE DISPOSAL WITH OFF-SITE DISPOSAL OF FRACTION EXCEEDING WAC	ILCR	$2.0x10^{-5}$	$3.0x10^{-5}$	$3.0x10^{-5}$	$9.2x10^{-6}$	$9.2x10^{-5}$
	HI	$2.9x10^{-4}$	$3.0x10^{-3}$	$3.0x10^{-3}$	$1.3x10^{-3}$	$3.8x10^{-3}$
	PI/F	$1.2/1.8x10^{-2}$	$2.0/3.0x10^{-2}$	$5.3/7.8x10^{-2}$	$2.4/3.6x10^{-2}$	$0.5/7.0x10^{-3}$
	p-rem					

SOURCES:

- THE RAWPA (DOE 1992) AND PREVIOUS FS RISK ASSESSMENTS DEFINE THE SCOPE OF QUANTITATIVE ANALYSIS FOR SHORT-TERM (REMEDIAL ACTION) AND LONG-TERM (RESIDUAL) RISKS. NOTE THAT CARCINOGENIC AND NONCARCINOGENIC RISKS RESULTING FROM ACCIDENTS ARE NOT INDICATED AND THEREFORE HAVE NOT BEEN CALCULATED.

RISKS

- CARCINOGENIC =INCREMENTAL LIFETIME CANCER RISK (ILCR) FROM CHEMICAL AND ALL RADIOLOGICAL IMPACTS (NCP TARGET RANGE IS 10^{-4} TO 10^{-6})
- NON CARCINOGENIC = HAZARD INDEX (HI) (HI NOT TO EXCEED 1.0)
- PHYSICAL INJURY = INJURIES PREDICTED PER WORK HOUR (PI)
- FATALITIES = DEATHS PREDICTED PER WORK HOUR (F)
- WHOLE BODY DOSE EQUIVALENT (PERSON REM, i.e., p=rem)
- DOE ANNUAL DOSE RATE = 5 REM (10CFR20 835)

ND = NOT DETERMINED

▒ = NOT APPLICABLE

* For residual risk analysis, these subunits are modeled as one combined, southern subunit, due to postremediation commingling.

** For remedial action risks, these subunits are modeled as one combined subunit, because the soil concentration data presented in the RI is for a combined subunit.

Risks calculated assuming no PPE or shielding.

TABLE C.9-1
RISK SUMMARY FOR OU2 ALTERNATIVES AND SUBUNITS
REMEDIAL WORKER

000501

6646

REMEDIAL ACTION RISKS*

REMEDIAL ALTERNATIVE	RISK	1. ACTIVE FLYASH PILE	2INACTIVE FLYASH PILE**	3. SOUTH FIELD**	4. LIME SLUDGE POND	5. SOLID WASTE LANDFILL
1 NO ACTION	ILCR					
	HI					
	PI/F					
	p-rem					
2 CONSOLIDATION AND CAPPING	ILCR	$7.5x10^{-7}$	$1.3x10^{-6}$	$1.3x10^{-6}$	$1.3X10^{-6}$	$1.3x10^{-6}$
	HI	ND	ND	ND	ND	ND
	PI/F					
	p-rem					
3 EXCAVATION AND OFF-SITE DISPOSAL	ILCR	$2.6x10^{-6}$	$1.6x10^{-6}$	$1.6x10^{-6}$	$3.4x10^{-7}$	$2.1x10^{-6}$
	HI	ND	ND	ND	ND	ND
	PI/F					
	p-rem					
6 EXCAVATION AND ON-SITE DISPOSAL WITH OFF-SITE DISPOSAL OF FRACTION EXCEEDING WAC	ILCR	$5.3x10^{-7}$	$1.8x10^{-6}$	$1.8x10^{-6}$	$3.4x10^{-7}$	$2.4x10^{-6}$
	HI	ND	ND	ND	ND	ND
	PI/F					
	p-rem					

SOURCES:

- THE RAWPA (DOE 1992) AND PREVIOUS FS RISK ASSESSMENTS DEFINE THE SCOPE OF QUANTITATIVE ANALYSIS FOR SHORT-TERM (REMEDIAL ACTION) AND LONG-TERM (RESIDUAL) RISKS. NOTE THAT CARCINOGENIC AND NONCARCINOGENIC RISKS RESULTING FROM ACCIDENTS ARE NOT INDICATED AND THEREFORE HAVE NOT BEEN CALCULATED.

RISKS

- CARCINOGENIC = INCREMENTAL LIFETIME CANCER RISK (ILCR) FROM CHEMICAL AND ALL RADIOLOGICAL IMPACTS (NCP TARGET RANGE IS 10^{-4} TO 10^{-6})
- NON CARCINOGENIC = HAZARD INDEX (HI) (HI NOT TO EXCEED 1.0)
- PHYSICAL INJURY = INJURIES PREDICTED PER WORK HOUR (PI)
- FATALITIES = DEATHS PREDICTED PER WORK HOUR (F)
- WHOLE BODY DOSE EQUIVALENT (PERSON REM, i.e., p=rem)
- DOE ANNUAL DOSE RATE = 5 REM (10CFR20 835)

ND = NOT DETERMINED

▒ = NOT APPLICABLE

* For residual risk analysis, these subunits are modeled as one combined, southern subunit, due to postremediation commingling.

** For remedial action risks, these subunits are modeled as one combined subunit, because the soil concentration data presented in the RI is for a combined subunit.

'Risks calculated assuming no PPE or shielding.

TABLE C.9-2
RISK SUMMARY FOR OU2 ALTERNATIVES AND SUBUNITS
NONREMEDIAL WORKER

000302

RESIDUAL RISKS

REMEDIAL ALTERNATIVE	RISK	1. ACTIVE FLYASH PILE*	2. INACTIVE FLYASH PILE*	3. SOUTH FIELD*	4. LIME SLUDGE POND	5. SOLID WASTE LANDFILL	6.DISPOSAL CELL
1 NO ACTION	ILCR	$1.1X10^{-5}$	$7.5X10^{-5}$	$8.7X10^{-5}$	$1.7X10^{-5}$	$6.7X10^{-7}$	
	HI	0.19	1.2	1.1	$2.0X10^{-5}$	$1.8X10^{-6}$	
2 CONSOLIDATION AND CAPPING	ILCR	1.6×10^{-6}	1.6×10^{-6}	1.6×10^{-6}	3.3×10^{-11}	2.3×10^{-9}	
	HI	1.8×10^{-2}	1.8×10^{-2}	1.8×10^{-2}	1.2×10^{-7}	2.5×10^{-5}	
3 EXCAVATION AND OFF-SITE DISPOSAL	ILCR	2.2×10^{-6}	2.2×10^{-6}	2.2×10^{-6}	9.3×10^{-8}	5.3×10^{-7}	
	HI	2.7×10^{-2}	2.7×10^{-2}	2.7×10^{-2}	1.5×10^{-3}	8.6×10^{-3}	
6 EXCAVATION AND ON-SITE DISPOSAL WITH OFF-SITE DISPOSAL OF FRACTION EXCEEDING WAC	ILCR	2.2×10^{-6}	2.2×10^{-6}	2.2×10^{-6}	9.3×10^{-8}	5.3×10^{-7}	1.6×10^{-6}
	HI	2.7×10^{-2}	2.7×10^{-2}	2.7×10^{-2}	1.5×10^{-3}	8.6×10^{-3}	2.6×10^{-2}

SOURCES:

- THE RAWPA (DOE 1992) AND PREVIOUS FS RISK ASSESSMENTS DEFINE THE SCOPE OF QUANTITATIVE ANALYSIS FOR SHORT-TERM (REMEDIAL ACTION) AND LONG-TERM (RESIDUAL) RISKS. NOTE THAT CARCINOGENIC AND NONCARCINOGENIC RISKS RESULTING FROM ACCIDENTS ARE NOT INDICATED AND THEREFORE HAVE NOT BEEN CALCULATED.

RISKS

- CARCINOGENIC = INCREMENTAL LIFETIME CANCER RISK (ILCR) FROM CHEMICAL AND ALL RADIOLOGICAL IMPACTS (NCP TARGET RANGE IS 10^{-4} TO 10^{-6})
- NON CARCINOGENIC = HAZARD INDEX (HI) (HI NOT TO EXCEED 1.0)
- PHYSICAL INJURY = INJURIES PREDICTED PER WORK HOUR (PI)
- FATALITIES = DEATHS PREDICTED PER WORK HOUR (F)
- WHOLE BODY DOSE EQUIVALENT (PERSON REM, i.e., p=rem)
- DOE ANNUAL DOSE RATE = 5 REM (10CFR20 835)

ND = NOT DETERMINED

= NOT APPLICABLE

- For residual risk analysis, these subunits are modeled as one combined, southern subunit, due to postremediation commingling.

TABLE C.9-3
RISK SUMMARY FOR OU2 ALTERNATIVES AND SUBUNITS
OFF-PROPERTY FARMER (ADULT)
FEDERAL OWNERSHIP WITH ACCESS CONTROLS

RESIDUAL RISKS

REMEDIAL ALTERNATIVE	RISK	1. ACTIVE FLYASH PILE*	2.INACTIVE FLYASH PILE*	3. SOUTH FIELD*	4. LIME SLUDGE POND	5. SOLID WASTE LANDFILL	6. DISPOSAL CELL
1 NO ACTION	ILCR	7.2×10^{-7}	4.0×10^{-6}	4.2×10^{-6}	1.6×10^{-8}	3.5×10^{-9}	
	HI	2.5	7.9×10^{-1}	3.1	9.3×10^{-4}	6.4×10^{-6}	
2 CONSOLIDATION AND CAPPING	ILCR	9.3×10^{-8}	9.3×10^{-8}	9.3×10^{-8}	1.7×10^{-12}	1.2×10^{-10}	
	HI	4.9×10^{-2}	4.9×10^{2}	4.9×10^{-2}	3.3×10^{-7}	6.6×10^{-5}	
3 EXCAVATION AND OFF-SITE DISPOSAL	ILCR	1.6×10^{-7}	1.6×10^{7}	1.6×10^{-7}	4.6×10^{-9}	2.7×10^{-8}	
	HI	7.2×10^{-2}	7.2×10^{2}	7.2×10^{-2}	4.1×10^{-3}	2.3×10^{-2}	
6 EXCAVATION AND ON-SITE DISPOSAL WITH OFF-SITE DISPOSAL OF FRACTION EXCEEDING WAC	ILCR	1.6×10^{-7}	1.6×10^{7}	1.6×10^{-7}	4.6×10^{-9}	2.7×10^{-8}	7.8×10^{-8}
	HI	7.2×10^{-2}	7.2×10^{2}	7.2×10^{-2}	4.1×10^{-3}	2.3×10^{-2}	6.9×10^{2}

LEGEND:

SOURCES:

- THE RAWPA (DOE 1992) AND PREVIOUS FS RISK ASSESSMENTS DEFINE THE SCOPE OF QUANTITATIVE ANALYSIS FOR SHORT-TERM (REMEDIAL ACTION) AND LONG-TERM (RESIDUAL) RISKS. NOTE THAT CARCINOGENIC AND NONCARCINOGENIC RISKS RESULTING FROM ACCIDENTS ARE NOT INDICATED AND THEREFORE HAVE NOT BEEN CALCULATED.

RISKS

- CARCINOGENIC = INCREMENTAL LIFETIME CANCER RISK (ILCR) FROM CHEMICAL AND ALL RADIOLOGICAL IMPACTS (NCP TARGET RANGE IS 10^{-4} TO 10^{-6})
- NON CARCINOGENIC = HAZARD INDEX (HI) (HI NOT TO EXCEED 1.0)
- PHYSICAL INJURY = INJURIES PREDICTED PER WORK HOUR (PI)
- FATALITIES = DEATHS PREDICTED PER WORK HOUR (F)
- WHOLE BODY DOSE EQUIVALENT (PERSON REM, i.e., p=rem)
- DOE ANNUAL DOSE RATE = 5 REM (10CFR20 835)

ND = NOT DETERMINED

▨ = NOT APPLICABLE

* For residual risk analysis, these subunits are modeled as one combined, southern subunit, due to postremediation commingling.

TABLE C.9-4
RISK SUMMARY FOR OU2 ALTERNATIVES AND SUBUNITS
OFF-PROPERTY FARMER (CHILD) FEDERAL OWNERSHIP WITH ACCESS CONTROLS

RESIDUAL RISKS

REMEDIAL ALTERNATIVE	RISK	1. ACTIVE FLYASH PILE*	2. INACTIVE FLYASH PILE*	3. SOUTH FIELD*	4. LIME SLUDGE POND	5. SOLID WASTE LANDFILL	6. DISPOSAL CELL
1 NO ACTION	ILCR	1.1×10^{-5}	7.5×10^{-5}	1.1×10^{-4}	1.7×10^{-7}	1.2×10^{-6}	
	HI	1.9×10^{-1}	$1.2 \times 10^{+0}$	1.1×10^{0}	2.0×10^{-3}	5.6×10^{-3}	
2 CONSOLIDATION AND CAPPING	ILCR						
	HI						
3 EXCAVATION AND OFF-SITE DISPOSAL	ILCR	1.4×10^{-7}	1.4×10^{-7}	1.4×10^{-7}	4.9×10^{-9}	2.2×10^{-8}	
	HI	1.3×10^{-3}	1.3×10^{-3}	1.3×10^{-3}	2.9×10^{-6}	1.4×10^{-4}	
6 EXCAVATION AND ON-SITE DISPOSAL WITH OFF-SITE DISPOSAL OF FRACTION EXCEEDING WAC	ILCR	1.4×10^{-7}	1.4×10^{-7}	1.4×10^{-7}	4.9×10^{-9}	2.2×10^{-8}	1.6×10^{-6}
	HI	1.3×10^{-3}	1.3×10^{-3}	1.3×10^{-3}	2.9×10^{-6}	1.4×10^{-4}	2.6×10^{-2}

SOURCES:

- THE RAWPA (DOE 1992) AND PREVIOUS FS RISK ASSESSMENTS DEFINE THE SCOPE OF QUANTITATIVE ANALYSIS FOR SHORT-TERM (REMEDIAL ACTION) AND LONG-TERM (RESIDUAL) RISKS. NOTE THAT CARCINOGENIC AND NONCARCINOGENIC RISKS RESULTING FROM ACCIDENTS ARE NOT INDICATED AND THEREFORE HAVE NOT BEEN CALCULATED.

RISKS

- CARCINOGENIC =INCREMENTAL LIFETIME CANCER RISK (ILCR) FROM CHEMICAL AND ALL RADIOLOGICAL IMPACTS (NCP TARGET RANGE IS 10^{-4} TO 10^{-6})
- NON CARCINOGENIC = HAZARD INDEX (HI) (HI NOT TO EXCEED 1.0)
- PHYSICAL INJURY = INJURIES PREDICTED PER WORK HOUR (PI)
- FATALITIES = DEATHS PREDICTED PER WORK HOUR (F)
- WHOLE BODY DOSE EQUIVALENT (PERSON REM, i.e., p=rem)
- DOE ANNUAL DOSE RATE = 5 REM (10CFR20 835)

ND = NOT DETERMINED

▒ = NOT APPLICABLE

* For residual risk analysis, these subunits are modeled as one combined, southern subunit, due to postremediation commingling.

** For remedial action risks, these subunits are modeled as one combined subunit, because the soil concentration data presented in the RI is for a combined subunit.

TABLE C.9-5
RISK SUMMARY FOR OU2 ALTERNATIVES AND SUBUNITS
OFF-PROPERTY FARMER (ADULT) PRIVATE OWNERSHIP WITHOUT ACCESS CONTROLS

000305

RESIDUAL RISKS

REMEDIAL ALTERNATIVE	RISK	1. ACTIVE FLYASH PILE*	2. INACTIVE FLYASH PILE*	3. SOUTH FIELD*	4. LIME SLUDGE POND	5. SOLID WASTE LANDFILL	6. DISPOSAL CELL
1 NO ACTION	ILCR	$7.2X10^{-7}$	$4.0X10^{-6}$	$1.5X10^{-5}$	$1.6X10^{-8}$	$7.0X10^{-8}$	
	HI	0.79	2.5	3.1	$9.3X10^{-5}$	$2.0X10^{-4}$	
2 CONSOLIDATION AND CAPPING	ILCR						
	HI						
3 EXCAVATION AND OFF-SITE DISPOSAL	ILCR	7.3×10^{-9}	7.3×10^{-9}	7.3×10^{-9}	2.5×10^{-9}	2.1×10^{-9}	
	HI	3.5×10^{-3}	3.5×10^{-3}	3.5×10^{-3}	7.6×10^{-6}	1.2×10^{-3}	
6 EXCAVATION AND ON-SITE DISPOSAL WITH OFF-SITE DISPOSAL OF FRACTION EXCEEDING WAC	ILCR	7.3×10^{-9}	7.3×10^{-9}	7.3×10^{-9}	2.5×10^{-10}	2.1×10^{-9}	7.8×10^{-8}
	HI	3.5×10^{-3}	3.5×10^{-3}	3.5×10^{-3}	7.6×10^{-6}	1.2×10^{-3}	6.9×10^{-2}

SOURCES:

- THE RAWPA (DOE 1992) AND PREVIOUS FS RISK ASSESSMENTS DEFINE THE SCOPE OF QUANTITATIVE ANALYSIS FOR SHORT-TERM (REMEDIAL ACTION) AND LONG-TERM (RESIDUAL) RISKS. NOTE THAT CARCINOGENIC AND NONCARCINOGENIC RISKS RESULTING FROM ACCIDENTS ARE NOT INDICATED AND THEREFORE HAVE NOT BEEN CALCULATED.

RISKS

- CARCINOGENIC = INCREMENTAL LIFETIME CANCER RISK (ILCR) FROM CHEMICAL AND ALL RADIOLOGICAL IMPACTS (NCP TARGET RANGE IS 10^{-4} TO 10^{-6})
- NON CARCINOGENIC = HAZARD INDEX (HI) (HI NOT TO EXCEED 1.0)
- PHYSICAL INJURY = INJURIES PREDICTED PER WORK HOUR (PI)
- FATALITIES = DEATHS PREDICTED PER WORK HOUR (F)
- WHOLE BODY DOSE EQUIVALENT (PERSON REM, i.e., p=rem)
- DOE ANNUAL DOSE RATE = 5 REM (10CFR20 835)

ND = NOT DETERMINED

= NOT APPLICABLE

* For residual risk analysis, these subunits are modeled as one combined, southern subunit, due to postremediation commingling.

TABLE C.9-6
RISK SUMMARY FOR OU2 ALTERNATIVES AND SUBUNITS
OFF-PROPERTY FARMER (CHILD) WITH PRIVATE OWNERSHIP WITHOUT ACCESS CONTROLS

REMEDIAL ACTION RISKS*

REMEDIAL ALTERNATIVE	RISK	1. ACTIVE FLYASH PILE	2. INACTIVE FLYASH PILE**	3. SOUTH FIELD**	4. LIME SLUDGE POND	5. SOLID WASTE LANDFILL
1 NO ACTION	ILCR					
	HI					
	PI/F					
	p-rem					
2 CONSOLIDATION AND CAPPING	ILCR	$5.7X10^{-7}$	$1.0X10^{-6}$	$1.0X10^{-6}$	$4.4X10^{-8}$	$7.4X10^{-7}$
	HI	ND	ND	ND	ND	ND
	PI/F					
	p-rem					
3 EXCAVATION AND OFF-SITE DISPOSAL	ILCR	2.0×10^{-6}	1.3×10^{-6}	1.3×10^{-6}	1.7×10^{-7}	1.2×10^{-6}
	HI	ND	ND	ND	ND	ND
	PI/F					
	p-rem					
6 EXCAVATION AND ON-SITE DISPOSAL WITH OFF-SITE DISPOSAL OF FRACTION EXCEEDING WAC	ILCR	4.0×10^{-7}	1.5×10^{-6}	1.5×10^{-6}	1.2×10^{-7}	1.3×10^{-6}
	HI	ND	ND	ND	ND	ND
	PI/F					
	p-rem					

SOURCES:

- THE RAWPA (DOE 1992) AND PREVIOUS FS RISK ASSESSMENTS DEFINE THE SCOPE OF QUANTITATIVE ANALYSIS FOR SHORT-TERM (REMEDIAL ACTION) AND LONG-TERM (RESIDUAL) RISKS. NOTE THAT CARCINOGENIC AND NONCARCINOGENIC RISKS RESULTING FROM ACCIDENTS ARE NOT INDICATED AND THEREFORE HAVE NOT BEEN CALCULATED.

* For residual risk analysis, these subunits are modeled as one combined, southern subunit, due to postremediation commingling.

** For remedial action risks, these subunits are modeled as one combined subunit, because the soil concentration data presented in the RI is for a combined subunit.

*Risks calculated assuming no PPE or shielding.

RISKS

- CARCINOGENIC = INCREMENTAL LIFETIME CANCER RISK (ILCR) FROM CHEMICAL AND ALL RADIOLOGICAL IMPACTS (NCP TARGET RANGE IS 10^{-4} TO 10^{-6})
- NON CARCINOGENIC = HAZARD INDEX (HI) (HI NOT TO EXCEED 1.0)
- PHYSICAL INJURY = INJURIES PREDICTED PER WORK HOUR (PI)
- FATALITIES = DEATHS PREDICTED PER WORK HOUR (F)
- WHOLE BODY DOSE EQUIVALENT (PERSON REM, i.e., p=rem)
- DOE ANNUAL DOSE RATE = 5 REM (10CFR20 835)

ND = NOT DETERMINED

▒ = NOT APPLICABLE

TABLE C.9-7
RISK SUMMARY FOR OU2 ALTERNATIVES AND SUBUNITS
GENERAL PUBLIC

RESIDUAL RISKS

REMEDIAL ALTERNATIVE	RISK	1. ACTIVE FLYASH PILE*	2.INACTIVE FLYASH PILE*	3. SOUTH FIELD*	4. LIME SLUDGE POND	5. SOLID WASTE LANDFILL	6. DISPOSAL CELL
1 NO ACTION	ILCR	$8.4X10^{-4}$	$1.5X10^{-3}$	$3.4X10^{-2}$	$1.3X10^{-6}$	$2.8X10^{-3}$	
	HI	0.99	22	23	$1.7X10^{-3}$	0.29	
2 CONSOLIDATION AND CAPPING	ILCR						
	HI						
3 EXCAVATION AND OFF-SITE DISPOSAL	ILCR	6.4×10^{-6}	6.4×10^{-6}	6.4×10^{-6}	3.4×10^{-6}	3.4×10^{-6}	
	HI	1.7×10^{-2}	1.7×10^{-2}	1.7×10^{-2}	7.5×10^{-5}	2.0×10^{-1}	
6 EXCAVATION AND ON-SITE DISPOSAL WITH OFF-SITE DISPOSAL OF FRACTION EXCEEDING WAC	ILCR	6.4×10^{-6}	6.4×10^{-6}	6.4×10^{-6}	3.4×10^{-6}	3.4×10^{-6}	
	HI	1.7×10^{-2}	1.7×10^{-2}	1.7×10^{-2}	7.5×10^{-5}	2.0×10^{-1}	

LEGEND:

SOURCES:

- THE RAWPA (DOE 1992) AND PREVIOUS FS RISK ASSESSMENTS DEFINE THE SCOPE OF QUANTITATIVE ANALYSIS FOR SHORT-TERM (REMEDIAL ACTION) AND LONG-TERM (RESIDUAL) RISKS. NOTE THAT CARCINOGENIC AND NONCARCINOGENIC RISKS RESULTING FROM ACCIDENTS ARE NOT INDICATED AND THEREFORE HAVE NOT BEEN CALCULATED.

RISKS

- CARCINOGENIC = INCREMENTAL LIFETIME CANCER RISK (ILCR) FROM CHEMICAL AND ALL RADIOLOGICAL IMPACTS (NCP TARGET RANGE IS 10^{-4} TO 10^{-6})
- NON CARCINOGENIC = HAZARD INDEX (HI) (HI NOT TO EXCEED 1.0)
- PHYSICAL INJURY = INJURIES PREDICTED PER WORK HOUR (PI)
- FATALITIES = DEATHS PREDICTED PER WORK HOUR (F)
- WHOLE BODY DOSE EQUIVALENT (PERSON REM, i.e., p=rem)
- DOE ANNUAL DOSE RATE = 5 REM (10CFR20 835)

ND = NOT DETERMINED

= NOT APPLICABLE

- For residual risk analysis, these subunits are modeled as one combined, southern subunit, due to postremediation comingling.

TABLE C.9-8
RISK SUMMARY FOR OU2 ALTERNATIVES AND SUBUNITS
ON-PROPERTY FARMER (ADULT) PRIVATE OWNERSHIP WITHOUT ACCESS CONTROLS

RESIDUAL RISKS

REMEDIAL ALTERNATIVE	RISK	1. ACTIVE FLYASH PILE*	2.INACTIVE FLYASH PILE*	3. SOUTH FIELD*	4. LIME SLUDGE POND	5. SOLID WASTE LANDFILL	6.DISPOSAL CELL
1 NO ACTION	ILCR	5.7×10^{-6}	7.7×10^{-5}	9.2×10^{-5}	1.2×10^{-6}	6.4×10^{-4}	
	HI	2.8	65	63	7.9×10^{-3}	1	
2 CONSOLIDATION AND CAPPING	ILCR						
	HI						
3 EXCAVATION AND OFF-SITE DISPOSAL	ILCR	4.9×10^{-7}	4.9×10^{-7}	4.9×10^{-7}	2.7×10^{-7}	4.3×10^{-7}	
	HI	5.2×10^{-2}	5.2×10^{-2}	5.2×10^{-2}	2.0×10^{-4}	7.6×10^{-1}	
6 EXCAVATION AND ON-SITE DISPOSAL WITH OFF-SITE DISPOSAL OF FRACTION EXCEEDING WAC	ILCR	4.9×10^{-7}	4.9×10^{-7}	4.9×10^{-7}	2.7×10^{-7}	4.3×10^{-7}	
	HI	5.2×10^{-2}	5.2×10^{-2}	5.2×10^{-2}	2.0×10^{-4}	7.6×10^{-1}	

SOURCES:

- THE RAWPA (DOE 1992) AND PREVIOUS FS RISK ASSESSMENTS DEFINE THE SCOPE OF QUANTITATIVE ANALYSIS FOR SHORT-TERM (REMEDIAL ACTION) AND LONG-TERM (RESIDUAL) RISKS. NOTE THAT CARCINOGENIC AND NONCARCINOGENIC RISKS RESULTING FROM ACCIDENTS ARE NOT INDICATED AND THEREFORE HAVE NOT BEEN CALCULATED.

RISKS

- CARCINOGENIC = INCREMENTAL LIFETIME CANCER RISK (ILCR) FROM CHEMICAL AND ALL RADIOLOGICAL IMPACTS (NCP TARGET RANGE IS 10^{-4} TO 10^{-6})
- NON CARCINOGENIC = HAZARD INDEX (HI) (HI NOT TO EXCEED 1.0)
- PHYSICAL INJURY = INJURIES PREDICTED PER WORK HOUR (PI)
- FATALITIES = DEATHS PREDICTED PER WORK HOUR (F)
- WHOLE BODY DOSE EQUIVALENT (PERSON REM, i.e., p=rem)
- DOE ANNUAL DOSE RATE = 5 REM (10CFR20 835)

ND = NOT DETERMINED

= NOT APPLICABLE

* For residual risk analysis, these subunits are modeled as one combined, southern subunit, due to postremediation comingling.

TABLE C.9-9
RISK SUMMARY FOR OU2 ALTERNATIVES AND SUBUNITS
ON-PROPERTY FARMER (CHILD) PRIVATE OWNERSHIP WITHOUT ACCESS CONTROLS

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RESIDUAL RISKS

REMEDIAL ALTERNATIVE	RISK	1. ACTIVE FLYASH PILE*	2. INACTIVE FLYASH PILE*	3. SOUTH FIELD*	4. LIME SLUDGE POND	5. SOLID WASTE LANDFILL	6. DISPOSAL CELL
1 NO ACTION	ILCR				$7.7X10^{-5}$	$2.8X10^{-3}$	
	HI				$3.1X10^{-3}$	ND	
2 CONSOLIDATION AND CAPPING	ILCR						
	HI						
3 EXCAVATION AND OFF-SITE DISPOSAL	ILCR				$4.6 X 10^{-6}$	$4.8 X 10^{-6}$	
	HI				$1.7 X 10^{-5}$	$2.0 X 10^{-1}$	
6 EXCAVATION AND ON-SITE DISPOSAL WITH OFF-SITE DISPOSAL OF FRACTION EXCEEDING WAC	ILCR				$4.6 X 10^{-6}$	$4.8 X 10^{-6}$	
	HI				$1.7 X 10^{-5}$	$2.0 X 10^{-1}$	

SOURCES:

- THE RAWPA (DOE 1992) AND PREVIOUS FS RISK ASSESSMENTS DEFINE THE SCOPE OF QUANTITATIVE ANALYSIS FOR SHORT-TERM (REMEDIAL ACTION) AND LONG-TERM (RESIDUAL) RISKS. NOTE THAT CARCINOGENIC AND NONCARCINOGENIC RISKS RESULTING FROM ACCIDENTS ARE NOT INDICATED AND THEREFORE HAVE NOT BEEN CALCULATED.

RISKS

- CARCINOGENIC = INCREMENTAL LIFETIME CANCER RISK (ILCR) FROM CHEMICAL AND ALL RADIOLOGICAL IMPACTS (NCP TARGET RANGE IS 10^{-4} TO 10^{-6})
- NON CARCINOGENIC = HAZARD INDEX (HI) (HI NOT TO EXCEED 1.0)
- PHYSICAL INJURY = INJURIES PREDICTED PER WORK HOUR (PI)
- FATALITIES = DEATHS PREDICTED PER WORK HOUR (F)
- WHOLE BODY DOSE EQUIVALENT (PERSON REM, i.e., p=rem)
- DOE ANNUAL DOSE RATE = 5 REM (10CFR20 835)

ND = NOT DETERMINED

= NOT APPLICABLE

- For residual risk analysis, these subunits are modeled as one combined, southern subunit, due to postremediation comingling.

TABLE C.9-10
RISK SUMMARY FOR OU2 ALTERNATIVES AND SUBUNITS
PERCHED GROUNDWATER USER PRIVATE OWNERSHIP WITHOUT ACCESS CONTROLS

REMEDIAL ACTION RISKS*

REMEDIAL ALTERNATIVE	RISK	1. ACTIVE FLYASH PILE	2. INACTIVE FLYASH PILE	3. SOUTH FIELD	4. LIME SLUDGE POND	5. SOLID WASTE LANDFILL
1 NO ACTION	ILCR					
	HI					
	PI/F					
	p-rem					
2 CONSOLIDATION AND CAPPING	ILCR					
	HI					
	PI/F					
	p-rem					
3 EXCAVATION AND OFF-SITE DISPOSAL	ILCR	ND	ND	ND	ND	ND
	HI	ND	ND	ND	ND	ND
	PI/F	$0.13/1.3 \times 10^{-3}$	$0.18/1.8 \times 10^{-3}$	$0.59/5.9 \times 10^{-3}$	$0.14/1.4 \times 10^{-3}$	$0.18/1.8 \times 10^{-3}$
	p-rem	3.2×10^{-5}	4.2×10^{-5}	1.4×10^{-4}	3.4×10^{-5}	4.3×10^{-5}
6 EXCAVATION AND ON-SITE DISPOSAL WITH OFF-SITE DISPOSAL OF FRACTION EXCEEDING WAC	ILCR	ND	ND	ND	ND	ND
	HI	ND	ND	ND	ND	ND
	PI/F		$0.018/1.8 \times 10^{-4}$	$0.018/1.8 \times 10^{-4}$		
	p-rem		1.2×10^{-6}	1.1×10^{-7}		

SOURCES:

- THE RAWPA (DOE 1992) AND PREVIOUS FS RISK ASSESSMENTS DEFINE THE SCOPE OF QUANTITATIVE ANALYSIS FOR SHORT-TERM (REMEDIAL ACTION) AND LONG-TERM (RESIDUAL) RISKS. NOTE THAT CARCINOGENIC AND NONCARCINOGENIC RISKS RESULTING FROM ACCIDENTS ARE NOT INDICATED AND THEREFORE HAVE NOT BEEN CALCULATED.

RISKS

- CARCINOGENIC = INCREMENTAL LIFETIME CANCER RISK (ILCR) FROM CHEMICAL AND ALL RADIOLOGICAL IMPACTS (NCP TARGET RANGE IS 10^{-4} TO 10^{-6})
- NON CARCINOGENIC = HAZARD INDEX (HI) (HI NOT TO EXCEED 1.0)
- PHYSICAL INJURY = INJURIES PREDICTED PER WORK HOUR (PI)
- FATALITIES = DEATHS PREDICTED PER WORK HOUR (F)
- WHOLE BODY DOSE EQUIVALENT (PERSON REM, i.e., p=rem)
- DOE ANNUAL DOSE RATE = 5 REM (10CFR20 835)

ND = NOT DETERMINED

= NOT APPLICABLE

* For residual risk analysis, these subunits are modeled as one combined, southern subunit, due to postremediation commingling.

Risks calculated assuming no PPE or shielding.

TABLE C.9-11
RISK SUMMARIES FOR OU2 ALTERNATIVES AND SUBUNITS
TRANSPORTATION - RAILWORKERS

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REMEDIAL ACTION RISKS[a]

REMEDIAL ALTERATIVE	RISK	1. ACTIVE FLYASH PILE	2. INACTIVE FLYASH PILE	3. SOUTH FIELD	4. LIME POND	5. SOLID WASTE LANDFILL
1 NO ACTION	ILCR					
	HI					
	PI/F					
	p-rem					
2 CONSOLIDATION AND CAPPING	ILCR					
	HI					
	PI/F					
	p-rem					
3 EXCAVATION AND OFF-SITE DISPOSAL	ILCR	ND	ND	ND	ND	ND
	HI	ND	ND	ND	ND	ND
	PI/F	$0.20/5.2 \times 10^{-2}$	$0.26/7.0 \times 10^{-2}$	$0.87/2.3 \times 10^{-1}$	$0.21/5.6 \times 10^{-2}$	$0.26/7.0 \times 10^{-2}$
	p-rem	8.2×10^{3}	1.1×10^{4}	3.6×19^{4}	8.9×10^{3}	1.1×10^{4}
6 EXCAVATION AND ON-SITE DISPOSAL WITH OFF-SITE DISPOSAL OF FRACTION EXCEEDING WAC	ILCR	ND	ND	ND	ND	ND
	HI	ND	ND	ND	ND	ND
	PI/F	0×10^{0}	6.9×10^{-3}	$0.026/6.9 \times 10^{-3}$		
	p-rem	0×10^{0}	3.0×10^{2}	2.9×10^{1}		

SOURCES:

- THE RAWPA (DOE 1992) AND PREVIOUS FS RISK ASSESSMENTS DEFINE THE SCOPE OF QUANTITATIVE ANALYSIS FOR SHORT-TERM (REMEDIAL ACTION) AND LONG-TERM (RESIDUAL) RISKS. NOTE THAT CARCINOGENIC AND NONCARCINOGENIC RISKS RESULTING FROM ACCIDENTS ARE NOT INDICATED AND THEREFORE HAVE NOT BEEN CALCULATED.

RISKS

- CARCINOGENIC = INCREMENTAL LIFETIME CANCER RISK (ILCR) FROM CHEMICAL AND ALL RADIOLOGICAL IMPACTS (NCP TARGET RANGE IS 10^{-4} TO 10^{-6})
- NON CARCINOGENIC = HAZARD INDEX (HI) (HI NOT TO EXCEED 1.0)
- PHYSICAL INJURY = INJURIES PREDICTED PER WORK HOUR (PI)
- FATALITIES = DEATHS PREDICTED PER WORK HOUR (F)
- WHOLE BODY DOSE EQUIVALENT (PERSON REM, i.e., p=rem)
- DOE ANNUAL DOSE RATE = 5 REM (10CFR20 835)

ND = NOT DETERMINED

▒ = NOT APPLICABLE

- For residual risk analysis, these subunits are modeled as one combined, southern subunit, due to postremediation commingling.

[a]Risks calculated assuming no PPE or shielding.

TABLE C.9-12
RISK SUMMARY FOR OU2 ALTERNATIVES AND SUBUNITS OFF-PROPERTY PUBLIC RECEPTOR ALONG TRANSPORTATION

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RESIDUAL RISKS

REMEDIAL ALTERNATIVE	RISK	1. ACTIVE FLYASH PILE*	2. INACTIVE FLYASH PILE*	3. SOUTH FIELD*	4. LIME SLUDGE POND	5. SOLID WASTE LANDFILL	6.DISPOSAL CELL
1 NO ACTION	ILCR	4.9×10^{-5}	3.0×1^{-5}	1.4×10^{-4}	2.4×10^{-5}	2.0×10^{-5}	
	HI	4.2×10^{-2}	1.0×10^{-1}	8.0×10^{-2}	2.2×10^{-1}	2.7×10^{-1}	
2 CONSOLIDATION AND CAPPING	ILCR	1.2×10^{-6}	1.2×10^{-6}	1.2×10^{-6}	5.9×10^{-15}	1.0×10^{-14}	
	HI	1.3×10^{-1}	1.3×10^{-1}	1.3×10^{-1}	NA	NA	
3 EXCAVATION AND OFF-SITE DISPOSAL	ILCR	2.5×10^{-6}	2.5×10^{-6}	2.5×10^{-6}	2.6×10^{-8}	4.0×10^{-7}	
	HI	1.3×10^{-2}	1.3×10^{-2}	1.3×10^{-2}	2.8×10^{-2}	2.0×10^{-2}	
6 EXCAVATION AND ON-SITE DISPOSAL WITH OFF-SITE DISPOSAL OF FRACTION EXCEEDING WAC	ILCR	2.5×10^{-6}	2.5×10^{-6}	2.5×10^{-6}	2.6×10^{-8}	4.0×10^{-7}	7.3×10^{-14}
	HI	1.3×10^{-2}	1.3×10^{-2}	1.3×10^{-2}	2.8×10^{-2}	2.0×10^{-2}	ND

LEGEND:

SOURCES:

- THE RAWPA (DOE 1992) AND PREVIOUS FS RISK ASSESSMENTS DEFINE THE SCOPE OF QUANTITATIVE ANALYSIS FOR SHORT-TERM (REMEDIAL ACTION) AND LONG-TERM (RESIDUAL) RISKS. NOTE THAT CARCINOGENIC AND NONCARCINOGENIC RISKS RESULTING FROM ACCIDENTS ARE NOT INDICATED AND THEREFORE HAVE NOT BEEN CALCULATED.

RISKS

- CARCINOGENIC = INCREMENTAL LIFETIME CANCER RISK (ILCR) FROM CHEMICAL AND ALL RADIOLOGICAL IMPACTS (NCP TARGET RANGE IS 10^{-4} TO 10^{-6})
- NON CARCINOGENIC = HAZARD INDEX (HI) (HI NOT TO EXCEED 1.0)
- PHYSICAL INJURY = INJURIES PREDICTED PER WORK HOUR (PI)
- FATALITIES = DEATHS PREDICTED PER WORK HOUR (F)
- WHOLE BODY DOSE EQUIVALENT (PERSON REM, i.e., p=rem)
- DOE ANNUAL DOSE RATE = 5 REM (10CFR20 835)

ND = NOT DETERMINED

= NOT APPLICABLE

- For residual risk analysis, these subunits are modeled as one combined, southern subunit, due to postremediation commingling.

TABLE C.9-13
RISK SUMMARIES FOR OU2 ALTERNATIVES AND SUBUNITS EXPANDED TRESPASSER RECEPTOR FEDERAL OWNERSHIP WITH ACCESS CONTROLS FOR THE ENTIRE FEMP

RESIDUAL RISKS

REMEDIAL ALTERNATIVE	RISK	1. ACTIVE FLYASH PILE*	2.INACTIVE FLYASH PILE*	3. SOUTH FIELD*	4. LIME SLUDGE POND	5. SOLID WASTE LANDFILL	6.DISPOSAL CELL
1 NO ACTION	ILCR						
	HI						
2 CONSOLIDATION AND CAPPING	ILCR						
	HI						
3 EXCAVATION AND OFF-SITE DISPOSAL	ILCR						
	HI						
6 EXCAVATION AND ON-SITE DISPOSAL WITH OFF-SITE DISPOSAL OF FRACTION EXCEEDING WAC	ILCR						1.4×10^{-13}
	HI						ND

SOURCES:

- THE RAWPA (DOE 1992) AND PREVIOUS FS RISK ASSESSMENTS DEFINE THE SCOPE OF QUANTITATIVE ANALYSIS FOR SHORT-TERM (REMEDIAL ACTION) AND LONG-TERM (RESIDUAL) RISKS. NOTE THAT CARCINOGENIC AND NONCARCINOGENIC RISKS RESULTING FROM ACCIDENTS ARE NOT INDICATED AND THEREFORE HAVE NOT BEEN CALCULATED.

RISKS

- CARCINOGENIC =INCREMENTAL LIFETIME CANCER RISK (ILCR) FROM CHEMICAL AND ALL RADIOLOGICAL IMPACTS (NCP TARGET RANGE IS 10^{-4} TO 10^{-6})
- NON CARCINOGENIC = HAZARD INDEX (HI) (HI NOT TO EXCEED 1.0)
- PHYSICAL INJURY = INJURIES PREDICTED PER WORK HOUR (PI)
- FATALITIES = DEATHS PREDICTED PER WORK HOUR (F)
- WHOLE BODY DOSE EQUIVALENT (PERSON REM, i.e., p=rem)
- DOE ANNUAL DOSE RATE = 5 REM (10CFR20 835)

ND = NOT DETERMINED

▒ = NOT APPLICABLE

* For residual risk analysis, these subunits are modeled as one combined, southern subunit, due to postremediation commingling.

TABLE C.9-14
RISK FOR OU2 ALTERNATIVES AND SUBUNITS EXPANDED TRESPASSER RECEPTOR FOR PRIVATE OWNERSHIP WITHOUT ACCESS CONTROLS FOR THE FEMP AND FEDERAL OWNERSHIP WITH ACCESS CONTROLS FOR THE DISPOSAL CELL

TABLE C.9-15

SUMMARY OF GREATEST REMEDIAL ACTION AND RESIDUAL RISKS[a] BY ALTERNATIVE ESTIMATED FOR OPERABLE UNIT 2

RECEPTORS	REMEDIAL ALTERNATIVES							
	Alternative 1: No Action		Alternative 2: Consolidation & Capping		Alternative 3: Excavation & Off-Site Disposal		Alternative 6: Excavation & On-Site Disposal with Off-Site Disposal of Fraction Exceeding WAC	
	ILCR	HI	ILCR	HI	ILCR	HI	ILCR	HI
	REMEDIAL ACTION RISKS							
Remedial Worker	NA	NA	2.9E-5[d]	3.4E-3[e,f]	5.1E-5[d]	8.9E-3[e,f]	3.0E-5[e,f]	3.8E-3[h]
Nonremedial Worker	NA	NA	1.3E-6[h]	ND	2.6E-6[d]	ND	2.4E-6[h]	ND
General Public	NA	NA	1.0E-6[e,f]	ND	2.0E-6[d]	ND	1.5E-6[e,f]	ND
Transportation-Railworkers	NA	NA	NA	NA	ND	ND	ND	ND
Off-Property Public Along Transportation Route	NA	NA	NA	NA	ND	ND	ND	ND
	RESIDUAL RISKS							
	Federal Ownership							
Off-Property Farmer	8.7E-5[f]	1.2[e]	1.6E-6[i]	1.8E-2[i]	2.2E-6[i]	2.7E-2[i]	2.2E-6[i]	2.7E-2[i]
Off-Property Child	4.2E-6[f]	3.1[f]	9.3E-8[i]	4.9E-2[i]	1.6E-7[i]	7.2E-2[i]	1.6E-7[i]	7.2E-2[i]
Expanded Trespasser	1.4E-4[f]	0.27[h]	1.2E-6[i]	0.13[i]	2.5E-6[i]	2.8E-2[g]	2.5E-6[i]	2.8E-2[g]

TABLE C.9-15
(Continued)

RECEPTORS	REMEDIAL ALTERNATIVES							
	Alternative 1: No Action		Alternative 2: Consolidation & Capping		Alternative 3: Excavation & Off-Site Disposal		Alternative 6: Excavation & On-Site Disposal with Off-Site Disposal of Fraction Exceeding WAC	
	ILCR	HI	ILCR	HI	ILCR	HI	ILCR	HI
	Private Ownership							
Off-Property Farmer	1.1E-4[f]	1.2[e]	NA	NA	1.4E-7[i]	1.3E-3[i]	1.6E-6[j]	2.6E-2[j]
Off-Property Child	1.5E-5[f]	3.1[f]	NA	NA	7.3E-9[i]	3.5E-3[i]	7.8E-8[i]	6.9E-2[j]
On-Property Resident Farmer	3.4E-2[f]	23[f]	NA	NA	6.4E-6[i]	0.2[h]	6.4E-6[i]	0.2[h]
On-Property Resident Child	9.2E-3[f]	65[f]	NA	NA	4.9E-7[i]	0.76[h]	4.9E-7[i]	0.76[h]
Perched Water User	2.8E-3[h]	3.1E-3[g]	NA	NA	4.8E-6[h]	0.2[h]	4.8E-6[h]	0.2[h]

[a] The estimated risks and hazards presented in this table represent the greatest risk and hazard calculated for the specified alternative. The subunit which poses the greatest risk and/or hazard is denoted by a footnote. Risks were calculated assuming no PPE or shielding.
[b] Incremental Lifetime Cancer Risk
[c] Hazard Index
[d] Active Flyash Pile
[e] Inactive Flyash Pile
[f] South Field
[g] Lime Sludge Ponds
[h] Solid Waste Landfill
[i] Southern Subunit (AFP/IFP/SF)
[j] Disposal Cell
NA - Not Applicable
ND - Not Determined

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Attachment C.I

Model Inputs and Sample Output

RAECOM SAMPLE OUTPUT

OU2 FS Solid Waste Landfill 8/9/94 - Short Term RA

********** INPUT PARAMETERS **********

NUMBER OF LAYERS:	1	
RADON FLUX INTO LAYER 1:	.000	pCi/m2/sec
SURFACE RADON CONCENTRATION:	.000	pCi/LITER
BARE SOURCE FLUX (Jo) FROM LAYER 1:	.7209	pCi/m2/sec

LAYER	THICKNESS (cm)	DIFF COEFF (cm2/SEC)	POROSITY	SOURCE (pCi/cm3/sec)	MOISTURE (dry wt. %)
1	300.	.9362E-02	.4500	.2400E-05	17.00

***** RESULTS OF RADON DIFFUSION CALCULATION*****

LAYER	THICKNESS (cm)	EXIT FLUX (pCi/m2/sec)	EXIT CONC. (pCi/liter)	MIC
1	300.	.7209E+00	.0000E+00	.5849

- 6646

RAECOM INPUT FILES

OU2 FS Active Flyash Pile 8/9/94 - Short Term RA
1,0.,0.,0,0.,0.001
300.,0,0.45,0.0000081,17

OU2 FS Lime Sludge Pond 8/9/94 - Short Term RA
1,0.,0.,0,0.,0.001
300.,0,0.45,0.0000024,17

OU2 FS South Field/Inactive Flyash Pile 8/9/94 - Short Term RA
1,0.,0.,0,0.,0.001
300.,0,0.45,0.0000045,17

OU2 FS Solid Waste Landfill 8/9/94 - Short Term RA
1,0.,0.,0,0.,0.001
300.,0,0.45,0.0000024,17

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ISCLT2 Input File For the OU2 FSRA

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CO STARTING
CO TITLEONE OU2 FS – Annual Conc.: 1 g/s (pCi/s) per m2, 1987–92 Met Data
CO TITLETWO OU2 FD No. 04/424331 G.POLLOCK 8/10/94
CO MODELOPT DFAULT CONC RURAL
CO AVERTIME ANNUAL
CO POLLUTID OTHER
CO TERRHGTS FLAT
CO ELEVUNIT METERS
CO FLAGPOLE 1.500000
CO RUNORNOT RUN
CO FINISHED
SO STARTING
SO LOCATION S_WST_LF AREA   975.00  -122.00     0.00
SO SRCPARAM S_WST_LF 1.000000     0.00    30.50
SO LOCATION SOUT_FLD AREA   975.00 -1524.00     0.00
SO SRCPARAM SOUT_FLD 1.000000     0.00    30.50
SO LOCATION NOR_STAG AREA   975.00  -244.00     0.00
SO SRCPARAM NOR_STAG 1.000000     0.00    30.50
SO LOCATION SOU_STAG AREA   792.00 -1402.00     0.00
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SO SRCPARAM NOR_DRIR 1.000000     5.00   373.00  10.2000    0.500
SO LOCATION SOU_DRIR POINT   792.00 -1402.00     0.00
SO SRCPARAM SOU_DRIR 1.000000     5.00   373.00  10.2000    0.500
SO LOCATION CONS/CAP AREA  1036.00 -1494.00     0.00
SO SRCPARAM CONS/CAP 1.000000     0.00    30.50
SO LOCATION DISP_CEL AREA  1737.00 -1341.00     0.00
SO SRCPARAM DISP_CEL 1.000000     0.00    30.50
SO LOCATION LIME_SLD AREA   945.00  -640.00     0.00
SO SRCPARAM LIME_SLD 1.000000     0.00    30.50
SO LOCATION SILOS AREA   884.00  -457.00     0.00
SO SRCPARAM SILOS 1.000000     0.00    30.50
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SO SRCGROUP SRC2 SOU_STAG
SO SRCGROUP SRC3 SOU_DRIR
SO SRCGROUP SRC4 SOUT_FLD
SO SRCGROUP SRC5 NOR_STAG
SO SRCGROUP SRC6 NOR_DRIR
SO SRCGROUP SRC7 LIME_SLD
SO SRCGROUP SRC8 SOUT_FLD
SO SRCGROUP SRC9 CONS/CAP
SO SRCGROUP SRC10 SILOS
SO FINISHED
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RE GRIDCART NO_1	FLAG 10	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 10	1.83			
RE GRIDCART NO_1	FLAG 11	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 11	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 11	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 11	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 11	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 11	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 11	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 11	1.83			
RE GRIDCART NO_1	FLAG 12	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 12	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 12	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 12	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 12	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 12	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 12	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 12	1.83			
RE GRIDCART NO_1	FLAG 13	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 13	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 13	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 13	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 13	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 13	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 13	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 13	1.83			
RE GRIDCART NO_1	FLAG 14	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 14	1.83	1.83	1.83	1.83

000329

ISCLT2 Input File For the OU2 FSRA

RE GRIDCART NO_1	FLAG 14	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 14	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 14	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 14	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 14	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 14	1.83			
RE GRIDCART NO_1	FLAG 15	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 15	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 15	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 15	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 15	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 15	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 15	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 15	1.83			
RE GRIDCART NO_1	FLAG 16	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 16	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 16	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 16	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 16	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 16	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 16	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 16	1.83			
RE GRIDCART NO_1	FLAG 17	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 17	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 17	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 17	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 17	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 17	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 17	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 17	1.83			
RE GRIDCART NO_1	FLAG 18	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 18	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 18	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 18	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 18	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 18	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 18	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 18	1.83			
RE GRIDCART NO_1	FLAG 19	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 19	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 19	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 19	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 19	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 19	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 19	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 19	1.83			
RE GRIDCART NO_1	FLAG 20	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 20	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 20	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 20	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 20	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 20	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 20	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 20	1.83			
RE GRIDCART NO_1	FLAG 21	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 21	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 21	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 21	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 21	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 21	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 21	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 21	1.83			
RE GRIDCART NO_1	FLAG 22	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 22	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 22	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 22	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 22	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 22	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 22	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 22	1.83			
RE GRIDCART NO_1	FLAG 23	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 23	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 23	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 23	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 23	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 23	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 23	1.83	1.83	1.83	1.83

ISCLT2 Input File For the OU2 FSRA

RE GRIDCART NO_1	FLAG 23	1.83			
RE GRIDCART NO_1	FLAG 24	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 24	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 24	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 24	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 24	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 24	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 24	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 24	1.83			
RE GRIDCART NO_1	FLAG 25	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 25	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 25	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 25	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 25	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 25	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 25	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 25	1.83			
RE GRIDCART NO_1	FLAG 26	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 26	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 26	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 26	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 26	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 26	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 26	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 26	1.83			
RE GRIDCART NO_1	FLAG 27	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 27	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 27	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 27	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 27	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 27	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 27	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 27	1.83			
RE GRIDCART NO_1	FLAG 28	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 28	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 28	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 28	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 28	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 28	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 28	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 28	1.83			
RE GRIDCART NO_1	FLAG 29	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 29	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 29	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 29	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 29	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 29	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 29	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 29	1.83			
RE GRIDCART NO_1	FLAG 30	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 30	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 30	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 30	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 30	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 30	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 30	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 30	1.83			
RE GRIDCART NO_1	FLAG 31	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 31	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 31	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 31	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 31	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 31	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 31	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 31	1.83			
RE GRIDCART NO_1	FLAG 32	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 32	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 32	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 32	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 32	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 32	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 32	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 32	1.83			
RE GRIDCART NO_1	FLAG 33	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 33	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 33	1.83	1.83	1.83	1.83
RE GRIDCART NO_1	FLAG 33	1.83	1.83	1.83	1.83

ISCLT2 Input File For the OU2 FSRA

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RE GRIDCART NO_1  FLAG 33  1.83  1.83  1.83  1.83
RE GRIDCART NO_1  FLAG 33  1.83  1.83  1.83  1.83
RE GRIDCART NO_1  FLAG 33  1.83  1.83  1.83  1.83
RE GRIDCART NO_1  FLAG 33  1.83
RE GRIDCART NO_1  FLAG 34  1.83  1.83  1.83  1.83
RE GRIDCART NO_1  FLAG 34  1.83  1.83  1.83  1.83
RE GRIDCART NO_1  FLAG 34  1.83  1.83  1.83  1.83
RE GRIDCART NO_1  FLAG 34  1.83  1.83  1.83  1.83
RE GRIDCART NO_1  FLAG 34  1.83  1.83  1.83  1.83
RE GRIDCART NO_1  FLAG 34  1.83  1.83  1.83  1.83
RE GRIDCART NO_1  FLAG 34  1.83  1.83  1.83  1.83
RE GRIDCART NO_1  FLAG 34  1.83
RE GRIDCART NO_1  END
RE DISCCART 0.00 366.00 1.830
RE DISCCART 50.00 366.00 1.830
RE DISCCART 99.00 366.00 1.830
RE DISCCART 149.00 366.00 1.830
RE DISCCART 199.00 366.00 1.830
RE DISCCART 248.00 366.00 1.830
RE DISCCART 298.00 366.00 1.830
RE DISCCART 348.00 366.00 1.830
RE DISCCART 397.00 366.00 1.830
RE DISCCART 447.00 366.00 1.830
RE DISCCART 497.00 366.00 1.830
RE DISCCART 546.00 366.00 1.830
RE DISCCART 596.00 366.00 1.830
RE DISCCART 646.00 366.00 0.000
RE DISCCART 695.00 366.00 0.000
RE DISCCART 745.00 366.00 0.000
RE DISCCART 795.00 366.00 0.000
RE DISCCART 844.00 366.00 0.000
RE DISCCART 894.00 366.00 0.000
RE DISCCART 944.00 366.00 0.000
RE DISCCART 993.00 366.00 0.000
RE DISCCART 1043.00 366.00 0.000
RE DISCCART 1093.00 366.00 0.000
RE DISCCART 1142.00 366.00 0.000
RE DISCCART 1192.00 366.00 0.000
RE DISCCART 1242.00 366.00 0.000
RE DISCCART 1291.00 366.00 0.000
RE DISCCART 1341.00 366.00 0.000
RE DISCCART 1341.00 412.00 0.000
RE DISCCART 1341.00 457.00 0.000
RE DISCCART 1387.00 450.00 0.000
RE DISCCART 1433.00 442.00 0.000
RE DISCCART 1478.00 435.00 0.000
RE DISCCART 1524.00 427.00 0.000
RE DISCCART 1567.00 433.00 0.000
RE DISCCART 1609.00 439.00 0.000
RE DISCCART 1652.00 445.00 0.000
RE DISCCART 1694.00 451.00 0.000
RE DISCCART 1737.00 457.00 0.000
RE DISCCART 1779.00 474.00 0.000
RE DISCCART 1822.00 491.00 0.000
RE DISCCART 1864.00 508.00 0.000
RE DISCCART 1906.00 525.00 0.000
RE DISCCART 1949.00 542.00 0.000
RE DISCCART 1991.00 559.00 0.000
RE DISCCART 2033.00 576.00 0.000
RE DISCCART 2076.00 593.00 0.000
RE DISCCART 2118.00 610.00 0.000
RE DISCCART 2116.00 563.00 0.000
RE DISCCART 2113.00 516.00 0.000
RE DISCCART 2111.00 469.00 0.000
RE DISCCART 2109.00 422.00 0.000
RE DISCCART 2106.00 375.00 0.000
RE DISCCART 2104.00 328.00 0.000
RE DISCCART 2102.00 282.00 0.000
RE DISCCART 2100.00 235.00 0.000
RE DISCCART 2097.00 188.00 0.000
RE DISCCART 2095.00 141.00 0.000
RE DISCCART 2093.00 94.00 0.000
RE DISCCART 2090.00 47.00 0.000
RE DISCCART 2088.00 0.00 0.000
RE DISCCART 2057.00 0.00 0.000
RE DISCCART 2058.00 -49.00 0.000
RE DISCCART 2059.00 -98.00 0.000
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ISCLT2 Input File For the OU2 FSRA

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RE DISCCART 2060.00 -147.00 0.000
RE DISCCART 2061.00 -196.00 0.000
RE DISCCART 2063.00 -245.00 0.000
RE DISCCART 2064.00 -294.00 0.000
RE DISCCART 2065.00 -343.00 0.000
RE DISCCART 2066.00 -392.00 0.000
RE DISCCART 2067.00 -441.00 0.000
RE DISCCART 2068.00 -490.00 0.000
RE DISCCART 2069.00 -539.00 0.000
RE DISCCART 2070.00 -588.00 0.000
RE DISCCART 2071.00 -637.00 0.000
RE DISCCART 2073.00 -686.00 0.000
RE DISCCART 2074.00 -735.00 0.000
RE DISCCART 2075.00 -784.00 0.000
RE DISCCART 2076.00 -833.00 0.000
RE DISCCART 2077.00 -882.00 0.000
RE DISCCART 2078.00 -931.00 0.000
RE DISCCART 2079.00 -980.00 0.000
RE DISCCART 2080.00 -1029.00 0.000
RE DISCCART 2081.00 -1078.00 0.000
RE DISCCART 2083.00 -1127.00 0.000
RE DISCCART 2084.00 -1176.00 0.000
RE DISCCART 2085.00 -1225.00 0.000
RE DISCCART 2086.00 -1274.00 0.000
RE DISCCART 2087.00 -1323.00 0.000
RE DISCCART 2088.00 -1372.00 0.000
RE DISCCART 2090.00 -1422.00 0.000
RE DISCCART 2092.00 -1471.00 0.000
RE DISCCART 2094.00 -1521.00 0.000
RE DISCCART 2096.00 -1570.00 0.000
RE DISCCART 2097.00 -1620.00 0.000
RE DISCCART 2099.00 -1669.00 0.000
RE DISCCART 2101.00 -1719.00 0.000
RE DISCCART 2103.00 -1768.00 0.000
RE DISCCART 2059.00 -1778.00 0.000
RE DISCCART 2015.00 -1788.00 0.000
RE DISCCART 1971.00 -1798.00 0.000
RE DISCCART 1927.00 -1808.00 0.000
RE DISCCART 1883.00 -1819.00 0.000
RE DISCCART 1839.00 -1829.00 0.000
RE DISCCART 1795.00 -1839.00 0.000
RE DISCCART 1751.00 -1849.00 0.000
RE DISCCART 1707.00 -1859.00 0.000
RE DISCCART 1661.00 -1872.00 0.000
RE DISCCART 1616.00 -1885.00 0.000
RE DISCCART 1570.00 -1898.00 0.000
RE DISCCART 1524.00 -1911.00 0.000
RE DISCCART 1478.00 -1924.00 0.000
RE DISCCART 1433.00 -1937.00 0.000
RE DISCCART 1387.00 -1950.00 0.000
RE DISCCART 1341.00 -1964.00 0.000
RE DISCCART 1296.00 -1977.00 0.000
RE DISCCART 1250.00 -1990.00 0.000
RE DISCCART 1204.00 -2003.00 0.000
RE DISCCART 1158.00 -2016.00 0.000
RE DISCCART 1113.00 -2029.00 0.000
RE DISCCART 1067.00 -2042.00 0.000
RE DISCCART 1021.00 -2032.00 0.000
RE DISCCART 975.00 -2022.00 0.000
RE DISCCART 930.00 -2011.00 0.000
RE DISCCART 884.00 -2001.00 0.000
RE DISCCART 838.00 -1991.00 0.000
RE DISCCART 792.00 -1981.00 0.000
RE DISCCART 762.00 -1961.00 0.000
RE DISCCART 731.00 -1940.00 0.000
RE DISCCART 701.00 -1920.00 0.000
RE DISCCART 691.00 -1879.00 0.000
RE DISCCART 681.00 -1839.00 0.000
RE DISCCART 671.00 -1798.00 0.000
RE DISCCART 653.00 -1761.00 0.000
RE DISCCART 634.00 -1725.00 0.000
RE DISCCART 616.00 -1688.00 0.000
RE DISCCART 597.00 -1652.00 0.000
RE DISCCART 579.00 -1615.00 0.000
RE DISCCART 552.00 -1574.00 0.000
RE DISCCART 525.00 -1534.00 0.000
RE DISCCART 498.00 -1493.00 0.000
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ISCLT2 Input File For the OU2 FSRA

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RE DISCCART 471.00 -1453.00 0.000
RE DISCCART 443.00 -1412.00 0.000
RE DISCCART 416.00 -1372.00 0.000
RE DISCCART 389.00 -1331.00 0.000
RE DISCCART 362.00 -1291.00 0.000
RE DISCCART 335.00 -1250.00 0.000
RE DISCCART 305.00 -1219.00 0.000
RE DISCCART 305.00 -1181.00 0.000
RE DISCCART 305.00 -1143.00 0.000
RE DISCCART 305.00 -1105.00 0.000
RE DISCCART 305.00 -1067.00 0.000
RE DISCCART 290.00 -1021.00 0.000
RE DISCCART 274.00 -975.00 0.000
RE DISCCART 270.00 -937.00 0.000
RE DISCCART 267.00 -899.00 0.000
RE DISCCART 263.00 -861.00 0.000
RE DISCCART 259.00 -823.00 0.000
RE DISCCART 247.00 -775.00 0.000
RE DISCCART 236.00 -726.00 0.000
RE DISCCART 224.00 -678.00 0.000
RE DISCCART 212.00 -629.00 0.000
RE DISCCART 201.00 -581.00 0.000
RE DISCCART 189.00 -533.00 0.000
RE DISCCART 177.00 -484.00 0.000
RE DISCCART 166.00 -436.00 0.000
RE DISCCART 154.00 -387.00 0.000
RE DISCCART 143.00 -339.00 0.000
RE DISCCART 131.00 -290.00 0.000
RE DISCCART 119.00 -242.00 0.000
RE DISCCART 108.00 -194.00 0.000
RE DISCCART 96.00 -145.00 0.000
RE DISCCART 84.00 -97.00 0.000
RE DISCCART 73.00 -48.00 0.000
RE DISCCART 61.00 0.00 0.000
RE DISCCART 31.00 0.00 0.000
RE DISCCART 0.00 0.00 0.000
RE DISCCART 0.00 46.00 0.000
RE DISCCART 0.00 92.00 0.000
RE DISCCART 0.00 137.00 0.000
RE DISCCART 0.00 183.00 0.000
RE DISCCART 0.00 229.00 0.000
RE DISCCART 0.00 275.00 0.000
RE DISCCART 0.00 320.00 0.000
RE DISCCART 0.00 366.00 0.000
RE GRIDCART NO_2  STA
RE GRIDCART NO_2  XYINC -250.00 28 100.00 -2350.00 33 100.00
RE GRIDCART NO_2  FLAG 1  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 1  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 1  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 1  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 1  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 1  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 1  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 2  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 2  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 2  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 2  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 2  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 2  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 2  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 3  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 3  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 3  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 3  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 3  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 3  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 4  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 4  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 4  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 4  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 4  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 4  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 4  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 5  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 5  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 5  1.83  1.83  1.83  1.83
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6646

ISCLT2 Input File For the OU2 FSRA

RE GRIDCART NO_2	FLAG 5	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 5	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 5	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 5	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 6	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 6	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 6	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 6	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 6	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 6	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 6	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 7	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 7	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 7	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 7	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 7	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 7	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 8	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 8	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 8	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 8	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 8	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 8	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 8	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 9	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 9	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 9	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 9	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 9	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 9	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 9	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 10	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 10	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 10	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 10	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 10	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 10	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 10	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 11	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 11	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 11	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 11	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 11	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 11	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 11	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 12	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 12	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 12	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 12	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 12	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 12	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 12	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 13	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 13	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 13	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 13	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 13	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 13	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 13	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 14	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 14	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 14	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 14	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 14	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 14	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 14	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 15	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 15	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 15	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 15	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 15	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 15	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 15	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 16	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 16	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 16	1.83	1.83	1.83	1.83

ISCLT2 Input File For the OU2 FSRA

RE GRIDCART NO_2	FLAG 16	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 16	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 16	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 16	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 17	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 17	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 17	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 17	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 17	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 17	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 18	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 18	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 18	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 18	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 18	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 18	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 18	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 19	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 19	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 19	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 19	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 19	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 19	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 19	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 20	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 20	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 20	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 20	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 20	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 20	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 20	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 21	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 21	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 21	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 21	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 21	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 21	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 21	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 22	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 22	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 22	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 22	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 22	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 22	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 22	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 23	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 23	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 23	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 23	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 23	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 23	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 23	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 24	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 24	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 24	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 24	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 24	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 24	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 24	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 25	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 25	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 25	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 25	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 25	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 25	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 25	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 26	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 26	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 26	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 26	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 26	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 26	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 26	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 27	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 27	1.83	1.83	1.83	1.83
RE GRIDCART NO_2	FLAG 27	1.83	1.83	1.83	1.83

6646

ISCLT2 Input File For the OU2 FSRA

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RE GRIDCART NO_2  FLAG 27  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 27  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 27  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 27  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 28  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 28  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 28  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 28  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 28  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 28  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 28  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 29  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 29  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 29  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 29  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 29  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 29  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 29  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 30  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 30  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 30  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 30  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 30  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 30  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 31  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 31  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 31  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 31  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 31  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 31  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 31  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 32  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 32  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 32  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 32  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 32  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 32  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 32  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 33  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 33  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 33  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 33  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 33  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  FLAG 33  1.83  1.83  1.83  1.83
RE GRIDCART NO_2  END
RE FINISHED
ME STARTING
ME INPUTFIL C:\MODEL\JFD8792.STR (7X,6F7.5)
ME ANEMHGHT  10.000 METERS
ME SURFDATA 93814 1987 FERNALD
ME UAIRDATA 13840 1987 DAYTON
ME AVETEMPS ANNUAL 290.00 289.00 288.00 283.00 283.00 283.00
ME AVEMIXHT ANNUAL A 1823.00 1991.00 1791.00 1695.00 1629.00 2313.00
ME AVEMIXHT ANNUAL B 1215.00 1327.00 1194.00 1130.00 1086.00 1542.00
ME AVEMIXHT ANNUAL C 1215.00 1327.00 1194.00 1130.00 1086.00 1542.00
ME AVEMIXHT ANNUAL D 1215.00 1327.00 1194.00 1130.00 1086.00 1542.00
ME AVEMIXHT ANNUAL E 5000.00 5000.00 5000.00 5000.00 5000.00 5000.00
ME AVEMIXHT ANNUAL F 5000.00 5000.00 5000.00 5000.00 5000.00 5000.00
ME FINISHED
OU STARTING
OU RECTABLE SRCGRP
OU MAXTABLE 10 SRCGRP SOCONT
OU PLOTFILE ANNUAL SRC1 C:\MODEL\OU2.GPH 70
OU FINISHED
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000337

* ISCLT2 Output (93109): OU2 FS – Annual Conc.: 1 g/s (pCi/s) per m2

X	Y	N Dryer (g/m3)/(g/s)	S Dryer (g/m3)/(g/s)
-150	-1850	0.002923	0.003524
-50	-1850	0.003003	0.004052
-250	-1450	0.003378	0.007014
2250	-1250	0.003199	0.004573
250	-1850	0.003225	0.00659
2350	-1250	0.003051	0.004243
150	-1850	0.003154	0.005518
2450	-1250	0.002905	0.003951
-250	-1150	0.003241	0.006052
250	-1350	0.004382	0.013601
50	-1850	0.00308	0.004698
2450	-1550	0.002583	0.003931
1450	-1950	0.001998	0.006091
2150	-1250	0.003349	0.004949
1950	-1950	0.002083	0.004297
-250	-1850	0.002841	0.003083
2450	-1950	0.002093	0.003201
2350	-1950	0.002103	0.003375
2250	-1950	0.002108	0.003561
2050	-1950	0.002099	0.004005
1850	-1950	0.002059	0.004612
150	-1350	0.004208	0.011605
1750	-1950	0.002028	0.00495
1650	-1950	0.002005	0.005314
1550	-1950	0.002007	0.005691
-50	-1350	0.003872	0.008963
50	-1350	0.004038	0.010124
2150	-1950	0.002107	0.003757
650	-1950	0.00248	0.008182
-150	-1150	0.003587	0.00657
1050	-2050	0.001745	0.007159
1750	-2050	0.001863	0.00463
1650	-2050	0.001862	0.004923
1550	-2050	0.001868	0.005223
1450	-2050	0.001864	0.005519
1350	-2050	0.001851	0.005899
1250	-2050	0.001826	0.006341
1150	-2050	0.001791	0.006823
950	-2050	0.001755	0.006022
1950	-2050	0.001927	0.004079
850	-2050	0.001953	0.004472
750	-2050	0.00214	0.004347
650	-2050	0.002314	0.006345
550	-2050	0.002472	0.007957
450	-2050	0.002613	0.007727
350	-2050	0.002736	0.007056
250	-2050	0.00284	0.006497
1850	-2050	0.001899	0.004348
2150	-2050	0.001961	0.003586
2050	-2050	0.001948	0.003825
-50	-1150	0.003979	0.007151
350	-1950	0.002956	0.007579
50	-1150	0.004422	0.007817
150	-1150	0.004703	0.008586
250	-1150	0.004952	0.009396
-150	-1450	0.003544	0.007721
450	-1850	0.003056	0.00925
550	-1950	0.00266	0.009709
450	-1950	0.002819	0.008497
250	-1950	0.003042	0.006859
2250	-2050	0.001968	0.003363
150	-1950	0.002983	0.005865
50	-1950	0.00292	0.005047
-50	-1950	0.002854	0.004383
-150	-1950	0.002784	0.003826
-250	-1950	0.002711	0.003362
2450	-2050	0.001965	0.003005
2350	-2050	0.00197	0.003156
350	-1850	0.00321	0.007961
2050	-1850	0.002263	0.004309
550	-1850	0.002876	0.011154
2250	-1350	0.003053	0.004754
2150	-1450	0.003007	0.005153
350	-1650	0.003734	0.006556
250	-1650	0.003637	0.005143

Max N Dryer (g/m3)/(g/s) 0.009178

Max S Dryer (g/m3)/(g/s) 0.020842

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• ISCLT2 Output (93109): OU2 FS – Annual Conc.: 1 g/s (pCi/s) per m2

X	Y	N Dryer (g/m3)/(g/s)	S Dryer (g/m3)/(g/s)
150	-1650	0.003536	0.004837
50	-1650	0.003433	0.005123
2450	-1350	0.002794	0.004087
2350	-1350	0.002923	0.004399
450	-1650	0.003659	0.008816
-250	-1250	0.003314	0.006672
-50	-1650	0.003328	0.005149
-150	-1650	0.003221	0.005039
-250	-1650	0.003115	0.004852
-150	-1250	0.003648	0.007322
2250	-1450	0.002914	0.004747
2150	-1550	0.002805	0.004907
550	-1650	0.003424	0.012451
50	-1250	0.004253	0.009
2150	-1650	0.002613	0.004636
-150	-1550	0.00338	0.006364
-250	-1550	0.00326	0.005928
2450	-1650	0.002483	0.003763
2350	-1650	0.002557	0.004022
2250	-1650	0.002588	0.004312
-50	-1450	0.003685	0.008552
2350	-1450	0.002801	0.004394
450	-1450	0.004406	0.01692
2150	-1350	0.003181	0.005163
50	-1450	0.003827	0.009556
150	-1450	0.003972	0.010788
250	-1450	0.004117	0.012371
350	-1450	0.004262	0.014432
-50	-1250	0.004022	0.008084
250	-1250	0.004661	0.011551
150	-1250	0.004453	0.010124
650	-1850	0.00267	0.011338
1850	-1850	0.002236	0.004882
2450	-1850	0.002228	0.003394
2350	-1850	0.002246	0.003597
2250	-1850	0.002259	0.003817
2150	-1850	0.002265	0.004054
1950	-1850	0.002254	0.004579
350	-1350	0.004559	0.016401
1750	-1850	0.002211	0.005283
-150	-1750	0.003069	0.003803
2250	-1550	0.002766	0.00454
2350	-1550	0.002684	0.004217
2450	-1450	0.002687	0.004083
-250	-1350	0.003358	0.007251
-150	-1350	0.003677	0.008028
-250	-1750	0.002976	0.003827
50	-1750	0.003251	0.004209
-50	-1750	0.003161	0.003636
2450	-1750	0.00237	0.003583
150	-1550	0.003747	0.00767
2350	-1750	0.002397	0.003814
2250	-1750	0.002419	0.004069
2150	-1750	0.002433	0.00435
-50	-1550	0.003503	0.006816
50	-1550	0.003625	0.007269
350	-1550	0.003987	0.007719
250	-1550	0.003868	0.007918
150	-1750	0.003339	0.004977
650	-1750	0.002891	0.016874
550	-1750	0.003128	0.012491
450	-1750	0.003333	0.009629
350	-1750	0.003503	0.0075
250	-1750	0.003423	0.006016
450	-1550	0.004047	0.007007
-300	-2400	0.002184	0.003764
2150	-1150	0.003527	0.004707
1750	550	0.004698	0.001723
2350	550	0.003526	0.001989
2250	550	0.003746	0.001966
2150	550	0.003971	0.001935
1950	550	0.004402	0.001848
1850	550	0.004585	0.00179
1650	550	0.004667	0.001646
-250	650	0.002538	0.001695

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ISCLT2 Output (93109): OU2 FS – Annual Conc.: 1 g/s (pCi/s) per m2

X	Y	N Dryer (g/m3)/(g/s)	S Dryer (g/m3)/(g/s)
1550	550	0.004592	0.00163
1450	550	0.004476	0.00168
1350	550	0.004335	0.001727
1250	550	0.004428	0.00177
1150	550	0.004708	0.001808
2450	550	0.003315	0.002004
-50	650	0.002485	0.001898
-150	650	0.002529	0.001799
950	550	0.005129	0.001869
750	650	0.004643	0.001797
1250	650	0.004039	0.001672
1150	650	0.004262	0.001705
1050	650	0.004454	0.001733
950	650	0.004593	0.001756
850	650	0.004649	0.001773
650	650	0.004583	0.00183
50	650	0.002397	0.001906
550	650	0.004272	0.001858
450	650	0.003792	0.00188
350	650	0.003345	0.001896
250	650	0.002941	0.001905
150	650	0.002581	0.001908
1050	550	0.004949	0.001841
850	550	0.005221	0.00189
1450	650	0.003973	0.001594
750	450	0.005985	0.002046
1250	450	0.004898	0.001877
1150	450	0.005246	0.001921
1050	450	0.005537	0.00196
950	450	0.005772	0.001993
850	450	0.005965	0.002018
650	450	0.005617	0.002081
1450	450	0.005049	0.001773
550	450	0.004833	0.002109
450	450	0.004131	0.002129
350	450	0.003523	0.002142
250	450	0.003221	0.002146
150	450	0.003357	0.002143
1350	450	0.004946	0.001827
2150	450	0.00415	0.002078
1550	450	0.005128	0.001716
750	550	0.005214	0.001915
150	550	0.002753	0.002021
650	550	0.005127	0.00195
550	550	0.004536	0.001978
450	550	0.003964	0.001999
350	550	0.003447	0.002013
250	550	0.002986	0.002021
50	550	0.002862	0.002015
2250	450	0.003893	0.002105
-50	550	0.00291	0.001968
-150	550	0.002914	0.001852
-250	550	0.002885	0.001739
2450	450	0.003411	0.002135
2350	450	0.003646	0.002124
1350	650	0.003817	0.001635
1650	650	0.004198	0.001515
1550	650	0.004102	0.001551
-50	450	0.003397	0.002032
150	850	0.002519	0.001708
650	850	0.003767	0.001624
550	850	0.003713	0.00165
450	850	0.003448	0.001672
350	850	0.003118	0.001689
250	850	0.002807	0.001701
50	850	0.002255	0.001711
850	850	0.003786	0.001573
-50	850	0.002017	0.00171
-150	850	0.001891	0.001696
-250	850	0.001949	0.001608
2450	750	0.003133	0.001768
2350	750	0.003306	0.001746
750	850	0.003792	0.001592
1050	850	0.003659	0.001544
950	850	0.003746	0.00156

• ISCLT2 Output (93109): OU2 FS – Annual Conc.: 1 g/s (pCi/s) per m2

X	Y	N Dryer (g/m3)/(g/s)	S Dryer (g/m3)/(g/s)
2150	750	0.003653	0.001683
1850	850	0.003564	0.001423
2350	850	0.003203	0.001638
2250	850	0.003359	0.001608
2150	850	0.003511	0.001572
2050	850	0.003627	0.001529
1950	850	0.003607	0.00148
1750	850	0.003495	0.00136
1150	850	0.003537	0.001523
1650	850	0.003398	0.001371
1550	850	0.003275	0.001406
1450	850	0.003129	0.00144
1350	850	0.003229	0.001471
1250	850	0.003392	0.001498
2250	750	0.003481	0.001718
2050	750	0.003817	0.001641
1750	650	0.00426	0.00159
2450	650	0.003223	0.001882
150	750	0.002557	0.001804
50	750	0.002268	0.001805
−50	750	0.002117	0.001801
−150	750	0.002189	0.001747
−250	750	0.002226	0.001651
2350	650	0.003414	0.001863
350	750	0.003233	0.001788
2250	650	0.003609	0.001837
2150	650	0.003806	0.001804
2050	650	0.003996	0.001763
1950	650	0.004171	0.001714
1850	650	0.00429	0.001656
250	750	0.002879	0.001799
550	750	0.004019	0.001749
450	750	0.003816	0.001771
1950	750	0.003937	0.001592
1350	750	0.003498	0.001549
1850	750	0.003912	0.001534
1750	750	0.003859	0.001469
1650	750	0.003776	0.001436
1550	750	0.003662	0.001476
1450	750	0.003521	0.001514
1250	750	0.003699	0.001581
650	750	0.004141	0.001722
1150	750	0.003879	0.00161
1050	750	0.004029	0.001634
950	750	0.004138	0.001654
850	750	0.004183	0.001668
750	750	0.004185	0.00169
50	450	0.003406	0.002133
−150	450	0.003346	0.001905
2250	−1150	0.003354	0.004368
2350	−750	0.003845	0.003261
50	−650	0.003456	0.002921
−50	−650	0.003255	0.003013
−150	−650	0.003304	0.003089
−250	−650	0.003289	0.003107
2450	−750	0.003634	0.003088
2250	−750	0.004067	0.003493
2150	−650	0.004703	0.003614
2150	−750	0.004335	0.003741
150	−750	0.004359	0.003446
50	−750	0.003795	0.003565
−50	−750	0.003324	0.003652
−150	−750	0.002931	0.003657
150	−650	0.00398	0.003395
2350	−650	0.004134	0.00318
2250	−650	0.004408	0.003391
2450	−850	0.003384	0.003274
2250	−550	0.004745	0.003294
−50	−450	0.005351	0.002516
−150	−450	0.005054	0.002221
−250	−450	0.004767	0.002278
2450	−550	0.004124	0.002919
2350	−550	0.004418	0.003102
2150	−550	0.005109	0.003495
2450	−650	0.003882	0.002982

• ISCLT2 Output (93109): OU2 FS – Annual Conc.: 1 g/s (pCi/s) per m2

X	Y	N Dryer (g/m3)/(g/s)	S Dryer (g/m3)/(g/s)
150	-550	0.004222	0.003314
50	-550	0.004308	0.002895
-50	-550	0.004265	0.002527
-150	-550	0.004154	0.0026
-250	-550	0.004012	0.002664
-250	-750	0.002612	0.003609
2350	-850	0.003608	0.003464
150	-450	0.00587	0.003215
150	-1050	0.004895	0.006968
2450	-1050	0.003138	0.003633
2350	-1050	0.003322	0.003876
2250	-1050	0.003516	0.004145
2150	-1050	0.003717	0.004446
250	-1050	0.005247	0.007254
50	-1050	0.004359	0.006606
-150	-950	0.00335	0.005037
-50	-1050	0.003894	0.006221
-150	-1050	0.003489	0.00581
-250	-1050	0.003136	0.005418
2450	-1150	0.00302	0.003799
2350	-1150	0.003184	0.004067
-250	-950	0.002995	0.004789
50	-950	0.00424	0.005434
-50	-950	0.003761	0.005261
2250	-850	0.003856	0.00367
-150	-850	0.003184	0.004307
2150	-850	0.004123	0.003892
250	-850	0.005315	0.004191
150	-850	0.004632	0.004326
50	-850	0.004055	0.004418
-50	-850	0.003572	0.004402
-250	-850	0.002816	0.004171
150	-950	0.004803	0.005524
2450	-950	0.003257	0.003457
2350	-950	0.003464	0.003673
2250	-950	0.003684	0.003911
2150	-950	0.003916	0.004172
250	-950	0.005465	0.005474
50	-450	0.005633	0.002847
2250	-450	0.005071	0.003201
2150	-450	0.005505	0.003382
-250	450	0.003269	0.001781
2350	50	0.004542	0.002657
2150	150	0.004933	0.00258
-50	150	0.00521	0.002222
-150	150	0.004892	0.002054
-250	150	0.004598	0.001896
2450	50	0.004225	0.002544
2250	50	0.004899	0.002771
2350	150	0.004282	0.002586
2150	50	0.005303	0.002775
-50	50	0.005861	0.002283
-150	50	0.005439	0.002099
-250	50	0.005064	0.001926
2450	-50	0.004432	0.002607
2250	150	0.004591	0.002591
-250	250	0.004137	0.001861
2450	150	0.004003	0.002481
2250	-50	0.005189	0.002854
-150	350	0.003826	0.001957
2450	350	0.003534	0.002275
2350	350	0.003772	0.002269
2250	350	0.004052	0.002255
2150	350	0.004348	0.002232
-50	350	0.003947	0.002096
-250	350	0.003688	0.001823
-150	250	0.00435	0.002007
2450	250	0.003771	0.002419
2350	250	0.004011	0.002425
2250	250	0.004273	0.002417
2150	250	0.004566	0.002399
-50	250	0.004558	0.002159
2350	-50	0.004786	0.00273
2150	-50	0.005654	0.002975
2350	-450	0.004691	0.003025

* ISCLT2 Output (93109): OU2 FS – Annual Conc.: 1 g/s (pCi/s) per m2

X	Y	N Dryer (g/m3)/(g/s)	S Dryer (g/m3)/(g/s)
2150	-350	0.005878	0.003274
-150	-250	0.006882	0.002202
-250	-250	0.006283	0.001978
2450	-350	0.004569	0.002795
2350	-350	0.004945	0.00295
2250	-350	0.005376	0.00311
50	-2050	0.00277	0.005269
50	-250	0.008439	0.002714
50	-350	0.007033	0.002785
-50	-350	0.006475	0.002488
-150	-350	0.005974	0.002218
-250	-350	0.005531	0.001976
2450	-450	0.004355	0.002857
-50	-250	0.007593	0.002447
2250	-250	0.00565	0.003023
2150	-250	0.006213	0.00317
50	-50	0.007118	0.002558
2250	-150	0.005452	0.002937
-50	-50	0.006511	0.002343
-150	-50	0.00598	0.00214
-250	-50	0.005521	0.001951
2450	-150	0.004619	0.00267
2350	-150	0.005005	0.002803
2150	-150	0.005973	0.003071
2350	-250	0.005172	0.002876
50	-150	0.007876	0.002637
-50	-150	0.00713	0.002398
-150	-150	0.006495	0.002175
-250	-150	0.005954	0.001969
2450	-250	0.004761	0.002733
150	-2050	0.002824	0.006026
2057	0	0.005936	0.002864
-50	-2050	0.002712	0.00461
-150	-2050	0.002651	0.004053
-300	-900	0.002753	0.004374
2300	-1000	0.003495	0.003899
2400	-1000	0.003294	0.003658
2500	-1000	0.003104	0.00344
-100	-900	0.00346	0.004747
-200	-900	0.00308	0.004571
2100	-1000	0.003926	0.004461
0	-900	0.003905	0.004871
100	-900	0.00443	0.004915
200	-900	0.005052	0.004835
2200	-1000	0.003706	0.004166
200	-1000	0.005166	0.006286
2200	-900	0.003892	0.003909
2400	-1100	0.003165	0.003842
2100	-1100	0.003715	0.004754
2200	-1100	0.003527	0.004414
2300	-1100	0.003343	0.004112
-300	-1000	0.00291	0.004948
2500	-1100	0.002994	0.0036
100	-1000	0.004572	0.006119
-200	-1000	0.003241	0.005267
-100	-1000	0.003622	0.005583
0	-1000	0.004062	0.005871
2100	-900	0.004148	0.00416
2300	-900	0.003651	0.003678
200	-1100	0.004962	0.008033
100	-700	0.003897	0.003165
-200	-700	0.002931	0.003362
-100	-700	0.002979	0.003349
0	-700	0.003395	0.003269
2100	-700	0.004636	0.003799
200	-700	0.0045	0.003706
2500	-800	0.003417	0.003098
2200	-700	0.004367	0.003557
2300	-700	0.004111	0.003329
2400	-700	0.003872	0.003115
-300	-700	0.002945	0.003329
2400	-800	0.003603	0.003268
2400	-900	0.003425	0.003466
-100	-800	0.003246	0.004
2500	-900	0.003214	0.003271

• ISCLT2 Output (93109): OU2 FS – Annual Conc.: 1 g/s (pCi/s) per m2

X	Y	N Dryer (g/m3)/(g/s)	S Dryer (g/m3)/(g/s)
-300	-800	0.002561	0.003826
-200	-800	0.002876	0.003932
100	-800	0.00421	0.003911
0	-800	0.003684	0.004005
2300	-800	0.00381	0.003452
200	-800	0.004835	0.003782
2100	-800	0.004379	0.003946
2200	-800	0.004083	0.003674
300	-1100	0.005244	0.008529
100	-1100	0.004648	0.007504
-300	-600	0.003596	0.002883
2100	-1400	0.003142	0.005494
200	-1400	0.004168	0.01329
300	-1400	0.004327	0.015978
400	-1400	0.004488	0.019876
2300	-1400	0.002922	0.004645
2200	-1400	0.003042	0.005038
0	-1400	0.003855	0.009959
2400	-1400	0.002801	0.004303
2500	-1400	0.00268	0.004003
-300	-1300	0.003189	0.006651
100	-1400	0.00401	0.011396
-100	-1400	0.003702	0.008831
-100	-1300	0.003843	0.008089
2100	-1500	0.002926	0.005249
300	-1500	0.004056	0.010563
400	-1500	0.004187	0.011271
500	-1500	0.004133	0.010833
2300	-1500	0.002795	0.004471
2200	-1500	0.002882	0.004833
-200	-1400	0.003522	0.007916
2400	-1500	0.002688	0.004154
2500	-1500	0.002581	0.003873
-300	-1400	0.003226	0.00715
-200	-1300	0.003499	0.007313
0	-1300	0.004055	0.009027
0	-1100	0.004162	0.006951
2300	-1200	0.003196	0.00431
300	-1200	0.004924	0.011158
2100	-1200	0.003517	0.005029
2200	-1200	0.003356	0.004646
2500	-1200	0.002887	0.003749
2400	-1200	0.003039	0.004013
100	-1200	0.004469	0.008861
-300	-1100	0.003034	0.005526
-200	-1100	0.003363	0.005957
-100	-1100	0.003736	0.00643
200	-1200	0.00469	0.009893
0	-1200	0.004214	0.007998
100	-1300	0.004237	0.010192
2200	-1300	0.003194	0.004856
200	-1300	0.004424	0.011677
300	-1300	0.004617	0.01368
2100	-1300	0.003332	0.005278
2400	-1300	0.002917	0.004168
2300	-1300	0.003056	0.004489
-100	-1200	0.003808	0.007272
2500	-1300	0.002782	0.003884
-300	-1200	0.003126	0.006102
-200	-1200	0.003447	0.006649
2500	-700	0.003649	0.002922
-100	-600	0.003743	0.002792
-200	-600	0.003688	0.002863
100	-1500	0.003792	0.0088
2100	100	0.005323	0.002668
-300	100	0.004676	0.001832
-200	100	0.004994	0.001993
-100	100	0.005345	0.002164
2300	100	0.004575	0.002676
2200	100	0.004928	0.00268
2400	0	0.004493	0.002634
2400	100	0.00426	0.002567
2500	100	0.003978	0.002459
-300	200	0.004245	0.001806
2500	0	0.004178	0.002517

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• ISCLT2 Output (93109): OU2 FS – Annual Conc.: 1 g/s (pCi/s) per m2

X	Y	N Dryer (g/m3)/(g/s)	S Dryer (g/m3)/(g/s)
2300	0	0.00485	0.002753
-100	200	0.004754	0.00211
2500	-100	0.004361	0.002576
2200	-100	0.005562	0.002959
2300	-100	0.005104	0.002831
2400	-100	0.004707	0.002702
-200	0	0.005496	0.002028
-300	0	0.005104	0.001854
2200	0	0.005257	0.002871
-100	0	0.005942	0.002215
0	0	0.006451	0.002414
2100	0	0.005723	0.002873
-200	200	0.004492	0.001954
2100	200	0.00491	0.002477
0	-100	0.007152	0.002483
300	400	0.003511	0.002213
0	400	0.003693	0.002132
100	400	0.003714	0.002202
200	400	0.003666	0.002211
500	400	0.004587	0.002191
400	400	0.003865	0.002206
-200	400	0.00353	0.001866
600	400	0.005433	0.002167
700	400	0.006379	0.002136
800	400	0.006491	0.002098
-100	400	0.003626	0.001997
-300	400	0.003416	0.00174
2200	200	0.004585	0.002496
-300	300	0.003822	0.001775
2300	200	0.004287	0.002506
2400	200	0.004014	0.0025
2500	200	0.003767	0.002401
-100	300	0.004166	0.002054
-200	300	0.003997	0.001911
2500	300	0.003548	0.002343
2200	300	0.004293	0.002325
2300	300	0.003992	0.002341
2400	300	0.003762	0.002348
2100	-100	0.006097	0.003085
-100	-100	0.006523	0.002263
0	-600	0.003733	0.002711
2500	-500	0.004097	0.002804
2200	-500	0.005104	0.003342
2300	-500	0.004728	0.003154
2400	-500	0.004395	0.002974
-200	-400	0.005327	0.002092
-300	-400	0.004979	0.002143
100	-500	0.005005	0.003064
-100	-400	0.005708	0.002359
0	-400	0.006118	0.002656
100	-400	0.006539	0.002986
2100	-500	0.005527	0.003535
0	-500	0.004889	0.002693
2200	-400	0.005453	0.003241
2200	-600	0.004738	0.003447
100	-600	0.003605	0.003127
200	-600	0.004041	0.003602
2100	-600	0.005082	0.003663
2400	-600	0.004138	0.003044
2300	-600	0.004424	0.00324
-100	-500	0.004702	0.002365
2500	-600	0.003877	0.002859
-300	-500	0.00428	0.002489
-200	-500	0.004494	0.00243
2100	-400	0.005957	0.003414
2300	-400	0.005017	0.003071
-200	-100	0.005983	0.002058
2100	-200	0.006427	0.00319
-100	-200	0.007062	0.002304
0	-200	0.007807	0.002548
100	-200	0.008695	0.002809
2300	-200	0.005328	0.002909
2200	-200	0.005631	0.00305
-300	-200	0.005901	0.001875
2400	-200	0.004897	0.00277

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* ISCLT2 Output (93109): OU2 FS – Annual Conc.: 1 g/s (pCi/s) per m2

X	Y	N Dryer (g/m3)/(g/s)	S Dryer (g/m3)/(g/s)
2500	-200	0.004523	0.002634
-300	-100	0.005517	0.001868
-200	-200	0.006435	0.00208
2500	-300	0.004491	0.002691
2400	-400	0.004637	0.002906
-100	-300	0.006723	0.002337
2500	-400	0.004303	0.002748
-300	-300	0.005676	0.001871
-200	-300	0.006161	0.002092
100	-300	0.008134	0.0029
0	-300	0.007376	0.002607
2400	-300	0.004858	0.002838
2100	-300	0.006354	0.003299
2200	-300	0.005773	0.003144
2300	-300	0.005281	0.002989
200	-1500	0.003924	0.009647
-100	-1500	0.003527	0.007353
0	-1500	0.003659	0.008033
1000	400	0.00599	0.002043
900	-2200	0.001723	0.003984
600	-2200	0.002168	0.005382
700	-2200	0.002031	0.004149
800	-2200	0.001882	0.002977
1100	-2200	0.001643	0.005429
1000	-2200	0.001609	0.004813
400	-2200	0.002404	0.006474
1200	-2200	0.001668	0.00536
1300	-2200	0.001685	0.00513
1400	-2200	0.001694	0.004911
500	-2200	0.002293	0.006409
300	-2200	0.002501	0.006074
1600	-2200	0.001689	0.004498
2500	-2300	0.001683	0.002671
2200	-2300	0.001653	0.00314
2300	-2300	0.001668	0.002976
2400	-2300	0.001678	0.00282
-200	-2200	0.002441	0.004032
-300	-2200	0.002388	0.003608
200	-2200	0.002584	0.005712
-100	-2200	0.002491	0.004521
0	-2200	0.002539	0.005067
100	-2200	0.002583	0.005376
1500	-2200	0.001695	0.004698
1700	-2200	0.001676	0.004293
2000	-2300	0.001607	0.003484
600	-2100	0.002315	0.006478
300	-2100	0.002688	0.006533
400	-2100	0.00258	0.007062
500	-2100	0.002456	0.00768
800	-2100	0.00199	0.003337
700	-2100	0.002159	0.004886
100	-2100	0.002723	0.005678
900	-2100	0.001809	0.004766
1000	-2100	0.001681	0.005913
1100	-2100	0.001725	0.006523
200	-2100	0.002771	0.006077
0	-2100	0.002672	0.005
1800	-2200	0.001665	0.004082
2200	-2200	0.001771	0.003271
1900	-2200	0.001701	0.003872
2000	-2200	0.001731	0.003664
2100	-2200	0.001754	0.003463
2400	-2200	0.001788	0.002915
2300	-2200	0.001782	0.003088
-100	-2100	0.002616	0.004404
2500	-2200	0.001789	0.002752
-300	-2100	0.002498	0.003465
-200	-2100	0.002558	0.003898
2100	-2300	0.001633	0.003309
1900	-2300	0.001576	0.00366
1300	-2100	0.001785	0.005771
1500	-2400	0.001509	0.003891
1200	-2400	0.001507	0.004105
1300	-2400	0.001514	0.004051
1400	-2400	0.001514	0.003975

• ISCLT2 Output (93109): OU2 FS – Annual Conc.: 1 g/s (pCi/s) per m2

X	Y	N Dryer (g/m3)/(g/s)	S Dryer (g/m3)/(g/s)
1700	−2400	0.001484	0.003709
1600	−2400	0.001499	0.003802
1000	−2400	0.001475	0.003514
1800	−2400	0.001465	0.003609
1900	−2400	0.001461	0.003463
2000	−2400	0.001494	0.003313
1100	−2400	0.001494	0.003857
900	−2400	0.001567	0.003079
2200	−2400	0.001545	0.003013
200	−2400	0.002257	0.004979
−100	−2400	0.002263	0.004337
0	−2400	0.002298	0.004542
100	−2400	0.002315	0.004756
400	−2400	0.002108	0.005296
300	−2400	0.002188	0.005211
800	−2400	0.001692	0.002563
500	−2400	0.002018	0.004735
600	−2400	0.001918	0.004059
700	−2400	0.001809	0.003284
2100	−2400	0.001522	0.003162
2300	−2400	0.001562	0.002867
1800	−2300	0.001554	0.003836
1200	−2300	0.001584	0.004688
900	−2300	0.001643	0.003455
1000	−2300	0.001541	0.004055
1100	−2300	0.001566	0.004516
1400	−2300	0.0016	0.004419
1300	−2300	0.001595	0.004556
700	−2300	0.001915	0.003648
1500	−2300	0.001597	0.004281
1600	−2300	0.001588	0.004144
1700	−2300	0.001574	0.004006
800	−2300	0.001783	0.002738
600	−2300	0.002037	0.004619
2400	−2400	0.001575	0.002726
−100	−2300	0.002373	0.004563
2500	−2400	0.001583	0.00259
−300	−2300	0.002283	0.003705
−200	−2300	0.00233	0.004115
100	−2300	0.002452	0.005063
0	−2300	0.002414	0.004805
500	−2300	0.002148	0.005455
200	−2300	0.002411	0.005339
300	−2300	0.002335	0.005633
400	−2300	0.002248	0.005944
1200	−2100	0.00176	0.006142
1500	−2100	0.001606	0.005134
1400	−2100	0.0018	0.005432
−200	−1500	0.003397	0.006751
2400	−1800	0.00231	0.003595
2100	−1800	0.002349	0.004341
2200	−1800	0.002343	0.00407
2300	−1800	0.00233	0.003822
−300	−1700	0.002995	0.00427
2500	−1800	0.002285	0.003388
600	−1800	0.00289	0.013457
−200	−1700	0.003095	0.004379
−100	−1700	0.003194	0.004406
0	−1700	0.003292	0.004288
2000	−1800	0.002348	0.004634
500	−1800	0.003097	0.010577
200	−1700	0.003482	0.005078
−200	−1800	0.002951	0.0033
2400	−1900	0.002167	0.00339
2500	−1900	0.00215	0.003209
−300	−1800	0.002864	0.003365
0	−1800	0.003123	0.004142
−100	−1800	0.003038	0.003586
400	−1800	0.003274	0.008691
100	−1800	0.003205	0.004845
200	−1800	0.003284	0.005768
300	−1800	0.003359	0.007007
100	−1700	0.003388	0.004244
300	−1700	0.003572	0.006279
2200	−1900	0.002184	0.003796

• ISCLT2 Output (93109): OU2 FS – Annual Conc.: 1 g/s (pCi/s) per m2

X	Y	N Dryer (g/m3)/(g/s)	S Dryer (g/m3)/(g/s)
2100	−1600	0.002721	0.004964
300	−1600	0.003805	0.005492
400	−1600	0.003911	0.00681
500	−1600	0.003724	0.009646
2300	−1600	0.002658	0.00427
2200	−1600	0.002693	0.004596
100	−1600	0.003584	0.006216
2400	−1600	0.002581	0.003981
2500	−1600	0.002484	0.003723
−300	−1500	0.003242	0.006211
200	−1600	0.003696	0.006105
0	−1600	0.003471	0.006082
400	−1700	0.003585	0.008097
2200	−1700	0.002513	0.004339
500	−1700	0.003384	0.010855
600	−1700	0.003147	0.015364
2100	−1700	0.002529	0.004659
2400	−1700	0.002461	0.003793
2300	−1700	0.00249	0.004052
−100	−1600	0.003357	0.005836
2500	−1700	0.00239	0.00356
−300	−1600	0.003131	0.005229
−200	−1600	0.003243	0.005544
2300	−1900	0.002178	0.003586
2100	−1900	0.002183	0.004018
1600	−2100	0.001803	0.004871
400	−2000	0.00278	0.007697
100	−2000	0.002873	0.005554
200	−2000	0.002929	0.006416
300	−2000	0.0029	0.006989
600	−2000	0.002481	0.008116
500	−2000	0.00264	0.00857
−100	−2000	0.00275	0.004216
700	−2000	0.002303	0.006036
800	−2000	0.00211	0.003906
900	−2000	0.001903	0.005967
0	−2000	0.002813	0.004826
−200	−2000	0.002683	0.003704
1400	−2000	0.001921	0.005976
2000	−2100	0.001866	0.003853
1700	−2100	0.001792	0.004607
1800	−2100	0.001806	0.004348
1900	−2100	0.00184	0.004096
2200	−2100	0.001898	0.003405
2100	−2100	0.001885	0.003623
−300	−2000	0.002614	0.003274
2300	−2100	0.001905	0.003201
2400	−2100	0.001906	0.00301
2500	−2100	0.001902	0.002842
1300	−2000	0.001898	0.006469
1500	−2000	0.001933	0.005622
2000	−1900	0.002174	0.004252
400	−1900	0.003009	0.008296
100	−1900	0.003033	0.005277
200	−1900	0.0031	0.006208
300	−1900	0.003142	0.007373
600	−1900	0.00267	0.01077
500	−1900	0.002851	0.009584
−100	−1900	0.00289	0.003946
1700	−1900	0.0021	0.005313
1800	−1900	0.002132	0.004927
1900	−1900	0.002157	0.004573
0	−1900	0.002963	0.004542
−200	−1900	0.002815	0.003447
1600	−2000	0.001934	0.005284
2000	−2000	0.002014	0.004049
1700	−2000	0.001925	0.004949
1800	−2000	0.001961	0.004631
1900	−2000	0.001991	0.004331
2200	−2000	0.002036	0.003541
2100	−2000	0.002028	0.003786
−300	−1900	0.002736	0.003032
2300	−2000	0.002037	0.003348
2400	−2000	0.002032	0.003182
2500	−2000	0.002022	0.003026

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* ISCLT2 Output (93109): OU2 FS – Annual Conc.: 1 g/s (pCi/s) per m2

X	Y	N Dryer (g/m3)/(g/s)	S Dryer (g/m3)/(g/s)	
900	400	0.006324	0.002075	
1100	400	0.005733	0.002004	
−250	−2050	0.002588	0.003584	
671	−1798	0.002725	0.012965	
701	−1920	0.002426	0.007465	
691	−1879	0.002519	0.008891	
681	−1839	0.002618	0.010657	
634	−1725	0.002987	0.01681	
653	−1761	0.002851	0.015898	
762	−1961	0.002236	0.004887	
616	−1688	0.003132	0.016432	
597	−1652	0.003287	0.015268	
579	−1615	0.003454	0.013307	
731	−1940	0.002331	0.006137	
792	−1981	0.002146	0.003815	
525	−1534	0.003907	0.00895	
1113	−2029	0.001792	0.007219	
1250	−1990	0.001891	0.0068	
1204	−2003	0.001858	0.006965	
1158	−2016	0.001825	0.007108	
1021	−2032	0.00174	0.00717	
1067	−2042	0.001757	0.007304	
838	−1991	0.002039	0.004785	
975	−2022	0.00172	0.006778	
930	−2011	0.001825	0.006284	
884	−2001	0.001931	0.00561	
552	−1574	0.003674	0.0112	
498	−1493	0.004162	0.01171	
1341	−1964	0.001953	0.006443	
247	−775	0.005078	0.004074	
267	−899	0.005505	0.004648	
263	−861	0.005411	0.004295	
259	−823	0.005299	0.004222	
224	−678	0.004554	0.003808	
236	−726	0.004832	0.003939	
274	−975	0.005526	0.005834	
212	−629	0.004248	0.003683	
201	−581	0.003932	0.003573	
189	−533	0.004413	0.003459	
270	−937	0.005575	0.005209	
290	−1021	0.005443	0.006693	
471	−1453	0.004418	0.016933	
362	−1291	0.004756	0.014887	
443	−1412	0.004508	0.020842	**********
416	−1372	0.004594	0.019524	
389	−1331	0.004679	0.017042	
305	−1219	0.004862	0.011658	
335	−1250	0.004832	0.013024	
305	−1067	0.005347	0.007716	
305	−1181	0.004981	0.010656	
305	−1143	0.005102	0.009627	
305	−1105	0.005224	0.008641	
1296	−1977	0.001922	0.006623	
1387	−1950	0.001984	0.006324	
166	−436	0.006132	0.003251	
2078	−931	0.004126	0.004313	
2075	−784	0.00449	0.003988	
2076	−833	0.004366	0.004065	
2077	−882	0.004245	0.004162	
2080	−1029	0.003899	0.004609	
2079	−980	0.004011	0.004462	
2073	−686	0.00477	0.003842	
2081	−1078	0.003791	0.004753	
2083	−1127	0.003684	0.004889	
2084	−1176	0.003583	0.005023	
2074	−735	0.004616	0.003913	
2071	−637	0.005005	0.003775	
2086	−1274	0.003392	0.005272	
2064	−294	0.006599	0.003344	
2060	−147	0.0065	0.003182	
2061	−196	0.006663	0.003235	
2063	−245	0.006797	0.003288	
2066	−392	0.00617	0.003459	
2065	−343	0.006389	0.0034	
2070	−588	0.00524	0.003708	

* ISCLT2 Output (93109): OU2 FS – Annual Conc.: 1 g/s (pCi/s) per m2

X	Y	N Dryer (g/m3)/(g/s)	S Dryer (g/m3)/(g/s)
2067	-441	0.005943	0.003518
2068	-490	0.005712	0.00358
2069	-539	0.005476	0.003643
2085	-1225	0.003486	0.005151
2087	-1323	0.003301	0.005384
1433	-1937	0.002012	0.006212
1707	-1859	0.002179	0.005423
1839	-1829	0.002272	0.004993
1795	-1839	0.002243	0.005124
1751	-1849	0.002212	0.005273
1616	-1885	0.002112	0.005706
1661	-1872	0.002138	0.005569
1927	-1808	0.002326	0.004621
1570	-1898	0.002089	0.005843
1524	-1911	0.002065	0.005974
1478	-1924	0.002039	0.006098
1883	-1819	0.002299	0.004908
1971	-1798	0.002348	0.004726
2088	-1372	0.003206	0.005487
2096	-1570	0.002779	0.005062
2090	-1422	0.003094	0.00549
2092	-1471	0.002987	0.005355
2094	-1521	0.002881	0.00521
2099	-1669	0.002585	0.004753
2097	-1620	0.002679	0.00491
2015	-1788	0.002369	0.004628
2101	-1719	0.002491	0.004591
2103	-1768	0.002403	0.00443
2059	-1778	0.002387	0.004529
177	-484	0.005283	0.003349
143	-339	0.007777	0.003066
154	-387	0.006978	0.003154
2058	-49	0.006134	0.002972
2150	-2250	0.001702	0.003294
1850	-2250	0.001619	0.003861
1950	-2250	0.001653	0.003668
2050	-2250	0.001681	0.003479
2350	-2250	0.001728	0.002948
2250	-2250	0.001718	0.003117
1650	-2250	0.001631	0.004238
2450	-2250	0.001734	0.002788
-250	-2150	0.002471	0.003749
-150	-2150	0.002526	0.004212
1750	-2250	0.001614	0.004052
1550	-2250	0.001642	0.004403
50	-2150	0.002628	0.005357
850	-2250	0.001758	0.003286
550	-2250	0.002162	0.005455
650	-2250	0.002038	0.00444
750	-2250	0.001903	0.003285
1050	-2250	0.00159	0.00469
950	-2250	0.001606	0.004068
1450	-2250	0.001646	0.004572
1150	-2250	0.001616	0.005099
1250	-2250	0.001633	0.004923
1350	-2250	0.001644	0.004747
-50	-2150	0.002579	0.00475
150	-2150	0.002674	0.005709
350	-2250	0.002372	0.006023
1950	-2150	0.001784	0.003869
1650	-2150	0.001739	0.004563
1750	-2150	0.001723	0.004329
1850	-2150	0.001752	0.004097
2150	-2150	0.001826	0.003439
2050	-2150	0.001808	0.003649
1450	-2150	0.001748	0.00504
2250	-2150	0.001838	0.00324
2350	-2150	0.001845	0.003052
2450	-2150	0.001846	0.002876
1550	-2150	0.001747	0.004794
1350	-2150	0.001741	0.005303
250	-2150	0.002637	0.006093
650	-2150	0.002168	0.005207
350	-2150	0.002543	0.006524
450	-2150	0.002433	0.007014

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• ISCLT2 Output (93109): OU2 FS – Annual Conc.: 1 g/s (pCi/s) per m2

X	Y	N Dryer (g/m3)/(g/s)	S Dryer (g/m3)/(g/s)	
550	−2150	0.002308	0.006481	
850	−2150	0.001851	0.003758	
750	−2150	0.002015	0.003707	
1250	−2150	0.001724	0.005588	
950	−2150	0.001678	0.004854	
1050	−2150	0.001665	0.005698	
1150	−2150	0.001699	0.005886	
450	−2250	0.002273	0.006287	
250	−2250	0.002457	0.005687	
131	−290	0.008539	0.002978	
−250	−2350	0.002255	0.003933	
0	275	0.004478	0.002218	
0	320	0.00418	0.002186	
0	366	0.00389	0.002154	
−50	−2350	0.002337	0.00456	
−150	−2350	0.002297	0.004343	
0	183	0.005129	0.002282	
50	−2350	0.002373	0.004789	
150	−2350	0.002363	0.00503	
250	−2350	0.002297	0.005285	
0	229	0.004797	0.00225	
0	137	0.00546	0.002315	
450	−2350	0.00213	0.0054	
84	−97	0.007712	0.00267	
119	−242	0.009178	0.002895	**********
108	−194	0.008699	0.002819	
98	−145	0.008199	0.002742	
61	0	0.006772	0.002536	
73	−48	0.007234	0.002603	
0	92	0.005779	0.002346	
31	0	0.006603	0.002474	
0	0	0.006436	0.002411	
0	46	0.006107	0.002379	
350	−2350	0.002219	0.005553	
550	−2350	0.00203	0.004712	
150	−2250	0.002529	0.00537	
2350	−2350	0.00162	0.002846	
2050	−2350	0.001564	0.003316	
2150	−2350	0.001588	0.003155	
2250	−2350	0.001606	0.002998	
−250	−2250	0.00236	0.003864	
2450	−2350	0.001629	0.002701	
1850	−2350	0.001499	0.00364	
−150	−2250	0.002408	0.00431	
−50	−2250	0.002454	0.004803	
50	−2250	0.002496	0.005075	
1950	−2350	0.001534	0.003479	
1750	−2350	0.001519	0.003797	
650	−2350	0.00192	0.003898	
1050	−2350	0.001519	0.003976	
750	−2350	0.0018	0.002991	
850	−2350	0.001671	0.00296	
950	−2350	0.001536	0.003521	
1250	−2350	0.00155	0.004345	
1150	−2350	0.001538	0.004314	
1650	−2350	0.001536	0.003914	
1350	−2350	0.001555	0.004244	
1450	−2350	0.001555	0.004137	
1550	−2350	0.001548	0.004026	
2059	−98	0.006323	0.003084	
2088	0	0.005775	0.002869	
−200	−2400	0.002225	0.00414	
1200	400	0.00538	0.001958	
600	700	0.004313	0.001789	
300	700	0.003096	0.001846	
400	700	0.003492	0.001833	
500	700	0.003921	0.001814	
800	700	0.00441	0.001726	
700	700	0.004384	0.001759	
100	700	0.002415	0.001855	
900	700	0.004387	0.001712	
1000	700	0.004305	0.001694	
1100	700	0.004153	0.00167	
200	700	0.002737	0.001854	
0	700	0.002249	0.001852	

• ISCLT2 Output (93109): OU2 FS – Annual Conc.: 1 g/s (pCi/s) per m2

X	Y	N Dryer (g/m3)/(g/s)	S Dryer (g/m3)/(g/s)
1300	700	0.003758	0.001609
2200	600	0.003782	0.001885
1800	600	0.004486	0.001689
1900	600	0.004369	0.001752
2000	600	0.00419	0.001805
2400	600	0.003368	0.001934
2300	600	0.003572	0.001913
−100	700	0.002329	0.001624
2500	600	0.003171	0.001948
−300	700	0.002379	0.001624
−200	700	0.002369	0.001723
1200	700	0.003967	0.001641
1400	700	0.003663	0.001573
1600	600	0.00439	0.001566
300	800	0.003006	0.001744
0	800	0.002136	0.001756
100	800	0.002398	0.001757
200	800	0.002688	0.001753
500	800	0.003715	0.00171
400	800	0.00335	0.00173
−200	800	0.002063	0.001675
600	800	0.003916	0.001686
700	800	0.003967	0.001656
800	800	0.003983	0.001625
−100	800	0.001998	0.001751
−300	800	0.002098	0.001584
1500	700	0.003811	0.001533
1900	700	0.004108	0.001624
1600	700	0.003932	0.001491
1700	700	0.004022	0.001492
1800	700	0.00408	0.001562
2100	700	0.003818	0.001723
2000	700	0.003987	0.001677
2500	700	0.003089	0.001832
2200	700	0.003637	0.00176
2300	700	0.003452	0.001791
2400	700	0.003268	0.001814
1700	600	0.004455	0.001618
1500	600	0.004284	0.001613
1000	800	0.003893	0.001597
800	500	0.00558	0.001961
500	500	0.004355	0.002053
600	500	0.005019	0.002029
700	500	0.005527	0.001997
1000	500	0.005336	0.001915
900	500	0.005518	0.001941
300	500	0.003235	0.00208
1100	500	0.005104	0.001882
1200	500	0.00481	0.001843
1300	500	0.004562	0.0018
400	500	0.003758	0.00207
200	500	0.00297	0.002083
1500	500	0.004807	0.001699
2400	400	0.003582	0.002201
1300	400	0.005256	0.001907
2200	400	0.004108	0.002167
2300	400	0.003838	0.002188
−300	500	0.003038	0.001703
2500	400	0.003343	0.002206
100	500	0.003091	0.002078
−200	500	0.003101	0.001819
−100	500	0.003139	0.001939
0	500	0.003141	0.002062
1400	500	0.004692	0.001751
1600	500	0.004891	0.001674
1400	600	0.004143	0.001659
800	600	0.004923	0.001837
500	600	0.004135	0.001928
600	600	0.004672	0.001903
700	600	0.004881	0.001872
1000	600	0.004781	0.001799
900	600	0.004894	0.001821
300	600	0.003175	0.001958
1100	600	0.004589	0.001771
1200	600	0.004354	0.001738

• ISCLT2 Output (93109): OU2 FS – Annual Conc.: 1 g/s (pCi/s) per m2

X	Y	N Dryer (g/m3)/(g/s)	S Dryer (g/m3)/(g/s)
1300	600	0.004093	0.0017
400	600	0.003635	0.001947
200	600	0.00277	0.001963
1700	500	0.004928	0.001757
2400	500	0.003472	0.002063
1800	500	0.004822	0.00183
2200	500	0.003938	0.002021
2300	500	0.003701	0.002046
-300	600	0.002693	0.001664
2500	500	0.003255	0.002073
100	600	0.002563	0.001962
-200	600	0.002715	0.001771
-100	600	0.002708	0.001881
0	600	0.002662	0.001955
900	800	0.003961	0.001613
1200	800	0.003624	0.001553
1100	800	0.003774	0.001577
2090	47	0.005576	0.002771
1341	366	0.005507	0.001922
1192	366	0.005619	0.002004
1242	366	0.005474	0.001977
1291	366	0.005487	0.00195
1341	457	0.004865	0.001824
1341	412	0.00517	0.001871
1093	366	0.005981	0.002051
1387	450	0.004958	0.001807
1433	442	0.005053	0.00179
1478	435	0.005133	0.001771
1142	366	0.005813	0.002028
1043	366	0.006123	0.002072
1567	433	0.005202	0.001743
695	366	0.006547	0.002188
546	366	0.005073	0.002231
596	366	0.005551	0.002219
646	366	0.006026	0.002204
795	366	0.006861	0.00215
745	366	0.006863	0.002169
993	366	0.006227	0.002092
844	366	0.006796	0.002138
894	366	0.006656	0.002125
944	366	0.006434	0.002109
1524	427	0.005212	0.001751
1609	439	0.005188	0.001772
447	366	0.004239	0.00225
2104	328	0.004534	0.002253
2111	469	0.004207	0.002036
2109	422	0.004309	0.002106
2106	375	0.00442	0.002178
2100	235	0.004781	0.002412
2102	282	0.004652	0.00233
2116	563	0.004017	0.001905
2097	188	0.004966	0.002497
2095	141	0.005168	0.002585
2093	94	0.00537	0.002677
2113	516	0.004111	0.001969
2118	610	0.003929	0.001843
1652	445	0.005171	0.0018
1822	491	0.004798	0.001857
1694	451	0.005128	0.001825
1737	457	0.005053	0.001849
1779	474	0.004927	0.001854
1906	525	0.004541	0.001859
1864	508	0.004669	0.001859
2076	593	0.004045	0.001848
1949	542	0.004413	0.001858
1991	559	0.004288	0.001856
2033	576	0.004166	0.001853
497	366	0.004641	0.002241
397	366	0.003873	0.002255
1300	800	0.003452	0.001525
100	900	0.002367	0.001666
-200	900	0.001793	0.001628
-100	900	0.001909	0.001665
0	900	0.002127	0.001667
300	900	0.002911	0.00165

• ISCLT2 Output (93109): OU2 FS – Annual Conc.: 1 g/s (pCi/s) per m2

X	Y	N Dryer (g/m3)/(g/s)	S Dryer (g/m3)/(g/s)
200	900	0.002629	0.00166
2500	800	0.003009	0.001723
400	900	0.003212	0.001635
500	900	0.003525	0.001615
600	900	0.003583	0.001591
-300	900	0.001846	0.001544
2400	800	0.003172	0.001703
800	900	0.003619	0.001533
1700	800	0.003631	0.001383
1400	800	0.003265	0.001493
1500	800	0.003393	0.001459
1600	800	0.003525	0.001422
1900	800	0.003755	0.001507
1800	800	0.003707	0.001446
2300	800	0.003337	0.001677
2000	800	0.003777	0.00156
2100	800	0.003659	0.001606
2200	800	0.003501	0.001645
700	900	0.003614	0.001563
900	900	0.003595	0.001523
348	366	0.003704	0.002259
50	366	0.00393	0.002227
2400	900	0.003079	0.001599
2500	900	0.00293	0.001621
0	366	0.003897	0.002156
149	366	0.003952	0.002253
99	366	0.003949	0.002247
2200	900	0.003373	0.001538
199	366	0.003932	0.002258
248	366	0.003888	0.00226
298	366	0.003813	0.002261
2300	900	0.003227	0.001572
2100	900	0.003486	0.001499
1000	900	0.003537	0.00151
1400	900	0.003029	0.001419
1100	900	0.003441	0.001492
1200	900	0.003321	0.001471
1300	900	0.003182	0.001447
1600	900	0.003166	0.001357
1500	900	0.003029	0.001389
2000	900	0.003469	0.001453
1700	900	0.003279	0.001322
1800	900	0.003368	0.001341
1900	900	0.00343	0.0014
2450	850	0.003047	0.001661

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Attachment C.II

Remedial Action Risk Quantification

Table C.II–1 Inhalation – Remedial and Nonremedial Worker
Alternative 2: Excavation Scenario
Active Flyash Pile

	Risk Factors							Intake Results		Risk Results
COC	Soil Conc units	Soil Conc	Dust Load mg/m^3	IR m^3/hr	Risk Risk/pCi	Risk 1/mg/kg/d	ETxEFxED hr	Intake pCi	Intake mg/kg–day	Risk
Antimony	mg/kg	2.000E+00	0.60	2.00		NA	2607.0		3.498E–09	
Arsenic	mg/kg	6.427E+01	0.60	2.00		1.500E+01	2607.0		1.124E–07	1.686E–06
Beryllium	mg/kg	3.375E+00	0.60	2.00		8.400E+00	2607.0		5.903E–09	4.959E–08
U–total	mg/kg	2.996E+01	0.60	2.00		NA	2607.0		5.241E–08	
Aroclor–1254	mg/kg	NA	0.60	2.00		NA	2607.0			
Aroclor–1260	mg/kg	NA	0.60	2.00		NA	2607.0			
Carbzole	mg/kg	NA	0.60	2.00		NA	2607.0			
Dieldrin	mg/kg	NA	0.60	2.00		1.600E+01	2607.0			
PAH	TE	NA	0.60	2.00		6.100E+00	2607.0			
							Total Risk From Chemicals=			1.736E–06
Sr–90	pCi/g	9.640E–01	0.60	2.00	6.200E–11		2607.0	3.016E+00		1.870E–10
Tc–99	pCi/g	NA	0.60	2.00	8.300E–12		2607.0			
Cs–137	pCi/g	NA	0.60	2.00	1.900E–11		2607.0			
Rn–222	pCi/g	5.240E+00	0.60	2.00	7.700E–12		2607.0	1.639E+01		1.262E–10
Ra–226	pCi/g	5.240E+00	0.60	2.00	3.000E–09		2607.0	1.639E+01		4.918E–08
Ra–228	pCi/g	4.336E+00	0.60	2.00	6.900E–10		2607.0	1.356E+01		9.360E–09
Th–228	pCi/g	5.790E+00	0.60	2.00	7.800E–08		2607.0	1.811E+01		1.413E–06
Th–230	pCi/g	5.717E+00	0.60	2.00	2.900E–08		2607.0	1.789E+01		5.187E–07
Th–232	pCi/g	3.866E+00	0.60	2.00	2.800E–08		2607.0	1.209E+01		3.386E–07
U–234	pCi/g	8.903E+00	0.60	2.00	2.600E–08		2607.0	2.785E+01		7.242E–07
U–235	pCi/g	4.720E+00	0.60	2.00	2.500E–08		2607.0	1.477E+01		3.692E–07
U–238	pCi/g	6.911E+00	0.60	2.00	2.400E–08		2607.0	2.162E+01		5.189E–07
Np–237	pCi/g	4.500E–01	0.60	2.00	2.900E–08		2607.0	1.408E+00		4.083E–08
Pu–238	pCi/g	1.230E–01	0.60	2.00	3.900E–08		2607.0	3.848E–01		1.501E–08
							Total Risk from Radionuclides=			3.997E–06

Formulas Radioactive Materials: Intake/hr = CA (pCi/g) x IR x 10^{-3}
Total Intake (pCi) = Intake/hr x ETx EF x ED
Hazardous Chemicals: Intake = CA x IR x ET x ED x EF x 10^{-6} / [BW x AT]

Parameters IR 2.0 m^3/hr
BW 70.0 kg
AT 25550.0 days

Notes: TE is the toxic equivalent as calculated in Table C.4–3

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Table C.II-2 Inhalation – Remedial and Nonremedial Worker
Alternative 2: Excavation Scenario
Lime Sludge Pond

	Risk Factors							Intake Results		Risk Results
COC	Soil Conc units	Soil Conc	Dust Load mg/m^3	IR m^3/hr	Risk Risk/pCi	Risk 1/mg/kg/d	ETxEFxED hr	Intake pCi	Intake mg/kg-day	Risk
Antimony	mg/kg	2.320E+01	0.60	2.00		NA	987.0		1.536E-08	
Arsenic	mg/kg	6.777E+00	0.60	2.00		1.500E+01	987.0		4.488E-09	6.732E-08
Beryllium	mg/kg	1.267E+00	0.60	2.00		8.400E+00	987.0		8.390E-10	7.048E-09
U-total	mg/kg	2.220E+01	0.60	2.00		NA	987.0		1.470E-08	
Aroclor-1254	mg/kg	4.300E-02	0.60	2.00		NA	987.0		2.848E-11	
Aroclor-1260	mg/kg	NA	0.60	2.00		NA	987.0			
Carbzole	mg/kg	NA	0.60	2.00		NA	987.0			
Dieldrin	mg/kg	NA	0.60	2.00		1.600E+01	987.0			
PAH	TE	3.775E-01	0.60	2.00		6.100E+00	987.0		2.500E-10	1.525E-09
							Total Risk From Chemicals=			7.589E-08
Sr-90	pCi/g	8.410E-01	0.60	2.00	6.200E-11		987.0	9.961E-01		6.176E-11
Tc-99	pCi/g	1.050E+00	0.60	2.00	8.300E-12		987.0	1.244E+00		1.032E-11
Cs-137	pCi/g	1.680E-01	0.60	2.00	1.900E-11		987.0	1.990E-01		3.781E-12
Rn-222	pCi/g	1.562E+00	0.60	2.00	7.700E-12		987.0	1.850E+00		1.425E-11
Ra-226	pCi/g	1.562E+00	0.60	2.00	3.000E-09		987.0	1.850E+00		5.550E-09
Ra-228	pCi/g	1.800E+00	0.60	2.00	6.900E-10		987.0	2.132E+00		1.471E-09
Th-228	pCi/g	1.540E+00	0.60	2.00	7.800E-08		987.0	1.824E+00		1.423E-07
Th-230	pCi/g	8.381E+00	0.60	2.00	2.900E-08		987.0	9.926E+00		2.879E-07
Th-232	pCi/g	1.070E+00	0.60	2.00	2.800E-08		987.0	1.267E+00		3.548E-08
U-234	pCi/g	6.176E+00	0.60	2.00	2.600E-08		987.0	7.315E+00		1.902E-07
U-235	pCi/g	4.350E-01	0.60	2.00	2.500E-08		987.0	5.152E-01		1.288E-08
U-238	pCi/g	7.468E+00	0.60	2.00	2.400E-08		987.0	8.845E+00		2.123E-07
Np-237	pCi/g	3.230E-01	0.60	2.00	2.900E-08		987.0	3.826E-01		1.109E-08
Pu-238	pCi/g	1.990E-01	0.60	2.00	3.900E-08		987.0	2.357E-01		9.192E-09
							Total Risk from Radionuclides=			9.084E-07

Formulas Radioactive Materials: Intake/hr = CA (pCi/g) x IR x 10^{-3}
Total Intake (pCi) = Intake/hr x ETx EF x ED
Hazardous Chemicals: Intake = CA x IR x ET x ED x EF x 10^{-6} / [BW x AT]

Parameters IR 2.0 m^3/hr
BW 70.0 kg
AT 25550.0 days

Notes: TE is the toxic equivalent as calculated in Table C.4-3

Table C.II–3 Inhalation – Remedial and Nonremedial Worker
Alternative 2: Excavation Scenario
South Field and Inactive Flyash Pond

	Risk Factors							Intake Results		
COC	Soil Conc units	Soil Conc	Dust Load mg/m^3	IR m^3/hr	Risk Risk/pCi	Risk 1/mg/kg/d	ETxEFxED hr	Intake pCi	Intake mg/kg–d	Risk
Antimony	mg/kg	1.206E+01	0.60	2.00		NA	2694.0		2.180E–08	
Arsenic	mg/kg	1.438E+00	0.60	2.00		1.500E+01	2694.0		2.599E–09	3.899E–08
Beryllium	mg/kg	1.044E+02	0.60	2.00		8.400E+00	2694.0		1.887E–07	1.585E–06
U–total	mg/kg	1.870E+01	0.60	2.00		NA	2694.0		3.380E–08	
Aroclor–1254	mg/kg	4.300E–01	0.60	2.00		NA	2694.0		7.772E–10	
Aroclor–1260	mg/kg	8.900E–02	0.60	2.00		NA	2694.0		1.609E–10	
Carbzole	mg/kg	1.000E–03	0.60	2.00		NA	2694.0		1.808E–12	
Dieldrin	mg/kg	1.600E–02	0.60	2.00		1.600E+01	2694.0		2.892E–11	4.627E–10
PAH	TE	3.505E–01	0.60	2.00		6.100E+00	2694.0		6.336E–10	3.865E–09
							Total Risk From Chemicals=			1.628E–06
Sr–90	pCi/g	1.360E+00	0.60	2.00	6.200E–11		2694.0	4.397E+00		2.726E–10
Tc–99	pCi/g	9.000E–01	0.60	2.00	8.300E–12		2694.0	2.910E+00		2.415E–11
Cs–137	pCi/g	2.370E–01	0.60	2.00	1.900E–11		2694.0	7.662E–01		1.456E–11
Rn–222	pCi/g	2.919E+00	0.60	2.00	7.700E–12		2694.0	9.437E+00		7.266E–11
Ra–226	pCi/g	2.919E+00	0.60	2.00	3.000E–09		2694.0	9.437E+00		2.831E–08
Ra–228	pCi/g	1.656E+00	0.60	2.00	6.900E–10		2694.0	5.354E+00		3.694E–09
Th–228	pCi/g	1.704E+00	0.60	2.00	7.800E–08		2694.0	5.509E+00		4.297E–07
Th–230	pCi/g	4.263E+00	0.60	2.00	2.900E–08		2694.0	1.378E+01		3.997E–07
Th–232	pCi/g	1.531E+00	0.60	2.00	2.800E–08		2694.0	4.949E+00		1.386E–07
U–234	pCi/g	3.019E+01	0.60	2.00	2.600E–08		2694.0	9.760E+01		2.538E–06
U–235	pCi/g	1.846E+01	0.60	2.00	2.500E–08		2694.0	5.968E+01		1.492E–06
U–238	pCi/g	3.230E+01	0.60	2.00	2.400E–08		2694.0	1.044E+02		2.506E–06
Np–237	pCi/g	3.000E–01	0.60	2.00	2.900E–08		2694.0	9.698E–01		2.813E–08
Pu–238	pCi/g	4.000E–02	0.60	2.00	3.900E–08		2694.0	1.293E–01		5.043E–09
							Total Risk from Radionuclides=			7.569E–06

Formulas Radioactive Materials: Intake/hr = CA (pCi/g) x IR x 10^{-3}
Total Intake (pCi) = Intake/hr x ETx EF x ED
Hazardous Chemicals: Intake = CA x IR x ET x ED x EF x 10^{-6} / [BW x AT]

Parameters IR 2.0 m^3/hr
BW 70.0 kg
AT 25550.0 days

Notes: TE is the toxic equivalent as calculated in Table C.4–3

Table C.II-4 Inhalation – Remedial and Nonremedial Worker
Alternative 2: Excavation Scenario
Solid Waste Landfill

	Risk Factors							Intake Results		Risk Results
COC	Soil Conc units	Soil Conc	Dust Load mg/m^3	IR m^3/hr	Risk Risk/pCi	Risk 1/mg/kg/d	ETxEFxED hr	Intake pCi	Intake mg/kg-day	Risk
Antimony	mg/kg	2.200E+01	0.60	2.00		NA	1095.0		1.616E-08	
Arsenic	mg/kg	1.380E+01	0.60	2.00		1.500E+01	1095.0		1.014E-08	1.521E-07
Beryllium	mg/kg	1.075E+00	0.60	2.00		8.400E+00	1095.0		7.898E-10	6.634E-09
U-total	mg/kg	4.460E+02	0.60	2.00		NA	1095.0		3.277E-07	
Aroclor-1254	mg/kg	4.800E-02	0.60	2.00		NA	1095.0		3.527E-11	
Aroclor-1260	mg/kg	7.700E-02	0.60	2.00		NA	1095.0		5.657E-11	
Carbzole	mg/kg	4.200E+00	0.60	2.00		NA	1095.0		3.086E-09	
Dieldrin	mg/kg	NA	0.60	2.00		1.600E+01	1095.0			
PAH	TE	1.072E+01	0.60	2.00		6.100E+00	1095.0		7.876E-09	4.804E-08
							Total Risk From Chemicals=			2.068E-07
Sr-90	pCi/g	1.580E+00	0.60	2.00	6.200E-11		1095.0	2.076E+00		1.287E-10
Tc-99	pCi/g	7.540E-01	0.60	2.00	8.300E-12		1095.0	9.908E-01		8.223E-12
Cs-137	pCi/g	2.500E-01	0.60	2.00	1.900E-11		1095.0	3.285E-01		6.241E-12
Rn-222	pCi/g	1.550E+00	0.60	2.00	7.700E-12		1095.0	2.037E+00		1.568E-11
Ra-226	pCi/g	1.550E+00	0.60	2.00	3.000E-09		1095.0	2.037E+00		6.110E-09
Ra-228	pCi/g	2.560E+00	0.60	2.00	6.900E-10		1095.0	3.364E+00		2.321E-09
Th-228	pCi/g	3.390E+00	0.60	2.00	7.800E-08		1095.0	4.454E+00		3.474E-07
Th-230	pCi/g	1.230E+01	0.60	2.00	2.900E-08		1095.0	1.616E+01		4.687E-07
Th-232	pCi/g	3.590E+00	0.60	2.00	2.800E-08		1095.0	4.717E+00		1.321E-07
U-234	pCi/g	9.700E+01	0.60	2.00	2.600E-08		1095.0	1.275E+02		3.314E-06
U-235	pCi/g	9.930E+00	0.60	2.00	2.500E-08		1095.0	1.305E+01		3.262E-07
U-238	pCi/g	1.700E+02	0.60	2.00	2.400E-08		1095.0	2.234E+02		5.361E-06
Np-237	pCi/g	3.510E-01	0.60	2.00	2.900E-08		1095.0	4.612E-01		1.338E-08
Pu-238	pCi/g	3.280E-01	0.60	2.00	3.900E-08		1095.0	4.310E-01		1.681E-08
							Total Risk from Radionuclides=			9.988E-06

Formulas Radioactive Materials: Intake/hr = CA (pCi/g) x IR x 10^{-3}
Total Intake (pCi) = Intake/hr x ETx EF x ED

Hazardous Chemicals: Intake = CA x IR x ET x ED x EF x 10^{-6} / [BW x AT]

Parameters IR 2.0 m^3/hr
BW 70.0 kg
AT 25550.0 days

Notes: TE is the toxic equivalent as calculated in Table C.4-3

Table C.II-1, 2, 3 & 4, Attachment C.II.
Footnote 1.

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Estimation of the risks to the public due to inhalation

The impact of dispersion on a contaminated dust cloud released during excavation activities can be estimated by the following method. The basic formula for Gaussian air dispersion to a receptor located at ground level is given by

$$\frac{\bar{\chi}}{Q'} = (2\Pi\sigma_y\sigma_z\bar{u})^{-1}\exp\{-(\frac{y^2}{2\sigma_y^2}+\frac{h^2}{2\sigma_z^2})\}$$

where

χ	=	ave. concentration (pCi/m³)
Q'	=	source strength (pCi/sec)
σ	=	standard deviation of the distribution of material in the y and z directions (m)
h	=	stack height (h)
u	=	component of wind in the x direction (m/sec)

using standard Figures for σ_y and σ_z values, it can be seen that regardless of Pasquill stability class, σ_y increases in value by a factor of 10 for every factor of 10 increase in distance from the source. In contrast, σ_z varies with the stability class, increasing by a factor of 6 for class F and by a factor of 40 for class A (the two bounding stability classes) over the distances 100 m to 1000 m. For case with the **least** impact on the total dispersion, for stability class F and at a distance of 1000 m from the release point,

$\sigma_y = 40$
$\sigma_z = 12$

and the equation becomes

$$\bar{\chi} = \frac{Q'}{2\pi(40)(12)(\bar{u})}\exp\{-(\frac{y^2}{2(40^2)}+\frac{h^2}{2(12^2)})\}$$

At 100 m,

$\sigma_y = 4$
$\sigma_z = 2$

As can be seen, the decrease in χ will be at least a factor of 100 as the distance increases from 100 m to 1000 m. (The exponential term will be less than 1 in both cases.)

The risk to the public, based on the intake for remediation workers, will then be at least one order of magnitude below that for the remediation workers, based on the effects of dispersion. The calculations for remediation workers were also extremely conservative, so that the overall risk to the public will be much less than 10^{-6}.

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Table C.II-5 Inhalation – °Remedial and Nonremedial Worker
Alternative 3: Excavation Scenario
Active Flyash Pile

	Risk Factors							Intake Results		Risk Results
COC	Soil Conc units	Soil Conc	Dust Load mg/m^3	IR m^3/hr	Risk Risk/pCi	Risk 1/mg/kg/d	ETxEFxED hr	Intake pCi	Intake mg/kg-day	Risk
Antimony	mg/kg	2.000E+00	0.60	2.00		NA	3439.0		4.615E-09	
Arsenic	mg/kg	6.427E+01	0.60	2.00		1.500E+01	3439.0		1.483E-07	2.224E-06
Beryllium	mg/kg	3.375E+00	0.60	2.00		8.400E+00	3439.0		7.788E-09	6.542E-08
U-total	mg/kg	2.996E+01	0.60	2.00		NA	3439.0		6.913E-08	
Aroclor-1254	mg/kg	NA	0.60	2.00		NA	3439.0			
Aroclor-1260	mg/kg	NA	0.60	2.00		NA	3439.0			
Carbzole	mg/kg	NA	0.60	2.00		NA	3439.0			
Dieldrin	mg/kg	NA	0.60	2.00		1.600E+01	3439.0			
PAH	TE	NA		2.00		6.100E+00	3439.0			
							Total Risk From Chemicals=			2.290E-06
Sr-90	pCi/g	9.640E-01	0.60	2.00	6.200E-11		3439.0	3.978E+00		2.467E-10
Tc-99	pCi/g	NA	0.60	2.00	8.300E-12		3439.0			
Cs-137	pCi/g	NA	0.60	2.00	1.900E-11		3439.0			
Rn-222	pCi/g	5.240E+00	0.60	2.00	7.700E-12		3439.0	2.162E+01		1.665E-10
Ra-226	pCi/g	5.240E+00	0.60	2.00	3.000E-09		3439.0	2.162E+01		6.487E-08
Ra-228	pCi/g	4.336E+00	0.60	2.00	6.900E-10		3439.0	1.789E+01		1.235E-08
Th-228	pCi/g	5.790E+00	0.60	2.00	7.800E-08		3439.0	2.389E+01		1.864E-06
Th-230	pCi/g	5.717E+00	0.60	2.00	2.900E-08		3439.0	2.359E+01		6.842E-07
Th-232	pCi/g	3.866E+00	0.60	2.00	2.800E-08		3439.0	1.595E+01		4.467E-07
U-234	pCi/g	8.903E+00	0.60	2.00	2.600E-08		3439.0	3.674E+01		9.553E-07
U-235	pCi/g	4.720E+00	0.60	2.00	2.500E-08		3439.0	1.948E+01		4.870E-07
U-238	pCi/g	6.911E+00	0.60	2.00	2.400E-08		3439.0	2.852E+01		6.845E-07
Np-237	pCi/g	4.500E-01	0.60	2.00	2.900E-08		3439.0	1.857E+00		5.385E-08
Pu-238	pCi/g	1.230E-01	0.60	2.00	3.900E-08		3439.0	5.076E-01		1.980E-08
							Total Risk from Radionuclides=			5.273E-06

Formulas Radioactive Materials: Intake/hr = CA (pCi/g) x IR x 10^{-3}
Total Intake (pCi) = Intake/hr x ETx EF x ED

Hazardous Chemicals: Intake = CA x IR x ET x ED x EF x 10^{-6} / [BW x AT]

Parameters IR 2.0 m^3/hr
BW 70.0 kg
AT 25550.0 days

Notes: TE is the toxic equivalent as calculated in Table C.4-3

Table C.II-6 Inhalation – Remedial and Nonremedial Worker
Alternative 3: Excavation Scenario
Lime Sludge Pond

	Risk Factors							Intake Results		Risk Results
COC	Soil Conc units	Soil Conc	Dust Load mg/m^3	IR m^3/hr	Risk Risk/pCi	Risk 1/mg/kg/d	ETxEFxED hr	Intake pCi	Intake mg/kg-day	Risk
Antimony	mg/kg	2.320E+01	0.60	2.00		NA	2100.0		3.269E-08	
Arsenic	mg/kg	6.777E+00	0.60	2.00		1.500E+01	2100.0		9.549E-09	1.432E-07
Beryllium	mg/kg	1.267E+00	0.60	2.00		8.400E+00	2100.0		1.785E-09	1.500E-08
U-total	mg/kg	2.220E+01	0.60	2.00		NA	2100.0		3.128E-08	
Aroclor-1254	mg/kg	4.300E-02	0.60	2.00		NA	2100.0		6.059E-11	
Aroclor-1260	mg/kg	NA	0.60	2.00		NA	2100.0			
Carbzole	mg/kg	NA	0.60	2.00		NA	2100.0			
Dieldrin	mg/kg	NA	0.60	2.00		1.600E+01	2100.0			
PAH	TE	3.775E-01	0.60	2.00		6.100E+00	2100.0		5.319E-10	3.244E-09
							Total Risk From Chemicals=			1.615E-07
Sr-90	pCi/g	8.410E-01	0.60	2.00	6.200E-11		2100.0	2.119E+00		1.314E-10
Tc-99	pCi/g	1.050E+00	0.60	2.00	8.300E-12		2100.0	2.646E+00		2.196E-11
Cs-137	pCi/g	1.680E-01	0.60	2.00	1.900E-11		2100.0	4.234E-01		8.044E-12
Rn-222	pCi/g	1.562E+00	0.60	2.00	7.700E-12		2100.0	3.936E+00		3.031E-11
Ra-226	pCi/g	1.562E+00	0.60	2.00	3.000E-09		2100.0	3.936E+00		1.181E-08
Ra-228	pCi/g	1.800E+00	0.60	2.00	6.900E-10		2100.0	4.536E+00		3.130E-09
Th-228	pCi/g	1.540E+00	0.60	2.00	7.800E-08		2100.0	3.881E+00		3.027E-07
Th-230	pCi/g	8.381E+00	0.60	2.00	2.900E-08		2100.0	2.112E+01		6.125E-07
Th-232	pCi/g	1.070E+00	0.60	2.00	2.800E-08		2100.0	2.696E+00		7.550E-08
U-234	pCi/g	6.176E+00	0.60	2.00	2.600E-08		2100.0	1.556E+01		4.047E-07
U-235	pCi/g	4.350E-01	0.60	2.00	2.500E-08		2100.0	1.096E+00		2.740E-08
U-238	pCi/g	7.468E+00	0.60	2.00	2.400E-08		2100.0	1.882E+01		4.517E-07
Np-237	pCi/g	3.230E-01	0.60	2.00	2.900E-08		2100.0	8.140E-01		2.360E-08
Pu-238	pCi/g	1.990E-01	0.60	2.00	3.900E-08		2100.0	5.015E-01		1.956E-08
							Total Risk from Radionuclides=			1.933E-06

Formulas: Radioactive Materials: Intake/hr = CA (pCi/g) x IR x 10^{-3}
Total Intake (pCi) = Intake/hr x ETx EF x ED
Hazardous Chemicals: Intake = CA x IR x ET x ED x EF x 10^{-6} / [BW x AT]

Parameters: IR 2.0 m^3/hr; BW 70.0 kg; AT 25550.0 days

Notes: TE is the toxic equivalent as calculated in Table C.4-3

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Table C.II-7 Inhalation – Remedial and Nonremedial Worker
Alternative 3: Excavation Scenario
South Field and Inactive Sludge Pond

	Risk Factors							Intake Results		Risk Results
COC	Soil Conc units	Soil Conc	Dust Load mg/m^3	IR m^3/hr	Risk Risk/pCi	Risk 1/mg/kg/d	ETxEFxED hr	Intake pCi	Intake mg/kg-day	Risk
Antimony	mg/kg	1.870E+01	0.60	2.00		NA	3838.0		4.815E-08	
Arsenic	mg/kg	1.206E+01	0.60	2.00		1.500E+01	3838.0		3.106E-08	4.658E-07
Beryllium	mg/kg	1.438E+00	0.60	2.00		8.400E+00	3838.0		3.703E-09	3.111E-08
U-total	mg/kg	1.044E+02	0.60	2.00		NA	3838.0		2.688E-07	
Aroclor-1254	mg/kg	4.300E-01	0.60	2.00		NA	3838.0		1.107E-09	
Aroclor-1260	mg/kg	8.900E-02	0.60	2.00		NA	3838.0		2.292E-10	
Carbzole	mg/kg	1.000E-03	0.60	2.00		NA	3838.0		2.575E-12	
Dieldrin	mg/kg	1.600E-02	0.60	2.00		1.600E+01	3838.0		4.120E-11	6.592E-10
PAH	TE	3.505E-01	0.60	2.00		6.100E+00	3838.0		9.027E-10	5.506E-09
							Total Risk From Chemicals=			5.031E-07
Sr-90	pCi/g	1.360E+00	0.60	2.00	6.200E-11		3838.0	6.264E+00		3.883E-10
Tc-99	pCi/g	9.000E-01	0.60	2.00	8.300E-12		3838.0	4.145E+00		3.440E-11
Cs-137	pCi/g	2.370E-01	0.60	2.00	1.900E-11		3838.0	1.092E+00		2.074E-11
Rn-222	pCi/g	2.919E+00	0.60	2.00	7.700E-12		3838.0	1.344E+01		1.035E-10
Ra-226	pCi/g	2.919E+00	0.60	2.00	3.000E-09		3838.0	1.344E+01		4.033E-08
Ra-228	pCi/g	1.656E+00	0.60	2.00	6.900E-10		3838.0	7.627E+00		5.263E-09
Th-228	pCi/g	1.704E+00	0.60	2.00	7.800E-08		3838.0	7.848E+00		6.121E-07
Th-230	pCi/g	4.263E+00	0.60	2.00	2.900E-08		3838.0	1.963E+01		5.694E-07
Th-232	pCi/g	1.531E+00	0.60	2.00	2.800E-08		3838.0	7.051E+00		1.974E-07
U-234	pCi/g	3.019E+01	0.60	2.00	2.600E-08		3838.0	1.390E+02		3.615E-06
U-235	pCi/g	1.846E+01	0.60	2.00	2.500E-08		3838.0	8.502E+01		2.125E-06
U-238	pCi/g	3.230E+01	0.60	2.00	2.400E-08		3838.0	1.488E+02		3.570E-06
Np-237	pCi/g	3.000E-01	0.60	2.00	2.900E-08		3838.0	1.382E+00		4.007E-08
Pu-238	pCi/g	4.000E-02	0.60	2.00	3.900E-08		3838.0	1.842E-01		7.185E-09
							Total Risk from Radionuclides=			1.078E-05

Formulas Radioactive Materials: Intake/hr = CA (pCi/g) x IR x 10^{-3}
Total Intake (pCi) = Intake/hr x ETx EF x ED
Hazardous Chemicals: Intake = CA x IR x ET x ED x EF x 10^{-6} / [BW x AT]

Parameters: IR 2.0 m^3/hr
BW 70.0 kg
AT 25550.0 days

Notes: TE is the toxic equivalent as calculated in Table C.4-3

Table C.II-8 Inhalation – Remedial and Nonremedial Worker
Alternative 3: Excavation Scenario
Solid Waste Landfill

	Risk Factors							Intake Results		Risk Results
COC	Soil Conc units	Soil Conc	Dust Load mg/m^3	IR m^3/hr	Risk Risk/pCi	Risk 1/mg/kg/d	ETxEFxED hr	Intake pCi	Intake mg/kg-day	Risk
Antimony	mg/kg	2.200E+01	0.60	2.00		NA	2186.0		3.227E-08	
Arsenic	mg/kg	1.380E+01	0.60	2.00		1.500E+01	2186.0		2.024E-08	3.036E-07
Beryllium	mg/kg	1.075E+00	0.60	2.00		8.400E+00	2186.0		1.577E-09	1.324E-08
U-total	mg/kg	4.460E+02	0.60	2.00		NA	2186.0		6.541E-07	
Aroclor-1254	mg/kg		0.60	2.00		NA	2186.0			
Aroclor-1260	mg/kg		0.60	2.00		NA	2186.0			
Carbzole	mg/kg	4.200E+00	0.60	2.00		NA	2186.0		6.160E-09	
Dieldrin	mg/kg	NA	0.60	2.00		1.600E+01	2186.0			
PAH	TE	1.072E+01	0.60	2.00		6.100E+00	2186.0		1.572E-08	9.591E-08
							Total Risk From Chemicals=			4.128E-07
Sr-90	pCi/g	1.580E+00	0.60	2.00	6.200E-11		2186.0	4.145E+00		2.570E-10
Tc-99	pCi/g	7.540E-01	0.60	2.00	8.300E-12		2186.0	1.978E+00		1.642E-11
Cs-137	pCi/g	2.500E-01	0.60	2.00	1.900E-11		2186.0	6.558E-01		1.246E-11
Rn-222	pCi/g	1.550E+00	0.60	2.00	7.700E-12		2186.0	4.066E+00		3.131E-11
Ra-226	pCi/g	1.550E+00	0.60	2.00	3.000E-09		2186.0	4.066E+00		1.220E-08
Ra-228	pCi/g	2.560E+00	0.60	2.00	6.900E-10		2186.0	6.715E+00		4.634E-09
Th-228	pCi/g	3.390E+00	0.60	2.00	7.800E-08		2186.0	8.893E+00		6.936E-07
Th-230	pCi/g	1.230E+01	0.60	2.00	2.900E-08		2186.0	3.227E+01		9.357E-07
Th-232	pCi/g	3.590E+00	0.60	2.00	2.800E-08		2186.0	9.417E+00		2.637E-07
U-234	pCi/g	9.700E+01	0.60	2.00	2.600E-08		2186.0	2.545E+02		6.616E-06
U-235	pCi/g	9.930E+00	0.60	2.00	2.500E-08		2186.0	2.605E+01		6.512E-07
U-238	pCi/g	1.700E+02	0.60	2.00	2.400E-08		2186.0	4.459E+02		1.070E-05
Np-237	pCi/g	3.510E-01	0.60	2.00	2.900E-08		2186.0	9.207E-01		2.670E-08
Pu-238	pCi/g	3.280E-01	0.60	2.00	3.900E-08		2186.0	8.604E-01		3.356E-08
							Total Risk from Radionuclides=			1.994E-05

Formulas Radioactive Materials: Intake/hr = CA (pCi/g) x IR x 10^{-3}
Total Intake (pCi) = Intake/hr x ETx EF x ED

Hazardous Chemicals: Intake = CA x IR x ET x ED x EF x 10^{-6} / [BW x AT]

Parameters IR 2.0 m^3/hr
BW 70.0 kg
AT 25550.0 days

Notes: TE is the toxic equivalent as calculated in Table C.4-3

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Table C.II-9 Inhalation – Remedial and Nonremedial Worker
Alternative 6: Excavation Scenario
Active Flyash Pile

	Risk Factors							Intake Results		Risk Results
COC	Soil Conc units	Soil Conc	Dust Load mg/m^3	IR m^3/hr	Risk Risk/pCi	Risk 1/mg/kg/d	ETxEFxED hr	Intake pCi	Intake mg/kg-day	Risk
Antimony	mg/kg	2.000E+00	0.60	2.00		NA	1818.0		2.440E-09	
Arsenic	mg/kg	6.427E+01	0.60	2.00		1.500E+01	1818.0		7.840E-08	1.176E-06
Beryllium	mg/kg	3.375E+00	0.60	2.00		8.400E+00	1818.0		4.117E-09	3.458E-08
U-total	mg/kg	2.996E+01	0.60	2.00		NA	1818.0		3.655E-08	
Aroclor-1254	mg/kg	NA	0.60	2.00		NA	1818.0			
Aroclor-1260	mg/kg	NA	0.60	2.00		NA	1818.0			
Carbzole	mg/kg	NA	0.60	2.00		NA	1818.0			
Dieldrin	mg/kg	NA	0.60	2.00		1.600E+01	1818.0			
PAH	TE	NA		2.00		6.100E+00	1818.0			
							Total Risk From Chemicals=			1.211E-06
Sr-90	pCi/g	9.640E-01	0.60	2.00	6.200E-11		1818.0	2.103E+00		1.304E-10
Tc-99	pCi/g	NA	0.60	2.00	8.300E-12		1818.0			
Cs-137	pCi/g	NA	0.60	2.00	1.900E-11		1818.0			
Rn-222	pCi/g	5.240E+00	0.60	2.00	7.700E-12		1818.0	1.143E+01		8.802E-11
Ra-226	pCi/g	5.240E+00	0.60	2.00	3.000E-09		1818.0	1.143E+01		3.429E-08
Ra-228	pCi/g	4.336E+00	0.60	2.00	6.900E-10		1818.0	9.459E+00		6.527E-09
Th-228	pCi/g	5.790E+00	0.60	2.00	7.800E-08		1818.0	1.263E+01		9.853E-07
Th-230	pCi/g	5.717E+00	0.60	2.00	2.900E-08		1818.0	1.247E+01		3.617E-07
Th-232	pCi/g	3.866E+00	0.60	2.00	2.800E-08		1818.0	8.434E+00		2.362E-07
U-234	pCi/g	8.903E+00	0.60	2.00	2.600E-08		1818.0	1.942E+01		5.050E-07
U-235	pCi/g	4.720E+00	0.60	2.00	2.500E-08		1818.0	1.030E+01		2.574E-07
U-238	pCi/g	6.911E+00	0.60	2.00	2.400E-08		1818.0	1.508E+01		3.618E-07
Np-237	pCi/g	4.500E-01	0.60	2.00	2.900E-08		1818.0	9.817E-01		2.847E-08
Pu-238	pCi/g	1.230E-01	0.60	2.00	3.900E-08		1818.0	2.683E-01		1.047E-08
							Total Risk from Radionuclides=			2.787E-06

Formulas Radioactive Materials: Intake/hr = CA (pCi/g) x IR x 10^{-3}
Total Intake (pCi) = Intake/hr x ETx EF x ED
Hazardous Chemicals: Intake = CA x IR x ET x ED x EF x 10^{-6} / [BW x AT]

Parameters IR 2.0 m^3/hr
BW 70.0 kg
AT 25550.0 days

Notes: TE is the toxic equivalent as calculated in Table C.4-3

Table C.II-10 Inhalation – Remedial and Nonremedial Worker
Alternative 6: Excavation Scenario
Lime Sludge Pond

	Risk Factors							Intake Results		Risk Results
COC	Soil Conc units	Soil Conc	Dust Load mg/m^3	IR m^3/hr	Risk Risk/pCi	Risk 1/mg/kg/d	ETxEFxED hr	Intake pCi	Intake mg/kg-day	Risk
Antimony	mg/kg	2.320E+01	0.60	2.00		NA	2397.0		3.731E-08	
Arsenic	mg/kg	6.777E+00	0.60	2.00		1.500E+01	2397.0		1.090E-08	1.635E-07
Beryllium	mg/kg	1.267E+00	0.60	2.00		8.400E+00	2397.0		2.038E-09	1.712E-08
U-total	mg/kg	2.220E+01	0.60	2.00		NA	2397.0		3.570E-08	
Aroclor-1254	mg/kg	4.300E-02	0.60	2.00		NA	2397.0		6.916E-11	
Aroclor-1260	mg/kg	NA	0.60	2.00		NA	2397.0			
Carbzole	mg/kg	NA	0.60	2.00		NA	2397.0			
Dieldrin	mg/kg	NA	0.60	2.00		1.600E+01	2397.0			
PAH	TE	3.775E-01	0.60	2.00		6.100E+00	2397.0		6.071E-10	3.703E-09
								Total Risk From Chemicals=		1.843E-07
Sr-90	pCi/g	8.410E-01	0.60	2.00	6.200E-11		2397.0	2.419E+00		1.500E-10
Tc-99	pCi/g	1.050E+00	0.60	2.00	8.300E-12		2397.0	3.020E+00		2.507E-11
Cs-137	pCi/g	1.680E-01	0.60	2.00	1.900E-11		2397.0	4.832E-01		9.181E-12
Rn-222	pCi/g	1.562E+00	0.60	2.00	7.700E-12		2397.0	4.493E+00		3.460E-11
Ra-226	pCi/g	1.562E+00	0.60	2.00	3.000E-09		2397.0	4.493E+00		1.348E-08
Ra-228	pCi/g	1.800E+00	0.60	2.00	6.900E-10		2397.0	5.178E+00		3.572E-09
Th-228	pCi/g	1.540E+00	0.60	2.00	7.800E-08		2397.0	4.430E+00		3.455E-07
Th-230	pCi/g	8.381E+00	0.60	2.00	2.900E-08		2397.0	2.411E+01		6.991E-07
Th-232	pCi/g	1.070E+00	0.60	2.00	2.800E-08		2397.0	3.078E+00		8.618E-08
U-234	pCi/g	6.176E+00	0.60	2.00	2.600E-08		2397.0	1.776E+01		4.619E-07
U-235	pCi/g	4.350E-01	0.60	2.00	2.500E-08		2397.0	1.251E+00		3.128E-08
U-238	pCi/g	7.468E+00	0.60	2.00	2.400E-08		2397.0	2.148E+01		5.155E-07
Np-237	pCi/g	3.230E-01	0.60	2.00	2.900E-08		2397.0	9.291E-01		2.694E-08
Pu-238	pCi/g	1.990E-01	0.60	2.00	3.900E-08		2397.0	5.724E-01		2.232E-08
								Total Risk from Radionuclides=		2.206E-06

Formulas Radioactive Materials: Intake/hr = CA (pCi/g) x IR x 10^{-3}
Total Intake (pCi) = Intake/hr x ETx EF x ED
Hazardous Chemicals: Intake = CA x IR x ET x ED x EF x 10^{-6} / [BW x AT]

Parameters IR 2.0 m^3/hr
BW 70.0 kg
AT 25550.0 days

Notes: TE is the toxic equivalent as calculated in Table C.4-3

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Table C.II-11 Inhalation - Remedial and Nonremedial Worker
Alternative 6: Excavation Scenario
South Field and Inactive Flyash Pond

	Risk Factors							Intake Results		Risk Results
COC	Soil Conc units	Soil Conc	Dust Load mg/m^3	IR m^3/hr	Risk Risk/pCi	Risk 1/mg/kg/d	ETxEFxED hr	Intake pCi	Intake mg/kg-day	Risk
Antimony	mg/kg	1.870E+01	0.60	2.00		NA	3536.0		4.437E-08	
Arsenic	mg/kg	1.206E+01	0.60	2.00		1.500E+01	3536.0		2.861E-08	4.292E-07
Beryllium	mg/kg	1.438E+00	0.60	2.00		8.400E+00	3536.0		3.412E-09	2.866E-08
U-total	mg/kg	1.044E+02	0.60	2.00		NA	3536.0		2.477E-07	
Aroclor-1254	mg/kg	4.300E-01	0.60	2.00		NA	3536.0		1.020E-09	
Aroclor-1260	mg/kg	8.900E-02	0.60	2.00		NA	3536.0		2.112E-10	
Carbzole	mg/kg	1.000E-03	0.60	2.00		NA	3536.0		2.372E-12	
Dieldrin	mg/kg	1.600E-02	0.60	2.00		1.600E+01	3536.0		3.796E-11	6.074E-10
PAH	TE	3.505E-01	0.60	2.00		6.100E+00	3536.0		8.316E-10	5.073E-09
							Total Risk From Chemicals=			4.635E-07
Sr-90	pCi/g	1.360E+00	0.60	2.00	6.200E-11		3536.0	5.771E+00		3.578E-10
Tc-99	pCi/g	9.000E-01	0.60	2.00	8.300E-12		3536.0	3.819E+00		3.170E-11
Cs-137	pCi/g	2.370E-01	0.60	2.00	1.900E-11		3536.0	1.006E+00		1.911E-11
Rn-222	pCi/g	2.919E+00	0.60	2.00	7.700E-12		3536.0	1.239E+01		9.537E-11
Ra-226	pCi/g	2.919E+00	0.60	2.00	3.000E-09		3536.0	1.239E+01		3.716E-08
Ra-228	pCi/g	1.656E+00	0.60	2.00	6.900E-10		3536.0	7.027E+00		4.848E-09
Th-228	pCi/g	1.704E+00	0.60	2.00	7.800E-08		3536.0	7.230E+00		5.640E-07
Th-230	pCi/g	4.263E+00	0.60	2.00	2.900E-08		3536.0	1.809E+01		5.246E-07
Th-232	pCi/g	1.531E+00	0.60	2.00	2.800E-08		3536.0	6.496E+00		1.819E-07
U-234	pCi/g	3.019E+01	0.60	2.00	2.600E-08		3536.0	1.281E+02		3.331E-06
U-235	pCi/g	1.846E+01	0.60	2.00	2.500E-08		3536.0	7.833E+01		1.958E-06
U-238	pCi/g	3.230E+01	0.60	2.00	2.400E-08		3536.0	1.371E+02		3.289E-06
Np-237	pCi/g	3.000E-01	0.60	2.00	2.900E-08		3536.0	1.273E+00		3.692E-08
Pu-238	pCi/g	4.000E-02	0.60	2.00	3.900E-08		3536.0	1.697E-01		6.619E-09
							Total Risk from Radionuclides=			9.935E-06

Formulas Radioactive Materials: Intake/hr = CA (pCi/g) x IR x 10^{-3}
Total Intake (pCi) = Intake/hr x ETx EF x ED
Hazardous Chemicals: Intake = CA x IR x ET x ED x EF x 10^{-6} / [BW x AT]

Parameters IR 2.0 m^3/hr
BW 70.0 kg
AT 25550.0 days

Notes: TE is the toxic equivalent as calculated in Table C.4-3

Table C.II-12 Inhalation – Remedial and Nonremedial Worker
Alternative 6: Excavation Scenario
Solid Waste Landfill

	Risk Factors							Intake Results		Risk Results
COC	Soil Conc units	Soil Conc	Dust Load mg/m^3	IR m^3/hr	Risk Risk/pCi	Risk 1/mg/kg/d	ETxEFxED hr	Intake pCi	Intake mg/kg-day	Risk
Antimony	mg/kg	2.200E+01	0.60	2.00		NA	2000.0		2.952E-08	
Arsenic	mg/kg	1.380E+01	0.60	2.00		1.500E+01	2000.0		1.852E-08	2.778E-07
Beryllium	mg/kg	1.075E+00	0.60	2.00		8.400E+00	2000.0		1.443E-09	1.212E-08
U-total	mg/kg	4.460E+02	0.60	2.00		NA	2000.0		5.985E-07	
Aroclor-1254	mg/kg	4.800E-02	0.60	2.00		NA	2000.0		6.441E-11	
Aroclor-1260	mg/kg	7.700E-02	0.60	2.00		NA	2000.0		1.033E-10	
Carbzole	mg/kg	4.200E+00	0.60	2.00		NA	2000.0		5.636E-09	
Dieldrin	mg/kg	NA	0.60	2.00		1.600E+01	2000.0			
PAH	TE	1.072E+01	0.60	2.00		6.100E+00	2000.0		1.439E-08	8.775E-08
							Total Risk From Chemicals=			3.776E-07
Sr-90	pCi/g	1.580E+00	0.60	2.00	6.200E-11		2000.0	3.792E+00		2.351E-10
Tc-99	pCi/g	7.540E-01	0.60	2.00	8.300E-12		2000.0	1.810E+00		1.502E-11
Cs-137	pCi/g	2.500E-01	0.60	2.00	1.900E-11		2000.0	6.000E-01		1.140E-11
Rn-222	pCi/g	1.550E+00	0.60	2.00	7.700E-12		2000.0	3.720E+00		2.864E-11
Ra-226	pCi/g	1.550E+00	0.60	2.00	3.000E-09		2000.0	3.720E+00		1.116E-08
Ra-228	pCi/g	2.560E+00	0.60	2.00	6.900E-10		2000.0	6.144E+00		4.239E-09
Th-228	pCi/g	3.390E+00	0.60	2.00	7.800E-08		2000.0	8.136E+00		6.346E-07
Th-230	pCi/g	1.230E+01	0.60	2.00	2.900E-08		2000.0	2.952E+01		8.561E-07
Th-232	pCi/g	3.590E+00	0.60	2.00	2.800E-08		2000.0	8.616E+00		2.412E-07
U-234	pCi/g	9.700E+01	0.60	2.00	2.600E-08		2000.0	2.328E+02		6.053E-06
U-235	pCi/g	9.930E+00	0.60	2.00	2.500E-08		2000.0	2.383E+01		5.958E-07
U-238	pCi/g	1.700E+02	0.60	2.00	2.400E-08		2000.0	4.080E+02		9.792E-06
Np-237	pCi/g	3.510E-01	0.60	2.00	2.900E-08		2000.0	8.424E-01		2.443E-08
Pu-238	pCi/g	3.280E-01	0.60	2.00	3.900E-08		2000.0	7.872E-01		3.070E-08
							Total Risk from Radionuclides=			1.824E-05

Formulas Radioactive Materials: Intake/hr = CA (pCi/g) x IR x 10^{-3}
Total Intake (pCi) = Intake/hr x ETx EF x ED
Hazardous Chemicals: Intake = CA x IR x ET x ED x EF x 10^{-6} / [BW x AT]

Parameters IR 2.0 m^3/hr
BW 70.0 kg
AT 25550.0 days

Notes: TE is the toxic equivalent as calculated in Table C.4-3

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Table C.II-13 Radon Inhalation Exposure Evaluations
Alternative 2, 3, and 6
Excavation

	Ca	IR	Exposure	Intake	CSF	Risk per
	pCi/m3	m3/hr	hr/person	pCi	1/pCi	Worker
Alternative 2						
Active Flyash Pile	4.65E+01	2.5	2607	3.03E+05	7.7E-12	2.33E-06
Lime Sludge Pile	4.77E+00	2.5	987	1.18E+04	7.7E-12	9.06E-08
South Field/Inactive Flyash Pile	5.61E+00	2.5	2694	3.78E+04	7.7E-12	2.91E-07
Solid Waste Landfill	4.65E+01	2.5	1095	1.27E+05	7.7E-12	9.80E-07
Total						3.70E-06
Alternative 3						
Active Flyash Pile	4.65E+01	2.5	3439	4.00E+05	7.7E-12	3.08E-06
Lime Sludge Pile	4.77E+00	2.5	2100	2.50E+04	7.7E-12	1.93E-07
South Field/Inactive Flyash Pile	5.61E+00	2.5	3838	5.38E+04	7.7E-12	4.14E-07
Solid Waste Landfill	4.65E+01	2.5	2186	2.54E+05	7.7E-12	1.96E-06
Total						5.64E-06
Alternative 6						
Active Flyash Pile	4.65E+01	2.5	1818	2.11E+05	7.7E-12	1.63E-06
Lime Sludge Pile	4.77E+00	2.5	2397	2.86E+04	7.7E-12	2.20E-07
South Field/Inactive Flyash Pile	5.61E+00	2.5	3536	4.96E+04	7.7E-12	3.82E-07
Solid Waste Landfill	4.65E+01	2.5	2000	2.33E+05	7.7E-12	1.79E-06
Total						4.02E-06

CSF - cancer slope factor from Section C.4.2

Table C.II-14 Dermal Exposure Pathways
Alternative 2
Excavation

COC	SF 1/(mg/kg-d)	RfD mg/kg-d	soil conc mg/kg	ABS	ED*EF	Intake mg/kg-d	Cancer Risks	Non-Carcin. HI
Active Flyash Pile								
Antimony	NA	6.00E-05	2.00E+00	1.0E-02	1.18E+02	7.57E-09	0.00E+00	1.26E-04
Arsenic	1.90E+00	2.85E-04	6.43E+01	1.0E-03	1.18E+02	2.43E-08	4.62E-08	8.54E-05
Beryllium	4.30E+00	5.00E-03	3.38E+00	1.0E-02	1.18E+02	1.28E-08	5.50E-08	2.56E-06
U-total	NA	1.50E-04	3.00E+01	1.0E-03	1.18E+02	1.13E-08	0.00E+00	7.56E-05
Aroclor-1254	1.03E+01	5.30E-05	NA	6.0E-02	1.18E+02	0.00E+00	0.00E+00	0.00E+00
Aroclor-1260	1.03E+01	5.30E-05	NA	6.0E-02	1.18E+02	0.00E+00	0.00E+00	0.00E+00
Carbazole	2.22E-02	NA	NA	3.0E-01	1.18E+02	0.00E+00	0.00E+00	--
Dieldrin	1.78E+01	4.5E-05	NA	3.0E-01	1.18E+02	0.00E+00	0.00E+00	0.00E+00
PAH	NA	NA	NA	NA	1.18E+02	0.00E+00	0.00E+00	--
Total							1.01E-07	2.90E-04
Lime Sludge Pond								
Antimony	NA	6.00E-05	2.32E+01	1.0E-02	9.50E+01	7.09E-08	0.00E+00	1.18E-03
Arsenic	1.90E+00	2.85E-04	6.78E+00	1.0E-03	9.50E+01	2.07E-09	3.93E-09	7.26E-06
Beryllium	4.30E+00	5.00E-03	1.27E+00	1.0E-02	9.50E+01	3.87E-09	1.66E-08	7.74E-07
U-total	NA	1.50E-04	2.22E+01	1.0E-03	9.50E+01	6.78E-09	0.00E+00	4.52E-05
Aroclor-1254	1.03E+01	5.30E-05	4.30E-02	6.0E-02	9.50E+01	7.88E-10	8.12E-09	1.49E-05
Aroclor-1260	1.03E+01	5.30E-05	NA	6.0E-02	9.50E+01	0.00E+00	0.00E+00	0.00E+00
Carbazole	2.22E-02	NA	NA	3.0E-01	9.50E+01	0.00E+00	0.00E+00	--
Dieldrin	1.78E+01	4.5E-05	NA	3.0E-01	9.50E+01	0.00E+00	0.00E+00	0.00E+00
PAH	NA	NA	1.90E-01	NA	9.50E+01	0.00E+00	0.00E+00	--
Total							2.87E-08	1.25E-03
South Field and Inactive Flyash Pile								
Antimony	NA	6.00E-05	1.87E+01	1.0E-02	2.58E+02	1.55E-07	0.00E+00	2.59E-03
Arsenic	1.90E+00	2.85E-04	1.21E+01	1.0E-03	2.58E+02	1.00E-08	1.90E-08	3.51E-05
Beryllium	4.30E+00	5.00E-03	1.44E+00	1.0E-02	2.58E+02	1.19E-08	5.14E-08	2.39E-06
U-total	NA	1.50E-04	1.04E+02	1.0E-03	2.58E+02	8.66E-08	0.00E+00	5.77E-04
Aroclor-1254	1.03E+01	5.30E-05	0.043	6.0E-02	2.58E+02	2.14E-09	2.20E-08	4.04E-05
Aroclor-1260	1.03E+01	5.30E-05	0.089	6.0E-02	2.58E+02	4.43E-09	4.56E-08	8.36E-05
Carbazole	2.22E-02	NA	0.001	3.0E-01	2.58E+02	2.49E-10	5.52E-12	--
Dieldrin	1.78E+01	4.5E-05	0.016	3.0E-01	2.58E+02	3.98E-09	7.09E-08	8.85E-05
PAH	NA	NA	0.18	NA	2.58E+02	0.00E+00	0.00E+00	--
Total							2.09E-07	3.41E-03
Solid Waste Landfill								
Antimony	NA	6.00E-05	2.20E+01	1.0E-02	1.05E+02	7.44E-08	0.00E+00	1.24E-03
Arsenic	1.90E+00	2.85E-04	1.38E+01	1.0E-03	1.05E+02	4.67E-09	8.87E-09	1.64E-05
Beryllium	4.30E+00	5.00E-03	1.08E+00	1.0E-02	1.05E+02	3.64E-09	1.56E-08	7.27E-07
U-total	NA	1.50E-04	4.46E+02	1.0E-03	1.05E+02	1.51E-07	0.00E+00	1.01E-03
Aroclor-1254	1.03E+01	5.30E-05	4.80E-02	6.0E-02	1.05E+02	9.74E-10	1.00E-08	1.84E-05
Aroclor-1260	1.03E+01	5.30E-05	7.70E-02	6.0E-02	1.05E+02	1.56E-09	1.61E-08	2.95E-05
Carbazole	2.22E-02	NA	4.20E+00	3.0E-01	1.05E+02	4.26E-07	9.46E-09	--
Dieldrin	1.78E+01	4.5E-05	NA	3.0E-01	1.05E+02	0.00E+00	0.00E+00	0.00E+00
PAH	NA	NA	NA	NA	1.05E+02	0.00E+00	0.00E+00	--
Total							6.01E-08	2.31E-03
Grand Total							3.99E-07	7.26E-03

Soil concentrations and dust loading from Tables C.II-2-5
Dermal Slope Factors (SF) from Table C.4-4
Dermal Reference Doses (RfD) from Table C.4-4
Formula (ref EPA RAGS): CS*AF*SA*ABS*CF*ED*EF/BW*AT
Dermal Absorption Coefficients (ABS) from Table C.3-4

CF = 10e-6 kg/mg
AF = 1 mg/cm2
SA assumed at 5750 cm^2 (Adult male)
BW = 70 kg
AT = 25550 days
EF = 200 events/yr

ED = 5.89E-01 Yr - AFP
4.75E-01 Yr - LSP
1.29E+00 Yr - SF/IFP
5.26E-01 Yr - SWL

Table C.II-15 Dermal Exposure Pathways
Alternative 3
Excavation

COC	SF 1/(mg/kg-d)	RfD mg/kg-d	soil conc mg/kg	ABS	ED*EF	Intake mg/kg-d	Cancer Risks	Non-Carcin. HI
Active Flyash Pile								
Antimony	NA	6.00E-05	2.00E+00	1.0E-02	3.30E+02	2.12E-08	0.00E+00	3.54E-04
Arsenic	1.90E+00	2.85E-04	6.43E+01	1.0E-03	3.30E+02	6.82E-08	1.30E-07	2.39E-04
Beryllium	4.30E+00	5.00E-03	3.38E+00	1.0E-02	3.30E+02	3.58E-08	1.54E-07	7.16E-06
U-total	NA	1.50E-04	3.00E+01	1.0E-03	3.30E+02	3.18E-08	0.00E+00	2.12E-04
Aroclor-1254	1.03E+01	5.30E-05	0	6.0E-02	3.30E+02	0.00E+00	0.00E+00	0.00E+00
Aroclor-1260	1.03E+01	5.30E-05	0	6.0E-02	3.30E+02	0.00E+00	0.00E+00	0.00E+00
Carbazole	2.22E-02	NA	0	3.0E-01	3.30E+02	0.00E+00	0.00E+00	--
Dieldrin	1.78E+01	4.5E-05	0	3.0E-01	3.30E+02	0.00E+00	0.00E+00	0.00E+00
PAH	NA	NA	0	NA	3.30E+02	0.00E+00	0.00E+00	--
Total							2.84E-07	8.12E-04
Lime Sludge Pond								
Antimony	NA	6.00E-05	2.32E+01	1.0E-02	2.02E+02	1.51E-07	0.00E+00	2.51E-03
Arsenic	1.90E+00	2.85E-04	6.78E+00	1.0E-03	2.02E+02	4.40E-09	8.36E-09	1.54E-05
Beryllium	4.30E+00	5.00E-03	1.27E+00	1.0E-02	2.02E+02	8.23E-09	3.54E-08	1.65E-06
U-total	NA	1.50E-04	2.22E+01	1.0E-03	2.02E+02	1.44E-08	0.00E+00	9.61E-05
Aroclor-1254	1.03E+01	5.30E-05	4.30E-02	6.0E-02	2.02E+02	1.68E-09	1.73E-08	3.16E-05
Aroclor-1260	1.03E+01	5.30E-05	NA	6.0E-02	2.02E+02	0.00E+00	0.00E+00	0.00E+00
Carbazole	2.22E-02	NA	NA	3.0E-01	2.02E+02	0.00E+00	0.00E+00	--
Dieldrin	1.78E+01	4.5E-05	NA	3.0E-01	2.02E+02	0.00E+00	0.00E+00	0.00E+00
PAH	NA	NA	1.90E-01	NA	2.02E+02	0.00E+00	0.00E+00	--
Total							6.10E-08	2.66E-03
South Field and Inactive Flyash Pile								
Antimony	NA	6.00E-05	1.87E+01	1.0E-02	6.72E+02	4.04E-07	0.00E+00	6.73E-03
Arsenic	1.90E+00	2.85E-04	1.21E+01	1.0E-03	6.72E+02	2.61E-08	4.95E-08	9.14E-05
Beryllium	4.30E+00	5.00E-03	1.44E+00	1.0E-02	6.72E+02	3.11E-08	1.34E-07	6.22E-06
U-total	NA	1.50E-04	1.04E+02	1.0E-03	6.72E+02	2.26E-07	0.00E+00	1.50E-03
Aroclor-1254	1.03E+01	5.30E-05	0.043	6.0E-02	6.72E+02	5.57E-09	5.74E-08	1.05E-04
Aroclor-1260	1.03E+01	5.30E-05	0.089	6.0E-02	6.72E+02	1.15E-08	1.19E-07	2.18E-04
Carbazole	2.22E-02	NA	0.001	3.0E-01	6.72E+02	6.48E-10	1.44E-11	--
Dieldrin	1.78E+01	4.5E-05	0.016	3.0E-01	6.72E+02	1.04E-08	1.85E-07	2.30E-04
PAH	NA	NA	0.18	NA	6.72E+02	0.00E+00	0.00E+00	--
Total							5.44E-07	8.89E-03
Solid Waste Landfill								
Antimony	NA	6.00E-05	2.20E+01	1.0E-02	2.10E+02	1.49E-07	0.00E+00	2.48E-03
Arsenic	1.90E+00	2.85E-04	1.38E+01	1.0E-03	2.10E+02	9.32E-09	1.77E-08	3.27E-05
Beryllium	4.30E+00	5.00E-03	1.08E+00	1.0E-02	2.10E+02	7.26E-09	3.12E-08	1.45E-06
U-total	NA	1.50E-04	4.46E+02	1.0E-03	2.10E+02	3.01E-07	0.00E+00	2.01E-03
Aroclor-1254	1.03E+01	5.30E-05	4.80E-02	6.0E-02	2.10E+02	1.94E-09	2.00E-08	3.67E-05
Aroclor-1260	1.03E+01	5.30E-05	7.70E-02	6.0E-02	2.10E+02	3.12E-09	3.21E-08	5.89E-05
Carbazole	2.22E-02	NA	4.20E+00	3.0E-01	2.10E+02	8.51E-07	1.89E-08	--
Dieldrin	1.78E+01	4.5E-05	NA	3.0E-01	2.10E+02	0.00E+00	0.00E+00	0.00E+00
PAH	NA	NA	NA	NA	2.10E+02	0.00E+00	0.00E+00	--
Total							1.20E-07	4.61E-03
Grand Total							1.01E-06	1.70E-02

Soil concentrations and dust loading from Tables C.II-2-5
Dermal Slope Factors (SF) from Table C.4-4
Dermal Reference Doses (RfD) from Table C.4-4
Formula (ref EPA RAGS): CS*AF*SA*ABS*CF*ED*EF/BW*AT
Dermal Absorption Coefficients (ABS) from Table C.3-4

CF = 10e-6 kg/mg
AF = 1 mg/cm2
SA assumed at 5750 cm^2 (Adult male)
BW = 70 kg
AT = 25550 days
EF = 200 events/yr

ED = 1.65E+00 Yr - AFP
1.01E+00 Yr - LSP
3.36E+00 Yr - SF/IFP
1.05E+00 Yr - SWL

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Table C.II-16 Dermal Exposure Pathways
Alternative 6
Excavation

COC	SF 1/(mg/kg-d)	RfD mg/kg-d	soil conc mg/kg	ABS	ED*EF	Intake mg/kg-d	Cancer Risks	Non-Carcin. HI
Active Flyash Pile								
Antimony	NA	6.00E-05	2.00E+00	1.0E-02	1.18E+02	7.57E-09	0.00E+00	1.26E-04
Arsenic	1.90E+00	2.85E-04	6.43E+01	1.0E-03	1.18E+02	2.43E-08	4.62E-08	8.54E-05
Beryllium	4.30E+00	5.00E-03	3.38E+00	1.0E-02	1.18E+02	1.28E-08	5.50E-08	2.56E-06
U-total	NA	1.50E-04	3.00E+01	1.0E-03	1.18E+02	1.13E-08	0.00E+00	7.56E-05
Aroclor-1254	1.03E+01	5.30E-05	0	6.0E-02	1.18E+02	0.00E+00	0.00E+00	0.00E+00
Aroclor-1260	1.03E+01	5.30E-05	0	6.0E-02	1.18E+02	0.00E+00	0.00E+00	0.00E+00
Carbazole	2.22E-02	NA	0	3.0E-01	1.18E+02	0.00E+00	0.00E+00	--
Dieldrin	1.78E+01	4.5E-05	0	3.0E-01	1.18E+02	0.00E+00	0.00E+00	0.00E+00
PAH	NA	NA	0	NA	1.18E+02	0.00E+00	0.00E+00	--
Total							1.012E-07	2.90E-04
Lime Sludge Pond								
Antimony	NA	6.00E-05	2.32E+01	1.0E-02	9.50E+01	7.09E-08	0.00E+00	1.18E-03
Arsenic	1.90E+00	2.85E-04	6.78E+00	1.0E-03	9.50E+01	2.07E-09	3.93E-09	7.26E-06
Beryllium	4.30E+00	5.00E-03	1.27E+00	1.0E-02	9.50E+01	3.87E-09	1.66E-08	7.74E-07
U-total	NA	1.50E-04	2.22E+01	1.0E-03	9.50E+01	6.78E-09	0.00E+00	4.52E-05
Aroclor-1254	1.03E+01	5.30E-05	4.30E-02	6.0E-02	9.50E+01	7.88E-10	8.12E-09	1.49E-05
Aroclor-1260	1.03E+01	5.30E-05	NA	6.0E-02	9.50E+01	0.00E+00	0.00E+00	0.00E+00
Carbazole	2.22E-02	NA	NA	3.0E-01	9.50E+01	0.00E+00	0.00E+00	--
Dieldrin	1.78E+01	4.5E-05	NA	3.0E-01	9.50E+01	0.00E+00	0.00E+00	0.00E+00
PAH	NA	NA	1.90E-01	NA	9.50E+01	0.00E+00	0.00E+00	--
Total							2.869E-08	1.25E-03
South Field and Inactive Flyash Pile								
Antimony	NA	6.00E-05	1.87E+01	1.0E-02	2.30E+02	1.38E-07	0.00E+00	2.30E-03
Arsenic	1.90E+00	2.85E-04	1.21E+01	1.0E-03	2.30E+02	8.92E-09	1.69E-08	3.13E-05
Beryllium	4.30E+00	5.00E-03	1.44E+00	1.0E-02	2.30E+02	1.06E-08	4.58E-08	2.13E-06
U-total	NA	1.50E-04	1.04E+02	1.0E-03	2.30E+02	7.72E-08	0.00E+00	5.15E-04
Aroclor-1254	1.03E+01	5.30E-05	0.043	6.0E-02	2.30E+02	1.91E-09	1.97E-08	3.60E-05
Aroclor-1260	1.03E+01	5.30E-05	0.089	6.0E-02	2.30E+02	3.95E-09	4.07E-08	7.45E-05
Carbazole	2.22E-02	NA	0.001	3.0E-01	2.30E+02	2.22E-10	4.92E-12	--
Dieldrin	1.78E+01	4.5E-05	0.016	3.0E-01	2.30E+02	3.55E-09	6.32E-08	7.89E-05
PAH	NA	NA	0.18	NA	2.30E+02	0.00E+00	0.00E+00	--
Total							1.862E-07	3.04E-03
Solid Waste Landfill								
Antimony	NA	6.00E-05	2.20E+01	1.0E-02	1.75E+02	1.24E-07	0.00E+00	2.06E-03
Arsenic	1.90E+00	2.85E-04	1.38E+01	1.0E-03	1.75E+02	7.76E-09	1.47E-08	2.72E-05
Beryllium	4.30E+00	5.00E-03	1.08E+00	1.0E-02	1.75E+02	6.04E-09	2.60E-08	1.21E-06
U-total	NA	1.50E-04	4.46E+02	1.0E-03	1.75E+02	2.51E-07	0.00E+00	1.67E-03
Aroclor-1254	1.03E+01	5.30E-05	4.80E-02	6.0E-02	1.75E+02	1.62E-09	1.67E-08	3.05E-05
Aroclor-1260	1.03E+01	5.30E-05	7.70E-02	6.0E-02	1.75E+02	2.60E-09	2.67E-08	4.90E-05
Carbazole	2.22E-02	NA	4.20E+00	3.0E-01	1.75E+02	7.08E-07	1.57E-08	--
Dieldrin	1.78E+01	4.5E-05	NA	3.0E-01	1.75E+02	0.00E+00	0.00E+00	0.00E+00
PAH	NA	NA	NA	NA	1.75E+02	0.00E+00	0.00E+00	--
Total							9.98E-08	3.84E-03
Grand Total							4.16E-07	8.42E-03

Soil concentrations and dust loading from Tables C.II-2-5
Dermal Slope Factors (SF) from Table C.4-4
Dermal Reference Doses (RfD) from Table C.4-4
Formula (ref EPA RAGS): CS*AF*SA*ABS*CF*ED*EF/BW*AT
Dermal Absorption Coefficients (ABS) from Table C.3-4

CF = 10e-6 kg/mg
AF = 1 mg/cm2
SA assumed at 5750 cm^2 (Adult male)
BW = 70 kg
AT = 25550 days
EF = 200 events/yr

ED = 8.74E-01 Yr - AFP
1.15E+00 Yr - LSP
4.16E+03 Yr - SF/IFP
4.20E+02 Yr - SWL

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Table C.II-17 VOC risks from the Dryer – to Nonremediation Workers and Offsite Persons
Alternative 3

							Inhalation Risks		Dermal Risks	
	Max air conc	IR	Exp Duration	BW	AT	Intake	CSF	Risk	DSF	Risk
	g/m³	m³/hr	hrs	kg	days		1/mg/kg-d		1/mg/kg-d	
Active Flyash Pile										
Aloclor-1254	NA	2	830	70	25550	0	NA	0	1.03E+01	0
Aroclor-1260	NA	2	830	70	25550	0	NA	0	1.03E+01	0
Carbzole	NA	2	830	70	25550	0	NA	0	2.22E-02	0
Dieldrin	NA	2	830	70	25550	0	1.60E+01	0	1.78E+01	0
PAH	NA	2	830	70	25550	0	6.10E+00	0	NA	0
Total								0		0
Lime Sludge Pond										
Aroclor-1254	2.07E-10	2	1660	70	25550	3.843E-10	NA	0	1.03E+01	3.958E-09
Aroclor-1260		2	1660	70	25550	0	NA	0	1.03E+01	0
Carbazole		2	1660	70	25550	0	NA	0	2.22E-02	0
Dieldrin		2	1660	70	25550	0	1.60E+01	0	1.78E+01	0
PAH	1.31E-13	2	1660	70	25550	2.432E-13	6.10E+00	1.483E-12	NA	0
Total								1.483E-12		3.958E-09
South Field/Inactive Flyash Pile										
Aroclor-1254	1.42E-10	2	3570	70	25550	5.669E-10	NA	0	1.03E+01	5.839E-09
Aroclor-1260	1.08E-10	2	3570	70	25550	4.312E-10	NA	0	1.03E+01	4.441E-09
Carbazole	NA	2	3570	70	25550	0	NA	0	2.22E-02	0
Dieldrin	4.73E-13	2	3570	70	25550	1.888E-12	1.60E+01	3.021E-11	1.78E+01	3.361E-11
PAH	9.22E-14	2	3570	70	25550	3.681E-13	6.10E+00	2.245E-12	NA	0
Total								3.246E-11		1.031E-08
Solid Waste Landfill										
Aroclor-1254	2.31E-10	2	740	70	25550	1.912E-10	NA	0	1.03E+01	1.969E-09
Aroclor-1260	1.78E-10	2	740	70	25550	1.473E-10	NA	0	1.03E+01	1.517E-09
Carbazole	NA	2	740	70	25550	0	NA	0	2.22E-02	0
Dieldrin	NA	2	740	70	25550	0	1.60E+01	0	1.78E+01	0
PAH	1.49E-14	2	740	70	25550	1.23E-14	6.10E+00	7.52E-14	NA	0
Total								7.52E-14		3.486E-09

Intake (mg/kg/d) = CA*IR*ET*EF*ED/BW*AT
Exp Duration = ET*EF*ED
CA = Air Conc g/m³
IR = Inhalation Rate

Table C.II–18 Immersion Doses
Alternative 2

			Immersion	
		Total Exp hr/person	Dose mrem/hr	Total Dose mrem
Active Flyash Pile				
Excavation	All Receptors	2607.00	1.13E–09	2.95E–06
Shred/Crush	RemedW	2530.00	1.13E–09	2.86E–06
Waste Staging	RemedW	2607.00	1.13E–09	2.95E–06
Load Rail Cars	RemedW		NA	
On–Site Transp.	RemedW	317.00	NA	
Total	RemedW			8.75E–06
Inactive Flyash/South Field				
Excavation	All Receptors	2690.00	6.51E–10	1.75E–06
Shred/Crush	RemedW	1940.00	6.51E–10	1.26E–06
Waste Staging	RemedW	2690.00	6.51E–10	1.75E–06
Load Rail Cars	RemedW		NA	
On–Site Transp.	RemedW	0.00	NA	
Total	RemedW			4.77E–06
Lime Sludge Ponds				
Excavation	All Receptors	990.00	3.52E–10	3.48E–07
Shred/Crush	RemedW	1482.00	3.52E–10	5.22E–07
Waste Staging	RemedW	990.00	3.52E–10	3.48E–07
Load Rail Cars	RemedW		NA	
On–Site Transp.	RemedW	20.40	NA	
Total	RemedW			1.22E–06
Solid Waste Landfill				
Excavation	All Receptors	1095.00	7.10E–10	7.77E–07
Shred/Crush	RemedW	1917.00	7.10E–10	1.36E–06
Waste Staging	RemedW	1095.00	7.10E–10	7.77E–07
Load Rail Cars	RemedW		NA	
On–Site Transp.	RemedW	15.00	NA	
Total	RemedW			2.92E–06

Table C.II–19 Immersion Doses
Alternative 3

			Immersion	
		Total Exp hr/person	Dose mrem/hr	Total Dose mrem
Active Flyash Pile				
Excavation	All Receptors	3439.00	1.13E–09	3.89E–06
Shred/Crush	RemedW		NA	
Waste Staging	RemedW		NA	
Load Rail Cars	RemedW	1972.00	NA	
On–Site Transp.	RemedW	1570.00	NA	
Total	RemedW			3.89E–06
Inactive Flyash/South Field				
Excavation	All Receptors	3840.00	6.51E–10	2.50E–06
Shred/Crush	RemedW		NA	
Waste Staging	RemedW		NA	
Load Rail Cars	RemedW *	7700.00	NA	
On–Site Transp.	RemedW	4440.00	NA	
Total	RemedW			2.50E–06
Lime Sludge Ponds				
Excavation	All Receptors	2100.00	3.52E–10	7.39E–07
Shred/Crush	RemedW	2184.00	3.52E–10	7.69E–07
Waste Staging	RemedW	2100.00	3.52E–10	7.39E–07
Load Rail Cars	RemedW	2143.00	NA	
On–Site Transp.	RemedW	160.00	NA	
Total	RemedW			2.25E–06
Solid Waste Landfill				
Excavation	All Receptors	2190.00	7.10E–10	1.55E–06
Shred/Crush	RemedW	2184.00	7.10E–10	1.55E–06
Waste Staging	RemedW	1750.00	7.10E–10	1.24E–06
Load Rail Cars	RemedW	2660.00	NA	
On–Site Transp.	RemedW	490.00	NA	
Total	RemedW			4.35E–06

* Reception exposure over 51 months

Table C.II–20 Immersion Doses
Alternative 6

			Immersion	
		Total Exp hr/person	Dose mrem/hr	Total Dose mrem
Active Flyash Pile				
Excavation	All Receptors	1818.00	1.13E–09	2.05E–06
Shred/Crush	RemedW	1688.00	1.13E–09	1.91E–06
Waste Staging	RemedW	1818.00	1.13E–09	2.05E–06
Load Rail Cars	RemedW		NA	
On–Site Transp.	RemedW	589.00	NA	
Total	RemedW			6.02E–06
Inactive Flyash/South Field				
Excavation	All Receptors	3540.00	6.51E–10	2.30E–06
Shred/Crush	RemedW	1010.00	6.51E–10	6.58E–07
Waste Staging	RemedW	3540.00	6.51E–10	2.30E–06
Load Rail Cars	RemedW	47.89	NA	
On–Site Transp.	RemedW	3704.00	NA	
Total	RemedW			5.27E–06
Lime Sludge Ponds				
Excavation	All Receptors	2397.00	3.52E–10	8.44E–07
Shred/Crush	RemedW		NA	
Waste Staging	RemedW		NA	
Load Rail Cars	RemedW		NA	
On–Site Transp.	RemedW	960.00	NA	
Total	RemedW			8.44E–07
Solid Waste Landfill				
Excavation	All Receptors	2000.00	7.10E–10	1.42E–06
Shred/Crush	RemedW	1390.00	7.10E–10	9.87E–07
Waste Staging	RemedW		NA	
Load Rail Cars	RemedW		NA	
On–Site Transp.	RemedW	1523.00	NA	
Total	RemedW			2.41E–06

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Table C.II–21 Industrial Hazards: Expected Accidents other than Onsite Trucking
Alternative 2, 3, and 6
Injury and Fatality Rates for Workers

Alternative 2	Total man–hr	Injury Rate per man–hr	Injury Risk	Fatality Rate per man–hr	Fatality Risk
Solid Waste Landfill	12000	3.4E–05	4.08E–01	5.0E–07	6.00E–03
Lime Sludge Pond	4000	3.4E–05	1.36E–01	5.0E–07	2.00E–03
Inactive Flyash Pile	37470	3.4E–05	1.27E+00	5.0E–07	1.87E–02
South Field	11020	3.4E–05	3.75E–01	5.0E–07	5.51E–03
Active Flyash Pile	52140	3.4E–05	1.77E+00	5.0E–07	2.61E–02
Alternative 3					
Solid Waste Landfill	43720	3.4E–05	1.49E+00	5.0E–07	2.19E–02
Lime Sludge Pond	42000	3.4E–05	1.43E+00	5.0E–07	2.10E–02
Inactive Flyash Pile	52840	3.4E–05	1.80E+00	5.0E–07	2.64E–02
South Field	143000	3.4E–05	4.86E+00	5.0E–07	7.15E–02
Active Flyash Pile	41270	3.4E–05	1.40E+00	5.0E–07	2.06E–02
Alternative 6					
Solid Waste Landfill	14000	3.4E–05	4.76E–01	5.0E–07	7.00E–03
Lime Sludge Pond	71920	3.4E–05	2.45E+00	5.0E–07	3.60E–02
Inactive Flyash Pile	59530	3.4E–05	2.02E+00	5.0E–07	2.98E–02
South Field	156170	3.4E–05	5.31E+00	5.0E–07	7.81E–02
Active Flyash Pile	36400	3.4E–05	1.24E+00	5.0E–07	1.82E–02

Injury and fatality rates from the RAWPA

Table C.II-22 Industrial Hazards: Expected Accidents from Onsite Trucking
Alternative 2, 3, and 6

	Roundtrip Truck Miles – Onsite		Remediation Workers		Remediation Workers	
	PO	FO	Rates for PO volumes		Rates for FO volumes	
			injuries	fatalities	injuries	fatalies
Alternative 2						
Solid Waste Landfill	0	142	0	0	5.84E-06	2.99E-07
Lime Sludge Pond	0	204	0	0	8.37E-06	4.29E-07
Inactive Flyash Pile	0	3669	0	0	1.50E-04	7.70E-06
South Field	0	42	0	0	1.72E-06	8.81E-08
Active Flyash Pile	0	3173	0	0	1.30E-04	6.66E-06
Total	0	7230	0	0	2.96E-04	1.52E-05
Alternative 3						
Solid Waste Landfill	4899	1153	2.01E-04	1.03E-05	4.73E-05	2.42E-06
Lime Sludge Pond	1600	366	6.56E-05	3.36E-06	1.50E-05	7.68E-07
Inactive Flyash Pile	11924	11129	4.89E-04	2.50E-05	4.56E-04	2.34E-05
South Field	32474	7629	1.33E-03	6.82E-05	3.13E-04	1.60E-05
Active Flyash Pile	8540	7460	3.50E-04	1.79E-05	3.06E-04	1.57E-05
Total	59438	27737	2.44E-03	1.25E-04	1.14E-03	5.82E-05
Alternative 6						
Solid Waste Landfill	15042	3539	6.17E-04	3.16E-05	1.45E-04	7.43E-06
Lime Sludge Pond	9707	2217	3.98E-04	2.04E-05	9.09E-05	4.66E-06
Inactive Flyash Pile	9178	8549	3.76E-04	1.93E-05	3.51E-04	1.80E-05
South Field	27689	6481	1.14E-03	5.81E-05	2.66E-04	1.36E-05
Active Flyash Pile	5988	5231	2.46E-04	1.26E-05	2.14E-04	1.10E-05
Total	67604	26017	2.77E-03	1.42E-04	1.07E-03	5.46E-05

PO – based on volumes used for Private Ownership calculations
FO – based on volumes used for Federal Ownership calcualations
Injury and fatality frequencies from RAWPA
Worker fatality rate = 2.1e-9/mile
Worker injury rate = 4.1e-8/mile

Table C.II–23 Industrial Hazards: Expected Accidents from Rail Transportation
Alternative 3
Private Ownership and Federal Ownership Volumes

	# cars	# trips	total miles	Workers injuries	Workers fatalities	Public injuries	Public fatalities
Private Ownership							
Solid Waste Landfill	1623	10.2	39025	1.80E–01	1.80E–03	2.65E–01	7.02E–02
Lime Sludge Pond	1307	8.2	31450	1.45E–01	1.45E–03	2.14E–01	5.66E–02
Inactive Flyash Pile	1606	10.1	38643	1.78E–01	1.78E–03	2.63E–01	6.96E–02
South Field	5306	33.4	127674	5.87E–01	5.87E–03	8.68E–01	2.30E–01
Active Flyash Pile	1203	7.6	28925	1.33E–01	1.33E–03	1.97E–01	5.21E–02
Total	11044	69.5	265830	1.22E+00	1.22E–02	1.81E+00	4.78E–01
Federal Ownership							
Solid Waste Landfill	382	2.4	9182	4.22E–02	4.22E–04	6.24E–02	1.65E–02
Lime Sludge Pond	299	1.9	7193	3.31E–02	3.31E–04	4.89E–02	1.29E–02
Inactive Flyash Pile	1499	9.4	36079	1.66E–01	1.66E–03	2.45E–01	6.49E–02
South Field	1248	7.8	29996	1.38E–01	1.38E–03	2.04E–01	5.40E–02
Active Flyash Pile	1051	6.6	25290	1.16E–01	1.16E–03	1.72E–01	4.55E–02
Total	4476	28.2	107702	4.95E–01	4.95E–03	7.32E–01	1.94E–01

Accident Rates (RAWPA):	Fatality risk/mile	Injury risk/mile
Rail Workers	4.6E–08	4.6E–06
Public	1.8E–06	6.8E–06

Rail miles per trip is based on 1913 miles one–way and is calculated for a roundtrip at 3826 miles

Table C.II–24 Industrial Hazards: Expected Accidents from Rail Transportation
Alternative 6
Private Ownership Volumes

	PO Volumes						
				Workers		Public	
	# cars	# trips	total miles	injuries	fatalities	injuries	fatalities
Alternative 6							
Solid Waste Landfill	0	0.0	0	0	0	0	0
Lime Sludge Pond	0	0.0	0	0	0	0	0
Inactive Flyash Pile	44	0.3	3826	1.76E–02	1.76E–04	2.60E–02	6.89E–03
South Field	4	0.0	3826	1.76E–02	1.76E–04	2.60E–02	6.89E–03
Active Flyash Pile	0	0.0	0	0	0	0	0
Total	48	0.3	3826	1.76E–02	1.76E–04	2.60E–02	6.89E–03

Accident Rates (RAWPA):	Fatality risk/mile	Injury risk/mile
Rail Workers	4.6E–08	4.6E–06
Public	1.8E–06	6.8E–06

Rail miles per trip is based on 1913 miles one–way and is calculated for a roundtrip at 3826 miles

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Table C.II-25 Rail Transportation: Doses from Incident-Free Impacts

Alternative 3 and 6

	Alternative 3						Alternative 6					
	Sol. Wst Landfill	Lime Sldg Pond	Inactive Flyash	South Field	Active Flyash	Total	Sol. Wst Landfill	Lime Sldg Pond	Inactive Flyash	South Field	Active Flyash	Totals
# cars	1622.54	1307.04	1605.63	5305.63	1202.82	11043.66	0	0	43.66	4.23	0	47.89
# trips	10.2	8.2	10.1	33.4	7.6	69.5	0.0	0.0	0.3	0.0	0.0	0.3
Doses, Workers (person rem)												
Rail Crew	4.29E-05	3.45E-05	4.24E-05	1.40E-04	3.18E-05	2.92E-04	0.00E+00	0.00E+00	1.15E-06	1.12E-07	0.00E+00	1.27E-06
Handlers	2.25E-01	1.81E-01	2.22E-01	7.34E-01	1.66E-01	1.53E+00	0.00E+00	0.00E+00	6.04E-03	5.85E-04	0.00E+00	6.63E-03
Doses, Public (person-rems)												
along route	5.04E-02	4.06E-02	4.99E-02	1.65E-01	3.74E-02	3.43E-01	0.00E+00	0.00E+00	1.36E-03	1.31E-04	0.00E+00	1.49E-03
on passing trains	5.70E-03	4.60E-03	5.64E-03	1.87E-02	4.23E-03	3.88E-02	0.00E+00	0.00E+00	1.53E-04	1.49E-05	0.00E+00	1.68E-04
on stops	8.33E-02	6.71E-02	8.24E-02	2.72E-01	6.17E-02	5.67E-01	0.00E+00	0.00E+00	2.24E-03	2.17E-04	0.00E+00	2.46E-03
storage depots	9.49E-03	7.64E-03	9.39E-03	3.10E-02	7.04E-03	6.46E-02	0.00E+00	0.00E+00	2.55E-04	2.47E-05	0.00E+00	2.80E-04
Total rems for all non-site populations	1.49E-01	1.20E-01	1.47E-01	4.87E-01	1.10E-01	1.01E+00	0.00E+00	0.00E+00	4.01E-03	3.88E-04	0.00E+00	4.39E-03

trips assumes 159 cars/trip

Table C.II-26 Rail Transport: Accident Impacts -- Doses
Alternative 3
Private Ownership and Federal Ownership Volumes

		Private Ownership Volume: Expected Doses							Federal Ownership Volume: Expected Doses						
		Sol. Wst Landfill	Lime Sldg Pond	Inactive Flyash	South Field	Active Flyash	Totals person rem	Total Dose per person	Sol. Wst Landfill	Lime Sldg Pond	Inactive Flyash	South Field	Active Flyash	Totals person rem	Total Dose per person
	# cars	1622.54	1307.04	1605.63	5305.63	1202.82	11043.66		381.69	298.59	1498.59	1246.48	1050.7	4476.05	
	# trips	10.2	8.2	10.1	33.4	7.6	69.5		2.4	1.9	9.4	7.8	6.6	28.2	
Population															
Urban	# persons exposed		4.81E+05												
	Severity Group														
	1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	2	2.90E+02	2.33E+02	2.87E+02	9.48E+02	2.15E+02	1.97E+03	4.10E-03	6.82E+01	5.34E+01	2.68E+02	2.23E+02	1.88E+02	8.00E+02	1.66E-03
	3	5.80E+02	4.67E+02	5.74E+02	1.90E+03	4.30E+02	3.95E+03	8.20E-03	1.36E+02	1.07E+02	5.36E+02	4.45E+02	3.75E+02	1.60E+03	3.33E-03
	4	8.68E+02	7.00E+02	8.59E+02	2.84E+03	6.44E+02	5.91E+03	1.23E-02	2.04E+02	1.60E+02	8.02E+02	6.67E+02	5.63E+02	2.40E+03	4.98E-03
	5	1.15E+03	9.29E+02	1.14E+03	3.77E+03	8.55E+02	7.85E+03	1.63E-02	2.71E+02	2.12E+02	1.07E+03	8.86E+02	7.47E+02	3.18E+03	6.62E-03
	6	1.45E+03	1.17E+03	1.43E+03	4.74E+03	1.07E+03	9.86E+03	2.05E-02	3.41E+02	2.67E+02	1.34E+03	1.11E+03	9.39E+02	4.00E+03	8.31E-03
	7	1.73E+03	1.40E+03	1.72E+03	5.67E+03	1.29E+03	1.18E+04	2.45E-02	4.08E+02	3.20E+02	1.60E+03	1.33E+03	1.12E+03	4.79E+03	9.95E-03
	8	2.90E+03	2.33E+03	2.87E+03	9.48E+03	2.15E+03	1.97E+04	4.10E-02	6.82E+02	5.34E+02	2.68E+03	2.23E+03	1.88E+03	8.00E+03	1.66E-02
	Total by Sub Unit	8.97E+03	7.23E+03	8.88E+03	2.93E+04	6.65E+03			2.11E+03	1.65E+03	8.29E+03	6.89E+03	5.81E+03		
Suburban	# persons exposed		6.75E+04												
	Severity Group														
	1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	2	6.74E+01	5.43E+01	6.66E+01	2.20E+02	4.99E+01	4.58E+02	6.79E-03	1.58E+01	1.24E+01	6.22E+01	5.17E+01	4.36E+01	1.86E+02	2.75E-03
	3	1.35E+02	1.09E+02	1.33E+02	4.40E+02	9.99E+01	9.17E+02	1.36E-02	3.17E+01	2.48E+01	1.24E+02	1.03E+02	8.73E+01	3.72E+02	5.51E-03
	4	2.02E+02	1.63E+02	2.00E+02	6.61E+02	1.50E+02	1.38E+03	2.04E-02	4.75E+01	3.72E+01	1.87E+02	1.55E+02	1.31E+02	5.58E+02	8.26E-03
	5	2.66E+02	2.15E+02	2.64E+02	8.71E+02	1.97E+02	1.81E+03	2.69E-02	6.26E+01	4.91E+01	2.46E+02	2.05E+02	1.73E+02	7.35E+02	1.09E-02
	6	3.36E+02	2.70E+02	3.32E+02	1.10E+03	2.49E+02	2.29E+03	3.39E-02	7.90E+01	6.19E+01	3.10E+02	2.58E+02	2.17E+02	9.26E+02	1.37E-02
	7	4.03E+02	3.25E+02	3.99E+02	1.32E+03	2.99E+02	2.74E+03	4.06E-02	9.48E+01	7.43E+01	3.72E+02	3.10E+02	2.61E+02	1.11E+03	1.65E-02
	8	6.72E+02	5.42E+02	6.65E+02	2.20E+03	4.99E+02	4.58E+03	6.78E-02	1.58E+02	1.24E+02	6.21E+02	5.17E+02	4.36E+02	1.86E+03	2.75E-02
	Total by Sub Unit	2.08E+03	1.68E+03	2.06E+03	6.81E+03	1.54E+03			4.90E+02	3.84E+02	1.92E+03	1.60E+03	1.35E+03		
Rural	# persons exposed		1.26E+03												
	Severity Group														
	1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	2	1.26E+00	1.01E+00	1.24E+00	4.10E+00	9.30E-01	8.54E+00	6.78E-03	2.95E-01	2.31E-01	1.16E+00	9.64E-01	8.13E-01	3.46E+00	2.75E-03
	3	2.51E+00	2.02E+00	2.48E+00	8.21E+00	1.86E+00	1.71E+01	1.36E-02	5.90E-01	4.62E-01	2.32E+00	1.93E+00	1.63E+00	6.93E+00	5.50E-03
	4	3.77E+00	3.03E+00	3.73E+00	1.23E+01	2.79E+00	2.56E+01	2.03E-02	8.86E-01	6.94E-01	3.48E+00	2.89E+00	2.44E+00	1.04E+01	8.25E-03
	5	5.02E+00	4.04E+00	4.97E+00	1.64E+01	3.72E+00	3.42E+01	2.71E-02	1.18E+00	9.25E-01	4.64E+00	3.86E+00	3.25E+00	1.39E+01	1.10E-02
	6	6.28E+00	5.06E+00	6.21E+00	2.05E+01	4.65E+00	4.27E+01	3.39E-02	1.48E+00	1.16E+00	5.80E+00	4.82E+00	4.07E+00	1.73E+01	1.37E-02
	7	7.53E+00	6.07E+00	7.45E+00	2.46E+01	5.58E+00	5.13E+01	4.07E-02	1.77E+00	1.39E+00	6.96E+00	5.79E+00	4.88E+00	2.08E+01	1.65E-02
	8	1.26E+01	1.01E+01	1.24E+01	4.10E+01	9.30E+00	8.54E+01	6.78E-02	2.95E+00	2.31E+00	1.16E+01	9.64E+00	8.13E+00	3.46E+01	2.75E-02
	Total by Sub Unit	3.89E+01	3.13E+01	3.85E+01	1.27E+02	2.88E+01			9.15E+00	7.17E+00	3.60E+01	2.99E+01	2.52E+01		

Accident Consequences per Shipment are from Table C.5.TBD

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Table C.II–27 Rail Transport: Accident Impacts
Alternative 6
Private Ownership Volumes

		Expected Doses						
		Sol. Wst Landfill	Lime Sldg Pond	Inactive Flyash	South Field	Active Flyash	Totals person rem	Total Dose per person
	# cars	0	0	43.66	4.23	0	47.89	
	# trips	0.0	0.0	0.3	0.0	0.0	0.3	
Population								
Urban	# persons exposed		4.81E+05					
	Severity Group							
	1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	2	0.00E+00	0.00E+00	7.80E+00	7.56E−01	0.00E+00	8.55E+00	1.78E−05
	3	0.00E+00	0.00E+00	1.56E+01	1.51E+00	0.00E+00	1.71E+01	3.56E−05
	4	0.00E+00	0.00E+00	2.34E+01	2.26E+00	0.00E+00	2.56E+01	5.33E−05
	5	0.00E+00	0.00E+00	3.10E+01	3.01E+00	0.00E+00	3.40E+01	7.08E−05
	6	0.00E+00	0.00E+00	3.90E+01	3.78E+00	0.00E+00	4.28E+01	8.89E−05
	7	0.00E+00	0.00E+00	4.67E+01	4.52E+00	0.00E+00	5.12E+01	1.06E−04
	8	0.00E+00	0.00E+00	7.80E+01	7.56E+00	0.00E+00	8.55E+01	1.78E−04
	Total by Sub Unit	0.00E+00	0.00E+00	2.41E+02	2.34E+01	0.00E+00		
Suburban	# persons exposed		6.75E+04					
	Severity Group							
	1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	2	0.00E+00	0.00E+00	1.81E+00	1.76E−01	0.00E+00	1.99E+00	2.95E−05
	3	0.00E+00	0.00E+00	3.62E+00	3.51E−01	0.00E+00	3.98E+00	5.89E−05
	4	0.00E+00	0.00E+00	5.44E+00	5.27E−01	0.00E+00	5.96E+00	8.84E−05
	5	0.00E+00	0.00E+00	7.17E+00	6.94E−01	0.00E+00	7.86E+00	1.16E−04
	6	0.00E+00	0.00E+00	9.03E+00	8.75E−01	0.00E+00	9.91E+00	1.47E−04
	7	0.00E+00	0.00E+00	1.08E+01	1.05E+00	0.00E+00	1.19E+01	1.76E−04
	8	0.00E+00	0.00E+00	1.81E+01	1.75E+00	0.00E+00	1.98E+01	2.94E−04
	Total by Sub Unit	0.00E+00	0.00E+00	5.60E+01	5.43E+00	0.00E+00		
Rural	# persons exposed		1.26E+03					
	Severity Group							
	1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	2	0.00E+00	0.00E+00	3.38E−02	3.27E−03	0.00E+00	3.70E−02	2.94E−05
	3	0.00E+00	0.00E+00	6.75E−02	6.54E−03	0.00E+00	7.41E−02	5.88E−05
	4	0.00E+00	0.00E+00	1.01E−01	9.82E−03	0.00E+00	1.11E−01	8.82E−05
	5	0.00E+00	0.00E+00	1.35E−01	1.31E−02	0.00E+00	1.48E−01	1.18E−04
	6	0.00E+00	0.00E+00	1.69E−01	1.64E−02	0.00E+00	1.85E−01	1.47E−04
	7	0.00E+00	0.00E+00	2.03E−01	1.96E−02	0.00E+00	2.22E−01	1.76E−04
	8	0.00E+00	0.00E+00	3.38E−01	3.27E−02	0.00E+00	3.70E−01	2.94E−04
	Total by Sub Unit	0.00E+00	0.00E+00	1.05E+00	1.01E−01	0.00E+00		

Table C.II-28 Direct Radiation Risks using HEAST External Exposure CSFs
Alternative 2
Excavation Soil Concentrations

		CSF		Solid Waste Landfill		Lime Sludge Pond		S. Field/Inact. Flyash		Active Flyash	
	Risk/yr per pCi/g			soil conc	CS x CSF	soil conc	CS x CSF	soil conc	CS x CSF	soil conc	CS x CSF
Sr-90		0		1.58E+00	0	0.84	0	1.36	0	0.96	0
Tc-99		6.0E-13		7.54E-01	4.52E-13	1.05	6.30E-13	0.90	5.40E-13	NA	0
Cs-137		2.0E-06		2.50E-01	5.00E-07	0.17	3.36E-07	0.24	4.74E-07	NA	0
Rn-222		5.9E-06		1.55E+00	9.15E-06	1.56	9.22E-06	2.92	1.72E-05	5.24	3.09E-05
Ra-226		1.2E-08		1.55E+00	1.86E-08	1.56	1.87E-08	2.92	3.50E-08	5.24	6.29E-08
Ra-228		2.9E-06		2.56E+00	7.42E-06	1.80	5.22E-06	1.66	4.80E-06	4.34	1.26E-05
Th-228		5.6E-06		3.39E+00	1.90E-05	1.54	8.62E-06	1.70	9.54E-06	5.79	3.24E-05
Th-230		5.4E-11		1.23E+01	6.64E-10	8.38	4.53E-10	4.26	2.30E-10	5.72	3.09E-10
Th-232		2.6E-11		3.59E+00	9.33E-11	1.07	2.78E-11	1.53	3.98E-11	3.87	1.01E-10
U-234		3.0E-11		9.70E+01	2.91E-09	6.18	1.85E-10	30.19	9.06E-10	8.90	2.67E-10
U-235		2.4E-07		9.93E+00	2.38E-06	0.44	1.04E-07	18.46	4.43E-06	4.72	1.13E-06
U-238		5.1E-08		1.70E+02	8.67E-06	7.47	3.81E-07	32.30	1.65E-06	6.91	3.52E-07
Np-237		4.3E-07		3.51E-01	1.51E-07	0.32	1.39E-07	0.30	1.29E-07	0.45	1.94E-07
Pu-238		2.8E-11		3.28E-01	9.18E-12	0.20	5.57E-12	0.04	1.12E-12	0.12	3.44E-12
Formula: CS x CSFx FY			CS x CSF		4.73E-05		2.40E-05		3.83E-05		7.77E-05
CS = soil conc			*CS x CSF - Rn	**	3.81E-05	**	1.48E-05	**	2.11E-05	**	4.67E-05
FY = fraction of yr exposed											
Remediation Worker			Hr for Excav		1095		987		2694		2607
FY = hr for excav / 24 x 365											
Assumes exposure at 1 m			FY		0.13		0.11		0.31		0.30
			Risk Total		5.91E-06		2.71E-06		1.18E-05		2.31E-05
Pubic Exposure											
Exposure at 1000 ft (304.8 m)											
Public exposure will be 24 hr/d for											
total of days excavation occcurs											
FY = hr for excav/2080			FY		0.53		0.47		1.30		1.25
Dose Reduction Factor =	0.0000108		Risk Total		2.68E-10		1.23E-10		5.34E-10		1.05E-09

***for comparison of Rn contribution only

Table C.II-29 Direct Radiation Risks using HEAST External Exposure CSFs
Alternative 3
Excavation Soil Concentrations

		CSF		Solid Waste Landfill		Lime Sludge Pond		S. Field/Inact. Flyash		Active Flyash	
	Risk/yr per pCi/g			soil conc	CS x CSF	soil conc	CS x CSF	soil conc	CS x CSF	soil conc	CS x CSF
Sr-90		0		1.58E+00	0	0.84	0	1.36	0	0.96	0
Tc-99		6.0E-13		7.54E-01	4.52E-13	1.05	6.30E-13	0.90	5.40E-13	NA	0
Cs-137		2.0E-06		2.50E-01	5.00E-07	0.17	3.36E-07	0.24	4.74E-07	NA	0
Rn-222		5.9E-06		1.55E+00	9.15E-06	1.56	9.22E-06	2.92	1.72E-05	5.24	3.09E-05
Ra-226		1.2E-08		1.55E+00	1.86E-08	1.56	1.87E-08	2.92	3.50E-08	5.24	6.29E-08
Ra-228		2.9E-06		2.56E+00	7.42E-06	1.80	5.22E-06	1.66	4.80E-06	4.34	1.26E-05
Th-228		5.6E-06		3.39E+00	1.90E-05	1.54	8.62E-06	1.70	9.54E-06	5.79	3.24E-05
Th-230		5.4E-11		1.23E+01	6.64E-10	8.38	4.53E-10	4.26	2.30E-10	5.72	3.09E-10
Th-232		2.6E-11		3.59E+00	9.33E-11	1.07	2.78E-11	1.53	3.98E-11	3.87	1.01E-10
U-234		3.0E-11		9.70E+01	2.91E-09	6.18	1.85E-10	30.19	9.06E-10	8.90	2.67E-10
U-235		2.4E-07		9.93E+00	2.38E-06	0.44	1.04E-07	18.46	4.43E-06	4.72	1.13E-06
U-238		5.1E-08		1.70E+02	8.67E-06	7.47	3.81E-07	32.30	1.65E-06	6.91	3.52E-07
Np-237		4.3E-07		3.51E-01	1.51E-07	0.32	1.39E-07	0.30	1.29E-07	0.45	1.94E-07
Pu-238		2.8E-11		3.28E-01	9.18E-12	0.20	5.57E-12	0.04	1.12E-12	0.12	3.44E-12
Formula: CS x CSFx FY											
CS = soil conc			CS x CSF		4.73E-05		2.40E-05		3.83E-05		7.77E-05
FY = fraction of yr exposed			*CS x CSF - Rn	**	3.81E-05	**	1.48E-05	**	2.11E-05	**	4.67E-05
Remediation Worker			Hr for Excav		2186		2100		3838		3439
FY = hr for excav / 24 x 365											
Assumes exposure at 1 m			FY		0.25		0.24		0.44		0.39
			Risk Total		1.18E-05		5.76E-06		1.68E-05		3.05E-05
Pubic Exposure											
Exposure at 1000 ft (304.8 m)											
Public exposure will be 24 hr/d for											
total of days excavation occcurs											
FY = hr for excav/2080			FY		1.05		1.01		1.85		1.65
Dose Reduction Factor =	0.0000108		Risk Total		5.35E-10		2.61E-10		7.60E-10		1.38E-09

***for comparison of Rn contribution only

Table C.II-30 Direct Radiation Risks using HEAST External Exposure CSFs
Alternative 6
Excavation Soil Concentrations

		CSF		Solid Waste Landfill		Lime Sludge Pond		S. Field/Inact. Flyash		Active Flyash	
	Risk/yr per pCi/g			soil conc	CS x CSF	soil conc	CS x CSF	soil conc	CS x CSF	soil conc	CS x CSF
Sr-90		0		1.58E+00	0	0.84	0	1.36	0	0.96	0
Tc-99		6.0E-13		7.54E-01	4.52E-13	1.05	6.30E-13	0.90	5.40E-13	NA	0
Cs-137		2.0E-06		2.50E-01	5.00E-07	0.17	3.36E-07	0.24	4.74E-07	NA	0
Rn-222		5.9E-06		1.55E+00	9.15E-06	1.56	9.22E-06	2.92	1.72E-05	5.24	3.09E-05
Ra-226		1.2E-08		1.55E+00	1.86E-08	1.56	1.87E-08	2.92	3.50E-08	5.24	6.29E-08
Ra-228		2.9E-06		2.56E+00	7.42E-06	1.80	5.22E-06	1.66	4.80E-06	4.34	1.26E-05
Th-228		5.6E-06		3.39E+00	1.90E-05	1.54	8.62E-06	1.70	9.54E-06	5.79	3.24E-05
Th-230		5.4E-11		1.23E+01	6.64E-10	8.38	4.53E-10	4.26	2.30E-10	5.72	3.09E-10
Th-232		2.6E-11		3.59E+00	9.33E-11	1.07	2.78E-11	1.53	3.98E-11	3.87	1.01E-10
U-234		3.0E-11		9.70E+01	2.91E-09	6.18	1.85E-10	30.19	9.06E-10	8.90	2.67E-10
U-235		2.4E-07		9.93E+00	2.38E-06	0.44	1.04E-07	18.46	4.43E-06	4.72	1.13E-06
U-238		5.1E-08		1.70E+02	8.67E-06	7.47	3.81E-07	32.30	1.65E-06	6.91	3.52E-07
Np-237		4.3E-07		3.51E-01	1.51E-07	0.32	1.39E-07	0.30	1.29E-07	0.45	1.94E-07
Pu-238		2.8E-11		3.28E-01	9.18E-12	0.20	5.57E-12	0.04	1.12E-12	0.12	3.44E-12
Formula: CS x CSFx FY											
CS = soil conc			CS x CSF		4.73E-05		2.40E-05		3.83E-05		7.77E-05
FY = fraction of yr exposed			*CS x CSF - Rn	**	3.81E-05	**	1.48E-05	**	2.11E-05	**	4.67E-05
Remediation Worker			Hr for Excav		2000		2397		3536		1818
FY = hr for excav / 24 x 365											
Assumes exposure at 1 m			FY		0.23		0.27		0.40		0.21
			Risk Total		1.08E-05		6.58E-06		1.55E-05		1.61E-05
Pubic Exposure											
Exposure at 1000 ft (304.8 m)											
Public exposure will be 24 hr/d for											
total of days excavation occcurs											
FY = hr for excav/2080			FY		0.96		1.15		1.70		0.87
Dose Reduction Factor =	0.0000108		Risk Total		4.89E-10		2.98E-10		7.01E-10		7.31E-10

***for comparison of Rn contribution only

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The following attachment contains the detailed residual risk calculations for the remedial alternatives evaluated in this feasibility study risk Assessment. This attachment contains all the equations and parameters used for the quantification of exposure and subsequent risk per exposure pathway. The exposure equations and the parameters used in the exposure models are summarized in Section C.3.0 of this report. The RAWPA (DOE 1992) is the primary sources for these values; other values were used in accordance with EPA and/or DOE guidance.

The primary exposure media considered for residual risk evaluation are groundwater, air, and soil. Exposure to sediments are included in the group detailing soil exposure pathways. Exposure to surface water is not a viable pathway to potential Operable Unit 2 receptors (see Section C.2.0) and is therefore not included in the following attachments. The development of concentration terms for air, groundwater, and soil is provided in Section C.5.2. These concentrations were used to quantify intake. Food pathway source terms were quantified using the equations presented in Section C.5.2 of this report. The following attachment contains the detailed residual risk calculations for the remedial alternatives evaluated in this feasibility study risk assessment. This attachment contains all the equations and parameters used for the quantification of exposure and subsequent risk per exposure pathway. The exposure equations and parameters used in the exposure models are summarized in Section C.3.0 of this report. The RAWPA (DOE 1992) is the primary sources for these values; other values were used in accordance with EPA and/or DOE guidance.

The primary exposure media considered for residual risk evaluation are groundwater, air, and soil. Exposers to sediments are included in the group detailing soil exposure pathways. Exposure to surface water is not viable pathway to potential Operable Unit 2 receptors (see Section C.2.0) and is therefore not included in the following attachments. The development of concentration terms for air, groundwater, and soil is provided in Section C.5.2. These concentrations were used to quantify intake. Food pathway sources terms were quantified using the equations presented in Section C.5.2 of this report.

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Table C.III-1
Summary of Intake and Risk Quantitation (radionuclides) Alternative 2
Lime Sludge Pond with Federal Ownership: Expanded Trespasser
Via Inhalation of Gases and Particulates

Intake Equation = CA X EFa X EDa X IR X ETa + CA X EFc EDc X IR X ETc

IR	Inhalation rate of gases	0.83 m^3/hour
EFa	Exposure frequency (adult)	40 days/year
EFc	Exposure frequency (child)	110 days/year
EDa	Exposure duration	32 Year
EDc	Exposure duration	12 Year
ETa	Exposure time (adult)	1 hour/day
ETc	Exposure time (child)	2 hour/day
CA	Concentration of radionuclides in air	(see table below)

Cs_{137+1d}	NA	pCi/m^3	$Th_{232+10d}$	NA	pCi/m^3
Np_{237+1d}	NA	pCi/m^3	U_{234}	NA	pCi/m^3
Pu_{238}	NA	pCi/m^3	U_{235+1d}	NA	pCi/m^3
Ra_{226+8d}	NA	pCi/m^3	U_{238+2d}	NA	pCi/m^3
Ra_{228+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Rn_{222+4d}	2.4E-07	pCi/m^3	NA	NA	pCi/m^3
Sr_{90+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Tc_{99}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{228+7d}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{230}	NA	pCi/m^3	NA	NA	pCi/m^3

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	1.9E-11	NA
Np_{237+1d}	NA	2.9E-08	NA
Pu_{238}	NA	3.9E-08	NA
Ra_{226+8d}	NA	7.0E-09	NA
Ra_{228+1d}	NA	6.9E-10	NA
Rn_{222+4d}	7.7E-04	7.7E-12	5.9E-15
Sr_{90+1d}	NA	6.2E-11	NA
Tc_{99}	NA	8.3E-12	NA
Th_{228+7d}	NA	7.8E-08	NA
Th_{230}	NA	2.9E-08	NA
$Th_{232+10d}$	NA	1.1E-07	NA
U_{234}	NA	2.6E-08	NA
U_{235+1d}	NA	2.5E-08	NA
U_{238+2d}	NA	2.4E-08	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
ILCR Summation	=		5.9E-15

Table C.III–2
Summary of Intake Quantitation (chemicals) Alternative 2
Lime Sludge Pond with Federal Ownership: Off–Property Farmer (Adult)
Via Drinking Water Ingestion

Intake Equation = $\frac{CS \times EF \times ED \times IR}{BW \times AT}$

IR	Ingestion rate of groundwater (RAGS, 1989)	2	l/day
EF	Exposure frequency	350	days/year
EDn	Exposure duration for non–carcinogens	70	Year
EDc	Exposure duration for carcinogens	70	Year
BW	Body weight	70	kg
ATc	Average time for carcinogens (lifetime)	25550	days
ATn	Average time for non–carcinogens (EDn x365)	25550	days
CS	Concentration of chemicals in groundwater		

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/l	NA	NA	mg/l
arsenic	NA	mg/l	NA	NA	mg/l
beryllium	NA	mg/l	NA	NA	mg/l
uranium–total	1.00E–08	mg/l	NA	NA	mg/l
benzo(a)pyrene	NA	mg/l	NA	NA	mg/l
carbazole	NA	mg/l	NA	NA	mg/l
arodor–1254	NA	mg/l	NA	NA	mg/l
arodor–1260	NA	mg/l	NA	NA	mg/l
dieldrin	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l			

References

Table C.III–2 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Federal Ownership: Off–Property Farmer (Adult)
Via Drinking Water Ingestion

	HQ Calculation		
Compound	CDI (mg/kg–day)	RfD (mg/kg–day)	HQ (unitless)
antimony	NA	4.00E–04	NA
arsenic	NA	3.00E–04	NA
beryllium	NA	5.00E–03	NA
uranium–total	2.74E–10	3.00E–03	9.13E–08
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor–1254	NA	NA	NA
aroclor–1260	NA	NA	NA
dieldrin	NA	5.00E–05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		9.13E–08

	ILCR Calculation		
Compound	CDI (mg/kg–day)	CSF $(mg/kg–day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.75E+00	NA
beryllium	NA	4.30E+00	NA
uranium–total	2.74E–10	NA	NA
benzo(a)pyrene	NA	7.30E+00	NA
carbazole	NA	2.00E–02	NA
aroclor–1254	NA	7.70E+00	NA
aroclor–1260	NA	7.70E+00	NA
dieldrin	NA	1.60E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

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Table C.III–3
Summary of Intake and Risk Quantitation (radionuclides) Alternative 2
Lime Sludge Pond with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Drinking Water

Intake Equation = Cw X EF X EDn X FI X IR

IR	Ingestion rate of groundwater (RAGS, 1989)	2 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
FI	Fractional intake for radionuclides	1 (Unitless)
Cw	Concentration of radionuclides in groundwater	(see table below)

Cs_{137+1d}	NA	pCi/l	$Th_{232+10d}$	NA	pCi/l
Np_{237+1d}	NA	pCi/l	U_{234}	1.0E–05	pCi/l
Pu_{238}	NA	pCi/l	U_{235+1d}	1.0E–05	pCi/l
Ra_{226+8d}	NA	pCi/l	U_{238+2d}	1.0E–05	pCi/l
Ra_{228+1d}	NA	pCi/l	NA	NA	pCi/l
Rn_{222+4d}	NA	pCi/l	NA	NA	pCi/l
Sr_{90+1d}	NA	pCi/l	NA	NA	pCi/l
Tc_{99}	NA	pCi/l	NA	NA	pCi/l
Th_{228+7d}	NA	pCi/l	NA	NA	pCi/l
Th_{230}	NA	pCi/l	NA	NA	pCi/l

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	NA	2.2E–10	NA
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	NA	1.3E–11	NA
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	4.9E–01	1.6E–11	7.8E–12
U_{235+1d}	4.9E–01	1.6E–11	7.8E–12
U_{238+2d}	4.9E–01	2.0E–11	9.8E–12
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 2.5E–11

000426

Table C.III–4
Summary of Intake Quantitation (chemicals) Alternative 2
Lime Sludge Pond with Federal Ownership: Off–Property Farmer (Adult)
Via Dermal Contact while Bathing

Intake Equation = $\frac{DA \times EF \times ED \times SA}{BW \times AT}$

DA	Dermal absorbed dose	csv	mg/cm^2–day
EF	Exposure frequency	350	days/year
EDn	Exposure duration for non–carcinogens	70	Year
EDc	Exposure duration for carcinogens	70	Year
BW	Body weight	70	kg
ATc	Average time for carcinogens (lifetime)	25550	days
ATn	Average time for non–carcinogens (EDn x365)	25550	days
SA	Skin surface area available for contact	23000	cm^2

Chemical Concentrations

Compound	DA	Units	Compound	DA	Units
antimony	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
arsenic	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
beryllium	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
uranium–total	2.50E–15	mg/cm^2–day	NA	NA	mg/cm^2–day
benzo(a)pyrene	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
carbazole	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
arodor–1254	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
arodor–1260	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
dieldrin	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day			

References

000627

Table C.III–4 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Federal Ownership: Off–Property Farmer (Adult)
Via Dermal Contact while Showering

	HQ Calculation		
Compound	CDI (mg/kg–day)	RfD (mg/kg–day)	HQ (unitless)
antimony	NA	6.00E–05	NA
arsenic	NA	2.85E–04	NA
beryllium	NA	5.00E–03	NA
uranium–total	7.88E–13	1.50E–04	5.25E–09
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor–1254	NA	NA	NA
aroclor–1260	NA	NA	NA
dieldrin	NA	4.50E–05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		5.25E–09

	ILCR Calculation		
Compound	CDI (mg/kg–day)	CSF $(mg/kg–day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.90E+00	NA
beryllium	NA	4.30E+00	NA
uranium–total	7.88E–13	NA	NA
benzo(a)pyrene	NA	NA	NA
carbazole	NA	2.22E–02	NA
aroclor–1254	NA	1.03E+01	NA
aroclor–1260	NA	1.03E+01	NA
dieldrin	NA	1.78E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

Table C.III–5
Summary of Intake and Risk Quantitation (radionuclides) Alternative 2
Lime Sludge Pond with Federal Ownership: Off–Property Farmer (Adult)
Via Inhalation of Gases and Particulates

Intake Equation = Ca X EF X EDn X IR

IR	Inhalation rate of gases (RAGS, 1989)	20 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Ca	Concentration of radionuclides in air	(see table below)

Cs_{137+1d}	NA	pCi/m^3	$Th_{232+10d}$	NA	pCi/m^3
Np_{237+1d}	NA	pCi/m^3	U_{234}	NA	pCi/m^3
Pu_{238}	NA	pCi/m^3	U_{235+1d}	NA	pCi/m^3
Ra_{226+8d}	NA	pCi/m^3	U_{238+2d}	NA	pCi/m^3
Ra_{228+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Rn_{222+4d}	3.4E–09	pCi/m^3	NA	NA	pCi/m^3
Sr_{90+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Tc_{99}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{228+7d}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{230}	NA	pCi/m^3	NA	NA	pCi/m^3

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	1.9E–11	NA
Np_{237+1d}	NA	2.9E–08	NA
Pu_{238}	NA	3.9E–08	NA
Ra_{226+8d}	NA	7.0E–09	NA
Ra_{228+1d}	NA	6.9E–10	NA
Rn_{222+4d}	1.7E–03	7.7E–12	1.3E–14
Sr_{90+1d}	NA	6.2E–11	NA
Tc_{99}	NA	8.3E–12	NA
Th_{228+7d}	NA	7.8E–08	NA
Th_{230}	NA	2.9E–08	NA
$Th_{232+10d}$	NA	1.1E–07	NA
U_{234}	NA	2.6E–08	NA
U_{235+1d}	NA	2.5E–08	NA
U_{238+2d}	NA	2.4E–08	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation	=	1.3E–14

Table C.III–6
Summary of Intake Quantitation (chemicals) Alternative 2
Lime Sludge Pond with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Meat Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of meat	0.101 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x365)	25550 days
CS	Concentration of chemicals in meat	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium–total	1.0E–10	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
arodor–1254	NA	mg/kg	NA	NA	mg/kg
arodor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

Table C.III–6 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Meat Products

	HQ Calculation		
Compound	CDI (mg/kg–day)	RfD (mg/kg–day)	HQ (unitless)
antimony	NA	4.0E–04	NA
arsenic	NA	3.0E–04	NA
beryllium	NA	5.0E–03	NA
uranium–total	1.0E–13	3.0E–03	3.5E–11
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor–1254	NA	NA	NA
aroclor–1260	NA	NA	NA
dieldrin	NA	5.0E–05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			3.5E–11

	ILCR Calculation		
Compound	CDI (mg/kg–day)	CSF $(mg/kg–day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium–total	1.0E–13	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E–02	NA
aroclor–1254	NA	7.7E+00	NA
aroclor–1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

000431

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Table C.III–7
Summary of Intake and Risk Quantitation (radionuclides) Alternative 2
Lime Sludge Pond with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Meat Products

Intake Equation = Cf X EF X EDn X FI X IR

IR	Ingestion rate of meat	0.101 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cf	Concentration of radionuclides in meat	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	NA	pCi/kg	U_{234}	1.0E–07	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	1.0E–07	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	1.0E–07	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	NA	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	NA	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	NA	2.2E–10	NA
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	NA	1.3E–11	NA
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	1.9E–04	1.6E–11	3.0E–15
U_{235+1d}	1.9E–04	1.6E–11	3.0E–15
U_{238+2d}	1.9E–04	2.0E–11	3.7E–15
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation	=	9.7E–15

000432

Table C.III–8
Summary of Intake Quantitation (chemicals) Alternative 2
Lime Sludge Pond with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Dairy Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of dairy products	0.4	l/day
FI	Fraction ingested from contaminated source	0.75	(Unitless)
EF	Exposure frequency	350	days/year
EDn	Exposure duration for non–carcinogens	70	Year
EDc	Exposure duration for carcinogens	70	Year
BW	Body weight	70	kg
ATc	Average time for carcinogens (lifetime)	25550	days
ATn	Average time for non–carcinogens (EDn x365)	25550	days
CS	Concentration of chemicals in animal products		

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium–total	3.6E–10	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
arodor–1254	NA	mg/kg	NA	NA	mg/kg
arodor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

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66446

Table C.III-8 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Federal Ownership: Off-Property Farmer (Adult)
Via Ingestion of Dairy Products

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	1.5E-12	3.0E-03	4.9E-10
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			4.9E-10

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	1.5E-12	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

Table C.III–9
Summary of Intake and Risk Quantitation (radionuclides) Alternative 2
Lime Sludge Pond with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Dairy Products

Intake Equation = Cp X EF X EDn X FI X IR

IR	Ingestion rate of dairy products	0.4 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cp	Concentration of radionuclides in animal products	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	NA	pCi/kg	U_{234}	3.6E–07	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	3.6E–07	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	3.6E–07	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	NA	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	NA	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	NA	2.2E–10	NA
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	NA	1.3E–11	NA
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	2.6E–03	1.6E–11	4.2E–14
U_{235+1d}	2.6E–03	1.6E–11	4.2E–14
U_{238+2d}	2.6E–03	2.0E–11	5.3E–14
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 1.4E–13

Table C.III-10
Summary of Intake and Risk Quantitation (chemicals) Alternative 2
Lime Sludge Pond with Federal Ownership: Off-Property Farmer (Adult)
Via Ingestion of Vegetables and Fruits

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of fruits or vegetables	0.122 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x365)	25550 days
CS	Concentration of chemicals in vegetables	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium-total	4.9E-08	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
arodor-1254	NA	mg/kg	NA	NA	mg/kg
arodor-1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

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Table C.III–10 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Vegetables and Fruits

	HQ Calculation		
Compound	CDI (mg/kg–day)	RfD (mg/kg–day)	HQ (unitless)
antimony	NA	4.0E–04	NA
arsenic	NA	3.0E–04	NA
beryllium	NA	5.0E–03	NA
uranium–total	8.2E–11	3.0E–03	2.7E–08
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor–1254	NA	NA	NA
aroclor–1260	NA	NA	NA
dieldrin	NA	5.0E–05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			2.7E–08

	ILCR Calculation		
Compound	CDI (mg/kg–day)	CSF $(mg/kg–day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium–total	8.2E–11	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E–02	NA
aroclor–1254	NA	7.7E+00	NA
aroclor–1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

000437
66466

Table C.III–11
Summary of Intake and Risk Quantitation (radionuclides) Alternative 2
Lime Sludge Pond with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Vegetables and Fruits

Intake Equation = Cv X EF X EDn X FI X IR

IR	Ingestion rate of fruits or vegetables	0.122 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cv	Concentration of radionuclides in vegetables	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	NA	pCi/kg	U_{234}	4.9E–05	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	4.9E–05	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	4.9E–05	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	NA	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	NA	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	NA	2.2E–10	NA
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	NA	1.3E–11	NA
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	1.5E–01	1.6E–11	2.3E–12
U_{235+1d}	1.5E–01	1.6E–11	2.3E–12
U_{238+2d}	1.5E–01	2.0E–11	2.9E–12
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 7.6E–12

000438

Table C.III-12
Summary of Intake Quantitation (chemicals) Alternative 2
Lime Sludge Pond with Federal Ownership: Off-Property Farmer (Child)
Via Drinking Water Ingestion

Intake Equation = $\frac{CS \times EF \times ED \times IR}{BW \times AT}$

IR	Ingestion rate of groundwater (RAGS, 1989)	1 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x365)	2190 days
CS	Concentration of chemicals in groundwater	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/l	NA	NA	mg/l
arsenic	NA	mg/l	NA	NA	mg/l
beryllium	NA	mg/l	NA	NA	mg/l
uranium-total	1.00E-08	mg/l	NA	NA	mg/l
benzo(a)pyrene	NA	mg/l	NA	NA	mg/l
carbazole	NA	mg/l	NA	NA	mg/l
arodor-1254	NA	mg/l	NA	NA	mg/l
arodor-1260	NA	mg/l	NA	NA	mg/l
dieldrin	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l			

References

000139

Table C.III-12 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Federal Ownership: Off-Property Farmer (Child)
Via Drinking Water Ingestion

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.00E-04	NA
arsenic	NA	3.00E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	6.39E-10	3.00E-03	2.13E-07
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.00E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			2.13E-07

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.75E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	5.48E-11	NA	NA
benzo(a)pyrene	NA	7.30E+00	NA
carbazole	NA	2.00E-02	NA
aroclor-1254	NA	7.70E+00	NA
aroclor-1260	NA	7.70E+00	NA
dieldrin	NA	1.60E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

Table C.III–13
Summary of Intake and Risk Quantitation (radionuclides) Alternative 2
Lime Sludge Pond with Federal Ownership: Off–Property Farmer (Child)
Via Ingestion of Drinking Water

Intake Equation = Cw X EF X EDn X FI X IR

IR	Ingestion rate of groundwater (RAGS, 1989)	1 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
FI	Fractional intake for radionuclides	1 (Unitless)
Cw	Concentration of radionuclides in groundwater	(see table below)

Cs_{137+1d}	NA	pCi/l	$Th_{232+10d}$	NA	pCi/l
Np_{237+1d}	NA	pCi/l	U_{234}	1.0E–05	pCi/l
Pu_{238}	NA	pCi/l	U_{235+1d}	1.0E–05	pCi/l
Ra_{226+8d}	NA	pCi/l	U_{238+2d}	1.0E–05	pCi/l
Ra_{228+1d}	NA	pCi/l	NA	NA	pCi/l
Rn_{222+4d}	NA	pCi/l	NA	NA	pCi/l
Sr_{90+1d}	NA	pCi/l	NA	NA	pCi/l
Tc_{99}	NA	pCi/l	NA	NA	pCi/l
Th_{228+7d}	NA	pCi/l	NA	NA	pCi/l
Th_{230}	NA	pCi/l	NA	NA	pCi/l

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	NA	2.2E–10	NA
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	NA	1.3E–11	NA
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	2.1E–02	1.6E–11	3.4E–13
U_{235+1d}	2.1E–02	1.6E–11	3.4E–13
U_{238+2d}	2.1E–02	2.0E–11	4.2E–13
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 1.1E–12

Table C.III-14
Summary of Intake Quantitation (chemicals) Alternative 2
Lime Sludge Pond with Federal Ownership: Off-Property Farmer (Child)
Via Dermal Contact while Bathing

Intake Equation = $\frac{DA \times EF \times ED \times SA}{BW \times AT}$

DA	Dermal absorbed dose	csv	mg/cm^2-day
EF	Exposure frequency	350	days/year
EDn	Exposure duration for non-carcinogens	6	Year
EDc	Exposure duration for carcinogens	6	Year
BW	Body weight	15	kg
ATc	Average time for carcinogens (lifetime)	25550	days
ATn	Average time for non-carcinogens (EDn x365)	2190	days
SA	Skin surface area available for contact	8000	cm^2

Chemical Concentrations

Compound	DA	Units	Compound	DA	Units
antimony	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
arsenic	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
beryllium	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
uranium-total	2.50E-15	mg/cm^2-day	NA	NA	mg/cm^2-day
benzo(a)pyrene	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
carbazole	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
arodor-1254	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
arodor-1260	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
dieldrin	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day			

References

000442

Table C.III–14 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Federal Ownership: Off–Property Farmer (Child)
Via Dermal Contact while Bathing

	HQ Calculation		
Compound	CDI (mg/kg–day)	RfD (mg/kg–day)	HQ (unitless)
antimony	NA	6.00E–05	NA
arsenic	NA	2.85E–04	NA
beryllium	NA	5.00E–03	NA
uranium–total	1.28E–12	1.50E–04	8.52E–09
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor–1254	NA	NA	NA
aroclor–1260	NA	NA	NA
dieldrin	NA	4.50E–05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			8.52E–09

	ILCR Calculation		
Compound	CDI (mg/kg–day)	CSF $(mg/kg–day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.90E+00	NA
beryllium	NA	4.30E+00	NA
uranium–total	1.10E–13	NA	NA
benzo(a)pyrene	NA	NA	NA
carbazole	NA	2.22E–02	NA
aroclor–1254	NA	1.03E+01	NA
aroclor–1260	NA	1.03E+01	NA
dieldrin	NA	1.78E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

000443

6646

Table C.III–15
Summary of Intake and Risk Quantitation (radionuclides) Alternative 2
Lime Sludge Pond with Federal Ownership: Off–Property Farmer (Child)
Via Inhalation of Gases and Particulates

Intake Equation = Ca X EF X EDn X IR

IR	Inhalation rate of gases (RAGS, 1989)	12 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Ca	Concentration of radionuclides in air	(see table below)

Cs_{137+1d}	NA	pCi/m^3	$Th_{232+10d}$	NA	pCi/m^3
Np_{237+1d}	NA	pCi/m^3	U_{234}	NA	pCi/m^3
Pu_{238}	NA	pCi/m^3	U_{235+1d}	NA	pCi/m^3
Ra_{226+8d}	NA	pCi/m^3	U_{238+2d}	NA	pCi/m^3
Ra_{228+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Rn_{222+4d}	3.4E–09	pCi/m^3	NA	NA	pCi/m^3
Sr_{90+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Tc_{99}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{228+7d}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{230}	NA	pCi/m^3	NA	NA	pCi/m^3

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	1.9E–11	NA
Np_{237+1d}	NA	2.9E–08	NA
Pu_{238}	NA	3.9E–08	NA
Ra_{226+8d}	NA	7.0E–09	NA
Ra_{228+1d}	NA	6.9E–10	NA
Rn_{222+4d}	8.6E–05	7.7E–12	6.6E–16
Sr_{90+1d}	NA	6.2E–11	NA
Tc_{99}	NA	8.3E–12	NA
Th_{228+7d}	NA	7.8E–08	NA
Th_{230}	NA	2.9E–08	NA
$Th_{232+10d}$	NA	1.1E–07	NA
U_{234}	NA	2.6E–08	NA
U_{235+1d}	NA	2.5E–08	NA
U_{238+2d}	NA	2.4E–08	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 6.6E–16

Table C.III–16
Summary of Intake Quantitation (chemicals) Alternative 2
Lime Sludge Pond with Federal Ownership: Off–Property Farmer (Child)
Via Ingestion of Meat Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of meat	0.039 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x365)	2190 days
CS	Concentration of chemicals in meat	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium–total	1.0E–10	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
arodor–1254	NA	mg/kg	NA	NA	mg/kg
arodor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

000245

000446

Table C.III-16 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Federal Ownership: Off-Property Farmer (Child)
Via Ingestion of Meat Products

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	1.9E-13	3.0E-03	6.2E-11
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		6.2E-11

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF (mg/kg-day)$^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	1.6E-14	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

Table C.III–17
Summary of Intake and Risk Quantitation (radionuclides) Alternative 2
Lime Sludge Pond with Federal Ownership: Off–Property Farmer (Child)
Via Ingestion of Meat Products

Intake Equation = Cf X EF X EDn X FI X IR

IR	Ingestion rate of meat	0.039 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cf	Concentration of radionuclides in meat	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	NA	pCi/kg	U_{234}	1.0E–07	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	1.0E–07	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	1.0E–07	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	NA	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	NA	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	NA	2.2E–10	NA
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	NA	1.3E–11	NA
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	6.1E–06	1.6E–11	9.8E–17
U_{235+1d}	6.1E–06	1.6E–11	9.8E–17
U_{238+2d}	6.1E–06	2.0E–11	1.2E–16
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		3.2E–16

000447

Table C.III-18
Summary of Intake Quantitation (chemicals) Alternative 2
Lime Sludge Pond with Federal Ownership: Off-Property Farmer (Child)
Via Ingestion of Dairy Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of dairy products	0.9 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x365)	2190 days
CS	Concentration of chemicals in animal products	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium-total	3.6E-10	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
arodor-1254	NA	mg/kg	NA	NA	mg/kg
arodor-1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

Table C.III-18 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Federal Ownership: Off-Property Farmer (Child)
Via Ingestion of Dairy Products

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	1.6E-11	3.0E-03	5.2E-09
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		5.2E-09

Compound	ILCR Calculation CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	1.3E-12	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

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000449

Table C.III–19
Summary of Intake and Risk Quantitation (radionuclides) Alternative 2
Lime Sludge Pond with Federal Ownership: Off–Property Farmer (Child)
Via Ingestion of Dairy Products

Intake Equation = Cp X EF X EDn X FI X IR

IR	Ingestion rate of dairy products	0.9 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cp	Concentration of radionuclides in animal products	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	NA	pCi/kg	U_{234}	3.6E–07	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	3.6E–07	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	3.6E–07	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	NA	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	NA	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	NA	2.2E–10	NA
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	NA	1.3E–11	NA
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	5.1E–04	1.6E–11	8.2E–15
U_{235+1d}	5.1E–04	1.6E–11	8.2E–15
U_{238+2d}	5.1E–04	2.0E–11	1.0E–14
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 2.7E–14

Table C.III–20
Summary of Intake Quantitation (chemicals) Alternative 2
Lime Sludge Pond with Federal Ownership: Off–Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of fruits or vegetables	0.1 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x365)	2190 days
CS	Concentration of chemicals in vegetables	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium–total	4.9E–08	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
arodor–1254	NA	mg/kg	NA	NA	mg/kg
arodor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

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Table C.III–20 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Federal Ownership: Off–Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

	HQ Calculation		
Compound	CDI (mg/kg–day)	RfD (mg/kg–day)	HQ (unitless)
antimony	NA	4.0E–04	NA
arsenic	NA	3.0E–04	NA
beryllium	NA	5.0E–03	NA
uranium–total	3.1E–10	3.0E–03	1.0E–07
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor–1254	NA	NA	NA
aroclor–1260	NA	NA	NA
dieldrin	NA	5.0E–05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			1.0E–07

	ILCR Calculation		
Compound	CDI (mg/kg–day)	CSF $(mg/kg–day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium–total	2.7E–11	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E–02	NA
aroclor–1254	NA	7.7E+00	NA
aroclor–1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

Table C.III–21
Summary of Intake and Risk Quantitation (radionuclides) Alternative 2
Lime Sludge Pond with Federal Ownership: Off–Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

Intake Equation = Cv X EF X EDn X FI X IR

IR	Ingestion rate of fruits or vegetables	0.1 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cv	Concentration of radionuclides in vegetables	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	NA	pCi/kg	U_{234}	4.9E–05	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	4.9E–05	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	4.9E–05	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	NA	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	NA	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	NA	2.2E–10	NA
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	NA	1.3E–11	NA
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	1.0E–02	1.6E–11	1.6E–13
U_{235+1d}	1.0E–02	1.6E–11	1.6E–13
U_{238+2d}	1.0E–02	2.0E–11	2.1E–13
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 5.3E–13

000453

Table C.III–22
Summary of Intake Quantitation (chemicals) Alternative 3
Lime Sludge Pond with Federal Ownership: Expanded Trespasser
Via Incidental Ingestion of Soil/Sediment

Intake Equation $= \frac{CS \times EFa \times EDa \times CF \times IRa}{BWa \times ATa} + \frac{CS \times EFc \times EDc \times CF \times IRc}{BWc \times ATc}$

IRa	Ingestion rate of soil (adult)	12.5 mg/day
IRc	Ingestion rate of soil (child)	12.5 mg/day
CF	Conversion factor	1.00E–06 kg/mg
EFa	Exposure frequency (adult)	40 days/year
EFc	Exposure frequency (child)	110 days/year
EDa	Exposure duration (adult)	32 Year
EDc	Exposure duration (child)	12 Year
BWa	Body weight (adult)	70 kg
BWc	Body weight (child)	43 kg
AT	Average time for carcinogens	25550 days
ATa	Average time for non–carcinogens (adult)	11680 days
ATc	Average time for non–carcinogens (child)	4380 days
CS	Concentration of chemicals in soil	(see table below)

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium–total	1.1E+01	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
arodor–1254	NA	mg/kg	NA	NA	mg/kg
arodor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

Table C.III-22 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Federal Ownership: Expanded Trespasser
Via Incidental Ingestion of Soil/Sediment

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	1.2E-06	3.0E-03	3.9E-04
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		3.9E-04

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	2.6E-07	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

000455

Table C.III–23
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Lime Sludge Pond with Federal Ownership: Expanded Trespasser
Via Incidental Ingestion of Soil/Sediment

Intake Equation = CS X EFa X EDa X FI X IRa + CS X EFc X EDc X FI X IRc

IRa	Ingestion rate of soil (adult)	12.5 mg/day
IRc	Ingestion rate of soil (child)	12.5 mg/day
EFa	Exposure frequency (adult)	40 days/year
EFc	Exposure frequency (child)	110 days/year
EDa	Exposure Duration	32 Year
EDc	Exposure Duration	12 Year
FI	Fractional Intake	1 (unitless)
CS	Concentration of radionuclides in soil	(see table below)

Cs_{137+1d}	NA	pCi/mg	$Th_{232+10d}$	NA	pCi/mg
Np_{237+1d}	1.3E−04	pCi/mg	U_{234}	NA	pCi/mg
Pu_{238}	NA	pCi/mg	U_{235+1d}	NA	pCi/mg
Ra_{226+8d}	NA	pCi/mg	U_{238+2d}	NA	pCi/mg
Ra_{228+1d}	NA	pCi/mg	NA	NA	pCi/mg
Rn_{222+4d}	NA	pCi/mg	NA	NA	pCi/mg
Sr_{90+1d}	5.4E−04	pCi/mg	NA	NA	pCi/mg
Tc_{99}	NA	pCi/mg	NA	NA	pCi/mg
Th_{228+7d}	NA	pCi/mg	NA	NA	pCi/mg
Th_{230}	5.2E−04	pCi/mg	NA	NA	pCi/mg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E−11	NA
Np_{237+1d}	4.2E+00	2.2E−10	9.3E−10
Pu_{238}	NA	2.2E−10	NA
Ra_{226+8d}	NA	7.8E−10	NA
Ra_{228+1d}	NA	1.0E−10	NA
Rn_{222+4d}	NA	1.7E−12	NA
Sr_{90+1d}	1.8E+01	3.6E−11	6.3E−10
Tc_{99}	NA	1.3E−12	NA
Th_{228+7d}	NA	5.5E−11	NA
Th_{230}	1.7E+01	1.3E−11	2.2E−10
$Th_{232+10d}$	NA	1.7E−10	NA
U_{234}	NA	1.6E−11	NA
U_{235+1d}	NA	1.6E−11	NA
U_{238+2d}	NA	2.0E−11	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		1.8E−09

Table C.III–24
Summary of Intake Quantitation (chemicals) Alternative 3
Lime Sludge Pond with Federal Ownership: Expanded Trespasser
Via Dermal Contact with Soil/Sediment

Intake Equation = $\frac{CS \times EFa \times EDa \times CF \times ABS \times AF \times SAa}{BWa \times ATa}$ + $\frac{CS \times EFc \times EDc \times CF \times ABS \times AF \times SAc}{BWc \times ATc}$

SA	Surface area of exposed skin (adult)	5750 cm^2/day
SA	Surface area of exposed skin (child)	4200 cm^2/day
AF	Soil to skin adherence factor	1 mg/cm^2
ABS	chemicals specific absorbtion factor (see table below)	csv
CF	Conversion factor	1E–06 kg/mg
EFa	Exposure frequency (adult)	40 days/year
EFc	Exposure frequency (child)	110 days/year
EDa	Exposure duration (adult)	32 Year
EDc	Exposure duration (child)	12 Year
BWa	Body weight (adult)	70 kg
BWc	Body weight (child)	43 kg
AT	Average time for carcinogens	25550 days
ATa	Average time for non–carcinogens (adult)	11680 days
ATc	Average time for non–carcinogens (child)	4380 days
CS	Concentration of chemicals in soil	(see table below)

Chemical Concentrations

Compound	ABS	Concentrati	Units	Compound	ABS	Concentrati	Units
antimony	1.0E–02	NA	mg/kg	NA	NA	NA	mg/kg
arsenic	1.0E–03	NA	mg/kg	NA	NA	NA	mg/kg
beryllium	1.0E–02	NA	mg/kg	NA	NA	NA	mg/kg
uranium–total	1.0E–02	1.1E+01	mg/kg	NA	NA	NA	mg/kg
benzo(a)pyrene	3.0E–01	NA	mg/kg	NA	NA	NA	mg/kg
carbazole	3.0E–01	NA	mg/kg	NA	NA	NA	mg/kg
arodor–1254	6.0E–02	NA	mg/kg	NA	NA	NA	mg/kg
arodor–1260	6.0E–02	NA	mg/kg	NA	NA	NA	mg/kg
dieldrin	3.0E–01	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg				

References

000457

Table C.III-24 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Federal Ownership: Expanded Trespasser
Via Dermal Contact with Soil/Sediment

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	6.0E-05	NA
arsenic	NA	2.9E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	4.2E-06	1.5E-04	2.8E-02
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	4.5E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			2.8E-02

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.9E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	1.0E-06	NA	NA
benzo(a)pyrene	NA	NA	NA
carbazole	NA	2.2E-02	NA
aroclor-1254	NA	1.0E+01	NA
aroclor-1260	NA	1.0E+01	NA
dieldrin	NA	1.8E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

Table C.III–25
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Lime Sludge Pond with Federal Ownership: Expanded Trespasser
Via Inhalation of Gases and Particulates

Intake Equation = CA X EFa X EDa X IR X ETa + CA X EFc EDc X IR X ETc

IR	Inhalation rate of gases	0.83 m^3/hour
EFa	Exposure frequency (adult)	40 days/year
EFc	Exposure frequency (child)	110 days/year
EDa	Exposure duration	32 Year
EDc	Exposure duration	12 Year
ETa	Exposure time (adult)	1 hour/day
ETc	Exposure time (child)	2 hour/day
CA	Concentration of radionuclides in air	(see table below)

Cs_{137+1d}	NA	pCi/m^3	$Th_{232+10d}$	NA	pCi/m^3
Np_{237+1d}	4.3E−07	pCi/m^3	U_{234}	NA	pCi/m^3
Pu_{238}	NA	pCi/m^3	U_{235+1d}	NA	pCi/m^3
Ra_{226+8d}	NA	pCi/m^3	U_{238+2d}	NA	pCi/m^3
Ra_{228+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Rn_{222+4d}	NA	pCi/m^3	NA	NA	pCi/m^3
Sr_{90+1d}	1.8E−06	pCi/m^3	NA	NA	pCi/m^3
Tc_{99}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{228+7d}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{230}	1.7E−06	pCi/m^3	NA	NA	pCi/m^3

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	1.9E−11	NA
Np_{237+1d}	1.4E−03	2.9E−08	4.1E−11
Pu_{238}	NA	3.9E−08	NA
Ra_{226+8d}	NA	7.0E−09	NA
Ra_{228+1d}	NA	6.9E−10	NA
Rn_{222+4d}	NA	7.7E−12	NA
Sr_{90+1d}	5.9E−03	6.2E−11	3.6E−13
Tc_{99}	NA	8.3E−12	NA
Th_{228+7d}	NA	7.8E−08	NA
Th_{230}	5.6E−03	2.9E−08	1.6E−10
$Th_{232+10d}$	NA	1.1E−07	NA
U_{234}	NA	2.6E−08	NA
U_{235+1d}	NA	2.5E−08	NA
U_{238+2d}	NA	2.4E−08	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 2.0E−10

000459

Table C.III–26
Summary of Risk Quantitation (radionuclides) Alternative 3
Lime Sludge Pond with Federal Ownership: Expanded Trespasser
Via External Radiation

Exposure Equation = $[CR \times EFa \times EDa \times ET_{oo} \times (1-SH_o)] + [CR \times EFc \times EDc \times ET_{oc} \times (1-SH_o)]$

EFa	Fraction of year spent exposured (adult)	0.11 (unitless)
EFc	Fraction of year spent exposured (child)	0.3 (unitless)
EDa	Exposure duration (adult)	32 Year
EDc	Exposure duration (child)	12 Year
ET_{oo}	Fraction of day spent outdoors (adult)	0.04 (unitless)
ET_{oc}	Fraction of day spent outdoors (child)	0.08 (unitless)
SH_o	Shield factor outdoors	NA (unitless)
CR	Radionuclide specific concentrations	(see table below)

Cs_{137+1d}	NA	pCi/g	$Th_{232+10d}$	NA	pCi/g
Np_{237+1d}	1.3E−01	pCi/g	U_{234}	NA	pCi/g
Pu_{238}	NA	pCi/g	U_{235+1d}	NA	pCi/g
Ra_{226+8d}	NA	pCi/g	U_{238+2d}	NA	pCi/g
Ra_{228+1d}	NA	pCi/g	NA	NA	pCi/g
Rn_{222+4d}	NA	pCi/g	NA	NA	pCi/g
Sr_{90+1d}	5.4E−01	pCi/g	NA	NA	pCi/g
Tc_{99}	NA	pCi/g	NA	NA	pCi/g
Th_{228+7d}	NA	pCi/g	NA	NA	pCi/g
Th_{230}	5.2E−01	pCi/g	NA	NA	pCi/g

Radionuclides	CDI (year pCi/g)	CSF $(g/pCi-year)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.0E−06	NA
Np_{237+1d}	5.6E−02	4.3E−07	2.4E−08
Pu_{238}	NA	2.8E−11	NA
Ra_{226+8d}	NA	6.0E−06	NA
Ra_{228+1d}	NA	2.9E−06	NA
Rn_{222+4d}	NA	5.9E−06	NA
Sr_{90+1d}	2.3E−01	NA	NA
Tc_{99}	NA	6.0E−13	NA
Th_{228+7d}	NA	5.6E−06	NA
Th_{230}	2.2E−01	5.4E−11	1.2E−11
$Th_{232+10d}$	NA	8.5E−06	NA
U_{234}	NA	3.0E−11	NA
U_{235+1d}	NA	2.4E−07	NA
U_{238+2d}	NA	5.1E−08	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation	=	2.4E−08

6646

Table C.III-27
Summary of Intake Quantitation (chemicals) Alternative 3
Lime Sludge Pond with Federal Ownership: Off-Property Farmer (Adult)
Via Drinking Water Ingestion

Intake Equation = $\frac{CS \times EF \times ED \times IR}{BW \times AT}$

IR	Ingestion rate of groundwater (RAGS, 1989)	2	l/day
EF	Exposure frequency	350	days/year
EDn	Exposure duration for non-carcinogens	70	Year
EDc	Exposure duration for carcinogens	70	Year
BW	Body weight	70	kg
ATc	Average time for carcinogens (lifetime)	25550	days
ATn	Average time for non-carcinogens (EDn x365)	25550	days
CS	Concentration of chemicals in groundwater		

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/l	NA	NA	mg/l
arsenic	NA	mg/l	NA	NA	mg/l
beryllium	NA	mg/l	NA	NA	mg/l
uranium-total	1.23E-04	mg/l	NA	NA	mg/l
benzo(a)pyrene	NA	mg/l	NA	NA	mg/l
carbazole	NA	mg/l	NA	NA	mg/l
arodor-1254	NA	mg/l	NA	NA	mg/l
arodor-1260	NA	mg/l	NA	NA	mg/l
dieldrin	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l			

References

000461

Table C.III–27 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Federal Ownership: Off–Property Farmer (Adult)
Via Drinking Water Ingestion

	HQ Calculation		
Compound	CDI (mg/kg–day)	RfD (mg/kg–day)	HQ (unitless)
antimony	NA	4.00E–04	NA
arsenic	NA	3.00E–04	NA
beryllium	NA	5.00E–03	NA
uranium–total	3.37E–06	3.00E–03	1.12E–03
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor–1254	NA	NA	NA
aroclor–1260	NA	NA	NA
dieldrin	NA	5.00E–05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			1.12E–03

	ILCR Calculation		
Compound	CDI (mg/kg–day)	CSF $(mg/kg–day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.75E+00	NA
beryllium	NA	4.30E+00	NA
uranium–total	3.37E–06	NA	NA
benzo(a)pyrene	NA	7.30E+00	NA
carbazole	NA	2.00E–02	NA
aroclor–1254	NA	7.70E+00	NA
aroclor–1260	NA	7.70E+00	NA
dieldrin	NA	1.60E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

Table C.III–28
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Lime Sludge Pond with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Drinking Water

Intake Equation = Cw X EF X EDn X FI X IR

IR	Ingestion rate of groundwater (RAGS, 1989)	2 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
FI	Fractional intake for radionuclides	1 (Unitless)
Cw	Concentration of radionuclides in groundwater	(see table below)

Cs_{137+1d}	NA	pCi/l	$Th_{232+10d}$	NA	pCi/l
Np_{237+1d}	NA	pCi/l	U_{234}	3.7E–02	pCi/l
Pu_{238}	NA	pCi/l	U_{235+1d}	2.0E–03	pCi/l
Ra_{226+8d}	NA	pCi/l	U_{238+2d}	4.1E–02	pCi/l
Ra_{228+1d}	NA	pCi/l	NA	NA	pCi/l
Rn_{222+4d}	NA	pCi/l	NA	NA	pCi/l
Sr_{90+1d}	NA	pCi/l	NA	NA	pCi/l
Tc_{99}	NA	pCi/l	NA	NA	pCi/l
Th_{228+7d}	NA	pCi/l	NA	NA	pCi/l
Th_{230}	NA	pCi/l	NA	NA	pCi/l

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	NA	2.2E–10	NA
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	NA	1.3E–11	NA
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	1.8E+03	1.6E–11	2.9E–08
U_{235+1d}	9.8E+01	1.6E–11	1.6E–09
U_{238+2d}	2.0E+03	2.0E–11	4.0E–08
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 7.1E–08

000463

Table C.III-29
Summary of Intake Quantitation (chemicals) Alternative 3
Lime Sludge Pond with Federal Ownership: Off-Property Farmer (Adult)
Via Dermal Contact while Bathing

Intake Equation = $\frac{DA \times EF \times ED \times SA}{BW \times AT}$

DA	Dermal absorbed dose	csv	mg/cm^2-day
EF	Exposure frequency	350	days/year
EDn	Exposure duration for non-carcinogens	70	Year
EDc	Exposure duration for carcinogens	70	Year
BW	Body weight	70	kg
ATc	Average time for carcinogens (lifetime)	25550	days
ATn	Average time for non-carcinogens (EDn x365)	25550	days
SA	Skin surface area available for contact	23000	cm^2

Chemical Concentrations

Compound	DA	Units	Compound	DA	Units
antimony	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
arsenic	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
beryllium	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
uranium-total	3.08E-11	mg/cm^2-day	NA	NA	mg/cm^2-day
benzo(a)pyrene	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
carbazole	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
arodor-1254	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
arodor-1260	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
dieldrin	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day			

References

Table C.III–29 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Federal Ownership: Off–Property Farmer (Adult)
Via Dermal Contact while Showering

	HQ Calculation		
Compound	CDI (mg/kg–day)	RfD (mg/kg–day)	HQ (unitless)
antimony	NA	6.00E–05	NA
arsenic	NA	2.85E–04	NA
beryllium	NA	5.00E–03	NA
uranium–total	9.69E–09	1.50E–04	6.46E–05
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor–1254	NA	NA	NA
aroclor–1260	NA	NA	NA
dieldrin	NA	4.50E–05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
HQ Summation =			6.46E–05

	ILCR Calculation		
Compound	CDI (mg/kg–day)	CSF $(mg/kg–day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.90E+00	NA
beryllium	NA	4.30E+00	NA
uranium–total	9.69E–09	NA	NA
benzo(a)pyrene	NA	NA	NA
carbazole	NA	2.22E–02	NA
aroclor–1254	NA	1.03E+01	NA
aroclor–1260	NA	1.03E+01	NA
dieldrin	NA	1.78E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
ILCR Summation =			NA

000465

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Table C.III-30
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Lime Sludge Pond with Federal Ownership: Off-Property Farmer (Adult)
Via Inhalation of Gases and Particulates

Intake Equation = Ca X EF X EDn X IR

IR	Inhalation rate of gases (RAGS, 1989)	20 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Ca	Concentration of radionuclides in air	(see table below)

Cs_{137+1d}	NA	pCi/m^3	$Th_{232+10d}$	NA	pCi/m^3
Np_{237+1d}	6.2E-09	pCi/m^3	U_{234}	NA	pCi/m^3
Pu_{238}	NA	pCi/m^3	U_{235+1d}	NA	pCi/m^3
Ra_{226+8d}	NA	pCi/m^3	U_{238+2d}	NA	pCi/m^3
Ra_{228+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Rn_{222+4d}	NA	pCi/m^3	NA	NA	pCi/m^3
Sr_{90+1d}	2.6E-08	pCi/m^3	NA	NA	pCi/m^3
Tc_{99}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{228+7d}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{230}	2.5E-08	pCi/m^3	NA	NA	pCi/m^3

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	1.9E-11	NA
Np_{237+1d}	3.0E-03	2.9E-08	8.8E-11
Pu_{238}	NA	3.9E-08	NA
Ra_{226+8d}	NA	7.0E-09	NA
Ra_{228+1d}	NA	6.9E-10	NA
Rn_{222+4d}	NA	7.7E-12	NA
Sr_{90+1d}	1.3E-02	6.2E-11	7.8E-13
Tc_{99}	NA	8.3E-12	NA
Th_{228+7d}	NA	7.8E-08	NA
Th_{230}	1.2E-02	2.9E-08	3.5E-10
$Th_{232+10d}$	NA	1.1E-07	NA
U_{234}	NA	2.6E-08	NA
U_{235+1d}	NA	2.5E-08	NA
U_{238+2d}	NA	2.4E-08	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation	=	4.4E-10

000466

Table C.III–31
Summary of Intake Quantitation (chemicals) Alternative 3
Lime Sludge Pond with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Meat Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of meat	0.101 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x365)	25550 days
CS	Concentration of chemicals in meat	

Chemical Concentrations

Compound	Concentration	Units
antimony	NA	mg/kg
arsenic	NA	mg/kg
beryllium	NA	mg/kg
uranium–total	1.2E–06	mg/kg
benzo(a)pyrene	NA	mg/kg
carbazole	NA	mg/kg
arodor–1254	NA	mg/kg
arodor–1260	NA	mg/kg
dieldrin	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg

Compound	Concentration	Units
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg

References

000467

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Table C.III–31 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Meat Products

	HQ Calculation		
Compound	CDI (mg/kg–day)	RfD (mg/kg–day)	HQ (unitless)
antimony	NA	4.0E–04	NA
arsenic	NA	3.0E–04	NA
beryllium	NA	5.0E–03	NA
uranium–total	1.3E–09	3.0E–03	4.3E–07
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor–1254	NA	NA	NA
aroclor–1260	NA	NA	NA
dieldrin	NA	5.0E–05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			4.3E–07

	ILCR Calculation		
Compound	CDI (mg/kg–day)	CSF $(mg/kg–day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium–total	1.3E–09	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E–02	NA
aroclor–1254	NA	7.7E+00	NA
aroclor–1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

6646

Table C.III–32
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Lime Sludge Pond with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Meat Products

Intake Equation = Cf X EF X EDn X FI X IR

IR	Ingestion rate of meat	0.101 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cf	Concentration of radionuclides in meat	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	2.6E–08	pCi/kg	U_{234}	3.7E–04	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	2.0E–05	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	4.1E–04	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	2.3E–06	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	1.3E–08	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	4.9E–05	2.2E–10	1.1E–14
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	4.2E–03	3.6E–11	1.5E–13
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	2.5E–05	1.3E–11	3.2E–16
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	6.9E–01	1.6E–11	1.1E–11
U_{235+1d}	3.7E–02	1.6E–11	5.9E–13
U_{238+2d}	7.6E–01	2.0E–11	1.5E–11
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 2.7E–11

000469

Table C.III–33
Summary of Intake Quantitation (chemicals) Alternative 3
Lime Sludge Pond with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Dairy Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of dairy products	0.4 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x365)	25550 days
CS	Concentration of chemicals in animal products	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium–total	4.5E–06	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
arodor–1254	NA	mg/kg	NA	NA	mg/kg
arodor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

Table C.III-33 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Federal Ownership: Off-Property Farmer (Adult)
Via Ingestion of Dairy Products

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	1.8E-08	3.0E-03	6.1E-06
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		6.1E-06

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	1.8E-08	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

6646

000471

Table C.III-34
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Lime Sludge Pond with Federal Ownership: Off-Property Farmer (Adult)
Via Ingestion of Dairy Products

Intake Equation = Cp X EF X EDn X FI X IR

IR	Ingestion rate of dairy products	0.4 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cp	Concentration of radionuclides in animal products	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	2.4E-09	pCi/kg	U_{234}	1.3E-03	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	7.2E-05	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	1.5E-03	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	1.1E-05	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	1.1E-08	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E-11	NA
Np_{237+1d}	1.8E-05	2.2E-10	3.9E-15
Pu_{238}	NA	2.2E-10	NA
Ra_{226+8d}	NA	7.8E-10	NA
Ra_{228+1d}	NA	1.0E-10	NA
Rn_{222+4d}	NA	1.7E-12	NA
Sr_{90+1d}	8.4E-02	3.6E-11	3.0E-12
Tc_{99}	NA	1.3E-12	NA
Th_{228+7d}	NA	5.5E-11	NA
Th_{230}	8.2E-05	1.3E-11	1.1E-15
$Th_{232+10d}$	NA	1.7E-10	NA
U_{234}	9.8E+00	1.6E-11	1.6E-10
U_{235+1d}	5.3E-01	1.6E-11	8.5E-12
U_{238+2d}	1.1E+01	2.0E-11	2.2E-10
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 3.9E-10

Table C.III–35
Summary of Intake and Risk Quantitation (chemicals) Alternative 3
Lime Sludge Pond with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Vegetables and Fruits

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of fruits or vegetables	0.122	kg/day
FI	Fraction ingested from contaminated source	1	(Unitless)
EF	Exposure frequency	350	days/year
EDn	Exposure duration for non–carcinogens	70	Year
EDc	Exposure duration for carcinogens	70	Year
BW	Body weight	70	kg
ATc	Average time for carcinogens (lifetime)	25550	days
ATn	Average time for non–carcinogens (EDn x365)	25550	days
CS	Concentration of chemicals in vegetables		

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium–total	6.0E–04	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
arodor–1254	NA	mg/kg	NA	NA	mg/kg
arodor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

000473

6646

Table C.III-35 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Federal Ownership: Off-Property Farmer (Adult)
Via Ingestion of Vegetables and Fruits

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	1.0E-06	3.0E-03	3.4E-04
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		3.4E-04

Compound	ILCR Calculation CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	1.0E-06	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

Table C.III–36
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Lime Sludge Pond with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Vegetables and Fruits

Intake Equation = Cv X EF X EDn X FI X IR

IR	Ingestion rate of fruits or vegetables	0.122 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cv	Concentration of radionuclides in vegetables	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	6.2E–06	pCi/kg	U_{234}	1.8E–01	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	9.8E–03	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	2.0E–01	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	7.4E–05	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	2.7E–05	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	1.8E–02	2.2E–10	4.1E–12
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	2.2E–01	3.6E–11	7.9E–12
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	8.2E–02	1.3E–11	1.1E–12
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	5.4E+02	1.6E–11	8.7E–09
U_{235+1d}	2.9E+01	1.6E–11	4.7E–10
U_{238+2d}	6.0E+02	2.0E–11	1.2E–08
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 2.1E–08

000475

Table C.III-37
Summary of Intake Quantitation (chemicals) Alternative 3
Lime Sludge Pond with Federal Ownership: Off-Property Farmer (Child)
Via Drinking Water Ingestion

Intake Equation = $\frac{CS \times EF \times ED \times IR}{BW \times AT}$

IR	Ingestion rate of groundwater (RAGS, 1989)	1 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x365)	2190 days
CS	Concentration of chemicals in groundwater	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/l	NA	NA	mg/l
arsenic	NA	mg/l	NA	NA	mg/l
beryllium	NA	mg/l	NA	NA	mg/l
uranium-total	1.23E-04	mg/l	NA	NA	mg/l
benzo(a)pyrene	NA	mg/l	NA	NA	mg/l
carbazole	NA	mg/l	NA	NA	mg/l
arodor-1254	NA	mg/l	NA	NA	mg/l
arodor-1260	NA	mg/l	NA	NA	mg/l
dieldrin	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l			

References

Table C.III–37 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Federal Ownership: Off–Property Farmer (Child)
Via Drinking Water Ingestion

	HQ Calculation		
Compound	CDI (mg/kg–day)	RfD (mg/kg–day)	HQ (unitless)
antimony	NA	4.00E–04	NA
arsenic	NA	3.00E–04	NA
beryllium	NA	5.00E–03	NA
uranium–total	7.86E–06	3.00E–03	2.62E–03
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor–1254	NA	NA	NA
aroclor–1260	NA	NA	NA
dieldrin	NA	5.00E–05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			2.62E–03

	ILCR Calculation		
Compound	CDI (mg/kg–day)	CSF $(mg/kg–day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.75E+00	NA
beryllium	NA	4.30E+00	NA
uranium–total	6.74E–07	NA	NA
benzo(a)pyrene	NA	7.30E+00	NA
carbazole	NA	2.00E–02	NA
aroclor–1254	NA	7.70E+00	NA
aroclor–1260	NA	7.70E+00	NA
dieldrin	NA	1.60E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

Table C.III–38
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Lime Sludge Pond with Federal Ownership: Off–Property Farmer (Child)
Via Ingestion of Drinking Water

Intake Equation = Cw X EF X EDn X FI X IR

IR	Ingestion rate of groundwater (RAGS, 1989)	1 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
FI	Fractional intake for radionuclides	1 (Unitless)
Cw	Concentration of radionuclides in groundwater	(see table below)

Cs_{137+1d}	NA	pCi/l	$Th_{232+10d}$	NA	pCi/l
Np_{237+1d}	NA	pCi/l	U_{234}	3.7E–02	pCi/l
Pu_{238}	NA	pCi/l	U_{235+1d}	2.0E–03	pCi/l
Ra_{226+8d}	NA	pCi/l	U_{238+2d}	4.1E–02	pCi/l
Ra_{228+1d}	NA	pCi/l	NA	NA	pCi/l
Rn_{222+4d}	NA	pCi/l	NA	NA	pCi/l
Sr_{90+1d}	NA	pCi/l	NA	NA	pCi/l
Tc_{99}	NA	pCi/l	NA	NA	pCi/l
Th_{228+7d}	NA	pCi/l	NA	NA	pCi/l
Th_{230}	NA	pCi/l	NA	NA	pCi/l

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	NA	2.2E–10	NA
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	NA	1.3E–11	NA
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	7.8E+01	1.6E–11	1.2E–09
U_{235+1d}	4.2E+00	1.6E–11	6.7E–11
U_{238+2d}	8.6E+01	2.0E–11	1.7E–09
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
ILCR Summation	=		3.0E–09

Table C.III-39
Summary of Intake Quantitation (chemicals) Alternative 3
Lime Sludge Pond with Federal Ownership: Off-Property Farmer (Child)
Via Dermal Contact while Bathing

Intake Equation = $\frac{DA \times EF \times ED \times SA}{BW \times AT}$

DA	Dermal absorbed dose	csv mg/cm^2-day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x365)	2190 days
SA	Skin surface area available for contact	8000 cm^2

Chemical Concentrations

Compound	DA	Units	Compound	DA	Units
antimony	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
arsenic	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
beryllium	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
uranium-total	3.08E-11	mg/cm^2-day	NA	NA	mg/cm^2-day
benzo(a)pyrene	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
carbazole	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
arodor-1254	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
arodor-1260	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
dieldrin	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day			

References

Table C.III-39
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Federal Ownership: Off-Property Farmer (Child)
Via Dermal Contact while Bathing

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	6.00E-05	NA
arsenic	NA	2.85E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	1.57E-08	1.50E-04	1.05E-04
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	4.50E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		1.05E-04

Compound	ILCR Calculation CDI (mg/kg-day)	CSF $(mg/kg\text{-}day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.90E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	1.35E-09	NA	NA
benzo(a)pyrene	NA	NA	NA
carbazole	NA	2.22E-02	NA
aroclor-1254	NA	1.03E+01	NA
aroclor-1260	NA	1.03E+01	NA
dieldrin	NA	1.78E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

Table C.III–40
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Lime Sludge Pond with Federal Ownership: Off–Property Farmer (Child)
Via Inhalation of Gases and Particulates

Intake Equation = Ca X EF X EDn X IR

IR	Inhalation rate of gases (RAGS, 1989)	12 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Ca	Concentration of radionuclides in air	(see table below)

Cs_{137+1d}	NA	pCi/m^3	$Th_{232+10d}$	NA	pCi/m^3
Np_{237+1d}	6.2E–09	pCi/m^3	U_{234}	NA	pCi/m^3
Pu_{238}	NA	pCi/m^3	U_{235+1d}	NA	pCi/m^3
Ra_{226+8d}	NA	pCi/m^3	U_{238+2d}	NA	pCi/m^3
Ra_{228+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Rn_{222+4d}	NA	pCi/m^3	NA	NA	pCi/m^3
Sr_{90+1d}	2.6E–08	pCi/m^3	NA	NA	pCi/m^3
Tc_{99}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{228+7d}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{230}	2.5E–08	pCi/m^3	NA	NA	pCi/m^3

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	1.9E–11	NA
Np_{237+1d}	1.6E–04	2.9E–08	4.5E–12
Pu_{238}	NA	3.9E–08	NA
Ra_{226+8d}	NA	7.0E–09	NA
Ra_{228+1d}	NA	6.9E–10	NA
Rn_{222+4d}	NA	7.7E–12	NA
Sr_{90+1d}	6.5E–04	6.2E–11	4.0E–14
Tc_{99}	NA	8.3E–12	NA
Th_{228+7d}	NA	7.8E–08	NA
Th_{230}	6.2E–04	2.9E–08	1.8E–11
$Th_{232+10d}$	NA	1.1E–07	NA
U_{234}	NA	2.6E–08	NA
U_{235+1d}	NA	2.5E–08	NA
U_{238+2d}	NA	2.4E–08	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 2.3E–11

000481

Table C.III–41
Summary of Intake Quantitation (chemicals) Alternative 3
Lime Sludge Pond with Federal Ownership: Off–Property Farmer (Child)
Via Ingestion of Meat Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of meat	0.039 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x365)	2190 days
CS	Concentration of chemicals in meat	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium–total	1.2E–06	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
arodor–1254	NA	mg/kg	NA	NA	mg/kg
arodor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

6646

Table C.III-41 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Federal Ownership: Off-Property Farmer (Child)
Via Ingestion of Meat Products

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	2.3E-09	3.0E-03	7.7E-07
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			7.7E-07

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	2.0E-10	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

000193

C006484

Table C.III–42
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Lime Sludge Pond with Federal Ownership: Off–Property Farmer (Child)
Via Ingestion of Meat Products

Intake Equation = Cf X EF X EDn X FI X IR

IR	Ingestion rate of meat	0.039 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cf	Concentration of radionuclides in meat	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	2.6E–08	pCi/kg	U_{234}	3.7E–04	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	2.0E–05	pCi/kg
Ra_{226+6d}	NA	pCi/kg	U_{238+2d}	4.1E–04	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	2.3E–06	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	1.3E–08	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	1.6E–06	2.2E–10	3.5E–16
Pu_{238}	NA	2.2E–10	NA
Ra_{226+6d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	1.4E–04	3.6E–11	5.0E–15
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	8.2E–07	1.3E–11	1.1E–17
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	2.3E–02	1.6E–11	3.6E–13
U_{235+1d}	1.2E–03	1.6E–11	2.0E–14
U_{238+2d}	2.5E–02	2.0E–11	5.0E–13
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation	=	8.9E–13

6643

Table C.III-43
Summary of Intake Quantitation (chemicals) Alternative 3
Lime Sludge Pond with Federal Ownership: Off-Property Farmer (Child)
Via Ingestion of Dairy Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of dairy products	0.9 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x365)	2190 days
CS	Concentration of chemicals in animal products	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium-total	4.5E-06	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
arodor-1254	NA	mg/kg	NA	NA	mg/kg
arodor-1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

000485

Table C.III–43 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Federal Ownership: Off–Property Farmer (Child)
Via Ingestion of *Dairy Products*

	HQ Calculation		
Compound	CDI (mg/kg–day)	RfD (mg/kg–day)	HQ (unitless)
antimony	NA	4.0E–04	NA
arsenic	NA	3.0E–04	NA
beryllium	NA	5.0E–03	NA
uranium–total	1.9E–07	3.0E–03	6.4E–05
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor–1254	NA	NA	NA
aroclor–1260	NA	NA	NA
dieldrin	NA	5.0E–05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	HQ Summation =		6.4E–05

	ILCR Calculation		
Compound	CDI (mg/kg–day)	CSF $(mg/kg–day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium–total	1.6E–08	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E–02	NA
aroclor–1254	NA	7.7E+00	NA
aroclor–1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	ILCR Summation =		NA

9800088

Table C.III-44
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Lime Sludge Pond with Federal Ownership: Off-Property Farmer (Child)
Via Ingestion of Dairy Products

Intake Equation = Cp X EF X EDn X FI X IR

IR	Ingestion rate of dairy products	0.9 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cp	Concentration of radionuclides in animal products	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	2.4E-09	pCi/kg	U_{234}	1.3E-03	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	7.2E-05	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	1.5E-03	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	1.1E-05	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	1.1E-08	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E-11	NA
Np_{237+1d}	3.4E-06	2.2E-10	7.4E-16
Pu_{238}	NA	2.2E-10	NA
Ra_{226+8d}	NA	7.8E-10	NA
Ra_{228+1d}	NA	1.0E-10	NA
Rn_{222+4d}	NA	1.7E-12	NA
Sr_{90+1d}	1.6E-02	3.6E-11	5.8E-13
Tc_{99}	NA	1.3E-12	NA
Th_{228+7d}	NA	5.5E-11	NA
Th_{230}	1.6E-05	1.3E-11	2.1E-16
$Th_{232+10d}$	NA	1.7E-10	NA
U_{234}	1.9E+00	1.6E-11	3.0E-11
U_{235+1d}	1.0E-01	1.6E-11	1.6E-12
U_{238+2d}	2.1E+00	2.0E-11	4.2E-11
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 7.4E-11

000387

Table C.III-45
Summary of Intake and Risk Quantitation (chemicals) Alternative 3
Lime Sludge Pond with Federal Ownership: Off-Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of fruits or vegetables	0.1 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x365)	2190 days
CS	Concentration of chemicals in vegetables	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium-total	6.0E-04	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
arodor-1254	NA	mg/kg	NA	NA	mg/kg
arodor-1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

000088

6646

Table C.III-45 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Federal Ownership: Off-Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	3.9E-06	3.0E-03	1.3E-03
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		1.3E-03

Compound	ILCR Calculation CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	3.3E-07	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

080490

Table C.III–46
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Lime Sludge Pond with Federal Ownership: Off–Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

Intake Equation = Cv X EF X EDn X FI X IR

IR	Ingestion rate of fruits or vegetables	0.1 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cv	Concentration of radionuclides in vegetables	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	6.2E–06	pCi/kg	U_{234}	1.8E–01	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	9.8E–03	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	2.0E–01	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	7.4E–05	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	2.7E–05	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	1.3E–03	2.2E–10	2.8E–13
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	1.5E–02	3.6E–11	5.6E–13
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	5.8E–03	1.3E–11	7.5E–14
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	3.8E+01	1.6E–11	6.1E–10
U_{235+1d}	2.1E+00	1.6E–11	3.3E–11
U_{238+2d}	4.2E+01	2.0E–11	8.4E–10
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		1.5E–09

Table C.III–47
Summary of Intake Quantitation (chemicals) Alternative 3
Lime Sludge Pond with Private Ownership: Off–Property Farmer (Adult)
Via Drinking Water Ingestion

Intake Equation = $\frac{CS \times EF \times ED \times IR}{BW \times AT}$

IR	Ingestion rate of groundwater (RAGS, 1989)	2 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x365)	25550 days
CS	Concentration of chemicals in groundwater	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/l	NA	NA	mg/l
arsenic	NA	mg/l	NA	NA	mg/l
beryllium	NA	mg/l	NA	NA	mg/l
uranium–total	2.30E–07	mg/l	NA	NA	mg/l
benzo(a)pyrene	NA	mg/l	NA	NA	mg/l
carbazole	NA	mg/l	NA	NA	mg/l
arodor–1254	NA	mg/l	NA	NA	mg/l
arodor–1260	NA	mg/l	NA	NA	mg/l
dieldrin	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l			

References

Table C.III-47 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Private Ownership: Off-Property Farmer (Adult)
Via Drinking Water Ingestion

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.00E-04	NA
arsenic	NA	3.00E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	6.30E-09	3.00E-03	2.10E-06
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.00E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		2.10E-06

Compound	ILCR Calculation CDI (mg/kg-day)	CSF $(mg/kg\text{-}day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.75E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	6.30E-09	NA	NA
benzo(a)pyrene	NA	7.30E+00	NA
carbazole	NA	2.00E-02	NA
aroclor-1254	NA	7.70E+00	NA
aroclor-1260	NA	7.70E+00	NA
dieldrin	NA	1.60E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

000392

000293

Table C.III–48
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Lime Sludge Pond with Private Ownership: Off–Property Farmer (Adult)
Via Ingestion of Drinking Water

Intake Equation = Cw X EF X EDn X FI X IR

IR	Ingestion rate of groundwater (RAGS, 1989)	2 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
FI	Fractional intake for radionuclides	1 (Unitless)
Cw	Concentration of radionuclides in groundwater	(see table below)

Cs_{137+1d}	NA	pCi/l	$Th_{232+10d}$	NA	pCi/l
Np_{237+1d}	NA	pCi/l	U_{234}	7.1E–05	pCi/l
Pu_{238}	NA	pCi/l	U_{235+1d}	3.7E–06	pCi/l
Ra_{226+8d}	NA	pCi/l	U_{238+2d}	7.8E–05	pCi/l
Ra_{228+1d}	NA	pCi/l	NA	NA	pCi/l
Rn_{222+4d}	NA	pCi/l	NA	NA	pCi/l
Sr_{90+1d}	NA	pCi/l	NA	NA	pCi/l
Tc_{99}	NA	pCi/l	NA	NA	pCi/l
Th_{228+7d}	NA	pCi/l	NA	NA	pCi/l
Th_{230}	NA	pCi/l	NA	NA	pCi/l

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	NA	2.2E–10	NA
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	NA	1.3E–11	NA
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	3.5E+00	1.6E–11	5.6E–11
U_{235+1d}	1.8E–01	1.6E–11	2.9E–12
U_{238+2d}	3.8E+00	2.0E–11	7.6E–11
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation	=	1.4E–10

Table C.III–49
Summary of Intake Quantitation (chemicals) Alternative 3
Lime Sludge Pond with Private Ownership: Off–Property Farmer (Adult)
Via Dermal Contact while Bathing

Intake Equation = $\frac{DA \times EF \times ED \times SA}{BW \times AT}$

DA	Dermal absorbed dose	csv mg/cm^2–day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x365)	25550 days
SA	Skin surface area available for contact	23000 cm^2

Chemical Concentrations

Compound	DA	Units	Compound	DA	Units
antimony	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
arsenic	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
beryllium	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
uranium–total	5.75E–14	mg/cm^2–day	NA	NA	mg/cm^2–day
benzo(a)pyrene	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
carbazole	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
arodor–1254	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
arodor–1260	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
dieldrin	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day			

References

Table C.III-49 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Private Ownership: Off-Property Farmer (Adult)
Via Dermal Contact while Bathing

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	6.00E-05	NA
arsenic	NA	2.85E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	1.81E-11	1.50E-04	1.21E-07
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	4.50E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		1.21E-07

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF (mg/kg-day)$^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.90E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	1.81E-11	NA	NA
benzo(a)pyrene	NA	NA	NA
carbazole	NA	2.22E-02	NA
aroclor-1254	NA	1.03E+01	NA
aroclor-1260	NA	1.03E+01	NA
dieldrin	NA	1.78E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

6646

000395

Table C.III–50
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Lime Sludge Pond with Private Ownership: Off–Property Farmer (Adult)
Via Inhalation of Gases and Particulates

Intake Equation = Ca X EF X EDn X IR

IR	Inhalation rate of gases (RAGS, 1989)	20 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Ca	Concentration of radionuclides in air	(see table below)

Cs_{137+1d}	NA	pCi/m^3	$Th_{232+10d}$	NA	pCi/m^3
Np_{237+1d}	3.2E–09	pCi/m^3	U_{234}	NA	pCi/m^3
Pu_{238}	NA	pCi/m^3	U_{235+1d}	NA	pCi/m^3
Ra_{226+8d}	NA	pCi/m^3	U_{238+2d}	NA	pCi/m^3
Ra_{228+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Rn_{222+4d}	NA	pCi/m^3	NA	NA	pCi/m^3
Sr_{90+1d}	3.5E–09	pCi/m^3	NA	NA	pCi/m^3
Tc_{99}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{228+7d}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{230}	3.3E–07	pCi/m^3	NA	NA	pCi/m^3

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	1.9E–11	NA
Np_{237+1d}	1.6E–03	2.9E–08	4.5E–11
Pu_{238}	NA	3.9E–08	NA
Ra_{226+8d}	NA	7.0E–09	NA
Ra_{228+1d}	NA	6.9E–10	NA
Rn_{222+4d}	NA	7.7E–12	NA
Sr_{90+1d}	1.7E–03	6.2E–11	1.1E–13
Tc_{99}	NA	8.3E–12	NA
Th_{228+7d}	NA	7.8E–08	NA
Th_{230}	1.6E–01	2.9E–08	4.6E–09
$Th_{232+10d}$	NA	1.1E–07	NA
U_{234}	NA	2.6E–08	NA
U_{235+1d}	NA	2.5E–08	NA
U_{238+2d}	NA	2.4E–08	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		4.7E–09

Table C.III–51
Summary of Intake Quantitation (chemicals) Alternative 3
Lime Sludge Pond with Private Ownership: Off–Property Farmer (Adult)
Via Ingestion of Meat Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of meat	0.101 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x365)	25550 days
CS	Concentration of chemicals in meat	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium–total	2.3E–09	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
arodor–1254	NA	mg/kg	NA	NA	mg/kg
arodor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg

References

Table C.III–51 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Private Ownership: Off–Property Farmer (Adult)
Via Ingestion of Meat Products

	HQ Calculation		
Compound	CDI (mg/kg–day)	RfD (mg/kg–day)	HQ (unitless)
antimony	NA	4.0E–04	NA
arsenic	NA	3.0E–04	NA
beryllium	NA	5.0E–03	NA
uranium–total	2.4E–12	3.0E–03	8.0E–10
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor–1254	NA	NA	NA
aroclor–1260	NA	NA	NA
dieldrin	NA	5.0E–05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			8.0E–10

	ILCR Calculation		
Compound	CDI (mg/kg–day)	CSF $(mg/kg–day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium–total	2.4E–12	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E–02	NA
aroclor–1254	NA	7.7E+00	NA
aroclor–1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

Table C.III-52
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Lime Sludge Pond with Private Ownership: Off-Property Farmer (Adult)
Via Ingestion of Meat Products

Intake Equation = Cf X EF X EDn X FI X IR

IR	Ingestion rate of meat	0.101 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cf	Concentration of radionuclides in meat	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	1.4E-08	pCi/kg	U_{234}	7.1E-07	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	3.7E-08	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	7.8E-07	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	3.1E-07	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	1.8E-07	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E-11	NA
Np_{237+1d}	2.5E-05	2.2E-10	5.5E-15
Pu_{238}	NA	2.2E-10	NA
Ra_{226+8d}	NA	7.8E-10	NA
Ra_{228+1d}	NA	1.0E-10	NA
Rn_{222+4d}	NA	1.7E-12	NA
Sr_{90+1d}	5.7E-04	3.6E-11	2.1E-14
Tc_{99}	NA	1.3E-12	NA
Th_{228+7d}	NA	5.5E-11	NA
Th_{230}	3.3E-04	1.3E-11	4.2E-15
$Th_{232+10d}$	NA	1.7E-10	NA
U_{234}	1.3E-03	1.6E-11	2.1E-14
U_{235+1d}	6.9E-05	1.6E-11	1.1E-15
U_{238+2d}	1.4E-03	2.0E-11	2.9E-14
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 8.2E-14

Table C.III–53
Summary of Intake Quantitation (chemicals) Alternative 3
Lime Sludge Pond with Private Ownership: Off–Property Farmer (Adult)
Via Ingestion of Dairy Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of dairy products	0.4 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x365)	25550 days
CS	Concentration of chemicals in animal products	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium–total	8.3E–09	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
arodor–1254	NA	mg/kg	NA	NA	mg/kg
arodor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

Table C.III-53 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Private Ownership: Off-Property Farmer (Adult)
Via Ingestion of Dairy Products

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	3.4E-11	3.0E-03	1.1E-08
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		1.1E-08

Compound	ILCR Calculation CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	3.4E-11	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

6643

000701

Table C.III–54
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Lime Sludge Pond with Private Ownership: Off–Property Farmer (Adult)
Via Ingestion of Dairy Products

Intake Equation = Cp X EF X EDn X FI X IR

IR	Ingestion rate of dairy products	0.4 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cp	Concentration of radionuclides in animal products	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	1.2E–09	pCi/kg	U_{234}	2.6E–06	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	1.3E–07	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	2.8E–06	pCi/kg
Ra_{228+1d}	NA	pCi/kg		NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg		NA	pCi/kg
Sr_{90+1d}	1.5E–06	pCi/kg		NA	pCi/kg
Tc_{99}	NA	pCi/kg		NA	pCi/kg
Th_{228+7d}	NA	pCi/kg		NA	pCi/kg
Th_{230}	1.5E–07	pCi/kg		NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	9.0E–06	2.2E–10	2.0E–15
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	1.1E–02	3.6E–11	4.1E–13
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	1.1E–03	1.3E–11	1.4E–14
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	1.9E–02	1.6E–11	3.0E–13
U_{235+1d}	9.8E–04	1.6E–11	1.6E–14
U_{238+2d}	2.1E–02	2.0E–11	4.1E–13
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
		ILCR Summation =	1.2E–12

Table C.III-55
Summary of Intake and Risk Quantitation (chemicals) Alternative 3
Lime Sludge Pond with Private Ownership: Off-Property Farmer (Adult)
Via Ingestion of Vegetables and Fruits

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of fruits or vegetables	0.122 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x365) .	25550 days
CS	Concentration of chemicals in vegetables	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium-total	1.1E-06	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
arodor-1254	NA	mg/kg	NA	NA	mg/kg
arodor-1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

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Table C.III–55 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Private Ownership: Off–Property Farmer (Adult)
Via Ingestion of Vegetables and Fruits

	HQ Calculation		
Compound	CDI (mg/kg–day)	RfD (mg/kg–day)	HQ (unitless)
antimony	NA	4.0E–04	NA
arsenic	NA	3.0E–04	NA
beryllium	NA	5.0E–03	NA
uranium–total	1.9E–09	3.0E–03	6.3E–07
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor–1254	NA	NA	NA
aroclor–1260	NA	NA	NA
dieldrin	NA	5.0E–05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			6.3E–07

	ILCR Calculation		
Compound	CDI (mg/kg–day)	CSF $(mg/kg–day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium–total	1.9E–09	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E–02	NA
aroclor–1254	NA	7.7E+00	NA
aroclor–1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

Table C.III–56
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Lime Sludge Pond with Private Ownership: Off–Property Farmer (Adult)
Via Ingestion of Vegetables and Fruits

Intake Equation = Cv X EF X EDn X FI X IR

IR	Ingestion rate of fruits or vegetables	0.122 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cv	Concentration of radionuclides in vegetables	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	3.2E–06	pCi/kg	U_{234}	3.5E–04	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	1.8E–05	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	3.8E–04	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	1.0E–05	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	3.6E–04	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	9.5E–03	2.2E–10	2.1E–12
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	3.0E–02	3.6E–11	1.1E–12
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	1.1E+00	1.3E–11	1.4E–11
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	1.0E+00	1.6E–11	1.7E–11
U_{235+1d}	5.4E–02	1.6E–11	8.7E–13
U_{238+2d}	1.1E+00	2.0E–11	2.3E–11
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		5.7E–11

Table C.III-57
Summary of Intake Quantitation (chemicals) Alternative 3
Lime Sludge Pond with Private Ownership: Off-Property Farmer (Child)
Via Drinking Water Ingestion

Intake Equation = $\frac{CS \times EF \times ED \times IR}{BW \times AT}$

IR	Ingestion rate of groundwater (RAGS, 1989)	1 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x365)	2190 days
CS	Concentration of chemicals in groundwater	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/l	NA	NA	mg/l
arsenic	NA	mg/l	NA	NA	mg/l
beryllium	NA	mg/l	NA	NA	mg/l
uranium-total	2.30E-07	mg/l	NA	NA	mg/l
benzo(a)pyrene	NA	mg/l	NA	NA	mg/l
carbazole	NA	mg/l	NA	NA	mg/l
arodor-1254	NA	mg/l	NA	NA	mg/l
arodor-1260	NA	mg/l	NA	NA	mg/l
dieldrin	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l			

References

Table C.III-57 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Private Ownership: Off-Property Farmer (Child)
Via Drinking Water Ingestion

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.00E-04	NA
arsenic	NA	3.00E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	1.47E-08	3.00E-03	4.90E-06
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.00E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		4.90E-06

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.75E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	1.26E-09	NA	NA
benzo(a)pyrene	NA	7.30E+00	NA
carbazole	NA	2.00E-02	NA
aroclor-1254	NA	7.70E+00	NA
aroclor-1260	NA	7.70E+00	NA
dieldrin	NA	1.60E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

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Table C.III-58
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Lime Sludge Pond with Private Ownership: Off-Property Farmer (Child)
Via Ingestion of Drinking Water

Intake Equation = Cw X EF X EDn X FI X IR

IR	Ingestion rate of groundwater (RAGS, 1989)	1 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
FI	Fractional intake for radionuclides	1 (Unitless)
Cw	Concentration of radionuclides in groundwater	(see table below)

Cs_{137+1d}	NA	pCi/l	$Th_{232+10d}$	NA	pCi/l
Np_{237+1d}	NA	pCi/l	U_{234}	7.1E-05	pCi/l
Pu_{238}	NA	pCi/l	U_{235+1d}	3.7E-06	pCi/l
Ra_{226+8d}	NA	pCi/l	U_{238+2d}	7.8E-05	pCi/l
Ra_{228+1d}	NA	pCi/l	NA	NA	pCi/l
Rn_{222+4d}	NA	pCi/l	NA	NA	pCi/l
Sr_{90+1d}	NA	pCi/l	NA	NA	pCi/l
Tc_{99}	NA	pCi/l	NA	NA	pCi/l
Th_{228+7d}	NA	pCi/l	NA	NA	pCi/l
Th_{230}	NA	pCi/l	NA	NA	pCi/l

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E-11	NA
Np_{237+1d}	NA	2.2E-10	NA
Pu_{238}	NA	2.2E-10	NA
Ra_{226+8d}	NA	7.8E-10	NA
Ra_{228+1d}	NA	1.0E-10	NA
Rn_{222+4d}	NA	1.7E-12	NA
Sr_{90+1d}	NA	3.6E-11	NA
Tc_{99}	NA	1.3E-12	NA
Th_{228+7d}	NA	5.5E-11	NA
Th_{230}	NA	1.3E-11	NA
$Th_{232+10d}$	NA	1.7E-10	NA
U_{234}	1.5E-01	1.6E-11	2.4E-12
U_{235+1d}	7.8E-03	1.6E-11	1.2E-13
U_{238+2d}	1.6E-01	2.0E-11	3.3E-12
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		5.8E-12

Table C.III-59
Summary of Intake Quantitation (chemicals) Alternative 3
Lime Sludge Pond with Private Ownership: Off-Property Farmer (Child)
Via Dermal Contact while Bathing

Intake Equation = $\frac{DA \times EF \times ED \times SA}{BW \times AT}$

DA	Dermal absorbed dose	csv	mg/cm^2-day
EF	Exposure frequency	350	days/year
EDn	Exposure duration for non-carcinogens	6	Year
EDc	Exposure duration for carcinogens	6	Year
BW	Body weight	15	kg
ATc	Average time for carcinogens (lifetime)	25550	days
ATn	Average time for non-carcinogens (EDn x365)	2190	days
SA	Skin surface area available for contact	8000	cm^2

Chemical Concentrations

Compound	DA	Units	Compound	DA	Units
antimony	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
arsenic	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
beryllium	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
uranium-total	5.75E-14	mg/cm^2-day	NA	NA	mg/cm^2-day
benzo(a)pyrene	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
carbazole	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
arodor-1254	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
arodor-1260	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
dieldrin	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day			

References

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Table C.III-59 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Private Ownership: Off-Property Farmer (Child)
Via Dermal Contact while Bathing

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	6.00E-05	NA
arsenic	NA	2.85E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	2.94E-11	1.50E-04	1.96E-07
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	4.50E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		1.96E-07

Compound	ILCR Calculation CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.90E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	2.52E-12	NA	NA
benzo(a)pyrene	NA	NA	NA
carbazole	NA	2.22E-02	NA
aroclor-1254	NA	1.03E+01	NA
aroclor-1260	NA	1.03E+01	NA
dieldrin	NA	1.78E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

Table C.III–60
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Lime Sludge Pond with Private Ownership: Off–Property Farmer (Child)
Via Inhalation of Gases and Particulates

Intake Equation = Ca X EF X EDn X IR

IR	Inhalation rate of gases (RAGS, 1989)	12 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Ca	Concentration of radionuclides in air	(see table below)

Cs_{137+1d}	NA	pCi/m^3	$Th_{232+10d}$	NA	pCi/m^3
Np_{237+1d}	3.2E–09	pCi/m^3	U_{234}	NA	pCi/m^3
Pu_{238}	NA	pCi/m^3	U_{235+1d}	NA	pCi/m^3
Ra_{226+8d}	NA	pCi/m^3	U_{238+2d}	NA	pCi/m^3
Ra_{228+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Rn_{222+4d}	NA	pCi/m^3	NA	NA	pCi/m^3
Sr_{90+1d}	3.5E–09	pCi/m^3	NA	NA	pCi/m^3
Tc_{99}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{228+7d}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{230}	3.3E–07	pCi/m^3	NA	NA	pCi/m^3

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	1.9E–11	NA
Np_{237+1d}	8.0E–05	2.9E–08	2.3E–12
Pu_{238}	NA	3.9E–08	NA
Ra_{226+8d}	NA	7.0E–09	NA
Ra_{228+1d}	NA	6.9E–10	NA
Rn_{222+4d}	NA	7.7E–12	NA
Sr_{90+1d}	8.8E–05	6.2E–11	5.5E–15
Tc_{99}	NA	8.3E–12	NA
Th_{228+7d}	NA	7.8E–08	NA
Th_{230}	8.2E–03	2.9E–08	2.4E–10
$Th_{232+10d}$	NA	1.1E–07	NA
U_{234}	NA	2.6E–08	NA
U_{235+1d}	NA	2.5E–08	NA
U_{238+2d}	NA	2.4E–08	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation	=	2.4E–10

Table C.III-61
Summary of Intake Quantitation (chemicals) Alternative 3
Lime Sludge Pond with Private Ownership: Off-Property Farmer (Child)
Via Ingestion of Meat Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of meat	0.039 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x365)	2190 days
CS	Concentration of chemicals in meat	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium-total	2.3E-09	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
arodor-1254	NA	mg/kg	NA	NA	mg/kg
arodor-1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

Table C.III-61 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Private Ownership: Off-Property Farmer (Child)
Via Ingestion of Meat Products

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	4.3E-12	3.0E-03	1.4E-09
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		1.4E-09

Compound	ILCR Calculation CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	3.7E-13	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

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Table C.III–62
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Lime Sludge Pond with Private Ownership: Off–Property Farmer (Child)
Via Ingestion of Meat Products

Intake Equation = Cf X EF X EDn X FI X IR

IR	Ingestion rate of meat	0.039 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cf	Concentration of radionuclides in meat	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	1.4E–08	pCi/kg	U_{234}	7.1E–07	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	3.7E–08	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	7.8E–07	pCi/kg
Ra_{228+1d}	NA	pCi/kg		NA	NA pCi/kg
Rn_{222+4d}	ERR	pCi/kg		NA	NA pCi/kg
Sr_{90+1d}	3.1E–07	pCi/kg		NA	NA pCi/kg
Tc_{99}	NA	pCi/kg		NA	NA pCi/kg
Th_{228+7d}	NA	pCi/kg		NA	NA pCi/kg
Th_{230}	1.8E–07	pCi/kg		NA	NA pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	8.3E–07	2.2E–10	1.8E–16
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	1.9E–05	3.6E–11	6.8E–16
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	1.1E–05	1.3E–11	1.4E–16
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	4.4E–05	1.6E–11	7.0E–16
U_{235+1d}	2.3E–06	1.6E–11	3.6E–17
U_{238+2d}	4.8E–05	2.0E–11	9.6E–16
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
		ILCR Summation =	2.7E–15

Table C.III–63
Summary of Intake Quantitation (chemicals) Alternative 3
Lime Sludge Pond with Private Ownership: Off–Property Farmer (Child)
Via Ingestion of Dairy Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of dairy products	0.9 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x365)	2190 days
CS	Concentration of chemicals in animal products	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium–total	8.3E–09	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
arodor–1254	NA	mg/kg	NA	NA	mg/kg
arodor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

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Table C.III-63 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Private Ownership: Off-Property Farmer (Child)
Via Ingestion of Dairy Products

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	3.6E-10	3.0E-03	1.2E-07
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			1.2E-07

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	3.1E-11	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

Table C.III-64
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Lime Sludge Pond with Private Ownership: Off-Property Farmer (Child)
Via Ingestion of Dairy Products

Intake Equation = Cp X EF X EDn X FI X IR

IR	Ingestion rate of dairy products	0.9 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cp	Concentration of radionuclides in animal products	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	1.2E-09	pCi/kg	U_{234}	2.6E-06	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	1.3E-07	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	2.8E-06	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	1.5E-06	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	1.5E-07	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E-11	NA
Np_{237+1d}	1.7E-06	2.2E-10	3.8E-16
Pu_{238}	NA	2.2E-10	NA
Ra_{226+8d}	NA	7.8E-10	NA
Ra_{228+1d}	NA	1.0E-10	NA
Rn_{222+4d}	NA	1.7E-12	NA
Sr_{90+1d}	2.2E-03	3.6E-11	7.9E-14
Tc_{99}	NA	1.3E-12	NA
Th_{228+7d}	NA	5.5E-11	NA
Th_{230}	2.1E-04	1.3E-11	2.7E-15
$Th_{232+10d}$	NA	1.7E-10	NA
U_{234}	3.6E-03	1.6E-11	5.8E-14
U_{235+1d}	1.9E-04	1.6E-11	3.0E-15
U_{238+2d}	4.0E-03	2.0E-11	8.0E-14
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 2.2E-13

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Table C.III-65
Summary of Intake and Risk Quantitation (chemicals) Alternative 3
Lime Sludge Pond with Private Ownership: Off-Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of fruits or vegetables	0.1 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x365)	2190 days
CS	Concentration of chemicals in vegetables	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium-total	1.1E-06	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
arodor-1254	NA	mg/kg	NA	NA	mg/kg
arodor-1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

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Table C.III-65 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Private Ownership: Off-Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	7.2E-09	3.0E-03	2.4E-06
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		2.4E-06

Compound	ILCR Calculation CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	6.2E-10	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

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Table C.III–66
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Lime Sludge Pond with Private Ownership: Off–Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

Intake Equation = Cv X EF X EDn X FI X IR

IR	Ingestion rate of fruits or vegetables	0.1 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cv	Concentration of radionuclides in vegetables	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	3.2E–06	pCi/kg	U_{234}	3.5E–04	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	1.8E–05	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	3.8E–04	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	1.0E–05	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	3.6E–04	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	6.7E–04	2.2E–10	1.5E–13
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	2.1E–03	3.6E–11	7.6E–14
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	7.5E–02	1.3E–11	9.8E–13
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	7.3E–02	1.6E–11	1.2E–12
U_{235+1d}	3.8E–03	1.6E–11	6.1E–14
U_{238+2d}	8.0E–02	2.0E–11	1.6E–12
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		4.0E–12

Table C.III–67
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Lime Sludge Pond with Private Ownership: On–Property Perched Groundwater User
Via Incidental Ingestion of Soil

Intake Equation = CS X EF X EDn X FI X IR

IRs	Ingestion rate of soil (RAGS, 1989)	180 mg/day
EF	Exposure frequency	350 days/year
EDn	Exposure Duration	70 Year
FI	Fractional Intake	1 (unitless)
CS	Concentration of radionuclides in soil	

Cs_{137+1d}	NA	pCi/mg	$Th_{232+10d}$	NA	pCi/mg
Np_{237+1d}	5.10E–06	pCi/mg	U_{234}	2.20E–04	pCi/mg
Pu_{238}	NA	pCi/mg	U_{235+1d}	9.00E–05	pCi/mg
Ra_{226+8d}	NA	pCi/mg	U_{238+2d}	NA	pCi/mg
Ra_{228+1d}	NA	pCi/mg	NA	NA	pCi/mg
Rn_{222+4d}	NA	pCi/mg	NA	NA	pCi/mg
Sr_{90+1d}	5.60E–06	pCi/mg	NA	NA	pCi/mg
Tc_{99}	NA	pCi/mg	NA	NA	pCi/mg
Th_{228+7d}	NA	pCi/mg	NA	NA	pCi/mg
Th_{230}	5.20E–04	pCi/mg	NA	NA	pCi/mg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.80E–11	NA
Np_{237+1d}	2.25E+01	2.20E–10	4.95E–09
Pu_{238}	NA	2.20E–10	NA
Ra_{226+8d}	NA	7.80E–10	NA
Ra_{228+1d}	NA	1.00E–10	NA
Rn_{222+4d}	NA	1.70E–12	NA
Sr_{90+1d}	2.47E+01	3.60E–11	8.89E–10
Tc_{99}	NA	1.30E–12	NA
Th_{228+7d}	NA	5.50E–11	NA
Th_{230}	2.29E+03	1.30E–11	2.98E–08
$Th_{232+10d}$	NA	1.70E–10	NA
U_{234}	9.70E+02	1.60E–11	1.55E–08
U_{235+1d}	3.97E+02	1.60E–11	6.35E–09
U_{238+2d}	NA	2.00E–11	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		5.75E–08

Table C.III–68
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Lime Sludge Pond with Private Ownership: On–Property Perched Groundwater User
Via Ingestion of Drinking Water

Intake Equation = Cw X EF X EDn X FI X IR

IR	Ingestion rate of groundwater (RAGS, 1989)	2 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
FI	Fractional intake for radionuclides	1 (Unitless)
Cw	Concentration of radionuclides in groundwater	(see table below)

Cs_{137+1d}	NA	pCi/l	$Th_{232+10d}$	NA	pCi/l
Np_{237+1d}	9.3E–05	pCi/l	U_{234}	6.4E–01	pCi/l
Pu_{238}	NA	pCi/l	U_{235+1d}	3.4E–02	pCi/l
Ra_{226+8d}	NA	pCi/l	U_{238+2d}	7.0E–01	pCi/l
Ra_{228+1d}	NA	pCi/l	NA	NA	pCi/l
Rn_{222+4d}	NA	pCi/l	NA	NA	pCi/l
Sr_{90+1d}	5.6E–04	pCi/l	NA	NA	pCi/l
Tc_{99}	1.6E–02	pCi/l	NA	NA	pCi/l
Th_{228+7d}	NA	pCi/l	NA	NA	pCi/l
Th_{230}	NA	pCi/l	NA	NA	pCi/l

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	4.6E+00	2.2E–10	1.0E–09
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	2.7E+01	3.6E–11	9.9E–10
Tc_{99}	7.8E+02	1.3E–12	1.0E–09
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	NA	1.3E–11	NA
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	3.1E+04	1.6E–11	5.0E–07
U_{235+1d}	1.7E+03	1.6E–11	2.7E–08
U_{238+2d}	3.4E+04	2.0E–11	6.9E–07
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation	=	1.2E–06

Table C.III–69
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Lime Sludge Pond with Private Ownership: On–Property Perched Groundwater User
Via Inhalation of Gases and Particulates

Intake Equation = Ca X EF X EDn X IR

IR	Inhalation rate of gases (RAGS, 1989)	20 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Ca	Concentration of radionuclides in air	(see table below)

Cs_{137+1d}	NA	pCi/m^3	$Th_{232+10d}$	NA	pCi/m^3
Np_{237+1d}	2.2E–07	pCi/m^3	U_{234}	NA	pCi/m^3
Pu_{238}	NA	pCi/m^3	U_{235+1d}	NA	pCi/m^3
Ra_{226+8d}	NA	pCi/m^3	U_{238+2d}	NA	pCi/m^3
Ra_{228+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Rn_{222+4d}	NA	pCi/m^3	NA	NA	pCi/m^3
Sr_{90+1d}	2.5E–07	pCi/m^3	NA	NA	pCi/m^3
Tc_{99}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{228+7d}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{230}	2.3E–05	pCi/m^3	NA	NA	pCi/m^3

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	1.9E–11	NA
Np_{237+1d}	1.1E–01	2.9E–08	3.2E–09
Pu_{238}	NA	3.9E–08	NA
Ra_{226+8d}	NA	7.0E–09	NA
Ra_{228+1d}	NA	6.9E–10	NA
Rn_{222+4d}	NA	7.7E–12	NA
Sr_{90+1d}	1.2E–01	6.2E–11	7.4E–12
Tc_{99}	NA	8.3E–12	NA
Th_{228+7d}	NA	7.8E–08	NA
Th_{230}	1.1E+01	2.9E–08	3.2E–07
$Th_{232+10d}$	NA	1.1E–07	NA
U_{234}	NA	2.6E–08	NA
U_{235+1d}	NA	2.5E–08	NA
U_{238+2d}	NA	2.4E–08	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
ILCR Summation	=		3.3E–07

Table C.III–70
Summary of Intake Quantitation (chemicals) Alternative 3
Lime Sludge Pond with Private Ownership: On–Property Perched Groundwater User
Via Ingestion of Meat Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of meat	0.101 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x365)	25550 days
CS	Concentration of chemicals in meat	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium–total	6.0E–08	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
arodor–1254	NA	mg/kg	NA	NA	mg/kg
arodor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

Table C.III–70 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Private Ownership: On–Property Perched Groundwater User
Via Ingestion of Meat Products

Compound	HQ Calculation CDI (mg/kg–day)	RfD (mg/kg–day)	HQ (unitless)
antimony	NA	4.0E–04	NA
arsenic	NA	3.0E–04	NA
beryllium	NA	5.0E–03	NA
uranium–total	6.2E–11	3.0E–03	2.1E–08
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor–1254	NA	NA	NA
aroclor–1260	NA	NA	NA
dieldrin	NA	5.0E–05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		2.1E–08

Compound	ILCR Calculation CDI (mg/kg–day)	CSF $(mg/kg–day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium–total	6.2E–11	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E–02	NA
aroclor–1254	NA	7.7E+00	NA
aroclor–1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

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Table C.III–71
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Lime Sludge Pond with Private Ownership: On–Property Perched Groundwater User
Via Ingestion of Meat Products

Intake Equation = Cf X EF X EDn X FI X IR

IR	Ingestion rate of meat	0.101 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cf	Concentration of radionuclides in meat	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	2.8E–04	pCi/kg	U_{234}	4.1E–02	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	1.7E–02	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	2.0E–05	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	2.1E–01	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	1.7E–03	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	5.2E–01	2.2E–10	1.1E–10
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	3.9E+02	3.6E–11	1.4E–08
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	3.2E+00	1.3E–11	4.1E–11
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	7.6E+01	1.6E–11	1.2E–09
U_{235+1d}	3.1E+01	1.6E–11	4.9E–10
U_{238+2d}	3.7E–02	2.0E–11	7.4E–13
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 1.6E–08

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Table C.III–72
Summary of Intake Quantitation (chemicals) Alternative 3
Lime Sludge Pond with Private Ownership: On–Property Perched Groundwater User
Via Ingestion of Dairy Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of dairy products	0.4 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x365)	25550 days
CS	Concentration of chemicals in animal products	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium–total	2.2E–07	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
arodor–1254	NA	mg/kg	NA	NA	mg/kg
arodor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

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Table C.III-72 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Private Ownership: On-Property Perched Groundwater User
Via Ingestion of Dairy Products

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	8.9E-10	3.0E-03	3.0E-07
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			3.0E-07

Compound	ILCR Calculation CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	8.9E-10	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

Table C.III-73
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Lime Sludge Pond with Private Ownership: On-Property Perched Groundwater User
Via Ingestion of Dairy Products

Intake Equation = Cp X EF X EDn X FI X IR

IR	Ingestion rate of dairy products	0.4 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cp	Concentration of radionuclides in animal products	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	2.6E-05	pCi/kg	U_{234}	1.2E-01	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	5.0E-02	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	7.2E-05	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	1.1E+00	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	1.4E-03	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E-11	NA
Np_{237+1d}	1.9E-01	2.2E-10	4.1E-11
Pu_{238}	NA	2.2E-10	NA
Ra_{226+8d}	NA	7.8E-10	NA
Ra_{228+1d}	NA	1.0E-10	NA
Rn_{222+4d}	NA	1.7E-12	NA
Sr_{90+1d}	7.7E+03	3.6E-11	2.8E-07
Tc_{99}	NA	1.3E-12	NA
Th_{228+7d}	NA	5.5E-11	NA
Th_{230}	1.0E+01	1.3E-11	1.4E-10
$Th_{232+10d}$	NA	1.7E-10	NA
U_{234}	9.0E+02	1.6E-11	1.4E-08
U_{235+1d}	3.7E+02	1.6E-11	5.9E-09
U_{238+2d}	5.3E-01	2.0E-11	1.1E-11
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 3.0E-07

Table C.III-74
Summary of Intake and Risk Quantitation (chemicals) Alternative 3
Lime Sludge Pond with Private Ownership: On-Property Perched Groundwater User
Via Ingestion of Vegetables and Fruits

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	*Ingestion rate of fruits or vegetables*	0.122 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	*Average time for carcinogens (lifetime)*	25550 days
ATn	Average time for non-carcinogens (EDn x365)	25550 days
CS	Concentration of chemicals in vegetables	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium-total	2.9E-05	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
arodor-1254	NA	mg/kg	NA	NA	mg/kg
arodor-1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

Table C.III–74 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Private Ownership: On–Property Perched Groundwater User
Via Ingestion of Vegetables and Fruits

	HQ Calculation		
Compound	CDI (mg/kg–day)	RfD (mg/kg–day)	HQ (unitless)
antimony	NA	4.0E–04	NA
arsenic	NA	3.0E–04	NA
beryllium	NA	5.0E–03	NA
uranium–total	4.9E–08	3.0E–03	1.6E–05
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor–1254	NA	NA	NA
aroclor–1260	NA	NA	NA
dieldrin	NA	5.0E–05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	HQ Summation =		1.6E–05

	ILCR Calculation		
Compound	CDI (mg/kg–day)	CSF $(mg/kg–day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium–total	4.9E–08	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E–02	NA
aroclor–1254	NA	7.7E+00	NA
aroclor–1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	ILCR Summation =		NA

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Table C.III–75
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Lime Sludge Pond with Private Ownership: On–Property Perched Groundwater User
Via Ingestion of Vegetables and Fruits

Intake Equation = Cv X EF X EDn X FI X IR

IR	Ingestion rate of fruits or vegetables	0.122 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cv	Concentration of radionuclides in vegetables	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	5.1E–02	pCi/kg	U_{234}	1.9E+00	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	7.7E–01	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	9.8E–03	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	1.4E+01	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	4.7E–01	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	1.5E+02	2.2E–10	3.4E–08
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	4.2E+04	3.6E–11	1.5E–06
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	1.4E+03	1.3E–11	1.8E–08
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	5.6E+03	1.6E–11	9.0E–08
U_{235+1d}	2.3E+03	1.6E–11	3.7E–08
U_{238+2d}	2.9E+01	2.0E–11	5.9E–10
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		1.7E–06

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Table C.III-76
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Lime Sludge Pond with Private Ownership: On-Property Perched Groundwater User
Via External Radiation

Dose Equivalency Equat: = $[DR \times EF \times EDn \times ET_i \times (1-SH_i)] + [DR \times EF \times EDn \times ET_o \times (1-SH_o)]$

EF	Fraction of year spent exposured	0.96 (unitless)
ED	Exposure duration	70 Year
ET_i	Fraction of day spent indoors	0.76 (unitless)
ET_o	Fraction of day spent outdoors	0.24 (unitless)
SH_i	Shield factor indoors	0.5 (unitless)
SH_o	Shield factor outdoors	NA (unitless)
DR	Radionuclide specific dose concentrations	(see table below)

Cs_{137+1d}	NA	pCi/g	$Th_{232+10d}$	NA	pCi/g
Np_{237+1d}	5.10E-03	pCi/g	U_{234}	2.20E-01	pCi/g
Pu_{238}	NA	pCi/g	U_{235+1d}	9.00E-02	pCi/g
Ra_{226+8d}	NA	pCi/g	U_{238+2d}	NA	pCi/g
Ra_{228+1d}	NA	pCi/g	NA	NA	pCi/g
Rn_{222+4d}	NA	pCi/g	NA	NA	pCi/g
Sr_{90+1d}	5.60E-03	pCi/g	NA	NA	pCi/g
Tc_{99}	NA	pCi/g	NA	NA	pCi/g
Th_{228+7d}	NA	pCi/g	NA	NA	pCi/g
Th_{230}	5.20E-01	pCi/g	NA	NA	pCi/g

Radionuclides	CDI (year pCi/g)	CSF $(g/pCi-year)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.0E-06	NA
Np_{237+1d}	2.1E-01	4.3E-07	9.1E-08
Pu_{238}	NA	2.8E-11	NA
Ra_{226+8d}	NA	6.0E-06	NA
Ra_{228+1d}	NA	2.9E-06	NA
Rn_{222+4d}	NA	5.9E-06	NA
Sr_{90+1d}	2.3E-01	NA	NA
Tc_{99}	NA	6.0E-13	NA
Th_{228+7d}	NA	5.6E-06	NA
Th_{230}	2.2E+01	5.4E-11	1.2E-09
$Th_{232+10d}$	NA	8.5E-06	NA
U_{234}	9.2E+00	3.0E-11	2.7E-10
U_{235+1d}	3.7E+00	2.4E-07	9.0E-07
U_{238+2d}	NA	5.1E-08	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
ILCR Summation	=		9.9E-07

Table C.III-77
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Lime Sludge Pond with Federal Ownership: On-Property RME Resident Farmer (Adult)
Via Incidental Ingestion of Soil

Intake Equation = CS X EF X EDn X FI X IR

IRs	Ingestion rate of soil (RAGS, 1989)	180 mg/day
EF	Exposure frequency	350 days/year
EDn	Exposure Duration	70 Year
FI	Fractional Intake	1 (unitless)
CS	Concentration of radionuclides in soil	

Cs_{137+1d}	NA	pCi/mg	$Th_{232+10d}$	NA	pCi/mg
Np_{237+1d}	5.10E-06	pCi/mg	U_{234}	2.20E-04	pCi/mg
Pu_{238}	NA	pCi/mg	U_{235+1d}	9.00E-05	pCi/mg
Ra_{226+8d}	NA	pCi/mg	U_{238+2d}	NA	pCi/mg
Ra_{228+1d}	NA	pCi/mg	NA	NA	pCi/mg
Rn_{222+4d}	NA	pCi/mg	NA	NA	pCi/mg
Sr_{90+1d}	5.60E-06	pCi/mg	NA	NA	pCi/mg
Tc_{99}	NA	pCi/mg	NA	NA	pCi/mg
Th_{228+7d}	NA	pCi/mg	NA	NA	pCi/mg
Th_{230}	5.20E-04	pCi/mg	NA	NA	pCi/mg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.80E-11	NA
Np_{237+1d}	2.25E+01	2.20E-10	4.95E-09
Pu_{238}	NA	2.20E-10	NA
Ra_{226+8d}	NA	7.80E-10	NA
Ra_{228+1d}	NA	1.00E-10	NA
Rn_{222+4d}	NA	1.70E-12	NA
Sr_{90+1d}	2.47E+01	3.60E-11	8.89E-10
Tc_{99}	NA	1.30E-12	NA
Th_{228+7d}	NA	5.50E-11	NA
Th_{230}	2.29E+03	1.30E-11	2.98E-08
$Th_{232+10d}$	NA	1.70E-10	NA
U_{234}	9.70E+02	1.60E-11	1.55E-08
U_{235+1d}	3.97E+02	1.60E-11	6.35E-09
U_{238+2d}	NA	2.00E-11	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
ILCR Summation	=		5.75E-08

Table C.III-78
Summary of Intake Quantitation (chemicals) Alternative 3
Lime Sludge Pond with Federal Ownership: On-Property RME Resident Farmer (Adult)
Via Drinking Water Ingestion

Intake Equation = $\frac{CS \times EF \times ED \times IR}{BW \times AT}$

IR	Ingestion rate of groundwater (RAGS, 1989)	2 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x365)	25550 days
CS	Concentration of chemicals in groundwater	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/l	NA	NA	mg/l
arsenic	NA	mg/l	NA	NA	mg/l
beryllium	NA	mg/l	NA	NA	mg/l
uranium-total	6.00E-06	mg/l	NA	NA	mg/l
benzo(a)pyrene	NA	mg/l	NA	NA	mg/l
carbazole	NA	mg/l	NA	NA	mg/l
arodor-1254	NA	mg/l	NA	NA	mg/l
arodor-1260	NA	mg/l	NA	NA	mg/l
dieldrin	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l			

References

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Table C.III-78 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Federal Ownership: On-Property RME Resident Farmer (Adult)
Via Drinking Water Ingestion

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.00E-04	NA
arsenic	NA	3.00E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	1.64E-07	3.00E-03	5.48E-05
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.00E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		5.48E-05

Compound	ILCR Calculation CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.75E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	1.64E-07	NA	NA
benzo(a)pyrene	NA	7.30E+00	NA
carbazole	NA	2.00E-02	NA
aroclor-1254	NA	7.70E+00	NA
aroclor-1260	NA	7.70E+00	NA
dieldrin	NA	1.60E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

Table C.III–79
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Lime Sludge Pond with Federal Ownership: On–Property RME Resident Farmer (Adult)
Via Ingestion of Drinking Water

Intake Equation = Cw X EF X EDn X FI X IR

IR	Ingestion rate of groundwater (RAGS, 1989)	2 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
FI	Fractional intake for radionuclides	1 (Unitless)
Cw	Concentration of radionuclides in groundwater	(see table below)

Cs_{137+1d}	NA	pCi/l	$Th_{232+10d}$	NA	pCi/l
Np_{237+1d}	NA	pCi/l	U_{234}	1.9E–03	pCi/l
Pu_{238}	NA	pCi/l	U_{235+1d}	1.0E–04	pCi/l
Ra_{226+8d}	NA	pCi/l	U_{238+2d}	2.0E–03	pCi/l
Ra_{228+1d}	NA	pCi/l	NA	NA	pCi/l
Rn_{222+4d}	NA	pCi/l	NA	NA	pCi/l
Sr_{90+1d}	NA	pCi/l	NA	NA	pCi/l
Tc_{99}	NA	pCi/l	NA	NA	pCi/l
Th_{228+7d}	NA	pCi/l	NA	NA	pCi/l
Th_{230}	NA	pCi/l	NA	NA	pCi/l

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	NA	2.2E–10	NA
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	NA	1.3E–11	NA
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	9.3E+01	1.6E–11	1.5E–09
U_{235+1d}	4.9E+00	1.6E–11	7.8E–11
U_{238+2d}	9.8E+01	2.0E–11	2.0E–09
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
ILCR Summation	=		3.5E–09

Table C.III-80
Summary of Intake Quantitation (chemicals) Alternative 3
Lime Sludge Pond with Federal Ownership: On-Property RME Resident Farmer (Adult)
Via Dermal Contact while Bathing

Intake Equation = $\frac{DA \times EF \times ED \times SA}{BW \times AT}$

DA	Dermal absorbed dose	csv	mg/cm^2-day
EF	Exposure frequency	350	days/year
EDn	Exposure duration for non-carcinogens	70	Year
EDc	Exposure duration for carcinogens	70	Year
BW	Body weight	70	kg
ATc	Average time for carcinogens (lifetime)	25550	days
ATn	Average time for non-carcinogens (EDn x365)	25550	days
SA	Skin surface area available for contact	23000	cm^2

Chemical Concentrations

Compound	DA	Units	Compound	DA	Units
antimony	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
arsenic	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
beryllium	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
uranium-total	1.50E-12	mg/cm^2-day	NA	NA	mg/cm^2-day
benzo(a)pyrene	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
carbazole	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
arodor-1254	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
arodor-1260	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
dieldrin	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day			

References

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Table C.III–80 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Federal Ownership: On–Property RME Resident Farmer (Adult)
Via Dermal Contact while Bathing

	HQ Calculation		
Compound	CDI (mg/kg–day)	RfD (mg/kg–day)	HQ (unitless)
antimony	NA	6.00E–05	NA
arsenic	NA	2.85E–04	NA
beryllium	NA	5.00E–03	NA
uranium–total	4.73E–10	1.50E–04	3.15E–06
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor–1254	NA	NA	NA
aroclor–1260	NA	NA	NA
dieldrin	NA	4.50E–05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		3.15E–06

	ILCR Calculation		
Compound	CDI (mg/kg–day)	CSF $(mg/kg–day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.90E+00	NA
beryllium	NA	4.30E+00	NA
uranium–total	4.73E–10	NA	NA
benzo(a)pyrene	NA	NA	NA
carbazole	NA	2.22E–02	NA
aroclor–1254	NA	1.03E+01	NA
aroclor–1260	NA	1.03E+01	NA
dieldrin	NA	1.78E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

000539

Table C.III–81
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Lime Sludge Pond with Federal Ownership: On–Property RME Resident Farmer (Adult)
Via Inhalation of Gases and Particulates

Intake Equation = Ca X EF X EDn X IR

IR	Inhalation rate of gases (RAGS, 1989)	20 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Ca	Concentration of radionuclides in air	(see table below)

Cs_{137+1d}	NA	pCi/m^3	$Th_{232+10d}$	NA	pCi/m^3
Np_{237+1d}	2.2E–07	pCi/m^3	U_{234}	NA	pCi/m^3
Pu_{238}	NA	pCi/m^3	U_{235+1d}	NA	pCi/m^3
Ra_{226+8d}	NA	pCi/m^3	U_{238+2d}	NA	pCi/m^3
Ra_{228+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Rn_{222+4d}	NA	pCi/m^3	NA	NA	pCi/m^3
Sr_{90+1d}	2.5E–07	pCi/m^3	NA	NA	pCi/m^3
Tc_{99}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{228+7d}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{230}	2.3E–05	pCi/m^3	NA	NA	pCi/m^3

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	1.9E–11	NA
Np_{237+1d}	1.1E–01	2.9E–08	3.2E–09
Pu_{238}	NA	3.9E–08	NA
Ra_{226+8d}	NA	7.0E–09	NA
Ra_{228+1d}	NA	6.9E–10	NA
Rn_{222+4d}	NA	7.7E–12	NA
Sr_{90+1d}	1.2E–01	6.2E–11	7.4E–12
Tc_{99}	NA	8.3E–12	NA
Th_{228+7d}	NA	7.8E–08	NA
Th_{230}	1.1E+01	2.9E–08	3.2E–07
$Th_{232+10d}$	NA	1.1E–07	NA
U_{234}	NA	2.6E–08	NA
U_{235+1d}	NA	2.5E–08	NA
U_{238+2d}	NA	2.4E–08	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		3.3E–07

Table C.III–82
Summary of Intake Quantitation (chemicals) Alternative 3
Lime Sludge Pond with Federal Ownership: On–Property RME Resident Farmer (Adult)
Via Ingestion of Meat Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of meat	0.101 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x365)	25550 days
CS	Concentration of chemicals in meat	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium–total	6.0E–08	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
arodor–1254	NA	mg/kg	NA	NA	mg/kg
arodor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

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Table C.III-82 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Federal Ownership: On-Property RME Resident Farmer (Adult)
Via Ingestion of Meat Products

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	6.2E-11	3.0E-03	2.1E-08
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		2.1E-08

Compound	ILCR Calculation CDI (mg/kg-day)	CSF $(mg/kg\text{-}day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	6.2E-11	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

Table C.III–83
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Lime Sludge Pond with Federal Ownership: On–Property RME Resident Farmer (Adult)
Via Ingestion of Meat Products

Intake Equation = Cf X EF X EDn X FI X IR

IR	Ingestion rate of meat	0.101 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cf	Concentration of radionuclides in meat	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	2.8E–04	pCi/kg	U_{234}	4.1E–02	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	1.7E–02	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	2.0E–05	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	2.1E–01	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	1.7E–03	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	5.2E–01	2.2E–10	1.1E–10
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	3.9E+02	3.6E–11	1.4E–08
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	3.2E+00	1.3E–11	4.1E–11
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	7.6E+01	1.6E–11	1.2E–09
U_{235+1d}	3.1E+01	1.6E–11	4.9E–10
U_{238+2d}	3.7E–02	2.0E–11	7.4E–13
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		1.6E–08

Table C.III-84
Summary of Intake Quantitation (chemicals) Alternative 3
Lime Sludge Pond with Federal Ownership: On-Property RME Resident Farmer (Adult)
Via Ingestion of Dairy Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of dairy products	0.4 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x365)	25550 days
CS	Concentration of chemicals in animal products	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium-total	2.2E-07	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
arodor-1254	NA	mg/kg	NA	NA	mg/kg
arodor-1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

Table C.III-84 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Federal Ownership: On-Property RME Resident Farmer (Adult)
Via Ingestion of Dairy Products

Compound	HQ Calculation: CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	8.9E-10	3.0E-03	3.0E-07
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		3.0E-07

Compound	ILCR Calculation: CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	8.9E-10	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

000545

6646

Table C.III–85
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Lime Sludge Pond with Federal Ownership: On–Property RME Resident Farmer (Adult)
Via Ingestion of Dairy Products

Intake Equation = Cp X EF X EDn X FI X IR

IR	Ingestion rate of dairy products	0.4 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cp	Concentration of radionuclides in animal products	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	2.6E–05	pCi/kg	U_{234}	1.2E–01	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	5.0E–02	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	7.2E–05	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	1.1E+00	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	1.4E–03	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	1.9E–01	2.2E–10	4.1E–11
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	7.7E+03	3.6E–11	2.8E–07
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	1.0E+01	1.3E–11	1.4E–10
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	9.0E+02	1.6E–11	1.4E–08
U_{235+1d}	3.7E+02	1.6E–11	5.9E–09
U_{238+2d}	5.3E–01	2.0E–11	1.1E–11
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 3.0E–07

Table C.III–86
Summary of Intake and Risk Quantitation (chemicals) Alternative 3
Lime Sludge Pond with Federal Ownership: On–Property RME Resident Farmer (Adult)
Via Ingestion of Vegetables and Fruits

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of fruits or vegetables	0.122	kg/day
FI	Fraction ingested from contaminated source	1	(Unitless)
EF	Exposure frequency	350	days/year
EDn	Exposure duration for non–carcinogens	70	Year
EDc	Exposure duration for carcinogens	70	Year
BW	Body weight	70	kg
ATc	Average time for carcinogens (lifetime)	25550	days
ATn	Average time for non–carcinogens (EDn x365)	25550	days
CS	Concentration of chemicals in vegetables		

Chemical Concentrations

Compound	Concentration	Units
antimony	NA	mg/kg
arsenic	NA	mg/kg
beryllium	NA	mg/kg
uranium–total	2.9E–05	mg/kg
benzo(a)pyrene	NA	mg/kg
carbazole	NA	mg/kg
arodor–1254	NA	mg/kg
arodor–1260	NA	mg/kg
dieldrin	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg

Compound	Concentration	Units
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg

References

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Table C.III-86 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Federal Ownership: On-Property RME Resident Farmer (Adult)
Via Ingestion of Vegetables and Fruits

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	4.9E-08	3.0E-03	1.6E-05
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		1.6E-05

Compound	ILCR Calculation CDI (mg/kg-day)	CSF $(mg/kg\text{-}day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	4.9E-08	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

Table C.III-87
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Lime Sludge Pond with Federal Ownership: On-Property RME Resident Farmer (Adult)
Via Ingestion of Vegetables and Fruits

Intake Equation = Cv X EF X EDn X FI X IR

IR	Ingestion rate of fruits or vegetables	0.122 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cv	Concentration of radionuclides in vegetables	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	5.1E-02	pCi/kg	U_{234}	1.9E+00	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	7.7E-01	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	9.8E-03	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	1.4E+01	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	4.7E-01	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E-11	NA
Np_{237+1d}	1.5E+02	2.2E-10	3.4E-08
Pu_{238}	NA	2.2E-10	NA
Ra_{226+8d}	NA	7.8E-10	NA
Ra_{228+1d}	NA	1.0E-10	NA
Rn_{222+4d}	NA	1.7E-12	NA
Sr_{90+1d}	4.2E+04	3.6E-11	1.5E-06
Tc_{99}	NA	1.3E-12	NA
Th_{228+7d}	NA	5.5E-11	NA
Th_{230}	1.4E+03	1.3E-11	1.8E-08
$Th_{232+10d}$	NA	1.7E-10	NA
U_{234}	5.6E+03	1.6E-11	9.0E-08
U_{235+1d}	2.3E+03	1.6E-11	3.7E-08
U_{238+2d}	2.9E+01	2.0E-11	5.9E-10
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
ILCR Summation	=		1.7E-06

000549

Table C.III-88
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Lime Sludge Pond with Federal Ownership: On-Property RME Resident Farmer (Adult)
Via External Radiation

Dose Equivalency Equat: = $[DR \times EF \times EDn \times ET_i \times (1-SH_i)] + [DR \times EF \times EDn \times ET_o \times (1-SH_o)]$

EF	Fraction of year spent exposured	0.96 (unitless)
ED	Exposure duration	70 Year
ET_i	Fraction of day spent indoors	0.76 (unitless)
ET_o	Fraction of day spent outdoors	0.24 (unitless)
SH_i	Shield factor indoors	0.5 (unitless)
SH_o	Shield factor outdoors	NA (unitless)
DR	Radionuclide specific dose concentrations	(see table below)

Cs_{137+1d}	NA	pCi/g	$Th_{232+10d}$	NA	pCi/g
Np_{237+1d}	5.10E-03	pCi/g	U_{234}	2.20E-01	pCi/g
Pu_{238}	NA	pCi/g	U_{235+1d}	9.00E-02	pCi/g
Ra_{226+8d}	NA	pCi/g	U_{238+2d}	NA	pCi/g
Ra_{228+1d}	NA	pCi/g	NA	NA	pCi/g
Rn_{222+4d}	NA	pCi/g	NA	NA	pCi/g
Sr_{90+1d}	5.60E-03	pCi/g	NA	NA	pCi/g
Tc_{99}	NA	pCi/g	NA	NA	pCi/g
Th_{228+7d}	NA	pCi/g	NA	NA	pCi/g
Th_{230}	5.20E-01	pCi/g	NA	NA	pCi/g

Radionuclides	CDI (year pCi/g)	CSF $(g/pCi-year)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.0E-06	NA
Np_{237+1d}	2.1E-01	4.3E-07	9.1E-08
Pu_{238}	NA	2.8E-11	NA
Ra_{226+8d}	NA	6.0E-06	NA
Ra_{228+1d}	NA	2.9E-06	NA
Rn_{222+4d}	NA	5.9E-06	NA
Sr_{90+1d}	2.3E-01	NA	NA
Tc_{99}	NA	6.0E-13	NA
Th_{228+7d}	NA	5.6E-06	NA
Th_{230}	2.2E+01	5.4E-11	1.2E-09
$Th_{232+10d}$	NA	8.5E-06	NA
U_{234}	9.2E+00	3.0E-11	2.7E-10
U_{235+1d}	3.7E+00	2.4E-07	9.0E-07
U_{238+2d}	NA	5.1E-08	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation	=	9.9E-07

000550

Table C.III-89
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Lime Sludge Pond with Private Ownership: On-Property Farmer (Child)
Via Incidental Ingestion of Soil

Intake Equation = CS X EF X EDn X FI X IR

IRs	Ingestion rate of soil (RAGS, 1989)	200 mg/day
EF	Exposure frequency	350 days/year
EDn	Exposure Duration	6 Year
FI	Fractional Intake	1 (unitless)
CS	Concentration of radionuclides in soil	

Cs_{137+1d}	0.00E+00	pCi/mg	$Th_{232+10d}$	0.00E+00	pCi/mg
Np_{237+1d}	5.10E-06	pCi/mg	U_{234}	2.20E-04	pCi/mg
Pu_{238}	0.00E+00	pCi/mg	U_{235+1d}	9.00E-05	pCi/mg
Ra_{226+8d}	0.00E+00	pCi/mg	U_{238+2d}	0.00E+00	pCi/mg
Ra_{228+1d}	0.00E+00	pCi/mg	0	0.00E+00	pCi/mg
Rn_{222+4d}	0.00E+00	pCi/mg	0	0.00E+00	pCi/mg
Sr_{90+1d}	5.60E-06	pCi/mg	0	0.00E+00	pCi/mg
Tc_{99}	0.00E+00	pCi/mg	0	0.00E+00	pCi/mg
Th_{228+7d}	0.00E+00	pCi/mg	0	0.00E+00	pCi/mg
Th_{230}	5.20E-04	pCi/mg	0	0.00E+00	pCi/mg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.80E-11	NA
Np_{237+1d}	2.14E+00	2.20E-10	4.71E-10
Pu_{238}	NA	2.20E-10	NA
Ra_{226+8d}	NA	7.80E-10	NA
Ra_{228+1d}	NA	1.00E-10	NA
Rn_{222+4d}	NA	1.70E-12	NA
Sr_{90+1d}	2.35E+00	3.60E-11	8.47E-11
Tc_{99}	NA	1.30E-12	NA
Th_{228+7d}	NA	5.50E-11	NA
Th_{230}	2.18E+02	1.30E-11	2.84E-09
$Th_{232+10d}$	NA	1.70E-10	NA
U_{234}	9.24E+01	1.60E-11	1.48E-09
U_{235+1d}	3.78E+01	1.60E-11	6.05E-10
U_{238+2d}	NA	2.00E-11	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA

ILCR Summation = 5.48E-09

000551

Table C.III-90
Summary of Intake Quantitation (chemicals) Alternative 3
Lime Sludge Pond with Private Ownership: On-Property Farmer (Child)
Via Drinking Water Ingestion

Intake Equation = $\frac{CS \times EF \times ED \times IR}{BW \times AT}$

IR	Ingestion rate of groundwater (RAGS, 1989)	1 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x365)	2190 days
CS	Concentration of chemicals in groundwater	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	0.00E+00	mg/l	0	0.00E+00	mg/l
arsenic	0.00E+00	mg/l	0	0.00E+00	mg/l
beryllium	0.00E+00	mg/l	0	0.00E+00	mg/l
uranium-total	6.00E-06	mg/l	0	0.00E+00	mg/l
benzo(a)pyrene	0.00E+00	mg/l	0	0.00E+00	mg/l
carbazole	0.00E+00	mg/l	0	0.00E+00	mg/l
arodor-1254	0.00E+00	mg/l	0	0.00E+00	mg/l
arodor-1260	0.00E+00	mg/l	0	0.00E+00	mg/l
dieldrin	0.00E+00	mg/l	0	0.00E+00	mg/l
0	0.00E+00	mg/l	0	0.00E+00	mg/l
0	0.00E+00	mg/l	0	0.00E+00	mg/l
0	0.00E+00	mg/l	0	0.00E+00	mg/l
0	0.00E+00	mg/l	0	0.00E+00	mg/l
0	0.00E+00	mg/l	0	0.00E+00	mg/l
0	0.00E+00	mg/l	0	0.00E+00	mg/l
0	0.00E+00	mg/l			

References

Table C.III–90 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Private Ownership: On–Property Farmer (Child)
Via Drinking Water Ingestion

	HQ Calculation		
Compound	CDI (mg/kg–day)	RfD (mg/kg–day)	HQ (unitless)
antimony	NA	4.00E–04	NA
arsenic	NA	3.00E–04	NA
beryllium	NA	5.00E–03	NA
uranium–total	3.84E–07	3.00E–03	1.28E–04
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor–1254	NA	NA	NA
aroclor–1260	NA	NA	NA
dieldrin	NA	5.00E–05	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
HQ Summation =			1.28E–04

	ILCR Calculation		
Compound	CDI (mg/kg–day)	CSF $(mg/kg–day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.75E+00	NA
beryllium	NA	4.30E+00	NA
uranium–total	3.29E–08	NA	NA
benzo(a)pyrene	NA	7.30E+00	NA
carbazole	NA	2.00E–02	NA
aroclor–1254	NA	7.70E+00	NA
aroclor–1260	NA	7.70E+00	NA
dieldrin	NA	1.60E+01	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
ILCR Summation =			0.00E+00

000553

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Table C.III-91
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Lime Sludge Pond with Private Ownership: On-Property Farmer (Child)
Via Ingestion of Drinking Water

Intake Equation = Cw X EF X EDn X FI X IR

IR	Ingestion rate of groundwater (RAGS, 1989)	1 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
FI	Fractional intake for radionuclides	1 (Unitless)
Cw	Concentration of radionuclides in groundwater	(see table below)

Cs_{137+1d}	0.0E+00	pCi/l	$Th_{232+10d}$	0.0E+00	pCi/l
Np_{237+1d}	0.0E+00	pCi/l	U_{234}	1.9E-03	pCi/l
Pu_{238}	0.0E+00	pCi/l	U_{235+1d}	1.0E-04	pCi/l
Ra_{226+8d}	0.0E+00	pCi/l	U_{238+2d}	2.0E-03	pCi/l
Ra_{228+1d}	0.0E+00	pCi/l	0.0E+00	0.0E+00	pCi/l
Rn_{222+4d}	0.0E+00	pCi/l	0.0E+00	0.0E+00	pCi/l
Sr_{90+1d}	0.0E+00	pCi/l	0.0E+00	0.0E+00	pCi/l
Tc_{99}	0.0E+00	pCi/l	0.0E+00	0.0E+00	pCi/l
Th_{228+7d}	0.0E+00	pCi/l	0.0E+00	0.0E+00	pCi/l
Th_{230}	0.0E+00	pCi/l	0.0E+00	0.0E+00	pCi/l

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E-11	NA
Np_{237+1d}	NA	2.2E-10	NA
Pu_{238}	NA	2.2E-10	NA
Ra_{226+8d}	NA	7.8E-10	NA
Ra_{228+1d}	NA	1.0E-10	NA
Rn_{222+4d}	NA	1.7E-12	NA
Sr_{90+1d}	NA	3.6E-11	NA
Tc_{99}	NA	1.3E-12	NA
Th_{228+7d}	NA	5.5E-11	NA
Th_{230}	NA	1.3E-11	NA
$Th_{232+10d}$	NA	1.7E-10	NA
U_{234}	4.0E+00	1.6E-11	6.4E-11
U_{235+1d}	2.1E-01	1.6E-11	3.4E-12
U_{238+2d}	4.2E+00	2.0E-11	8.4E-11
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
	ILCR Summation	=	1.5E-10

000554

6646

Table C.III-92
Summary of Intake Quantitation (chemicals) Alternative 3
Lime Sludge Pond with Private Ownership: On-Property Farmer (Child)
Via Dermal Contact while Bathing

Intake Equation = $\frac{DA \times EF \times ED \times SA}{BW \times AT}$

DA	Dermal absorbed dose	csv	mg/cm^2-day
EF	Exposure frequency	350	days/year
EDn	Exposure duration for non-carcinogens	6	Year
EDc	Exposure duration for carcinogens	6	Year
BW	Body weight	15	kg
ATc	Average time for carcinogens (lifetime)	25550	days
ATn	Average time for non-carcinogens (EDn x365)	2190	days
SA	Skin surface area available for contact	8000	cm^2

Chemical Concentrations

Compound	DA	Units	Compound	DA	Units
antimony	NA	mg/cm^2-day	0	NA	mg/cm^2-day
arsenic	NA	mg/cm^2-day	0	NA	mg/cm^2-day
beryllium	NA	mg/cm^2-day	0	NA	mg/cm^2-day
uranium-total	1.50E-12	mg/cm^2-day	0	NA	mg/cm^2-day
benzo(a)pyrene	NA	mg/cm^2-day	0	NA	mg/cm^2-day
carbazole	NA	mg/cm^2-day	0	NA	mg/cm^2-day
aroclor-1254	NA	mg/cm^2-day	0	NA	mg/cm^2-day
aroclor-1260	NA	mg/cm^2-day	0	NA	mg/cm^2-day
dieldrin	NA	mg/cm^2-day	0	NA	mg/cm^2-day
0	NA	mg/cm^2-day	0	NA	mg/cm^2-day
0	NA	mg/cm^2-day	0	NA	mg/cm^2-day
0	NA	mg/cm^2-day	0	NA	mg/cm^2-day
0	NA	mg/cm^2-day	0	NA	mg/cm^2-day
0	NA	mg/cm^2-day	0	NA	mg/cm^2-day
0	NA	mg/cm^2-day	0	NA	mg/cm^2-day
0	NA	mg/cm^2-day			

References

000555

Table C.III-92
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Private Ownership: On-Property Farmer (Child)
Via Dermal Contact while Bathing

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	6.00E-05	NA
arsenic	NA	2.85E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	7.67E-10	1.50E-04	5.11E-06
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	4.50E-05	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
	HQ Summation =		5.11E-06

Compound	ILCR Calculation CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.90E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	6.58E-11	NA	NA
benzo(a)pyrene	NA	NA	NA
carbazole	NA	2.22E-02	NA
aroclor-1254	NA	1.03E+01	NA
aroclor-1260	NA	1.03E+01	NA
dieldrin	NA	1.78E+01	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
	ILCR Summation =		0.00E+00

Table C.III–93
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Lime Sludge Pond with Private Ownership: On–Property Farmer (Child)
Via Inhalation of Gases and Particulates

Intake Equation = Ca X EF X EDn X IR

IR	Inhalation rate of gases (RAGS, 1989)	12 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Ca	Concentration of radionuclides in air	(see table below)

Cs_{137+1d}	0.0E+00	pCi/m^3	$Th_{232+10d}$	0.0E+00	pCi/m^3
Np_{237+1d}	2.2E–07	pCi/m^3	U_{234}	0.0E+00	pCi/m^3
Pu_{238}	0.0E+00	pCi/m^3	U_{235+1d}	0.0E+00	pCi/m^3
Ra_{226+8d}	0.0E+00	pCi/m^3	U_{238+2d}	0.0E+00	pCi/m^3
Ra_{228+1d}	0.0E+00	pCi/m^3	0.0E+00	0.0E+00	pCi/m^3
Rn_{222+4d}	0.0E+00	pCi/m^3	0.0E+00	0.0E+00	pCi/m^3
Sr_{90+1d}	2.5E–07	pCi/m^3	0.0E+00	0.0E+00	pCi/m^3
Tc_{99}	0.0E+00	pCi/m^3	0.0E+00	0.0E+00	pCi/m^3
Th_{228+7d}	0.0E+00	pCi/m^3	0.0E+00	0.0E+00	pCi/m^3
Th_{230}	2.3E–05	pCi/m^3	0.0E+00	0.0E+00	pCi/m^3

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	1.9E–11	NA
Np_{237+1d}	5.6E–03	2.9E–08	1.6E–10
Pu_{238}	NA	3.9E–08	NA
Ra_{226+8d}	NA	7.0E–09	NA
Ra_{228+1d}	NA	6.9E–10	NA
Rn_{222+4d}	NA	7.7E–12	NA
Sr_{90+1d}	6.2E–03	6.2E–11	3.8E–13
Tc_{99}	NA	8.3E–12	NA
Th_{228+7d}	NA	7.8E–08	NA
Th_{230}	5.7E–01	2.9E–08	1.7E–08
$Th_{232+10d}$	NA	1.1E–07	NA
U_{234}	NA	2.6E–08	NA
U_{235+1d}	NA	2.5E–08	NA
U_{238+2d}	NA	2.4E–08	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA

ILCR Summation = 1.7E–08

000557

Table C.III-94
Summary of Intake Quantitation (chemicals) Alternative 3
Lime Sludge Pond with Private Ownership: On-Property Farmer (Child)
Via Ingestion of Meat Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of meat	0.039 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x365)	2190 days
CS	Concentration of chemicals in meat	

Chemical Concentrations

Compound	Concentration	Units
antimony	0.0E+00	mg/kg
arsenic	0.0E+00	mg/kg
beryllium	0.0E+00	mg/kg
uranium-total	6.0E-08	mg/kg
benzo(a)pyrene	0.0E+00	mg/kg
carbazole	0.0E+00	mg/kg
arodor-1254	0.0E+00	mg/kg
arodor-1260	0.0E+00	mg/kg
dieldrin	0.0E+00	mg/kg
0	0.0E+00	mg/kg
0	0.0E+00	mg/kg
0	0.0E+00	mg/kg
0	0.0E+00	mg/kg
0	0.0E+00	mg/kg
0	0.0E+00	mg/kg
0	0.0E+00	mg/kg

Compound	Concentration	Units
...	0.0E+00	mg/kg
...	0.0E+00	mg/kg
...	0.0E+00	mg/kg
...	0.0E+00	mg/kg
...	0.0E+00	mg/kg
...	0.0E+00	mg/kg
...	0.0E+00	mg/kg
...	0.0E+00	mg/kg
...	0.0E+00	mg/kg
...	0.0E+00	mg/kg
...	0.0E+00	mg/kg
...	0.0E+00	mg/kg
...	0.0E+00	mg/kg
...	0.0E+00	mg/kg
...	0.0E+00	mg/kg

References

Table C.III-94 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Private Ownership: On-Property Farmer (Child)
Via Ingestion of Meat Products

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	1.1E-10	3.0E-03	3.7E-08
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
	HQ Summation =		3.7E-08

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	9.6E-12	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
	ILCR Summation =		0.0E+00

000559

6646

Table C.III–95
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Lime Sludge Pond with Private Ownership: On–Property Farmer (Child)
Via Ingestion of Meat Products

Intake Equation = Cf X EF X EDn X FI X IR

IR	Ingestion rate of meat	0.039 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cf	Concentration of radionuclides in meat	

Cs_{137+1d}	0.0E+00	pCi/kg	$Th_{232+10d}$	0.0E+00	pCi/kg
Np_{237+1d}	2.8E–04	pCi/kg	U_{234}	4.1E–02	pCi/kg
Pu_{238}	0.0E+00	pCi/kg	U_{235+1d}	1.7E–02	pCi/kg
Ra_{226+8d}	0.0E+00	pCi/kg	U_{238+2d}	2.0E–05	pCi/kg
Ra_{228+1d}	0.0E+00	pCi/kg	0.0E+00	0.0E+00	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	0.0E+00	0.0E+00	pCi/kg
Sr_{90+1d}	2.1E–01	pCi/kg	0.0E+00	0.0E+00	pCi/kg
Tc_{99}	0.0E+00	pCi/kg	0.0E+00	0.0E+00	pCi/kg
Th_{228+7d}	0.0E+00	pCi/kg	0.0E+00	0.0E+00	pCi/kg
Th_{230}	1.7E–03	pCi/kg	0.0E+00	0.0E+00	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	1.7E–02	2.2E–10	3.8E–12
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	1.3E+01	3.6E–11	4.7E–10
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	1.0E–01	1.3E–11	1.4E–12
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	2.5E+00	1.6E–11	4.0E–11
U_{235+1d}	1.0E+00	1.6E–11	1.6E–11
U_{238+2d}	1.2E–03	2.0E–11	2.5E–14
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
	ILCR Summation	=	5.3E–10

000560

Table C.III–96
Summary of Intake Quantitation (chemicals) Alternative 3
Lime Sludge Pond with Private Ownership: On–Property Farmer (Child)
Via Ingestion of Dairy Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of dairy products	0.9 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x365)	2190 days
CS	Concentration of chemicals in animal products	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	0.0E+00	mg/kg	•••	0.0E+00	mg/kg
arsenic	0.0E+00	mg/kg	•••	0.0E+00	mg/kg
beryllium	0.0E+00	mg/kg	•••	0.0E+00	mg/kg
uranium–total	2.2E–07	mg/kg	•••	0.0E+00	mg/kg
benzo(a)pyrene	0.0E+00	mg/kg	•••	0.0E+00	mg/kg
carbazole	0.0E+00	mg/kg	•••	0.0E+00	mg/kg
arodor–1254	0.0E+00	mg/kg	•••	0.0E+00	mg/kg
arodor–1260	0.0E+00	mg/kg	•••	0.0E+00	mg/kg
dieldrin	0.0E+00	mg/kg	•••	0.0E+00	mg/kg
••••••••	0.0E+00	mg/kg	•••	0.0E+00	mg/kg
••••••••	0.0E+00	mg/kg	•••	0.0E+00	mg/kg
••••••••	0.0E+00	mg/kg	•••	0.0E+00	mg/kg
••••••••	0.0E+00	mg/kg	•••	0.0E+00	mg/kg
••••••••	0.0E+00	mg/kg	•••	0.0E+00	mg/kg
••••••••	0.0E+00	mg/kg	•••	0.0E+00	mg/kg
••••••••	0.0E+00	mg/kg			

References

Table C.III-96 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Private Ownership: On-Property Farmer (Child)
Via Ingestion of Dairy Products

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	9.3E-09	3.0E-03	3.1E-06
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
	HQ Summation =		3.1E-06

Compound	ILCR Calculation CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	8.0E-10	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
	ILCR Summation =		0.0E+00

000562

Table C.III–97
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Lime Sludge Pond with Private Ownership: On–Property Farmer (Child)
Via Ingestion of Dairy Products

Intake Equation = Cp X EF X EDn X FI X IR

IR	Ingestion rate of dairy products	0.9 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cp	Concentration of radionuclides in animal products	

Cs_{137+1d}	0.0E+00	pCi/kg	$Th_{232+10d}$	0.0E+00	pCi/kg
Np_{237+1d}	2.6E–05	pCi/kg	U_{234}	1.2E–01	pCi/kg
Pu_{238}	0.0E+00	pCi/kg	U_{235+1d}	5.0E–02	pCi/kg
Ra_{226+8d}	0.0E+00	pCi/kg	U_{238+2d}	7.2E–05	pCi/kg
Ra_{228+1d}	0.0E+00	pCi/kg	0.0E+00	0.0E+00	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	0.0E+00	0.0E+00	pCi/kg
Sr_{90+1d}	1.1E+00	pCi/kg	0.0E+00	0.0E+00	pCi/kg
Tc_{99}	0.0E+00	pCi/kg	0.0E+00	0.0E+00	pCi/kg
Th_{228+7d}	0.0E+00	pCi/kg	0.0E+00	0.0E+00	pCi/kg
Th_{230}	1.4E–03	pCi/kg	0.0E+00	0.0E+00	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	3.6E–02	2.2E–10	8.0E–12
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	1.5E+03	3.6E–11	5.4E–08
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	2.0E+00	1.3E–11	2.6E–11
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	1.7E+02	1.6E–11	2.8E–09
U_{235+1d}	7.1E+01	1.6E–11	1.1E–09
U_{238+2d}	1.0E–01	2.0E–11	2.0E–12
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA

ILCR Summation = 5.8E–08

000563

Table C.III-98
Summary of Intake and Risk Quantitation (chemicals) Alternative 3
Lime Sludge Pond with Private Ownership: On-Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of fruits or vegetables	0.1 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x365)	2190 days
CS	Concentration of chemicals in vegetables	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	0.0E+00	mg/kg	***	0.0E+00	mg/kg
arsenic	0.0E+00	mg/kg	***	0.0E+00	mg/kg
beryllium	0.0E+00	mg/kg	***	0.0E+00	mg/kg
uranium-total	2.9E-05	mg/kg	***	0.0E+00	mg/kg
benzo(a)pyrene	0.0E+00	mg/kg	***	0.0E+00	mg/kg
carbazole	0.0E+00	mg/kg	***	0.0E+00	mg/kg
aroclor-1254	0.0E+00	mg/kg	***	0.0E+00	mg/kg
aroclor-1260	0.0E+00	mg/kg	***	0.0E+00	mg/kg
dieldrin	0.0E+00	mg/kg	***	0.0E+00	mg/kg
********	0.0E+00	mg/kg	***	0.0E+00	mg/kg
********	0.0E+00	mg/kg	***	0.0E+00	mg/kg
********	0.0E+00	mg/kg	***	0.0E+00	mg/kg
********	0.0E+00	mg/kg	***	0.0E+00	mg/kg
********	0.0E+00	mg/kg	***	0.0E+00	mg/kg
********	0.0E+00	mg/kg	***	0.0E+00	mg/kg
********	0.0E+00	mg/kg	***	0.0E+00	mg/kg

References

000564

Table C.III–98 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Private Ownership: On–Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

Compound	HQ Calculation CDI (mg/kg–day)	RfD (mg/kg–day)	HQ (unitless)
antimony	NA	4.0E–04	NA
arsenic	NA	3.0E–04	NA
beryllium	NA	5.0E–03	NA
uranium–total	1.9E–07	3.0E–03	6.3E–05
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor–1254	NA	NA	NA
aroclor–1260	NA	NA	NA
dieldrin	NA	5.0E–05	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
HQ Summation =			6.3E–05

Compound	ILCR Calculation CDI (mg/kg–day)	CSF $(mg/kg–day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium–total	1.6E–08	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E–02	NA
aroclor–1254	NA	7.7E+00	NA
aroclor–1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
ILCR Summation =			0.0E+00

6646

Table C.III–99
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Lime Sludge Pond with Private Ownership: On–Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

Intake Equation = Cv X EF X EDn X FI X IR

IR	Ingestion rate of fruits or vegetables	0.1 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cv	Concentration of radionuclides in vegetables	

Cs_{137+1d}	0.0E+00	pCi/kg	$Th_{232+10d}$	0.0E+00	pCi/kg
Np_{237+1d}	5.1E–02	pCi/kg	U_{234}	1.9E+00	pCi/kg
Pu_{238}	0.0E+00	pCi/kg	U_{235+1d}	7.7E–01	pCi/kg
Ra_{226+8d}	0.0E+00	pCi/kg	U_{238+2d}	9.8E–03	pCi/kg
Ra_{228+1d}	0.0E+00	pCi/kg	0.0E+00	0.0E+00	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	0.0E+00	0.0E+00	pCi/kg
Sr_{90+1d}	1.4E+01	pCi/kg	0.0E+00	0.0E+00	pCi/kg
Tc_{99}	0.0E+00	pCi/kg	0.0E+00	0.0E+00	pCi/kg
Th_{228+7d}	0.0E+00	pCi/kg	0.0E+00	0.0E+00	pCi/kg
Th_{230}	4.7E–01	pCi/kg	0.0E+00	0.0E+00	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	1.1E+01	2.2E–10	2.4E–09
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	2.9E+03	3.6E–11	1.1E–07
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	9.9E+01	1.3E–11	1.3E–09
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	3.9E+02	1.6E–11	6.3E–09
U_{235+1d}	1.6E+02	1.6E–11	2.6E–09
U_{238+2d}	2.1E+00	2.0E–11	4.1E–11
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA

ILCR Summation = 1.2E–07

Table C.III-100
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Lime Sludge Pond with Private Ownership: On-Property Farmer (Child)
Via External Radiation

Dose Equivalency Equat: = $[DR \times EF \times EDn \times ET_i \times (1-SH_i)] + [DR \times EF \times EDn \times ET_o \times (1-SH_o)]$

EF	Fraction of year spent exposured	0.96 (unitless)
ED	Exposure duration	6 Year
ET_i	Fraction of day spent indoors	0.92 (unitless)
ET_o	Fraction of day spent outdoors	0.08 (unitless)
SH_i	Shield factor indoors	0.5 (unitless)
SH_o	Shield factor outdoors	0 (unitless)
DR	Radionuclide specific dose concentrations	(see table below)

Cs_{137+1d}	NA	pCi/g	$Th_{232+10d}$	NA	pCi/g
Np_{237+1d}	5.10E-03	pCi/g	U_{234}	2.20E-01	pCi/g
Pu_{238}	NA	pCi/g	U_{235+1d}	9.00E-02	pCi/g
Ra_{226+8d}	NA	pCi/g	U_{238+2d}	NA	pCi/g
Ra_{228+1d}	NA	pCi/g	0	NA	pCi/g
Rn_{222+4d}	NA	pCi/g	0	NA	pCi/g
Sr_{90+1d}	5.60E-03	pCi/g	0	NA	pCi/g
Tc_{99}	NA	pCi/g	0	NA	pCi/g
Th_{228+7d}	NA	pCi/g	0	NA	pCi/g
Th_{230}	5.20E-01	pCi/g	0	NA	pCi/g

Radionuclides	CDI (year pCi/g)	CSF $(g/pCi-year)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.0E-06	NA
Np_{237+1d}	1.6E-02	4.3E-07	6.8E-09
Pu_{238}	NA	2.8E-11	NA
Ra_{226+8d}	NA	6.0E-06	NA
Ra_{228+1d}	NA	2.9E-06	NA
Rn_{222+4d}	NA	5.9E-06	NA
Sr_{90+1d}	1.7E-02	NA	0.0E+00
Tc_{99}	NA	6.0E-13	NA
Th_{228+7d}	NA	5.6E-06	NA
Th_{230}	1.6E+00	5.4E-11	8.7E-11
$Th_{232+10d}$	NA	8.5E-06	NA
U_{234}	6.8E-01	3.0E-11	2.1E-11
U_{235+1d}	2.8E-01	2.4E-07	6.7E-08
U_{238+2d}	NA	5.1E-08	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA

ILCR Summation = 7.4E-08

000567

Table C.III-101
Summary of Intake Quantitation (chemicals) Alternative 6
Lime Sludge Pond with Federal Ownership: Expanded Trespasser
Via Incidental Ingestion of Soil/Sediment

Intake Equation

$$= \frac{CS \times EFa \times EDa \times CF \times IRa}{BWa \times ATa} + \frac{CS \times EFc \times EDc \times CF \times IRc}{BWc \times ATc}$$

IRa	Ingestion rate of soil (adult)	12.5 mg/day
IRc	Ingestion rate of soil (child)	12.5 mg/day
CF	Conversion factor	1.00E-06 kg/mg
EFa	Exposure frequency (adult)	40 days/year
EFc	Exposure frequency (child)	110 days/year
EDa	Exposure duration (adult)	32 Year
EDc	Exposure duration (child)	12 Year
BWa	Body weight (adult)	70 kg
BWc	Body weight (child)	43 kg
AT	Average time for carcinogens	25550 days
ATa	Average time for non-carcinogens (adult)	11680 days
ATc	Average time for non-carcinogens (child)	4380 days
CS	Concentration of chemicals in soil	(see table below)

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium-total	1.1E+01	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
arodor-1254	NA	mg/kg	NA	NA	mg/kg
arodor-1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

6646

Table C.III-101 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Federal Ownership: Expanded Trespasser
Via Incidental Ingestion of Soil/Sediment

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	1.2E-06	3.0E-03	3.9E-04
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		3.9E-04

Compound	ILCR Calculation CDI (mg/kg-day)	CSF $(mg/kg\text{-}day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	2.6E-07	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

000563

Table C.III-102
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Lime Sludge Pond with Federal Ownership: Expanded Trespasser
Via Incidental Ingestion of Soil/Sediment

Intake Equation = CS X EFa X EDa X FI X IRa + CS X EFc X EDc X FI X IRc

IRa	Ingestion rate of soil (adult)	12.5 mg/day
IRc	Ingestion rate of soil (child)	12.5 mg/day
EFa	Exposure frequency (adult)	40 days/year
EFc	Exposure frequency (child)	110 days/year
EDa	Exposure Duration	32 Year
EDc	Exposure Duration	12 Year
FI	Fractional Intake	1 (unitless)
CS	Concentration of radionuclides in soil	(see table below)

Cs_{137+1d}	NA	pCi/mg	$Th_{232+10d}$	NA	pCi/mg
Np_{237+1d}	1.3E-04	pCi/mg	U_{234}	NA	pCi/mg
Pu_{238}	NA	pCi/mg	U_{235+1d}	NA	pCi/mg
Ra_{226+8d}	NA	pCi/mg	U_{238+2d}	NA	pCi/mg
Ra_{228+1d}	NA	pCi/mg	NA	NA	pCi/mg
Rn_{222+4d}	NA	pCi/mg	NA	NA	pCi/mg
Sr_{90+1d}	5.4E-04	pCi/mg	NA	NA	pCi/mg
Tc_{99}	NA	pCi/mg	NA	NA	pCi/mg
Th_{228+7d}	NA	pCi/mg	NA	NA	pCi/mg
Th_{230}	5.2E-04	pCi/mg	NA	NA	pCi/mg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E-11	NA
Np_{237+1d}	4.2E+00	2.2E-10	9.3E-10
Pu_{238}	NA	2.2E-10	NA
Ra_{226+8d}	NA	7.8E-10	NA
Ra_{228+1d}	NA	1.0E-10	NA
Rn_{222+4d}	NA	1.7E-12	NA
Sr_{90+1d}	1.8E+01	3.6E-11	6.3E-10
Tc_{99}	NA	1.3E-12	NA
Th_{228+7d}	NA	5.5E-11	NA
Th_{230}	1.7E+01	1.3E-11	2.2E-10
$Th_{232+10d}$	NA	1.7E-10	NA
U_{234}	NA	1.6E-11	NA
U_{235+1d}	NA	1.6E-11	NA
U_{238+2d}	NA	2.0E-11	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 1.8E-09

000170

Table C.III–103
Summary of Intake Quantitation (chemicals) Alternative 6
Lime Sludge Pond with Federal Ownership: Expanded Trespasser
Via Dermal Contact with Soil/Sediment

Intake Equation = $\frac{CS \times EFa \times EDa \times CF \times ABS \times AF \times SAa}{BWa \times ATa}$ + $\frac{CS \times EFc \times EDc \times CF \times ABS \times AF \times SAc}{BWc \times ATc}$

SA	Surface area of exposed skin (adult)	5750 cm^2/day
SA	Surface area of exposed skin (child)	4200 cm^2/day
AF	Soil to skin adherence factor	1 mg/cm^2
ABS	chemicals specific absorbtion factor (see table below)	csv
CF	Conversion factor	1E–06 kg/mg
EFa	Exposure frequency (adult)	40 days/year
EFc	Exposure frequency (child)	110 days/year
EDa	Exposure duration (adult)	32 Year
EDc	Exposure duration (child)	12 Year
BWa	Body weight (adult)	70 kg
BWc	Body weight (child)	43 kg
AT	Average time for carcinogens	25550 days
ATa	Average time for non–carcinogens (adult)	11680 days
ATc	Average time for non–carcinogens (child)	4380 days
CS	Concentration of chemicals in soil	(see table below)

Chemical Concentrations

Compound	ABS	Concentrati	Units	Compound	ABS	Concentrati	Units
antimony	1.0E–02	NA	mg/kg	NA	NA	NA	mg/kg
arsenic	1.0E–03	NA	mg/kg	NA	NA	NA	mg/kg
beryllium	1.0E–02	NA	mg/kg	NA	NA	NA	mg/kg
uranium–total	1.0E–02	1.1E+01	mg/kg	NA	NA	NA	mg/kg
benzo(a)pyrene	3.0E–01	NA	mg/kg	NA	NA	NA	mg/kg
carbazole	3.0E–01	NA	mg/kg	NA	NA	NA	mg/kg
arodor–1254	6.0E–02	NA	mg/kg	NA	NA	NA	mg/kg
arodor–1260	6.0E–02	NA	mg/kg	NA	NA	NA	mg/kg
dieldrin	3.0E–01	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg				

References

Table C.III−103 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Federal Ownership: Expanded Trespasser
Via Dermal Contact with Soil/Sediment

Compound	HQ Calculation CDI (mg/kg−day)	RfD (mg/kg−day)	HQ (unitless)
antimony	NA	6.0E−05	NA
arsenic	NA	2.9E−04	NA
beryllium	NA	5.0E−03	NA
uranium−total	4.2E−06	1.5E−04	2.8E−02
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor−1254	NA	NA	NA
aroclor−1260	NA	NA	NA
dieldrin	NA	4.5E−05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		2.8E−02

Compound	ILCR Calculation CDI (mg/kg−day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.9E+00	NA
beryllium	NA	4.3E+00	NA
uranium−total	1.0E−06	NA	NA
benzo(a)pyrene	NA	NA	NA
carbazole	NA	2.2E−02	NA
aroclor−1254	NA	1.0E+01	NA
aroclor−1260	NA	1.0E+01	NA
dieldrin	NA	1.8E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

Table C.III–104
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Lime Sludge Pond with Federal Ownership: Expanded Trespasser
Via Inhalation of Gases and Particulates

Intake Equation = CA X EFa X EDa X IR X ETa + CA X EFc EDc X IR X ETc

IR	Inhalation rate of gases	0.83 m^3/hour
EFa	Exposure frequency (adult)	40 days/year
EFc	Exposure frequency (child)	110 days/year
EDa	Exposure duration	32 Year
EDc	Exposure duration	12 Year
ETa	Exposure time (adult)	1 hour/day
ETc	Exposure time (child)	2 hour/day
CA	Concentration of radionuclides in air	(see table below)

Cs_{137+1d}	NA	pCi/m^3	$Th_{232+10d}$	NA	pCi/m^3
Np_{237+1d}	4.3E–07	pCi/m^3	U_{234}	NA	pCi/m^3
Pu_{238}	NA	pCi/m^3	U_{235+1d}	NA	pCi/m^3
Ra_{226+8d}	NA	pCi/m^3	U_{238+2d}	NA	pCi/m^3
Ra_{228+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Rn_{222+4d}	NA	pCi/m^3	NA	NA	pCi/m^3
Sr_{90+1d}	1.8E–06	pCi/m^3	NA	NA	pCi/m^3
Tc_{99}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{228+7d}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{230}	1.7E–06	pCi/m^3	NA	NA	pCi/m^3

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	1.9E–11	NA
Np_{237+1d}	1.4E–03	2.9E–08	4.1E–11
Pu_{238}	NA	3.9E–08	NA
Ra_{226+8d}	NA	7.0E–09	NA
Ra_{228+1d}	NA	6.9E–10	NA
Rn_{222+4d}	NA	7.7E–12	NA
Sr_{90+1d}	5.9E–03	6.2E–11	3.6E–13
Tc_{99}	NA	8.3E–12	NA
Th_{228+7d}	NA	7.8E–08	NA
Th_{230}	5.6E–03	2.9E–08	1.6E–10
$Th_{232+10d}$	NA	1.1E–07	NA
U_{234}	NA	2.6E–08	NA
U_{235+1d}	NA	2.5E–08	NA
U_{238+2d}	NA	2.4E–08	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
		ILCR Summation =	2.0E–10

000773

Table C.III–105
Summary of Risk Quantitation (radionuclides) Alternative 6
Lime Sludge Pond with Federal Ownership: Expanded Trespasser
Via External Radiation

Exposure Equation = $[CR \times EFa \times EDa \times ET_{oo} \times (1-SH_o)] + [CR \times EFc \times EDc \times ET_{oc} \times (1-SH_o)]$

EFa	Fraction of year spent exposured (adult)	0.11 (unitless)
EFc	Fraction of year spent exposured (child)	0.3 (unitless)
EDa	Exposure duration (adult)	32 Year
EDc	Exposure duration (child)	12 Year
ET_{oo}	Fraction of day spent outdoors (adult)	0.04 (unitless)
ET_{oc}	Fraction of day spent outdoors (child)	0.08 (unitless)
SH_o	Shield factor outdoors	NA (unitless)
CR	Radionuclide specific concentrations	(see table below)

Cs_{137+1d}	NA	pCi/g	$Th_{232+10d}$	NA	pCi/g
Np_{237+1d}	1.3E−01	pCi/g	U_{234}	NA	pCi/g
Pu_{238}	NA	pCi/g	U_{235+1d}	NA	pCi/g
Ra_{226+8d}	NA	pCi/g	U_{238+2d}	NA	pCi/g
Ra_{228+1d}	NA	pCi/g	NA	NA	pCi/g
Rn_{222+4d}	NA	pCi/g	NA	NA	pCi/g
Sr_{90+1d}	5.4E−01	pCi/g	NA	NA	pCi/g
Tc_{99}	NA	pCi/g	NA	NA	pCi/g
Th_{228+7d}	NA	pCi/g	NA	NA	pCi/g
Th_{230}	5.2E−01	pCi/g	NA	NA	pCi/g

Radionuclides	CDI (year pCi/g)	CSF $(g/pCi-year)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.0E−06	NA
Np_{237+1d}	5.6E−02	4.3E−07	2.4E−08
Pu_{238}	NA	2.8E−11	NA
Ra_{226+8d}	NA	6.0E−06	NA
Ra_{228+1d}	NA	2.9E−06	NA
Rn_{222+4d}	NA	5.9E−06	NA
Sr_{90+1d}	2.3E−01	NA	NA
Tc_{99}	NA	6.0E−13	NA
Th_{228+7d}	NA	5.6E−06	NA
Th_{230}	2.2E−01	5.4E−11	1.2E−11
$Th_{232+10d}$	NA	8.5E−06	NA
U_{234}	NA	3.0E−11	NA
U_{235+1d}	NA	2.4E−07	NA
U_{238+2d}	NA	5.1E−08	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation	=	2.4E−08

Table C.III – 106
Summary of Intake Quantitation (chemicals) Alternative 6
Lime Sludge Pond with Federal Ownership: Off–Property Farmer (Adult)
Via Drinking Water Ingestion

Intake Equation = $\frac{CS \times EF \times ED \times IR}{BW \times AT}$

IR	Ingestion rate of groundwater (RAGS, 1989)	2	l/day
EF	Exposure frequency	350	days/year
EDn	Exposure duration for non–carcinogens	70	Year
EDc	Exposure duration for carcinogens	70	Year
BW	Body weight	70	kg
ATc	Average time for carcinogens (lifetime)	25550	days
ATn	Average time for non–carcinogens (EDn x365)	25550	days
CS	Concentration of chemicals in groundwater		

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/l	NA	NA	mg/l
arsenic	NA	mg/l	NA	NA	mg/l
beryllium	NA	mg/l	NA	NA	mg/l
uranium–total	1.23E–04	mg/l	NA	NA	mg/l
benzo(a)pyrene	NA	mg/l	NA	NA	mg/l
carbazole	NA	mg/l	NA	NA	mg/l
arodor–1254	NA	mg/l	NA	NA	mg/l
arodor–1260	NA	mg/l	NA	NA	mg/l
dieldrin	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l			

References

6646

Table C.III-106 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Federal Ownership: Off-Property Farmer (Adult)
Via Drinking Water Ingestion

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.00E-04	NA
arsenic	NA	3.00E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	3.37E-06	3.00E-03	1.12E-03
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.00E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			1.12E-03

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.75E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	3.37E-06	NA	NA
benzo(a)pyrene	NA	7.30E+00	NA
carbazole	NA	2.00E-02	NA
aroclor-1254	NA	7.70E+00	NA
aroclor-1260	NA	7.70E+00	NA
dieldrin	NA	1.60E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

Table C.III–107
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Lime Sludge Pond with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Drinking Water

Intake Equation = Cw X EF X EDn X FI X IR

IR	Ingestion rate of groundwater (RAGS, 1989)	2 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
FI	Fractional intake for radionuclides	1 (Unitless)
Cw	Concentration of radionuclides in groundwater	(see table below)

Cs_{137+1d}	NA	pCi/l	$Th_{232+10d}$	NA	pCi/l
Np_{237+1d}	NA	pCi/l	U_{234}	3.7E–02	pCi/l
Pu_{238}	NA	pCi/l	U_{235+1d}	2.0E–03	pCi/l
Ra_{226+8d}	NA	pCi/l	U_{238+2d}	4.1E–02	pCi/l
Ra_{228+1d}	NA	pCi/l	NA	NA	pCi/l
Rn_{222+4d}	NA	pCi/l	NA	NA	pCi/l
Sr_{90+1d}	NA	pCi/l	NA	NA	pCi/l
Tc_{99}	NA	pCi/l	NA	NA	pCi/l
Th_{228+7d}	NA	pCi/l	NA	NA	pCi/l
Th_{230}	NA	pCi/l	NA	NA	pCi/l

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	NA	2.2E–10	NA
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	NA	1.3E–11	NA
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	1.8E+03	1.6E–11	2.9E–08
U_{235+1d}	9.8E+01	1.6E–11	1.6E–09
U_{238+2d}	2.0E+03	2.0E–11	4.0E–08
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
ILCR Summation	=		7.1E–08

090727

Table C.III-108
Summary of Intake Quantitation (chemicals) Alternative 6
Lime Sludge Pond with Federal Ownership: Off-Property Farmer (Adult)
Via Dermal Contact while Bathing

Intake Equation = $\frac{DA \times EF \times ED \times SA}{BW \times AT}$

DA	Dermal absorbed dose	csv mg/cm^2-day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x365)	25550 days
SA	Skin surface area available for contact	23000 cm^2

Chemical Concentrations

Compound	DA	Units	Compound	DA	Units
antimony	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
arsenic	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
beryllium	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
uranium-total	3.08E-11	mg/cm^2-day	NA	NA	mg/cm^2-day
benzo(a)pyrene	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
carbazole	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
arodor-1254	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
arodor-1260	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
dieldrin	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day			

References

Table C.III–108 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Federal Ownership: Off–Property Farmer (Adult)
Via Dermal Contact while Showering

	HQ Calculation		
Compound	CDI (mg/kg–day)	RfD (mg/kg–day)	HQ (unitless)
antimony	NA	6.00E–05	NA
arsenic	NA	2.85E–04	NA
beryllium	NA	5.00E–03	NA
uranium–total	9.69E–09	1.50E–04	6.46E–05
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor–1254	NA	NA	NA
aroclor–1260	NA	NA	NA
dieldrin	NA	4.50E–05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			6.46E–05

	ILCR Calculation		
Compound	CDI (mg/kg–day)	CSF $(mg/kg–day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.90E+00	NA
beryllium	NA	4.30E+00	NA
uranium–total	9.69E–09	NA	NA
benzo(a)pyrene	NA	NA	NA
carbazole	NA	2.22E–02	NA
aroclor–1254	NA	1.03E+01	NA
aroclor–1260	NA	1.03E+01	NA
dieldrin	NA	1.78E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

66466

Table C.III–109
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Lime Sludge Pond with Federal Ownership: Off–Property Farmer (Adult)
Via Inhalation of Gases and Particulates

Intake Equation = Ca X EF X EDn X IR

IR	Inhalation rate of gases (RAGS, 1989)	20 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Ca	Concentration of radionuclides in air	(see table below)

Cs_{137+1d}	NA	pCi/m^3	$Th_{232+10d}$	NA	pCi/m^3
Np_{237+1d}	6.2E–09	pCi/m^3	U_{234}	NA	pCi/m^3
Pu_{238}	NA	pCi/m^3	U_{235+1d}	NA	pCi/m^3
Ra_{226+8d}	NA	pCi/m^3	U_{238+2d}	NA	pCi/m^3
Ra_{228+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Rn_{222+4d}	NA	pCi/m^3	NA	NA	pCi/m^3
Sr_{90+1d}	2.6E–08	pCi/m^3	NA	NA	pCi/m^3
Tc_{99}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{228+7d}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{230}	2.5E–08	pCi/m^3	NA	NA	pCi/m^3

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	1.9E–11	NA
Np_{237+1d}	3.0E–03	2.9E–08	8.8E–11
Pu_{238}	NA	3.9E–08	NA
Ra_{226+8d}	NA	7.0E–09	NA
Ra_{228+1d}	NA	6.9E–10	NA
Rn_{222+4d}	NA	7.7E–12	NA
Sr_{90+1d}	1.3E–02	6.2E–11	7.8E–13
Tc_{99}	NA	8.3E–12	NA
Th_{228+7d}	NA	7.8E–08	NA
Th_{230}	1.2E–02	2.9E–08	3.5E–10
$Th_{232+10d}$	NA	1.1E–07	NA
U_{234}	NA	2.6E–08	NA
U_{235+1d}	NA	2.5E–08	NA
U_{238+2d}	NA	2.4E–08	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		4.4E–10

000580

Table C.III-110
Summary of Intake Quantitation (chemicals) Alternative 6
Lime Sludge Pond with Federal Ownership: Off-Property Farmer (Adult)
Via Ingestion of Meat Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of meat	0.101 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x365)	25550 days
CS	Concentration of chemicals in meat	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium-total	1.2E-06	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
arodor-1254	NA	mg/kg	NA	NA	mg/kg
arodor-1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

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6645

Table C.III–110 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Meat Products

	HQ Calculation		
Compound	CDI (mg/kg–day)	RfD (mg/kg–day)	HQ (unitless)
antimony	NA	4.0E–04	NA
arsenic	NA	3.0E–04	NA
beryllium	NA	5.0E–03	NA
uranium–total	1.3E–09	3.0E–03	4.3E–07
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor–1254	NA	NA	NA
aroclor–1260	NA	NA	NA
dieldrin	NA	5.0E–05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			4.3E–07

	ILCR Calculation		
Compound	CDI (mg/kg–day)	CSF (mg/kg–day)$^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium–total	1.3E–09	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E–02	NA
aroclor–1254	NA	7.7E+00	NA
aroclor–1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

Table C.III–111
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Lime Sludge Pond with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Meat Products

Intake Equation = Cf X EF X EDn X FI X IR

IR	Ingestion rate of meat	0.101 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cf	Concentration of radionuclides in meat	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	2.6E–08	pCi/kg	U_{234}	3.7E–04	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	2.0E–05	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	4.1E–04	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	2.3E–06	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	1.3E–08	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	4.9E–05	2.2E–10	1.1E–14
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	4.2E–03	3.6E–11	1.5E–13
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	2.5E–05	1.3E–11	3.2E–16
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	6.9E–01	1.6E–11	1.1E–11
U_{235+1d}	3.7E–02	1.6E–11	5.9E–13
U_{238+2d}	7.6E–01	2.0E–11	1.5E–11
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 2.7E–11

Table C.III-112
Summary of Intake Quantitation (chemicals) Alternative 6
Lime Sludge Pond with Federal Ownership: Off-Property Farmer (Adult)
Via Ingestion of Dairy Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of dairy products	0.4 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x365)	25550 days
CS	Concentration of chemicals in animal products	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium-total	4.5E-06	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
arodor-1254	NA	mg/kg	NA	NA	mg/kg
arodor-1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

Table C.III-112 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Federal Ownership: Off-Property Farmer (Adult)
Via Ingestion of Dairy Products

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	1.8E-08	3.0E-03	6.1E-06
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	-NA
	HQ Summation =		6.1E-06

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	1.8E-08	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

6646

000585

Table C.III-113
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Lime Sludge Pond with Federal Ownership: Off-Property Farmer (Adult)
Via Ingestion of Dairy Products

Intake Equation = Cp X EF X EDn X FI X IR

IR	Ingestion rate of dairy products	0.4 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cp	Concentration of radionuclides in animal products	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	2.4E-09	pCi/kg	U_{234}	1.3E-03	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	7.2E-05	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	1.5E-03	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	1.1E-05	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	1.1E-08	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E-11	NA
Np_{237+1d}	1.8E-05	2.2E-10	3.9E-15
Pu_{238}	NA	2.2E-10	NA
Ra_{226+8d}	NA	7.8E-10	NA
Ra_{228+1d}	NA	1.0E-10	NA
Rn_{222+4d}	NA	1.7E-12	NA
Sr_{90+1d}	8.4E-02	3.6E-11	3.0E-12
Tc_{99}	NA	1.3E-12	NA
Th_{228+7d}	NA	5.5E-11	NA
Th_{230}	8.2E-05	1.3E-11	1.1E-15
$Th_{232+10d}$	NA	1.7E-10	NA
U_{234}	9.8E+00	1.6E-11	1.6E-10
U_{235+1d}	5.3E-01	1.6E-11	8.5E-12
U_{238+2d}	1.1E+01	2.0E-11	2.2E-10
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 3.9E-10

000586

Table C.III-114
Summary of Intake and Risk Quantitation (chemicals) Alternative 6
Lime Sludge Pond with Federal Ownership: Off-Property Farmer (Adult)
Via Ingestion of Vegetables and Fruits

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of fruits or vegetables	0.122 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x365)	25550 days
CS	Concentration of chemicals in vegetables	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium-total	6.0E-04	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
arodor-1254	NA	mg/kg	NA	NA	mg/kg
arodor-1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

000582

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Table C.III–114 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Vegetables and Fruits

Compound	HQ Calculation CDI (mg/kg–day)	RfD (mg/kg–day)	HQ (unitless)
antimony	NA	4.0E–04	NA
arsenic	NA	3.0E–04	NA
beryllium	NA	5.0E–03	NA
uranium–total	1.0E–06	3.0E–03	3.4E–04
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor–1254	NA	NA	NA
aroclor–1260	NA	NA	NA
dieldrin	NA	5.0E–05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		3.4E–04

Compound	ILCR Calculation CDI (mg/kg–day)	CSF $(mg/kg–day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium–total	1.0E–06	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E–02	NA
aroclor–1254	NA	7.7E+00	NA
aroclor–1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

000588

Table C.III-115
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Lime Sludge Pond with Federal Ownership: Off-Property Farmer (Adult)
Via Ingestion of Vegetables and Fruits

ntake Equation = Cv X EF X EDn X FI X IR

IR	Ingestion rate of fruits or vegetables	0.122 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cv	Concentration of radionuclides in vegetables	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	6.2E-06	pCi/kg	U_{234}	1.8E-01	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	9.8E-03	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	2.0E-01	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	7.4E-05	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	2.7E-05	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E-11	NA
Np_{237+1d}	1.8E-02	2.2E-10	4.1E-12
Pu_{238}	NA	2.2E-10	NA
Ra_{226+8d}	NA	7.8E-10	NA
Ra_{228+1d}	NA	1.0E-10	NA
Rn_{222+4d}	NA	1.7E-12	NA
Sr_{90+1d}	2.2E-01	3.6E-11	7.9E-12
Tc_{99}	NA	1.3E-12	NA
Th_{228+7d}	NA	5.5E-11	NA
Th_{230}	8.2E-02	1.3E-11	1.1E-12
$Th_{232+10d}$	NA	1.7E-10	NA
U_{234}	5.4E+02	1.6E-11	8.7E-09
U_{235+1d}	2.9E+01	1.6E-11	4.7E-10
U_{238+2d}	6.0E+02	2.0E-11	1.2E-08
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		2.1E-08

000589

Table C.III-116
Summary of Intake Quantitation (chemicals) Alternative 6
Lime Sludge Pond with Federal Ownership: Off-Property Farmer (Child)
Via Drinking Water Ingestion

Intake Equation = $\frac{CS \times EF \times ED \times IR}{BW \times AT}$

IR	Ingestion rate of groundwater (RAGS, 1989)	1 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x365)	2190 days
CS	Concentration of chemicals in groundwater	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/l	NA	NA	mg/l
arsenic	NA	mg/l	NA	NA	mg/l
beryllium	NA	mg/l	NA	NA	mg/l
uranium-total	1.23E-04	mg/l	NA	NA	mg/l
benzo(a)pyrene	NA	mg/l	NA	NA	mg/l
carbazole	NA	mg/l	NA	NA	mg/l
arodor-1254	NA	mg/l	NA	NA	mg/l
arodor-1260	NA	mg/l	NA	NA	mg/l
dieldrin	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l			

References

Table C.III-116 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Federal Ownership: Off-Property Farmer (Child)
Via Drinking Water Ingestion

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.00E-04	NA
arsenic	NA	3.00E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	7.86E-06	3.00E-03	2.62E-03
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.00E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	HQ Summation =		2.62E-03

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.75E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	6.74E-07	NA	NA
benzo(a)pyrene	NA	7.30E+00	NA
carbazole	NA	2.00E-02	NA
aroclor-1254	NA	7.70E+00	NA
aroclor-1260	NA	7.70E+00	NA
dieldrin	NA	1.60E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	ILCR Summation =		NA

000591

6646

Table C.III–117
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Lime Sludge Pond with Federal Ownership: Off–Property Farmer (Child)
Via Ingestion of Drinking Water

Intake Equation = Cw X EF X EDn X FI X IR

IR	Ingestion rate of groundwater (RAGS, 1989)	1 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
FI	Fractional intake for radionuclides	1 (Unitless)
Cw	Concentration of radionuclides in groundwater	(see table below)

Cs_{137+1d}	NA	pCi/l	$Th_{232+10d}$	NA	pCi/l
Np_{237+1d}	NA	pCi/l	U_{234}	3.7E–02	pCi/l
Pu_{238}	NA	pCi/l	U_{235+1d}	2.0E–03	pCi/l
Ra_{226+8d}	NA	pCi/l	U_{238+2d}	4.1E–02	pCi/l
Ra_{228+1d}	NA	pCi/l	NA	NA	pCi/l
Rn_{222+4d}	NA	pCi/l	NA	NA	pCi/l
Sr_{90+1d}	NA	pCi/l	NA	NA	pCi/l
Tc_{99}	NA	pCi/l	NA	NA	pCi/l
Th_{228+7d}	NA	pCi/l	NA	NA	pCi/l
Th_{230}	NA	pCi/l	NA	NA	pCi/l

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	NA	2.2E–10	NA
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	NA	1.3E–11	NA
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	7.8E+01	1.6E–11	1.2E–09
U_{235+1d}	4.2E+00	1.6E–11	6.7E–11
U_{238+2d}	8.6E+01	2.0E–11	1.7E–09
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation	=	3.0E–09

000592

Table C.III-118
Summary of Intake Quantitation (chemicals) Alternative 6
Lime Sludge Pond with Federal Ownership: Off-Property Farmer (Child)
Via Dermal Contact while Bathing

Intake Equation = $\frac{DA \times EF \times ED \times SA}{BW \times AT}$

DA	Dermal absorbed dose	csv mg/cm^2-day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x365)	2190 days
SA	Skin surface area available for contact	8000 cm^2

Chemical Concentrations

Compound	DA	Units	Compound	DA	Units
antimony	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
arsenic	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
beryllium	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
uranium-total	3.08E-11	mg/cm^2-day	NA	NA	mg/cm^2-day
benzo(a)pyrene	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
carbazole	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
arodor-1254	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
arodor-1260	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
dieldrin	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day			

References

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000594

Table C.III-118
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Federal Ownership: Off-Property Farmer (Child)
Via Dermal Contact while Bathing

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	6.00E-05	NA
arsenic	NA	2.85E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	1.57E-08	1.50E-04	1.05E-04
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	4.50E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		1.05E-04

Compound	ILCR Calculation CDI (mg/kg-day)	CSF (mg/kg-day)$^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.90E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	1.35E-09	NA	NA
benzo(a)pyrene	NA	NA	NA
carbazole	NA	2.22E-02	NA
aroclor-1254	NA	1.03E+01	NA
aroclor-1260	NA	1.03E+01	NA
dieldrin	NA	1.78E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

Table C.III–119
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Lime Sludge Pond with Federal Ownership: Off–Property Farmer (Child)
Via Inhalation of Gases and Particulates

Intake Equation = Ca X EF X EDn X IR

IR	Inhalation rate of gases (RAGS, 1989)	12 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Ca	Concentration of radionuclides in air	(see table below)

Cs_{137+1d}	NA	pCi/m^3	$Th_{232+10d}$	NA	pCi/m^3
Np_{237+1d}	6.2E–09	pCi/m^3	U_{234}	NA	pCi/m^3
Pu_{238}	NA	pCi/m^3	U_{235+1d}	NA	pCi/m^3
Ra_{226+8d}	NA	pCi/m^3	U_{238+2d}	NA	pCi/m^3
Ra_{228+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Rn_{222+4d}	NA	pCi/m^3	NA	NA	pCi/m^3
Sr_{90+1d}	2.6E–08	pCi/m^3	NA	NA	pCi/m^3
Tc_{99}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{228+7d}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{230}	2.5E–08	pCi/m^3	NA	NA	pCi/m^3

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	1.9E–11	NA
Np_{237+1d}	1.6E–04	2.9E–08	4.5E–12
Pu_{238}	NA	3.9E–08	NA
Ra_{226+8d}	NA	7.0E–09	NA
Ra_{228+1d}	NA	6.9E–10	NA
Rn_{222+4d}	NA	7.7E–12	NA
Sr_{90+1d}	6.5E–04	6.2E–11	4.0E–14
Tc_{99}	NA	8.3E–12	NA
Th_{228+7d}	NA	7.8E–08	NA
Th_{230}	6.2E–04	2.9E–08	1.8E–11
$Th_{232+10d}$	NA	1.1E–07	NA
U_{234}	NA	2.6E–08	NA
U_{235+1d}	NA	2.5E–08	NA
U_{238+2d}	NA	2.4E–08	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation	=	2.3E–11

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Table C.III-120
Summary of Intake Quantitation (chemicals) Alternative 6
Lime Sludge Pond with Federal Ownership: Off-Property Farmer (Child)
Via Ingestion of Meat Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of meat	0.039 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x365)	2190 days
CS	Concentration of chemicals in meat	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium-total	1.2E-06	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
arodor-1254	NA	mg/kg	NA	NA	mg/kg
arodor-1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

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Table C.III-120 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Federal Ownership: Off-Property Farmer (Child)
Via Ingestion of Meat Products

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	2.3E-09	3.0E-03	7.7E-07
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			7.7E-07

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	2.0E-10	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

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Table C.III–121
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Lime Sludge Pond with Federal Ownership: Off–Property Farmer (Child)
Via Ingestion of Meat Products

Intake Equation = Cf X EF X EDn X FI X IR

IR	Ingestion rate of meat	0.039 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cf	Concentration of radionuclides in meat	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	2.6E–08	pCi/kg	U_{234}	3.7E–04	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	2.0E–05	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	4.1E–04	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	2.3E–06	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	1.3E–08	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	1.6E–06	2.2E–10	3.5E–16
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	1.4E–04	3.6E–11	5.0E–15
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	8.2E–07	1.3E–11	1.1E–17
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	2.3E–02	1.6E–11	3.6E–13
U_{235+1d}	1.2E–03	1.6E–11	2.0E–14
U_{238+2d}	2.5E–02	2.0E–11	5.0E–13
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
		ILCR Summation =	8.9E–13

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Table C.III–122
Summary of Intake Quantitation (chemicals) Alternative 6
Lime Sludge Pond with Federal Ownership: Off–Property Farmer (Child)
Via Ingestion of Dairy Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of dairy products	0.9 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x365)	2190 days
CS	Concentration of chemicals in animal products	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium–total	4.5E–06	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
arodor–1254	NA	mg/kg	NA	NA	mg/kg
arodor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

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Table C.III-122 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Federal Ownership: Off-Property Farmer (Child)
Via Ingestion of Dairy Products

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	1.9E-07	3.0E-03	6.4E-05
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			6.4E-05

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	1.6E-08	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

Table C.III-123
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Lime Sludge Pond with Federal Ownership: Off-Property Farmer (Child)
Via Ingestion of Dairy Products

Intake Equation = Cp X EF X EDn X FI X IR

IR	Ingestion rate of dairy products	0.9 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cp	Concentration of radionuclides in animal products	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	2.4E-09	pCi/kg	U_{234}	1.3E-03	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	7.2E-05	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	1.5E-03	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	1.1E-05	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	1.1E-08	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E-11	NA
Np_{237+1d}	3.4E-06	2.2E-10	7.4E-16
Pu_{238}	NA	2.2E-10	NA
Ra_{226+8d}	NA	7.8E-10	NA
Ra_{228+1d}	NA	1.0E-10	NA
Rn_{222+4d}	NA	1.7E-12	NA
Sr_{90+1d}	1.6E-02	3.6E-11	5.8E-13
Tc_{99}	NA	1.3E-12	NA
Th_{228+7d}	NA	5.5E-11	NA
Th_{230}	1.6E-05	1.3E-11	2.1E-16
$Th_{232+10d}$	NA	1.7E-10	NA
U_{234}	1.9E+00	1.6E-11	3.0E-11
U_{235+1d}	1.0E-01	1.6E-11	1.6E-12
U_{238+2d}	2.1E+00	2.0E-11	4.2E-11
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation	=	7.4E-11

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Table C.III-124
Summary of Intake and Risk Quantitation (chemicals) Alternative 6
Lime Sludge Pond with Federal Ownership: Off-Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of fruits or vegetables	0.1 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x365)	2190 days
CS	Concentration of chemicals in vegetables	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium-total	6.0E-04	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
arodor-1254	NA	mg/kg	NA	NA	mg/kg
arodor-1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

Table C.III–124 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Federal Ownership: Off–Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

	HQ Calculation		
Compound	CDI (mg/kg–day)	RfD (mg/kg–day)	HQ (unitless)
antimony	NA	4.0E–04	NA
arsenic	NA	3.0E–04	NA
beryllium	NA	5.0E–03	NA
uranium–total	3.9E–06	3.0E–03	1.3E–03
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor–1254	NA	NA	NA
aroclor–1260	NA	NA	NA
dieldrin	NA	5.0E–05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	HQ Summation =		1.3E–03

	ILCR Calculation		
Compound	CDI (mg/kg–day)	CSF $(mg/kg–day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium–total	3.3E–07	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E–02	NA
aroclor–1254	NA	7.7E+00	NA
aroclor–1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	ILCR Summation =		NA

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Table C.III–125
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Lime Sludge Pond with Federal Ownership: Off–Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

Intake Equation = Cv X EF X EDn X FI X IR

IR	Ingestion rate of fruits or vegetables	0.1 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cv	Concentration of radionuclides in vegetables	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	6.2E–06	pCi/kg	U_{234}	1.8E–01	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	9.8E–03	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	2.0E–01	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	7.4E–05	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	2.7E–05	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	1.3E–03	2.2E–10	2.8E–13
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	1.5E–02	3.6E–11	5.6E–13
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	5.8E–03	1.3E–11	7.5E–14
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	3.8E+01	1.6E–11	6.1E–10
U_{235+1d}	2.1E+00	1.6E–11	3.3E–11
U_{238+2d}	4.2E+01	2.0E–11	8.4E–10
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 1.5E–09

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Table C.III-126
Summary of Intake Quantitation (chemicals) Alternative 6
Lime Sludge Pond with Private Ownership: Off-Property Farmer (Adult)
Via Drinking Water Ingestion

Intake Equation = $\frac{CS \times EF \times ED \times IR}{BW \times AT}$

IR	Ingestion rate of groundwater (RAGS, 1989)	2 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x365)	25550 days
CS	Concentration of chemicals in groundwater	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/l	NA	NA	mg/l
arsenic	NA	mg/l	NA	NA	mg/l
beryllium	NA	mg/l	NA	NA	mg/l
uranium-total	2.30E-07	mg/l	NA	NA	mg/l
benzo(a)pyrene	NA	mg/l	NA	NA	mg/l
carbazole	NA	mg/l	NA	NA	mg/l
arodor-1254	NA	mg/l	NA	NA	mg/l
arodor-1260	NA	mg/l	NA	NA	mg/l
dieldrin	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l			

References

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Table C.III-126 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Private Ownership: Off-Property Farmer (Adult)
Via Drinking Water Ingestion

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.00E-04	NA
arsenic	NA	3.00E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	6.30E-09	3.00E-03	2.10E-06
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.00E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			2.10E-06

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.75E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	6.30E-09	NA	NA
benzo(a)pyrene	NA	7.30E+00	NA
carbazole	NA	2.00E-02	NA
aroclor-1254	NA	7.70E+00	NA
aroclor-1260	NA	7.70E+00	NA
dieldrin	NA	1.60E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

Table C.III–127
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Lime Sludge Pond with Private Ownership: Off–Property Farmer (Adult)
Via Ingestion of Drinking Water

Intake Equation = Cw X EF X EDn X FI X IR

IR	Ingestion rate of groundwater (RAGS, 1989)	2 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
FI	Fractional intake for radionuclides	1 (Unitless)
Cw	Concentration of radionuclides in groundwater	(see table below)

Cs_{137+1d}	NA	pCi/l	$Th_{232+10d}$	NA	pCi/l
Np_{237+1d}	NA	pCi/l	U_{234}	7.1E–05	pCi/l
Pu_{238}	NA	pCi/l	U_{235+1d}	3.7E–06	pCi/l
Ra_{226+8d}	NA	pCi/l	U_{238+2d}	7.8E–05	pCi/l
Ra_{228+1d}	NA	pCi/l	NA	NA	pCi/l
Rn_{222+4d}	NA	pCi/l	NA	NA	pCi/l
Sr_{90+1d}	NA	pCi/l	NA	NA	pCi/l
Tc_{99}	NA	pCi/l	NA	NA	pCi/l
Th_{228+7d}	NA	pCi/l	NA	NA	pCi/l
Th_{230}	NA	pCi/l	NA	NA	pCi/l

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	NA	2.2E–10	NA
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	NA	1.3E–11	NA
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	3.5E+00	1.6E–11	5.6E–11
U_{235+1d}	1.8E–01	1.6E–11	2.9E–12
U_{238+2d}	3.8E+00	2.0E–11	7.6E–11
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
		ILCR Summation =	1.4E–10

000607

Table C.III-128
Summary of Intake Quantitation (chemicals) Alternative 6
Lime Sludge Pond with Private Ownership: Off-Property Farmer (Adult)
Via Dermal Contact while Bathing

Intake Equation = $\frac{DA \times EF \times ED \times SA}{BW \times AT}$

DA	Dermal absorbed dose	csv	mg/cm^2-day
EF	Exposure frequency	350	days/year
EDn	Exposure duration for non-carcinogens	70	Year
EDc	Exposure duration for carcinogens	70	Year
BW	Body weight	70	kg
ATc	Average time for carcinogens (lifetime)	25550	days
ATn	Average time for non-carcinogens (EDn x365)	25550	days
SA	Skin surface area available for contact	23000	cm^2

Chemical Concentrations

Compound	DA	Units	Compound	DA	Units
antimony	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
arsenic	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
beryllium	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
uranium-total	5.75E-14	mg/cm^2-day	NA	NA	mg/cm^2-day
benzo(a)pyrene	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
carbazole	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
arodor-1254	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
arodor-1260	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
dieldrin	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day			

References

Table C.III–128 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Private Ownership: Off–Property Farmer (Adult)
Via Dermal Contact while Bathing

	HQ Calculation		
Compound	CDI (mg/kg–day)	RfD (mg/kg–day)	HQ (unitless)
antimony	NA	6.00E–05	NA
arsenic	NA	2.85E–04	NA
beryllium	NA	5.00E–03	NA
uranium–total	1.81E–11	1.50E–04	1.21E–07
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor–1254	NA	NA	NA
aroclor–1260	NA	NA	NA
dieldrin	NA	4.50E–05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		1.21E–07

	ILCR Calculation		
Compound	CDI (mg/kg–day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.90E+00	NA
beryllium	NA	4.30E+00	NA
uranium–total	1.81E–11	NA	NA
benzo(a)pyrene	NA	NA	NA
carbazole	NA	2.22E–02	NA
aroclor–1254	NA	1.03E+01	NA
aroclor–1260	NA	1.03E+01	NA
dieldrin	NA	1.78E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

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Table C.III–129
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Lime Sludge Pond with Private Ownership: Off–Property Farmer (Adult)
Via Inhalation of Gases and Particulates

Intake Equation = Ca X EF X EDn X IR

IR	Inhalation rate of gases (RAGS, 1989)	20 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Ca	Concentration of radionuclides in air	(see table below)

Cs_{137+1d}	NA	pCi/m^3	$Th_{232+10d}$	NA	pCi/m^3
Np_{237+1d}	3.2E–09	pCi/m^3	U_{234}	NA	pCi/m^3
Pu_{238}	NA	pCi/m^3	U_{235+1d}	NA	pCi/m^3
Ra_{226+8d}	NA	pCi/m^3	U_{238+2d}	NA	pCi/m^3
Ra_{228+1d}	NA	pCi/m^3		NA	pCi/m^3
Rn_{222+4d}	NA	pCi/m^3		NA	pCi/m^3
Sr_{90+1d}	3.5E–09	pCi/m^3		NA	pCi/m^3
Tc_{99}	NA	pCi/m^3		NA	pCi/m^3
Th_{228+7d}	NA	pCi/m^3		NA	pCi/m^3
Th_{230}	3.3E–07	pCi/m^3		NA	pCi/m^3

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	1.9E–11	NA
Np_{237+1d}	1.6E–03	2.9E–08	4.5E–11
Pu_{238}	NA	3.9E–08	NA
Ra_{226+8d}	NA	7.0E–09	NA
Ra_{228+1d}	NA	6.9E–10	NA
Rn_{222+4d}	NA	7.7E–12	NA
Sr_{90+1d}	1.7E–03	6.2E–11	1.1E–13
Tc_{99}	NA	8.3E–12	NA
Th_{228+7d}	NA	7.8E–08	NA
Th_{230}	1.6E–01	2.9E–08	4.6E–09
$Th_{232+10d}$	NA	1.1E–07	NA
U_{234}	NA	2.6E–08	NA
U_{235+1d}	NA	2.5E–08	NA
U_{238+2d}	NA	2.4E–08	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
		ILCR Summation =	4.7E–09

000610

Table C.III – 130
Summary of Intake Quantitation (chemicals) Alternative 6
Lime Sludge Pond with Private Ownership: Off–Property Farmer (Adult)
Via Ingestion of Meat Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of meat	0.101	kg/day
FI	Fraction ingested from contaminated source	0.75	(Unitless)
EF	Exposure frequency	350	days/year
EDn	Exposure duration for non–carcinogens	70	Year
EDc	Exposure duration for carcinogens	70	Year
BW	Body weight	70	kg
ATc	Average time for carcinogens (lifetime)	25550	days
ATn	Average time for non–carcinogens (EDn x365)	25550	days
CS	Concentration of chemicals in meat		

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium–total	2.3E–09	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
arodor–1254	NA	mg/kg	NA	NA	mg/kg
arodor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

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Table C.III-130 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Private Ownership: Off-Property Farmer (Adult)
Via Ingestion of Meat Products

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	2.4E-12	3.0E-03	8.0E-10
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			8.0E-10

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	2.4E-12	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

Table C.III-131
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Lime Sludge Pond with Private Ownership: Off-Property Farmer (Adult)
Via Ingestion of Meat Products

Intake Equation = Cf X EF X EDn X FI X IR

IR	Ingestion rate of meat	0.101 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cf	Concentration of radionuclides in meat	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	1.4E-08	pCi/kg	U_{234}	7.1E-07	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	3.7E-08	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	7.8E-07	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	3.1E-07	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	1.8E-07	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E-11	NA
Np_{237+1d}	2.5E-05	2.2E-10	5.5E-15
Pu_{238}	NA	2.2E-10	NA
Ra_{226+8d}	NA	7.8E-10	NA
Ra_{228+1d}	NA	1.0E-10	NA
Rn_{222+4d}	NA	1.7E-12	NA
Sr_{90+1d}	5.7E-04	3.6E-11	2.1E-14
Tc_{99}	NA	1.3E-12	NA
Th_{228+7d}	NA	5.5E-11	NA
Th_{230}	3.3E-04	1.3E-11	4.2E-15
$Th_{232+10d}$	NA	1.7E-10	NA
U_{234}	1.3E-03	1.6E-11	2.1E-14
U_{235+1d}	6.9E-05	1.6E-11	1.1E-15
U_{238+2d}	1.4E-03	2.0E-11	2.9E-14
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		8.2E-14

000613

Table C.III–132
Summary of Intake Quantitation (chemicals) Alternative 6
Lime Sludge Pond with Private Ownership: Off–Property Farmer (Adult)
Via Ingestion of Dairy Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of dairy products	0.4 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x365)	25550 days
CS	Concentration of chemicals in animal products	

Chemical Concentrations

Compound	Concentration	Units
antimony	NA	mg/kg
arsenic	NA	mg/kg
beryllium	NA	mg/kg
uranium–total	8.3E–09	mg/kg
benzo(a)pyrene	NA	mg/kg
carbazole	NA	mg/kg
arodor–1254	NA	mg/kg
arodor–1260	NA	mg/kg
dieldrin	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg

Compound	Concentration	Units
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg

References

Table C.III–132 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Private Ownership: Off–Property Farmer (Adult)
Via Ingestion of Dairy Products

	HQ Calculation		
Compound	CDI (mg/kg–day)	RfD (mg/kg–day)	HQ (unitless)
antimony	NA	4.0E–04	NA
arsenic	NA	3.0E–04	NA
beryllium	NA	5.0E–03	NA
uranium–total	3.4E–11	3.0E–03	1.1E–08
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor–1254	NA	NA	NA
aroclor–1260	NA	NA	NA
dieldrin	NA	5.0E–05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			1.1E–08

	ILCR Calculation		
Compound	CDI (mg/kg–day)	CSF $(mg/kg–day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium–total	3.4E–11	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E–02	NA
aroclor–1254	NA	7.7E+00	NA
aroclor–1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

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Table C.III–133
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Lime Sludge Pond with Private Ownership: Off–Property Farmer (Adult)
Via Ingestion of Dairy Products

Intake Equation = Cp X EF X EDn X FI X IR

IR	Ingestion rate of dairy products	0.4 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cp	Concentration of radionuclides in animal products	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	1.2E–09	pCi/kg	U_{234}	2.6E–06	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	1.3E–07	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	2.8E–06	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	1.5E–06	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	1.5E–07	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	9.0E–06	2.2E–10	2.0E–15
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	1.1E–02	3.6E–11	4.1E–13
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	1.1E–03	1.3E–11	1.4E–14
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	1.9E–02	1.6E–11	3.0E–13
U_{235+1d}	9.8E–04	1.6E–11	1.6E–14
U_{238+2d}	2.1E–02	2.0E–11	4.1E–13
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 1.2E–12

Table C.III – 134
Summary of Intake and Risk Quantitation (chemicals) Alternative 6
Lime Sludge Pond with Private Ownership: Off–Property Farmer (Adult)
Via Ingestion of Vegetables and Fruits

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of fruits or vegetables	0.122 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x365)	25550 days
CS	Concentration of chemicals in vegetables	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium–total	1.1E–06	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
arodor–1254	NA	mg/kg	NA	NA	mg/kg
arodor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

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Table C.III–134 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Private Ownership: Off–Property Farmer (Adult)
Via Ingestion of Vegetables and Fruits

	HQ Calculation		
Compound	CDI (mg/kg–day)	RfD (mg/kg–day)	HQ (unitless)
antimony	NA	4.0E–04	NA
arsenic	NA	3.0E–04	NA
beryllium	NA	5.0E–03	NA
uranium–total	1.9E–09	3.0E–03	6.3E–07
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor–1254	NA	NA	NA
aroclor–1260	NA	NA	NA
dieldrin	NA	5.0E–05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			6.3E–07

	ILCR Calculation		
Compound	CDI (mg/kg–day)	CSF $(mg/kg–day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium–total	1.9E–09	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E–02	NA
aroclor–1254	NA	7.7E+00	NA
aroclor–1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

Table C.III–135
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Lime Sludge Pond with Private Ownership: Off–Property Farmer (Adult)
Via Ingestion of Vegetables and Fruits

Intake Equation = Cv X EF X EDn X FI X IR

IR	Ingestion rate of fruits or vegetables	0.122 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cv	Concentration of radionuclides in vegetables	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	3.2E–06	pCi/kg	U_{234}	3.5E–04	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	1.8E–05	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	3.8E–04	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	1.0E–05	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	3.6E–04	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	9.5E–03	2.2E–10	2.1E–12
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	3.0E–02	3.6E–11	1.1E–12
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	1.1E+00	1.3E–11	1.4E–11
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	1.0E+00	1.6E–11	1.7E–11
U_{235+1d}	5.4E–02	1.6E–11	8.7E–13
U_{238+2d}	1.1E+00	2.0E–11	2.3E–11
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation	=	5.7E–11

000619

Table C.III-136
Summary of Intake Quantitation (chemicals) Alternative 6
Lime Sludge Pond with Private Ownership: Off-Property Farmer (Child)
Via Drinking Water Ingestion

Intake Equation = $\frac{CS \times EF \times ED \times IR}{BW \times AT}$

IR	Ingestion rate of groundwater (RAGS, 1989)	1 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x365)	2190 days
CS	Concentration of chemicals in groundwater	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/l	NA	NA	mg/l
arsenic	NA	mg/l	NA	NA	mg/l
beryllium	NA	mg/l	NA	NA	mg/l
uranium-total	2.30E-07	mg/l	NA	NA	mg/l
benzo(a)pyrene	NA	mg/l	NA	NA	mg/l
carbazole	NA	mg/l	NA	NA	mg/l
arodor-1254	NA	mg/l	NA	NA	mg/l
arodor-1260	NA	mg/l	NA	NA	mg/l
dieldrin	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l			

References

Table C.III–136 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Private Ownership: Off–Property Farmer (Child)
Via Drinking Water Ingestion

Compound	HQ Calculation CDI (mg/kg–day)	RfD (mg/kg–day)	HQ (unitless)
antimony	NA	4.00E–04	NA
arsenic	NA	3.00E–04	NA
beryllium	NA	5.00E–03	NA
uranium–total	1.47E–08	3.00E–03	4.90E–06
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor–1254	NA	NA	NA
aroclor–1260	NA	NA	NA
dieldrin	NA	5.00E–05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		4.90E–06

Compound	ILCR Calculation CDI (mg/kg–day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.75E+00	NA
beryllium	NA	4.30E+00	NA
uranium–total	1.26E–09	NA	NA
benzo(a)pyrene	NA	7.30E+00	NA
carbazole	NA	2.00E–02	NA
aroclor–1254	NA	7.70E+00	NA
aroclor–1260	NA	7.70E+00	NA
dieldrin	NA	1.60E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

Table C.III–137
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Lime Sludge Pond with Private Ownership: Off–Property Farmer (Child)
Via Ingestion of Drinking Water

Intake Equation = Cw X EF X EDn X FI X IR

IR	Ingestion rate of groundwater (RAGS, 1989)	1 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
FI	Fractional intake for radionuclides	1 (Unitless)
Cw	Concentration of radionuclides in groundwater	(see table below)

Cs_{137+1d}	NA	pCi/l	$Th_{232+10d}$	NA	pCi/l
Np_{237+1d}	NA	pCi/l	U_{234}	7.1E–05	pCi/l
Pu_{238}	NA	pCi/l	U_{235+1d}	3.7E–06	pCi/l
Ra_{226+8d}	NA	pCi/l	U_{238+2d}	7.8E–05	pCi/l
Ra_{228+1d}	NA	pCi/l	NA	NA	pCi/l
Rn_{222+4d}	NA	pCi/l	NA	NA	pCi/l
Sr_{90+1d}	NA	pCi/l	NA	NA	pCi/l
Tc_{99}	NA	pCi/l	NA	NA	pCi/l
Th_{228+7d}	NA	pCi/l	NA	NA	pCi/l
Th_{230}	NA	pCi/l	NA	NA	pCi/l

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	NA	2.2E–10	NA
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	NA	1.3E–11	NA
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	1.5E–01	1.6E–11	2.4E–12
U_{235+1d}	7.8E–03	1.6E–11	1.2E–13
U_{238+2d}	1.6E–01	2.0E–11	3.3E–12
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation	=	5.8E–12

000622

Table C.III-138
Summary of Intake Quantitation (chemicals) Alternative 6
Lime Sludge Pond with Private Ownership: Off-Property Farmer (Child)
Via Dermal Contact while Bathing

Intake Equation = $\frac{DA \times EF \times ED \times SA}{BW \times AT}$

DA	Dermal absorbed dose	csv	mg/cm^2-day
EF	Exposure frequency	350	days/year
EDn	Exposure duration for non-carcinogens	6	Year
EDc	Exposure duration for carcinogens	6	Year
BW	Body weight	15	kg
ATc	Average time for carcinogens (lifetime)	25550	days
ATn	Average time for non-carcinogens (EDn x365)	2190	days
SA	Skin surface area available for contact	8000	cm^2

Chemical Concentrations

Compound	DA	Units	Compound	DA	Units
antimony	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
arsenic	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
beryllium	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
uranium-total	5.75E-14	mg/cm^2-day	NA	NA	mg/cm^2-day
benzo(a)pyrene	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
carbazole	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
arodor-1254	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
arodor-1260	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
dieldrin	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day			

References

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Table C.III-138 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Private Ownership: Off-Property Farmer (Child)
Via Dermal Contact while Bathing

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	6.00E-05	NA
arsenic	NA	2.85E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	2.94E-11	1.50E-04	1.96E-07
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	4.50E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		1.96E-07

Compound	ILCR Calculation CDI (mg/kg-day)	CSF (mg/kg-day)$^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.90E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	2.52E-12	NA	NA
benzo(a)pyrene	NA	NA	NA
carbazole	NA	2.22E-02	NA
aroclor-1254	NA	1.03E+01	NA
aroclor-1260	NA	1.03E+01	NA
dieldrin	NA	1.78E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

Table C.III-139
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Lime Sludge Pond with Private Ownership: Off-Property Farmer (Child)
Via Inhalation of Gases and Particulates

Intake Equation = Ca X EF X EDn X IR

IR	Inhalation rate of gases (RAGS, 1989)	12 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Ca	Concentration of radionuclides in air	(see table below)

Cs_{137+1d}	NA	pCi/m^3	$Th_{232+10d}$	NA	pCi/m^3
Np_{237+1d}	3.2E-09	pCi/m^3	U_{234}	NA	pCi/m^3
Pu_{238}	NA	pCi/m^3	U_{235+1d}	NA	pCi/m^3
Ra_{226+8d}	NA	pCi/m^3	U_{238+2d}	NA	pCi/m^3
Ra_{228+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Rn_{222+4d}	NA	pCi/m^3	NA	NA	pCi/m^3
Sr_{90+1d}	3.5E-09	pCi/m^3	NA	NA	pCi/m^3
Tc_{99}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{228+7d}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{230}	3.3E-07	pCi/m^3	NA	NA	pCi/m^3

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	1.9E-11	NA
Np_{237+1d}	8.0E-05	2.9E-08	2.3E-12
Pu_{238}	NA	3.9E-08	NA
Ra_{226+8d}	NA	7.0E-09	NA
Ra_{228+1d}	NA	6.9E-10	NA
Rn_{222+4d}	NA	7.7E-12	NA
Sr_{90+1d}	8.8E-05	6.2E-11	5.5E-15
Tc_{99}	NA	8.3E-12	NA
Th_{228+7d}	NA	7.8E-08	NA
Th_{230}	8.2E-03	2.9E-08	2.4E-10
$Th_{232+10d}$	NA	1.1E-07	NA
U_{234}	NA	2.6E-08	NA
U_{235+1d}	NA	2.5E-08	NA
U_{238+2d}	NA	2.4E-08	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation	=	2.4E-10

Table C.III-140
Summary of Intake Quantitation (chemicals) Alternative 6
Lime Sludge Pond with Private Ownership: Off-Property Farmer (Child)
Via Ingestion of Meat Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of meat	0.039 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x365)	2190 days
CS	Concentration of chemicals in meat	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium-total	2.3E-09	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
arodor-1254	NA	mg/kg	NA	NA	mg/kg
arodor-1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

Table C.III–140 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Private Ownership: Off–Property Farmer (Child)
Via Ingestion of Meat Products

	HQ Calculation		
Compound	CDI (mg/kg–day)	RfD (mg/kg–day)	HQ (unitless)
antimony	NA	4.0E–04	NA
arsenic	NA	3.0E–04	NA
beryllium	NA	5.0E–03	NA
uranium–total	4.3E–12	3.0E–03	1.4E–09
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor–1254	NA	NA	NA
aroclor–1260	NA	NA	NA
dieldrin	NA	5.0E–05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			1.4E–09

	ILCR Calculation		
Compound	CDI (mg/kg–day)	CSF $(mg/kg–day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium–total	3.7E–13	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E–02	NA
aroclor–1254	NA	7.7E+00	NA
aroclor–1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

000627
6646

Table C.III–141
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Lime Sludge Pond with Private Ownership: Off–Property Farmer (Child)
Via Ingestion of Meat Products

Intake Equation = Cf X EF X EDn X FI X IR

IR	Ingestion rate of meat	0.039 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cf	Concentration of radionuclides in meat	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	1.4E–08	pCi/kg	U_{234}	7.1E–07	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	3.7E–08	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	7.8E–07	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	3.1E–07	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	1.8E–07	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	8.3E–07	2.2E–10	1.8E–16
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	1.9E–05	3.6E–11	6.8E–16
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	1.1E–05	1.3E–11	1.4E–16
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	4.4E–05	1.6E–11	7.0E–16
U_{235+1d}	2.3E–06	1.6E–11	3.6E–17
U_{238+2d}	4.8E–05	2.0E–11	9.6E–16
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation	=	2.7E–15

000628

Table C.III–142
Summary of Intake Quantitation (chemicals) Alternative 6
Lime Sludge Pond with Private Ownership: Off–Property Farmer (Child)
Via Ingestion of Dairy Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of dairy products	0.9 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x365)	2190 days
CS	Concentration of chemicals in animal products	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium–total	8.3E–09	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
arodor–1254	NA	mg/kg	NA	NA	mg/kg
arodor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

000229

Table C.III–142 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Private Ownership: Off–Property Farmer (Child)
Via Ingestion of Dairy Products

	HQ Calculation		
Compound	CDI (mg/kg–day)	RfD (mg/kg–day)	HQ (unitless)
antimony	NA	4.0E–04	NA
arsenic	NA	3.0E–04	NA
beryllium	NA	5.0E–03	NA
uranium–total	3.6E–10	3.0E–03	1.2E–07
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor–1254	NA	NA	NA
aroclor–1260	NA	NA	NA
dieldrin	NA	5.0E–05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			1.2E–07

	ILCR Calculation		
Compound	CDI (mg/kg–day)	CSF $(mg/kg–day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium–total	3.1E–11	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E–02	NA
aroclor–1254	NA	7.7E+00	NA
aroclor–1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

6646

Table C.III-143
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Lime Sludge Pond with Private Ownership: Off-Property Farmer (Child)
Via Ingestion of Dairy Products

ntake Equation = Cp X EF X EDn X FI X IR

IR	Ingestion rate of dairy products	0.9 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cp	Concentration of radionuclides in animal products	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	1.2E-09	pCi/kg	U_{234}	2.6E-06	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	1.3E-07	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	2.8E-06	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	1.5E-06	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	1.5E-07	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E-11	NA
Np_{237+1d}	1.7E-06	2.2E-10	3.8E-16
Pu_{238}	NA	2.2E-10	NA
Ra_{226+8d}	NA	7.8E-10	NA
Ra_{228+1d}	NA	1.0E-10	NA
Rn_{222+4d}	NA	1.7E-12	NA
Sr_{90+1d}	2.2E-03	3.6E-11	7.9E-14
Tc_{99}	NA	1.3E-12	NA
Th_{228+7d}	NA	5.5E-11	NA
Th_{230}	2.1E-04	1.3E-11	2.7E-15
$Th_{232+10d}$	NA	1.7E-10	NA
U_{234}	3.6E-03	1.6E-11	5.8E-14
U_{235+1d}	1.9E-04	1.6E-11	3.0E-15
U_{238+2d}	4.0E-03	2.0E-11	8.0E-14
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 2.2E-13

000631

Table C.III – 144
Summary of Intake and Risk Quantitation (chemicals) Alternative 6
Lime Sludge Pond with Private Ownership: Off–Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of fruits or vegetables	0.1 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x365)	2190 days
CS	Concentration of chemicals in vegetables	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium–total	1.1E–06	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
arodor–1254	NA	mg/kg	NA	NA	mg/kg
arodor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

Table C.III-145
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Lime Sludge Pond with Private Ownership: Off-Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

Intake Equation = Cv X EF X EDn X FI X IR

IR	Ingestion rate of fruits or vegetables	0.1 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cv	Concentration of radionuclides in vegetables	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	3.2E-06	pCi/kg	U_{234}	3.5E-04	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	1.8E-05	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	3.8E-04	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	1.0E-05	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	3.6E-04	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E-11	NA
Np_{237+1d}	6.7E-04	2.2E-10	1.5E-13
Pu_{238}	NA	2.2E-10	NA
Ra_{226+8d}	NA	7.8E-10	NA
Ra_{228+1d}	NA	1.0E-10	NA
Rn_{222+4d}	NA	1.7E-12	NA
Sr_{90+1d}	2.1E-03	3.6E-11	7.6E-14
Tc_{99}	NA	1.3E-12	NA
Th_{228+7d}	NA	5.5E-11	NA
Th_{230}	7.5E-02	1.3E-11	9.8E-13
$Th_{232+10d}$	NA	1.7E-10	NA
U_{234}	7.3E-02	1.6E-11	1.2E-12
U_{235+1d}	3.8E-03	1.6E-11	6.1E-14
U_{238+2d}	8.0E-02	2.0E-11	1.6E-12
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 4.0E-12

006633

Table C.III-146
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Lime Sludge Pond with Private Ownership: On-Property Perched Groundwater User
Via Incidental Ingestion of Soil

Intake Equation = CS X EF X EDn X FI X IR

IRs	Ingestion rate of soil (RAGS, 1989)	180 mg/day
EF	Exposure frequency	350 days/year
EDn	Exposure Duration	70 Year
FI	Fractional Intake	1 (unitless)
CS	Concentration of radionuclides in soil	

Cs_{137+1d}	NA	pCi/mg	$Th_{232+10d}$	NA	pCi/mg
Np_{237+1d}	5.10E-06	pCi/mg	U_{234}	2.20E-04	pCi/mg
Pu_{238}	NA	pCi/mg	U_{235+1d}	9.00E-05	pCi/mg
Ra_{226+8d}	NA	pCi/mg	U_{238+2d}	NA	pCi/mg
Ra_{228+1d}	NA	pCi/mg	NA	NA	pCi/mg
Rn_{222+4d}	NA	pCi/mg	NA	NA	pCi/mg
Sr_{90+1d}	5.60E-06	pCi/mg	NA	NA	pCi/mg
Tc_{99}	NA	pCi/mg	NA	NA	pCi/mg
Th_{228+7d}	NA	pCi/mg	NA	NA	pCi/mg
Th_{230}	5.20E-04	pCi/mg	NA	NA	pCi/mg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.80E-11	NA
Np_{237+1d}	2.25E+01	2.20E-10	4.95E-09
Pu_{238}	NA	2.20E-10	NA
Ra_{226+8d}	NA	7.80E-10	NA
Ra_{228+1d}	NA	1.00E-10	NA
Rn_{222+4d}	NA	1.70E-12	NA
Sr_{90+1d}	2.47E+01	3.60E-11	8.89E-10
Tc_{99}	NA	1.30E-12	NA
Th_{228+7d}	NA	5.50E-11	NA
Th_{230}	2.29E+03	1.30E-11	2.98E-08
$Th_{232+10d}$	NA	1.70E-10	NA
U_{234}	9.70E+02	1.60E-11	1.55E-08
U_{235+1d}	3.97E+02	1.60E-11	6.35E-09
U_{238+2d}	NA	2.00E-11	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		5.75E-08

Table C.III–147
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Lime Sludge Pond with Private Ownership: On–Property Perched Groundwater User
Via Ingestion of Drinking Water

ntake Equation = Cw X EF X EDn X FI X IR

IR	Ingestion rate of groundwater (RAGS, 1989)	2 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
FI	Fractional intake for radionuclides	1 (Unitless)
Cw	Concentration of radionuclides in groundwater	(see table below)

Cs_{137+1d}	NA	pCi/l	$Th_{232+10d}$	NA	pCi/l
Np_{237+1d}	9.3E–05	pCi/l	U_{234}	6.4E–01	pCi/l
Pu_{238}	NA	pCi/l	U_{235+1d}	3.4E–02	pCi/l
Ra_{226+8d}	NA	pCi/l	U_{238+2d}	7.0E–01	pCi/l
Ra_{228+1d}	NA	pCi/l	NA	NA	pCi/l
Rn_{222+4d}	NA	pCi/l	NA	NA	pCi/l
Sr_{90+1d}	5.6E–04	pCi/l	NA	NA	pCi/l
Tc_{99}	1.6E–02	pCi/l	NA	NA	pCi/l
Th_{228+7d}	NA	pCi/l	NA	NA	pCi/l
Th_{230}	NA	pCi/l	NA	NA	pCi/l

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	4.6E+00	2.2E–10	1.0E–09
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	2.7E+01	3.6E–11	9.9E–10
Tc_{99}	7.8E+02	1.3E–12	1.0E–09
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	NA	1.3E–11	NA
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	3.1E+04	1.6E–11	5.0E–07
U_{235+1d}	1.7E+03	1.6E–11	2.7E–08
U_{238+2d}	3.4E+04	2.0E–11	6.9E–07
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
		ILCR Summation =	1.2E–06

Table C.III–148
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Lime Sludge Pond with Private Ownership: On–Property Perched Groundwater User
Via Inhalation of Gases and Particulates

Intake Equation = Ca X EF X EDn X IR

IR	Inhalation rate of gases (RAGS, 1989)	20 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Ca	Concentration of radionuclides in air	(see table below)

Cs_{137+1d}	NA	pCi/m^3	$Th_{232+10d}$	NA	pCi/m^3
Np_{237+1d}	2.2E–07	pCi/m^3	U_{234}	NA	pCi/m^3
Pu_{238}	NA	pCi/m^3	U_{235+1d}	NA	pCi/m^3
Ra_{226+8d}	NA	pCi/m^3	U_{238+2d}	NA	pCi/m^3
Ra_{228+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Rn_{222+4d}	NA	pCi/m^3	NA	NA	pCi/m^3
Sr_{90+1d}	2.5E–07	pCi/m^3	NA	NA	pCi/m^3
Tc_{99}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{228+7d}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{230}	2.3E–05	pCi/m^3	NA	NA	pCi/m^3

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	1.9E–11	NA
Np_{237+1d}	1.1E–01	2.9E–08	3.2E–09
Pu_{238}	NA	3.9E–08	NA
Ra_{226+8d}	NA	7.0E–09	NA
Ra_{228+1d}	NA	6.9E–10	NA
Rn_{222+4d}	NA	7.7E–12	NA
Sr_{90+1d}	1.2E–01	6.2E–11	7.4E–12
Tc_{99}	NA	8.3E–12	NA
Th_{228+7d}	NA	7.8E–08	NA
Th_{230}	1.1E+01	2.9E–08	3.2E–07
$Th_{232+10d}$	NA	1.1E–07	NA
U_{234}	NA	2.6E–08	NA
U_{235+1d}	NA	2.5E–08	NA
U_{238+2d}	NA	2.4E–08	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
		ILCR Summation =	3.3E–07

000636

Table C.III – 149
Summary of Intake Quantitation (chemicals) Alternative 6
Lime Sludge Pond with Private Ownership: On – Property Perched Groundwater User
Via Ingestion of Meat Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of meat	0.101 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non – carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non – carcinogens (EDn x365)	25550 days
CS	Concentration of chemicals in meat	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium – total	6.0E – 08	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
arodor – 1254	NA	mg/kg	NA	NA	mg/kg
arodor – 1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

000638

Table C.III-149 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Private Ownership: On-Property Perched Groundwater User
Via Ingestion of Meat Products

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	6.2E-11	3.0E-03	2.1E-08
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		2.1E-08

Compound	ILCR Calculation CDI (mg/kg-day)	CSF $(mg/kg\text{-}day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	6.2E-11	NA	NA.
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

6646

Table C.III-150
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Lime Sludge Pond with Private Ownership: On-Property Perched Groundwater User
Via *Ingestion of Meat Products*

Intake Equation = *Cf X EF X EDn X FI X IR*

IR	Ingestion rate of meat	0.101 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cf	Concentration of radionuclides in meat	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	2.8E-04	pCi/kg	U_{234}	4.1E-02	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	1.7E-02	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	2.0E-05	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	2.1E-01	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	1.7E-03	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E-11	NA
Np_{237+1d}	5.2E-01	2.2E-10	1.1E-10
Pu_{238}	NA	2.2E-10	NA
Ra_{226+8d}	NA	7.8E-10	NA
Ra_{228+1d}	NA	1.0E-10	NA
Rn_{222+4d}	NA	1.7E-12	NA
Sr_{90+1d}	3.9E+02	3.6E-11	1.4E-08
Tc_{99}	NA	1.3E-12	NA
Th_{228+7d}	NA	5.5E-11	NA
Th_{230}	3.2E+00	1.3E-11	4.1E-11
$Th_{232+10d}$	NA	1.7E-10	NA
U_{234}	7.6E+01	1.6E-11	1.2E-09
U_{235+1d}	3.1E+01	1.6E-11	4.9E-10
U_{238+2d}	3.7E-02	2.0E-11	7.4E-13
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 1.6E-08

000639

Table C.III-151
Summary of Intake Quantitation (chemicals) Alternative 6
Lime Sludge Pond with Private Ownership: On-Property Perched Groundwater User
Via Ingestion of Dairy Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of dairy products	0.4 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x365)	25550 days
CS	Concentration of chemicals in animal products	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium-total	2.2E-07	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
arodor-1254	NA	mg/kg	NA	NA	mg/kg
arodor-1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

Table C.III–151 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Private Ownership: On–Property Perched Groundwater User
Via Ingestion of Dairy Products

	HQ Calculation		
Compound	CDI (mg/kg–day)	RfD (mg/kg–day)	HQ (unitless)
antimony	NA	4.0E–04	NA
arsenic	NA	3.0E–04	NA
beryllium	NA	5.0E–03	NA
uranium–total	8.9E–10	3.0E–03	3.0E–07
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor–1254	NA	NA	NA
aroclor–1260	NA	NA	NA
dieldrin	NA	5.0E–05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			3.0E–07

	ILCR Calculation		
Compound	CDI (mg/kg–day)	CSF $(mg/kg–day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium–total	8.9E–10	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E–02	NA
aroclor–1254	NA	7.7E+00	NA
aroclor–1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

000641

6643

Table C.III–152
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Lime Sludge Pond with Private Ownership: On–Property Perched Groundwater User
Via Ingestion of Dairy Products

Intake Equation = Cp X EF X EDn X FI X IR

IR	Ingestion rate of dairy products	0.4 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cp	Concentration of radionuclides in animal products	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	2.6E–05	pCi/kg	U_{234}	1.2E–01	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	5.0E–02	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	7.2E–05	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	1.1E+00	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	1.4E–03	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	1.9E–01	2.2E–10	4.1E–11
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	7.7E+03	3.6E–11	2.8E–07
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	1.0E+01	1.3E–11	1.4E–10
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	9.0E+02	1.6E–11	1.4E–08
U_{235+1d}	3.7E+02	1.6E–11	5.9E–09
U_{238+2d}	5.3E–01	2.0E–11	1.1E–11
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 3.0E–07

000642

Table C.III-153
Summary of Intake and Risk Quantitation (chemicals) Alternative 6
Lime Sludge Pond with Private Ownership: On-Property Perched Groundwater User
Via Ingestion of Vegetables and Fruits

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of fruits or vegetables	0.122 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x365)	25550 days
CS	Concentration of chemicals in vegetables	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium-total	2.9E-05	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
arodor-1254	NA	mg/kg	NA	NA	mg/kg
arodor-1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

000643

6646

Table C.III–153 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Private Ownership: On–Property Perched Groundwater User
Via Ingestion of Vegetables and Fruits

	HQ Calculation		
Compound	CDI (mg/kg–day)	RfD (mg/kg–day)	HQ (unitless)
antimony	NA	4.0E–04	NA
arsenic	NA	3.0E–04	NA
beryllium	NA	5.0E–03	NA
uranium–total	4.9E–08	3.0E–03	1.6E–05
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor–1254	NA	NA	NA
aroclor–1260	NA	NA	NA
dieldrin	NA	5.0E–05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	HQ Summation =		1.6E–05

	ILCR Calculation		
Compound	CDI (mg/kg–day)	CSF $(mg/kg–day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium–total	4.9E–08	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E–02	NA
aroclor–1254	NA	7.7E+00	NA
aroclor–1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	ILCR Summation =		NA

Table C.III–154
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Lime Sludge Pond with Private Ownership: On–Property Perched Groundwater User
Via Ingestion of Vegetables and Fruits

Intake Equation = Cv X EF X EDn X FI X IR

IR	Ingestion rate of fruits or vegetables	0.122 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cv	Concentration of radionuclides in vegetables	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	5.1E–02	pCi/kg	U_{234}	1.9E+00	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	7.7E–01	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	9.8E–03	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	1.4E+01	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	4.7E–01	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	1.5E+02	2.2E–10	3.4E–08
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	4.2E+04	3.6E–11	1.5E–06
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	1.4E+03	1.3E–11	1.8E–08
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	5.6E+03	1.6E–11	9.0E–08
U_{235+1d}	2.3E+03	1.6E–11	3.7E–08
U_{238+2d}	2.9E+01	2.0E–11	5.9E–10
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		1.7E–06

000645

Table C.III-155
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Lime Sludge Pond with Private Ownership: On-Property Perched Groundwater User
Via External Radiation

Dose Equivalency Equat: = $[DR \times EF \times EDn \times ET_i \times (1-SH_i)] + [DR \times EF \times EDn \times ET_o \times (1-SH_o)]$

EF	Fraction of year spent exposured	0.96 (unitless)
ED	Exposure duration	70 Year
ET_i	Fraction of day spent indoors	0.76 (unitless)
ET_o	Fraction of day spent outdoors	0.24 (unitless)
SH_i	Shield factor indoors	0.5 (unitless)
SH_o	Shield factor outdoors	NA (unitless)
DR	Radionuclide specific dose concentrations	(see table below)

Cs_{137+1d}	NA	pCi/g	$Th_{232+10d}$	NA	pCi/g
Np_{237+1d}	5.10E-03	pCi/g	U_{234}	2.20E-01	pCi/g
Pu_{238}	NA	pCi/g	U_{235+1d}	9.00E-02	pCi/g
Ra_{226+8d}	NA	pCi/g	U_{238+2d}	NA	pCi/g
Ra_{228+1d}	NA	pCi/g	NA	NA	pCi/g
Rn_{222+4d}	NA	pCi/g	NA	NA	pCi/g
Sr_{90+1d}	5.60E-03	pCi/g	NA	NA	pCi/g
Tc_{99}	NA	pCi/g	NA	NA	pCi/g
Th_{228+7d}	NA	pCi/g	NA	NA	pCi/g
Th_{230}	5.20E-01	pCi/g	NA	NA	pCi/g

Radionuclides	CDI (year pCi/g)	CSF $(g/pCi-year)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.0E-06	NA
Np_{237+1d}	2.1E-01	4.3E-07	9.1E-08
Pu_{238}	NA	2.8E-11	NA
Ra_{226+8d}	NA	6.0E-06	NA
Ra_{228+1d}	NA	2.9E-06	NA
Rn_{222+4d}	NA	5.9E-06	NA
Sr_{90+1d}	2.3E-01	NA	NA
Tc_{99}	NA	6.0E-13	NA
Th_{228+7d}	NA	5.6E-06	NA
Th_{230}	2.2E+01	5.4E-11	1.2E-09
$Th_{232+10d}$	NA	8.5E-06	NA
U_{234}	9.2E+00	3.0E-11	2.7E-10
U_{235+1d}	3.7E+00	2.4E-07	9.0E-07
U_{238+2d}	NA	5.1E-08	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
		ILCR Summation =	9.9E-07

000646

Table C.III–156
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Lime Sludge Pond with Federal Ownership: On–Property RME Resident Farmer (Adult)
Via Incidental Ingestion of Soil

Intake Equation = CS X EF X EDn X FI X IR

IRs	Ingestion rate of soil (RAGS, 1989)	180 mg/day
EF	Exposure frequency	350 days/year
EDn	Exposure Duration	70 Year
FI	Fractional Intake	1 (unitless)
CS	Concentration of radionuclides in soil	

Cs_{137+1d}	NA	pCi/mg	$Th_{232+10d}$	NA	pCi/mg
Np_{237+1d}	5.10E–06	pCi/mg	U_{234}	2.20E–04	pCi/mg
Pu_{238}	NA	pCi/mg	U_{235+1d}	9.00E–05	pCi/mg
Ra_{226+8d}	NA	pCi/mg	U_{238+2d}	NA	pCi/mg
Ra_{228+1d}	NA	pCi/mg	NA	NA	pCi/mg
Rn_{222+4d}	NA	pCi/mg	NA	NA	pCi/mg
Sr_{90+1d}	5.60E–06	pCi/mg	NA	NA	pCi/mg
Tc_{99}	NA	pCi/mg	NA	NA	pCi/mg
Th_{228+7d}	NA	pCi/mg	NA	NA	pCi/mg
Th_{230}	5.20E–04	pCi/mg	NA	NA	pCi/mg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.80E–11	NA
Np_{237+1d}	2.25E+01	2.20E–10	4.95E–09
Pu_{238}	NA	2.20E–10	NA
Ra_{226+8d}	NA	7.80E–10	NA
Ra_{228+1d}	NA	1.00E–10	NA
Rn_{222+4d}	NA	1.70E–12	NA
Sr_{90+1d}	2.47E+01	3.60E–11	8.89E–10
Tc_{99}	NA	1.30E–12	NA
Th_{228+7d}	NA	5.50E–11	NA
Th_{230}	2.29E+03	1.30E–11	2.98E–08
$Th_{232+10d}$	NA	1.70E–10	NA
U_{234}	9.70E+02	1.60E–11	1.55E–08
U_{235+1d}	3.97E+02	1.60E–11	6.35E–09
U_{238+2d}	NA	2.00E–11	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 5.75E–08

Table C.III-157
Summary of Intake Quantitation (chemicals) Alternative 6
Lime Sludge Pond with Federal Ownership: On-Property RME Resident Farmer (Adult)
Via Drinking Water Ingestion

Intake Equation = $\frac{CS \times EF \times ED \times IR}{BW \times AT}$

IR	Ingestion rate of groundwater (RAGS, 1989)	2 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x365)	25550 days
CS	Concentration of chemicals in groundwater	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/l	NA	NA	mg/l
arsenic	NA	mg/l	NA	NA	mg/l
beryllium	NA	mg/l	NA	NA	mg/l
uranium-total	6.00E-06	mg/l	NA	NA	mg/l
benzo(a)pyrene	NA	mg/l	NA	NA	mg/l
carbazole	NA	mg/l	NA	NA	mg/l
arodor-1254	NA	mg/l	NA	NA	mg/l
arodor-1260	NA	mg/l	NA	NA	mg/l
dieldrin	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l			

References

Table C.III–157 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Federal Ownership: On–Property RME Resident Farmer (Adult)
Via Drinking Water Ingestion

	HQ Calculation		
Compound	CDI (mg/kg–day)	RfD (mg/kg–day)	HQ (unitless)
antimony	NA	4.00E–04	NA
arsenic	NA	3.00E–04	NA
beryllium	NA	5.00E–03	NA
uranium–total	1.64E–07	3.00E–03	5.48E–05
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor–1254	NA	NA	NA
aroclor–1260	NA	NA	NA
dieldrin	NA	5.00E–05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	HQ Summation =		5.48E–05

	ILCR Calculation		
Compound	CDI (mg/kg–day)	CSF $(mg/kg–day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.75E+00	NA
beryllium	NA	4.30E+00	NA
uranium–total	1.64E–07	NA	NA
benzo(a)pyrene	NA	7.30E+00	NA
carbazole	NA	2.00E–02	NA
aroclor–1254	NA	7.70E+00	NA
aroclor–1260	NA	7.70E+00	NA
dieldrin	NA	1.60E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	ILCR Summation =		NA

6646

Table C.III-158
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Lime Sludge Pond with Federal Ownership: On-Property RME Resident Farmer (Adult)
Via Ingestion of Drinking Water

Intake Equation = Cw X EF X EDn X FI X IR

IR	Ingestion rate of groundwater (RAGS, 1989)	2 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
FI	Fractional intake for radionuclides	1 (Unitless)
Cw	Concentration of radionuclides in groundwater	(see table below)

Cs_{137+1d}	NA	pCi/l	$Th_{232+10d}$	NA	pCi/l
Np_{237+1d}	NA	pCi/l	U_{234}	1.9E-03	pCi/l
Pu_{238}	NA	pCi/l	U_{235+1d}	1.0E-04	pCi/l
Ra_{226+8d}	NA	pCi/l	U_{238+2d}	2.0E-03	pCi/l
Ra_{228+1d}	NA	pCi/l	NA	NA	pCi/l
Rn_{222+4d}	NA	pCi/l	NA	NA	pCi/l
Sr_{90+1d}	NA	pCi/l	NA	NA	pCi/l
Tc_{99}	NA	pCi/l	NA	NA	pCi/l
Th_{228+7d}	NA	pCi/l	NA	NA	pCi/l
Th_{230}	NA	pCi/l	NA	NA	pCi/l

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E-11	NA
Np_{237+1d}	NA	2.2E-10	NA
Pu_{238}	NA	2.2E-10	NA
Ra_{226+8d}	NA	7.8E-10	NA
Ra_{228+1d}	NA	1.0E-10	NA
Rn_{222+4d}	NA	1.7E-12	NA
Sr_{90+1d}	NA	3.6E-11	NA
Tc_{99}	NA	1.3E-12	NA
Th_{228+7d}	NA	5.5E-11	NA
Th_{230}	NA	1.3E-11	NA
$Th_{232+10d}$	NA	1.7E-10	NA
U_{234}	9.3E+01	1.6E-11	1.5E-09
U_{235+1d}	4.9E+00	1.6E-11	7.8E-11
U_{238+2d}	9.8E+01	2.0E-11	2.0E-09
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		3.5E-09

000650

Table C.III-159
Summary of Intake Quantitation (chemicals) Alternative 6
Lime Sludge Pond with Federal Ownership: On-Property RME Resident Farmer (Adult)
Via Dermal Contact while Bathing

Intake Equation = $\frac{DA \times EF \times ED \times SA}{BW \times AT}$

DA	Dermal absorbed dose	csv	mg/cm^2-day
EF	Exposure frequency	350	days/year
EDn	Exposure duration for non-carcinogens	70	Year
EDc	Exposure duration for carcinogens	70	Year
BW	Body weight	70	kg
ATc	Average time for carcinogens (lifetime)	25550	days
ATn	Average time for non-carcinogens (EDn x365)	25550	days
SA	Skin surface area available for contact	23000	cm^2

Chemical Concentrations

Compound	DA	Units	Compound	DA	Units
antimony	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
arsenic	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
beryllium	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
uranium-total	1.50E-12	mg/cm^2-day	NA	NA	mg/cm^2-day
benzo(a)pyrene	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
carbazole	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
arodor-1254	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
arodor-1260	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
dieldrin	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day			

References

Table C.III–159 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Federal Ownership: On–Property RME Resident Farmer (Adult)
Via Dermal Contact while Bathing

	HQ Calculation		
Compound	CDI (mg/kg–day)	RfD (mg/kg–day)	HQ (unitless)
antimony	NA	6.00E–05	NA
arsenic	NA	2.85E–04	NA
beryllium	NA	5.00E–03	NA
uranium–total	4.73E–10	1.50E–04	3.15E–06
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor–1254	NA	NA	NA
aroclor–1260	NA	NA	NA
dieldrin	NA	4.50E–05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			3.15E–06

	ILCR Calculation		
Compound	CDI (mg/kg–day)	CSF $(mg/kg–day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.90E+00	NA
beryllium	NA	4.30E+00	NA
uranium–total	4.73E–10	NA	NA
benzo(a)pyrene	NA	NA	NA
carbazole	NA	2.22E–02	NA
aroclor–1254	NA	1.03E+01	NA
aroclor–1260	NA	1.03E+01	NA
dieldrin	NA	1.78E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

Table C.III–160
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Lime Sludge Pond with Federal Ownership: On–Property RME Resident Farmer (Adult)
Via Inhalation of Gases and Particulates

Intake Equation = Ca X EF X EDn X IR

IR	Inhalation rate of gases (RAGS, 1989)	20 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Ca	Concentration of radionuclides in air	(see table below)

Cs_{137+1d}	NA	pCi/m^3	$Th_{232+10d}$	NA	pCi/m^3
Np_{237+1d}	2.2E–07	pCi/m^3	U_{234}	NA	pCi/m^3
Pu_{238}	NA	pCi/m^3	U_{235+1d}	NA	pCi/m^3
Ra_{226+8d}	NA	pCi/m^3	U_{238+2d}	NA	pCi/m^3
Ra_{228+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Rn_{222+4d}	NA	pCi/m^3	NA	NA	pCi/m^3
Sr_{90+1d}	2.5E–07	pCi/m^3	NA	NA	pCi/m^3
Tc_{99}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{228+7d}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{230}	2.3E–05	pCi/m^3	NA	NA	pCi/m^3

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	1.9E–11	NA
Np_{237+1d}	1.1E–01	2.9E–08	3.2E–09
Pu_{238}	NA	3.9E–08	NA
Ra_{226+8d}	NA	7.0E–09	NA
Ra_{228+1d}	NA	6.9E–10	NA
Rn_{222+4d}	NA	7.7E–12	NA
Sr_{90+1d}	1.2E–01	6.2E–11	7.4E–12
Tc_{99}	NA	8.3E–12	NA
Th_{228+7d}	NA	7.8E–08	NA
Th_{230}	1.1E+01	2.9E–08	3.2E–07
$Th_{232+10d}$	NA	1.1E–07	NA
U_{234}	NA	2.6E–08	NA
U_{235+1d}	NA	2.5E–08	NA
U_{238+2d}	NA	2.4E–08	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		3.3E–07

000553

Table C.III–161
Summary of Intake Quantitation (chemicals) Alternative 6
Lime Sludge Pond with Federal Ownership: On–Property RME Resident Farmer (Adult)
Via Ingestion of Meat Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of meat	0.101 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x365)	25550 days
CS	Concentration of chemicals in meat	

Chemical Concentrations

Compound	Concentration	Units
antimony	NA	mg/kg
arsenic	NA	mg/kg
beryllium	NA	mg/kg
uranium–total	6.0E–08	mg/kg
benzo(a)pyrene	NA	mg/kg
carbazole	NA	mg/kg
arodor–1254	NA	mg/kg
arodor–1260	NA	mg/kg
dieldrin	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg

Compound	Concentration	Units
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg

References

Table C.III-161 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Federal Ownership: On-Property RME Resident Farmer (Adult)
Via Ingestion of Meat Products

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	6.2E-11	3.0E-03	2.1E-08
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			2.1E-08

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	6.2E-11	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

Table C.III–162
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Lime Sludge Pond with Federal Ownership: On–Property RME Resident Farmer (Adult)
Via Ingestion of Meat Products

Intake Equation = Cf X EF X EDn X FI X IR

IR	Ingestion rate of meat	0.101 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cf	Concentration of radionuclides in meat	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	2.8E–04	pCi/kg	U_{234}	4.1E–02	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	1.7E–02	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	2.0E–05	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	2.1E–01	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	1.7E–03	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	5.2E–01	2.2E–10	1.1E–10
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	3.9E+02	3.6E–11	1.4E–08
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	3.2E+00	1.3E–11	4.1E–11
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	7.6E+01	1.6E–11	1.2E–09
U_{235+1d}	3.1E+01	1.6E–11	4.9E–10
U_{238+2d}	3.7E–02	2.0E–11	7.4E–13
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 1.6E–08

000576

Table C.III–163
Summary of Intake Quantitation (chemicals) Alternative 6
Lime Sludge Pond with Federal Ownership: On–Property RME Resident Farmer (Adult)
Via Ingestion of Dairy Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of dairy products	0.4 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x365)	25550 days
CS	Concentration of chemicals in animal products	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium–total	2.2E–07	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
arodor–1254	NA	mg/kg	NA	NA	mg/kg
arodor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

Table C.III-163 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Federal Ownership: On-Property RME Resident Farmer (Adult)
Via Ingestion of Dairy Products

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	8.9E-10	3.0E-03	3.0E-07
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			3.0E-07

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	8.9E-10	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

Table C.III-164
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Lime Sludge Pond with Federal Ownership: On-Property RME Resident Farmer (Adult)
Via Ingestion of Dairy Products

Intake Equation = Cp X EF X EDn X FI X IR

IR	Ingestion rate of dairy products	0.4 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cp	Concentration of radionuclides in animal products	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	2.6E-05	pCi/kg	U_{234}	1.2E-01	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	5.0E-02	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	7.2E-05	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	1.1E+00	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	1.4E-03	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E-11	NA
Np_{237+1d}	1.9E-01	2.2E-10	4.1E-11
Pu_{238}	NA	2.2E-10	NA
Ra_{226+8d}	NA	7.8E-10	NA
Ra_{228+1d}	NA	1.0E-10	NA
Rn_{222+4d}	NA	1.7E-12	NA
Sr_{90+1d}	7.7E+03	3.6E-11	2.8E-07
Tc_{99}	NA	1.3E-12	NA
Th_{228+7d}	NA	5.5E-11	NA
Th_{230}	1.0E+01	1.3E-11	1.4E-10
$Th_{232+10d}$	NA	1.7E-10	NA
U_{234}	9.0E+02	1.6E-11	1.4E-08
U_{235+1d}	3.7E+02	1.6E-11	5.9E-09
U_{238+2d}	5.3E-01	2.0E-11	1.1E-11
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 3.0E-07

Table C.III – 165
Summary of Intake and Risk Quantitation (chemicals) Alternative 6
Lime Sludge Pond with Federal Ownership: On – Property RME Resident Farmer (Adult)
Via Ingestion of Vegetables and Fruits

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of fruits or vegetables	0.122 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x365)	25550 days
CS	Concentration of chemicals in vegetables	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium-total	2.9E-05	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
arodor-1254	NA	mg/kg	NA	NA	mg/kg
arodor-1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

Table C.III–165 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Federal Ownership: On–Property RME Resident Farmer (Adult)
Via Ingestion of Vegetables and Fruits

	HQ Calculation		
Compound	CDI (mg/kg–day)	RfD (mg/kg–day)	HQ (unitless)
antimony	NA	4.0E–04	NA
arsenic	NA	3.0E–04	NA
beryllium	NA	5.0E–03	NA
uranium–total	4.9E–08	3.0E–03	1.6E–05
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor–1254	NA	NA	NA
aroclor–1260	NA	NA	NA
dieldrin	NA	5.0E–05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	HQ Summation =		1.6E–05

	ILCR Calculation		
Compound	CDI (mg/kg–day)	CSF $(mg/kg–day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium–total	4.9E–08	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E–02	NA
aroclor–1254	NA	7.7E+00	NA
aroclor–1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	ILCR Summation =		NA

000661

6643

Table C.III–166
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Lime Sludge Pond with Federal Ownership: On–Property RME Resident Farmer (Adult)
Via Ingestion of Vegetables and Fruits

Intake Equation = Cv X EF X EDn X FI X IR

IR	Ingestion rate of fruits or vegetables	0.122 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cv	Concentration of radionuclides in vegetables	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	5.1E–02	pCi/kg	U_{234}	1.9E+00	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	7.7E–01	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	9.8E–03	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	1.4E+01	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	4.7E–01	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	1.5E+02	2.2E–10	3.4E–08
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	4.2E+04	3.6E–11	1.5E–06
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	1.4E+03	1.3E–11	1.8E–08
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	5.6E+03	1.6E–11	9.0E–08
U_{235+1d}	2.3E+03	1.6E–11	3.7E–08
U_{238+2d}	2.9E+01	2.0E–11	5.9E–10
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 1.7E–06

000662

Table C.III-167
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Lime Sludge Pond with Federal Ownership: On-Property RME Resident Farmer (Adult)
Via External Radiation

Dose Equivalency Equat: = $[DR \times EF \times EDn \times ET_i \times (1-SH_i)] + [DR \times EF \times EDn \times ET_o \times (1-SH_o)]$

EF	Fraction of year spent exposured	0.96 (unitless)
ED	Exposure duration	70 Year
ET_i	Fraction of day spent indoors	0.76 (unitless)
ET_o	Fraction of day spent outdoors	0.24 (unitless)
SH_i	Shield factor indoors	0.5 (unitless)
SH_o	Shield factor outdoors	NA (unitless)
DR	Radionuclide specific dose concentrations	(see table below)

Cs_{137+1d}	NA	pCi/g	$Th_{232+10d}$	NA	pCi/g
Np_{237+1d}	5.10E-03	pCi/g	U_{234}	2.20E-01	pCi/g
Pu_{238}	NA	pCi/g	U_{235+1d}	9.00E-02	pCi/g
Ra_{226+8d}	NA	pCi/g	U_{238+2d}	NA	pCi/g
Ra_{228+1d}	NA	pCi/g	NA	NA	pCi/g
Rn_{222+4d}	NA	pCi/g	NA	NA	pCi/g
Sr_{90+1d}	5.60E-03	pCi/g	NA	NA	pCi/g
Tc_{99}	NA	pCi/g	NA	NA	pCi/g
Th_{228+7d}	NA	pCi/g	NA	NA	pCi/g
Th_{230}	5.20E-01	pCi/g	NA	NA	pCi/g

Radionuclides	CDI (year pCi/g)	CSF $(g/pCi-year)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.0E-06	NA
Np_{237+1d}	2.1E-01	4.3E-07	9.1E-08
Pu_{238}	NA	2.8E-11	NA
Ra_{226+8d}	NA	6.0E-06	NA
Ra_{228+1d}	NA	2.9E-06	NA
Rn_{222+4d}	NA	5.9E-06	NA
Sr_{90+1d}	2.3E-01	NA	NA
Tc_{99}	NA	6.0E-13	NA
Th_{228+7d}	NA	5.6E-06	NA
Th_{230}	2.2E+01	5.4E-11	1.2E-09
$Th_{232+10d}$	NA	8.5E-06	NA
U_{234}	9.2E+00	3.0E-11	2.7E-10
U_{235+1d}	3.7E+00	2.4E-07	9.0E-07
U_{238+2d}	NA	5.1E-08	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation	=	9.9E-07

000663

Table C.III–168
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Lime Sludge Pond with Private Ownership: On–Property Farmer (Child)
Via Incidental Ingestion of Soil

Intake Equation = CS X EF X EDn X FI X IR

IRs	Ingestion rate of soil (RAGS, 1989)	200 mg/day
EF	Exposure frequency	350 days/year
EDn	Exposure Duration	6 Year
FI	Fractional Intake	1 (unitless)
CS	Concentration of radionuclides in soil	

Cs_{137+1d}	0.00E+00	pCi/mg	$Th_{232+10d}$	0.00E+00	pCi/mg
Np_{237+1d}	5.10E–06	pCi/mg	U_{234}	2.20E–04	pCi/mg
Pu_{238}	0.00E+00	pCi/mg	U_{235+1d}	9.00E–05	pCi/mg
Ra_{226+8d}	0.00E+00	pCi/mg	U_{238+2d}	0.00E+00	pCi/mg
Ra_{228+1d}	0.00E+00	pCi/mg	0	0.00E+00	pCi/mg
Rn_{222+4d}	0.00E+00	pCi/mg	0	0.00E+00	pCi/mg
Sr_{90+1d}	5.60E–06	pCi/mg	0	0.00E+00	pCi/mg
Tc_{99}	0.00E+00	pCi/mg	0	0.00E+00	pCi/mg
Th_{228+7d}	0.00E+00	pCi/mg	0	0.00E+00	pCi/mg
Th_{230}	5.20E–04	pCi/mg	0	0.00E+00	pCi/mg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.80E–11	NA
Np_{237+1d}	2.14E+00	2.20E–10	4.71E–10
Pu_{238}	NA	2.20E–10	NA
Ra_{226+8d}	NA	7.80E–10	NA
Ra_{228+1d}	NA	1.00E–10	NA
Rn_{222+4d}	NA	1.70E–12	NA
Sr_{90+1d}	2.35E+00	3.60E–11	8.47E–11
Tc_{99}	NA	1.30E–12	NA
Th_{228+7d}	NA	5.50E–11	NA
Th_{230}	2.18E+02	1.30E–11	2.84E–09
$Th_{232+10d}$	NA	1.70E–10	NA
U_{234}	9.24E+01	1.60E–11	1.48E–09
U_{235+1d}	3.78E+01	1.60E–11	6.05E–10
U_{238+2d}	NA	2.00E–11	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA

ILCR Summation = 5.48E–09

000664

Table C.III-169
Summary of Intake Quantitation (chemicals) Alternative 6
Lime Sludge Pond with Private Ownership: On-Property Farmer (Child)
Via Drinking Water Ingestion

Intake Equation = $\frac{CS \times EF \times ED \times IR}{BW \times AT}$

IR	Ingestion rate of groundwater (RAGS, 1989)	1 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x365)	2190 days
CS	Concentration of chemicals in groundwater	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	0.00E+00	mg/l	0	0.00E+00	mg/l
arsenic	0.00E+00	mg/l	0	0.00E+00	mg/l
beryllium	0.00E+00	mg/l	0	0.00E+00	mg/l
uranium-total	6.00E-06	mg/l	0	0.00E+00	mg/l
benzo(a)pyrene	0.00E+00	mg/l	0	0.00E+00	mg/l
carbazole	0.00E+00	mg/l	0	0.00E+00	mg/l
arodor-1254	0.00E+00	mg/l	0	0.00E+00	mg/l
arodor-1260	0.00E+00	mg/l	0	0.00E+00	mg/l
dieldrin	0.00E+00	mg/l	0	0.00E+00	mg/l
0	0.00E+00	mg/l	0	0.00E+00	mg/l
0	0.00E+00	mg/l	0	0.00E+00	mg/l
0	0.00E+00	mg/l	0	0.00E+00	mg/l
0	0.00E+00	mg/l	0	0.00E+00	mg/l
0	0.00E+00	mg/l	0	0.00E+00	mg/l
0	0.00E+00	mg/l	0	0.00E+00	mg/l
0	0.00E+00	mg/l			

References

3200900665

Table C.III-169 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Private Ownership: On-Property Farmer (Child)
Via Drinking Water Ingestion

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.00E-04	NA
arsenic	NA	3.00E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	3.84E-07	3.00E-03	1.28E-04
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.00E-05	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
HQ Summation =			1.28E-04

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.75E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	3.29E-08	NA	NA
benzo(a)pyrene	NA	7.30E+00	NA
carbazole	NA	2.00E-02	NA
aroclor-1254	NA	7.70E+00	NA
aroclor-1260	NA	7.70E+00	NA
dieldrin	NA	1.60E+01	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
ILCR Summation =			0.00E+00

Table C.III–170
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Lime Sludge Pond with Private Ownership: On–Property Farmer (Child)
Via Ingestion of Drinking Water

ntake Equation = Cw X EF X EDn X FI X IR

IR	Ingestion rate of groundwater (RAGS, 1989)	1 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
FI	Fractional intake for radionuclides	1 (Unitless)
Cw	Concentration of radionuclides in groundwater	(see table below)

Cs_{137+1d}	0.0E+00	pCi/l	$Th_{232+10d}$	0.0E+00	pCi/l
Np_{237+1d}	0.0E+00	pCi/l	U_{234}	1.9E–03	pCi/l
Pu_{238}	0.0E+00	pCi/l	U_{235+1d}	1.0E–04	pCi/l
Ra_{226+8d}	0.0E+00	pCi/l	U_{238+2d}	2.0E–03	pCi/l
Ra_{228+1d}	0.0E+00	pCi/l	0.0E+00	0.0E+00	pCi/l
Rn_{222+4d}	0.0E+00	pCi/l	0.0E+00	0.0E+00	pCi/l
Sr_{90+1d}	0.0E+00	pCi/l	0.0E+00	0.0E+00	pCi/l
Tc_{99}	0.0E+00	pCi/l	0.0E+00	0.0E+00	pCi/l
Th_{228+7d}	0.0E+00	pCi/l	0.0E+00	0.0E+00	pCi/l
Th_{230}	0.0E+00	pCi/l	0.0E+00	0.0E+00	pCi/l

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	NA	2.2E–10	NA
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	NA	1.3E–11	NA
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	4.0E+00	1.6E–11	6.4E–11
U_{235+1d}	2.1E–01	1.6E–11	3.4E–12
U_{238+2d}	4.2E+00	2.0E–11	8.4E–11
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
ILCR Summation	=		1.5E–10

000667

Table C.III-171
Summary of Intake Quantitation (chemicals) Alternative 6
Lime Sludge Pond with Private Ownership: On-Property Farmer (Child)
Via Dermal Contact while Bathing

Intake Equation = $\frac{DA \times EF \times ED \times SA}{BW \times AT}$

DA	Dermal absorbed dose	csv	mg/cm^2-day
EF	Exposure frequency	350	days/year
EDn	Exposure duration for non-carcinogens	6	Year
EDc	Exposure duration for carcinogens	6	Year
BW	Body weight	15	kg
ATc	Average time for carcinogens (lifetime)	25550	days
ATn	Average time for non-carcinogens (EDn x365)	2190	days
SA	Skin surface area available for contact	8000	cm^2

Chemical Concentrations

Compound	DA	Units	Compound	DA	Units
antimony	NA	mg/cm^2-day	0	NA	mg/cm^2-day
arsenic	NA	mg/cm^2-day	0	NA	mg/cm^2-day
beryllium	NA	mg/cm^2-day	0	NA	mg/cm^2-day
uranium-total	1.50E-12	mg/cm^2-day	0	NA	mg/cm^2-day
benzo(a)pyrene	NA	mg/cm^2-day	0	NA	mg/cm^2-day
carbazole	NA	mg/cm^2-day	0	NA	mg/cm^2-day
arodor-1254	NA	mg/cm^2-day	0	NA	mg/cm^2-day
arodor-1260	NA	mg/cm^2-day	0	NA	mg/cm^2-day
dieldrin	NA	mg/cm^2-day	0	NA	mg/cm^2-day
0	NA	mg/cm^2-day	0	NA	mg/cm^2-day
0	NA	mg/cm^2-day	0	NA	mg/cm^2-day
0	NA	mg/cm^2-day	0	NA	mg/cm^2-day
0	NA	mg/cm^2-day	0	NA	mg/cm^2-day
0	NA	mg/cm^2-day	0	NA	mg/cm^2-day
0	NA	mg/cm^2-day	0	NA	mg/cm^2-day
0	NA	mg/cm^2-day			

References

Table C.III–171
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Private Ownership: On–Property Farmer (Child)
Via Dermal Contact while Bathing

	HQ Calculation		
Compound	CDI (mg/kg–day)	RfD (mg/kg–day)	HQ (unitless)
antimony	NA	6.00E–05	NA
arsenic	NA	2.85E–04	NA
beryllium	NA	5.00E–03	NA
uranium–total	7.67E–10	1.50E–04	5.11E–06
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor–1254	NA	NA	NA
aroclor–1260	NA	NA	NA
dieldrin	NA	4.50E–05	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
HQ Summation =			5.11E–06

	ILCR Calculation		
Compound	CDI (mg/kg–day)	CSF $(mg/kg–day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.90E+00	NA
beryllium	NA	4.30E+00	NA
uranium–total	6.58E–11	NA	NA
benzo(a)pyrene	NA	NA	NA
carbazole	NA	2.22E–02	NA
aroclor–1254	NA	1.03E+01	NA
aroclor–1260	NA	1.03E+01	NA
dieldrin	NA	1.78E+01	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
ILCR Summation =			0.00E+00

699069

Table C.III-172
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Lime Sludge Pond with Private Ownership: On-Property Farmer (Child)
Via Inhalation of Gases and Particulates

Intake Equation = Ca X EF X EDn X IR

IR	Inhalation rate of gases (RAGS, 1989)	12 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Ca	Concentration of radionuclides in air	(see table below)

Cs_{137+1d}	0.0E+00	pCi/m^3	$Th_{232+10d}$	0.0E+00	pCi/m^3
Np_{237+1d}	2.2E-07	pCi/m^3	U_{234}	0.0E+00	pCi/m^3
Pu_{238}	0.0E+00	pCi/m^3	U_{235+1d}	0.0E+00	pCi/m^3
Ra_{226+8d}	0.0E+00	pCi/m^3	U_{238+2d}	0.0E+00	pCi/m^3
Ra_{228+1d}	0.0E+00	pCi/m^3	0.0E+00	0.0E+00	pCi/m^3
Rn_{222+4d}	0.0E+00	pCi/m^3	0.0E+00	0.0E+00	pCi/m^3
Sr_{90+1d}	2.5E-07	pCi/m^3	0.0E+00	0.0E+00	pCi/m^3
Tc_{99}	0.0E+00	pCi/m^3	0.0E+00	0.0E+00	pCi/m^3
Th_{228+7d}	0.0E+00	pCi/m^3	0.0E+00	0.0E+00	pCi/m^3
Th_{230}	2.3E-05	pCi/m^3	0.0E+00	0.0E+00	pCi/m^3

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	1.9E-11	NA
Np_{237+1d}	5.6E-03	2.9E-08	1.6E-10
Pu_{238}	NA	3.9E-08	NA
Ra_{226+8d}	NA	7.0E-09	NA
Ra_{228+1d}	NA	6.9E-10	NA
Rn_{222+4d}	NA	7.7E-12	NA
Sr_{90+1d}	6.2E-03	6.2E-11	3.8E-13
Tc_{99}	NA	8.3E-12	NA
Th_{228+7d}	NA	7.8E-08	NA
Th_{230}	5.7E-01	2.9E-08	1.7E-08
$Th_{232+10d}$	NA	1.1E-07	NA
U_{234}	NA	2.6E-08	NA
U_{235+1d}	NA	2.5E-08	NA
U_{238+2d}	NA	2.4E-08	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
	ILCR Summation	=	1.7E-08

000670

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Table C.III – 173
Summary of Intake Quantitation (chemicals) Alternative 6
Lime Sludge Pond with Private Ownership: On – Property Farmer (Child)
Via Ingestion of Meat Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of meat	0.039 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non – carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non – carcinogens (EDn x365)	2190 days
CS	Concentration of chemicals in meat	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	0.0E+00	mg/kg	***	0.0E+00	mg/kg
arsenic	0.0E+00	mg/kg	***	0.0E+00	mg/kg
beryllium	0.0E+00	mg/kg	***	0.0E+00	mg/kg
uranium – total	6.0E–08	mg/kg	***	0.0E+00	mg/kg
benzo(a)pyrene	0.0E+00	mg/kg	***	0.0E+00	mg/kg
carbazole	0.0E+00	mg/kg	***	0.0E+00	mg/kg
arodor – 1254	0.0E+00	mg/kg	***	0.0E+00	mg/kg
arodor – 1260	0.0E+00	mg/kg	***	0.0E+00	mg/kg
dieldrin	0.0E+00	mg/kg	***	0.0E+00	mg/kg
0	0.0E+00	mg/kg	***	0.0E+00	mg/kg
0	0.0E+00	mg/kg	***	0.0E+00	mg/kg
0	0.0E+00	mg/kg	***	0.0E+00	mg/kg
0	0.0E+00	mg/kg	***	0.0E+00	mg/kg
0	0.0E+00	mg/kg	***	0.0E+00	mg/kg
0	0.0E+00	mg/kg	***	0.0E+00	mg/kg
0	0.0E+00	mg/kg			

References

000671

Table C.III–173 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Private Ownership: On–Property Farmer (Child)
Via Ingestion of Meat Products

	HQ Calculation		
Compound	CDI (mg/kg–day)	RfD (mg/kg–day)	HQ (unitless)
antimony	NA	4.0E–04	NA
arsenic	NA	3.0E–04	NA
beryllium	NA	5.0E–03	NA
uranium–total	1.1E–10	3.0E–03	3.7E–08
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor–1254	NA	NA	NA
aroclor–1260	NA	NA	NA
dieldrin	NA	5.0E–05	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
HQ Summation =			3.7E–08

	ILCR Calculation		
Compound	CDI (mg/kg–day)	CSF $(mg/kg–day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium–total	9.6E–12	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E–02	NA
aroclor–1254	NA	7.7E+00	NA
aroclor–1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
ILCR Summation =			0.0E+00

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Table C.III-174
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Lime Sludge Pond with Private Ownership: On-Property Farmer (Child)
Via Ingestion of Meat Products

Intake Equation = Cf X EF X EDn X FI X IR

IR	Ingestion rate of meat	0.039 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cf	Concentration of radionuclides in meat	

Cs_{137+1d}	0.0E+00	pCi/kg	$Th_{232+10d}$	0.0E+00	pCi/kg
Np_{237+1d}	2.8E-04	pCi/kg	U_{234}	4.1E-02	pCi/kg
Pu_{238}	0.0E+00	pCi/kg	U_{235+1d}	1.7E-02	pCi/kg
Ra_{226+8d}	0.0E+00	pCi/kg	U_{238+2d}	2.0E-05	pCi/kg
Ra_{228+1d}	0.0E+00	pCi/kg	0.0E+00	0.0E+00	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	0.0E+00	0.0E+00	pCi/kg
Sr_{90+1d}	2.1E-01	pCi/kg	0.0E+00	0.0E+00	pCi/kg
Tc_{99}	0.0E+00	pCi/kg	0.0E+00	0.0E+00	pCi/kg
Th_{228+7d}	0.0E+00	pCi/kg	0.0E+00	0.0E+00	pCi/kg
Th_{230}	1.7E-03	pCi/kg	0.0E+00	0.0E+00	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E-11	NA
Np_{237+1d}	1.7E-02	2.2E-10	3.8E-12
Pu_{238}	NA	2.2E-10	NA
Ra_{226+8d}	NA	7.8E-10	NA
Ra_{228+1d}	NA	1.0E-10	NA
Rn_{222+4d}	NA	1.7E-12	NA
Sr_{90+1d}	1.3E+01	3.6E-11	4.7E-10
Tc_{99}	NA	1.3E-12	NA
Th_{228+7d}	NA	5.5E-11	NA
Th_{230}	1.0E-01	1.3E-11	1.4E-12
$Th_{232+10d}$	NA	1.7E-10	NA
U_{234}	2.5E+00	1.6E-11	4.0E-11
U_{235+1d}	1.0E+00	1.6E-11	1.6E-11
U_{238+2d}	1.2E-03	2.0E-11	2.5E-14
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
		ILCR Summation =	5.3E-10

000673

Table C.III – 175
Summary of Intake Quantitation (chemicals) Alternative 6
Lime Sludge Pond with Private Ownership: On–Property Farmer (Child)
Via Ingestion of Dairy Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of dairy products	0.9 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x365)	2190 days
CS	Concentration of chemicals in animal products	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	0.0E+00	mg/kg	•••	0.0E+00	mg/kg
arsenic	0.0E+00	mg/kg	•••	0.0E+00	mg/kg
beryllium	0.0E+00	mg/kg	•••	0.0E+00	mg/kg
uranium–total	2.2E–07	mg/kg	•••	0.0E+00	mg/kg
benzo(a)pyrene	0.0E+00	mg/kg	•••	0.0E+00	mg/kg
carbazole	0.0E+00	mg/kg	•••	0.0E+00	mg/kg
arodor–1254	0.0E+00	mg/kg	•••	0.0E+00	mg/kg
arodor–1260	0.0E+00	mg/kg	•••	0.0E+00	mg/kg
dieldrin	0.0E+00	mg/kg	•••	0.0E+00	mg/kg
••••••••	0.0E+00	mg/kg	•••	0.0E+00	mg/kg
••••••••	0.0E+00	mg/kg	•••	0.0E+00	mg/kg
••••••••	0.0E+00	mg/kg	•••	0.0E+00	mg/kg
••••••••	0.0E+00	mg/kg	•••	0.0E+00	mg/kg
••••••••	0.0E+00	mg/kg	•••	0.0E+00	mg/kg
••••••••	0.0E+00	mg/kg	•••	0.0E+00	mg/kg
••••••••	0.0E+00	mg/kg			

References

Table C.III-175 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Private Ownership: On-Property Farmer (Child)
Via Ingestion of Dairy Products

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	9.3E-09	3.0E-03	3.1E-06
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
	HQ Summation =		3.1E-06

Compound	ILCR Calculation CDI (mg/kg-day)	CSF $(mg/kg\text{-}day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	8.0E-10	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
	ILCR Summation =		0.0E+00

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Table C.III-176
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Lime Sludge Pond with Private Ownership: On-Property Farmer (Child)
Via Ingestion of Dairy Products

Intake Equation = Cp X EF X EDn X FI X IR

IR	Ingestion rate of dairy products	0.9 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cp	Concentration of radionuclides in animal products	

Cs_{137+1d}	0.0E+00	pCi/kg	$Th_{232+10d}$	0.0E+00	pCi/kg
Np_{237+1d}	2.6E-05	pCi/kg	U_{234}	1.2E-01	pCi/kg
Pu_{238}	0.0E+00	pCi/kg	U_{235+1d}	5.0E-02	pCi/kg
Ra_{226+8d}	0.0E+00	pCi/kg	U_{238+2d}	7.2E-05	pCi/kg
Ra_{228+1d}	0.0E+00	pCi/kg	0.0E+00	0.0E+00	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	0.0E+00	0.0E+00	pCi/kg
Sr_{90+1d}	1.1E+00	pCi/kg	0.0E+00	0.0E+00	pCi/kg
Tc_{99}	0.0E+00	pCi/kg	0.0E+00	0.0E+00	pCi/kg
Th_{228+7d}	0.0E+00	pCi/kg	0.0E+00	0.0E+00	pCi/kg
Th_{230}	1.4E-03	pCi/kg	0.0E+00	0.0E+00	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E-11	NA
Np_{237+1d}	3.6E-02	2.2E-10	8.0E-12
Pu_{238}	NA	2.2E-10	NA
Ra_{226+8d}	NA	7.8E-10	NA
Ra_{228+1d}	NA	1.0E-10	NA
Rn_{222+4d}	NA	1.7E-12	NA
Sr_{90+1d}	1.5E+03	3.6E-11	5.4E-08
Tc_{99}	NA	1.3E-12	NA
Th_{228+7d}	NA	5.5E-11	NA
Th_{230}	2.0E+00	1.3E-11	2.6E-11
$Th_{232+10d}$	NA	1.7E-10	NA
U_{234}	1.7E+02	1.6E-11	2.8E-09
U_{235+1d}	7.1E+01	1.6E-11	1.1E-09
U_{238+2d}	1.0E-01	2.0E-11	2.0E-12
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA

ILCR Summation = 5.8E-08

Table C.III–177
Summary of Intake and Risk Quantitation (chemicals) Alternative 6
Lime Sludge Pond with Private Ownership: On–Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of fruits or vegetables	0.1 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x365)	2190 days
CS	Concentration of chemicals in vegetables	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	0.0E+00	mg/kg	•••	0.0E+00	mg/kg
arsenic	0.0E+00	mg/kg	•••	0.0E+00	mg/kg
beryllium	0.0E+00	mg/kg	•••	0.0E+00	mg/kg
uranium–total	2.9E–05	mg/kg	•••	0.0E+00	mg/kg
benzo(a)pyrene	0.0E+00	mg/kg	•••	0.0E+00	mg/kg
carbazole	0.0E+00	mg/kg	•••	0.0E+00	mg/kg
arodor–1254	0.0E+00	mg/kg	•••	0.0E+00	mg/kg
arodor–1260	0.0E+00	mg/kg	•••	0.0E+00	mg/kg
dieldrin	0.0E+00	mg/kg	•••	0.0E+00	mg/kg
••••••••	0.0E+00	mg/kg	•••	0.0E+00	mg/kg
••••••••	0.0E+00	mg/kg	•••	0.0E+00	mg/kg
••••••••	0.0E+00	mg/kg	•••	0.0E+00	mg/kg
••••••••	0.0E+00	mg/kg	•••	0.0E+00	mg/kg
••••••••	0.0E+00	mg/kg	•••	0.0E+00	mg/kg
••••••••	0.0E+00	mg/kg	•••	0.0E+00	mg/kg
••••••••	0.0E+00	mg/kg			

References

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Table C.III-177 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Private Ownership: On-Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	1.9E-07	3.0E-03	6.3E-05
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
HQ Summation =			6.3E-05

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	1.6E-08	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
ILCR Summation =			0.0E+00

Table C.III–178
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Lime Sludge Pond with Private Ownership: On–Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

Intake Equation = Cv X EF X EDn X FI X IR

IR	Ingestion rate of fruits or vegetables	0.1 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cv	Concentration of radionuclides in vegetables	

Cs_{137+1d}	0.0E+00	pCi/kg	$Th_{232+10d}$	0.0E+00	pCi/kg
Np_{237+1d}	5.1E–02	pCi/kg	U_{234}	1.9E+00	pCi/kg
Pu_{238}	0.0E+00	pCi/kg	U_{235+1d}	7.7E–01	pCi/kg
Ra_{226+8d}	0.0E+00	pCi/kg	U_{238+2d}	9.8E–03	pCi/kg
Ra_{228+1d}	0.0E+00	pCi/kg	0.0E+00	0.0E+00	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	0.0E+00	0.0E+00	pCi/kg
Sr_{90+1d}	1.4E+01	pCi/kg	0.0E+00	0.0E+00	pCi/kg
Tc_{99}	0.0E+00	pCi/kg	0.0E+00	0.0E+00	pCi/kg
Th_{228+7d}	0.0E+00	pCi/kg	0.0E+00	0.0E+00	pCi/kg
Th_{230}	4.7E–01	pCi/kg	0.0E+00	0.0E+00	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	1.1E+01	2.2E–10	2.4E–09
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	2.9E+03	3.6E–11	1.1E–07
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	9.9E+01	1.3E–11	1.3E–09
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	3.9E+02	1.6E–11	6.3E–09
U_{235+1d}	1.6E+02	1.6E–11	2.6E–09
U_{238+2d}	2.1E+00	2.0E–11	4.1E–11
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA

ILCR Summation = 1.2E–07

000679

Table C.III-179
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Lime Sludge Pond with Private Ownership: On-Property Farmer (Child)
Via External Radiation

Dose Equivalency Equat: = $[DR \times EF \times EDn \times ET_i \times (1-SH_i)] + [DR \times EF \times EDn \times ET_o \times (1-SH_o)]$

EF	Fraction of year spent exposured	0.96 (unitless)
ED	Exposure duration	6 Year
ET_i	Fraction of day spent indoors	0.92 (unitless)
ET_o	Fraction of day spent outdoors	0.08 (unitless)
SH_i	Shield factor indoors	0.5 (unitless)
SH_o	Shield factor outdoors	0 (unitless)
DR	Radionuclide specific dose concentrations	(see table below)

Cs_{137+1d}	NA	pCi/g	$Th_{232+10d}$	NA	pCi/g
Np_{237+1d}	5.10E-03	pCi/g	U_{234}	2.20E-01	pCi/g
Pu_{238}	NA	pCi/g	U_{235+1d}	9.00E-02	pCi/g
Ra_{226+8d}	NA	pCi/g	U_{238+2d}	NA	pCi/g
Ra_{228+1d}	NA	pCi/g	0	NA	pCi/g
Rn_{222+4d}	NA	pCi/g	0	NA	pCi/g
Sr_{90+1d}	5.60E-03	pCi/g	0	NA	pCi/g
Tc_{99}	NA	pCi/g	0	NA	pCi/g
Th_{228+7d}	NA	pCi/g	0	NA	pCi/g
Th_{230}	5.20E-01	pCi/g	0	NA	pCi/g

Radionuclides	CDI (year pCi/g)	CSF $(g/pCi-year)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.0E-06	NA
Np_{237+1d}	1.6E-02	4.3E-07	6.8E-09
Pu_{238}	NA	2.8E-11	NA
Ra_{226+8d}	NA	6.0E-06	NA
Ra_{228+1d}	NA	2.9E-06	NA
Rn_{222+4d}	NA	5.9E-06	NA
Sr_{90+1d}	1.7E-02	NA	0.0E+00
Tc_{99}	NA	6.0E-13	NA
Th_{228+7d}	NA	5.6E-06	NA
Th_{230}	1.6E+00	5.4E-11	8.7E-11
$Th_{232+10d}$	NA	8.5E-06	NA
U_{234}	6.8E-01	3.0E-11	2.1E-11
U_{235+1d}	2.8E-01	2.4E-07	6.7E-08
U_{238+2d}	NA	5.1E-08	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
	ILCR Summation =		7.4E-08

000680

Table C.III-144 (continued)
Summary of Risk Characterization (chemicals)
Lime Sludge Pond with Private Ownership: Off-Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

Compound	HQ Calculation		
	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	7.2E-09	3.0E-03	2.4E-06
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		2.4E-06

Compound	ILCR Calculation		
	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	6.2E-10	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

000681

Table C.III–180
Summary of Intake and Risk Quantitation (radionuclides) Alternative 2
Solid Waste Landfill with Federal Ownership: Expanded Trespasser
Via Inhalation of Gases and Particulates

Intake Equation = CA X EFa X EDa X IR X ETa + CA X EFc EDc X IR X ETc

IR	Inhalation rate of gases	0.83 m^3/hour
EFa	Exposure frequency (adult)	40 days/year
EFc	Exposure frequency (child)	110 days/year
EDa	Exposure duration	32 Year
EDc	Exposure duration	12 Year
ETa	Exposure time (adult)	1 hour/day
ETc	Exposure time (child)	2 hour/day
CA	Concentration of radionuclides in air	(see table below)

Cs_{137+1d}	NA	pCi/m^3	$Th_{232+10d}$	NA	pCi/m^3
Np_{237+1d}	NA	pCi/m^3	U_{234}	NA	pCi/m^3
Pu_{238}	NA	pCi/m^3	U_{235+1d}	NA	pCi/m^3
Ra_{226+8d}	NA	pCi/m^3	U_{238+2d}	NA	pCi/m^3
Ra_{228+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Rn_{222+4d}	4.1E−07	pCi/m^3	NA	NA	pCi/m^3
Sr_{90+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Tc_{99}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{228+7d}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{230}	NA	pCi/m^3	NA	NA	pCi/m^3

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	1.9E−11	NA
Np_{237+1d}	NA	2.9E−08	NA
Pu_{238}	NA	3.9E−08	NA
Ra_{226+8d}	NA	7.0E−09	NA
Ra_{228+1d}	NA	6.9E−10	NA
Rn_{222+4d}	1.3E−03	7.7E−12	1.0E−14
Sr_{90+1d}	NA	6.2E−11	NA
Tc_{99}	NA	8.3E−12	NA
Th_{228+7d}	NA	7.8E−08	NA
Th_{230}	NA	2.9E−08	NA
$Th_{232+10d}$	NA	1.1E−07	NA
U_{234}	NA	2.6E−08	NA
U_{235+1d}	NA	2.5E−08	NA
U_{238+2d}	NA	2.4E−08	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 1.0E−14

000682

Table C.III-181
Summary of Intake Quantitation (chemicals) Alternative 2
Solid Waste Landfill with Federal Ownership: Off-Property Farmer (Adult)
Via Drinking Water Ingestion

Intake Equation = $\frac{CS \times EF \times ED \times IR}{BW \times AT}$

IR	Ingestion rate of groundwater (RAGS, 1989)	2 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in groundwater	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/l	NA	NA	mg/l
arsenic	NA	mg/l	NA	NA	mg/l
beryllium	NA	mg/l	NA	NA	mg/l
uranium-total	2.00E-06	mg/l	NA	NA	mg/l
benzo(a)pyrene	NA	mg/l	NA	NA	mg/l
carbazole	NA	mg/l	NA	NA	mg/l
aroclor-1254	NA	mg/l	NA	NA	mg/l
aroclor-1260	NA	mg/l	NA	NA	mg/l
dieldrin	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l			

References

000883

Table C.III-181 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Federal Ownership: Off-Property Farmer (Adult)
Via Drinking Water Ingestion

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.00E-04	NA
arsenic	NA	3.00E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	5.48E-08	3.00E-03	1.83E-05
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.00E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			1.83E-05

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.75E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	5.48E-08	NA	NA
benzo(a)pyrene	NA	7.30E+00	NA
carbazole	NA	2.00E-02	NA
aroclor-1254	NA	7.70E+00	NA
aroclor-1260	NA	7.70E+00	NA
dieldrin	NA	1.60E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

Table C.III–182
Summary of Intake and Risk Quantitation (radionuclides) Alternative 2
Solid Waste Landfill with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Drinking Water

Intake Equation = Cw X EF X EDn X FI X IR

IR	Ingestion rate of groundwater (RAGS, 1989)	2 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
FI	Fractional intake for radionuclides	1 (Unitless)
Cw	Concentration of radionuclides in groundwater	(see table below)

Cs_{137+1d}	NA	pCi/l	$Th_{232+10d}$	NA	pCi/l
Np_{237+1d}	NA	pCi/l	U_{234}	7.0E–04	pCi/l
Pu_{238}	NA	pCi/l	U_{235+1d}	7.0E–04	pCi/l
Ra_{226+8d}	NA	pCi/l	U_{238+2d}	7.0E–04	pCi/l
Ra_{228+1d}	NA	pCi/l	NA	NA	pCi/l
Rn_{222+4d}	NA	pCi/l	NA	NA	pCi/l
Sr_{90+1d}	NA	pCi/l	NA	NA	pCi/l
Tc_{99}	NA	pCi/l	NA	NA	pCi/l
Th_{228+7d}	NA	pCi/l	NA	NA	pCi/l
Th_{230}	NA	pCi/l	NA	NA	pCi/l

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	NA	2.2E–10	NA
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	NA	1.3E–11	NA
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	3.4E+01	1.6E–11	5.5E–10
U_{235+1d}	3.4E+01	1.6E–11	5.5E–10
U_{238+2d}	3.4E+01	2.0E–11	6.9E–10
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
ILCR Summation	=		1.8E–09

000685

Table C.III–183
Summary of Intake Quantitation (chemicals) Alternative 2
Solid Waste Landfill with Federal Ownership: Off–Property Farmer (Adult)
Via Dermal Contact while Bathing

Intake Equation = $\frac{DA \times EF \times ED \times SA}{BW \times AT}$

DA	Dermal absorbed dose	csv mg/cm^2–day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	*Average time for carcinogens (lifetime)*	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
SA	Skin surface area available for contact	23000 cm^2

Chemical Concentrations

Compound	DA	Units	Compound	DA	Units
antimony	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
arsenic	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
beryllium	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
uranium–total	5.00E–13	mg/cm^2–day	NA	NA	mg/cm^2–day
benzo(a)pyrene	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
carbazole	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
aroclor–1254	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
aroclor–1260	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
dieldrin	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day			

References

Table C.III–183 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Federal Ownership: Off–Property Farmer (Adult)
Via Dermal Contact while Bathing

Compound	HQ Calculation CDI (mg/kg–day)	RfD (mg/kg–day)	HQ (unitless)
antimony	NA	6.00E–05	NA
arsenic	NA	2.85E–04	NA
beryllium	NA	5.00E–03	NA
uranium–total	1.58E–10	1.50E–04	1.05E–06
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor–1254	NA	NA	NA
aroclor–1260	NA	NA	NA
dieldrin	NA	4.50E–05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		1.05E–06

Compound	ILCR Calculation CDI (mg/kg–day)	CSF (mg/kg–day)$^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.90E+00	NA
beryllium	NA	4.30E+00	NA
uranium–total	1.58E–10	NA	NA
benzo(a)pyrene	NA	NA	NA
carbazole	NA	2.22E–02	NA
aroclor–1254	NA	1.03E+01	NA
aroclor–1260	NA	1.03E+01	NA
dieldrin	NA	1.78E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

6646
000687

Table C.III–184
Summary of Intake and Risk Quantitation (radionuclides) Alternative 2
Solid Waste Landfill with Federal Ownership: Off–Property Farmer (Adult)
Via Inhalation of Gases and Particulates

Intake Equation = Ca X EF X EDn X IR

IR	Inhalation rate of gases (RAGS, 1989)	20 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Ca	Concentration of radionuclides in air	(see table below)

Cs_{137+1d}	NA	pCi/m^3	$Th_{232+10d}$	NA	pCi/m^3
Np_{237+1d}	NA	pCi/m^3	U_{234}	NA	pCi/m^3
Pu_{238}	NA	pCi/m^3	U_{235+1d}	NA	pCi/m^3
Ra_{226+8d}	NA	pCi/m^3	U_{238+2d}	NA	pCi/m^3
Ra_{228+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Rn_{222+4d}	1.1E–08	pCi/m^3	NA	NA	pCi/m^3
Sr_{90+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Tc_{99}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{228+7d}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{230}	NA	pCi/m^3	NA	NA	pCi/m^3

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	1.9E–11	NA
Np_{237+1d}	NA	2.9E–08	NA
Pu_{238}	NA	3.9E–08	NA
Ra_{226+8d}	NA	7.0E–09	NA
Ra_{228+1d}	NA	6.9E–10	NA
Rn_{222+4d}	5.5E–03	7.7E–12	4.2E–14
Sr_{90+1d}	NA	6.2E–11	NA
Tc_{99}	NA	8.3E–12	NA
Th_{228+7d}	NA	7.8E–08	NA
Th_{230}	NA	2.9E–08	NA
$Th_{232+10d}$	NA	1.1E–07	NA
U_{234}	NA	2.6E–08	NA
U_{235+1d}	NA	2.5E–08	NA
U_{238+2d}	NA	2.4E–08	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 4.2E–14

000688

Table C.III–185
Summary of Intake Quantitation (chemicals) Alternative 2
Solid Waste Landfill with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Meat Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of meat	0.101 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in meat	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium–total	2.0E–08	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor–1254	NA	mg/kg	NA	NA	mg/kg
aroclor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

000689

F-6645

Table C.III-185 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Federal Ownership: Off-Property Farmer (Adult)
Via Ingestion of Meat Products

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	2.1E-11	3.0E-03	6.9E-09
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			6.9E-09

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	2.1E-11	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

Table C.III–186
Summary of Intake and Risk Quantitation (radionuclides) Alternative 2
Solid Waste Landfill with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Meat Products

Intake Equation = Cf X EF X EDn X FI X IR

IR	Ingestion rate of meat	0.101 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cf	Concentration of radionuclides in meat	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	NA	pCi/kg	U_{234}	7.0E–06	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	7.0E–06	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	7.0E–06	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	NA	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	NA	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	NA	2.2E–10	NA
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	NA	1.3E–11	NA
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	1.3E–02	1.6E–11	2.1E–13
U_{235+1d}	1.3E–02	1.6E–11	2.1E–13
U_{238+2d}	1.3E–02	2.0E–11	2.6E–13
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
ILCR Summation	=		6.8E–13

000691

Table C.III–187
Summary of Intake Quantitation (chemicals) Alternative 2
Solid Waste Landfill with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Dairy Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of dairy products	0.4 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in animal products	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium–total	7.2E–08	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor–1254	NA	mg/kg	NA	NA	mg/kg
aroclor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

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Table C.III-187 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Federal Ownership: Off-Property Farmer (Adult)
Via Ingestion of Dairy Products

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	3.0E-10	3.0E-03	9.9E-08
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		9.9E-08

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	3.0E-10	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

000693

Table C.III–188
Summary of Intake and Risk Quantitation (radionuclides) Alternative 2
Solid Waste Landfill with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Dairy Products

Intake Equation = Cp X EF X EDn X FI X IR

IR	Ingestion rate of dairy products	0.4 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cp	Concentration of radionuclides in animal products	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	NA	pCi/kg	U_{234}	2.5E–05	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	2.5E–05	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	2.5E–05	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	NA	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	NA	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	NA	2.2E–10	NA
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	NA	1.3E–11	NA
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	1.9E–01	1.6E–11	3.0E–12
U_{235+1d}	1.9E–01	1.6E–11	3.0E–12
U_{238+2d}	1.9E–01	2.0E–11	3.7E–12
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		9.6E–12

000634

Table C.III–189
Summary of Intake Quantitation (chemicals) Alternative 2
Solid Waste Landfill with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Vegetables and Fruits

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of fruits or vegetables	0.122 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in vegetables	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium–total	9.8E–06	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor–1254	NA	mg/kg	NA	NA	mg/kg
aroclor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

559000

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000696

Table C.III-189 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Federal Ownership: Off-Property Farmer (Adult)
Via Ingestion of Vegetables and Fruits

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	1.6E-08	3.0E-03	5.5E-06
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		5.5E-06

Compound	ILCR Calculation CDI (mg/kg-day)	CSF (mg/kg-day)$^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	1.6E-08	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

6646

Table C.III-190
Summary of Intake and Risk Quantitation (radionuclides) Alternative 2
Solid Waste Landfill with Federal Ownership: Off-Property Farmer (Adult)
Via Ingestion of Vegetables and Fruits

Intake Equation = Cv X EF X EDn X FI X IR

IR	Ingestion rate of fruits or vegetables	0.122 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cv	Concentration of radionuclides in vegetables	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	NA	pCi/kg	U_{234}	3.4E-03	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	3.4E-03	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	3.4E-03	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	NA	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	NA	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E-11	NA
Np_{237+1d}	NA	2.2E-10	NA
Pu_{238}	NA	2.2E-10	NA
Ra_{226+8d}	NA	7.8E-10	NA
Ra_{228+1d}	NA	1.0E-10	NA
Rn_{222+4d}	NA	1.7E-12	NA
Sr_{90+1d}	NA	3.6E-11	NA
Tc_{99}	NA	1.3E-12	NA
Th_{228+7d}	NA	5.5E-11	NA
Th_{230}	NA	1.3E-11	NA
$Th_{232+10d}$	NA	1.7E-10	NA
U_{234}	1.0E+01	1.6E-11	1.6E-10
U_{235+1d}	1.0E+01	1.6E-11	1.6E-10
U_{238+2d}	1.0E+01	2.0E-11	2.0E-10
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation	=	5.3E-10

000697

Table C.III-191
Summary of Intake Quantitation (chemicals) Alternative 2
Solid Waste Landfill with Federal Ownership: Off-Property Farmer (Child)
Via Drinking Water Ingestion.

Intake Equation = $\frac{CS \times EF \times ED \times IR}{BW \times AT}$

IR	Ingestion rate of groundwater (RAGS, 1989)	1 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in groundwater	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/l	NA	NA	mg/l
arsenic	NA	mg/l	NA	NA	mg/l
beryllium	NA	mg/l	NA	NA	mg/l
uranium-total	2.00E-06	mg/l	NA	NA	mg/l
benzo(a)pyrene	NA	mg/l	NA	NA	mg/l
carbazole	NA	mg/l	NA	NA	mg/l
aroclor-1254	NA	mg/l	NA	NA	mg/l
aroclor-1260	NA	mg/l	NA	NA	mg/l
dieldrin	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l			

References

Table C.III-191 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Federal Ownership: Off-Property Farmer (Child)
Via Drinking Water Ingestion

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.00E-04	NA
arsenic	NA	3.00E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	1.28E-07	3.00E-03	4.26E-05
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.00E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	HQ Summation =		4.26E-05

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.75E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	1.10E-08	NA	NA
benzo(a)pyrene	NA	7.30E+00	NA
carbazole	NA	2.00E-02	NA
aroclor-1254	NA	7.70E+00	NA
aroclor-1260	NA	7.70E+00	NA
dieldrin	NA	1.60E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	ILCR Summation =		NA

000699

6646

Table C.III–192
Summary of Intake and Risk Quantitation (radionuclides) Alternative 2
Solid Waste Landfill with Federal Ownership: Off–Property Farmer (Child)
Via Ingestion of Drinking Water

Intake Equation = Cw X EF X EDn X FI X IR

IR	Ingestion rate of groundwater (RAGS, 1989)	1 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
FI	Fractional intake for radionuclides	1 (Unitless)
Cw	Concentration of radionuclides in groundwater	(see table below)

Cs_{137+1d}	NA	pCi/l	$Th_{232+10d}$	NA	pCi/l
Np_{237+1d}	NA	pCi/l	U_{234}	7.0E–04	pCi/l
Pu_{238}	NA	pCi/l	U_{235+1d}	7.0E–04	pCi/l
Ra_{226+8d}	NA	pCi/l	U_{238+2d}	7.0E–04	pCi/l
Ra_{228+1d}	NA	pCi/l		NA	pCi/l
Rn_{222+4d}	NA	pCi/l		NA	pCi/l
Sr_{90+1d}	NA	pCi/l		NA	pCi/l
Tc_{99}	NA	pCi/l		NA	pCi/l
Th_{228+7d}	NA	pCi/l		NA	pCi/l
Th_{230}	NA	pCi/l		NA	pCi/l

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	NA	2.2E–10	NA
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	NA	1.3E–11	NA
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	1.5E+00	1.6E–11	2.4E–11
U_{235+1d}	1.5E+00	1.6E–11	2.4E–11
U_{238+2d}	1.5E+00	2.0E–11	2.9E–11
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
		ILCR Summation =	7.6E–11

000700

Table C.III–193
Summary of Intake Quantitation (chemicals) Alternative 2
Solid Waste Landfill with Federal Ownership: Off–Property Farmer (Child)
Via Dermal Contact while Bathing

Intake Equation = $\frac{DA \times EF \times ED \times SA}{BW \times AT}$

DA	Dermal absorbed dose	csv mg/cm^2–day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	2190 days
SA	Skin surface area available for contact	8000 cm^2

Chemical Concentrations

Compound	DA	Units	Compound	DA	Units
antimony	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
arsenic	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
beryllium	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
uranium–total	5.00E–13	mg/cm^2–day	NA	NA	mg/cm^2–day
benzo(a)pyrene	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
carbazole	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
aroclor–1254	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
aroclor–1260	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
dieldrin	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day

References

000201

Table C.III-193 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Federal Ownership: Off-Property Farmer (Child)
Via Dermal Contact while Bathing

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	6.00E-05	NA
arsenic	NA	2.85E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	2.56E-10	1.50E-04	1.70E-06
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	4.50E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		1.70E-06

Compound	ILCR Calculation CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.90E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	2.19E-11	NA	NA
benzo(a)pyrene	NA	NA	NA
carbazole	NA	2.22E-02	NA
aroclor-1254	NA	1.03E+01	NA
aroclor-1260	NA	1.03E+01	NA
dieldrin	NA	1.78E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

Table C.III–194
Summary of Intake and Risk Quantitation (radionuclides) Alternative 2
Solid Waste Landfill with Federal Ownership: Off–Property Farmer (Child)
Via Inhalation of Gases and Particulates

Intake Equation = Ca X EF X EDn X IR

IR	Inhalation rate of gases (RAGS, 1989)	12 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Ca	Concentration of radionuclides in air	(see table below)

Cs_{137+1d}	NA	pCi/m^3	$Th_{232+10d}$	NA	pCi/m^3
Np_{237+1d}	NA	pCi/m^3	U_{234}	NA	pCi/m^3
Pu_{238}	NA	pCi/m^3	U_{235+1d}	NA	pCi/m^3
Ra_{226+8d}	NA	pCi/m^3	U_{238+2d}	NA	pCi/m^3
Ra_{228+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Rn_{222+4d}	1.1E–08	pCi/m^3	NA	NA	pCi/m^3
Sr_{90+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Tc_{99}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{228+7d}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{230}	NA	pCi/m^3	NA	NA	pCi/m^3

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	1.9E–11	NA
Np_{237+1d}	NA	2.9E–08	NA
Pu_{238}	NA	3.9E–08	NA
Ra_{226+8d}	NA	7.0E–09	NA
Ra_{228+1d}	NA	6.9E–10	NA
Rn_{222+4d}	2.8E–04	7.7E–12	2.2E–15
Sr_{90+1d}	NA	6.2E–11	NA
Tc_{99}	NA	8.3E–12	NA
Th_{228+7d}	NA	7.8E–08	NA
Th_{230}	NA	2.9E–08	NA
$Th_{232+10d}$	NA	1.1E–07	NA
U_{234}	NA	2.6E–08	NA
U_{235+1d}	NA	2.5E–08	NA
U_{238+2d}	NA	2.4E–08	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 2.2E–15

Table C.III–195
Summary of Intake Quantitation (chemicals) Alternative 2
Solid Waste Landfill with Federal Ownership: Off–Property Farmer (Child)
Via Ingestion of Meat Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of meat	0.039 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in meat	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium–total	2.0E–08	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor–1254	NA	mg/kg	NA	NA	mg/kg
aroclor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

Table C.III-195 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Federal Ownership: Off-Property Farmer (Child)
Via Ingestion of Meat Products

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	3.7E-11	3.0E-03	1.2E-08
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	HQ Summation =		1.2E-08

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	3.2E-12	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	ILCR Summation =		NA

002005

66466

Table C.III–196
Summary of Intake and Risk Quantitation (radionuclides) Alternative 2
Solid Waste Landfill with Federal Ownership: Off–Property Farmer (Child)
Via Ingestion of Meat Products

Intake Equation = Cf X EF X EDn X FI X IR

IR	Ingestion rate of meat	0.039 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cf	Concentration of radionuclides in meat	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	NA	pCi/kg	U_{234}	7.0E–06	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	7.0E–06	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	7.0E–06	pCi/kg
Ra_{228+1d}	NA	pCi/kg		NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg		NA	pCi/kg
Sr_{90+1d}	NA	pCi/kg		NA	pCi/kg
Tc_{99}	NA	pCi/kg		NA	pCi/kg
Th_{228+7d}	NA	pCi/kg		NA	pCi/kg
Th_{230}	NA	pCi/kg		NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	NA	2.2E–10	NA
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	NA	1.3E–11	NA
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	4.3E–04	1.6E–11	6.9E–15
U_{235+1d}	4.3E–04	1.6E–11	6.9E–15
U_{238+2d}	4.3E–04	2.0E–11	8.6E–15
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 2.2E–14

000706

Table C.III–197
Summary of Intake Quantitation (chemicals) Alternative 2
Solid Waste Landfill with Federal Ownership: Off–Property Farmer (Child)
Via Ingestion of Dairy Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of dairy products	0.9 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in animal products	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium–total	7.2E–08	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor–1254	NA	mg/kg	NA	NA	mg/kg
aroclor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

202000

66646

Table C.III-197 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Federal Ownership: Off-Property Farmer (Child)
Via Ingestion of Dairy Products

Compound	HQ Calculation		
	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	3.1E-09	3.0E-03	1.0E-06
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		1.0E-06

Compound	ILCR Calculation		
	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	2.7E-10	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

000708

Table C.III–198
Summary of Intake and Risk Quantitation (radionuclides) Alternative 2
Solid Waste Landfill with Federal Ownership: Off–Property Farmer (Child)
Via Ingestion of Dairy Products

Intake Equation = Cp X EF X EDn X FI X IR

IR	Ingestion rate of dairy products	0.9 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cp	Concentration of radionuclides in animal products	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	NA	pCi/kg	U_{234}	2.5E–05	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	2.5E–05	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	2.5E–05	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	NA	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	NA	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	NA	2.2E–10	NA
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	NA	1.3E–11	NA
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	3.6E–02	1.6E–11	5.7E–13
U_{235+1d}	3.6E–02	1.6E–11	5.7E–13
U_{238+2d}	3.6E–02	2.0E–11	7.1E–13
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 1.9E–12

000709

Table C.III–199
Summary of Risk Characterization (chemicals) Alternative 2
Solid Waste Landfill with Federal Ownership: Off–Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of fruits or vegetables	0.1 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in vegetables	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium–total	9.8E–06	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor–1254	NA	mg/kg	NA	NA	mg/kg
aroclor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

Table C.III-199 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Federal Ownership: Off-Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	6.3E-08	3.0E-03	2.1E-05
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			2.1E-05

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	5.4E-09	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

011200

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Table C.III–200
Summary of Intake and Risk Quantitation (radionuclides) Alternative 2
Solid Waste Landfill with Federal Ownership: Off–Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

Intake Equation = Cv X EF X EDn X FI X IR

IR	*Ingestion rate of fruits or vegetables*	0.1 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cv	Concentration of radionuclides in vegetables	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	NA	pCi/kg	U_{234}	3.4E–03	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	3.4E–03	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	3.4E–03	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	NA	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	NA	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	NA	2.2E–10	NA
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	NA	1.3E–11	NA
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	7.2E–01	1.6E–11	1.2E–11
U_{235+1d}	7.2E–01	1.6E–11	1.2E–11
U_{238+2d}	7.2E–01	2.0E–11	1.4E–11
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
ILCR Summation	=		3.7E–11

000712

Table C.III–201
Summary of Intake Quantitation (chemicals) Alternative 3
Solid Waste Landfill with Federal Ownership: Expanded Trespasser
Via Incidental Ingestion of Soil/Sediment

Intake Equation $= \frac{CS \times EFa \times EDa \times CF \times IRa}{BWa \times ATa} + \frac{CS \times EFc \times EDc \times CF \times IRc}{BWc \times ATc}$

IRa	Ingestion rate of soil (adult)	12.5 mg/day
IRc	Ingestion rate of soil (child)	12.5 mg/day
CF	Conversion factor	1.00E–06 kg/mg
EFa	Exposure frequency (adult)	40 days/year
EFc	Exposure frequency (child)	110 days/year
EDa	Exposure duration (adult)	32 Year
EDc	Exposure duration (child)	12 Year
BWa	Body weight (adult)	70 kg
BWc	Body weight (child)	43 kg
AT	Average time for carcinogens	25550 days
ATa	Average time for non–carcinogens (adult)	11680 days
ATc	Average time for non–carcinogens (child)	4380 days
CS	Concentration of chemicals in soil	(see table below)

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	1.3E+00	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	4.0E–01	mg/kg	NA	NA	mg/kg
uranium–total	4.3E+00	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	2.9E–01	mg/kg	NA	NA	mg/kg
carbazole	2.1E–01	mg/kg	NA	NA	mg/kg
aroclor–1254	NA	mg/kg	NA	NA	mg/kg
aroclor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

000713

Table C.III-201 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Federal Ownership: Expanded Trespasser
Via Incidental Ingestion of Soil/Sediment

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	1.4E-07	4.0E-04	3.6E-04
arsenic	NA	3.0E-04	NA
beryllium	4.3E-08	5.0E-03	8.6E-06
uranium-total	4.6E-07	3.0E-03	1.5E-04
benzo(a)pyrene	3.1E-08	NA	NA
carbazole	2.3E-08	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	HQ Summation =		5.2E-04

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	3.2E-08	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	9.6E-09	4.3E+00	4.1E-08
uranium-total	1.0E-07	NA	NA
benzo(a)pyrene	6.9E-09	7.3E+00	5.1E-08
carbazole	5.0E-09	2.0E-02	1.0E-10
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	ILCR Summation =		9.2E-08

Table C.III–202
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Solid Waste Landfill with Federal Ownership: Expanded Trespasser
Via Incidental Ingestion of Soil/Sediment

Intake Equation = CS X EFa X EDa X FI X IRa + CS X EFc X EDc X FI X IRc

IRa	Ingestion rate of soil (adult)	12.5 mg/day
IRc	Ingestion rate of soil (child)	12.5 mg/day
EFa	Exposure frequency (adult)	40 days/year
EFc	Exposure frequency (child)	110 days/year
EDa	Exposure Duration	32 Year
EDc	Exposure Duration	12 Year
FI	Fractional Intake	1 (unitless)
CS	Concentration of radionuclides in soil	(see table below)

Cs_{137+1d}	NA	pCi/mg	$Th_{232+10d}$	NA	pCi/mg
Np_{237+1d}	4.0E−04	pCi/mg	U_{234}	2.6E−04	pCi/mg
Pu_{238}	2.0E−04	pCi/mg	U_{235+1d}	NA	pCi/mg
Ra_{226+8d}	NA	pCi/mg	U_{238+2d}	2.4E−03	pCi/mg
Ra_{228+1d}	NA	pCi/mg	NA	NA	pCi/mg
Rn_{222+4d}	NA	pCi/mg	NA	NA	pCi/mg
Sr_{90+1d}	NA	pCi/mg	NA	NA	pCi/mg
Tc_{99}	NA	pCi/mg	NA	NA	pCi/mg
Th_{228+7d}	NA	pCi/mg	NA	NA	pCi/mg
Th_{230}	1.1E−03	pCi/mg	NA	NA	pCi/mg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E−11	NA
Np_{237+1d}	1.3E+01	2.2E−10	2.9E−09
Pu_{238}	6.5E+00	2.2E−10	1.4E−09
Ra_{226+8d}	NA	7.8E−10	NA
Ra_{228+1d}	NA	1.0E−10	NA
Rn_{222+4d}	NA	1.7E−12	NA
Sr_{90+1d}	NA	3.6E−11	NA
Tc_{99}	NA	1.3E−12	NA
Th_{228+7d}	NA	5.5E−11	NA
Th_{230}	3.7E+01	1.3E−11	4.8E−10
$Th_{232+10d}$	NA	1.7E−10	NA
U_{234}	8.5E+00	1.6E−11	1.4E−10
U_{235+1d}	NA	1.6E−11	NA
U_{238+2d}	7.7E+01	2.0E−11	1.5E−09
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 6.4E−09

Table C.III–203
Summary of Intake Quantitation (chemicals) Alternative 3
Solid Waste Landfill with Federal Ownership: Expanded Trespasser
Via Dermal Contact with Soil/Sediment

Intake Equation = $\frac{CS \times EFa \times EDa \times CF \times ABS \times AF \times SAa}{BWa \times ATa}$ + $\frac{CS \times EFc \times EDc \times CF \times ABS \times AF \times SAc}{BWc \times ATc}$

SA	Surface area of exposed skin (adult)	5750 cm^2/day
SA	Surface area of exposed skin (child)	4200 cm^2/day
AF	Soil to skin adherence factor	1 mg/cm^2
ABS	chemicals specific absorbtion factor (see table below)	csv
CF	Conversion factor	1E–06 kg/mg
EFa	Exposure frequency (adult)	40 days/year
EFc	Exposure frequency (child)	110 days/year
EDa	Exposure duration (adult)	32 Year
EDc	Exposure duration (child)	12 Year
BWa	Body weight (adult)	70 kg
BWc	Body weight (child)	43 kg
AT	Average time for carcinogens	25550 days
ATa	Average time for non–carcinogens (adult)	11680 days
ATc	Average time for non–carcinogens (child)	4380 days
CS	Concentration of chemicals in soil	(see table below)

Chemical Concentrations

Compound	ABS	Concentrati	Units	Compound	ABS	Concentrati	Units
antimony	1.0E–02	1.3E+00	mg/kg	NA	NA	NA	mg/kg
arsenic	1.0E–03	NA	mg/kg	NA	NA	NA	mg/kg
beryllium	1.0E–02	4.0E–01	mg/kg	NA	NA	NA	mg/kg
uranium–total	1.0E–02	4.3E+00	mg/kg	NA	NA	NA	mg/kg
benzo(a)pyrene	3.0E–01	2.9E–01	mg/kg	NA	NA	NA	mg/kg
carbazole	3.0E–01	2.1E–01	mg/kg	NA	NA	NA	mg/kg
aroclor–1254	6.0E–02	NA	mg/kg	NA	NA	NA	mg/kg
aroclor–1260	6.0E–02	NA	mg/kg	NA	NA	NA	mg/kg
dieldrin	3.0E–01	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg				

References

Table C.III-203 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Federal Ownership: Expanded Trespasser
Via Dermal Contact with Soil/Sediment

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	5.1E-07	6.0E-05	8.5E-03
arsenic	NA	2.9E-04	NA
beryllium	1.5E-07	5.0E-03	3.1E-05
uranium-total	1.7E-06	1.5E-04	1.1E-02
benzo(a)pyrene	3.3E-06	NA	NA
carbazole	2.4E-06	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	4.5E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		2.0E-02

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg\text{-}day)^{-1}$	ILCR (unitless)
antimony	1.2E-07	NA	NA
arsenic	NA	1.9E+00	NA
beryllium	3.7E-08	4.3E+00	1.6E-07
uranium-total	3.9E-07	NA	NA
benzo(a)pyrene	8.0E-07	NA	NA
carbazole	5.8E-07	2.2E-02	1.3E-08
aroclor-1254	NA	1.0E+01	NA
aroclor-1260	NA	1.0E+01	NA
dieldrin	NA	1.8E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		1.7E-07

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Table C.III–204
Summary of Intake Quantitation (chemicals) Alternative 3
Solid Waste Landfill with Federal Ownership: Expanded Trespasser
Via Inhalation of Particulates

Intake Equation $= \frac{CS \times EFa \times EDa \times IR \times ETa}{BWa \times ATa} + \frac{CS \times EFc \times EDc \times IR \times ETc}{BWc \times ATc}$

IR	Inhalation rate of gases	0.83 m^3/hour
ETa	Exposure time (adult)	1 hour/day
ETc	Exposure time (child)	2 hour/day
EFa	Exposure frequency (adult)	40 days/year
EFc	Exposure frequency (child)	110 days/year
EDa	Exposure duration (adult)	32 Year
EDc	Exposure duration (child)	12 Year
BWa	Body weight (adult)	70 kg
BWc	Body weight (child)	43 kg
AT	Average time for carcinogens	25550 days
ATa	Average time for non–carcinogens (adult)	11680 days
ATc	Average time for non–carcinogens (child)	4380 days
CS	Concentration of chemicals in particulate as modeled	(see table below)

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	2.7E–09	mg/m^3	NA	NA	mg/m^3
arsenic	NA	mg/m^3	NA	NA	mg/m^3
beryllium	9.4E–10	mg/m^3	NA	NA	mg/m^3
uranium–total	1.0E–08	mg/m^3	NA	NA	mg/m^3
benzo(a)pyrene	6.8E–10	mg/m^3	NA	NA	mg/m^3
carbazole	4.9E–10	mg/m^3	NA	NA	mg/m^3
aroclor–1254	NA	mg/m^3	NA	NA	mg/m^3
aroclor–1260	NA	mg/m^3	NA	NA	mg/m^3
dieldrin	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3			

References

Table C.III-204 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Federal Ownership: Expanded Trespasser
Via Inhalation of Particulates

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	3.4E-11	NA	NA
arsenic	NA	NA	NA
beryllium	1.2E-11	NA	NA
uranium-total	1.3E-10	NA	NA
benzo(a)pyrene	8.8E-12	NA	NA
carbazole	6.4E-12	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			NA

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	6.9E-12	NA	NA
arsenic	NA	1.5E+01	NA
beryllium	2.4E-12	8.4E+00	2.0E-11
uranium-total	2.6E-11	NA	NA
benzo(a)pyrene	1.8E-12	6.1E+00	1.1E-11
carbazole	1.3E-12	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			3.1E-11

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Table C.III–205
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Solid Waste Landfill with Federal Ownership: Expanded Trespasser
Via Inhalation of Gases and Particulates

Intake Equation = CA X EFa X EDa X IR X ETa + CA X EFc EDc X IR X ETc

IR	Inhalation rate of gases	0.83 m^3/hour
EFa	Exposure frequency (adult)	40 days/year
EFc	Exposure frequency (child)	110 days/year
EDa	Exposure duration	32 Year
EDc	Exposure duration	12 Year
ETa	Exposure time (adult)	1 hour/day
ETc	Exposure time (child)	2 hour/day
CA	Concentration of radionuclides in air	(see table below)

Cs_{137+1d}	NA	pCi/m^3	$Th_{232+10d}$	NA	pCi/m^3
Np_{237+1d}	9.4E−07	pCi/m^3	U_{234}	6.1E−07	pCi/m^3
Pu_{238}	4.7E−07	pCi/m^3	U_{235+1d}	NA	pCi/m^3
Ra_{226+8d}	NA	pCi/m^3	U_{238+2d}	5.6E−06	pCi/m^3
Ra_{228+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Rn_{222+4d}	NA	pCi/m^3	NA	NA	pCi/m^3
Sr_{90+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Tc_{99}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{228+7d}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{230}	2.6E−06	pCi/m^3	NA	NA	pCi/m^3

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	1.9E−11	NA
Np_{237+1d}	3.0E−03	2.9E−08	8.8E−11
Pu_{238}	1.5E−03	3.9E−08	5.9E−11
Ra_{226+8d}	NA	7.0E−09	NA
Ra_{228+1d}	NA	6.9E−10	NA
Rn_{222+4d}	NA	7.7E−12	NA
Sr_{90+1d}	NA	6.2E−11	NA
Tc_{99}	NA	8.3E−12	NA
Th_{228+7d}	NA	7.8E−08	NA
Th_{230}	8.6E−03	2.9E−08	2.5E−10
$Th_{232+10d}$	NA	1.1E−07	NA
U_{234}	2.0E−03	2.6E−08	5.1E−11
U_{235+1d}	NA	2.5E−08	NA
U_{238+2d}	1.8E−02	2.4E−08	4.3E−10
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		8.8E−10

Table C.III-206
Summary of Risk Quantitation (radionuclides) Alternative 3
Solid Waste Landfill with Federal Ownership: Expanded Trespasser
Via External Radiation

Exposure Equation = $[CR \times EFa \times EDa \times ET_{oa} \times (1-SH_o)]+[CR \times EFc \times EDc \times ET_{oc} \times (1-SH_o)]$

EFa	Fraction of year spent exposured (adult)	0.11 (unitless)
EFc	Fraction of year spent exposured (child)	0.3 (unitless)
EDa	Exposure duration (adult)	32 Year
EDc	Exposure duration (child)	12 Year
ET_{oa}	Fraction of day spent outdoors (adult)	0.04 (unitless)
ET_{oc}	Fraction of day spent outdoors (child)	0.08 (unitless)
SH_o	Shield factor outdoors	NA (unitless)
CR	Radionuclide specific concentrations	(see table below)

Cs_{137+1d}	NA	pCi/g	$Th_{232+10d}$	NA	pCi/g
Np_{237+1d}	4.0E-01	pCi/g	U_{234}	2.6E-01	pCi/g
Pu_{238}	2.0E-01	pCi/g	U_{235+1d}	NA	pCi/g
Ra_{226+8d}	NA	pCi/g	U_{238+2d}	2.4E+00	pCi/g
Ra_{228+1d}	NA	pCi/g	NA	NA	pCi/g
Rn_{222+4d}	NA	pCi/g	NA	NA	pCi/g
Sr_{90+1d}	NA	pCi/g	NA	NA	pCi/g
Tc_{99}	NA	pCi/g	NA	NA	pCi/g
Th_{228+7d}	NA	pCi/g	NA	NA	pCi/g
Th_{230}	1.1E+00	pCi/g	NA	NA	pCi/g

Radionuclides	CDI (year pCi/g)	CSF $(g/pCi-year)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.0E-06	NA
Np_{237+1d}	1.7E-01	4.3E-07	7.4E-08
Pu_{238}	8.6E-02	2.8E-11	2.4E-12
Ra_{226+8d}	NA	6.0E-06	NA
Ra_{228+1d}	NA	2.9E-06	NA
Rn_{222+4d}	NA	5.9E-06	NA
Sr_{90+1d}	NA	NA	NA
Tc_{99}	NA	6.0E-13	NA
Th_{228+7d}	NA	5.6E-06	NA
Th_{230}	4.8E-01	5.4E-11	2.6E-11
$Th_{232+10d}$	NA	8.5E-06	NA
U_{234}	1.1E-01	3.0E-11	3.3E-12
U_{235+1d}	NA	2.4E-07	NA
U_{238+2d}	1.0E+00	5.1E-08	5.2E-08
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		1.3E-07

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Table C.III-206
Summary of Intake Quantitation (chemicals) Alternative 3
Solid Waste Landfill with Federal Ownership: Off-Property Farmer (Adult)
Via Drinking Water Ingestion

Intake Equation = $\frac{CS \times EF \times ED \times IR}{BW \times AT}$

IR	Ingestion rate of groundwater (RAGS, 1989)	2 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens'(lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in groundwater	

Chemical Concentrations

Compound	Concentration	Units
antimony	NA	mg/l
arsenic	NA	mg/l
beryllium	NA	mg/l
uranium-total	6.90E-04	mg/l
benzo(a)pyrene	NA	mg/l
carbazole	NA	mg/l
aroclor-1254	NA	mg/l
aroclor-1260	NA	mg/l
dieldrin	NA	mg/l
NA	NA	mg/l
NA	NA	mg/l
NA	NA	mg/l
NA	NA	mg/l
NA	NA	mg/l
NA	NA	mg/l
NA	NA	mg/l

Compound	Concentration	Units
NA	NA	mg/l
NA	NA	mg/l
NA	NA	mg/l
NA	NA	mg/l
NA	NA	mg/l
NA	NA	mg/l
NA	NA	mg/l
NA	NA	mg/l
NA	NA	mg/l
NA	NA	mg/l
NA	NA	mg/l
NA	NA	mg/l
NA	NA	mg/l
NA	NA	mg/l
NA	NA	mg/l

References

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Table C.III-206 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Federal Ownership: Off-Property Farmer (Adult)
Via Drinking Water Ingestion

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.00E-04	NA
arsenic	NA	3.00E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	1.89E-05	3.00E-03	6.30E-03
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.00E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		6.30E-03

Compound	ILCR Calculation CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.75E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	1.89E-05	NA	NA
benzo(a)pyrene	NA	7.30E+00	NA
carbazole	NA	2.00E-02	NA
aroclor-1254	NA	7.70E+00	NA
aroclor-1260	NA	7.70E+00	NA
dieldrin	NA	1.60E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

000723

Table C.III–207
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Solid Waste Landfill with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Drinking Water

Intake Equation = Cw X EF X EDn X FI X IR

IR	Ingestion rate of groundwater (RAGS, 1989)	2 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
FI	Fractional intake for radionuclides	1 (Unitless)
Cw	Concentration of radionuclides in groundwater	(see table below)

Cs_{137+1d}	NA	pCi/l	$Th_{232+10d}$	NA	pCi/l
Np_{237+1d}	NA	pCi/l	U_{234}	2.1E–01	pCi/l
Pu_{238}	NA	pCi/l	U_{235+1d}	1.1E–02	pCi/l
Ra_{226+8d}	NA	pCi/l	U_{238+2d}	2.3E–01	pCi/l
Ra_{228+1d}	NA	pCi/l		NA	pCi/l
Rn_{222+4d}	NA	pCi/l		NA	pCi/l
Sr_{90+1d}	NA	pCi/l		NA	pCi/l
Tc_{99}	NA	pCi/l		NA	pCi/l
Th_{228+7d}	NA	pCi/l		NA	pCi/l
Th_{230}	NA	pCi/l		NA	pCi/l

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	NA	2.2E–10	NA
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	NA	1.3E–11	NA
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	1.0E+04	1.6E–11	1.6E–07
U_{235+1d}	5.4E+02	1.6E–11	8.6E–09
U_{238+2d}	1.1E+04	2.0E–11	2.3E–07
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
		ILCR Summation =	4.0E–07

Table C.III–208
Summary of Intake Quantitation (chemicals) Alternative 3
Solid Waste Landfill with Federal Ownership: Off–Property Farmer (Adult)
Via Dermal Contact while Bathing

Intake Equation = $\frac{DA \times EF \times ED \times SA}{BW \times AT}$

DA	Dermal absorbed dose	csv mg/cm^2–day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
SA	Skin surface area available for contact	23000 cm^2

Chemical Concentrations

Compound	DA	Units	Compound	DA	Units
antimony	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
arsenic	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
beryllium	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
uranium–total	1.73E–10	mg/cm^2–day	NA	NA	mg/cm^2–day
benzo(a)pyrene	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
carbazole	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
aroclor–1254	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
aroclor–1260	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
dieldrin	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day			

References

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Table C.III-208 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Federal Ownership: Off-Property Farmer (Adult)
Via Dermal Contact while Bathing

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	6.00E-05	NA
arsenic	NA	2.85E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	5.43E-08	1.50E-04	3.62E-04
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	4.50E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		3.62E-04

Compound	ILCR Calculation CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.90E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	5.43E-08	NA	NA
benzo(a)pyrene	NA	NA	NA
carbazole	NA	2.22E-02	NA
aroclor-1254	NA	1.03E+01	NA
aroclor-1260	NA	1.03E+01	NA
dieldrin	NA	1.78E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

Table C.III–209
Summary of Intake Quantitation (chemicals) Alternative 3
Solid Waste Landfill with Federal Ownership: Off–Property Farmer (Adult)
Via Inhalation of Particulates

Intake Equation = $\frac{CS \times EF \times ED \times IR}{BW \times AT}$

IR	Inhalation rate of gases (RAGS, 1989)	20 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in soil	(see table below)

Chemical Concentrations

Compound	Concentration	Units
antimony	7.2E–11	mg/m^3
arsenic	NA	mg/m^3
beryllium	2.6E–11	mg/m^3
uranium–total	2.7E–10	mg/m^3
benzo(a)pyrene	1.9E–11	mg/m^3
carbazole	1.3E–11	mg/m^3
aroclor–1254	NA	mg/m^3
aroclor–1260	NA	mg/m^3
dieldrin	NA	mg/m^3
NA	NA	mg/m^3
NA	NA	mg/m^3
NA	NA	mg/m^3
NA	NA	mg/m^3
NA	NA	mg/m^3
NA	NA	mg/m^3
NA	NA	mg/m^3
NA	NA	mg/m^3

Compound	Concentration	Units
NA	NA	mg/m^3
NA	NA	mg/m^3
NA	NA	mg/m^3
NA	NA	mg/m^3
NA	NA	mg/m^3
NA	NA	mg/m^3
NA	NA	mg/m^3
NA	NA	mg/m^3
NA	NA	mg/m^3
NA	NA	mg/m^3
NA	NA	mg/m^3
NA	NA	mg/m^3
NA	NA	mg/m^3
NA	NA	mg/m^3
NA	NA	mg/m^3

References

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Table C.III-209 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Federal Ownership: Off-Property Farmer (Adult)
Via Inhalation of Particulates

Compound	HQ Calculation		
	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	2.0E-11	NA	NA
arsenic	NA	NA	NA
beryllium	7.0E-12	NA	NA
uranium-total	7.5E-11	NA	NA
benzo(a)pyrene	5.1E-12	NA	NA
carbazole	3.7E-12	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
Hazard Quotient Sum =			NA

Compound	ILCR Calculation		
	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	2.0E-11	NA	NA
arsenic	NA	1.5E+01	NA
beryllium	7.0E-12	8.4E+00	5.9E-11
uranium-total	7.5E-11	NA	NA
benzo(a)pyrene	5.1E-12	6.1E+00	3.1E-11
carbazole	3.7E-12	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			9.0E-11

Table C.III–210
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Solid Waste Landfill with Federal Ownership: Off–Property Farmer (Adult)
Via Inhalation of Gases and Particulates

Intake Equation = Ca X EF X EDn X IR

IR	*Inhalation rate of gases (RAGS, 1989)*	20 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Ca	Concentration of radionuclides in air	(see table below)

Cs_{137+1d}	NA	pCi/m^3	$Th_{232+10d}$	NA	pCi/m^3
Np_{237+1d}	2.6E–08	pCi/m^3	U_{234}	1.7E–08	pCi/m^3
Pu_{238}	1.3E–08	pCi/m^3	U_{235+1d}	NA	pCi/m^3
Ra_{226+8d}	NA	pCi/m^3	U_{238+2d}	1.5E–07	pCi/m^3
Ra_{228+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Rn_{222+4d}	NA	pCi/m^3	NA	NA	pCi/m^3
Sr_{90+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Tc_{99}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{228+7d}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{230}	7.2E–08	pCi/m^3	NA	NA	pCi/m^3

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	1.9E–11	NA
Np_{237+1d}	1.2E–02	2.9E–08	3.6E–10
Pu_{238}	6.3E–03	3.9E–08	2.4E–10
Ra_{226+8d}	NA	7.0E–09	NA
Ra_{228+1d}	NA	6.9E–10	NA
Rn_{222+4d}	NA	7.7E–12	NA
Sr_{90+1d}	NA	6.2E–11	NA
Tc_{99}	NA	8.3E–12	NA
Th_{228+7d}	NA	7.8E–08	NA
Th_{230}	3.5E–02	2.9E–08	1.0E–09
$Th_{232+10d}$	NA	1.1E–07	NA
U_{234}	8.1E–03	2.6E–08	2.1E–10
U_{235+1d}	NA	2.5E–08	NA
U_{238+2d}	7.4E–02	2.4E–08	1.8E–09
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 3.6E–09

000729

Table C.III-211
Summary of Intake Quantitation (chemicals) Alternative 3
Solid Waste Landfill with Federal Ownership: Off-Property Farmer (Adult)
Via Ingestion of Meat Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of meat	0.101 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in meat	

Chemical Concentrations

Compound	Concentration	Units
antimony	9.1E-09	mg/kg
arsenic	NA	mg/kg
beryllium	4.0E-09	mg/kg
uranium-total	6.9E-06	mg/kg
benzo(a)pyrene	4.5E-08	mg/kg
carbazole	8.4E-11	mg/kg
aroclor-1254	NA	mg/kg
aroclor-1260	NA	mg/kg
dieldrin	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg

Compound	Concentration	Units
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg

References

Table C.III-211 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Federal Ownership: Off-Property Farmer (Adult)
Via Ingestion of Meat Products

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	9.5E-12	4.0E-04	2.4E-08
arsenic	NA	3.0E-04	NA
beryllium	4.2E-12	5.0E-03	8.3E-10
uranium-total	7.2E-09	3.0E-03	2.4E-06
benzo(a)pyrene	4.7E-11	NA	NA
carbazole	8.7E-14	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			2.4E-06

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF (mg/kg-day)$^{-1}$	ILCR (unitless)
antimony	9.5E-12	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	4.2E-12	4.3E+00	1.8E-11
uranium-total	7.2E-09	NA	NA
benzo(a)pyrene	4.7E-11	7.3E+00	3.4E-10
carbazole	8.7E-14	2.0E-02	1.7E-15
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			3.6E-10

0007231

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Table C.III–212
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Solid Waste Landfill with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Meat Products

Intake Equation = Cf X EF X EDn X FI X IR

IR	Ingestion rate of meat	0.101 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cf	Concentration of radionuclides in meat	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	1.1E–07	pCi/kg	U_{234}	2.1E–03	pCi/kg
Pu_{238}	4.9E–10	pCi/kg	U_{235+1d}	1.1E–04	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	2.3E–03	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	NA	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	3.9E–08	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	2.0E–04	2.2E–10	4.4E–14
Pu_{238}	9.0E–07	2.2E–10	2.0E–16
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	7.2E–05	1.3E–11	9.4E–16
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	3.9E+00	1.6E–11	6.2E–11
U_{235+1d}	2.0E–01	1.6E–11	3.3E–12
U_{238+2d}	4.3E+00	2.0E–11	8.5E–11
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 1.5E–10

000732

Table C.III–213
Summary of Intake Quantitation (chemicals) Alternative 3
Solid Waste Landfill with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Dairy Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of dairy products	0.4 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in animal products	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	9.1E–10	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	3.6E–12	mg/kg	NA	NA	mg/kg
uranium–total	2.5E–05	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	1.4E–08	mg/kg	NA	NA	mg/kg
carbazole	2.6E–11	mg/kg	NA	NA	mg/kg
aroclor–1254	NA	mg/kg	NA	NA	mg/kg
aroclor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

0007733

Table C.III-213 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Federal Ownership: Off-Property Farmer (Adult)
Via Ingestion of Dairy Products

Compound	HQ Calculation		
	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	3.7E-12	4.0E-04	9.4E-09
arsenic	NA	3.0E-04	NA
beryllium	1.5E-14	5.0E-03	3.0E-12
uranium-total	1.0E-07	3.0E-03	3.4E-05
benzo(a)pyrene	5.9E-11	NA	NA
carbazole	1.1E-13	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			3.4E-05

Compound	ILCR Calculation		
	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	3.7E-12	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	1.5E-14	4.3E+00	6.4E-14
uranium-total	1.0E-07	NA	NA
benzo(a)pyrene	5.9E-11	7.3E+00	4.3E-10
carbazole	1.1E-13	2.0E-02	2.2E-15
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			4.3E-10

Table C.III–214
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Solid Waste Landfill with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Dairy Products

ntake Equation = Cp X EF X EDn X FI X IR

IR	Ingestion rate of dairy products	0.4 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cp	Concentration of radionuclides in animal products	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	9.8E−09	pCi/kg	U_{234}	7.6E−03	pCi/kg
Pu_{238}	9.7E−11	pCi/kg	U_{235+1d}	4.0E−04	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	8.3E−03	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	NA	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	3.2E−08	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E−11	NA
Np_{237+1d}	7.2E−05	2.2E−10	1.6E−14
Pu_{238}	7.1E−07	2.2E−10	1.6E−16
Ra_{226+8d}	NA	7.8E−10	NA
Ra_{228+1d}	NA	1.0E−10	NA
Rn_{222+4d}	NA	1.7E−12	NA
Sr_{90+1d}	NA	3.6E−11	NA
Tc_{99}	NA	1.3E−12	NA
Th_{228+7d}	NA	5.5E−11	NA
Th_{230}	2.4E−04	1.3E−11	3.1E−15
$Th_{232+10d}$	NA	1.7E−10	NA
U_{234}	5.6E+01	1.6E−11	8.9E−10
U_{235+1d}	2.9E+00	1.6E−11	4.7E−11
U_{238+2d}	6.1E+01	2.0E−11	1.2E−09
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 2.2E−09

Table C.III–215
Summary of Intake Quantitation (chemicals) Alternative 3
Solid Waste Landfill with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Vegetables and Fruits

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of fruits or vegetables	0.122 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in vegetables	

Chemical Concentrations

Compound	Concentration	Units
antimony	1.0E–07	mg/kg
arsenic	NA	mg/kg
beryllium	4.3E–08	mg/kg
uranium–total	3.4E–03	mg/kg
benzo(a)pyrene	1.8E–08	mg/kg
carbazole	1.3E–08	mg/kg
aroclor–1254	NA	mg/kg
aroclor–1260	NA	mg/kg
dieldrin	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg

Compound	Concentration	Units
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg

References

Table C.III-215 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Federal Ownership: Off-Property Farmer (Adult)
Via Ingestion of Vegetables and Fruits

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	1.7E-10	4.0E-04	4.3E-07
arsenic	NA	3.0E-04	NA
beryllium	7.2E-11	5.0E-03	1.4E-08
uranium-total	5.6E-06	3.0E-03	1.9E-03
benzo(a)pyrene	3.1E-11	NA	NA
carbazole	2.2E-11	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			1.9E-03

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF (mg/kg-day)$^{-1}$	ILCR (unitless)
antimony	1.7E-10	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	7.2E-11	4.3E+00	3.1E-10
uranium-total	5.6E-06	NA	NA
benzo(a)pyrene	3.1E-11	7.3E+00	2.3E-10
carbazole	2.2E-11	2.0E-02	4.4E-13
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			5.3E-10

002237

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Table C.III–216
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Solid Waste Landfill with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Vegetables and Fruits

Intake Equation = Cv X EF X EDn X FI X IR

IR	Ingestion rate of fruits or vegetables	0.122 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cv	Concentration of radionuclides in vegetables	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	2.5E–05	pCi/kg	U_{234}	1.0E+00	pCi/kg
Pu_{238}	1.3E–05	pCi/kg	U_{235+1d}	5.4E–02	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	1.1E+00	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	NA	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	8.0E–05	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	7.6E–02	2.2E–10	1.7E–11
Pu_{238}	3.8E–02	2.2E–10	8.3E–12
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	2.4E–01	1.3E–11	3.1E–12
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	3.1E+03	1.6E–11	4.9E–08
U_{235+1d}	1.6E+02	1.6E–11	2.6E–09
U_{238+2d}	3.4E+03	2.0E–11	6.7E–08
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 1.2E–07

000738

Table C.III-217
Summary of Intake Quantitation (chemicals) Alternative 3
Solid Waste Landfill with Federal Ownership: Off-Property Farmer (Child)
Via Drinking Water Ingestion

Intake Equation =

$$\frac{CS \times EF \times ED \times IR}{BW \times AT}$$

IR	Ingestion rate of groundwater (RAGS, 1989)	1 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in groundwater	

Chemical Concentrations

Compound	Concentration	Units
antimony	NA	mg/l
arsenic	NA	mg/l
beryllium	NA	mg/l
uranium-total	6.90E-04	mg/l
benzo(a)pyrene	NA	mg/l
carbazole	NA	mg/l
aroclor-1254	NA	mg/l
aroclor-1260	NA	mg/l
dieldrin	NA	mg/l
NA	NA	mg/l
NA	NA	mg/l
NA	NA	mg/l
NA	NA	mg/l
NA	NA	mg/l
NA	NA	mg/l
NA	NA	mg/l

Compound	Concentration	Units
NA	NA	mg/l
NA	NA	mg/l
NA	NA	mg/l
NA	NA	mg/l
NA	NA	mg/l
NA	NA	mg/l
NA	NA	mg/l
NA	NA	mg/l
NA	NA	mg/l
NA	NA	mg/l
NA	NA	mg/l
NA	NA	mg/l
NA	NA	mg/l
NA	NA	mg/l
NA	NA	mg/l

References

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Table C.III-217 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Federal Ownership: Off-Property Farmer (Child)
Via Drinking Water Ingestion

Compound	HQ Calculation		
	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.00E-04	NA
arsenic	NA	3.00E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	4.41E-05	3.00E-03	1.47E-02
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.00E-05	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
HQ Summation =			1.47E-02

Compound	ILCR Calculation		
	CDI (mg/kg-day)	CSF (mg/kg-day)$^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.75E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	3.78E-06	NA	NA
benzo(a)pyrene	NA	7.30E+00	NA
carbazole	NA	2.00E-02	NA
aroclor-1254	NA	7.70E+00	NA
aroclor-1260	NA	7.70E+00	NA
dieldrin	NA	1.60E+01	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
ILCR Summation =			NA

Table C.III–218
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Solid Waste Landfill with Federal Ownership: Off–Property Farmer (Child)
Via Ingestion of Drinking Water

Intake Equation = Cw X EF X EDn X FI X IR

IR	Ingestion rate of groundwater (RAGS, 1989)	1 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
FI	Fractional intake for radionuclides	1 (Unitless)
Cw	Concentration of radionuclides in groundwater	(see table below)

Cs_{137+1d}	NA	pCi/l	$Th_{232+10d}$	NA	pCi/l
Np_{237+1d}	NA	pCi/l	U_{234}	2.1E–01	pCi/l
Pu_{238}	NA	pCi/l	U_{235+1d}	1.1E–02	pCi/l
Ra_{226+8d}	NA	pCi/l	U_{238+2d}	2.3E–01	pCi/l
Ra_{228+1d}	NA	pCi/l	NA	NA	pCi/l
Rn_{222+4d}	NA	pCi/l	NA	NA	pCi/l
Sr_{90+1d}	NA	pCi/l	NA	NA	pCi/l
Tc_{99}	NA	pCi/l	NA	NA	pCi/l
Th_{228+7d}	NA	pCi/l	NA	NA	pCi/l
Th_{230}	NA	pCi/l	NA	NA	pCi/l

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	NA	2.2E–10	NA
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	NA	1.3E–11	NA
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	4.4E+02	1.6E–11	7.1E–09
U_{235+1d}	2.3E+01	1.6E–11	3.7E–10
U_{238+2d}	4.8E+02	2.0E–11	9.7E–09
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		1.7E–08

Table C.III-219
Summary of Intake Quantitation (chemicals) Alternative 3
Solid Waste Landfill with Federal Ownership: Off-Property Farmer (Child)
Via Dermal Contact while Bathing

Intake Equation = $\frac{DA \times EF \times ED \times SA}{BW \times AT}$

DA	Dermal absorbed dose	csv mg/cm^2-day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	2190 days
SA	Skin surface area available for contact	8000 cm^2

Chemical Concentrations

Compound	DA	Units
antimony	NA	mg/cm^2-day
arsenic	NA	mg/cm^2-day
beryllium	NA	mg/cm^2-day
uranium-total	1.73E-10	mg/cm^2-day
benzo(a)pyrene	NA	mg/cm^2-day
carbazole	NA	mg/cm^2-day
aroclor-1254	NA	mg/cm^2-day
aroclor-1260	NA	mg/cm^2-day
dieldrin	NA	mg/cm^2-day
NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day

Compound	DA	Units
NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day

References

Table C.III-220
Summary of Intake Quantitation (chemicals) Alternative 3
Solid Waste Landfill with Federal Ownership: Off-Property Farmer (Child)
Via Inhalation of Particulates

Intake Equation = $\frac{CS \times EF \times ED \times IR}{BW \times AT}$

IR	Inhalation rate of gases (RAGS, 1989)	12 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in soil	(see table below)

Chemical Concentrations

Compound	Concentration	Units
antimony	7.2E-11	mg/m^3
arsenic	NA	mg/m^3
beryllium	2.6E-11	mg/m^3
uranium-total	2.7E-10	mg/m^3
benzo(a)pyrene	1.9E-11	mg/m^3
carbazole	1.3E-11	mg/m^3
aroclor-1254	NA	mg/m^3
aroclor-1260	NA	mg/m^3
dieldrin	NA	mg/m^3
NA	NA	mg/m^3
NA	NA	mg/m^3
NA	NA	mg/m^3
NA	NA	mg/m^3
NA	NA	mg/m^3
NA	NA	mg/m^3
NA	NA	mg/m^3

Compound	Concentration	Units
NA	NA	mg/m^3
NA	NA	mg/m^3
NA	NA	mg/m^3
NA	NA	mg/m^3
NA	NA	mg/m^3
NA	NA	mg/m^3
NA	NA	mg/m^3
NA	NA	mg/m^3
NA	NA	mg/m^3
NA	NA	mg/m^3
NA	NA	mg/m^3
NA	NA	mg/m^3
NA	NA	mg/m^3
NA	NA	mg/m^3
NA	NA	mg/m^3

References

000743

Table C.III-220 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Federal Ownership: Off-Property Farmer (Child)
Via Inhalation of Particulates

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	5.5E-11	NA	NA
arsenic	NA	NA	NA
beryllium	2.0E-11	NA	NA
uranium-total	2.1E-10	NA	NA
benzo(a)pyrene	1.4E-11	NA	NA
carbazole	1.0E-11	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
Hazard Quotient Sum =			NA

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	4.7E-12	NA	NA
arsenic	NA	1.5E+01	NA
beryllium	1.7E-12	8.4E+00	1.4E-11
uranium-total	1.8E-11	NA	NA
benzo(a)pyrene	1.2E-12	6.1E+00	7.4E-12
carbazole	8.8E-13	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			2.2E-11

Table C.III–221
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Solid Waste Landfill with Federal Ownership: Off–Property Farmer (Child)
Via Inhalation of Gases and Particulates

Intake Equation = Ca X EF X EDn X IR

IR	Inhalation rate of gases (RAGS, 1989)	12 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Ca	Concentration of radionuclides in air	(see table below)

Cs_{137+1d}	NA	pCi/m^3	$Th_{232+10d}$	NA	pCi/m^3
Np_{237+1d}	2.6E–08	pCi/m^3	U_{234}	1.7E–08	pCi/m^3
Pu_{238}	1.3E–08	pCi/m^3	U_{235+1d}	NA	pCi/m^3
Ra_{226+8d}	NA	pCi/m^3	U_{238+2d}	1.5E–07	pCi/m^3
Ra_{228+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Rn_{222+4d}	NA	pCi/m^3	NA	NA	pCi/m^3
Sr_{90+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Tc_{99}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{228+7d}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{230}	7.2E–08	pCi/m^3	NA	NA	pCi/m^3

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	1.9E–11	NA
Np_{237+1d}	6.4E–04	2.9E–08	1.9E–11
Pu_{238}	3.2E–04	3.9E–08	1.3E–11
Ra_{226+8d}	NA	7.0E–09	NA
Ra_{228+1d}	NA	6.9E–10	NA
Rn_{222+4d}	NA	7.7E–12	NA
Sr_{90+1d}	NA	6.2E–11	NA
Tc_{99}	NA	8.3E–12	NA
Th_{228+7d}	NA	7.8E–08	NA
Th_{230}	1.8E–03	2.9E–08	5.3E–11
$Th_{232+10d}$	NA	1.1E–07	NA
U_{234}	4.2E–04	2.6E–08	1.1E–11
U_{235+1d}	NA	2.5E–08	NA
U_{238+2d}	3.8E–03	2.4E–08	9.2E–11
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		1.9E–10

000745

Table C.III-222
Summary of Intake Quantitation (chemicals) Alternative 3
Solid Waste Landfill with Federal Ownership: Off-Property Farmer (Child)
Via Ingestion of Meat Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of meat	0.039 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in meat	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	9.1E-09	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	4.0E-09	mg/kg	NA	NA	mg/kg
uranium-total	6.9E-06	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	4.5E-08	mg/kg	NA	NA	mg/kg
carbazole	8.4E-11	mg/kg	NA	NA	mg/kg
aroclor-1254	NA	mg/kg	NA	NA	mg/kg
aroclor-1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

Table C.III-223
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Solid Waste Landfill with Federal Ownership: Off-Property Farmer (Child)
Via Ingestion of Meat Products

Intake Equation = Cf X EF X EDn X FI X IR

IR	Ingestion rate of meat	0.039 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cf	Concentration of radionuclides in meat	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	1.1E-07	pCi/kg	U_{234}	2.1E-03	pCi/kg
Pu_{238}	4.9E-10	pCi/kg	U_{235+1d}	1.1E-04	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	2.3E-03	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	NA	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	3.9E-08	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E-11	NA
Np_{237+1d}	6.6E-06	2.2E-10	1.5E-15
Pu_{238}	3.0E-08	2.2E-10	6.6E-18
Ra_{226+8d}	NA	7.8E-10	NA
Ra_{228+1d}	NA	1.0E-10	NA
Rn_{222+4d}	NA	1.7E-12	NA
Sr_{90+1d}	NA	3.6E-11	NA
Tc_{99}	NA	1.3E-12	NA
Th_{228+7d}	NA	5.5E-11	NA
Th_{230}	2.4E-06	1.3E-11	3.1E-17
$Th_{232+10d}$	NA	1.7E-10	NA
U_{234}	1.3E-01	1.6E-11	2.1E-12
U_{235+1d}	6.8E-03	1.6E-11	1.1E-13
U_{238+2d}	1.4E-01	2.0E-11	2.8E-12
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 5.0E-12

AR 000747

Table C.III-224
Summary of Intake Quantitation (chemicals) Alternative 3
Solid Waste Landfill with Federal Ownership: Off-Property Farmer (Child)
Via Ingestion of Dairy Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of dairy products	0.9 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in animal products	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	9.1E-10	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	3.6E-12	mg/kg	NA	NA	mg/kg
uranium-total	2.5E-05	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	1.4E-08	mg/kg	NA	NA	mg/kg
carbazole	2.6E-11	mg/kg	NA	NA	mg/kg
aroclor-1254	NA	mg/kg	NA	NA	mg/kg
aroclor-1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

Table C.III-224 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Federal Ownership: Off-Property Farmer (Child)
Via Ingestion of Dairy Products

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	3.9E-11	4.0E-04	9.8E-08
arsenic	NA	3.0E-04	NA
beryllium	1.6E-13	5.0E-03	3.1E-11
uranium-total	1.1E-06	3.0E-03	3.6E-04
benzo(a)pyrene	6.2E-10	NA	NA
carbazole	1.1E-12	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			3.6E-04

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF (mg/kg-day)$^{-1}$	ILCR (unitless)
antimony	3.4E-12	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	1.3E-14	4.3E+00	5.7E-14
uranium-total	9.2E-08	NA	NA
benzo(a)pyrene	5.3E-11	7.3E+00	3.9E-10
carbazole	9.8E-14	2.0E-02	2.0E-15
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			3.9E-10

000749

6646

Table C.III-225
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Solid Waste Landfill with Federal Ownership: Off-Property Farmer (Child)
Via Ingestion of Dairy Products

Intake Equation = Cp X EF X EDn X FI X IR

IR	Ingestion rate of dairy products	0.9 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cp	Concentration of radionuclides in animal products	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	9.8E-09	pCi/kg	U_{234}	7.6E-03	pCi/kg
Pu_{238}	9.7E-11	pCi/kg	U_{235+1d}	4.0E-04	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	8.3E-03	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	NA	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	3.2E-08	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E-11	NA
Np_{237+1d}	1.4E-05	2.2E-10	3.1E-15
Pu_{238}	1.4E-07	2.2E-10	3.0E-17
Ra_{226+8d}	NA	7.8E-10	NA
Ra_{228+1d}	NA	1.0E-10	NA
Rn_{222+4d}	NA	1.7E-12	NA
Sr_{90+1d}	NA	3.6E-11	NA
Tc_{99}	NA	1.3E-12	NA
Th_{228+7d}	NA	5.5E-11	NA
Th_{230}	4.6E-05	1.3E-11	6.0E-16
$Th_{232+10d}$	NA	1.7E-10	NA
U_{234}	1.1E+01	1.6E-11	1.7E-10
U_{235+1d}	5.6E-01	1.6E-11	9.0E-12
U_{238+2d}	1.2E+01	2.0E-11	2.3E-10
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 4.2E-10

Table C.III–226
Summary of Intake Quantitation (chemicals) Alternative 3
Solid Waste Landfill with Federal Ownership: Off–Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of fruits or vegetables	0.1 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in vegetables	

Chemical Concentrations

Compound	Concentration	Units
antimony	1.0E–07	mg/kg
arsenic	NA	mg/kg
beryllium	4.3E–08	mg/kg
uranium–total	3.4E–03	mg/kg
benzo(a)pyrene	1.8E–08	mg/kg
carbazole	1.3E–08	mg/kg
aroclor–1254	NA	mg/kg
aroclor–1260	NA	mg/kg
dieldrin	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg

Compound	Concentration	Units
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg

References

0007751

Table C.III-226 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Federal Ownership: Off-Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

Compound	HQ Calculation		
	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	6.5E-10	4.0E-04	1.6E-06
arsenic	NA	3.0E-04	NA
beryllium	2.7E-10	5.0E-03	5.5E-08
uranium-total	2.2E-05	3.0E-03	7.2E-03
benzo(a)pyrene	1.2E-10	NA	NA
carbazole	8.5E-11	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			7.2E-03

Compound	ILCR Calculation		
	CDI (mg/kg-day)	CSF (mg/kg-day)$^{-1}$	ILCR (unitless)
antimony	5.6E-11	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	2.3E-11	4.3E+00	1.0E-10
uranium-total	1.9E-06	NA	NA
benzo(a)pyrene	1.0E-11	7.3E+00	7.4E-11
carbazole	7.3E-12	2.0E-02	1.5E-13
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			1.8E-10

Table C.III-227
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Solid Waste Landfill with Federal Ownership: Off-Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

Intake Equation = Cv X EF X EDn X FI X IR

IR	Ingestion rate of fruits or vegetables	0.1 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cv	Concentration of radionuclides in vegetables	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	2.5E-05	pCi/kg	U_{234}	1.0E+00	pCi/kg
Pu_{238}	1.3E-05	pCi/kg	U_{235+1d}	5.4E-02	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	1.1E+00	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	NA	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	8.0E-05	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E-11	NA
Np_{237+1d}	5.3E-03	2.2E-10	1.2E-12
Pu_{238}	2.6E-03	2.2E-10	5.8E-13
Ra_{226+8d}	NA	7.8E-10	NA
Ra_{228+1d}	NA	1.0E-10	NA
Rn_{222+4d}	NA	1.7E-12	NA
Sr_{90+1d}	NA	3.6E-11	NA
Tc_{99}	NA	1.3E-12	NA
Th_{228+7d}	NA	5.5E-11	NA
Th_{230}	1.7E-02	1.3E-11	2.2E-13
$Th_{232+10d}$	NA	1.7E-10	NA
U_{234}	2.2E+02	1.6E-11	3.5E-09
U_{235+1d}	1.1E+01	1.6E-11	1.8E-10
U_{238+2d}	2.4E+02	2.0E-11	4.7E-09
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 8.4E-09

000753

Table C.III-228
Summary of Intake Quantitation (chemicals) Alternative 3
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Adult)
Via Drinking Water Ingestion

Intake Equation = $\frac{CS \times EF \times ED \times IR}{BW \times AT}$

IR	Ingestion rate of groundwater (RAGS, 1989)	2 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in groundwater	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	0.00E+00	mg/l	0	0.00E+00	mg/l
arsenic	0.00E+00	mg/l	0	0.00E+00	mg/l
beryllium	0.00E+00	mg/l	0	0.00E+00	mg/l
uranium-total	2.70E-06	mg/l	0	0.00E+00	mg/l
benzo(a)pyrene	0.00E+00	mg/l	0	0.00E+00	mg/l
carbazole	0.00E+00	mg/l	0	0.00E+00	mg/l
aroclor-1254	0.00E+00	mg/l	0	0.00E+00	mg/l
aroclor-1260	0.00E+00	mg/l	0	0.00E+00	mg/l
dieldrin	0.00E+00	mg/l	0	0.00E+00	mg/l
0	0.00E+00	mg/l	0	0.00E+00	mg/l
0	0.00E+00	mg/l	0	0.00E+00	mg/l
0	0.00E+00	mg/l	0	0.00E+00	mg/l
0	0.00E+00	mg/l	0	0.00E+00	mg/l
0	0.00E+00	mg/l	0	0.00E+00	mg/l
0	0.00E+00	mg/l	0	0.00E+00	mg/l
0	0.00E+00	mg/l			

References

Table C.III–206
Summary of Intake Quantitation (chemicals) Alternative 3
Solid Waste Landfill with Federal Ownership: Off–Property Farmer (Adult)
Via Drinking Water Ingestion

Intake Equation = $\frac{CS \times EF \times ED \times IR}{BW \times AT}$

IR	Ingestion rate of groundwater (RAGS, 1989)	2 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in groundwater	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/l	NA	NA	mg/l
arsenic	NA	mg/l	NA	NA	mg/l
beryllium	NA	mg/l	NA	NA	mg/l
uranium–total	6.90E–04	mg/l	NA	NA	mg/l
benzo(a)pyrene	NA	mg/l	NA	NA	mg/l
carbazole	NA	mg/l	NA	NA	mg/l
aroclor–1254	NA	mg/l	NA	NA	mg/l
aroclor–1260	NA	mg/l	NA	NA	mg/l
dieldrin	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l			

References

1000255

Table C.III-206 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Federal Ownership: Off-Property Farmer (Adult)
Via Drinking Water Ingestion

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.00E-04	NA
arsenic	NA	3.00E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	1.89E-05	3.00E-03	6.30E-03
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.00E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		6.30E-03

Compound	ILCR Calculation CDI (mg/kg-day)	CSF (mg/kg-day)$^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.75E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	1.89E-05	NA	NA
benzo(a)pyrene	NA	7.30E+00	NA
carbazole	NA	2.00E-02	NA
aroclor-1254	NA	7.70E+00	NA
aroclor-1260	NA	7.70E+00	NA
dieldrin	NA	1.60E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

Table C.III–207
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Solid Waste Landfill with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Drinking Water

Intake Equation = Cw X EF X EDn X FI X IR

IR	Ingestion rate of groundwater (RAGS, 1989)	2 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
FI	Fractional intake for radionuclides	1 (Unitless)
Cw	Concentration of radionuclides in groundwater	(see table below)

Cs_{137+1d}	NA	pCi/l	$Th_{232+10d}$	NA	pCi/l
Np_{237+1d}	NA	pCi/l	U_{234}	2.1E–01	pCi/l
Pu_{238}	NA	pCi/l	U_{235+1d}	1.1E–02	pCi/l
Ra_{226+8d}	NA	pCi/l	U_{238+2d}	2.3E–01	pCi/l
Ra_{228+1d}	NA	pCi/l	NA	NA	pCi/l
Rn_{222+4d}	NA	pCi/l	NA	NA	pCi/l
Sr_{90+1d}	NA	pCi/l	NA	NA	pCi/l
Tc_{99}	NA	pCi/l	NA	NA	pCi/l
Th_{228+7d}	NA	pCi/l	NA	NA	pCi/l
Th_{230}	NA	pCi/l	NA	NA	pCi/l

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	NA	2.2E–10	NA
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	NA	1.3E–11	NA
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	1.0E+04	1.6E–11	1.6E–07
U_{235+1d}	5.4E+02	1.6E–11	8.6E–09
U_{238+2d}	1.1E+04	2.0E–11	2.3E–07
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 4.0E–07

000757

Table C.III–208
Summary of Intake Quantitation (chemicals) Alternative 3
Solid Waste Landfill with Federal Ownership: Off–Property Farmer (Adult)
Via Dermal Contact while Bathing

Intake Equation = $\frac{DA \times EF \times ED \times SA}{BW \times AT}$

DA	Dermal absorbed dose	csv mg/cm^2–day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
SA	Skin surface area available for contact	23000 cm^2

Chemical Concentrations

Compound	DA	Units	Compound	DA	Units
antimony	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
arsenic	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
beryllium	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
uranium–total	1.73E–10	mg/cm^2–day	NA	NA	mg/cm^2–day
benzo(a)pyrene	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
carbazole	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
aroclor–1254	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
aroclor–1260	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
dieldrin	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day			

References

Table C.III-208 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Federal Ownership: Off-Property Farmer (Adult)
Via Dermal Contact while Bathing

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	6.00E-05	NA
arsenic	NA	2.85E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	5.43E-08	1.50E-04	3.62E-04
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	4.50E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		3.62E-04

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.90E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	5.43E-08	NA	NA
benzo(a)pyrene	NA	NA	NA
carbazole	NA	2.22E-02	NA
aroclor-1254	NA	1.03E+01	NA
aroclor-1260	NA	1.03E+01	NA
dieldrin	NA	1.78E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

000759

Table C.III-209
Summary of Intake Quantitation (chemicals) Alternative 3
Solid Waste Landfill with Federal Ownership: Off-Property Farmer (Adult)
Via Inhalation of Particulates

Intake Equation = $\frac{CS \times EF \times ED \times IR}{BW \times AT}$

IR	Inhalation rate of gases (RAGS, 1989)	20 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in soil	(see table below)

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	7.2E-11	mg/m^3	NA	NA	mg/m^3
arsenic	NA	mg/m^3	NA	NA	mg/m^3
beryllium	2.6E-11	mg/m^3	NA	NA	mg/m^3
uranium-total	2.7E-10	mg/m^3	NA	NA	mg/m^3
benzo(a)pyrene	1.9E-11	mg/m^3	NA	NA	mg/m^3
carbazole	1.3E-11	mg/m^3	NA	NA	mg/m^3
aroclor-1254	NA	mg/m^3	NA	NA	mg/m^3
aroclor-1260	NA	mg/m^3	NA	NA	mg/m^3
dieldrin	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3			

References

Table C.III-209 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Federal Ownership: Off-Property Farmer (Adult)
Via Inhalation of Particulates

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	2.0E-11	NA	NA
arsenic	NA	NA	NA
beryllium	7.0E-12	NA	NA
uranium-total	7.5E-11	NA	NA
benzo(a)pyrene	5.1E-12	NA	NA
carbazole	3.7E-12	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	Hazard Quotient Sum =		NA

Compound	ILCR Calculation CDI (mg/kg-day)	CSF $(mg/kg\text{-}day)^{-1}$	ILCR (unitless)
antimony	2.0E-11	NA	NA
arsenic	NA	1.5E+01	NA
beryllium	7.0E-12	8.4E+00	5.9E-11
uranium-total	7.5E-11	NA	NA
benzo(a)pyrene	5.1E-12	6.1E+00	3.1E-11
carbazole	3.7E-12	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		9.0E-11

6646

000761

Table C.III–210
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Solid Waste Landfill with Federal Ownership: Off–Property Farmer (Adult)
Via Inhalation of Gases and Particulates

Intake Equation = Ca X EF X EDn X IR

IR	Inhalation rate of gases (RAGS, 1989)	20 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Ca	Concentration of radionuclides in air	(see table below)

Cs_{137+1d}	NA	pCi/m^3	$Th_{232+10d}$	NA	pCi/m^3
Np_{237+1d}	2.6E–08	pCi/m^3	U_{234}	1.7E–08	pCi/m^3
Pu_{238}	1.3E–08	pCi/m^3	U_{235+1d}	NA	pCi/m^3
Ra_{226+8d}	NA	pCi/m^3	U_{238+2d}	1.5E–07	pCi/m^3
Ra_{228+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Rn_{222+4d}	NA	pCi/m^3	NA	NA	pCi/m^3
Sr_{90+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Tc_{99}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{228+7d}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{230}	7.2E–08	pCi/m^3	NA	NA	pCi/m^3

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	1.9E–11	NA
Np_{237+1d}	1.2E–02	2.9E–08	3.6E–10
Pu_{238}	6.3E–03	3.9E–08	2.4E–10
Ra_{226+8d}	NA	7.0E–09	NA
Ra_{228+1d}	NA	6.9E–10	NA
Rn_{222+4d}	NA	7.7E–12	NA
Sr_{90+1d}	NA	6.2E–11	NA
Tc_{99}	NA	8.3E–12	NA
Th_{228+7d}	NA	7.8E–08	NA
Th_{230}	3.5E–02	2.9E–08	1.0E–09
$Th_{232+10d}$	NA	1.1E–07	NA
U_{234}	8.1E–03	2.6E–08	2.1E–10
U_{235+1d}	NA	2.5E–08	NA
U_{238+2d}	7.4E–02	2.4E–08	1.8E–09
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
		ILCR Summation =	3.6E–09

Table C.III–211
Summary of Intake Quantitation (chemicals) Alternative 3
Solid Waste Landfill with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Meat Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of meat	0.101 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in meat	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	9.1E–09	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	4.0E–09	mg/kg	NA	NA	mg/kg
uranium–total	6.9E–06	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	4.5E–08	mg/kg	NA	NA	mg/kg
carbazole	8.4E–11	mg/kg	NA	NA	mg/kg
aroclor–1254	NA	mg/kg	NA	NA	mg/kg
aroclor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

0002753

Table C.III-211 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Federal Ownership: Off-Property Farmer (Adult)
Via Ingestion of Meat Products

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	9.5E-12	4.0E-04	2.4E-08
arsenic	NA	3.0E-04	NA
beryllium	4.2E-12	5.0E-03	8.3E-10
uranium-total	7.2E-09	3.0E-03	2.4E-06
benzo(a)pyrene	4.7E-11	NA	NA
carbazole	8.7E-14	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	HQ Summation =		2.4E-06

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	9.5E-12	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	4.2E-12	4.3E+00	1.8E-11
uranium-total	7.2E-09	NA	NA
benzo(a)pyrene	4.7E-11	7.3E+00	3.4E-10
carbazole	8.7E-14	2.0E-02	1.7E-15
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	ILCR Summation =		3.6E-10

Table C.III–212
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Solid Waste Landfill with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Meat Products

Intake Equation = Cf X EF X EDn X FI X IR

IR	Ingestion rate of meat	0.101 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cf	Concentration of radionuclides in meat	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	1.1E–07	pCi/kg	U_{234}	2.1E–03	pCi/kg
Pu_{238}	4.9E–10	pCi/kg	U_{235+1d}	1.1E–04	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	2.3E–03	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	NA	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	3.9E–08	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	2.0E–04	2.2E–10	4.4E–14
Pu_{238}	9.0E–07	2.2E–10	2.0E–16
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	7.2E–05	1.3E–11	9.4E–16
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	3.9E+00	1.6E–11	6.2E–11
U_{235+1d}	2.0E–01	1.6E–11	3.3E–12
U_{238+2d}	4.3E+00	2.0E–11	8.5E–11
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 1.5E–10

000765

Table C.III–213
Summary of Intake Quantitation (chemicals) Alternative 3
Solid Waste Landfill with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Dairy Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of dairy products	0.4 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in animal products	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	9.1E–10	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	3.6E–12	mg/kg	NA	NA	mg/kg
uranium–total	2.5E–05	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	1.4E–08	mg/kg	NA	NA	mg/kg
carbazole	2.6E–11	mg/kg	NA	NA	mg/kg
aroclor–1254	NA	mg/kg	NA	NA	mg/kg
aroclor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

Table C.III-213 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Federal Ownership: Off-Property Farmer (Adult)
Via Ingestion of Dairy Products

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	3.7E-12	4.0E-04	9.4E-09
arsenic	NA	3.0E-04	NA
beryllium	1.5E-14	5.0E-03	3.0E-12
uranium-total	1.0E-07	3.0E-03	3.4E-05
benzo(a)pyrene	5.9E-11	NA	NA
carbazole	1.1E-13	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		3.4E-05

Compound	ILCR Calculation CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	3.7E-12	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	1.5E-14	4.3E+00	6.4E-14
uranium-total	1.0E-07	NA	NA
benzo(a)pyrene	5.9E-11	7.3E+00	4.3E-10
carbazole	1.1E-13	2.0E-02	2.2E-15
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		4.3E-10

000757

6646

Table C.III–214
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Solid Waste Landfill with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Dairy Products

Intake Equation = Cp X EF X EDn X FI X IR

IR	Ingestion rate of dairy products	0.4 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cp	*Concentration of radionuclides in animal products*	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	9.8E–09	pCi/kg	U_{234}	7.6E–03	pCi/kg
Pu_{238}	9.7E–11	pCi/kg	U_{235+1d}	4.0E–04	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	8.3E–03	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	NA	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	3.2E–08	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	7.2E–05	2.2E–10	1.6E–14
Pu_{238}	7.1E–07	2.2E–10	1.6E–16
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	2.4E–04	1.3E–11	3.1E–15
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	5.6E+01	1.6E–11	8.9E–10
U_{235+1d}	2.9E+00	1.6E–11	4.7E–11
U_{238+2d}	6.1E+01	2.0E–11	1.2E–09
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 2.2E–09

Table C.III–215
Summary of Intake Quantitation (chemicals) Alternative 3
Solid Waste Landfill with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Vegetables and Fruits

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of fruits or vegetables	0.122 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in vegetables	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	1.0E–07	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	4.3E–08	mg/kg	NA	NA	mg/kg
uranium–total	3.4E–03	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	1.8E–08	mg/kg	NA	NA	mg/kg
carbazole	1.3E–08	mg/kg	NA	NA	mg/kg
aroclor–1254	NA	mg/kg	NA	NA	mg/kg
aroclor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

000259

Table C.III-215 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Federal Ownership: Off-Property Farmer (Adult)
Via Ingestion of Vegetables and Fruits

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	1.7E-10	4.0E-04	4.3E-07
arsenic	NA	3.0E-04	NA
beryllium	7.2E-11	5.0E-03	1.4E-08
uranium-total	5.6E-06	3.0E-03	1.9E-03
benzo(a)pyrene	3.1E-11	NA	NA
carbazole	2.2E-11	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		1.9E-03

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg\text{-}day)^{-1}$	ILCR (unitless)
antimony	1.7E-10	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	7.2E-11	4.3E+00	3.1E-10
uranium-total	5.6E-06	NA	NA
benzo(a)pyrene	3.1E-11	7.3E+00	2.3E-10
carbazole	2.2E-11	2.0E-02	4.4E-13
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		5.3E-10

000770

Table C.III–216
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Solid Waste Landfill with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Vegetables and Fruits

Intake Equation = Cv X EF X EDn X FI X IR

IR	Ingestion rate of fruits or vegetables	0.122 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cv	Concentration of radionuclides in vegetables	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	2.5E−05	pCi/kg	U_{234}	1.0E+00	pCi/kg
Pu_{238}	1.3E−05	pCi/kg	U_{235+1d}	5.4E−02	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	1.1E+00	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	NA	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	8.0E−05	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E−11	NA
Np_{237+1d}	7.6E−02	2.2E−10	1.7E−11
Pu_{238}	3.8E−02	2.2E−10	8.3E−12
Ra_{226+8d}	NA	7.8E−10	NA
Ra_{228+1d}	NA	1.0E−10	NA
Rn_{222+4d}	NA	1.7E−12	NA
Sr_{90+1d}	NA	3.6E−11	NA
Tc_{99}	NA	1.3E−12	NA
Th_{228+7d}	NA	5.5E−11	NA
Th_{230}	2.4E−01	1.3E−11	3.1E−12
$Th_{232+10d}$	NA	1.7E−10	NA
U_{234}	3.1E+03	1.6E−11	4.9E−08
U_{235+1d}	1.6E+02	1.6E−11	2.6E−09
U_{238+2d}	3.4E+03	2.0E−11	6.7E−08
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 1.2E−07

000771

Table C.III-217
Summary of Intake Quantitation (chemicals) Alternative 3
Solid Waste Landfill with Federal Ownership: Off-Property Farmer (Child)
Via Drinking Water Ingestion

Intake Equation = $\frac{CS \times EF \times ED \times IR}{BW \times AT}$

IR	Ingestion rate of groundwater (RAGS, 1989)	1 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in groundwater	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/l	NA	NA	mg/l
arsenic	NA	mg/l	NA	NA	mg/l
beryllium	NA	mg/l	NA	NA	mg/l
uranium-total	6.90E-04	mg/l	NA	NA	mg/l
benzo(a)pyrene	NA	mg/l	NA	NA	mg/l
carbazole	NA	mg/l	NA	NA	mg/l
aroclor-1254	NA	mg/l	NA	NA	mg/l
aroclor-1260	NA	mg/l	NA	NA	mg/l
dieldrin	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l			

References

Table C.III−217 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Federal Ownership: Off−Property Farmer (Child)
Via Drinking Water Ingestion

Compound	HQ Calculation CDI (mg/kg−day)	RfD (mg/kg−day)	HQ (unitless)
antimony	NA	4.00E−04	NA
arsenic	NA	3.00E−04	NA
beryllium	NA	5.00E−03	NA
uranium−total	4.41E−05	3.00E−03	1.47E−02
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor−1254	NA	NA	NA
aroclor−1260	NA	NA	NA
dieldrin	NA	5.00E−05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		1.47E−02

Compound	ILCR Calculation CDI (mg/kg−day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.75E+00	NA
beryllium	NA	4.30E+00	NA
uranium−total	3.78E−06	NA	NA
benzo(a)pyrene	NA	7.30E+00	NA
carbazole	NA	2.00E−02	NA
aroclor−1254	NA	7.70E+00	NA
aroclor−1260	NA	7.70E+00	NA
dieldrin	NA	1.60E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

000773

6646

Table C.III–218
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Solid Waste Landfill with Federal Ownership: Off–Property Farmer (Child)
Via Ingestion of Drinking Water

Intake Equation = Cw X EF X EDn X FI X IR

IR	Ingestion rate of groundwater (RAGS, 1989)	1 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
FI	Fractional intake for radionuclides	1 (Unitless)
Cw	Concentration of radionuclides in groundwater	(see table below)

Cs_{137+1d}	NA	pCi/l	$Th_{232+10d}$	NA	pCi/l
Np_{237+1d}	NA	pCi/l	U_{234}	2.1E–01	pCi/l
Pu_{238}	NA	pCi/l	U_{235+1d}	1.1E–02	pCi/l
Ra_{226+8d}	NA	pCi/l	U_{238+2d}	2.3E–01	pCi/l
Ra_{228+1d}	NA	pCi/l	NA	NA	pCi/l
Rn_{222+4d}	NA	pCi/l	NA	NA	pCi/l
Sr_{90+1d}	NA	pCi/l	NA	NA	pCi/l
Tc_{99}	NA	pCi/l	NA	NA	pCi/l
Th_{228+7d}	NA	pCi/l	NA	NA	pCi/l
Th_{230}	NA	pCi/l	NA	NA	pCi/l

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	NA	2.2E–10	NA
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	NA	1.3E–11	NA
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	4.4E+02	1.6E–11	7.1E–09
U_{235+1d}	2.3E+01	1.6E–11	3.7E–10
U_{238+2d}	4.8E+02	2.0E–11	9.7E–09
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation	=	1.7E–08

000774

Table C.III–219
Summary of Intake Quantitation (chemicals) Alternative 3
Solid Waste Landfill with Federal Ownership: Off–Property Farmer (Child)
Via Dermal Contact while Bathing

Intake Equation = $\frac{DA \times EF \times ED \times SA}{BW \times AT}$

DA	Dermal absorbed dose	csv mg/cm^2–day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	2190 days
SA	Skin surface area available for contact	8000 cm^2

Chemical Concentrations

Compound	DA	Units	Compound	DA	Units
antimony	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
arsenic	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
beryllium	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
uranium–total	1.73E–10	mg/cm^2–day	NA	NA	mg/cm^2–day
benzo(a)pyrene	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
carbazole	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
aroclor–1254	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
aroclor–1260	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
dieldrin	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day			

References

S22000

Table C.III-219 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Federal Ownership: Off-Property Farmer (Child)
Via Dermal Contact while Bathing

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	6.00E-05	NA
arsenic	NA	2.85E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	8.82E-08	1.50E-04	5.88E-04
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	4.50E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	HQ Summation =		5.88E-04

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.90E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	7.56E-09	NA	NA
benzo(a)pyrene	NA	NA	NA
carbazole	NA	2.22E-02	NA
aroclor-1254	NA	1.03E+01	NA
aroclor-1260	NA	1.03E+01	NA
dieldrin	NA	1.78E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	ILCR Summation =		NA

Table C.III–220
Summary of Intake Quantitation (chemicals) Alternative 3
Solid Waste Landfill with Federal Ownership: Off–Property Farmer (Child)
Via Inhalation of Particulates

Intake Equation = $\frac{CS \times EF \times ED \times IR}{BW \times AT}$

IR	Inhalation rate of gases (RAGS, 1989)	12 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in soil	(see table below)

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	7.2E–11	mg/m^3	NA	NA	mg/m^3
arsenic	NA	mg/m^3	NA	NA	mg/m^3
beryllium	2.6E–11	mg/m^3	NA	NA	mg/m^3
uranium–total	2.7E–10	mg/m^3	NA	NA	mg/m^3
benzo(a)pyrene	1.9E–11	mg/m^3	NA	NA	mg/m^3
carbazole	1.3E–11	mg/m^3	NA	NA	mg/m^3
aroclor–1254	NA	mg/m^3	NA	NA	mg/m^3
aroclor–1260	NA	mg/m^3	NA	NA	mg/m^3
dieldrin	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3			

References

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Table C.III-220 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Federal Ownership: Off-Property Farmer (Child)
Via Inhalation of Particulates

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	5.5E-11	NA	NA
arsenic	NA	NA	NA
beryllium	2.0E-11	NA	NA
uranium-total	2.1E-10	NA	NA
benzo(a)pyrene	1.4E-11	NA	NA
carbazole	1.0E-11	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	Hazard Quotient Sum =		NA

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	4.7E-12	NA	NA
arsenic	NA	1.5E+01	NA
beryllium	1.7E-12	8.4E+00	1.4E-11
uranium-total	1.8E-11	NA	NA
benzo(a)pyrene	1.2E-12	6.1E+00	7.4E-12
carbazole	8.8E-13	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		2.2E-11

Table C.III–221
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Solid Waste Landfill with Federal Ownership: Off–Property Farmer (Child)
Via Inhalation of Gases and Particulates

Intake Equation = Ca X EF X EDn X IR

IR	Inhalation rate of gases (RAGS, 1989)	12 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Ca	Concentration of radionuclides in air	(see table below)

Cs_{137+1d}	NA	pCi/m^3	$Th_{232+10d}$	NA	pCi/m^3
Np_{237+1d}	2.6E–08	pCi/m^3	U_{234}	1.7E–08	pCi/m^3
Pu_{238}	1.3E–08	pCi/m^3	U_{235+1d}	NA	pCi/m^3
Ra_{226+8d}	NA	pCi/m^3	U_{238+2d}	1.5E–07	pCi/m^3
Ra_{228+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Rn_{222+4d}	NA	pCi/m^3	NA	NA	pCi/m^3
Sr_{90+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Tc_{99}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{228+7d}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{230}	7.2E–08	pCi/m^3	NA	NA	pCi/m^3

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	1.9E–11	NA
Np_{237+1d}	6.4E–04	2.9E–08	1.9E–11
Pu_{238}	3.2E–04	3.9E–08	1.3E–11
Ra_{226+8d}	NA	7.0E–09	NA
Ra_{228+1d}	NA	6.9E–10	NA
Rn_{222+4d}	NA	7.7E–12	NA
Sr_{90+1d}	NA	6.2E–11	NA
Tc_{99}	NA	8.3E–12	NA
Th_{228+7d}	NA	7.8E–08	NA
Th_{230}	1.8E–03	2.9E–08	5.3E–11
$Th_{232+10d}$	NA	1.1E–07	NA
U_{234}	4.2E–04	2.6E–08	1.1E–11
U_{235+1d}	NA	2.5E–08	NA
U_{238+2d}	3.8E–03	2.4E–08	9.2E–11
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
ILCR Summation	=		1.9E–10

Table C.III-222
Summary of Intake Quantitation (chemicals) Alternative 3
Solid Waste Landfill with Federal Ownership: Off-Property Farmer (Child)
Via Ingestion of Meat Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of meat	0.039 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	*Exposure duration for non-carcinogens*	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in meat	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	9.1E-09	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	4.0E-09	mg/kg	NA	NA	mg/kg
uranium-total	6.9E-06	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	4.5E-08	mg/kg	NA	NA	mg/kg
carbazole	8.4E-11	mg/kg	NA	NA	mg/kg
aroclor-1254	NA	mg/kg	NA	NA	mg/kg
aroclor-1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

Table C.III-222 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Federal Ownership: Off-Property Farmer (Child)
Via Ingestion of Meat Products

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	1.7E-11	4.0E-04	4.3E-08
arsenic	NA	3.0E-04	NA
beryllium	7.5E-12	5.0E-03	1.5E-09
uranium-total	1.3E-08	3.0E-03	4.3E-06
benzo(a)pyrene	8.5E-11	NA	NA
carbazole	1.6E-13	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		4.3E-06

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF (mg/kg-day)$^{-1}$	ILCR (unitless)
antimony	1.5E-12	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	6.4E-13	4.3E+00	2.8E-12
uranium-total	1.1E-09	NA	NA
benzo(a)pyrene	7.2E-12	7.3E+00	5.3E-11
carbazole	1.3E-14	2.0E-02	2.7E-16
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		5.6E-11

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Table C.III–223
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Solid Waste Landfill with Federal Ownership: Off–Property Farmer (Child)
Via Ingestion of Meat Products

Intake Equation = Cf X EF X EDn X FI X IR

IR	Ingestion rate of meat	0.039 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cf	Concentration of radionuclides in meat	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	1.1E–07	pCi/kg	U_{234}	2.1E–03	pCi/kg
Pu_{238}	4.9E–10	pCi/kg	U_{235+1d}	1.1E–04	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	2.3E–03	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	NA	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	3.9E–08	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	6.6E–06	2.2E–10	1.5E–15
Pu_{238}	3.0E–08	2.2E–10	6.6E–18
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	2.4E–06	1.3E–11	3.1E–17
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	1.3E–01	1.6E–11	2.1E–12
U_{235+1d}	6.8E–03	1.6E–11	1.1E–13
U_{238+2d}	1.4E–01	2.0E–11	2.8E–12
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		5.0E–12

Table C.III–224
Summary of Intake Quantitation (chemicals) Alternative 3
Solid Waste Landfill with Federal Ownership: Off–Property Farmer (Child)
Via Ingestion of Dairy Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of dairy products	0.9 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in animal products	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	9.1E–10	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	3.6E–12	mg/kg	NA	NA	mg/kg
uranium–total	2.5E–05	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	1.4E–08	mg/kg	NA	NA	mg/kg
carbazole	2.6E–11	mg/kg	NA	NA	mg/kg
aroclor–1254	NA	mg/kg	NA	NA	mg/kg
aroclor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

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Table C.III-224 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Federal Ownership: Off-Property Farmer (Child)
Via Ingestion of Dairy Products

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	3.9E-11	4.0E-04	9.8E-08
arsenic	NA	3.0E-04	NA
beryllium	1.6E-13	5.0E-03	3.1E-11
uranium-total	1.1E-06	3.0E-03	3.6E-04
benzo(a)pyrene	6.2E-10	NA	NA
carbazole	1.1E-12	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			3.6E-04

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	3.4E-12	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	1.3E-14	4.3E+00	5.7E-14
uranium-total	9.2E-08	NA	NA
benzo(a)pyrene	5.3E-11	7.3E+00	3.9E-10
carbazole	9.8E-14	2.0E-02	2.0E-15
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			3.9E-10

Table C.III–225
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Solid Waste Landfill with Federal Ownership: Off–Property Farmer (Child)
Via Ingestion of Dairy Products

Intake Equation = Cp X EF X EDn X FI X IR

IR	Ingestion rate of dairy products	0.9 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cp	Concentration of radionuclides in animal products	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	9.8E–09	pCi/kg	U_{234}	7.6E–03	pCi/kg
Pu_{238}	9.7E–11	pCi/kg	U_{235+1d}	4.0E–04	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	8.3E–03	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	NA	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	3.2E–08	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	1.4E–05	2.2E–10	3.1E–15
Pu_{238}	1.4E–07	2.2E–10	3.0E–17
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	4.6E–05	1.3E–11	6.0E–16
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	1.1E+01	1.6E–11	1.7E–10
U_{235+1d}	5.6E–01	1.6E–11	9.0E–12
U_{238+2d}	1.2E+01	2.0E–11	2.3E–10
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 4.2E–10

000785

Table C.III–226
Summary of Intake Quantitation (chemicals) Alternative 3
Solid Waste Landfill with Federal Ownership: Off–Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of fruits or vegetables	0.1 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in vegetables	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	1.0E–07	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	4.3E–08	mg/kg	NA	NA	mg/kg
uranium–total	3.4E–03	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	1.8E–08	mg/kg	NA	NA	mg/kg
carbazole	1.3E–08	mg/kg	NA	NA	mg/kg
aroclor–1254	NA	mg/kg	NA	NA	mg/kg
aroclor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

Table C.III-226 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Federal Ownership: Off-Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	6.5E-10	4.0E-04	1.6E-06
arsenic	NA	3.0E-04	NA
beryllium	2.7E-10	5.0E-03	5.5E-08
uranium-total	2.2E-05	3.0E-03	7.2E-03
benzo(a)pyrene	1.2E-10	NA	NA
carbazole	8.5E-11	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		7.2E-03

Compound	ILCR Calculation CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	5.6E-11	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	2.3E-11	4.3E+00	1.0E-10
uranium-total	1.9E-06	NA	NA
benzo(a)pyrene	1.0E-11	7.3E+00	7.4E-11
carbazole	7.3E-12	2.0E-02	1.5E-13
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		1.8E-10

000787

6646

Table C.III–227
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Solid Waste Landfill with Federal Ownership: Off–Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

Intake Equation = Cv X EF X EDn X FI X IR

IR	Ingestion rate of fruits or vegetables	0.1 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cv	Concentration of radionuclides in vegetables	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	2.5E–05	pCi/kg	U_{234}	1.0E+00	pCi/kg
Pu_{238}	1.3E–05	pCi/kg	U_{235+1d}	5.4E–02	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	1.1E+00	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	NA	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	8.0E–05	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	5.3E–03	2.2E–10	1.2E–12
Pu_{238}	2.6E–03	2.2E–10	5.8E–13
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	1.7E–02	1.3E–11	2.2E–13
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	2.2E+02	1.6E–11	3.5E–09
U_{235+1d}	1.1E+01	1.6E–11	1.8E–10
U_{238+2d}	2.4E+02	2.0E–11	4.7E–09
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 8.4E–09

Table C.III–228
Summary of Intake Quantitation (chemicals) Alternative 3
Solid Waste Landfill with Private Ownership: Off–Property Farmer (Adult)
Via Drinking Water Ingestion

Intake Equation = $\frac{CS \times EF \times ED \times IR}{BW \times AT}$

IR	Ingestion rate of groundwater (RAGS, 1989)	2 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in groundwater	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	0.00E+00	mg/l	0	0.00E+00	mg/l
arsenic	0.00E+00	mg/l	0	0.00E+00	mg/l
beryllium	0.00E+00	mg/l	0	0.00E+00	mg/l
uranium–total	2.70E–06	mg/l	0	0.00E+00	mg/l
benzo(a)pyrene	0.00E+00	mg/l	0	0.00E+00	mg/l
carbazole	0.00E+00	mg/l	0	0.00E+00	mg/l
aroclor–1254	0.00E+00	mg/l	0	0.00E+00	mg/l
aroclor–1260	0.00E+00	mg/l	0	0.00E+00	mg/l
dieldrin	0.00E+00	mg/l	0	0.00E+00	mg/l
0	0.00E+00	mg/l	0	0.00E+00	mg/l
0	0.00E+00	mg/l	0	0.00E+00	mg/l
0	0.00E+00	mg/l	0	0.00E+00	mg/l
0	0.00E+00	mg/l	0	0.00E+00	mg/l
0	0.00E+00	mg/l	0	0.00E+00	mg/l
0	0.00E+00	mg/l	0	0.00E+00	mg/l
0	0.00E+00	mg/l			

References

Table C.III-229
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Adult)
Via Ingestion of Drinking Water

Intake Equation = Cw X EF X EDn X FI X IR

IR	Ingestion rate of groundwater (RAGS. 1989)	2 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
FI	Fractional intake for radionuclides	1 (Unitless)
Cw	Concentration of radionuclides in groundwater	(see table below)

Cs_{137+1d}	0.0E+00	pCi/l	$Th_{232+10d}$	0.0E+00	pCi/l
Np_{237+1d}	0.0E+00	pCi/l	U_{234}	8.0E-04	pCi/l
Pu_{238}	0.0E+00	pCi/l	U_{235+1d}	4.0E-05	pCi/l
Ra_{226+8d}	0.0E+00	pCi/l	U_{238+2d}	9.0E-04	pCi/l
Ra_{228+1d}	0.0E+00	pCi/l	0.0E+00	0.0E+00	pCi/l
Rn_{222+4d}	0.0E+00	pCi/l	0.0E+00	0.0E+00	pCi/l
Sr_{90+1d}	0.0E+00	pCi/l	0.0E+00	0.0E+00	pCi/l
Tc_{99}	0.0E+00	pCi/l	0.0E+00	0.0E+00	pCi/l
Th_{228+7d}	0.0E+00	pCi/l	0.0E+00	0.0E+00	pCi/l
Th_{230}	0.0E+00	pCi/l	0.0E+00	0.0E+00	pCi/l

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E-11	NA
Np_{237+1d}	NA	2.2E-10	NA
Pu_{238}	NA	2.2E-10	NA
Ra_{226+8d}	NA	7.8E-10	NA
Ra_{228+1d}	NA	1.0E-10	NA
Rn_{222+4d}	NA	1.7E-12	NA
Sr_{90+1d}	NA	3.6E-11	NA
Tc_{99}	NA	1.3E-12	NA
Th_{228+7d}	NA	5.5E-11	NA
Th_{230}	NA	1.3E-11	NA
$Th_{232+10d}$	NA	1.7E-10	NA
U_{234}	3.9E+01	1.6E-11	6.3E-10
U_{235+1d}	2.0E+00	1.6E-11	3.1E-11
U_{238+2d}	4.4E+01	2.0E-11	8.8E-10
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
	ILCR Summation	=	1.5E-09

000790

Table C.III–230
Summary of Intake Quantitation (chemicals) Alternative 3
Solid Waste Landfill with Private Ownership: Off–Property Farmer (Adult)
Via Dermal Contact while Bathing

Intake Equation = $\frac{DA \times EF \times ED \times SA}{BW \times AT}$

DA	Dermal absorbed dose	csv mg/cm^2–day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
SA	Skin surface area available for contact	23000 cm^2

Chemical Concentrations

Compound	DA	Units	Compound	DA	Units
antimony	0.00E+00	mg/cm^2–day	0	0.00E+00	mg/cm^2–day
arsenic	0.00E+00	mg/cm^2–day	0	0.00E+00	mg/cm^2–day
beryllium	0.00E+00	mg/cm^2–day	0	0.00E+00	mg/cm^2–day
uranium–total	6.75E–13	mg/cm^2–day	0	0.00E+00	mg/cm^2–day
benzo(a)pyrene	0.00E+00	mg/cm^2–day	0	0.00E+00	mg/cm^2–day
carbazole	0.00E+00	mg/cm^2–day	0	0.00E+00	mg/cm^2–day
aroclor–1254	0.00E+00	mg/cm^2–day	0	0.00E+00	mg/cm^2–day
aroclor–1260	0.00E+00	mg/cm^2–day	0	0.00E+00	mg/cm^2–day
dieldrin	0.00E+00	mg/cm^2–day	0	0.00E+00	mg/cm^2–day
0	0.00E+00	mg/cm^2–day	0	0.00E+00	mg/cm^2–day
0	0.00E+00	mg/cm^2–day	0	0.00E+00	mg/cm^2–day
0	0.00E+00	mg/cm^2–day	0	0.00E+00	mg/cm^2–day
0	0.00E+00	mg/cm^2–day	0	0.00E+00	mg/cm^2–day
0	0.00E+00	mg/cm^2–day	0	0.00E+00	mg/cm^2–day
0	0.00E+00	mg/cm^2–day	0	0.00E+00	mg/cm^2–day
0	0.00E+00	mg/cm^2–day			

References

0002814

Table C.III-230 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Adult)
Via Dermal Contact while Showering

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	6.00E-05	NA
arsenic	NA	2.85E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	2.13E-10	1.50E-04	1.42E-06
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	4.50E-05	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
HQ Summation =			1.42E-06

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.90E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	2.13E-10	NA	NA
benzo(a)pyrene	NA	NA	NA
carbazole	NA	2.22E-02	NA
aroclor-1254	NA	1.03E+01	NA
aroclor-1260	NA	1.03E+01	NA
dieldrin	NA	1.78E+01	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
ILCR Summation =			0.00E+00

Table C.III-231
Summary of Intake Quantitation (chemicals) Alternative 3
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Adult)
Via Inhalation of Particulates

Intake Equation = $\frac{CS \times EF \times ED \times IR}{BW \times AT}$

IR	Inhalation rate of gases (RAGS, 1989)	20 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in soil	(see table below)

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	9.5E-10	mg/m^3	•••	0.0E+00	mg/m^3
arsenic	0.0E+00	mg/m^3	•••	0.0E+00	mg/m^3
beryllium	0.0E+00	mg/m^3	•••	0.0E+00	mg/m^3
uranium-total	0.0E+00	mg/m^3	•••	0.0E+00	mg/m^3
benzo(a)pyrene	1.3E-12	mg/m^3	•••	0.0E+00	mg/m^3
carbazole	5.4E-12	mg/m^3	•••	0.0E+00	mg/m^3
aroclor-1254	0.0E+00	mg/m^3	•••	0.0E+00	mg/m^3
aroclor-1260	0.0E+00	mg/m^3	•••	0.0E+00	mg/m^3
dieldrin	0.0E+00	mg/m^3	•••	0.0E+00	mg/m^3
••••••••	0.0E+00	mg/m^3	•••	0.0E+00	mg/m^3
••••••••	0.0E+00	mg/m^3	•••	0.0E+00	mg/m^3
••••••••	0.0E+00	mg/m^3	•••	0.0E+00	mg/m^3
••••••••	0.0E+00	mg/m^3	•••	0.0E+00	mg/m^3
••••••••	0.0E+00	mg/m^3	•••	0.0E+00	mg/m^3
••••••••	0.0E+00	mg/m^3	•••	0.0E+00	mg/m^3
••••••••	0.0E+00	mg/m^3			

References

000293

Table C.III-231 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Adult)
Via Inhalation of Particulates

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	2.6E-10	NA	NA
arsenic	NA	NA	NA
beryllium	NA	NA	NA
uranium-total	NA	NA	NA
benzo(a)pyrene	3.5E-13	NA	NA
carbazole	1.5E-12	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
Hazard Quotient Sum =			0.0E+00

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	2.6E-10	NA	NA
arsenic	NA	1.5E+01	NA
beryllium	NA	8.4E+00	NA
uranium-total	NA	NA	NA
benzo(a)pyrene	3.5E-13	6.1E+00	2.1E-12
carbazole	1.5E-12	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	1.6E+01	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
ILCR Summation =			2.1E-12

Table C.III–232
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Solid Waste Landfill with Private Ownership: Off–Property Farmer (Adult)
Via Inhalation of Gases and Particulates

Intake Equation = Ca X EF X EDn X IR

IR	Inhalation rate of gases (RAGS, 1989)	20 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Ca	Concentration of radionuclides in air	(see table below)

Cs_{137+1d}	0.0E+00	pCi/m^3	$Th_{232+10d}$	0.0E+00	pCi/m^3
Np_{237+1d}	3.6E–08	pCi/m^3	U_{234}	6.7E–08	pCi/m^3
Pu_{238}	1.7E–07	pCi/m^3	U_{235+1d}	0.0E+00	pCi/m^3
Ra_{226+8d}	0.0E+00	pCi/m^3	U_{238+2d}	0.0E+00	pCi/m^3
Ra_{228+1d}	0.0E+00	pCi/m^3	0.0E+00	0.0E+00	pCi/m^3
Rn_{222+4d}	0.0E+00	pCi/m^3	0.0E+00	0.0E+00	pCi/m^3
Sr_{90+1d}	0.0E+00	pCi/m^3	0.0E+00	0.0E+00	pCi/m^3
Tc_{99}	0.0E+00	pCi/m^3	0.0E+00	0.0E+00	pCi/m^3
Th_{228+7d}	0.0E+00	pCi/m^3	0.0E+00	0.0E+00	pCi/m^3
Th_{230}	6.5E–07	pCi/m^3	0.0E+00	0.0E+00	pCi/m^3

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	1.9E–11	NA
Np_{237+1d}	1.8E–02	2.9E–08	5.1E–10
Pu_{238}	8.2E–02	3.9E–08	3.2E–09
Ra_{226+8d}	NA	7.0E–09	NA
Ra_{228+1d}	NA	6.9E–10	NA
Rn_{222+4d}	NA	7.7E–12	NA
Sr_{90+1d}	NA	6.2E–11	NA
Tc_{99}	NA	8.3E–12	NA
Th_{228+7d}	NA	7.8E–08	NA
Th_{230}	3.2E–01	2.9E–08	9.2E–09
$Th_{232+10d}$	NA	1.1E–07	NA
U_{234}	3.3E–02	2.6E–08	8.5E–10
U_{235+1d}	NA	2.5E–08	NA
U_{238+2d}	NA	2.4E–08	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
	ILCR Summation	=	1.4E–08

Table C.III-233
Summary of Intake Quantitation (chemicals) Alternative 3
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Adult)
Via Ingestion of Meat Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of meat	0.101 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in meat	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	1.2E-07	mg/kg	...	0.0E+00	mg/kg
arsenic	0.0E+00	mg/kg	...	0.0E+00	mg/kg
beryllium	0.0E+00	mg/kg	...	0.0E+00	mg/kg
uranium-total	2.7E-08	mg/kg	...	0.0E+00	mg/kg
benzo(a)pyrene	3.1E-09	mg/kg	...	0.0E+00	mg/kg
carbazole	3.4E-11	mg/kg	...	0.0E+00	mg/kg
aroclor-1254	0.0E+00	mg/kg	...	0.0E+00	mg/kg
aroclor-1260	0.0E+00	mg/kg	...	0.0E+00	mg/kg
dieldrin	0.0E+00	mg/kg	...	0.0E+00	mg/kg
0	0.0E+00	mg/kg	...	0.0E+00	mg/kg
0	0.0E+00	mg/kg	...	0.0E+00	mg/kg
0	0.0E+00	mg/kg	...	0.0E+00	mg/kg
0	0.0E+00	mg/kg	...	0.0E+00	mg/kg
0	0.0E+00	mg/kg	...	0.0E+00	mg/kg
0	0.0E+00	mg/kg	...	0.0E+00	mg/kg
0	0.0E+00	mg/kg			

References

Table C.III-233 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Adult)
Via Ingestion of Meat Products

Compound	HQ Calculation		
	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	1.2E-10	4.0E-04	3.1E-07
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	2.8E-11	3.0E-03	9.3E-09
benzo(a)pyrene	3.2E-12	NA	NA
carbazole	3.5E-14	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
	HQ Summation =		3.2E-07

Compound	ILCR Calculation		
	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	1.2E-10	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	2.8E-11	NA	NA
benzo(a)pyrene	3.2E-12	7.3E+00	2.3E-11
carbazole	3.5E-14	2.0E-02	7.0E-16
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
	ILCR Summation =		2.3E-11

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Table C.III–234
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Solid Waste Landfill with Private Ownership: Off–Property Farmer (Adult)
Via Ingestion of Meat Products

Intake Equation = Cf X EF X EDn X FI X IR

IR	Ingestion rate of meat	0.101 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cf	Concentration of radionuclides in meat	

Cs_{137+1d}	0.0E+00	pCi/kg	$Th_{232+10d}$	0.0E+00	pCi/kg
Np_{237+1d}	1.5E−07	pCi/kg	U_{234}	9.0E−06	pCi/kg
Pu_{238}	6.4E−09	pCi/kg	U_{235+1d}	4.0E−07	pCi/kg
Ra_{226+8d}	0.0E+00	pCi/kg	U_{238+2d}	9.0E−06	pCi/kg
Ra_{228+1d}	0.0E+00	pCi/kg	0.0E+00	0.0E+00	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	0.0E+00	0.0E+00	pCi/kg
Sr_{90+1d}	0.0E+00	pCi/kg	0.0E+00	0.0E+00	pCi/kg
Tc_{99}	0.0E+00	pCi/kg	0.0E+00	0.0E+00	pCi/kg
Th_{228+7d}	0.0E+00	pCi/kg	0.0E+00	0.0E+00	pCi/kg
Th_{230}	3.5E−07	pCi/kg	0.0E+00	0.0E+00	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E−11	NA
Np_{237+1d}	2.8E−04	2.2E−10	6.2E−14
Pu_{238}	1.2E−05	2.2E−10	2.6E−15
Ra_{226+8d}	NA	7.8E−10	NA
Ra_{228+1d}	NA	1.0E−10	NA
Rn_{222+4d}	NA	1.7E−12	NA
Sr_{90+1d}	NA	3.6E−11	NA
Tc_{99}	NA	1.3E−12	NA
Th_{228+7d}	NA	5.5E−11	NA
Th_{230}	6.5E−04	1.3E−11	8.4E−15
$Th_{232+10d}$	NA	1.7E−10	NA
U_{234}	1.7E−02	1.6E−11	2.7E−13
U_{235+1d}	7.4E−04	1.6E−11	1.2E−14
U_{238+2d}	1.7E−02	2.0E−11	3.3E−13
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA

ILCR Summation = 6.9E−13

Table C.III–235
Summary of Intake Quantitation (chemicals) Alternative 3
Solid Waste Landfill with Private Ownership: Off–Property Farmer (Adult)
Via Ingestion of Dairy Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of dairy products	0.4 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in animal products	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	1.2E–08	mg/kg	•••	0.0E+00	mg/kg
arsenic	0.0E+00	mg/kg	•••	0.0E+00	mg/kg
beryllium	0.0E+00	mg/kg	•••	0.0E+00	mg/kg
uranium–total	7.5E–05	mg/kg	•••	0.0E+00	mg/kg
benzo(a)pyrene	0.0E+00	mg/kg	•••	0.0E+00	mg/kg
carbazole	0.0E+00	mg/kg	•••	0.0E+00	mg/kg
aroclor–1254	0.0E+00	mg/kg	•••	0.0E+00	mg/kg
aroclor–1260	0.0E+00	mg/kg	•••	0.0E+00	mg/kg
dieldrin	0.0E+00	mg/kg	•••	0.0E+00	mg/kg
••••••••	0.0E+00	mg/kg	•••	0.0E+00	mg/kg
••••••••	0.0E+00	mg/kg	•••	0.0E+00	mg/kg
••••••••	0.0E+00	mg/kg	•••	0.0E+00	mg/kg
••••••••	0.0E+00	mg/kg	•••	0.0E+00	mg/kg
••••••••	0.0E+00	mg/kg	•••	0.0E+00	mg/kg
••••••••	0.0E+00	mg/kg	•••	0.0E+00	mg/kg
••••••••	0.0E+00	mg/kg			

References

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Table C.III-235 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Adult)
Via Ingestion of Dairy Products

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	4.9E-11	4.0E-04	1.2E-07
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	3.1E-07	3.0E-03	1.0E-04
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
	HQ Summation =		1.0E-04

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	4.9E-11	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	3.1E-07	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
	ILCR Summation =		0.0E+00

Table C.III–236
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Solid Waste Landfill with Private Ownership: Off–Property Farmer (Adult)
Via Ingestion of Dairy Products

Intake Equation = Cp X EF X EDn X FI X IR

IR	Ingestion rate of dairy products	0.4 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cp	Concentration of radionuclides in animal products	

Cs_{137+1d}	0.0E+00	pCi/kg	$Th_{232+10d}$	0.0E+00	pCi/kg
Np_{237+1d}	0.0E+00	pCi/kg	U_{234}	2.3E–02	pCi/kg
Pu_{238}	0.0E+00	pCi/kg	U_{235+1d}	1.2E–03	pCi/kg
Ra_{226+8d}	0.0E+00	pCi/kg	U_{238+2d}	2.5E–02	pCi/kg
Ra_{228+1d}	0.0E+00	pCi/kg	0.0E+00	0.0E+00	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	0.0E+00	0.0E+00	pCi/kg
Sr_{90+1d}	0.0E+00	pCi/kg	0.0E+00	0.0E+00	pCi/kg
Tc_{99}	0.0E+00	pCi/kg	0.0E+00	0.0E+00	pCi/kg
Th_{228+7d}	0.0E+00	pCi/kg	0.0E+00	0.0E+00	pCi/kg
Th_{230}	0.0E+00	pCi/kg	0.0E+00	0.0E+00	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	NA	2.2E–10	NA
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	NA	1.3E–11	NA
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	1.7E+02	1.6E–11	2.7E–09
U_{235+1d}	8.7E+00	1.6E–11	1.4E–10
U_{238+2d}	1.8E+02	2.0E–11	3.7E–09
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA

ILCR Summation = 6.5E–09

000801

Table C.III–237
Summary of Intake Quantitation (chemicals) Alternative 3
Solid Waste Landfill with Private Ownership: Off–Property Farmer (Adult)
Via Ingestion of Vegetables and Fruits

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of fruits or vegetables	0.122 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in vegetables	

Chemical Concentrations

Compound	Concentration	Units
antimony	1.3E–06	mg/kg
arsenic	0.0E+00	mg/kg
beryllium	0.0E+00	mg/kg
uranium–total	1.3E–05	mg/kg
benzo(a)pyrene	1.3E–09	mg/kg
carbazole	5.3E–09	mg/kg
aroclor–1254	0.0E+00	mg/kg
aroclor–1260	0.0E+00	mg/kg
dieldrin	0.0E+00	mg/kg
••••••••	0.0E+00	mg/kg
••••••••	0.0E+00	mg/kg
••••••••	0.0E+00	mg/kg
••••••••	0.0E+00	mg/kg
••••••••	0.0E+00	mg/kg
••••••••	0.0E+00	mg/kg
••••••••	0.0E+00	mg/kg

Compound	Concentration	Units
•••	0.0E+00	mg/kg
•••	0.0E+00	mg/kg
•••	0.0E+00	mg/kg
•••	0.0E+00	mg/kg
•••	0.0E+00	mg/kg
•••	0.0E+00	mg/kg
•••	0.0E+00	mg/kg
•••	0.0E+00	mg/kg
•••	0.0E+00	mg/kg
•••	0.0E+00	mg/kg
•••	0.0E+00	mg/kg
•••	0.0E+00	mg/kg
•••	0.0E+00	mg/kg
•••	0.0E+00	mg/kg

References

Table C.III-237 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Adult)
Via Ingestion of Vegetables and Fruits

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	2.2E-09	4.0E-04	5.6E-06
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	2.2E-08	3.0E-03	7.4E-06
benzo(a)pyrene	2.1E-12	NA	NA
carbazole	8.9E-12	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
HQ Summation =			1.3E-05

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	2.2E-09	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	2.2E-08	NA	NA
benzo(a)pyrene	2.1E-12	7.3E+00	1.5E-11
carbazole	8.9E-12	2.0E-02	1.8E-13
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
ILCR Summation =			1.6E-11

000803

Table C.III-238
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Adult)
Via Ingestion of Vegetables and Fruits

Intake Equation = Cv X EF X EDn X FI X IR

IR	Ingestion rate of fruits or vegetables	0.122 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cv	Concentration of radionuclides in vegetables	

Cs_{137+1d}	0.0E+00	pCi/kg	$Th_{232+10d}$	0.0E+00	pCi/kg
Np_{237+1d}	3.6E-05	pCi/kg	U_{234}	4.0E-03	pCi/kg
Pu_{238}	1.7E-04	pCi/kg	U_{235+1d}	2.0E-04	pCi/kg
Ra_{226+8d}	0.0E+00	pCi/kg	U_{238+2d}	4.4E-03	pCi/kg
Ra_{228+1d}	0.0E+00	pCi/kg	0.0E+00	0.0E+00	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	0.0E+00	0.0E+00	pCi/kg
Sr_{90+1d}	0.0E+00	pCi/kg	0.0E+00	0.0E+00	pCi/kg
Tc_{99}	0.0E+00	pCi/kg	0.0E+00	0.0E+00	pCi/kg
Th_{228+7d}	0.0E+00	pCi/kg	0.0E+00	0.0E+00	pCi/kg
Th_{230}	7.1E-04	pCi/kg	0.0E+00	0.0E+00	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E-11	NA
Np_{237+1d}	1.1E-01	2.2E-10	2.4E-11
Pu_{238}	4.9E-01	2.2E-10	1.1E-10
Ra_{226+8d}	NA	7.8E-10	NA
Ra_{228+1d}	NA	1.0E-10	NA
Rn_{222+4d}	NA	1.7E-12	NA
Sr_{90+1d}	NA	3.6E-11	NA
Tc_{99}	NA	1.3E-12	NA
Th_{228+7d}	NA	5.5E-11	NA
Th_{230}	2.1E+00	1.3E-11	2.8E-11
$Th_{232+10d}$	NA	1.7E-10	NA
U_{234}	1.2E+01	1.6E-11	1.9E-10
U_{235+1d}	5.9E-01	1.6E-11	9.4E-12
U_{238+2d}	1.3E+01	2.0E-11	2.6E-10
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA

ILCR Summation = 6.2E-10

000804

Table C.III–239
Summary of Intake Quantitation (chemicals) Alternative 3
Solid Waste Landfill with Private Ownership: Off–Property Farmer (Child)
Via Drinking Water Ingestion

Intake Equation = $\frac{CS \times EF \times ED \times IR}{BW \times AT}$

IR	Ingestion rate of groundwater (RAGS, 1989)	1 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in groundwater	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/l	NA	NA	mg/l
arsenic	NA	mg/l	NA	NA	mg/l
beryllium	NA	mg/l	NA	NA	mg/l
uranium–total	2.70E–06	mg/l	NA	NA	mg/l
benzo(a)pyrene	NA	mg/l	NA	NA	mg/l
carbazole	NA	mg/l	NA	NA	mg/l
aroclor–1254	NA	mg/l	NA	NA	mg/l
aroclor–1260	NA	mg/l	NA	NA	mg/l
dieldrin	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l			

References

000805

6646

Table C.III-239 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Child)
Via Drinking Water Ingestion

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.00E-04	NA
arsenic	NA	3.00E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	1.73E-07	3.00E-03	5.75E-05
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.00E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			5.75E-05

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.75E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	1.48E-08	NA	NA
benzo(a)pyrene	NA	7.30E+00	NA
carbazole	NA	2.00E-02	NA
aroclor-1254	NA	7.70E+00	NA
aroclor-1260	NA	7.70E+00	NA
dieldrin	NA	1.60E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

Table C.III–240
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Solid Waste Landfill with Private Ownership: Off–Property Farmer (Child)
Via Ingestion of Drinking Water

Intake Equation = Cw X EF X EDn X FI X IR

IR	Ingestion rate of groundwater (RAGS, 1989)	1 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
FI	Fractional intake for radionuclides	1 (Unitless)
Cw	Concentration of radionuclides in groundwater	(see table below)

Cs_{137+1d}	NA	pCi/l	$Th_{232+10d}$	NA	pCi/l
Np_{237+1d}	NA	pCi/l	U_{234}	8.0E–04	pCi/l
Pu_{238}	NA	pCi/l	U_{235+1d}	4.0E–05	pCi/l
Ra_{226+8d}	NA	pCi/l	U_{238+2d}	9.0E–04	pCi/l
Ra_{228+1d}	NA	pCi/l	NA	NA	pCi/l
Rn_{222+4d}	NA	pCi/l	NA	NA	pCi/l
Sr_{90+1d}	NA	pCi/l	NA	NA	pCi/l
Tc_{99}	NA	pCi/l	NA	NA	pCi/l
Th_{228+7d}	NA	pCi/l	NA	NA	pCi/l
Th_{230}	NA	pCi/l	NA	NA	pCi/l

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	NA	2.2E–10	NA
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	NA	1.3E–11	NA
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	1.7E+00	1.6E–11	2.7E–11
U_{235+1d}	8.4E–02	1.6E–11	1.3E–12
U_{238+2d}	1.9E+00	2.0E–11	3.8E–11
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
ILCR Summation	=		6.6E–11

000807

Table C.III–241
Summary of Intake Quantitation (chemicals) Alternative 3
Solid Waste Landfill with Private Ownership: Off–Property Farmer (Child)
Via Dermal Contact while Bathing

Intake Equation = $\frac{DA \times EF \times ED \times SA}{BW \times AT}$

DA	Dermal absorbed dose	csv mg/cm^2–day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	2190 days
SA	Skin surface area available for contact	8000 cm^2

Chemical Concentrations

Compound	DA	Units	Compound	DA	Units
antimony	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
arsenic	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
beryllium	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
uranium–total	6.75E–13	mg/cm^2–day	NA	NA	mg/cm^2–day
benzo(a)pyrene	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
carbazole	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
aroclor–1254	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
aroclor–1260	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
dieldrin	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day			

References

Table C.III-241 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Child)
Via Dermal Contact while Bathing

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	6.00E-05	NA
arsenic	NA	2.85E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	3.45E-10	1.50E-04	2.30E-06
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	4.50E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			2.30E-06

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.90E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	2.96E-11	NA	NA
benzo(a)pyrene	NA	NA	NA
carbazole	NA	2.22E-02	NA
aroclor-1254	NA	1.03E+01	NA
aroclor-1260	NA	1.03E+01	NA
dieldrin	NA	1.78E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

000809

Table C.III-242a
Summary of Intake Quantitation (chemicals) Alternative 3
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Child)
Via Inhalation of Particulates

Intake Equation = $\frac{CS \times IR \times EF \times ED \times IR}{BW \times AT}$

IR	Inhalation rate of gases (RAGS, 1989)	12 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in soil	(see table below)

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	9.5E-10	mg/m^3	NA	NA	mg/m^3
arsenic	NA	mg/m^3	NA	NA	mg/m^3
beryllium	NA	mg/m^3	NA	NA	mg/m^3
uranium-total	NA	mg/m^3	NA	NA	mg/m^3
benzo(a)pyrene	1.3E-12	mg/m^3	NA	NA	mg/m^3
carbazole	5.4E-12	mg/m^3	NA	NA	mg/m^3
aroclor-1254	NA	mg/m^3	NA	NA	mg/m^3
aroclor-1260	NA	mg/m^3	NA	NA	mg/m^3
dieldrin	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3			

References

6646

Table C.III-242a (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Child)
Via Inhalation of Particulates

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	7.2E-10	NA	NA
arsenic	NA	NA	NA
beryllium	NA	NA	NA
uranium-total	NA	NA	NA
benzo(a)pyrene	9.7E-13	NA	NA
carbazole	4.1E-12	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	Hazard Quotient Sum =		NA

Compound	ILCR Calculation CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	6.2E-11	NA	NA
arsenic	NA	1.5E+01	NA
beryllium	NA	8.4E+00	NA
uranium-total	NA	NA	NA
benzo(a)pyrene	8.3E-14	6.1E+00	5.1E-13
carbazole	3.5E-13	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		5.1E-13

000811

Table C.III–242b
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Solid Waste Landfill with Private Ownership: Off–Property Farmer (Child)
Via Inhalation of Gases and Particulates

Intake Equation = Ca X EF X EDn X IR

IR	Inhalation rate of gases (RAGS, 1989)	12 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Ca	Concentration of radionuclides in air	(see table below)

Cs_{137+1d}	NA	pCi/m^3	$Th_{232+10d}$	NA	pCi/m^3
Np_{237+1d}	3.6E–08	pCi/m^3	U_{234}	6.7E–08	pCi/m^3
Pu_{238}	1.7E–07	pCi/m^3	U_{235+1d}	NA	pCi/m^3
Ra_{226+8d}	NA	pCi/m^3	U_{238+2d}	NA	pCi/m^3
Ra_{228+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Rn_{222+4d}	NA	pCi/m^3	NA	NA	pCi/m^3
Sr_{90+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Tc_{99}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{228+7d}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{230}	6.5E–07	pCi/m^3	NA	NA	pCi/m^3

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	1.9E–11	NA
Np_{237+1d}	9.1E–04	2.9E–08	2.6E–11
Pu_{238}	4.2E–03	3.9E–08	1.7E–10
Ra_{226+8d}	NA	7.0E–09	NA
Ra_{228+1d}	NA	6.9E–10	NA
Rn_{222+4d}	NA	7.7E–12	NA
Sr_{90+1d}	NA	6.2E–11	NA
Tc_{99}	NA	8.3E–12	NA
Th_{228+7d}	NA	7.8E–08	NA
Th_{230}	1.6E–02	2.9E–08	4.7E–10
$Th_{232+10d}$	NA	1.1E–07	NA
U_{234}	1.7E–03	2.6E–08	4.4E–11
U_{235+1d}	NA	2.5E–08	NA
U_{238+2d}	NA	2.4E–08	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 7.1E–10

000812

Table C.III–243a
Summary of Intake Quantitation (chemicals) Alternative 3
Solid Waste Landfill with Private Ownership: Off–Property Farmer (Child)
Via Ingestion of Meat Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of meat	0.039 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in meat	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	1.2E–07	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium–total	2.7E–08	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	3.1E–09	mg/kg	NA	NA	mg/kg
carbazole	3.4E–11	mg/kg	NA	NA	mg/kg
aroclor–1254	NA	mg/kg	NA	NA	mg/kg
aroclor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

000813

000814

Table C.III-243a (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Child)
Via Ingestion of Meat Products

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	2.2E-10	4.0E-04	5.6E-07
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	5.0E-11	3.0E-03	1.7E-08
benzo(a)pyrene	5.8E-12	NA	NA
carbazole	6.3E-14	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		5.8E-07

Compound	ILCR Calculation CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	1.9E-11	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	4.3E-12	NA	NA
benzo(a)pyrene	4.9E-13	7.3E+00	3.6E-12
carbazole	5.4E-15	2.0E-02	1.1E-16
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		3.6E-12

Table C.III-243b
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Child)
Via Ingestion of Meat Products

Intake Equation = Cf X EF X EDn X FI X IR

IR	Ingestion rate of meat	0.039 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cf	Concentration of radionuclides in meat	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	1.5E-07	pCi/kg	U_{234}	9.0E-06	pCi/kg
Pu_{238}	6.4E-09	pCi/kg	U_{235+1d}	4.0E-07	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	9.0E-06	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	NA	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	3.5E-07	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E-11	NA
Np_{237+1d}	9.4E-06	2.2E-10	2.1E-15
Pu_{238}	3.9E-07	2.2E-10	8.6E-17
Ra_{226+8d}	NA	7.8E-10	NA
Ra_{228+1d}	NA	1.0E-10	NA
Rn_{222+4d}	NA	1.7E-12	NA
Sr_{90+1d}	NA	3.6E-11	NA
Tc_{99}	NA	1.3E-12	NA
Th_{228+7d}	NA	5.5E-11	NA
Th_{230}	2.1E-05	1.3E-11	2.8E-16
$Th_{232+10d}$	NA	1.7E-10	NA
U_{234}	5.5E-04	1.6E-11	8.9E-15
U_{235+1d}	2.5E-05	1.6E-11	3.9E-16
U_{238+2d}	5.5E-04	2.0E-11	1.1E-14
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 2.3E-14

Table C.III–244a
Summary of Intake Quantitation (chemicals) Alternative 3
Solid Waste Landfill with Private Ownership: Off–Property Farmer (Child)
Via Ingestion of Dairy Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of dairy products	0.9 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in animal products	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	1.2E–08	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium–total	7.5E–05	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor–1254	NA	mg/kg	NA	NA	mg/kg
aroclor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

Table C.III-244a (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Child)
Via Ingestion of Dairy Products

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	5.2E-10	4.0E-04	1.3E-06
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	3.2E-06	3.0E-03	1.1E-03
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		1.1E-03

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	4.4E-11	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	2.8E-07	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

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Table C.III-244b
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Child)
Via Ingestion of Dairy Products

Intake Equation = Cp X EF X EDn X FI X IR

IR	Ingestion rate of dairy products	0.9 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cp	Concentration of radionuclides in animal products	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	NA	pCi/kg	U_{234}	2.3E-02	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	1.2E-03	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	2.5E-02	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	NA	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	NA	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E-11	NA
Np_{237+1d}	NA	2.2E-10	NA
Pu_{238}	NA	2.2E-10	NA
Ra_{226+8d}	NA	7.8E-10	NA
Ra_{228+1d}	NA	1.0E-10	NA
Rn_{222+4d}	NA	1.7E-12	NA
Sr_{90+1d}	NA	3.6E-11	NA
Tc_{99}	NA	1.3E-12	NA
Th_{228+7d}	NA	5.5E-11	NA
Th_{230}	NA	1.3E-11	NA
$Th_{232+10d}$	NA	1.7E-10	NA
U_{234}	3.2E+01	1.6E-11	5.2E-10
U_{235+1d}	1.7E+00	1.6E-11	2.7E-11
U_{238+2d}	3.5E+01	2.0E-11	7.1E-10
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 1.3E-09

Table C.III–245
Solid Waste Landfill with Private Ownership: Off–Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of fruits or vegetables	0.1 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in vegetables	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	1.3E–06	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium–total	1.3E–05	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	1.3E–09	mg/kg	NA	NA	mg/kg
carbazole	5.3E–09	mg/kg	NA	NA	mg/kg
aroclor–1254	NA	mg/kg	NA	NA	mg/kg
aroclor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

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Table C.III-245 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	8.6E-09	4.0E-04	2.1E-05
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	8.4E-08	3.0E-03	2.8E-05
benzo(a)pyrene	8.1E-12	NA	NA
carbazole	3.4E-11	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	HQ Summation =		5.0E-05

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	7.3E-10	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	7.2E-09	NA	NA
benzo(a)pyrene	6.9E-13	7.3E+00	5.0E-12
carbazole	2.9E-12	2.0E-02	5.9E-14
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	ILCR Summation =		5.1E-12

Table C.III-246
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

Intake Equation = Cv X EF X EDn X FI X IR

IR	Ingestion rate of fruits or vegetables	0.1 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cv	Concentration of radionuclides in vegetables	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	3.6E-05	pCi/kg	U_{234}	4.0E-03	pCi/kg
Pu_{238}	1.7E-04	pCi/kg	U_{235+1d}	2.0E-04	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	4.4E-03	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	NA	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	7.1E-04	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E-11	NA
Np_{237+1d}	7.5E-03	2.2E-10	1.7E-12
Pu_{238}	3.5E-02	2.2E-10	7.6E-12
Ra_{226+8d}	NA	7.8E-10	NA
Ra_{228+1d}	NA	1.0E-10	NA
Rn_{222+4d}	NA	1.7E-12	NA
Sr_{90+1d}	NA	3.6E-11	NA
Tc_{99}	NA	1.3E-12	NA
Th_{228+7d}	NA	5.5E-11	NA
Th_{230}	1.5E-01	1.3E-11	1.9E-12
$Th_{232+10d}$	NA	1.7E-10	NA
U_{234}	8.4E-01	1.6E-11	1.3E-11
U_{235+1d}	4.1E-02	1.6E-11	6.6E-13
U_{238+2d}	9.2E-01	2.0E-11	1.8E-11
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
ILCR Summation	=		4.4E-11

Table C.III-247
Summary of Intake Quantitation (chemicals) Alternative 3
Solid Waste Landfill with Private Ownership: On-Property Perched Groundwater User
Via Incidental Ingestion of Soil

Intake Equation = $\frac{CS \times EF \times ED \times CF \times IR}{BW \times AT}$

IRs	Ingestion rate of soil (RAGS, 1989)	180 mg/day
CF	Conversion factor	1.0E-06 kg/mg
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in soil	(see table below)

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	1.3E+00	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium-total	NA	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	1.5E-03	mg/kg	NA	NA	mg/kg
carbazole	6.4E-03	mg/kg	NA	NA	mg/kg
aroclor-1254	NA	mg/kg	NA	NA	mg/kg
aroclor-1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

Table C.III-247 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Private Ownership: On-Property Perched Groundwater User
Via Incidental Ingestion of Soil

Compound	HQ Calculation		
	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	3.3E-06	4.0E-04	8.2E-03
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	NA	3.0E-03	NA
benzo(a)pyrene	3.7E-09	NA	NA
carbazole	1.6E-08	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		8.2E-03

Compound	ILCR Calculation		
	CDI (mg/kg-day)	CSF (mg/kg-day)$^{-1}$	ILCR (unitless)
antimony	3.3E-06	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	NA	NA	NA
benzo(a)pyrene	3.7E-09	7.3E+00	2.7E-08
carbazole	1.6E-08	2.0E-02	3.2E-10
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		2.7E-08

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Table C.III-248
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Solid Waste Landfill with Private Ownership: On-Property Perched Groundwater User
Via Incidental Ingestion of Soil

Intake Equation = CS X EF X EDn X FI X IR

IRs	Ingestion rate of soil (RAGS, 1989)	180 mg/day
EF	Exposure frequency	350 days/year
EDn	Exposure Duration	70 Year
FI	Fractional Intake	1 (unitless)
CS	Concentration of radionuclides in soil	

Cs_{137+1d}	NA	pCi/mg	$Th_{232+10d}$	NA	pCi/mg
Np_{237+1d}	4.30E-05	pCi/mg	U_{234}	8.00E-05	pCi/mg
Pu_{238}	2.00E-04	pCi/mg	U_{235+1d}	NA	pCi/mg
Ra_{226+8d}	NA	pCi/mg	U_{238+2d}	NA	pCi/mg
Ra_{228+1d}	NA	pCi/mg	NA	NA	pCi/mg
Rn_{222+4d}	NA	pCi/mg	NA	NA	pCi/mg
Sr_{90+1d}	NA	pCi/mg	NA	NA	pCi/mg
Tc_{99}	NA	pCi/mg	NA	NA	pCi/mg
Th_{228+7d}	NA	pCi/mg	NA	NA	pCi/mg
Th_{230}	7.70E-04	pCi/mg	NA	NA	pCi/mg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.80E-11	NA
Np_{237+1d}	1.90E+02	2.20E-10	4.17E-08
Pu_{238}	8.82E+02	2.20E-10	1.94E-07
Ra_{226+8d}	NA	7.80E-10	NA
Ra_{228+1d}	NA	1.00E-10	NA
Rn_{222+4d}	NA	1.70E-12	NA
Sr_{90+1d}	NA	3.60E-11	NA
Tc_{99}	NA	1.30E-12	NA
Th_{228+7d}	NA	5.50E-11	NA
Th_{230}	3.40E+03	1.30E-11	4.41E-08
$Th_{232+10d}$	NA	1.70E-10	NA
U_{234}	3.53E+02	1.60E-11	5.64E-09
U_{235+1d}	NA	1.60E-11	NA
U_{238+2d}	NA	2.00E-11	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		2.86E-07

000824

Table C.III-249
Summary of Intake Quantitation (chemicals) Alternative 3
Solid Waste Landfill with Private Ownership: On-Property Perched Groundwater User
Via Dermal Contact with Soil

Intake Equation = $\frac{CS \times EF \times ED \times CF \times ABS \times AF \times SA}{BW \times AT}$

SA	Surface area of exposed skin (50th percentile, hands only)	5750 cm^2/day
AF	Soil to skin adherence factor (RAGS, 1989)	1 mg/cm^2
ABS	chemicals specific absorbtion factor (see table below)	csv
CF	Conversion factor	1E-06 kg/mg
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in soil	

Chemical Concentrations

Compound	ABS	Concentrati	Units	Compound		Concentrati	Units
antimony	1.00E-02	1.33E+00	mg/kg	NA	NA	NA	mg/kg
arsenic	1.00E-03	NA	mg/kg	NA	NA	NA	mg/kg
beryllium	1.00E-02	NA	mg/kg	NA	NA	NA	mg/kg
uranium-total	1.00E-02	NA	mg/kg	NA	NA	NA	mg/kg
benzo(a)pyrene	3.00E-01	1.50E-03	mg/kg	NA	NA	NA	mg/kg
carbazole	3.00E-01	6.40E-03	mg/kg	NA	NA	NA	mg/kg
aroclor-1254	6.00E-02	NA	mg/kg	NA	NA	NA	mg/kg
aroclor-1260	6.00E-02	NA	mg/kg	NA	NA	NA	mg/kg
dieldrin	3.00E-01	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg				

References

000825

Table C.III-249 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Private Ownership: On-Property Perched Groundwater User
Via Dermal Contact with Soil

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	1.05E-06	6.00E-05	1.75E-02
arsenic	NA	2.85E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	NA	1.50E-04	NA
benzo(a)pyrene	3.54E-08	NA	NA
carbazole	1.51E-07	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	4.50E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		1.75E-02

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	1.05E-06	NA	NA
arsenic	NA	1.90E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	NA	NA	NA
benzo(a)pyrene	3.54E-08	NA	NA
carbazole	1.51E-07	2.22E-02	3.36E-09
aroclor-1254	NA	1.03E+01	NA
aroclor-1260	NA	1.03E+01	NA
dieldrin	NA	1.78E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		3.36E-09

000826

Table C.III-250
Summary of Intake Quantitation (chemicals) Alternative 3
Solid Waste Landfill with Private Ownership: On-Property Perched Groundwater User
Via Drinking Water Ingestion

Intake Equation = $\frac{CS \times EF \times ED \times IR}{BW \times AT}$

IR	Ingestion rate of groundwater (RAGS, 1989)	2 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in groundwater	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/l	NA	NA	mg/l
arsenic	NA	mg/l	NA	NA	mg/l
beryllium	NA	mg/l	NA	NA	mg/l
uranium-total	NA	mg/l	NA	NA	mg/l
benzo(a)pyrene	NA	mg/l	NA	NA	mg/l
carbazole	4.70E-04	mg/l	NA	NA	mg/l
aroclor-1254	NA	mg/l	NA	NA	mg/l
aroclor-1260	NA	mg/l	NA	NA	mg/l
dieldrin	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l			

References

000827

000828

C-III-406

Table C.III-250 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Private Ownership: On-Property Perched Groundwater User
Via Drinking Water Ingestion

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.00E-04	NA
arsenic	NA	3.00E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	NA	3.00E-03	NA
benzo(a)pyrene	NA	NA	NA
carbazole	1.29E-05	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.00E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		NA

Compound	ILCR Calculation CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.75E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	NA	NA	NA
benzo(a)pyrene	NA	7.30E+00	NA
carbazole	1.29E-05	2.00E-02	2.58E-07
aroclor-1254	NA	7.70E+00	NA
aroclor-1260	NA	7.70E+00	NA
dieldrin	NA	1.60E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		2.58E-07

Table C.III-251
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Solid Waste Landfill with Private Ownership: On-Property Perched Groundwater User
Via Ingestion of Drinking Water

Intake Equation = Cw X EF X EDn X FI X IR

IR	Ingestion rate of groundwater (RAGS, 1989)	2 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
FI	Fractional intake for radionuclides	1 (Unitless)
Cw	Concentration of radionuclides in groundwater	(see table below)

Cs_{137+1d}	NA	pCi/l	$Th_{232+10d}$	NA	pCi/l
Np_{237+1d}	NA	pCi/l	U_{234}	6.1E-01	pCi/l
Pu_{238}	NA	pCi/l	U_{235+1d}	3.2E-02	pCi/l
Ra_{226+8d}	NA	pCi/l	U_{238+2d}	6.7E-01	pCi/l
Ra_{228+1d}	NA	pCi/l	NA	NA	pCi/l
Rn_{222+4d}	NA	pCi/l	NA	NA	pCi/l
Sr_{90+1d}	NA	pCi/l	NA	NA	pCi/l
Tc_{99}	1.6E-02	pCi/l	NA	NA	pCi/l
Th_{228+7d}	NA	pCi/l	NA	NA	pCi/l
Th_{230}	NA	pCi/l	NA	NA	pCi/l

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E-11	NA
Np_{237+1d}	NA	2.2E-10	NA
Pu_{238}	NA	2.2E-10	NA
Ra_{226+8d}	NA	7.8E-10	NA
Ra_{228+1d}	NA	1.0E-10	NA
Rn_{222+4d}	NA	1.7E-12	NA
Sr_{90+1d}	NA	3.6E-11	NA
Tc_{99}	7.8E+02	1.3E-12	1.0E-09
Th_{228+7d}	NA	5.5E-11	NA
Th_{230}	NA	1.3E-11	NA
$Th_{232+10d}$	NA	1.7E-10	NA
U_{234}	3.0E+04	1.6E-11	4.8E-07
U_{235+1d}	1.6E+03	1.6E-11	2.5E-08
U_{238+2d}	3.3E+04	2.0E-11	6.6E-07
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 1.2E-06

000829

Table C.III-252
Summary of Intake Quantitation (chemicals) Alternative 3
Solid Waste Landfill with Private Ownership: On-Property Perched Groundwater User
Via Dermal Contact while Bathing

Intake Equation = $\frac{DA \times EF \times ED \times SA}{BW \times AT}$

DA	Dermal absorbed dose	csv mg/cm^2-day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	25550 days
SA	Skin surface area available for contact	23000 cm^2

Chemical Concentrations

Compound	DA	Units
antimony	NA	mg/cm^2-day
arsenic	NA	mg/cm^2-day
beryllium	NA	mg/cm^2-day
uranium-total	NA	mg/cm^2-day
benzo(a)pyrene	NA	mg/cm^2-day
carbazole	1.17E-09	mg/cm^2-day
aroclor-1254	NA	mg/cm^2-day
aroclor-1260	NA	mg/cm^2-day
dieldrin	NA	mg/cm^2-day
NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day

Compound	DA	Units
NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day

References

Table C.III-252 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Private Ownership: On-Property Perched Groundwater User
Via Dermal Contact while Bathing

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	6.00E-05	NA
arsenic	NA	2.85E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	NA	1.50E-04	NA
benzo(a)pyrene	NA	NA	NA
carbazole	3.70E-07	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	4.50E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		NA

Compound	ILCR Calculation CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.90E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	NA	NA	NA
benzo(a)pyrene	NA	NA	NA
carbazole	3.70E-07	2.22E-02	8.23E-09
aroclor-1254	NA	1.03E+01	NA
aroclor-1260	NA	1.03E+01	NA
dieldrin	NA	1.78E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		8.23E-09

Table C.III–253
Summary of Intake Quantitation (chemicals) Alternative 3
Solid Waste Landfill with Private Ownership: On–Property Perched Groundwater User
Via Inhalation of Particulates

Intake Equation = $\frac{CS \times EF \times ED \times IR}{BW \times AT}$

IR	Inhalation rate of gases (RAGS, 1989)	20 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in soil	(see table below)

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	3.5E–08	mg/m^3	NA	NA	mg/m^3
arsenic	NA	mg/m^3	NA	NA	mg/m^3
beryllium	NA	mg/m^3	NA	NA	mg/m^3
uranium–total	NA	mg/m^3	NA	NA	mg/m^3
benzo(a)pyrene	4.6E–11	mg/m^3	NA	NA	mg/m^3
carbazole	2.0E–10	mg/m^3	NA	NA	mg/m^3
aroclor–1254	NA	mg/m^3	NA	NA	mg/m^3
aroclor–1260	NA	mg/m^3	NA	NA	mg/m^3
dieldrin	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3			

References

Table C.III-253 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Private Ownership: On-Property Perched Groundwater User
Via Inhalation of Particulates

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	9.5E-09	NA	NA
arsenic	NA	NA	NA
beryllium	NA	NA	NA
uranium-total	NA	NA	NA
benzo(a)pyrene	1.3E-11	NA	NA
carbazole	5.4E-11	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
Hazard Quotient Sum =			NA

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	9.5E-09	NA	NA
arsenic	NA	1.5E+01	NA
beryllium	NA	8.4E+00	NA
uranium-total	NA	NA	NA
benzo(a)pyrene	1.3E-11	6.1E+00	7.7E-11
carbazole	5.4E-11	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			7.7E-11

0000833

66446

Table C.III-254
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Solid Waste Landfill with Private Ownership: On-Property Perched Groundwater User
Via Inhalation of Gases and Particulates

Intake Equation = Ca X EF X EDn X IR

IR	Inhalation rate of gases (RAGS, 1989)	20 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Ca	Concentration of radionuclides in air	(see table below)

Cs_{137+1d}	NA	pCi/m^3	$Th_{232+10d}$	NA	pCi/m^3
Np_{237+1d}	1.3E-06	pCi/m^3	U_{234}	2.5E-06	pCi/m^3
Pu_{238}	6.2E-06	pCi/m^3	U_{235+1d}	NA	pCi/m^3
Ra_{226+8d}	NA	pCi/m^3	U_{238+2d}	NA	pCi/m^3
Ra_{228+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Rn_{222+4d}	NA	pCi/m^3	NA	NA	pCi/m^3
Sr_{90+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Tc_{99}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{228+7d}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{230}	2.4E-05	pCi/m^3	NA	NA	pCi/m^3

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	1.9E-11	NA
Np_{237+1d}	6.5E-01	2.9E-08	1.9E-08
Pu_{238}	3.0E+00	3.9E-08	1.2E-07
Ra_{226+8d}	NA	7.0E-09	NA
Ra_{228+1d}	NA	6.9E-10	NA
Rn_{222+4d}	NA	7.7E-12	NA
Sr_{90+1d}	NA	6.2E-11	NA
Tc_{99}	NA	8.3E-12	NA
Th_{228+7d}	NA	7.8E-08	NA
Th_{230}	1.2E+01	2.9E-08	3.4E-07
$Th_{232+10d}$	NA	1.1E-07	NA
U_{234}	1.2E+00	2.6E-08	3.1E-08
U_{235+1d}	NA	2.5E-08	NA
U_{238+2d}	NA	2.4E-08	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		5.0E-07

000834

Table C.III–255
Summary of Intake Quantitation (chemicals) Alternative 3
Solid Waste Landfill with Private Ownership: On–Property Perched Groundwater User
Via Ingestion of Meat Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of meat	0.101 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in meat	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	2.7E–03	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium–total	8.0E–07	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	5.1E–05	mg/kg	NA	NA	mg/kg
carbazole	9.7E–06	mg/kg	NA	NA	mg/kg
aroclor–1254	NA	mg/kg	NA	NA	mg/kg
aroclor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

000835

Table C.III-255 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Private Ownership: On-Property Perched Groundwater User
Via Ingestion of Meat Products

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	2.8E-06	4.0E-04	6.9E-03
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	8.3E-10	3.0E-03	2.8E-07
benzo(a)pyrene	5.3E-08	NA	NA
carbazole	1.0E-08	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		6.9E-03

Compound	ILCR Calculation CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	2.8E-06	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	8.3E-10	NA	NA
benzo(a)pyrene	5.3E-08	7.3E+00	3.9E-07
carbazole	1.0E-08	2.0E-02	2.0E-10
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		3.9E-07

Table C.III-256
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Solid Waste Landfill with Private Ownership: On-Property Perched Groundwater User
Via Ingestion of Meat Products

Intake Equation = Cf X EF X EDn X FI X IR

IR	Ingestion rate of meat	0.101 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cf	Concentration of radionuclides in meat	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	2.4E-03	pCi/kg	U_{234}	1.5E-02	pCi/kg
Pu_{238}	5.2E-05	pCi/kg	U_{235+1d}	1.2E-05	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	2.6E-04	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	NA	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	2.5E-03	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E-11	NA
Np_{237+1d}	4.4E+00	2.2E-10	9.7E-10
Pu_{238}	9.7E-02	2.2E-10	2.1E-11
Ra_{226+8d}	NA	7.8E-10	NA
Ra_{228+1d}	NA	1.0E-10	NA
Rn_{222+4d}	NA	1.7E-12	NA
Sr_{90+1d}	NA	3.6E-11	NA
Tc_{99}	NA	1.3E-12	NA
Th_{228+7d}	NA	5.5E-11	NA
Th_{230}	4.7E+00	1.3E-11	6.1E-11
$Th_{232+10d}$	NA	1.7E-10	NA
U_{234}	2.8E+01	1.6E-11	4.5E-10
U_{235+1d}	2.2E-02	1.6E-11	3.6E-13
U_{238+2d}	4.8E-01	2.0E-11	9.7E-12
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
ILCR Summation	=		1.5E-09

000837

Table C.III-257
Summary of Intake Quantitation (chemicals) Alternative 3
Solid Waste Landfill with Private Ownership: On-Property Perched Groundwater User
Via Ingestion of Dairy Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of dairy products	0.4 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in animal products	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	2.7E-04	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium-total	4.7E-04	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor-1254	NA	mg/kg	NA	NA	mg/kg
aroclor-1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

Table C.III-257 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Private Ownership: On-Property Perched Groundwater User
Via Ingestion of Dairy Products

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	1.1E-06	4.0E-04	2.7E-03
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	1.9E-06	3.0E-03	6.5E-04
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			3.4E-03

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	1.1E-06	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	1.9E-06	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

000839

Table C.III–258
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Solid Waste Landfill with Private Ownership: On–Property Perched Groundwater User
Via Ingestion of Dairy Products

Intake Equation = Cp X EF X EDn X FI X IR

IR	Ingestion rate of dairy products	0.4 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cp	Concentration of radionuclides in animal products	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	7.9E–05	pCi/kg	U_{234}	2.4E–02	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	3.6E–04	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	2.3E–02	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	2.4E+00	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	3.5E–04	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	5.8E–01	2.2E–10	1.3E–10
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	1.8E+04	3.6E–11	6.4E–07
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	2.6E+00	1.3E–11	3.4E–11
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	1.8E+02	1.6E–11	2.8E–09
U_{235+1d}	2.6E+00	1.6E–11	4.2E–11
U_{238+2d}	1.7E+02	2.0E–11	3.3E–09
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 6.4E–07

Table C.III–259
Summary of Intake Quantitation (chemicals) Alternative 3
Solid Waste Landfill with Private Ownership: On–Property Perched Groundwater User
Via Ingestion of Vegetables and Fruits

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of fruits or vegetables	0.122 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in vegetables	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	4.0E–02	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium–total	3.9E–04	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	1.7E–05	mg/kg	NA	NA	mg/kg
carbazole	2.3E–03	mg/kg	NA	NA	mg/kg
aroclor–1254	NA	mg/kg	NA	NA	mg/kg
aroclor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg

References

000841

Table C.III-259 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Private Ownership: On-Property Perched Groundwater User
Via Ingestion of Vegetables and Fruits

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	6.7E-05	4.0E-04	1.7E-01
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	6.5E-07	3.0E-03	2.2E-04
benzo(a)pyrene	2.9E-08	NA	NA
carbazole	3.9E-06	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			1.7E-01

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	6.7E-05	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	6.5E-07	NA	NA
benzo(a)pyrene	2.9E-08	7.3E+00	2.1E-07
carbazole	3.9E-06	2.0E-02	7.7E-08
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			2.9E-07

Table C.III-260
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Solid Waste Landfill with Private Ownership: On-Property Perched Groundwater User
Via Ingestion of Vegetables and Fruits

Intake Equation = Cv X EF X EDn X FI X IR

IR	Ingestion rate of fruits or vegetables	0.122 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cv	Concentration of radionuclides in vegetables	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	4.3E-01	pCi/kg	U_{234}	8.0E-01	pCi/kg
Pu_{238}	9.6E-02	pCi/kg	U_{235+1d}	5.9E-03	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	1.3E-01	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	NA	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	6.8E-01	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E-11	NA
Np_{237+1d}	1.3E+03	2.2E-10	2.8E-07
Pu_{238}	2.9E+02	2.2E-10	6.3E-08
Ra_{226+8d}	NA	7.8E-10	NA
Ra_{228+1d}	NA	1.0E-10	NA
Rn_{222+4d}	NA	1.7E-12	NA
Sr_{90+1d}	NA	3.6E-11	NA
Tc_{99}	NA	1.3E-12	NA
Th_{228+7d}	NA	5.5E-11	NA
Th_{230}	2.0E+03	1.3E-11	2.7E-08
$Th_{232+10d}$	NA	1.7E-10	NA
U_{234}	2.4E+03	1.6E-11	3.8E-08
U_{235+1d}	1.8E+01	1.6E-11	2.8E-10
U_{238+2d}	3.8E+02	2.0E-11	7.6E-09
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
ILCR Summation	=		4.2E-07

Table C.III-261
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Solid Waste Landfill with Private Ownership: On-Property Perched Groundwater User
Via External Radiation

Dose Equivalency Equat = $[DR \times EF \times EDn \times ET_i \times (1-SH_i)] + [DR \times EF \times EDn \times ET_o \times (1-SH_o)]$

EF	Fraction of year spent exposured	0.96 (unitless)
ED	Exposure duration	70 Year
ET_i	Fraction of day spent indoors	0.76 (unitless)
ET_o	Fraction of day spent outdoors	0.24 (unitless)
SH_i	Shield factor indoors	0.5 (unitless)
SH_o	Shield factor outdoors	NA (unitless)
DR	Radionuclide specific dose concentrations	(see table below)

Cs_{137+1d}	NA	pCi/g	$Th_{232+10d}$	NA	pCi/g
Np_{237+1d}	4.30E-02	pCi/g	U_{234}	8.00E-02	pCi/g
Pu_{238}	2.00E-01	pCi/g	U_{235+1d}	NA	pCi/g
Ra_{226+8d}	NA	pCi/g	U_{238+2d}	NA	pCi/g
Ra_{228+1d}	NA	pCi/g	NA	NA	pCi/g
Rn_{222+4d}	NA	pCi/g	NA	NA	pCi/g
Sr_{90+1d}	NA	pCi/g	NA	NA	pCi/g
Tc_{99}	NA	pCi/g	NA	NA	pCi/g
Th_{228+7d}	NA	pCi/g	NA	NA	pCi/g
Th_{230}	7.70E-01	pCi/g	NA	NA	pCi/g

Radionuclides	CDI (year pCi/g)	CSF $(g/pCi-year)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.0E-06	NA
Np_{237+1d}	1.8E+00	4.3E-07	7.7E-07
Pu_{238}	8.3E+00	2.8E-11	2.3E-10
Ra_{226+8d}	NA	6.0E-06	NA
Ra_{228+1d}	NA	2.9E-06	NA
Rn_{222+4d}	NA	5.9E-06	NA
Sr_{90+1d}	NA	NA	NA
Tc_{99}	NA	6.0E-13	NA
Th_{228+7d}	NA	5.6E-06	NA
Th_{230}	3.2E+01	5.4E-11	1.7E-09
$Th_{232+10d}$	NA	8.5E-06	NA
U_{234}	3.3E+00	3.0E-11	1.0E-10
U_{235+1d}	NA	2.4E-07	NA
U_{238+2d}	NA	5.1E-08	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 7.7E-07

Table C.III–262
Summary of Intake Quantitation (chemicals) Alternative 3
Solid Waste Landfill with Federal Ownership: On–Property RME Resident Farmer (Adult)
Via Incidental Ingestion of Soil

Intake Equation = $\frac{CS \times EF \times ED \times CF \times IR}{BW \times AT}$

IRs	Ingestion rate of soil (RAGS, 1989)	180 mg/day
CF	Conversion factor	1.0E–06 kg/mg
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in soil	(see table below)

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	1.3E+00	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium–total	NA	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	1.5E–03	mg/kg	NA	NA	mg/kg
carbazole	6.4E–03	mg/kg	NA	NA	mg/kg
aroclor–1254	NA	mg/kg	NA	NA	mg/kg
aroclor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

000845

66466

000846

Table C.III-262 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Federal Ownership: On-Property RME Resident Farmer (Adult)
Via Incidental Ingestion of Soil

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	3.3E-06	4.0E-04	8.2E-03
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	NA	3.0E-03	NA
benzo(a)pyrene	3.7E-09	NA	NA
carbazole	1.6E-08	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		8.2E-03

Compound	ILCR Calculation CDI (mg/kg-day)	CSF (mg/kg-day)$^{-1}$	ILCR (unitless)
antimony	3.3E-06	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	NA	NA	NA
benzo(a)pyrene	3.7E-09	7.3E+00	2.7E-08
carbazole	1.6E-08	2.0E-02	3.2E-10
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		2.7E-08

Table C.III-263
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Solid Waste Landfill with Federal Ownership: On-Property RME Resident Farmer (Adult)
Via Incidental Ingestion of Soil

Intake Equation = CS X EF X EDn X FI X IR

IRs	Ingestion rate of soil (RAGS, 1989)	180 mg/day
EF	Exposure frequency	350 days/year
EDn	Exposure Duration	70 Year
FI	Fractional Intake	1 (unitless)
CS	Concentration of radionuclides in soil	

Cs_{137+1d}	NA	pCi/mg	$Th_{232+10d}$	NA	pCi/mg
Np_{237+1d}	4.30E-05	pCi/mg	U_{234}	8.00E-05	pCi/mg
Pu_{238}	2.00E-04	pCi/mg	U_{235+1d}	NA	pCi/mg
Ra_{226+8d}	NA	pCi/mg	U_{238+2d}	NA	pCi/mg
Ra_{228+1d}	NA	pCi/mg	NA	NA	pCi/mg
Rn_{222+4d}	NA	pCi/mg	NA	NA	pCi/mg
Sr_{90+1d}	NA	pCi/mg	NA	NA	pCi/mg
Tc_{99}	NA	pCi/mg	NA	NA	pCi/mg
Th_{228+7d}	NA	pCi/mg	NA	NA	pCi/mg
Th_{230}	7.70E-04	pCi/mg	NA	NA	pCi/mg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.80E-11	NA
Np_{237+1d}	1.90E+02	2.20E-10	4.17E-08
Pu_{238}	8.82E+02	2.20E-10	1.94E-07
Ra_{226+8d}	NA	7.80E-10	NA
Ra_{228+1d}	NA	1.00E-10	NA
Rn_{222+4d}	NA	1.70E-12	NA
Sr_{90+1d}	NA	3.60E-11	NA
Tc_{99}	NA	1.30E-12	NA
Th_{228+7d}	NA	5.50E-11	NA
Th_{230}	3.40E+03	1.30E-11	4.41E-08
$Th_{232+10d}$	NA	1.70E-10	NA
U_{234}	3.53E+02	1.60E-11	5.64E-09
U_{235+1d}	NA	1.60E-11	NA
U_{238+2d}	NA	2.00E-11	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 2.86E-07

Table C.III-264
Summary of Intake Quantitation (chemicals) Alternative 3
Solid Waste Landfill with Federal Ownership: On-Property RME Resident Farmer (Adult)
Via Dermal Contact with Soil

Intake Equation = $\frac{CS \times IF \times ED \times CF \times ABS \times AF \times SA}{BW \times AT}$

SA	Surface area of exposed skin (50th percentile, hands only)	5750 cm^2/day
AF	Soil to skin adherence factor (RAGS, 1989)	1 mg/cm^2
ABS	chemicals specific absorbtion factor (see table below)	csv
CF	Conversion factor	1E-06 kg/mg
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in soil	

Chemical Concentrations

Compound	ABS	Concentrati	Units	Compound		Concentrati	Units
antimony	1.00E-02	1.33E+00	mg/kg	NA	NA	NA	mg/kg
arsenic	1.00E-03	NA	mg/kg	NA	NA	NA	mg/kg
beryllium	1.00E-02	NA	mg/kg	NA	NA	NA	mg/kg
uranium-total	1.00E-02	NA	mg/kg	NA	NA	NA	mg/kg
benzo(a)pyrene	3.00E-01	1.50E-03	mg/kg	NA	NA	NA	mg/kg
carbazole	3.00E-01	6.40E-03	mg/kg	NA	NA	NA	mg/kg
aroclor-1254	6.00E-02	NA	mg/kg	NA	NA	NA	mg/kg
aroclor-1260	6.00E-02	NA	mg/kg	NA	NA	NA	mg/kg
dieldrin	3.00E-01	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg

References

Table C.III-264 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Federal Ownership: On-Property RME Resident Farmer (Adult)
Via Dermal Contact with Soil

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	1.05E-06	6.00E-05	1.75E-02
arsenic	NA	2.85E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	NA	1.50E-04	NA
benzo(a)pyrene	3.54E-08	NA	NA
carbazole	1.51E-07	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	4.50E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		1.75E-02

Compound	ILCR Calculation CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	1.05E-06	NA	NA
arsenic	NA	1.90E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	NA	NA	NA
benzo(a)pyrene	3.54E-08	NA	NA
carbazole	1.51E-07	2.22E-02	3.36E-09
aroclor-1254	NA	1.03E+01	NA
aroclor-1260	NA	1.03E+01	NA
dieldrin	NA	1.78E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		3.36E-09

6646

000849

Table C.III–265
Summary of Intake Quantitation (chemicals) Alternative 3
Solid Waste Landfill with Federal Ownership: On–Property RME Resident Farmer (Adult)
Via Drinking Water Ingestion

Intake Equation = $\frac{CS \times EF \times ED \times IR}{BW \times AT}$

IR	Ingestion rate of groundwater (RAGS, 1989)	2 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in groundwater	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/l	NA	NA	mg/l
arsenic	NA	mg/l	NA	NA	mg/l
beryllium	NA	mg/l	NA	NA	mg/l
uranium–total	8.00E–05	mg/l	NA	NA	mg/l
benzo(a)pyrene	NA	mg/l	NA	NA	mg/l
carbazole	NA	mg/l	NA	NA	mg/l
aroclor–1254	NA	mg/l	NA	NA	mg/l
aroclor–1260	NA	mg/l	NA	NA	mg/l
dieldrin	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l			

References

Table C.III-265 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Federal Ownership: On-Property RME Resident Farmer (Adult)
Via Drinking Water Ingestion

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.00E-04	NA
arsenic	NA	3.00E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	2.19E-06	3.00E-03	7.31E-04
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.00E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			7.31E-04

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.75E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	2.19E-06	NA	NA
benzo(a)pyrene	NA	7.30E+00	NA
carbazole	NA	2.00E-02	NA
aroclor-1254	NA	7.70E+00	NA
aroclor-1260	NA	7.70E+00	NA
dieldrin	NA	1.60E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

1580851

66466

Table C.III–266
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Solid Waste Landfill with Federal Ownership: On–Property RME Resident Farmer (Adult)
Via Ingestion of Drinking Water

Intake Equation = Cw X EF X EDn X FI X IR

IR	Ingestion rate of groundwater (RAGS, 1989)	2 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
FI	Fractional intake for radionuclides	1 (Unitless)
Cw	Concentration of radionuclides in groundwater	(see table below)

Cs_{137+1d}	NA	pCi/l	$Th_{232+10d}$	NA	pCi/l
Np_{237+1d}	NA	pCi/l	U_{234}	2.4E–02	pCi/l
Pu_{238}	NA	pCi/l	U_{235+1d}	1.2E–03	pCi/l
Ra_{226+8d}	NA	pCi/l	U_{238+2d}	2.6E–02	pCi/l
Ra_{228+1d}	NA	pCi/l	NA	NA	pCi/l
Rn_{222+4d}	NA	pCi/l	NA	NA	pCi/l
Sr_{90+1d}	NA	pCi/l	NA	NA	pCi/l
Tc_{99}	NA	pCi/l	NA	NA	pCi/l
Th_{228+7d}	NA	pCi/l	NA	NA	pCi/l
Th_{230}	NA	pCi/l	NA	NA	pCi/l

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	NA	2.2E–10	NA
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	NA	1.3E–11	NA
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	1.2E+03	1.6E–11	1.9E–08
U_{235+1d}	5.9E+01	1.6E–11	9.4E–10
U_{238+2d}	1.3E+03	2.0E–11	2.5E–08
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		4.5E–08

000852

Table C.III–267
Summary of Intake Quantitation (chemicals) Alternative 3
Solid Waste Landfill with Federal Ownership: On–Property RME Resident Farmer (Adult)
Via Dermal Contact while Bathing

Intake Equation = $\frac{DA \times EF \times ED \times SA}{BW \times AT}$

DA	Dermal absorbed dose	csv mg/cm^2–day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
SA	Skin surface area available for contact	23000 cm^2

Chemical Concentrations

Compound	DA	Units
antimony	NA	mg/cm^2–day
arsenic	NA	mg/cm^2–day
beryllium	NA	mg/cm^2–day
uranium–total	2.00E–11	mg/cm^2–day
benzo(a)pyrene	NA	mg/cm^2–day
carbazole	NA	mg/cm^2–day
aroclor–1254	NA	mg/cm^2–day
aroclor–1260	NA	mg/cm^2–day
dieldrin	NA	mg/cm^2–day
NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day

Compound	DA	Units
NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day

References

000853

Table C.III-267 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Federal Ownership: On-Property RME Resident Farmer (Adult)
Via Dermal Contact while Bathing

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	6.00E-05	NA
arsenic	NA	2.85E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	6.30E-09	1.50E-04	4.20E-05
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	4.50E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		4.20E-05

Compound	ILCR Calculation CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.90E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	6.30E-09	NA	NA
benzo(a)pyrene	NA	NA	NA
carbazole	NA	2.22E-02	NA
aroclor-1254	NA	1.03E+01	NA
aroclor-1260	NA	1.03E+01	NA
dieldrin	NA	1.78E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

Table C.III–268
Summary of Intake Quantitation (chemicals) Alternative 3
Solid Waste Landfill with Federal Ownership: On–Property RME Resident Farmer (Adult)
Via Inhalation of Particulates

Intake Equation = $\frac{CS \times EF \times ED \times IR}{BW \times AT}$

IR	Inhalation rate of gases (RAGS, 1989)	20 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in soil	(see table below)

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	3.5E–08	mg/m^3	NA	NA	mg/m^3
arsenic	NA	mg/m^3	NA	NA	mg/m^3
beryllium	NA	mg/m^3	NA	NA	mg/m^3
uranium–total	NA	mg/m^3	NA	NA	mg/m^3
benzo(a)pyrene	4.6E–11	mg/m^3	NA	NA	mg/m^3
carbazole	2.0E–10	mg/m^3	NA	NA	mg/m^3
aroclor–1254	NA	mg/m^3	NA	NA	mg/m^3
aroclor–1260	NA	mg/m^3	NA	NA	mg/m^3
dieldrin	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3			

References

0008555

Table C.III-268 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Federal Ownership: On-Property RMI Resident Farmer (Adult)
Via Inhalation of Particulates

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	9.5E-09	NA	NA
arsenic	NA	NA	NA
beryllium	NA	NA	NA
uranium-total	NA	NA	NA
benzo(a)pyrene	1.3E-11	NA	NA
carbazole	5.4E-11	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
Hazard Quotient Sum =			NA

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	9.5E-09	NA	NA
arsenic	NA	1.5E+01	NA
beryllium	NA	8.4E+00	NA
uranium-total	NA	NA	NA
benzo(a)pyrene	1.3E-11	6.1E+00	7.7E-11
carbazole	5.4E-11	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			7.7E-11

Table C.III–269
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Solid Waste Landfill with Federal Ownership: On–Property RME Resident Farmer (Adult)
Via Inhalation of Gases and Particulates

Intake Equation = Ca X EF X EDn X IR

IR	Inhalation rate of gases (RAGS, 1989)	20 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Ca	Concentration of radionuclides in air	(see table below)

Cs_{137+1d}	NA	pCi/m^3	$Th_{232+10d}$	NA	pCi/m^3
Np_{237+1d}	1.3E–06	pCi/m^3	U_{234}	2.5E–06	pCi/m^3
Pu_{238}	6.2E–06	pCi/m^3	U_{235+1d}	NA	pCi/m^3
Ra_{226+8d}	NA	pCi/m^3	U_{238+2d}	NA	pCi/m^3
Ra_{228+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Rn_{222+4d}	NA	pCi/m^3	NA	NA	pCi/m^3
Sr_{90+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Tc_{99}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{228+7d}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{230}	2.4E–05	pCi/m^3	NA	NA	pCi/m^3

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	1.9E–11	NA
Np_{237+1d}	6.5E–01	2.9E–08	1.9E–08
Pu_{238}	3.0E+00	3.9E–08	1.2E–07
Ra_{226+8d}	NA	7.0E–09	NA
Ra_{228+1d}	NA	6.9E–10	NA
Rn_{222+4d}	NA	7.7E–12	NA
Sr_{90+1d}	NA	6.2E–11	NA
Tc_{99}	NA	8.3E–12	NA
Th_{228+7d}	NA	7.8E–08	NA
Th_{230}	1.2E+01	2.9E–08	3.4E–07
$Th_{232+10d}$	NA	1.1E–07	NA
U_{234}	1.2E+00	2.6E–08	3.1E–08
U_{235+1d}	NA	2.5E–08	NA
U_{238+2d}	NA	2.4E–08	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		5.0E–07

AR000857

Table C.III-270
Summary of Intake Quantitation (chemicals) Alternative 3
Solid Waste Landfill with Federal Ownership: On-Property RME Resident Farmer (Adult)
Via Ingestion of Meat Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of meat	0.101 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in meat	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	2.7E-03	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium-total	8.0E-07	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	5.1E-05	mg/kg	NA	NA	mg/kg
carbazole	9.7E-06	mg/kg	NA	NA	mg/kg
aroclor-1254	NA	mg/kg	NA	NA	mg/kg
aroclor-1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

Table C.III-270 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Federal Ownership: On-Property RME Resident Farmer (Adult)
Via Ingestion of Meat Products

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	2.8E-06	4.0E-04	6.9E-03
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	8.3E-10	3.0E-03	2.8E-07
benzo(a)pyrene	5.3E-08	NA	NA
carbazole	1.0E-08	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	HQ Summation =		6.9E-03

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	2.8E-06	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	8.3E-10	NA	NA
benzo(a)pyrene	5.3E-08	7.3E+00	3.9E-07
carbazole	1.0E-08	2.0E-02	2.0E-10
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	ILCR Summation =		3.9E-07

000859

6646

Table C.III–271
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Solid Waste Landfill with Federal Ownership: On–Property RME Resident Farmer (Adult)
Via Ingestion of Meat Products

Intake Equation = Cf X EF X EDn X FI X IR

IR	Ingestion rate of meat	0.101 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cf	Concentration of radionuclides in meat	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	2.4E–03	pCi/kg	U_{234}	1.5E–02	pCi/kg
Pu_{238}	5.2E–05	pCi/kg	U_{235+1d}	1.2E–05	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	2.6E–04	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	NA	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	2.5E–03	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	4.4E+00	2.2E–10	9.7E–10
Pu_{238}	9.7E–02	2.2E–10	2.1E–11
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	4.7E+00	1.3E–11	6.1E–11
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	2.8E+01	1.6E–11	4.5E–10
U_{235+1d}	2.2E–02	1.6E–11	3.6E–13
U_{238+2d}	4.8E–01	2.0E–11	9.7E–12
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 1.5E–09

000860

Table C.III–272
Summary of Intake Quantitation (chemicals) Alternative 3
Solid Waste Landfill with Federal Ownership: On–Property RME Resident Farmer (Adult)
Via Ingestion of Dairy Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of dairy products	0.4 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in animal products	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	2.7E–04	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium–total	4.7E–04	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor–1254	NA	mg/kg	NA	NA	mg/kg
aroclor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

Table C.III-272 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Federal Ownership: On-Property RME Resident Farmer (Adult)
Via Ingestion of Dairy Products

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	1.1E-06	4.0E-04	2.7E-03
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	1.9E-06	3.0E-03	6.5E-04
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			3.4E-03

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF (mg/kg-day)$^{-1}$	ILCR (unitless)
antimony	1.1E-06	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	1.9E-06	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

Table C.III-273
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Solid Waste Landfill with Federal Ownership: On-Property RME Resident Farmer (Adult)
Via Ingestion of Dairy Products

Intake Equation = Cp X EF X EDn X FI X IR

IR	Ingestion rate of dairy products	0.4 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cp	Concentration of radionuclides in animal products	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	7.9E-05	pCi/kg	U_{234}	2.4E-02	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	3.6E-04	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	2.3E-02	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	2.4E+00	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	3.5E-04	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E-11	NA
Np_{237+1d}	5.8E-01	2.2E-10	1.3E-10
Pu_{238}	NA	2.2E-10	NA
Ra_{226+8d}	NA	7.8E-10	NA
Ra_{228+1d}	NA	1.0E-10	NA
Rn_{222+4d}	NA	1.7E-12	NA
Sr_{90+1d}	1.8E+04	3.6E-11	6.4E-07
Tc_{99}	NA	1.3E-12	NA
Th_{228+7d}	NA	5.5E-11	NA
Th_{230}	2.6E+00	1.3E-11	3.4E-11
$Th_{232+10d}$	NA	1.7E-10	NA
U_{234}	1.8E+02	1.6E-11	2.8E-09
U_{235+1d}	2.6E+00	1.6E-11	4.2E-11
U_{238+2d}	1.7E+02	2.0E-11	3.3E-09
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation	=	6.4E-07

Table C.III-274
Summary of Intake Quantitation (chemicals) Alternative 3
Solid Waste Landfill with Federal Ownership: On-Property RME Resident Farmer (Adult)
Via Ingestion of Vegetables and Fruits

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of fruits or vegetables	0.122 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in vegetables	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	4.0E-02	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium-total	3.9E-04	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	1.7E-05	mg/kg	NA	NA	mg/kg
carbazole	2.3E-03	mg/kg	NA	NA	mg/kg
aroclor-1254	NA	mg/kg	NA	NA	mg/kg
aroclor-1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

Table C.III-274 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Federal Ownership: On-Property RME Resident Farmer (Adult)
Via Ingestion of Vegetables and Fruits

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	6.7E-05	4.0E-04	1.7E-01
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	6.5E-07	3.0E-03	2.2E-04
benzo(a)pyrene	2.9E-08	NA	NA
carbazole	3.9E-06	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		1.7E-01

Compound	ILCR Calculation CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	6.7E-05	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	6.5E-07	NA	NA
benzo(a)pyrene	2.9E-08	7.3E+00	2.1E-07
carbazole	3.9E-06	2.0E-02	7.7E-08
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		2.9E-07

000865

6646

Table C.III–275
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Solid Waste Landfill with Federal Ownership: On–Property RME Resident Farmer (Adult)
Via Ingestion of Vegetables and Fruits

Intake Equation = Cv X EF X EDn X FI X IR

IR	Ingestion rate of fruits or vegetables	0.122 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cv	Concentration of radionuclides in vegetables	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	4.3E–01	pCi/kg	U_{234}	8.0E–01	pCi/kg
Pu_{238}	9.6E–02	pCi/kg	U_{235+1d}	5.9E–03	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	1.3E–01	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	NA	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	6.8E–01	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	1.3E+03	2.2E–10	2.8E–07
Pu_{238}	2.9E+02	2.2E–10	6.3E–08
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	2.0E+03	1.3E–11	2.7E–08
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	2.4E+03	1.6E–11	3.8E–08
U_{235+1d}	1.8E+01	1.6E–11	2.8E–10
U_{238+2d}	3.8E+02	2.0E–11	7.6E–09
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		4.2E–07

000866

Table C.III-276
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
Solid Waste Landfill with Federal Ownership: On-Property RME Resident Farmer (Adult)
Via External Radiation

Dose Equivalency Equat = $[DR \times EF \times EDn \times ET_i \times (1-SH_i)] + [DR \times EF \times EDn \times ET_o \times (1-SH_o)]$

EF	Fraction of year spent exposured	0.96 (unitless)
ED	Exposure duration	70 Year
ET_i	Fraction of day spent indoors	0.76 (unitless)
ET_o	Fraction of day spent outdoors	0.24 (unitless)
SH_i	Shield factor indoors	0.5 (unitless)
SH_o	Shield factor outdoors	NA (unitless)
DR	Radionuclide specific dose concentrations	(see table below)

Cs_{137+1d}	NA	pCi/g	$Th_{232+10d}$	NA	pCi/g
Np_{237+1d}	4.30E-02	pCi/g	U_{234}	8.00E-02	pCi/g
Pu_{238}	2.00E-01	pCi/g	U_{235+1d}	NA	pCi/g
Ra_{226+8d}	NA	pCi/g	U_{238+2d}	NA	pCi/g
Ra_{228+1d}	NA	pCi/g	NA	NA	pCi/g
Rn_{222+4d}	NA	pCi/g	NA	NA	pCi/g
Sr_{90+1d}	NA	pCi/g	NA	NA	pCi/g
Tc_{99}	NA	pCi/g	NA	NA	pCi/g
Th_{228+7d}	NA	pCi/g	NA	NA	pCi/g
Th_{230}	7.70E-01	pCi/g	NA	NA	pCi/g

Radionuclides	CDI (year pCi/g)	CSF $(g/pCi-year)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.0E-06	NA
Np_{237+1d}	1.8E+00	4.3E-07	7.7E-07
Pu_{238}	8.3E+00	2.8E-11	2.3E-10
Ra_{226+8d}	NA	6.0E-06	NA
Ra_{228+1d}	NA	2.9E-06	NA
Rn_{222+4d}	NA	5.9E-06	NA
Sr_{90+1d}	NA	NA	NA
Tc_{99}	NA	6.0E-13	NA
Th_{228+7d}	NA	5.6E-06	NA
Th_{230}	3.2E+01	5.4E-11	1.7E-09
$Th_{232+10d}$	NA	8.5E-06	NA
U_{234}	3.3E+00	3.0E-11	1.0E-10
U_{235+1d}	NA	2.4E-07	NA
U_{238+2d}	NA	5.1E-08	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		7.7E-07

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Table C.III-277
Summary of Intake Quantitation (chemicals) Alternatives 3
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Child)
Via Incidental Ingestion of Soil

Intake Equation = $\frac{CS \times EF \times ED \times CF \times IR}{BW \times AT}$

IRs	Ingestion rate of soil (RAGS, 1989)	200 mg/day
CF	Conversion factor	1.0E-06 kg/mg
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in soil	(see table below)

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	1.3E+00	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium-total	NA	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	1.5E-03	mg/kg	NA	NA	mg/kg
carbazole	6.4E-03	mg/kg	NA	NA	mg/kg
aroclor-1254	NA	mg/kg	NA	NA	mg/kg
aroclor-1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

Table C.III-277 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Child)
Via Incidental Ingestion of Soil

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	1.7E-05	4.0E-04	4.3E-02
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	NA	3.0E-03	NA
benzo(a)pyrene	1.9E-08	NA	NA
carbazole	8.2E-08	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		4.3E-02

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	1.5E-06	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	NA	NA	NA
benzo(a)pyrene	1.6E-09	7.3E+00	1.2E-08
carbazole	7.0E-09	2.0E-02	1.4E-10
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		1.2E-08

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Table C.III−278
Summary of Intake and Risk Quantitation (radionuclides) Alternatives 3
Solid Waste Landfill with Private Ownership: Off−Property Farmer (Child)
Via Incidental Ingestion of Soil

Intake Equation = CS X EF X EDn X FI X IR

IRs	Ingestion rate of soil (RAGS. 1989)	200 mg/day
EF	Exposure frequency	350 days/year
EDn	Exposure Duration	6 Year
FI	Fractional Intake	1 (unitless)
CS	Concentration of radionuclides in soil	

Cs_{137+1d}	NA	pCi/mg	$Th_{232+10d}$	NA	pCi/mg
Np_{237+1d}	4.30E−05	pCi/mg	U_{234}	8.00E−05	pCi/mg
Pu_{238}	2.00E−04	pCi/mg	U_{235+1d}	NA	pCi/mg
Ra_{226+8d}	NA	pCi/mg	U_{238+2d}	NA	pCi/mg
Ra_{228+1d}	NA	pCi/mg	NA	NA	pCi/mg
Rn_{222+4d}	NA	pCi/mg	NA	NA	pCi/mg
Sr_{90+1d}	NA	pCi/mg	NA	NA	pCi/mg
Tc_{99}	NA	pCi/mg	NA	NA	pCi/mg
Th_{228+7d}	NA	pCi/mg	NA	NA	pCi/mg
Th_{230}	7.70E−04	pCi/mg	NA	NA	pCi/mg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.80E−11	NA
Np_{237+1d}	1.81E+01	2.20E−10	3.97E−09
Pu_{238}	8.40E+01	2.20E−10	1.85E−08
Ra_{226+8d}	NA	7.80E−10	NA
Ra_{228+1d}	NA	1.00E−10	NA
Rn_{222+4d}	NA	1.70E−12	NA
Sr_{90+1d}	NA	3.60E−11	NA
Tc_{99}	NA	1.30E−12	NA
Th_{228+7d}	NA	5.50E−11	NA
Th_{230}	3.23E+02	1.30E−11	4.20E−09
$Th_{232+10d}$	NA	1.70E−10	NA
U_{234}	3.36E+01	1.60E−11	5.38E−10
U_{235+1d}	NA	1.60E−11	NA
U_{238+2d}	NA	2.00E−11	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		2.72E−08

Table C.III–279
Summary of Intake Quantitation (chemicals) Alternatives 3
Solid Waste Landfill with Private Ownership: Off–Property Farmer (Child)
Via Dermal Contact with Soil

Intake Equation = $\frac{CS \times EF \times ED \times CF \times ABS \times AF \times SA}{BW \times AT}$

SA	Surface area of exposed skin (50th percentile, hands only)	2000 cm^2/day
AF	Soil to skin adherence factor (RAGS, 1989)	1 mg/cm^2
ABS	chemicals specific absorbtion factor (see table below)	csv
CF	Conversion factor	1E–06 kg/mg
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in soil	

Chemical Concentrations

Compound	ABS	Concentrati	Units	Compound		Concentrati	Units
antimony	1.00E–02	1.33E+00	mg/kg	NA	NA	NA	mg/kg
arsenic	1.00E–03	NA	mg/kg	NA	NA	NA	mg/kg
beryllium	1.00E–02	NA	mg/kg	NA	NA	NA	mg/kg
uranium–total	1.00E–02	NA	mg/kg	NA	NA	NA	mg/kg
benzo(a)pyrene	3.00E–01	1.50E–03	mg/kg	NA	NA	NA	mg/kg
carbazole	3.00E–01	6.40E–03	mg/kg	NA	NA	NA	mg/kg
aroclor–1254	6.00E–02	NA	mg/kg	NA	NA	NA	mg/kg
aroclor–1260	6.00E–02	NA	mg/kg	NA	NA	NA	mg/kg
dieldrin	3.00E–01	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg				

References

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Table C.III-279 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Child)
Via Dermal Contact with Soil

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	1.70E-06	6.00E-05	2.83E-02
arsenic	NA	2.85E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	NA	1.50E-04	NA
benzo(a)pyrene	5.75E-08	NA	NA
carbazole	2.45E-07	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	4.50E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			2.83E-02

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	1.46E-07	NA	NA
arsenic	NA	1.90E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	NA	NA	NA
benzo(a)pyrene	4.93E-09	NA	NA
carbazole	2.10E-08	2.22E-02	4.68E-10
aroclor-1254	NA	1.03E+01	NA
aroclor-1260	NA	1.03E+01	NA
dieldrin	NA	1.78E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			4.68E-10

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Table C.III–280
Summary of Intake Quantitation (chemicals) Alternatives 3
Solid Waste Landfill with Private Ownership: Off–Property Farmer (Child)
Via Drinking Water Ingestion

Intake Equation = $\frac{CS \times EF \times ED \times IR}{BW \times AT}$

IR	Ingestion rate of groundwater (RAGS, 1989)	1 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in groundwater	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/l	NA	NA	mg/l
arsenic	NA	mg/l	NA	NA	mg/l
beryllium	NA	mg/l	NA	NA	mg/l
uranium–total	8.00E–05	mg/l	NA	NA	mg/l
benzo(a)pyrene	NA	mg/l	NA	NA	mg/l
carbazole	NA	mg/l	NA	NA	mg/l
aroclor–1254	NA	mg/l	NA	NA	mg/l
aroclor–1260	NA	mg/l	NA	NA	mg/l
dieldrin	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l			

References

Table C.III-280 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Child)
Via Drinking Water Ingestion

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.00E-04	NA
arsenic	NA	3.00E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	5.11E-06	3.00E-03	1.70E-03
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.00E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		1.70E-03

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.75E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	4.38E-07	NA	NA
benzo(a)pyrene	NA	7.30E+00	NA
carbazole	NA	2.00E-02	NA
aroclor-1254	NA	7.70E+00	NA
aroclor-1260	NA	7.70E+00	NA
dieldrin	NA	1.60E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

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Table C.III–281
Summary of Intake and Risk Quantitation (radionuclides) Alternatives 3
Solid Waste Landfill with Private Ownership: Off–Property Farmer (Child)
Via Ingestion of Drinking Water

Intake Equation = Cw X EF X EDn X FI X IR

IR	Ingestion rate of groundwater (RAGS, 1989)	1 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
FI	Fractional intake for radionuclides	1 (Unitless)
Cw	Concentration of radionuclides in groundwater	(see table below)

Cs_{137+1d}	NA	pCi/l	$Th_{232+10d}$	NA	pCi/l
Np_{237+1d}	NA	pCi/l	U_{234}	2.4E–02	pCi/l
Pu_{238}	NA	pCi/l	U_{235+1d}	1.2E–03	pCi/l
Ra_{226+8d}	NA	pCi/l	U_{238+2d}	2.6E–02	pCi/l
Ra_{228+1d}	NA	pCi/l	NA	NA	pCi/l
Rn_{222+4d}	NA	pCi/l	NA	NA	pCi/l
Sr_{90+1d}	NA	pCi/l	NA	NA	pCi/l
Tc_{99}	NA	pCi/l	NA	NA	pCi/l
Th_{228+7d}	NA	pCi/l	NA	NA	pCi/l
Th_{230}	NA	pCi/l	NA	NA	pCi/l

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	NA	2.2E–10	NA
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	NA	1.3E–11	NA
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	5.0E+01	1.6E–11	8.1E–10
U_{235+1d}	2.5E+00	1.6E–11	4.0E–11
U_{238+2d}	5.5E+01	2.0E–11	1.1E–09
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 1.9E–09

Table C.III-282
Summary of Intake Quantitation (chemicals) Alternatives 3
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Child)
Via Dermal Contact while Bathing

Intake Equation = $\frac{DA \times EF \times ED \times SA}{BW \times AT}$

DA	Dermal absorbed dose	csv mg/cm^2-day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	2190 days
SA	Skin surface area available for contact	8000 cm^2

Chemical Concentrations

Compound	DA	Units	Compound	DA	Units
antimony	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
arsenic	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
beryllium	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
uranium-total	2.00E-11	mg/cm^2-day	NA	NA	mg/cm^2-day
benzo(a)pyrene	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
carbazole	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
aroclor-1254	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
aroclor-1260	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
dieldrin	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day			

References

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Table C.III-282 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Child)
Via Dermal Contact while Bathing

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	6.00E-05	NA
arsenic	NA	2.85E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	1.02E-08	1.50E-04	6.82E-05
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	4.50E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			6.82E-05

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.90E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	8.77E-10	NA	NA
benzo(a)pyrene	NA	NA	NA
carbazole	NA	2.22E-02	NA
aroclor-1254	NA	1.03E+01	NA
aroclor-1260	NA	1.03E+01	NA
dieldrin	NA	1.78E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

Table C.III-283
Summary of Intake Quantitation (chemicals) Alternatives 3
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Child)
Via Inhalation of Particulates

Intake Equation $= \frac{CS \times EF \times ED \times IR}{BW \times AT}$

IR	Inhalation rate of gases (RAGS, 1989)	12 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in soil	(see table below)

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	3.5E-08	mg/m^3	NA	NA	mg/m^3
arsenic	NA	mg/m^3	NA	NA	mg/m^3
beryllium	NA	mg/m^3	NA	NA	mg/m^3
uranium-total	NA	mg/m^3	NA	NA	mg/m^3
benzo(a)pyrene	4.6E-11	mg/m^3	NA	NA	mg/m^3
carbazole	2.0E-10	mg/m^3	NA	NA	mg/m^3
aroclor-1254	NA	mg/m^3	NA	NA	mg/m^3
aroclor-1260	NA	mg/m^3	NA	NA	mg/m^3
dieldrin	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3

References

Table C.III-283 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Child)
Via Inhalation of Particulates

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	2.7E-08	NA	NA
arsenic	NA	NA	NA
beryllium	NA	NA	NA
uranium-total	NA	NA	NA
benzo(a)pyrene	3.5E-11	NA	NA
carbazole	1.5E-10	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	Hazard Quotient Sum =		NA

Compound	ILCR Calculation CDI (mg/kg-day)	CSF $(mg/kg\text{-}day)^{-1}$	ILCR (unitless)
antimony	2.3E-09	NA	NA
arsenic	NA	1.5E+01	NA
beryllium	NA	8.4E+00	NA
uranium-total	NA	NA	NA
benzo(a)pyrene	3.0E-12	6.1E+00	1.8E-11
carbazole	1.3E-11	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		1.8E-11

Table C.III–284
Summary of Intake and Risk Quantitation (radionuclides) Alternatives 3
Solid Waste Landfill with Private Ownership: Off–Property Farmer (Child)
Via Inhalation of Gases and Particulates

Intake Equation = Ca X EF X EDn X IR

IR	Inhalation rate of gases (RAGS, 1989)	12 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Ca	Concentration of radionuclides in air	(see table below)

Cs_{137+1d}	NA	pCi/m^3	$Th_{232+10d}$	NA	pCi/m^3
Np_{237+1d}	1.3E–06	pCi/m^3	U_{234}	2.5E–06	pCi/m^3
Pu_{238}	6.2E–06	pCi/m^3	U_{235+1d}	NA	pCi/m^3
Ra_{226+8d}	NA	pCi/m^3	U_{238+2d}	NA	pCi/m^3
Ra_{228+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Rn_{222+4d}	NA	pCi/m^3	NA	NA	pCi/m^3
Sr_{90+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Tc_{99}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{228+7d}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{230}	2.4E–05	pCi/m^3	NA	NA	pCi/m^3

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	1.9E–11	NA
Np_{237+1d}	3.3E–02	2.9E–08	9.6E–10
Pu_{238}	1.5E–01	3.9E–08	6.0E–09
Ra_{226+8d}	NA	7.0E–09	NA
Ra_{228+1d}	NA	6.9E–10	NA
Rn_{222+4d}	NA	7.7E–12	NA
Sr_{90+1d}	NA	6.2E–11	NA
Tc_{99}	NA	8.3E–12	NA
Th_{228+7d}	NA	7.8E–08	NA
Th_{230}	6.0E–01	2.9E–08	1.7E–08
$Th_{232+10d}$	NA	1.1E–07	NA
U_{234}	6.2E–02	2.6E–08	1.6E–09
U_{235+1d}	NA	2.5E–08	NA
U_{238+2d}	NA	2.4E–08	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 2.6E–08

000881

Table C.III–285
Summary of Intake Quantitation (chemicals) Alternatives 3
Solid Waste Landfill with Private Ownership: Off–Property Farmer (Child)
Via Ingestion of Meat Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of meat	0.039 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in meat	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	2.7E–03	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium–total	8.0E–07	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	5.1E–05	mg/kg	NA	NA	mg/kg
carbazole	9.7E–06	mg/kg	NA	NA	mg/kg
aroclor–1254	NA	mg/kg	NA	NA	mg/kg
aroclor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

Table C.III-285 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Child)
Via Ingestion of Meat Products

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	5.0E-06	4.0E-04	1.2E-02
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	1.5E-09	3.0E-03	5.0E-07
benzo(a)pyrene	9.5E-08	NA	NA
carbazole	1.8E-08	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		1.2E-02

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	4.3E-07	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	1.3E-10	NA	NA
benzo(a)pyrene	8.2E-09	7.3E+00	6.0E-08
carbazole	1.6E-09	2.0E-02	3.1E-11
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		6.0E-08

Table C.III-286
Summary of Intake and Risk Quantitation (radionuclides) Alternatives 3
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Child)
Via Ingestion of Meat Products

Intake Equation = Cf X EF X EDn X FI X IR

IR	Ingestion rate of meat	0.039 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cf	Concentration of radionuclides in meat	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	2.4E-03	pCi/kg	U_{234}	1.5E-02	pCi/kg
Pu_{238}	5.2E-05	pCi/kg	U_{235+1d}	1.2E-05	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	2.6E-04	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	NA	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	2.5E-03	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E-11	NA
Np_{237+1d}	1.5E-01	2.2E-10	3.2E-11
Pu_{238}	3.2E-03	2.2E-10	7.1E-13
Ra_{226+8d}	NA	7.8E-10	NA
Ra_{228+1d}	NA	1.0E-10	NA
Rn_{222+4d}	NA	1.7E-12	NA
Sr_{90+1d}	NA	3.6E-11	NA
Tc_{99}	NA	1.3E-12	NA
Th_{228+7d}	NA	5.5E-11	NA
Th_{230}	1.5E-01	1.3E-11	2.0E-12
$Th_{232+10d}$	NA	1.7E-10	NA
U_{234}	9.3E-01	1.6E-11	1.5E-11
U_{235+1d}	7.4E-04	1.6E-11	1.2E-14
U_{238+2d}	1.6E-02	2.0E-11	3.2E-13
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 5.0E-11

000884

Table C.III–287
Summary of Intake Quantitation (chemicals) Alternatives 3
Solid Waste Landfill with Private Ownership: Off–Property Farmer (Child)
Via Ingestion of Dairy Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of dairy products	0.9 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in animal products	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	2.7E–04	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium–total	4.7E–04	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor–1254	NA	mg/kg	NA	NA	mg/kg
aroclor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

000836

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Table C.III-287 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Child)
Via Ingestion of Dairy Products

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	1.1E-05	4.0E-04	2.9E-02
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	2.0E-05	3.0E-03	6.8E-03
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		3.6E-02

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	9.9E-07	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	1.8E-06	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

Table C.III–288
Summary of Intake and Risk Quantitation (radionuclides) Alternatives 3
Solid Waste Landfill with Private Ownership: Off–Property Farmer (Child)
Via Ingestion of Dairy Products

Intake Equation = Cp X EF X EDn X FI X IR

IR	Ingestion rate of dairy products	0.9 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cp	Concentration of radionuclides in animal products	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	7.9E–05	pCi/kg	U_{234}	2.4E–02	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	3.6E–04	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	2.3E–02	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	2.4E+00	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	3.5E–04	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	1.1E–01	2.2E–10	2.5E–11
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	3.4E+03	3.6E–11	1.2E–07
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	5.0E–01	1.3E–11	6.5E–12
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	3.4E+01	1.6E–11	5.5E–10
U_{235+1d}	5.1E–01	1.6E–11	8.2E–12
U_{238+2d}	3.2E+01	2.0E–11	6.5E–10
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 1.2E–07

000887

Table C.III-289
Summary of Intake Quantitation (chemicals) Alternatives 3
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of fruits or vegetables	0.1 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in vegetables	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	4.0E-02	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium-total	3.9E-04	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	1.7E-05	mg/kg	NA	NA	mg/kg
carbazole	2.3E-03	mg/kg	NA	NA	mg/kg
aroclor-1254	NA	mg/kg	NA	NA	mg/kg
aroclor-1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

Table C.III-289 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	2.6E-04	4.0E-04	6.4E-01
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	2.5E-06	3.0E-03	8.3E-04
benzo(a)pyrene	1.1E-07	NA	NA
carbazole	1.5E-05	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		6.4E-01

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	2.2E-05	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	2.1E-07	NA	NA
benzo(a)pyrene	9.5E-09	7.3E+00	6.9E-08
carbazole	1.3E-06	2.0E-02	2.5E-08
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		9.5E-08

Table C.III-290
Summary of Intake and Risk Quantitation (radionuclides) Alternatives 3
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

Intake Equation = Cv X EF X EDn X FI X IR

IR	Ingestion rate of fruits or vegetables	0.1 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cv	Concentration of radionuclides in vegetables	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	4.3E-01	pCi/kg	U_{234}	8.0E-01	pCi/kg
Pu_{238}	9.6E-02	pCi/kg	U_{235+1d}	5.9E-03	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	1.3E-01	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	NA	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	6.8E-01	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E-11	NA
Np_{237+1d}	9.1E+01	2.2E-10	2.0E-08
Pu_{238}	2.0E+01	2.2E-10	4.4E-09
Ra_{226+8d}	NA	7.8E-10	NA
Ra_{228+1d}	NA	1.0E-10	NA
Rn_{222+4d}	NA	1.7E-12	NA
Sr_{90+1d}	NA	3.6E-11	NA
Tc_{99}	NA	1.3E-12	NA
Th_{228+7d}	NA	5.5E-11	NA
Th_{230}	1.4E+02	1.3E-11	1.9E-09
$Th_{232+10d}$	NA	1.7E-10	NA
U_{234}	1.7E+02	1.6E-11	2.7E-09
U_{235+1d}	1.2E+00	1.6E-11	2.0E-11
U_{238+2d}	2.7E+01	2.0E-11	5.3E-10
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 2.9E-08

Table C.III-291
Summary of Intake and Risk Quantitation (radionuclides) Alternatives 3
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Child)
Via External Radiation

Dose Equivalency Equat = $[DR \times EF \times EDn \times ET_i \times (1-SH_i)] + [DR \times EF \times EDn \times ET_o \times (1-SH_o)]$

EF	Fraction of year spent exposured	0.96 (unitless)
ED	Exposure duration	6 Year
ET_i	Fraction of day spent indoors	0.92 (unitless)
ET_o	Fraction of day spent outdoors	0.08 (unitless)
SH_i	Shield factor indoors	0.5 (unitless)
SH_o	Shield factor outdoors	NA (unitless)
DR	Radionuclide specific dose concentrations	(see table below)

Cs_{137+1d}	NA	pCi/g	$Th_{232+10d}$	NA	pCi/g
Np_{237+1d}	4.30E-02	pCi/g	U_{234}	8.00E-02	pCi/g
Pu_{238}	2.00E-01	pCi/g	U_{235+1d}	NA	pCi/g
Ra_{226+8d}	NA	pCi/g	U_{238+2d}	NA	pCi/g
Ra_{228+1d}	NA	pCi/g	NA	NA	pCi/g
Rn_{222+4d}	NA	pCi/g	NA	NA	pCi/g
Sr_{90+1d}	NA	pCi/g	NA	NA	pCi/g
Tc_{99}	NA	pCi/g	NA	NA	pCi/g
Th_{228+7d}	NA	pCi/g	NA	NA	pCi/g
Th_{230}	7.70E-01	pCi/g	NA	NA	pCi/g

Radionuclides	CDI (year pCi/g)	CSF $(g/pCi-year)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.0E-06	NA
Np_{237+1d}	1.3E-01	4.3E-07	5.8E-08
Pu_{238}	6.2E-01	2.8E-11	1.7E-11
Ra_{226+8d}	NA	6.0E-06	NA
Ra_{228+1d}	NA	2.9E-06	NA
Rn_{222+4d}	NA	5.9E-06	NA
Sr_{90+1d}	NA	NA	NA
Tc_{99}	NA	6.0E-13	NA
Th_{228+7d}	NA	5.6E-06	NA
Th_{230}	2.4E+00	5.4E-11	1.3E-10
$Th_{232+10d}$	NA	8.5E-06	NA
U_{234}	2.5E-01	3.0E-11	7.5E-12
U_{235+1d}	NA	2.4E-07	NA
U_{238+2d}	NA	5.1E-08	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		5.8E-08

000891

Table C.III–292
Summary of Intake Quantitation (chemicals) Alternative 6
Solid Waste Landfill with Federal Ownership: Expanded Trespasser
Via Incidental Ingestion of Soil/Sediment

Intake Equation $= \frac{CS \times EFa \times EDa \times CF \times IRa}{BWa \times ATa} + \frac{CS \times EFc \times EDc \times CF \times IRc}{BWc \times ATc}$

IRa	Ingestion rate of soil (adult)	12.5 mg/day
IRc	Ingestion rate of soil (child)	12.5 mg/day
CF	Conversion factor	1.00E–06 kg/mg
EFa	Exposure frequency (adult)	40 days/year
EFc	Exposure frequency (child)	110 days/year
EDa	Exposure duration (adult)	32 Year
EDc	Exposure duration (child)	12 Year
BWa	Body weight (adult)	70 kg
BWc	Body weight (child)	43 kg
AT	Average time for carcinogens	25550 days
ATa	Average time for non–carcinogens (adult)	11680 days
ATc	Average time for non–carcinogens (child)	4380 days
CS	Concentration of chemicals in soil	(see table below)

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	1.3E+00	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	4.0E–01	mg/kg	NA	NA	mg/kg
uranium–total	4.3E+00	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	2.9E–01	mg/kg	NA	NA	mg/kg
carbazole	2.1E–01	mg/kg	NA	NA	mg/kg
aroclor–1254	NA	mg/kg	NA	NA	mg/kg
aroclor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

Table C.III-292 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Federal Ownership: Expanded Trespasser
Via Incidental Ingestion of Soil/Sediment

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	1.4E-07	4.0E-04	3.6E-04
arsenic	NA	3.0E-04	NA
beryllium	4.3E-08	5.0E-03	8.6E-06
uranium-total	4.6E-07	3.0E-03	1.5E-04
benzo(a)pyrene	3.1E-08	NA	NA
carbazole	2.3E-08	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		5.2E-04

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	3.2E-08	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	9.6E-09	4.3E+00	4.1E-08
uranium-total	1.0E-07	NA	NA
benzo(a)pyrene	6.9E-09	7.3E+00	5.1E-08
carbazole	5.0E-09	2.0E-02	1.0E-10
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		9.2E-08

000893

6646

Table C.III–293
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Solid Waste Landfill with Federal Ownership: Expanded Trespasser
Via Incidental Ingestion of Soil/Sediment

Intake Equation = CS X EFa X EDa X FI X IRa + CS X EFc X EDc X FI X IRc

IRa	Ingestion rate of soil (adult)	12.5 mg/day
IRc	Ingestion rate of soil (child)	12.5 mg/day
EFa	Exposure frequency (adult)	40 days/year
EFc	Exposure frequency (child)	110 days/year
EDa	Exposure Duration	32 Year
EDc	Exposure Duration	12 Year
FI	Fractional Intake	1 (unitless)
CS	Concentration of radionuclides in soil	(see table below)

Cs_{137+1d}	NA	pCi/mg	$Th_{232+10d}$	NA	pCi/mg
Np_{237+1d}	4.0E−04	pCi/mg	U_{234}	2.6E−04	pCi/mg
Pu_{238}	2.0E−04	pCi/mg	U_{235+1d}	NA	pCi/mg
Ra_{226+8d}	NA	pCi/mg	U_{238+2d}	2.4E−03	pCi/mg
Ra_{228+1d}	NA	pCi/mg	NA	NA	pCi/mg
Rn_{222+4d}	NA	pCi/mg	NA	NA	pCi/mg
Sr_{90+1d}	NA	pCi/mg	NA	NA	pCi/mg
Tc_{99}	NA	pCi/mg	NA	NA	pCi/mg
Th_{228+7d}	NA	pCi/mg	NA	NA	pCi/mg
Th_{230}	1.1E−03	pCi/mg	NA	NA	pCi/mg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E−11	NA
Np_{237+1d}	1.3E+01	2.2E−10	2.9E−09
Pu_{238}	6.5E+00	2.2E−10	1.4E−09
Ra_{226+8d}	NA	7.8E−10	NA
Ra_{228+1d}	NA	1.0E−10	NA
Rn_{222+4d}	NA	1.7E−12	NA
Sr_{90+1d}	NA	3.6E−11	NA
Tc_{99}	NA	1.3E−12	NA
Th_{228+7d}	NA	5.5E−11	NA
Th_{230}	3.7E+01	1.3E−11	4.8E−10
$Th_{232+10d}$	NA	1.7E−10	NA
U_{234}	8.5E+00	1.6E−11	1.4E−10
U_{235+1d}	NA	1.6E−11	NA
U_{238+2d}	7.7E+01	2.0E−11	1.5E−09
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 6.4E−09

000894

Table C.III–294
Summary of Intake Quantitation (chemicals) Alternative 6
Solid Waste Landfill with Federal Ownership: Expanded Trespasser
Via Dermal Contact with Soil/Sediment

Intake Equation = $\frac{CS \times EFa \times EDa \times CF \times ABS \times AF \times SAa}{BWa \times ATa}$ + $\frac{CS \times EFc \times EDc \times CF \times ABS \times AF \times SAc}{BWc \times ATc}$

SA	Surface area of exposed skin (adult)	5750 cm^2/day
SA	Surface area of exposed skin (child)	4200 cm^2/day
AF	Soil to skin adherence factor	1 mg/cm^2
ABS	chemicals specific absorbtion factor (see table below)	csv
CF	Conversion factor	1E–06 kg/mg
EFa	Exposure frequency (adult)	40 days/year
EFc	Exposure frequency (child)	110 days/year
EDa	Exposure duration (adult)	32 Year
EDc	Exposure duration (child)	12 Year
BWa	Body weight (adult)	70 kg
BWc	Body weight (child)	43 kg
AT	Average time for carcinogens	25550 days
ATa	Average time for non–carcinogens (adult)	11680 days
ATc	Average time for non–carcinogens (child)	4380 days
CS	Concentration of chemicals in soil	(see table below)

Chemical Concentrations

Compound	ABS	Concentrati	Units	Compound	ABS	Concentrati	Units
antimony	1.0E–02	1.3E+00	mg/kg	NA	NA	NA	mg/kg
arsenic	1.0E–03	NA	mg/kg	NA	NA	NA	mg/kg
beryllium	1.0E–02	4.0E–01	mg/kg	NA	NA	NA	mg/kg
uranium–total	1.0E–02	4.3E+00	mg/kg	NA	NA	NA	mg/kg
benzo(a)pyrene	3.0E–01	2.9E–01	mg/kg	NA	NA	NA	mg/kg
carbazole	3.0E–01	2.1E–01	mg/kg	NA	NA	NA	mg/kg
aroclor–1254	6.0E–02	NA	mg/kg	NA	NA	NA	mg/kg
aroclor–1260	6.0E–02	NA	mg/kg	NA	NA	NA	mg/kg
dieldrin	3.0E–01	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg				

References

000895

Table C.III-294 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Federal Ownership: Expanded Trespasser
Via Dermal Contact with Soil/Sediment

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	5.1E-07	6.0E-05	8.5E-03
arsenic	NA	2.9E-04	NA
beryllium	1.5E-07	5.0E-03	3.1E-05
uranium-total	1.7E-06	1.5E-04	1.1E-02
benzo(a)pyrene	3.3E-06	NA	NA
carbazole	2.4E-06	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	4.5E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		2.0E-02

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	1.2E-07	NA	NA
arsenic	NA	1.9E+00	NA
beryllium	3.7E-08	4.3E+00	1.6E-07
uranium-total	3.9E-07	NA	NA
benzo(a)pyrene	8.0E-07	NA	NA
carbazole	5.8E-07	2.2E-02	1.3E-08
aroclor-1254	NA	1.0E+01	NA
aroclor-1260	NA	1.0E+01	NA
dieldrin	NA	1.8E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		1.7E-07

Table C.III–295
Summary of Intake Quantitation (chemicals) Alternative 6
Solid Waste Landfill with Federal Ownership: Expanded Trespasser
Via Inhalation of Particulates

Intake Equation = $\frac{CS \times EFa \times EDa \times IR \times ETa}{BWa \times ATa} + \frac{CS \times EFc \times EDc \times IR \times ETc}{BWc \times ATc}$

IR	Inhalation rate of gases	0.83 m^3/hour
ETa	Exposure time (adult)	1 hour/day
ETc	Exposure time (child)	2 hour/day
EFa	Exposure frequency (adult)	40 days/year
EFc	Exposure frequency (child)	110 days/year
EDa	Exposure duration (adult)	32 Year
EDc	Exposure duration (child)	12 Year
BWa	Body weight (adult)	70 kg
BWc	Body weight (child)	43 kg
AT	Average time for carcinogens	25550 days
ATa	Average time for non–carcinogens (adult)	11680 days
ATc	Average time for non–carcinogens (child)	4380 days
CS	Concentration of chemicals in particulate as modeled	(see table below)

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	2.7E–09	mg/m^3	NA	NA	mg/m^3
arsenic	NA	mg/m^3	NA	NA	mg/m^3
beryllium	9.4E–10	mg/m^3	NA	NA	mg/m^3
uranium–total	1.0E–08	mg/m^3	NA	NA	mg/m^3
benzo(a)pyrene	6.8E–10	mg/m^3	NA	NA	mg/m^3
carbazole	4.9E–10	mg/m^3	NA	NA	mg/m^3
aroclor–1254	NA	mg/m^3	NA	NA	mg/m^3
aroclor–1260	NA	mg/m^3	NA	NA	mg/m^3
dieldrin	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3			

References

000892

Table C.III-295 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Federal Ownership: Expanded Trespasser
Via Inhalation of Particulates

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	3.4E-11	NA	NA
arsenic	NA	NA	NA
beryllium	1.2E-11	NA	NA
uranium-total	1.3E-10	NA	NA
benzo(a)pyrene	8.8E-12	NA	NA
carbazole	6.4E-12	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			NA

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	6.9E-12	NA	NA
arsenic	NA	1.5E+01	NA
beryllium	2.4E-12	8.4E+00	2.0E-11
uranium-total	2.6E-11	NA	NA
benzo(a)pyrene	1.8E-12	6.1E+00	1.1E-11
carbazole	1.3E-12	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			3.1E-11

Table C.III–296
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Solid Waste Landfill with Federal Ownership: Expanded Trespasser
Via Inhalation of Gases and Particulates

Intake Equation = CA X EFa X EDa X IR X ETa + CA X EFc EDc X IR X ETc

IR	Inhalation rate of gases	0.83 m^3/hour
EFa	Exposure frequency (adult)	40 days/year
EFc	Exposure frequency (child)	110 days/year
EDa	Exposure duration	32 Year
EDc	Exposure duration	12 Year
ETa	Exposure time (adult)	1 hour/day
ETc	Exposure time (child)	2 hour/day
CA	Concentration of radionuclides in air	(see table below)

Cs_{137+1d}	NA	pCi/m^3	$Th_{232+10d}$	NA	pCi/m^3
Np_{237+1d}	9.4E−07	pCi/m^3	U_{234}	6.1E−07	pCi/m^3
Pu_{238}	4.7E−07	pCi/m^3	U_{235+1d}	NA	pCi/m^3
Ra_{226+8d}	NA	pCi/m^3	U_{238+2d}	5.6E−06	pCi/m^3
Ra_{228+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Rn_{222+4d}	NA	pCi/m^3	NA	NA	pCi/m^3
Sr_{90+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Tc_{99}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{228+7d}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{230}	2.6E−06	pCi/m^3	NA	NA	pCi/m^3

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	1.9E−11	NA
Np_{237+1d}	3.0E−03	2.9E−08	8.8E−11
Pu_{238}	1.5E−03	3.9E−08	5.9E−11
Ra_{226+8d}	NA	7.0E−09	NA
Ra_{228+1d}	NA	6.9E−10	NA
Rn_{222+4d}	NA	7.7E−12	NA
Sr_{90+1d}	NA	6.2E−11	NA
Tc_{99}	NA	8.3E−12	NA
Th_{228+7d}	NA	7.8E−08	NA
Th_{230}	8.6E−03	2.9E−08	2.5E−10
$Th_{232+10d}$	NA	1.1E−07	NA
U_{234}	2.0E−03	2.6E−08	5.1E−11
U_{235+1d}	NA	2.5E−08	NA
U_{238+2d}	1.8E−02	2.4E−08	4.3E−10
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		8.8E−10

000899

Table C.III–297
Summary of Risk Quantitation (radionuclides) Alternative 6
Solid Waste Landfill with Federal Ownership: Expanded Trespasser
Via External Radiation

Exposure Equation = $[CR \times EFa \times EDa \times ET_{oa} \times (1-SH_o)]+[CR \times EFc \times EDc \times ET_{oc} \times (1-SH_o)]$

EFa	Fraction of year spent exposured (adult)	0.11 (unitless)
EFc	Fraction of year spent exposured (child)	0.3 (unitless)
EDa	Exposure duration (adult)	32 Year
EDc	Exposure duration (child)	12 Year
ET_{oa}	Fraction of day spent outdoors (adult)	0.04 (unitless)
ET_{oc}	Fraction of day spent outdoors (child)	0.08 (unitless)
SH_o	Shield factor outdoors	NA (unitless)
CR	Radionuclide specific concentrations	(see table below)

Cs_{137+1d}	NA	pCi/g	$Th_{232+10d}$	NA	pCi/g
Np_{237+1d}	4.0E−01	pCi/g	U_{234}	2.6E−01	pCi/g
Pu_{238}	2.0E−01	pCi/g	U_{235+1d}	NA	pCi/g
Ra_{226+8d}	NA	pCi/g	U_{238+2d}	2.4E+00	pCi/g
Ra_{228+1d}	NA	pCi/g	NA	NA	pCi/g
Rn_{222+4d}	NA	pCi/g	NA	NA	pCi/g
Sr_{90+1d}	NA	pCi/g	NA	NA	pCi/g
Tc_{99}	NA	pCi/g	NA	NA	pCi/g
Th_{228+7d}	NA	pCi/g	NA	NA	pCi/g
Th_{230}	1.1E+00	pCi/g	NA	NA	pCi/g

Radionuclides	CDI (year pCi/g)	CSF $(g/pCi-year)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.0E−06	NA
Np_{237+1d}	1.7E−01	4.3E−07	7.4E−08
Pu_{238}	8.6E−02	2.8E−11	2.4E−12
Ra_{226+8d}	NA	6.0E−06	NA
Ra_{228+1d}	NA	2.9E−06	NA
Rn_{222+4d}	NA	5.9E−06	NA
Sr_{90+1d}	NA	NA	NA
Tc_{99}	NA	6.0E−13	NA
Th_{228+7d}	NA	5.6E−06	NA
Th_{230}	4.8E−01	5.4E−11	2.6E−11
$Th_{232+10d}$	NA	8.5E−06	NA
U_{234}	1.1E−01	3.0E−11	3.3E−12
U_{235+1d}	NA	2.4E−07	NA
U_{238+2d}	1.0E+00	5.1E−08	5.2E−08
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		1.3E−07

000900

Table C.III–298
Summary of Intake Quantitation (chemicals) Alternative 6
Solid Waste Landfill with Federal Ownership: Off–Property Farmer (Adult)
Via Drinking Water Ingestion

Intake Equation = $\frac{CS \times EF \times ED \times IR}{BW \times AT}$

IR	Ingestion rate of groundwater (RAGS, 1989)	2 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in groundwater	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/l	NA	NA	mg/l
arsenic	NA	mg/l	NA	NA	mg/l
beryllium	NA	mg/l	NA	NA	mg/l
uranium–total	6.90E–04	mg/l	NA	NA	mg/l
benzo(a)pyrene	NA	mg/l	NA	NA	mg/l
carbazole	NA	mg/l	NA	NA	mg/l
aroclor–1254	NA	mg/l	NA	NA	mg/l
aroclor–1260	NA	mg/l	NA	NA	mg/l
dieldrin	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l			

References

000901

66646

Table C.III–298 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Federal Ownership: Off–Property Farmer (Adult)
Via Drinking Water Ingestion

	HQ Calculation		
Compound	CDI (mg/kg–day)	RfD (mg/kg–day)	HQ (unitless)
antimony	NA	4.00E–04	NA
arsenic	NA	3.00E–04	NA
beryllium	NA	5.00E–03	NA
uranium–total	1.89E–05	3.00E–03	6.30E–03
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor–1254	NA	NA	NA
aroclor–1260	NA	NA	NA
dieldrin	NA	5.00E–05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	HQ Summation =		6.30E–03

	ILCR Calculation		
Compound	CDI (mg/kg–day)	CSF $(mg/kg–day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.75E+00	NA
beryllium	NA	4.30E+00	NA
uranium–total	1.89E–05	NA	NA
benzo(a)pyrene	NA	7.30E+00	NA
carbazole	NA	2.00E–02	NA
aroclor–1254	NA	7.70E+00	NA
aroclor–1260	NA	7.70E+00	NA
dieldrin	NA	1.60E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	ILCR Summation =		NA

Table C.III–299
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Solid Waste Landfill with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Drinking Water

Intake Equation = Cw X EF X EDn X FI X IR

IR	Ingestion rate of groundwater (RAGS, 1989)	2 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
FI	Fractional intake for radionuclides	1 (Unitless)
Cw	Concentration of radionuclides in groundwater	(see table below)

Cs_{137+1d}	NA	pCi/l	$Th_{232+10d}$	NA	pCi/l
Np_{237+1d}	NA	pCi/l	U_{234}	2.1E–01	pCi/l
Pu_{238}	NA	pCi/l	U_{235+1d}	1.1E–02	pCi/l
Ra_{226+8d}	NA	pCi/l	U_{238+2d}	2.3E–01	pCi/l
Ra_{228+1d}	NA	pCi/l	NA	NA	pCi/l
Rn_{222+4d}	NA	pCi/l	NA	NA	pCi/l
Sr_{90+1d}	NA	pCi/l	NA	NA	pCi/l
Tc_{99}	NA	pCi/l	NA	NA	pCi/l
Th_{228+7d}	NA	pCi/l	NA	NA	pCi/l
Th_{230}	NA	pCi/l	NA	NA	pCi/l

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	NA	2.2E–10	NA
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	NA	1.3E–11	NA
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	1.0E+04	1.6E–11	1.6E–07
U_{235+1d}	5.4E+02	1.6E–11	8.6E–09
U_{238+2d}	1.1E+04	2.0E–11	2.3E–07
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		4.0E–07

000303

Table C.III-300
Summary of Intake Quantitation (chemicals) Alternative 6
Solid Waste Landfill with Federal Ownership: Off-Property Farmer (Adult)
Via Dermal Contact while Bathing

Intake Equation = $\frac{DA \times EF \times ED \times SA}{BW \times AT}$

DA	Dermal absorbed dose	csv mg/cm^2-day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	25550 days
SA	Skin surface area available for contact	23000 cm^2

Chemical Concentrations

Compound	DA	Units	Compound	DA	Units
antimony	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
arsenic	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
beryllium	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
uranium-total	1.73E-10	mg/cm^2-day	NA	NA	mg/cm^2-day
benzo(a)pyrene	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
carbazole	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
aroclor-1254	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
aroclor-1260	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
dieldrin	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day			

References

Table C.III-300 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Federal Ownership: Off-Property Farmer (Adult)
Via Dermal Contact while Bathing

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	6.00E-05	NA
arsenic	NA	2.85E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	5.43E-08	1.50E-04	3.62E-04
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	4.50E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		3.62E-04

Compound	ILCR Calculation CDI (mg/kg-day)	CSF (mg/kg-day)$^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.90E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	5.43E-08	NA	NA
benzo(a)pyrene	NA	NA	NA
carbazole	NA	2.22E-02	NA
aroclor-1254	NA	1.03E+01	NA
aroclor-1260	NA	1.03E+01	NA
dieldrin	NA	1.78E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

6646

000905

Table C.III-301
Summary of Intake Quantitation (chemicals) Alternative 6
Solid Waste Landfill with Federal Ownership: Off-Property Farmer (Adult)
Via Inhalation of Particulates

Intake Equation = $\frac{CS \times EF \times ED \times IR}{BW \times AT}$

IR	Inhalation rate of gases (RAGS, 1989)	20 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in soil	(see table below)

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	7.2E-11	mg/m^3	NA	NA	mg/m^3
arsenic	NA	mg/m^3	NA	NA	mg/m^3
beryllium	2.6E-11	mg/m^3	NA	NA	mg/m^3
uranium-total	2.7E-10	mg/m^3	NA	NA	mg/m^3
benzo(a)pyrene	1.9E-11	mg/m^3	NA	NA	mg/m^3
carbazole	1.3E-11	mg/m^3	NA	NA	mg/m^3
aroclor-1254	NA	mg/m^3	NA	NA	mg/m^3
aroclor-1260	NA	mg/m^3	NA	NA	mg/m^3
dieldrin	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3			

References

Table C.III-301 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Federal Ownership: Off-Property Farmer (Adult)
Via Inhalation of Particulates

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	2.0E-11	NA	NA
arsenic	NA	NA	NA
beryllium	7.0E-12	NA	NA
uranium-total	7.5E-11	NA	NA
benzo(a)pyrene	5.1E-12	NA	NA
carbazole	3.7E-12	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
Hazard Quotient Sum =			NA

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	2.0E-11	NA	NA
arsenic	NA	1.5E+01	NA
beryllium	7.0E-12	8.4E+00	5.9E-11
uranium-total	7.5E-11	NA	NA
benzo(a)pyrene	5.1E-12	6.1E+00	3.1E-11
carbazole	3.7E-12	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			9.0E-11

000307

Table C.III–302
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Solid Waste Landfill with Federal Ownership: Off–Property Farmer (Adult)
Via Inhalation of Gases and Particulates

Intake Equation = Ca X EF X EDn X IR

IR	Inhalation rate of gases (RAGS, 1989)	20 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Ca	Concentration of radionuclides in air	(see table below)

Cs_{137+1d}	NA	pCi/m^3	$Th_{232+10d}$	NA	pCi/m^3
Np_{237+1d}	2.6E–08	pCi/m^3	U_{234}	1.7E–08	pCi/m^3
Pu_{238}	1.3E–08	pCi/m^3	U_{235+1d}	NA	pCi/m^3
Ra_{226+8d}	NA	pCi/m^3	U_{238+2d}	1.5E–07	pCi/m^3
Ra_{228+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Rn_{222+4d}	NA	pCi/m^3	NA	NA	pCi/m^3
Sr_{90+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Tc_{99}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{228+7d}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{230}	7.2E–08	pCi/m^3	NA	NA	pCi/m^3

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	1.9E–11	NA
Np_{237+1d}	1.2E–02	2.9E–08	3.6E–10
Pu_{238}	6.3E–03	3.9E–08	2.4E–10
Ra_{226+8d}	NA	7.0E–09	NA
Ra_{228+1d}	NA	6.9E–10	NA
Rn_{222+4d}	NA	7.7E–12	NA
Sr_{90+1d}	NA	6.2E–11	NA
Tc_{99}	NA	8.3E–12	NA
Th_{228+7d}	NA	7.8E–08	NA
Th_{230}	3.5E–02	2.9E–08	1.0E–09
$Th_{232+10d}$	NA	1.1E–07	NA
U_{234}	8.1E–03	2.6E–08	2.1E–10
U_{235+1d}	NA	2.5E–08	NA
U_{238+2d}	7.4E–02	2.4E–08	1.8E–09
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 3.6E–09

000905

Table C.III-303
Summary of Intake Quantitation (chemicals) Alternative 6
Solid Waste Landfill with Federal Ownership: Off-Property Farmer (Adult)
Via Ingestion of Meat Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of meat	0.101 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in meat	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	9.1E-09	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	4.0E-09	mg/kg	NA	NA	mg/kg
uranium-total	6.9E-06	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	4.5E-08	mg/kg	NA	NA	mg/kg
carbazole	8.4E-11	mg/kg	NA	NA	mg/kg
aroclor-1254	NA	mg/kg	NA	NA	mg/kg
aroclor-1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

000909

000310

Table C.III-303 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Federal Ownership: Off-Property Farmer (Adult)
Via Ingestion of Meat Products

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	9.5E-12	4.0E-04	2.4E-08
arsenic	NA	3.0E-04	NA
beryllium	4.2E-12	5.0E-03	8.3E-10
uranium-total	7.2E-09	3.0E-03	2.4E-06
benzo(a)pyrene	4.7E-11	NA	NA
carbazole	8.7E-14	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		2.4E-06

Compound	ILCR Calculation CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	9.5E-12	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	4.2E-12	4.3E+00	1.8E-11
uranium-total	7.2E-09	NA	NA
benzo(a)pyrene	4.7E-11	7.3E+00	3.4E-10
carbazole	8.7E-14	2.0E-02	1.7E-15
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		3.6E-10

Table C.III–304
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Solid Waste Landfill with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Meat Products

Intake Equation = Cf X EF X EDn X FI X IR

IR	Ingestion rate of meat	0.101 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cf	Concentration of radionuclides in meat	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	1.1E–07	pCi/kg	U_{234}	2.1E–03	pCi/kg
Pu_{238}	4.9E–10	pCi/kg	U_{235+1d}	1.1E–04	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	2.3E–03	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	NA	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	3.9E–08	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	2.0E–04	2.2E–10	4.4E–14
Pu_{238}	9.0E–07	2.2E–10	2.0E–16
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	7.2E–05	1.3E–11	9.4E–16
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	3.9E+00	1.6E–11	6.2E–11
U_{235+1d}	2.0E–01	1.6E–11	3.3E–12
U_{238+2d}	4.3E+00	2.0E–11	8.5E–11
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		1.5E–10

000911

Table C.III-305
Summary of Intake Quantitation (chemicals) Alternative 6
Solid Waste Landfill with Federal Ownership: Off-Property Farmer (Adult)
Via Ingestion of Dairy Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of dairy products	0.4 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in animal products	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	9.1E-10	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	3.6E-12	mg/kg	NA	NA	mg/kg
uranium-total	2.5E-05	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	1.4E-08	mg/kg	NA	NA	mg/kg
carbazole	2.6E-11	mg/kg	NA	NA	mg/kg
aroclor-1254	NA	mg/kg	NA	NA	mg/kg
aroclor-1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

Table C.III–305 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Dairy Products

	HQ Calculation		
Compound	CDI (mg/kg–day)	RfD (mg/kg–day)	HQ (unitless)
antimony	3.7E–12	4.0E–04	9.4E–09
arsenic	NA	3.0E–04	NA
beryllium	1.5E–14	5.0E–03	3.0E–12
uranium–total	1.0E–07	3.0E–03	3.4E–05
benzo(a)pyrene	5.9E–11	NA	NA
carbazole	1.1E–13	NA	NA
aroclor–1254	NA	NA	NA
aroclor–1260	NA	NA	NA
dieldrin	NA	5.0E–05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	HQ Summation =		3.4E–05

	ILCR Calculation		
Compound	CDI (mg/kg–day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	3.7E–12	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	1.5E–14	4.3E+00	6.4E–14
uranium–total	1.0E–07	NA	NA
benzo(a)pyrene	5.9E–11	7.3E+00	4.3E–10
carbazole	1.1E–13	2.0E–02	2.2E–15
aroclor–1254	NA	7.7E+00	NA
aroclor–1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	ILCR Summation =		4.3E–10

000913

Table C.III–306
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Solid Waste Landfill with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Dairy Products

Intake Equation = Cp X EF X EDn X FI X IR

IR	Ingestion rate of dairy products	0.4 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cp	Concentration of radionuclides in animal products	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	9.8E–09	pCi/kg	U_{234}	7.6E–03	pCi/kg
Pu_{238}	9.7E–11	pCi/kg	U_{235+1d}	4.0E–04	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	8.3E–03	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	NA	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	3.2E–08	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	7.2E–05	2.2E–10	1.6E–14
Pu_{238}	7.1E–07	2.2E–10	1.6E–16
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	2.4E–04	1.3E–11	3.1E–15
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	5.6E+01	1.6E–11	8.9E–10
U_{235+1d}	2.9E+00	1.6E–11	4.7E–11
U_{238+2d}	6.1E+01	2.0E–11	1.2E–09
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 2.2E–09

000914

Table C.III–307
Summary of Intake Quantitation (chemicals) Alternative 6
Solid Waste Landfill with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Vegetables and Fruits

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of fruits or vegetables	0.122 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in vegetables	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	1.0E–07	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	4.3E–08	mg/kg	NA	NA	mg/kg
uranium–total	3.4E–03	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	1.8E–08	mg/kg	NA	NA	mg/kg
carbazole	1.3E–08	mg/kg	NA	NA	mg/kg
aroclor–1254	NA	mg/kg	NA	NA	mg/kg
aroclor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

000915

Table C.III-307 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Federal Ownership: Off-Property Farmer (Adult)
Via Ingestion of Vegetables and Fruits

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	1.7E-10	4.0E-04	4.3E-07
arsenic	NA	3.0E-04	NA
beryllium	7.2E-11	5.0E-03	1.4E-08
uranium-total	5.6E-06	3.0E-03	1.9E-03
benzo(a)pyrene	3.1E-11	NA	NA
carbazole	2.2E-11	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		1.9E-03

Compound	ILCR Calculation CDI (mg/kg-day)	CSF (mg/kg-day)$^{-1}$	ILCR (unitless)
antimony	1.7E-10	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	7.2E-11	4.3E+00	3.1E-10
uranium-total	5.6E-06	NA	NA
benzo(a)pyrene	3.1E-11	7.3E+00	2.3E-10
carbazole	2.2E-11	2.0E-02	4.4E-13
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		5.3E-10

Table C.III–308
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Solid Waste Landfill with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Vegetables and Fruits

Intake Equation = Cv X EF X EDn X FI X IR

IR	Ingestion rate of fruits or vegetables	0.122 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cv	Concentration of radionuclides in vegetables	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	2.5E–05	pCi/kg	U_{234}	1.0E+00	pCi/kg
Pu_{238}	1.3E–05	pCi/kg	U_{235+1d}	5.4E–02	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	1.1E+00	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	NA	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	8.0E–05	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	7.6E–02	2.2E–10	1.7E–11
Pu_{238}	3.8E–02	2.2E–10	8.3E–12
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	2.4E–01	1.3E–11	3.1E–12
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	3.1E+03	1.6E–11	4.9E–08
U_{235+1d}	1.6E+02	1.6E–11	2.6E–09
U_{238+2d}	3.4E+03	2.0E–11	6.7E–08
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 1.2E–07

000917

Table C.III-309
Summary of Intake Quantitation (chemicals) Alternative 6
Solid Waste Landfill with Federal Ownership: Off-Property Farmer (Child)
Via Drinking Water Ingestion

Intake Equation = $\frac{CS \times EF \times ED \times IR}{BW \times AT}$

IR	Ingestion rate of groundwater (RAGS, 1989)	1 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in groundwater	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/l	NA	NA	mg/l
arsenic	NA	mg/l	NA	NA	mg/l
beryllium	NA	mg/l	NA	NA	mg/l
uranium-total	6.90E-04	mg/l	NA	NA	mg/l
benzo(a)pyrene	NA	mg/l	NA	NA	mg/l
carbazole	NA	mg/l	NA	NA	mg/l
aroclor-1254	NA	mg/l	NA	NA	mg/l
aroclor-1260	NA	mg/l	NA	NA	mg/l
dieldrin	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l			

References

Table C.III-309 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Federal Ownership: Off-Property Farmer (Child)
Via Drinking Water Ingestion

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.00E-04	NA
arsenic	NA	3.00E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	4.41E-05	3.00E-03	1.47E-02
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.00E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		1.47E-02

Compound	ILCR Calculation CDI (mg/kg-day)	CSF (mg/kg-day)$^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.75E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	3.78E-06	NA	NA
benzo(a)pyrene	NA	7.30E+00	NA
carbazole	NA	2.00E-02	NA
aroclor-1254	NA	7.70E+00	NA
aroclor-1260	NA	7.70E+00	NA
dieldrin	NA	1.60E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

000919

Table C.III–310
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Solid Waste Landfill with Federal Ownership: Off–Property Farmer (Child)
Via Ingestion of Drinking Water

Intake Equation = Cw X EF X EDn X FI X IR

IR	Ingestion rate of groundwater (RAGS, 1989)	1 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
FI	Fractional intake for radionuclides	1 (Unitless)
Cw	Concentration of radionuclides in groundwater	(see table below)

Cs_{137+1d}	NA	pCi/l	$Th_{232+10d}$	NA	pCi/l
Np_{237+1d}	NA	pCi/l	U_{234}	2.1E–01	pCi/l
Pu_{238}	NA	pCi/l	U_{235+1d}	1.1E–02	pCi/l
Ra_{226+8d}	NA	pCi/l	U_{238+2d}	2.3E–01	pCi/l
Ra_{228+1d}	NA	pCi/l		NA	pCi/l
Rn_{222+4d}	NA	pCi/l		NA	pCi/l
Sr_{90+1d}	NA	pCi/l		NA	pCi/l
Tc_{99}	NA	pCi/l		NA	pCi/l
Th_{228+7d}	NA	pCi/l		NA	pCi/l
Th_{230}	NA	pCi/l		NA	pCi/l

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	NA	2.2E–10	NA
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	NA	1.3E–11	NA
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	4.4E+02	1.6E–11	7.1E–09
U_{235+1d}	2.3E+01	1.6E–11	3.7E–10
U_{238+2d}	4.8E+02	2.0E–11	9.7E–09
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
		ILCR Summation =	1.7E–08

Table C.III-311
Summary of Intake Quantitation (chemicals) Alternative 6
Solid Waste Landfill with Federal Ownership: Off-Property Farmer (Child)
Via Dermal Contact while Bathing

Intake Equation = $\frac{DA \times EF \times ED \times SA}{BW \times AT}$

DA	Dermal absorbed dose	csv mg/cm^2-day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	2190 days
SA	Skin surface area available for contact	8000 cm^2

Chemical Concentrations

Compound	DA	Units	Compound	DA	Units
antimony	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
arsenic	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
beryllium	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
uranium-total	1.73E-10	mg/cm^2-day	NA	NA	mg/cm^2-day
benzo(a)pyrene	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
carbazole	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
aroclor-1254	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
aroclor-1260	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
dieldrin	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day			

References

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Table C.III-311 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Federal Ownership: Off-Property Farmer (Child)
Via Dermal Contact while Bathing

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	6.00E-05	NA
arsenic	NA	2.85E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	8.82E-08	1.50E-04	5.88E-04
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	4.50E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		5.88E-04

Compound	ILCR Calculation CDI (mg/kg-day)	CSF $(mg/kg\text{-}day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.90E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	7.56E-09	NA	NA
benzo(a)pyrene	NA	NA	NA
carbazole	NA	2.22E-02	NA
aroclor-1254	NA	1.03E+01	NA
aroclor-1260	NA	1.03E+01	NA
dieldrin	NA	1.78E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

Table C.III-312
Summary of Intake Quantitation (chemicals) Alternative 6
Solid Waste Landfill with Federal Ownership: Off-Property Farmer (Child)
Via Inhalation of Particulates

Intake Equation = $\frac{CS \times EF \times ED \times IR}{BW \times AT}$

IR	Inhalation rate of gases (RAGS, 1989)	12 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in soil	(see table below)

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	7.2E-11	mg/m^3	NA	NA	mg/m^3
arsenic	NA	mg/m^3	NA	NA	mg/m^3
beryllium	2.6E-11	mg/m^3	NA	NA	mg/m^3
uranium-total	2.7E-10	mg/m^3	NA	NA	mg/m^3
benzo(a)pyrene	1.9E-11	mg/m^3	NA	NA	mg/m^3
carbazole	1.3E-11	mg/m^3	NA	NA	mg/m^3
aroclor-1254	NA	mg/m^3	NA	NA	mg/m^3
aroclor-1260	NA	mg/m^3	NA	NA	mg/m^3
dieldrin	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3			

References

Table C.III-312 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Federal Ownership: Off-Property Farmer (Child)
Via Inhalation of Particulates

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	5.5E-11	NA	NA
arsenic	NA	NA	NA
beryllium	2.0E-11	NA	NA
uranium-total	2.1E-10	NA	NA
benzo(a)pyrene	1.4E-11	NA	NA
carbazole	1.0E-11	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	Hazard Quotient Sum =		NA

Compound	ILCR Calculation CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	4.7E-12	NA	NA
arsenic	NA	1.5E+01	NA
beryllium	1.7E-12	8.4E+00	1.4E-11
uranium-total	1.8E-11	NA	NA
benzo(a)pyrene	1.2E-12	6.1E+00	7.4E-12
carbazole	8.8E-13	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		2.2E-11

Table C.III–313
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Solid Waste Landfill with Federal Ownership: Off–Property Farmer (Child)
Via Inhalation of Gases and Particulates

Intake Equation = Ca X EF X EDn X IR

IR	Inhalation rate of gases (RAGS, 1989)	12 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Ca	Concentration of radionuclides in air	(see table below)

Cs_{137+1d}	NA	pCi/m^3	$Th_{232+10d}$	NA	pCi/m^3
Np_{237+1d}	2.6E–08	pCi/m^3	U_{234}	1.7E–08	pCi/m^3
Pu_{238}	1.3E–08	pCi/m^3	U_{235+1d}	NA	pCi/m^3
Ra_{226+8d}	NA	pCi/m^3	U_{238+2d}	1.5E–07	pCi/m^3
Ra_{228+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Rn_{222+4d}	NA	pCi/m^3	NA	NA	pCi/m^3
Sr_{90+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Tc_{99}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{228+7d}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{230}	7.2E–08	pCi/m^3	NA	NA	pCi/m^3

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	1.9E–11	NA
Np_{237+1d}	6.4E–04	2.9E–08	1.9E–11
Pu_{238}	3.2E–04	3.9E–08	1.3E–11
Ra_{226+8d}	NA	7.0E–09	NA
Ra_{228+1d}	NA	6.9E–10	NA
Rn_{222+4d}	NA	7.7E–12	NA
Sr_{90+1d}	NA	6.2E–11	NA
Tc_{99}	NA	8.3E–12	NA
Th_{228+7d}	NA	7.8E–08	NA
Th_{230}	1.8E–03	2.9E–08	5.3E–11
$Th_{232+10d}$	NA	1.1E–07	NA
U_{234}	4.2E–04	2.6E–08	1.1E–11
U_{235+1d}	NA	2.5E–08	NA
U_{238+2d}	3.8E–03	2.4E–08	9.2E–11
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
ILCR Summation	=		1.9E–10

Table C.III-314
Summary of Intake Quantitation (chemicals) Alternative 6
Solid Waste Landfill with Federal Ownership: Off-Property Farmer (Child)
Via Ingestion of Meat Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of meat	0.039 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in meat	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	9.1E-09	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	4.0E-09	mg/kg	NA	NA	mg/kg
uranium-total	6.9E-06	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	4.5E-08	mg/kg	NA	NA	mg/kg
carbazole	8.4E-11	mg/kg	NA	NA	mg/kg
aroclor-1254	NA	mg/kg	NA	NA	mg/kg
aroclor-1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

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Table C.III-314 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Federal Ownership: Off-Property Farmer (Child)
Via Ingestion of Meat Products

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	1.7E-11	4.0E-04	4.3E-08
arsenic	NA	3.0E-04	NA
beryllium	7.5E-12	5.0E-03	1.5E-09
uranium-total	1.3E-08	3.0E-03	4.3E-06
benzo(a)pyrene	8.5E-11	NA	NA
carbazole	1.6E-13	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		4.3E-06

Compound	ILCR Calculation CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	1.5E-12	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	6.4E-13	4.3E+00	2.8E-12
uranium-total	1.1E-09	NA	NA
benzo(a)pyrene	7.2E-12	7.3E+00	5.3E-11
carbazole	1.3E-14	2.0E-02	2.7E-16
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		5.6E-11

Table C.III–315
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Solid Waste Landfill with Federal Ownership: Off–Property Farmer (Child)
Via Ingestion of Meat Products

Intake Equation = Cf X EF X EDn X FI X IR

IR	Ingestion rate of meat	0.039 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cf	Concentration of radionuclides in meat	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	1.1E–07	pCi/kg	U_{234}	2.1E–03	pCi/kg
Pu_{238}	4.9E–10	pCi/kg	U_{235+1d}	1.1E–04	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	2.3E–03	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	NA	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	3.9E–08	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	6.6E–06	2.2E–10	1.5E–15
Pu_{238}	3.0E–08	2.2E–10	6.6E–18
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	2.4E–06	1.3E–11	3.1E–17
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	1.3E–01	1.6E–11	2.1E–12
U_{235+1d}	6.8E–03	1.6E–11	1.1E–13
U_{238+2d}	1.4E–01	2.0E–11	2.8E–12
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
ILCR Summation	=		5.0E–12

000929

Table C.III–316
Summary of Intake Quantitation (chemicals) Alternative 6
Solid Waste Landfill with Federal Ownership: Off–Property Farmer (Child)
Via Ingestion of Dairy Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of dairy products	0.9 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	*Exposure frequency*	350 days/year
EDn	Exposure duration for non–carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in animal products	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	9.1E–10	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	3.6E–12	mg/kg	NA	NA	mg/kg
uranium–total	2.5E–05	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	1.4E–08	mg/kg	NA	NA	mg/kg
carbazole	2.6E–11	mg/kg	NA	NA	mg/kg
aroclor–1254	NA	mg/kg	NA	NA	mg/kg
aroclor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

Table C.III–316 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Federal Ownership: Off–Property Farmer (Child)
Via Ingestion of Dairy Products

	HQ Calculation		
Compound	CDI (mg/kg–day)	RfD (mg/kg–day)	HQ (unitless)
antimony	3.9E–11	4.0E–04	9.8E–08
arsenic	NA	3.0E–04	NA
beryllium	1.6E–13	5.0E–03	3.1E–11
uranium–total	1.1E–06	3.0E–03	3.6E–04
benzo(a)pyrene	6.2E–10	NA	NA
carbazole	1.1E–12	NA	NA
aroclor–1254	NA	NA	NA
aroclor–1260	NA	NA	NA
dieldrin	NA	5.0E–05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	HQ Summation =		3.6E–04

	ILCR Calculation		
Compound	CDI (mg/kg–day)	CSF $(mg/kg–day)^{-1}$	ILCR (unitless)
antimony	3.4E–12	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	1.3E–14	4.3E+00	5.7E–14
uranium–total	9.2E–08	NA	NA
benzo(a)pyrene	5.3E–11	7.3E+00	3.9E–10
carbazole	9.8E–14	2.0E–02	2.0E–15
aroclor–1254	NA	7.7E+00	NA
aroclor–1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	ILCR Summation =		3.9E–10

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Table C.III–317
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Solid Waste Landfill with Federal Ownership: Off–Property Farmer (Child)
Via Ingestion of Dairy Products

Intake Equation = Cp X EF X EDn X FI X IR

IR	Ingestion rate of dairy products	0.9 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cp	Concentration of radionuclides in animal products	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	9.8E–09	pCi/kg	U_{234}	7.6E–03	pCi/kg
Pu_{238}	9.7E–11	pCi/kg	U_{235+1d}	4.0E–04	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	8.3E–03	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	NA	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	3.2E–08	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	1.4E–05	2.2E–10	3.1E–15
Pu_{238}	1.4E–07	2.2E–10	3.0E–17
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	4.6E–05	1.3E–11	6.0E–16
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	1.1E+01	1.6E–11	1.7E–10
U_{235+1d}	5.6E–01	1.6E–11	9.0E–12
U_{238+2d}	1.2E+01	2.0E–11	2.3E–10
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 4.2E–10

Table C.III–318
Summary of Intake Quantitation (chemicals) Alternative 6
Solid Waste Landfill with Federal Ownership: Off–Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of fruits or vegetables	0.1 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in vegetables	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	1.0E–07	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	4.3E–08	mg/kg	NA	NA	mg/kg
uranium–total	3.4E–03	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	1.8E–08	mg/kg	NA	NA	mg/kg
carbazole	1.3E–08	mg/kg	NA	NA	mg/kg
aroclor–1254	NA	mg/kg	NA	NA	mg/kg
aroclor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

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Table C.III−318 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Federal Ownership: Off−Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

	HQ Calculation		
Compound	CDI (mg/kg−day)	RfD (mg/kg−day)	HQ (unitless)
antimony	6.5E−10	4.0E−04	1.6E−06
arsenic	NA	3.0E−04	NA
beryllium	2.7E−10	5.0E−03	5.5E−08
uranium−total	2.2E−05	3.0E−03	7.2E−03
benzo(a)pyrene	1.2E−10	NA	NA
carbazole	8.5E−11	NA	NA
aroclor−1254	NA	NA	NA
aroclor−1260	NA	NA	NA
dieldrin	NA	5.0E−05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		7.2E−03

	ILCR Calculation		
Compound	CDI (mg/kg−day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	5.6E−11	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	2.3E−11	4.3E+00	1.0E−10
uranium−total	1.9E−06	NA	NA
benzo(a)pyrene	1.0E−11	7.3E+00	7.4E−11
carbazole	7.3E−12	2.0E−02	1.5E−13
aroclor−1254	NA	7.7E+00	NA
aroclor−1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		1.8E−10

Table C.III–319
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Solid Waste Landfill with Federal Ownership: Off–Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

Intake Equation = $Cv \times EF \times EDn \times FI \times IR$

IR	Ingestion rate of fruits or vegetables	0.1 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cv	Concentration of radionuclides in vegetables	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	2.5E–05	pCi/kg	U_{234}	1.0E+00	pCi/kg
Pu_{238}	1.3E–05	pCi/kg	U_{235+1d}	5.4E–02	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	1.1E+00	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	NA	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	8.0E–05	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	5.3E–03	2.2E–10	1.2E–12
Pu_{238}	2.6E–03	2.2E–10	5.8E–13
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	1.7E–02	1.3E–11	2.2E–13
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	2.2E+02	1.6E–11	3.5E–09
U_{235+1d}	1.1E+01	1.6E–11	1.8E–10
U_{238+2d}	2.4E+02	2.0E–11	4.7E–09
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 8.4E–09

000935

Table C.III–320
Summary of Intake Quantitation (chemicals) Alternative 6
Solid Waste Landfill with Private Ownership: Off–Property Farmer (Adult)
Via Drinking Water Ingestion

Intake Equation = $\frac{CS \times EF \times ED \times IR}{BW \times AT}$

IR	Ingestion rate of groundwater (RAGS, 1989)	2 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in groundwater	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	0.00E+00	mg/l	0	0.00E+00	mg/l
arsenic	0.00E+00	mg/l	0	0.00E+00	mg/l
beryllium	0.00E+00	mg/l	0	0.00E+00	mg/l
uranium–total	2.70E–06	mg/l	0	0.00E+00	mg/l
benzo(a)pyrene	0.00E+00	mg/l	0	0.00E+00	mg/l
carbazole	0.00E+00	mg/l	0	0.00E+00	mg/l
aroclor–1254	0.00E+00	mg/l	0	0.00E+00	mg/l
aroclor–1260	0.00E+00	mg/l	0	0.00E+00	mg/l
dieldrin	0.00E+00	mg/l	0	0.00E+00	mg/l
0	0.00E+00	mg/l	0	0.00E+00	mg/l
0	0.00E+00	mg/l	0	0.00E+00	mg/l
0	0.00E+00	mg/l	0	0.00E+00	mg/l
0	0.00E+00	mg/l	0	0.00E+00	mg/l
0	0.00E+00	mg/l	0	0.00E+00	mg/l
0	0.00E+00	mg/l	0	0.00E+00	mg/l
0	0.00E+00	mg/l			

References

Table C.III-320 (continued)

Summary of Risk Characterization (chemicals)

Solid Waste Landfill with Private Ownership: Off-Property Farmer (Adult)
Via Drinking Water Ingestion

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.00E-04	NA
arsenic	NA	3.00E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	7.40E-08	3.00E-03	2.47E-05
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.00E-05	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
HQ Summation =			2.47E-05

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.75E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	7.40E-08	NA	NA
benzo(a)pyrene	NA	7.30E+00	NA
carbazole	NA	2.00E-02	NA
aroclor-1254	NA	7.70E+00	NA
aroclor-1260	NA	7.70E+00	NA
dieldrin	NA	1.60E+01	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
ILCR Summation =			0.00E+00

000937

Table C.III–321
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Solid Waste Landfill with Private Ownership: Off–Property Farmer (Adult)
Via Ingestion of Drinking Water

Intake Equation = Cw X EF X EDn X FI X IR

IR	Ingestion rate of groundwater (RAGS, 1989)	2 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
FI	Fractional intake for radionuclides	1 (Unitless)
Cw	Concentration of radionuclides in groundwater	(see table below)

Cs_{137+1d}	0.0E+00	pCi/l	$Th_{232+10d}$	0.0E+00	pCi/l
Np_{237+1d}	0.0E+00	pCi/l	U_{234}	8.0E–04	pCi/l
Pu_{238}	0.0E+00	pCi/l	U_{235+1d}	4.0E–05	pCi/l
Ra_{226+8d}	0.0E+00	pCi/l	U_{238+2d}	9.0E–04	pCi/l
Ra_{228+1d}	0.0E+00	pCi/l	0.0E+00	0.0E+00	pCi/l
Rn_{222+4d}	0.0E+00	pCi/l	0.0E+00	0.0E+00	pCi/l
Sr_{90+1d}	0.0E+00	pCi/l	0.0E+00	0.0E+00	pCi/l
Tc_{99}	0.0E+00	pCi/l	0.0E+00	0.0E+00	pCi/l
Th_{228+7d}	0.0E+00	pCi/l	0.0E+00	0.0E+00	pCi/l
Th_{230}	0.0E+00	pCi/l	0.0E+00	0.0E+00	pCi/l

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	NA	2.2E–10	NA
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	NA	1.3E–11	NA
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	3.9E+01	1.6E–11	6.3E–10
U_{235+1d}	2.0E+00	1.6E–11	3.1E–11
U_{238+2d}	4.4E+01	2.0E–11	8.8E–10
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA

ILCR Summation = 1.5E–09

000938

Table C.III–322
Summary of Intake Quantitation (chemicals) Alternative 6
Solid Waste Landfill with Private Ownership: Off–Property Farmer (Adult)
Via Dermal Contact while Bathing

Intake Equation = $\frac{DA \times EF \times ED \times SA}{BW \times AT}$

DA	Dermal absorbed dose	csv mg/cm^2–day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
SA	Skin surface area available for contact	23000 cm^2

Chemical Concentrations

Compound	DA	Units	Compound	DA	Units
antimony	0.00E+00	mg/cm^2–day	0	0.00E+00	mg/cm^2–day
arsenic	0.00E+00	mg/cm^2–day	0	0.00E+00	mg/cm^2–day
beryllium	0.00E+00	mg/cm^2–day	0	0.00E+00	mg/cm^2–day
uranium–total	6.75E–13	mg/cm^2–day	0	0.00E+00	mg/cm^2–day
benzo(a)pyrene	0.00E+00	mg/cm^2–day	0	0.00E+00	mg/cm^2–day
carbazole	0.00E+00	mg/cm^2–day	0	0.00E+00	mg/cm^2–day
aroclor–1254	0.00E+00	mg/cm^2–day	0	0.00E+00	mg/cm^2–day
aroclor–1260	0.00E+00	mg/cm^2–day	0	0.00E+00	mg/cm^2–day
dieldrin	0.00E+00	mg/cm^2–day	0	0.00E+00	mg/cm^2–day
0	0.00E+00	mg/cm^2–day	0	0.00E+00	mg/cm^2–day
0	0.00E+00	mg/cm^2–day	0	0.00E+00	mg/cm^2–day
0	0.00E+00	mg/cm^2–day	0	0.00E+00	mg/cm^2–day
0	0.00E+00	mg/cm^2–day	0	0.00E+00	mg/cm^2–day
0	0.00E+00	mg/cm^2–day	0	0.00E+00	mg/cm^2–day
0	0.00E+00	mg/cm^2–day	0	0.00E+00	mg/cm^2–day
0	0.00E+00	mg/cm^2–day			

References

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Table C.III-322 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Adult)
Via Dermal Contact while Showering

Compound	HQ Calculation		
	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	6.00E-05	NA
arsenic	NA	2.85E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	2.13E-10	1.50E-04	1.42E-06
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	4.50E-05	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
	HQ Summation =		1.42E-06

Compound	ILCR Calculation		
	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.90E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	2.13E-10	NA	NA
benzo(a)pyrene	NA	NA	NA
carbazole	NA	2.22E-02	NA
aroclor-1254	NA	1.03E+01	NA
aroclor-1260	NA	1.03E+01	NA
dieldrin	NA	1.78E+01	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
	ILCR Summation =		0.00E+00

Table C.III–323
Summary of Intake Quantitation (chemicals) Alternative 6
Solid Waste Landfill with Private Ownership: Off–Property Farmer (Adult)
Via Inhalation of Particulates

Intake Equation = $\frac{CS \times EF \times ED \times IR}{BW \times AT}$

IR	Inhalation rate of gases (RAGS, 1989)	20 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in soil	(see table below)

Chemical Concentrations

Compound	Concentration	Units
antimony	9.5E–10	mg/m^3
arsenic	0.0E+00	mg/m^3
beryllium	0.0E+00	mg/m^3
uranium–total	0.0E+00	mg/m^3
benzo(a)pyrene	1.3E–12	mg/m^3
carbazole	5.4E–12	mg/m^3
aroclor–1254	0.0E+00	mg/m^3
aroclor–1260	0.0E+00	mg/m^3
dieldrin	0.0E+00	mg/m^3
•••••••••	0.0E+00	mg/m^3
•••••••••	0.0E+00	mg/m^3
•••••••••	0.0E+00	mg/m^3
•••••••••	0.0E+00	mg/m^3
•••••••••	0.0E+00	mg/m^3
•••••••••	0.0E+00	mg/m^3
•••••••••	0.0E+00	mg/m^3

Compound	Concentration	Units
•••	0.0E+00	mg/m^3
•••	0.0E+00	mg/m^3
•••	0.0E+00	mg/m^3
•••	0.0E+00	mg/m^3
•••	0.0E+00	mg/m^3
•••	0.0E+00	mg/m^3
•••	0.0E+00	mg/m^3
•••	0.0E+00	mg/m^3
•••	0.0E+00	mg/m^3
•••	0.0E+00	mg/m^3
•••	0.0E+00	mg/m^3
•••	0.0E+00	mg/m^3
•••	0.0E+00	mg/m^3

References

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Table C.III-323 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Adult)
Via Inhalation of Particulates

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	2.6E-10	NA	NA
arsenic	NA	NA	NA
beryllium	NA	NA	NA
uranium-total	NA	NA	NA
benzo(a)pyrene	3.5E-13	NA	NA
carbazole	1.5E-12	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
Hazard Quotient Sum =			0.0E+00

Compound	ILCR Calculation CDI (mg/kg-day)	CSF (mg/kg-day)$^{-1}$	ILCR (unitless)
antimony	2.6E-10	NA	NA
arsenic	NA	1.5E+01	NA
beryllium	NA	8.4E+00	NA
uranium-total	NA	NA	NA
benzo(a)pyrene	3.5E-13	6.1E+00	2.1E-12
carbazole	1.5E-12	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	1.6E+01	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
ILCR Summation =			2.1E-12

Table C.III–324
Summary of Intake and Risk Quantitation (radionuclides) Alternate 6
Solid Waste Landfill with Private Ownership: Off–Property Farmer (Adult)
Via Inhalation of Gases and Particulates

Intake Equation = Ca X EF X EDn X IR

IR	Inhalation rate of gases (RAGS, 1989)	20 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Ca	Concentration of radionuclides in air	(see table below)

Cs_{137+1d}	0.0E+00	pCi/m^3	$Th_{232+10d}$	0.0E+00	pCi/m^3
Np_{237+1d}	3.6E–08	pCi/m^3	U_{234}	6.7E–08	pCi/m^3
Pu_{238}	1.7E–07	pCi/m^3	U_{235+1d}	0.0E+00	pCi/m^3
Ra_{226+8d}	0.0E+00	pCi/m^3	U_{238+2d}	0.0E+00	pCi/m^3
Ra_{228+1d}	0.0E+00	pCi/m^3	0.0E+00	0.0E+00	pCi/m^3
Rn_{222+4d}	0.0E+00	pCi/m^3	0.0E+00	0.0E+00	pCi/m^3
Sr_{90+1d}	0.0E+00	pCi/m^3	0.0E+00	0.0E+00	pCi/m^3
Tc_{99}	0.0E+00	pCi/m^3	0.0E+00	0.0E+00	pCi/m^3
Th_{228+7d}	0.0E+00	pCi/m^3	0.0E+00	0.0E+00	pCi/m^3
Th_{230}	6.5E–07	pCi/m^3	0.0E+00	0.0E+00	pCi/m^3

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	1.9E–11	NA
Np_{237+1d}	1.8E–02	2.9E–08	5.1E–10
Pu_{238}	8.2E–02	3.9E–08	3.2E–09
Ra_{226+8d}	NA	7.0E–09	NA
Ra_{228+1d}	NA	6.9E–10	NA
Rn_{222+4d}	NA	7.7E–12	NA
Sr_{90+1d}	NA	6.2E–11	NA
Tc_{99}	NA	8.3E–12	NA
Th_{228+7d}	NA	7.8E–08	NA
Th_{230}	3.2E–01	2.9E–08	9.2E–09
$Th_{232+10d}$	NA	1.1E–07	NA
U_{234}	3.3E–02	2.6E–08	8.5E–10
U_{235+1d}	NA	2.5E–08	NA
U_{238+2d}	NA	2.4E–08	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
ILCR Summation	=		1.4E–08

000943

Table C.III-325
Summary of Intake Quantitation (chemicals) Alternative 6
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Adult)
Via Ingestion of Meat Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of meat	0.101 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in meat	

Chemical Concentrations

Compound	Concentration	Units
antimony	1.2E-07	mg/kg
arsenic	0.0E+00	mg/kg
beryllium	0.0E+00	mg/kg
uranium-total	2.7E-08	mg/kg
benzo(a)pyrene	3.1E-09	mg/kg
carbazole	3.4E-11	mg/kg
aroclor-1254	0.0E+00	mg/kg
aroclor-1260	0.0E+00	mg/kg
dieldrin	0.0E+00	mg/kg
0	0.0E+00	mg/kg
0	0.0E+00	mg/kg
0	0.0E+00	mg/kg
0	0.0E+00	mg/kg
0	0.0E+00	mg/kg
0	0.0E+00	mg/kg
0	0.0E+00	mg/kg

Compound	Concentration	Units
...	0.0E+00	mg/kg
...	0.0E+00	mg/kg
...	0.0E+00	mg/kg
...	0.0E+00	mg/kg
...	0.0E+00	mg/kg
...	0.0E+00	mg/kg
...	0.0E+00	mg/kg
...	0.0E+00	mg/kg
...	0.0E+00	mg/kg
...	0.0E+00	mg/kg
...	0.0E+00	mg/kg
...	0.0E+00	mg/kg
...	0.0E+00	mg/kg
...	0.0E+00	mg/kg
...	0.0E+00	mg/kg

References

Table C.III-325 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Adult)
Via Ingestion of Meat Products

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	1.2E-10	4.0E-04	3.1E-07
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	2.8E-11	3.0E-03	9.3E-09
benzo(a)pyrene	3.2E-12	NA	NA
carbazole	3.5E-14	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
	HQ Summation =		3.2E-07

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	1.2E-10	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	2.8E-11	NA	NA
benzo(a)pyrene	3.2E-12	7.3E+00	2.3E-11
carbazole	3.5E-14	2.0E-02	7.0E-16
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
	ILCR Summation =		2.3E-11

0009453

Table C.III–326
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Solid Waste Landfill with Private Ownership: Off–Property Farmer (Adult)
Via Ingestion of Meat Products

Intake Equation = Cf X EF X EDn X FI X IR

IR	Ingestion rate of meat	*0.101 kg/day*
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cf	Concentration of radionuclides in meat	

Cs_{137+1d}	0.0E+00	pCi/kg	$Th_{232+10d}$	0.0E+00	pCi/kg
Np_{237+1d}	1.5E–07	pCi/kg	U_{234}	9.0E–06	pCi/kg
Pu_{238}	6.4E–09	pCi/kg	U_{235+1d}	4.0E–07	pCi/kg
Ra_{226+8d}	0.0E+00	pCi/kg	U_{238+2d}	9.0E–06	pCi/kg
Ra_{228+1d}	0.0E+00	pCi/kg	0.0E+00	0.0E+00	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	0.0E+00	0.0E+00	pCi/kg
Sr_{90+1d}	0.0E+00	pCi/kg	0.0E+00	0.0E+00	pCi/kg
Tc_{99}	0.0E+00	pCi/kg	0.0E+00	0.0E+00	pCi/kg
Th_{228+7d}	0.0E+00	pCi/kg	0.0E+00	0.0E+00	pCi/kg
Th_{230}	3.5E–07	pCi/kg	0.0E+00	0.0E+00	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	2.8E–04	2.2E–10	6.2E–14
Pu_{238}	1.2E–05	2.2E–10	2.6E–15
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	6.5E–04	1.3E–11	8.4E–15
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	1.7E–02	1.6E–11	2.7E–13
U_{235+1d}	7.4E–04	1.6E–11	1.2E–14
U_{238+2d}	1.7E–02	2.0E–11	3.3E–13
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA

ILCR Summation = 6.9E–13

Table C.III–327
Summary of Intake Quantitation (chemicals) Alternative 6
Solid Waste Landfill with Private Ownership: Off–Property Farmer (Adult)
Via Ingestion of Dairy Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of dairy products	0.4 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in animal products	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	1.2E–08	mg/kg	•••	0.0E+00	mg/kg
arsenic	0.0E+00	mg/kg	•••	0.0E+00	mg/kg
beryllium	0.0E+00	mg/kg	•••	0.0E+00	mg/kg
uranium–total	7.5E–05	mg/kg	•••	0.0E+00	mg/kg
benzo(a)pyrene	0.0E+00	mg/kg	•••	0.0E+00	mg/kg
carbazole	0.0E+00	mg/kg	•••	0.0E+00	mg/kg
aroclor–1254	0.0E+00	mg/kg	•••	0.0E+00	mg/kg
aroclor–1260	0.0E+00	mg/kg	•••	0.0E+00	mg/kg
dieldrin	0.0E+00	mg/kg	•••	0.0E+00	mg/kg
••••••••	0.0E+00	mg/kg	•••	0.0E+00	mg/kg
••••••••	0.0E+00	mg/kg	•••	0.0E+00	mg/kg
••••••••	0.0E+00	mg/kg	•••	0.0E+00	mg/kg
••••••••	0.0E+00	mg/kg	•••	0.0E+00	mg/kg
••••••••	0.0E+00	mg/kg	•••	0.0E+00	mg/kg
••••••••	0.0E+00	mg/kg	•••	0.0E+00	mg/kg
••••••••	0.0E+00	mg/kg			

References

000947

000948

Table C.III-327 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Adult)
Via Ingestion of Dairy Products

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	4.9E-11	4.0E-04	1.2E-07
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	3.1E-07	3.0E-03	1.0E-04
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
	HQ Summation =		1.0E-04

Compound	ILCR Calculation CDI (mg/kg-day)	CSF (mg/kg-day)$^{-1}$	ILCR (unitless)
antimony	4.9E-11	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	3.1E-07	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
	ILCR Summation =		0.0E+00

Table C.III–328
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Solid Waste Landfill with Private Ownership: Off–Property Farmer (Adult)
Via Ingestion of Dairy Products

Intake Equation = Cp X EF X EDn X FI X IR

IR	Ingestion rate of dairy products	0.4 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cp	Concentration of radionuclides in animal products	

Cs_{137+1d}	0.0E+00	pCi/kg	$Th_{232+10d}$	0.0E+00	pCi/kg
Np_{237+1d}	0.0E+00	pCi/kg	U_{234}	2.3E–02	pCi/kg
Pu_{238}	0.0E+00	pCi/kg	U_{235+1d}	1.2E–03	pCi/kg
Ra_{226+8d}	0.0E+00	pCi/kg	U_{238+2d}	2.5E–02	pCi/kg
Ra_{228+1d}	0.0E+00	pCi/kg	0.0E+00	0.0E+00	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	0.0E+00	0.0E+00	pCi/kg
Sr_{90+1d}	0.0E+00	pCi/kg	0.0E+00	0.0E+00	pCi/kg
Tc_{99}	0.0E+00	pCi/kg	0.0E+00	0.0E+00	pCi/kg
Th_{228+7d}	0.0E+00	pCi/kg	0.0E+00	0.0E+00	pCi/kg
Th_{230}	0.0E+00	pCi/kg	0.0E+00	0.0E+00	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	NA	2.2E–10	NA
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	NA	1.3E–11	NA
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	1.7E+02	1.6E–11	2.7E–09
U_{235+1d}	8.7E+00	1.6E–11	1.4E–10
U_{238+2d}	1.8E+02	2.0E–11	3.7E–09
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA

ILCR Summation = 6.5E–09

000949

Table C.III-329
Summary of Intake Quantitation (chemicals) Alternative 6
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Adult)
Via Ingestion of Vegetables and Fruits

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of fruits or vegetables	0.122 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in vegetables	

Chemical Concentrations

Compound	Concentration	Units
antimony	1.3E-06	mg/kg
arsenic	0.0E+00	mg/kg
beryllium	0.0E+00	mg/kg
uranium-total	1.3E-05	mg/kg
benzo(a)pyrene	1.3E-09	mg/kg
carbazole	5.3E-09	mg/kg
aroclor-1254	0.0E+00	mg/kg
aroclor-1260	0.0E+00	mg/kg
dieldrin	0.0E+00	mg/kg
•••••••••	0.0E+00	mg/kg
•••••••••	0.0E+00	mg/kg
•••••••••	0.0E+00	mg/kg
•••••••••	0.0E+00	mg/kg
•••••••••	0.0E+00	mg/kg
•••••••••	0.0E+00	mg/kg
•••••••••	0.0E+00	mg/kg

Compound	Concentration	Units
•••	0.0E+00	mg/kg
•••	0.0E+00	mg/kg
•••	0.0E+00	mg/kg
•••	0.0E+00	mg/kg
•••	0.0E+00	mg/kg
•••	0.0E+00	mg/kg
•••	0.0E+00	mg/kg
•••	0.0E+00	mg/kg
•••	0.0E+00	mg/kg
•••	0.0E+00	mg/kg
•••	0.0E+00	mg/kg
•••	0.0E+00	mg/kg
•••	0.0E+00	mg/kg
•••	0.0E+00	mg/kg

References

Table C.III-329 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Adult)
Via Ingestion of Vegetables and Fruits

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	2.2E-09	4.0E-04	5.6E-06
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	2.2E-08	3.0E-03	7.4E-06
benzo(a)pyrene	2.1E-12	NA	NA
carbazole	8.9E-12	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
HQ Summation =			1.3E-05

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	2.2E-09	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	2.2E-08	NA	NA
benzo(a)pyrene	2.1E-12	7.3E+00	1.5E-11
carbazole	8.9E-12	2.0E-02	1.8E-13
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
0.0E+00	NA	NA	NA
ILCR Summation =			1.6E-11

000951

Table C.III-330
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Adult)
Via Ingestion of Vegetables and Fruits

Intake Equation = Cv X EF X EDn X FI X IR

IR	Ingestion rate of fruits or vegetables	0.122 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cv	Concentration of radionuclides in vegetables	

Cs_{137+1d}	0.0E+00	pCi/kg	$Th_{232+10d}$	0.0E+00	pCi/kg
Np_{237+1d}	3.6E-05	pCi/kg	U_{234}	4.0E-03	pCi/kg
Pu_{238}	1.7E-04	pCi/kg	U_{235+1d}	2.0E-04	pCi/kg
Ra_{226+8d}	0.0E+00	pCi/kg	U_{238+2d}	4.4E-03	pCi/kg
Ra_{228+1d}	0.0E+00	pCi/kg	0.0E+00	0.0E+00	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	0.0E+00	0.0E+00	pCi/kg
Sr_{90+1d}	0.0E+00	pCi/kg	0.0E+00	0.0E+00	pCi/kg
Tc_{99}	0.0E+00	pCi/kg	0.0E+00	0.0E+00	pCi/kg
Th_{228+7d}	0.0E+00	pCi/kg	0.0E+00	0.0E+00	pCi/kg
Th_{230}	7.1E-04	pCi/kg	0.0E+00	0.0E+00	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E-11	NA
Np_{237+1d}	1.1E-01	2.2E-10	2.4E-11
Pu_{238}	4.9E-01	2.2E-10	1.1E-10
Ra_{226+8d}	NA	7.8E-10	NA
Ra_{228+1d}	NA	1.0E-10	NA
Rn_{222+4d}	NA	1.7E-12	NA
Sr_{90+1d}	NA	3.6E-11	NA
Tc_{99}	NA	1.3E-12	NA
Th_{228+7d}	NA	5.5E-11	NA
Th_{230}	2.1E+00	1.3E-11	2.8E-11
$Th_{232+10d}$	NA	1.7E-10	NA
U_{234}	1.2E+01	1.6E-11	1.9E-10
U_{235+1d}	5.9E-01	1.6E-11	9.4E-12
U_{238+2d}	1.3E+01	2.0E-11	2.6E-10
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
	ILCR Summation =		6.2E-10

000952

Table C.III-331
Summary of Intake Quantitation (chemicals) Alternative 6
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Child)
Via Drinking Water Ingestion

Intake Equation = $\frac{CS \times EF \times ED \times IR}{BW \times AT}$

IR	Ingestion rate of groundwater (RAGS, 1989)	1 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in groundwater	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/l	NA	NA	mg/l
arsenic	NA	mg/l	NA	NA	mg/l
beryllium	NA	mg/l	NA	NA	mg/l
uranium-total	2.70E-06	mg/l	NA	NA	mg/l
benzo(a)pyrene	NA	mg/l	NA	NA	mg/l
carbazole	NA	mg/l	NA	NA	mg/l
aroclor-1254	NA	mg/l	NA	NA	mg/l
aroclor-1260	NA	mg/l	NA	NA	mg/l
dieldrin	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l			

References

000955

000954

Table C.III-331 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Child)
Via Drinking Water Ingestion

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.00E-04	NA
arsenic	NA	3.00E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	1.73E-07	3.00E-03	5.75E-05
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.00E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		5.75E-05

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF (mg/kg-day)$^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.75E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	1.48E-08	NA	NA
benzo(a)pyrene	NA	7.30E+00	NA
carbazole	NA	2.00E-02	NA
aroclor-1254	NA	7.70E+00	NA
aroclor-1260	NA	7.70E+00	NA
dieldrin	NA	1.60E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

Table C.III–332
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Solid Waste Landfill with Private Ownership: Off–Property Farmer (Child)
Via Ingestion of Drinking Water

Intake Equation = Cw X EF X EDn X FI X IR

IR	Ingestion rate of groundwater (RAGS, 1989)	1 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
FI	Fractional intake for radionuclides	1 (Unitless)
Cw	Concentration of radionuclides in groundwater	(see table below)

Cs_{137+1d}	NA	pCi/l	$Th_{232+10d}$	NA	pCi/l
Np_{237+1d}	NA	pCi/l	U_{234}	8.0E–04	pCi/l
Pu_{238}	NA	pCi/l	U_{235+1d}	4.0E–05	pCi/l
Ra_{226+8d}	NA	pCi/l	U_{238+2d}	9.0E–04	pCi/l
Ra_{228+1d}	NA	pCi/l	NA	NA	pCi/l
Rn_{222+4d}	NA	pCi/l	NA	NA	pCi/l
Sr_{90+1d}	NA	pCi/l	NA	NA	pCi/l
Tc_{99}	NA	pCi/l	NA	NA	pCi/l
Th_{228+7d}	NA	pCi/l	NA	NA	pCi/l
Th_{230}	NA	pCi/l	NA	NA	pCi/l

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	NA	2.2E–10	NA
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	NA	1.3E–11	NA
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	1.7E+00	1.6E–11	2.7E–11
U_{235+1d}	8.4E–02	1.6E–11	1.3E–12
U_{238+2d}	1.9E+00	2.0E–11	3.8E–11
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		6.6E–11

000955

Table C.III-333
Summary of Intake Quantitation (chemicals) Alternative 6
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Child)
Via Dermal Contact while Bathing

Intake Equation = $\frac{DA \times EF \times ED \times SA}{BW \times AT}$

DA	Dermal absorbed dose	csv mg/cm^2-day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	2190 days
SA	Skin surface area available for contact	8000 cm^2

Chemical Concentrations

Compound	DA	Units	Compound	DA	Units
antimony	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
arsenic	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
beryllium	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
uranium-total	6.75E-13	mg/cm^2-day	NA	NA	mg/cm^2-day
benzo(a)pyrene	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
carbazole	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
aroclor-1254	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
aroclor-1260	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
dieldrin	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day			

References

Table C.III-333 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Child)
Via Dermal Contact while Bathing

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	6.00E-05	NA
arsenic	NA	2.85E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	3.45E-10	1.50E-04	2.30E-06
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	4.50E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	HQ Summation =		2.30E-06

Compound	ILCR Calculation CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.90E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	2.96E-11	NA	NA
benzo(a)pyrene	NA	NA	NA
carbazole	NA	2.22E-02	NA
aroclor-1254	NA	1.03E+01	NA
aroclor-1260	NA	1.03E+01	NA
dieldrin	NA	1.78E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	ILCR Summation =		NA

000952

6646

Table C.III-334
Summary of Intake Quantitation (chemicals) Alternative 6
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Child)
Via Inhalation of Particulates

Intake Equation = $\frac{CS \times EF \times ED \times IR}{BW \times AT}$

IR	Inhalation rate of gases (RAGS, 1989)	12 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in soil	(see table below)

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	9.5E-10	mg/m^3	NA	NA	mg/m^3
arsenic	NA	mg/m^3	NA	NA	mg/m^3
beryllium	NA	mg/m^3	NA	NA	mg/m^3
uranium-total	NA	mg/m^3	NA	NA	mg/m^3
benzo(a)pyrene	1.3E-12	mg/m^3	NA	NA	mg/m^3
carbazole	5.4E-12	mg/m^3	NA	NA	mg/m^3
aroclor-1254	NA	mg/m^3	NA	NA	mg/m^3
aroclor-1260	NA	mg/m^3	NA	NA	mg/m^3
dieldrin	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3			

References

Table C.III−334 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Private Ownership: Off−Property Farmer (Child)
Via Inhalation of Particulates

Compound	HQ Calculation: CDI (mg/kg−day)	HQ Calculation: RfD (mg/kg−day)	HQ Calculation: HQ (unitless)	ILCR Calculation: CDI (mg/kg−day)	ILCR Calculation: CSF (mg/kg−day)$^{-1}$	ILCR Calculation: ILCR (unitless)
antimony	7.2E−10	NA	NA	6.2E−11	NA	NA
arsenic	NA	NA	NA	NA	1.5E+01	NA
beryllium	NA	NA	NA	NA	8.4E+00	NA
uranium−total	NA	NA	NA	NA	NA	NA
benzo(a)pyrene	9.7E−13	NA	NA	8.3E−14	6.1E+00	5.1E−13
carbazole	4.1E−12	NA	NA	3.5E−13	NA	NA
aroclor−1254	NA	NA	NA	NA	NA	NA
aroclor−1260	NA	NA	NA	NA	NA	NA
dieldrin	NA	NA	NA	NA	1.6E+01	NA
NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA
	Hazard Quotient Sum =		NA	**ILCR Summation =**		5.1E−13

Table C.III–335
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Solid Waste Landfill with Private Ownership: Off–Property Farmer (Child)
Via Inhalation of Gases and Particulates

Intake Equation = Ca X EF X EDn X IR

IR	Inhalation rate of gases (RAGS. 1989)	12 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Ca	Concentration of radionuclides in air	(see table below)

Cs_{137+1d}	NA	pCi/m^3	$Th_{232+10d}$	NA	pCi/m^3
Np_{237+1d}	3.6E–08	pCi/m^3	U_{234}	6.7E–08	pCi/m^3
Pu_{238}	1.7E–07	pCi/m^3	U_{235+1d}	NA	pCi/m^3
Ra_{226+8d}	NA	pCi/m^3	U_{238+2d}	NA	pCi/m^3
Ra_{228+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Rn_{222+4d}	NA	pCi/m^3	NA	NA	pCi/m^3
Sr_{90+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Tc_{99}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{228+7d}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{230}	6.5E–07	pCi/m^3	NA	NA	pCi/m^3

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	1.9E–11	NA
Np_{237+1d}	9.1E–04	2.9E–08	2.6E–11
Pu_{238}	4.2E–03	3.9E–08	1.7E–10
Ra_{226+8d}	NA	7.0E–09	NA
Ra_{228+1d}	NA	6.9E–10	NA
Rn_{222+4d}	NA	7.7E–12	NA
Sr_{90+1d}	NA	6.2E–11	NA
Tc_{99}	NA	8.3E–12	NA
Th_{228+7d}	NA	7.8E–08	NA
Th_{230}	1.6E–02	2.9E–08	4.7E–10
$Th_{232+10d}$	NA	1.1E–07	NA
U_{234}	1.7E–03	2.6E–08	4.4E–11
U_{235+1d}	NA	2.5E–08	NA
U_{238+2d}	NA	2.4E–08	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		7.1E–10

000360

Table C.III-336
Summary of Intake Quantitation (chemicals) Alternative 6
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Child)
Via Ingestion of Meat Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of meat	0.039 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in meat	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	1.2E-07	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium-total	2.7E-08	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	3.1E-09	mg/kg	NA	NA	mg/kg
carbazole	3.4E-11	mg/kg	NA	NA	mg/kg
aroclor-1254	NA	mg/kg	NA	NA	mg/kg
aroclor-1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

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Table C.III-336 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Child)
Via Ingestion of Meat Products

Compound	HQ Calculation		
	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	2.2E-10	4.0E-04	5.6E-07
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	5.0E-11	3.0E-03	1.7E-08
benzo(a)pyrene	5.8E-12	NA	NA
carbazole	6.3E-14	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		5.8E-07

Compound	ILCR Calculation		
	CDI (mg/kg-day)	CSF (mg/kg-day)$^{-1}$	ILCR (unitless)
antimony	1.9E-11	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	4.3E-12	NA	NA
benzo(a)pyrene	4.9E-13	7.3E+00	3.6E-12
carbazole	5.4E-15	2.0E-02	1.1E-16
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		3.6E-12

Table C.III–337
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Solid Waste Landfill with Private Ownership: Off–Property Farmer (Child)
Via Ingestion of Meat Products

Intake Equation = Cf X EF X EDn X FI X IR

IR	Ingestion rate of meat	0.039 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cf	Concentration of radionuclides in meat	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	1.5E–07	pCi/kg	U_{234}	9.0E–06	pCi/kg
Pu_{238}	6.4E–09	pCi/kg	U_{235+1d}	4.0E–07	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	9.0E–06	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	NA	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	3.5E–07	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	9.4E–06	2.2E–10	2.1E–15
Pu_{238}	3.9E–07	2.2E–10	8.6E–17
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	2.1E–05	1.3E–11	2.8E–16
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	5.5E–04	1.6E–11	8.9E–15
U_{235+1d}	2.5E–05	1.6E–11	3.9E–16
U_{238+2d}	5.5E–04	2.0E–11	1.1E–14
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 2.3E–14

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Table C.III338
Summary of Intake Quantitation (chemicals) Alternative 6
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Child)
Via Ingestion of Dairy Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of dairy products	0.9 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in animal products	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	1.2E-08	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium-total	7.5E-05	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor-1254	NA	mg/kg	NA	NA	mg/kg
aroclor-1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

Table C.III338 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Child)
Via Ingestion of Dairy Products

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	5.2E-10	4.0E-04	1.3E-06
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	3.2E-06	3.0E-03	1.1E-03
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		1.1E-03

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	4.4E-11	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	2.8E-07	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

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Table C.III–339
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Solid Waste Landfill with Private Ownership: Off–Property Farmer (Child)
Via Ingestion of Dairy Products

Intake Equation = Cp X EF X EDn X FI X IR

IR	Ingestion rate of dairy products	0.9 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cp	Concentration of radionuclides in animal products	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	NA	pCi/kg	U_{234}	2.3E–02	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	1.2E–03	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	2.5E–02	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	NA	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	NA	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	NA	2.2E–10	NA
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	NA	1.3E–11	NA
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	3.2E+01	1.6E–11	5.2E–10
U_{235+1d}	1.7E+00	1.6E–11	2.7E–11
U_{238+2d}	3.5E+01	2.0E–11	7.1E–10
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
		ILCR Summation =	1.3E–09

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Table C.III-340
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of fruits or vegetables	0.1 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in vegetables	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	1.3E-06	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium-total	1.3E-05	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	1.3E-09	mg/kg	NA	NA	mg/kg
carbazole	5.3E-09	mg/kg	NA	NA	mg/kg
aroclor-1254	NA	mg/kg	NA	NA	mg/kg
aroclor-1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

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Table C.III-340 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	8.6E-09	4.0E-04	2.1E-05
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	8.4E-08	3.0E-03	2.8E-05
benzo(a)pyrene	8.1E-12	NA	NA
carbazole	3.4E-11	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		5.0E-05

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	7.3E-10	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	7.2E-09	NA	NA
benzo(a)pyrene	6.9E-13	7.3E+00	5.0E-12
carbazole	2.9E-12	2.0E-02	5.9E-14
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		5.1E-12

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Table C.III-341
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

Intake Equation = Cv X EF X EDn X FI X IR

IR	Ingestion rate of fruits or vegetables	0.1 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cv	Concentration of radionuclides in vegetables	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	3.6E-05	pCi/kg	U_{234}	4.0E-03	pCi/kg
Pu_{238}	1.7E-04	pCi/kg	U_{235+1d}	2.0E-04	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	4.4E-03	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	NA	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	7.1E-04	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E-11	NA
Np_{237+1d}	7.5E-03	2.2E-10	1.7E-12
Pu_{238}	3.5E-02	2.2E-10	7.6E-12
Ra_{226+8d}	NA	7.8E-10	NA
Ra_{228+1d}	NA	1.0E-10	NA
Rn_{222+4d}	NA	1.7E-12	NA
Sr_{90+1d}	NA	3.6E-11	NA
Tc_{99}	NA	1.3E-12	NA
Th_{228+7d}	NA	5.5E-11	NA
Th_{230}	1.5E-01	1.3E-11	1.9E-12
$Th_{232+10d}$	NA	1.7E-10	NA
U_{234}	8.4E-01	1.6E-11	1.3E-11
U_{235+1d}	4.1E-02	1.6E-11	6.6E-13
U_{238+2d}	9.2E-01	2.0E-11	1.8E-11
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 4.4E-11

000969

Table C.III-342
Summary of Intake Quantitation (chemicals) Alternative 6
Solid Waste Landfill with Private Ownership: On-Property Perched Groundwater User
Via Incidental Ingestion of Soil

Intake Equation = $\frac{CS \times EF \times ED \times CF \times IR}{BW \times AT}$

IRs	Ingestion rate of soil (RAGS, 1989)	180 mg/day
CF	Conversion factor	1.0E-06 kg/mg
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in soil	(see table below)

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	1.3E+00	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium-total	NA	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	1.5E-03	mg/kg	NA	NA	mg/kg
carbazole	6.4E-03	mg/kg	NA	NA	mg/kg
aroclor-1254	NA	mg/kg	NA	NA	mg/kg
aroclor-1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

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Table C.III-342 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Private Ownership: On-Property Perched Groundwater User
Via Incidental Ingestion of Soil

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	3.3E-06	4.0E-04	8.2E-03
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	NA	3.0E-03	NA
benzo(a)pyrene	3.7E-09	NA	NA
carbazole	1.6E-08	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		8.2E-03

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	3.3E-06	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	NA	NA	NA
benzo(a)pyrene	3.7E-09	7.3E+00	2.7E-08
carbazole	1.6E-08	2.0E-02	3.2E-10
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		2.7E-08

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Table C.III–343
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Solid Waste Landfill with Private Ownership: On–Property Perched Groundwater User
Via Incidental Ingestion of Soil

Intake Equation = CS X EF X EDn X FI X IR

IRs	Ingestion rate of soil (RAGS, 1989)	180 mg/day
EF	Exposure frequency	350 days/year
EDn	Exposure Duration	70 Year
FI	Fractional Intake	1 (unitless)
CS	Concentration of radionuclides in soil	

Cs_{137+1d}	NA	pCi/mg	$Th_{232+10d}$	NA	pCi/mg
Np_{237+1d}	4.30E–05	pCi/mg	U_{234}	8.00E–05	pCi/mg
Pu_{238}	2.00E–04	pCi/mg	U_{235+1d}	NA	pCi/mg
Ra_{226+8d}	NA	pCi/mg	U_{238+2d}	NA	pCi/mg
Ra_{228+1d}	NA	pCi/mg	NA	NA	pCi/mg
Rn_{222+4d}	NA	pCi/mg	NA	NA	pCi/mg
Sr_{90+1d}	NA	pCi/mg	NA	NA	pCi/mg
Tc_{99}	NA	pCi/mg	NA	NA	pCi/mg
Th_{228+7d}	NA	pCi/mg	NA	NA	pCi/mg
Th_{230}	7.70E–04	pCi/mg	NA	NA	pCi/mg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.80E–11	NA
Np_{237+1d}	1.90E+02	2.20E–10	4.17E–08
Pu_{238}	8.82E+02	2.20E–10	1.94E–07
Ra_{226+8d}	NA	7.80E–10	NA
Ra_{228+1d}	NA	1.00E–10	NA
Rn_{222+4d}	NA	1.70E–12	NA
Sr_{90+1d}	NA	3.60E–11	NA
Tc_{99}	NA	1.30E–12	NA
Th_{228+7d}	NA	5.50E–11	NA
Th_{230}	3.40E+03	1.30E–11	4.41E–08
$Th_{232+10d}$	NA	1.70E–10	NA
U_{234}	3.53E+02	1.60E–11	5.64E–09
U_{235+1d}	NA	1.60E–11	NA
U_{238+2d}	NA	2.00E–11	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
		ILCR Summation =	2.86E–07

Table C.III-344
Summary of Intake Quantitation (chemicals) Alternative 6
Solid Waste Landfill with Private Ownership: On-Property Perched Groundwater User
Via Dermal Contact with Soil

Intake Equation = $\frac{CS \times EF \times ED \times CF \times ABS \times AF \times SA}{BW \times AT}$

SA	Surface area of exposed skin (50th percentile, hands only)	5750 cm^2/day
AF	Soil to skin adherence factor (RAGS, 1989)	1 mg/cm^2
ABS	chemicals specific absorbtion factor (see table below)	csv
CF	Conversion factor	1E-06 kg/mg
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in soil	

Chemical Concentrations

Compound	ABS	Concentrati	Units	Compound		Concentrati	Units
antimony	1.00E-02	1.33E+00	mg/kg	NA	NA	NA	mg/kg
arsenic	1.00E-03	NA	mg/kg	NA	NA	NA	mg/kg
beryllium	1.00E-02	NA	mg/kg	NA	NA	NA	mg/kg
uranium-total	1.00E-02	NA	mg/kg	NA	NA	NA	mg/kg
benzo(a)pyrene	3.80E-01	1.50E-03	mg/kg	NA	NA	NA	mg/kg
carbazole	3.00E-01	6.40E-03	mg/kg	NA	NA	NA	mg/kg
aroclor-1254	6.00E-02	NA	mg/kg	NA	NA	NA	mg/kg
aroclor-1260	6.00E-02	NA	mg/kg	NA	NA	NA	mg/kg
dieldrin	3.00E-01	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg				

References

000923

Table C.III-344 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Private Ownership: On-Property Perched Groundwater User
Via Dermal Contact with Soil

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	1.05E-06	6.00E-05	1.75E-02
arsenic	NA	2.85E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	NA	1.50E-04	NA
benzo(a)pyrene	3.54E-08	NA	NA
carbazole	1.51E-07	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	4.50E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			1.75E-02

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	1.05E-06	NA	NA
arsenic	NA	1.90E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	NA	NA	NA
benzo(a)pyrene	3.54E-08	NA	NA
carbazole	1.51E-07	2.22E-02	3.36E-09
aroclor-1254	NA	1.03E+01	NA
aroclor-1260	NA	1.03E+01	NA
dieldrin	NA	1.78E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			3.36E-09

Table C.III-345 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Private Ownership: On-Property Perched Groundwater User
Via Drinking Water Ingestion

Compound	HQ Calculation: CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.00E-04	NA
arsenic	NA	3.00E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	NA	3.00E-03	NA
benzo(a)pyrene	NA	NA	NA
carbazole	1.29E-05	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.00E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		NA

Compound	ILCR Calculation: CDI (mg/kg-day)	CSF (mg/kg-day)$^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.75E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	NA	NA	NA
benzo(a)pyrene	NA	7.30E+00	NA
carbazole	1.29E-05	2.00E-02	2.58E-07
aroclor-1254	NA	7.70E+00	NA
aroclor-1260	NA	7.70E+00	NA
dieldrin	NA	1.60E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		2.58E-07

000975

Table C.III–346
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Solid Waste Landfill with Private Ownership: On–Property Perched Groundwater User
Via Ingestion of Drinking Water

Intake Equation = Cw X EF X EDn X FI X IR

IR	Ingestion rate of groundwater (RAGS, 1989)	2 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
FI	Fractional intake for radionuclides	1 (Unitless)
Cw	Concentration of radionuclides in groundwater	(see table below)

Cs_{137+1d}	NA	pCi/l	$Th_{232+10d}$	NA	pCi/l
Np_{237+1d}	NA	pCi/l	U_{234}	6.1E–01	pCi/l
Pu_{238}	NA	pCi/l	U_{235+1d}	3.2E–02	pCi/l
Ra_{226+8d}	NA	pCi/l	U_{238+2d}	6.7E–01	pCi/l
Ra_{228+1d}	NA	pCi/l	NA	NA	pCi/l
Rn_{222+4d}	NA	pCi/l	NA	NA	pCi/l
Sr_{90+1d}	NA	pCi/l	NA	NA	pCi/l
Tc_{99}	1.6E–02	pCi/l	NA	NA	pCi/l
Th_{228+7d}	NA	pCi/l	NA	NA	pCi/l
Th_{230}	NA	pCi/l	NA	NA	pCi/l

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	NA	2.2E–10	NA
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	7.8E+02	1.3E–12	1.0E–09
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	NA	1.3E–11	NA
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	3.0E+04	1.6E–11	4.8E–07
U_{235+1d}	1.6E+03	1.6E–11	2.5E–08
U_{238+2d}	3.3E+04	2.0E–11	6.6E–07
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		1.2E–06

000978

Table C.III-347
Summary of Intake Quantitation (chemicals) Alternative 6
Solid Waste Landfill with Private Ownership: On-Property Perched Groundwater User
Via Dermal Contact while Bathing

Intake Equation = $\frac{DA \times EF \times ED \times SA}{BW \times AT}$

DA	Dermal absorbed dose	csv mg/cm^2-day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	25550 days
SA	Skin surface area available for contact	23000 cm^2

Chemical Concentrations

Compound	DA	Units	Compound	DA	Units
antimony	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
arsenic	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
beryllium	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
uranium-total	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
benzo(a)pyrene	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
carbazole	1.17E-09	mg/cm^2-day	NA	NA	mg/cm^2-day
aroclor-1254	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
aroclor-1260	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
dieldrin	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day			

References

0009277

Table C.III-347 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Private Ownership: On-Property Perched Groundwater User
Via Dermal Contact while Bathing

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	6.00E-05	NA
arsenic	NA	2.85E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	NA	1.50E-04	NA
benzo(a)pyrene	NA	NA	NA
carbazole	3.70E-07	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	4.50E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		NA

Compound	ILCR Calculation CDI (mg/kg-day)	CSF (mg/kg-day)$^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.90E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	NA	NA	NA
benzo(a)pyrene	NA	NA	NA
carbazole	3.70E-07	2.22E-02	8.23E-09
aroclor-1254	NA	1.03E+01	NA
aroclor-1260	NA	1.03E+01	NA
dieldrin	NA	1.78E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		8.23E-09

Table C.III–348
Summary of Intake Quantitation (chemicals) Alternative 6
Solid Waste Landfill with Private Ownership: On–Property Perched Groundwater User
Via Inhalation of Particulates

Intake Equation = $\frac{CS \times EF \times ED \times IR}{BW \times AT}$

IR	Inhalation rate of gases (RAGS, 1989)	20 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in soil	(see table below)

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	3.5E–08	mg/m^3	NA	NA	mg/m^3
arsenic	NA	mg/m^3	NA	NA	mg/m^3
beryllium	NA	mg/m^3	NA	NA	mg/m^3
uranium–total	NA	mg/m^3	NA	NA	mg/m^3
benzo(a)pyrene	4.6E–11	mg/m^3	NA	NA	mg/m^3
carbazole	2.0E–10	mg/m^3	NA	NA	mg/m^3
aroclor–1254	NA	mg/m^3	NA	NA	mg/m^3
aroclor–1260	NA	mg/m^3	NA	NA	mg/m^3
dieldrin	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3			

References

000380

Table C.III-348 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Private Ownership: On-Property Perched Groundwater User
Via Inhalation of Particulates

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	9.5E-09	NA	NA
arsenic	NA	NA	NA
beryllium	NA	NA	NA
uranium-total	NA	NA	NA
benzo(a)pyrene	1.3E-11	NA	NA
carbazole	5.4E-11	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	Hazard Quotient Sum =		NA

Compound	ILCR Calculation CDI (mg/kg-day)	CSF (mg/kg-day)$^{-1}$	ILCR (unitless)
antimony	9.5E-09	NA	NA
arsenic	NA	1.5E+01	NA
beryllium	NA	8.4E+00	NA
uranium-total	NA	NA	NA
benzo(a)pyrene	1.3E-11	6.1E+00	7.7E-11
carbazole	5.4E-11	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		7.7E-11

Table C.III–349
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Solid Waste Landfill with Private Ownership: On–Property Perched Groundwater User
Via Inhalation of Gases and Particulates

Intake Equation = Ca X EF X EDn X IR

IR	Inhalation rate of gases (RAGS, 1989)	20 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Ca	Concentration of radionuclides in air	(see table below)

Cs_{137+1d}	NA	pCi/m^3	$Th_{232+10d}$	NA	pCi/m^3
Np_{237+1d}	1.3E–06	pCi/m^3	U_{234}	2.5E–06	pCi/m^3
Pu_{238}	6.2E–06	pCi/m^3	U_{235+1d}	NA	pCi/m^3
Ra_{226+8d}	NA	pCi/m^3	U_{238+2d}	NA	pCi/m^3
Ra_{228+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Rn_{222+4d}	NA	pCi/m^3	NA	NA	pCi/m^3
Sr_{90+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Tc_{99}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{228+7d}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{230}	2.4E–05	pCi/m^3	NA	NA	pCi/m^3

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	1.9E–11	NA
Np_{237+1d}	6.5E–01	2.9E–08	1.9E–08
Pu_{238}	3.0E+00	3.9E–08	1.2E–07
Ra_{226+8d}	NA	7.0E–09	NA
Ra_{228+1d}	NA	6.9E–10	NA
Rn_{222+4d}	NA	7.7E–12	NA
Sr_{90+1d}	NA	6.2E–11	NA
Tc_{99}	NA	8.3E–12	NA
Th_{228+7d}	NA	7.8E–08	NA
Th_{230}	1.2E+01	2.9E–08	3.4E–07
$Th_{232+10d}$	NA	1.1E–07	NA
U_{234}	1.2E+00	2.6E–08	3.1E–08
U_{235+1d}	NA	2.5E–08	NA
U_{238+2d}	NA	2.4E–08	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		5.0E–07

000981

Table C.III-350
Summary of Intake Quantitation (chemicals) Alternative 6
Solid Waste Landfill with Private Ownership: On-Property Perched Groundwater User
Via Ingestion of Meat Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of meat	0.101 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in meat	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	2.7E-03	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium-total	8.0E-07	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	5.1E-05	mg/kg	NA	NA	mg/kg
carbazole	9.7E-06	mg/kg	NA	NA	mg/kg
aroclor-1254	NA	mg/kg	NA	NA	mg/kg
aroclor-1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

Table C.III-350 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Private Ownership: On-Property Perched Groundwater User
Via Ingestion of Meat Products

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	2.8E-06	4.0E-04	6.9E-03
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	8.3E-10	3.0E-03	2.8E-07
benzo(a)pyrene	5.3E-08	NA	NA
carbazole	1.0E-08	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	HQ Summation =		6.9E-03

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	2.8E-06	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	8.3E-10	NA	NA
benzo(a)pyrene	5.3E-08	7.3E+00	3.9E-07
carbazole	1.0E-08	2.0E-02	2.0E-10
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	ILCR Summation =		3.9E-07

000983

66446

Table C.III–351
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Solid Waste Landfill with Private Ownership: On–Property Perched Groundwater User
Via Ingestion of Meat Products

Intake Equation = Cf X EF X EDn X FI X IR

IR	Ingestion rate of meat	0.101 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cf	Concentration of radionuclides in meat	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	2.4E–03	pCi/kg	U_{234}	1.5E–02	pCi/kg
Pu_{238}	5.2E–05	pCi/kg	U_{235+1d}	1.2E–05	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	2.6E–04	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	NA	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	2.5E–03	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	4.4E+00	2.2E–10	9.7E–10
Pu_{238}	9.7E–02	2.2E–10	2.1E–11
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	4.7E+00	1.3E–11	6.1E–11
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	2.8E+01	1.6E–11	4.5E–10
U_{235+1d}	2.2E–02	1.6E–11	3.6E–13
U_{238+2d}	4.8E–01	2.0E–11	9.7E–12
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 1.5E–09

Table C.III–352
Summary of Intake Quantitation (chemicals) Alternative 6
Solid Waste Landfill with Private Ownership: On–Property Perched Groundwater User
Via Ingestion of Dairy Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of dairy products	0.4 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in animal products	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	2.7E–04	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium–total	4.7E–04	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor–1254	NA	mg/kg	NA	NA	mg/kg
aroclor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

000585

6646

Table C.III−352 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Private Ownership: On−Property Perched Groundwater User
Via Ingestion of Dairy Products

Compound	HQ Calculation CDI (mg/kg−day)	RfD (mg/kg−day)	HQ (unitless)
antimony	1.1E−06	4.0E−04	2.7E−03
arsenic	NA	3.0E−04	NA
beryllium	NA	5.0E−03	NA
uranium−total	1.9E−06	3.0E−03	6.5E−04
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor−1254	NA	NA	NA
aroclor−1260	NA	NA	NA
dieldrin	NA	5.0E−05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		3.4E−03

Compound	ILCR Calculation CDI (mg/kg−day)	CSF (mg/kg−day)$^{-1}$	ILCR (unitless)
antimony	1.1E−06	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium−total	1.9E−06	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E−02	NA
aroclor−1254	NA	7.7E+00	NA
aroclor−1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

Table C.III–353
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Solid Waste Landfill with Private Ownership: On–Property Perched Groundwater User
Via Ingestion of Dairy Products

Intake Equation = Cp X EF X EDn X FI X IR

IR	Ingestion rate of dairy products	0.4 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cp	Concentration of radionuclides in animal products	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	7.9E–05	pCi/kg	U_{234}	2.4E–02	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	3.6E–04	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	2.3E–02	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	2.4E+00	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	3.5E–04	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	5.8E–01	2.2E–10	1.3E–10
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	1.8E+04	3.6E–11	6.4E–07
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	2.6E+00	1.3E–11	3.4E–11
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	1.8E+02	1.6E–11	2.8E–09
U_{235+1d}	2.6E+00	1.6E–11	4.2E–11
U_{238+2d}	1.7E+02	2.0E–11	3.3E–09
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 6.4E–07

Table C.III-354
Summary of Intake Quantitation (chemicals) Alternative 6
Solid Waste Landfill with Private Ownership: On-Property Perched Groundwater User
Via Ingestion of Vegetables and Fruits

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	*Ingestion rate of fruits or vegetables*	0.122 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in vegetables	

Chemical Concentrations

Compound	Concentration	Units
antimony	4.0E-02	mg/kg
arsenic	NA	mg/kg
beryllium	NA	mg/kg
uranium-total	3.9E-04	mg/kg
benzo(a)pyrene	1.7E-05	mg/kg
carbazole	2.3E-03	mg/kg
aroclor-1254	NA	mg/kg
aroclor-1260	NA	mg/kg
dieldrin	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg

Compound	Concentration	Units
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg

References

Table C.III-354 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Private Ownership: On-Property Perched Groundwater User
Via Ingestion of Vegetables and Fruits

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	6.7E-05	4.0E-04	1.7E-01
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	6.5E-07	3.0E-03	2.2E-04
benzo(a)pyrene	2.9E-08	NA	NA
carbazole	3.9E-06	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	HQ Summation =		1.7E-01

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	6.7E-05	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	6.5E-07	NA	NA
benzo(a)pyrene	2.9E-08	7.3E+00	2.1E-07
carbazole	3.9E-06	2.0E-02	7.7E-08
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	ILCR Summation =		2.9E-07

000889

Table C.III–355
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Solid Waste Landfill with Private Ownership: On–Property Perched Groundwater User
Via Ingestion of Vegetables and Fruits

Intake Equation = Cv X EF X EDn X FI X IR

IR	Ingestion rate of fruits or vegetables	0.122 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cv	Concentration of radionuclides in vegetables	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	4.3E–01	pCi/kg	U_{234}	8.0E–01	pCi/kg
Pu_{238}	9.6E–02	pCi/kg	U_{235+1d}	5.9E–03	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	1.3E–01	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	NA	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	6.8E–01	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	1.3E+03	2.2E–10	2.8E–07
Pu_{238}	2.9E+02	2.2E–10	6.3E–08
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	2.0E+03	1.3E–11	2.7E–08
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	2.4E+03	1.6E–11	3.8E–08
U_{235+1d}	1.8E+01	1.6E–11	2.8E–10
U_{238+2d}	3.8E+02	2.0E–11	7.6E–09
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		4.2E–07

Table C.III–356
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Solid Waste Landfill with Private Ownership: On–Property Perched Groundwater User
Via External Radiation

Dose Equivalency Equat = $[DR \times EF \times EDn \times ET_i \times (1-SH_i)] + [DR \times EF \times EDn \times ET_o \times (1-SH_o)]$

EF	Fraction of year spent exposured	0.96 (unitless)
ED	Exposure duration	70 Year
ET_i	Fraction of day spent indoors	0.76 (unitless)
ET_o	Fraction of day spent outdoors	0.24 (unitless)
SH_i	Shield factor indoors	0.5 (unitless)
SH_o	Shield factor outdoors	NA (unitless)
DR	Radionuclide specific dose concentrations	(see table below)

Cs_{137+1d}	NA	pCi/g	$Th_{232+10d}$	NA	pCi/g
Np_{237+1d}	4.30E–02	pCi/g	U_{234}	8.00E–02	pCi/g
Pu_{238}	2.00E–01	pCi/g	U_{235+1d}	NA	pCi/g
Ra_{226+8d}	NA	pCi/g	U_{238+2d}	NA	pCi/g
Ra_{228+1d}	NA	pCi/g	NA	NA	pCi/g
Rn_{222+4d}	NA	pCi/g	NA	NA	pCi/g
Sr_{90+1d}	NA	pCi/g	NA	NA	pCi/g
Tc_{99}	NA	pCi/g	NA	NA	pCi/g
Th_{228+7d}	NA	pCi/g	NA	NA	pCi/g
Th_{230}	7.70E–01	pCi/g	NA	NA	pCi/g

Radionuclides	CDI (year pCi/g)	CSF $(g/pCi-year)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.0E–06	NA
Np_{237+1d}	1.8E+00	4.3E–07	7.7E–07
Pu_{238}	8.3E+00	2.8E–11	2.3E–10
Ra_{226+8d}	NA	6.0E–06	NA
Ra_{228+1d}	NA	2.9E–06	NA
Rn_{222+4d}	NA	5.9E–06	NA
Sr_{90+1d}	NA	NA	NA
Tc_{99}	NA	6.0E–13	NA
Th_{228+7d}	NA	5.6E–06	NA
Th_{230}	3.2E+01	5.4E–11	1.7E–09
$Th_{232+10d}$	NA	8.5E–06	NA
U_{234}	3.3E+00	3.0E–11	1.0E–10
U_{235+1d}	NA	2.4E–07	NA
U_{238+2d}	NA	5.1E–08	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 7.7E–07

000991

Table C.III-357
Summary of Intake Quantitation (chemicals) Alternative 6
Solid Waste Landfill with Federal Ownership: On-Property RME Resident Farmer (Adult)
Via Incidental Ingestion of Soil

Intake Equation = $\frac{CS \times EF \times ED \times CF \times IR}{BW \times AT}$

IRs	Ingestion rate of soil (RAGS, 1989)	180 mg/day
CF	Conversion factor	1.0E-06 kg/mg
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in soil	(see table below)

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	1.3E+00	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium-total	NA	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	1.5E-03	mg/kg	NA	NA	mg/kg
carbazole	6.4E-03	mg/kg	NA	NA	mg/kg
aroclor-1254	NA	mg/kg	NA	NA	mg/kg
aroclor-1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

Table C.III-357 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Federal Ownership: On-Property RME Resident Farmer (Adult)
Via Incidental Ingestion of Soil

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	3.3E-06	4.0E-04	8.2E-03
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	NA	3.0E-03	NA
benzo(a)pyrene	3.7E-09	NA	NA
carbazole	1.6E-08	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	HQ Summation =		8.2E-03

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	3.3E-06	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	NA	NA	NA
benzo(a)pyrene	3.7E-09	7.3E+00	2.7E-08
carbazole	1.6E-08	2.0E-02	3.2E-10
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	ILCR Summation =		2.7E-08

Table C.III-358
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Solid Waste Landfill with Federal Ownership: On-Property RME Resident Farmer (Adult)
Via Incidental Ingestion of Soil

Intake Equation = CS X EF X EDn X FI X IR

IRs	Ingestion rate of soil (RAGS, 1989)	180 mg/day
EF	Exposure frequency	350 days/year
EDn	Exposure Duration	70 Year
FI	Fractional Intake	1 (unitless)
CS	Concentration of radionuclides in soil	

Cs_{137+1d}	NA	pCi/mg	$Th_{232+10d}$	NA	pCi/mg
Np_{237+1d}	4.30E-05	pCi/mg	U_{234}	8.00E-05	pCi/mg
Pu_{238}	2.00E-04	pCi/mg	U_{235+1d}	NA	pCi/mg
Ra_{226+8d}	NA	pCi/mg	U_{238+2d}	NA	pCi/mg
Ra_{228+1d}	NA	pCi/mg	NA	NA	pCi/mg
Rn_{222+4d}	NA	pCi/mg	NA	NA	pCi/mg
Sr_{90+1d}	NA	pCi/mg	NA	NA	pCi/mg
Tc_{99}	NA	pCi/mg	NA	NA	pCi/mg
Th_{228+7d}	NA	pCi/mg	NA	NA	pCi/mg
Th_{230}	7.70E-04	pCi/mg	NA	NA	pCi/mg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.80E-11	NA
Np_{237+1d}	1.90E+02	2.20E-10	4.17E-08
Pu_{238}	8.82E+02	2.20E-10	1.94E-07
Ra_{226+8d}	NA	7.80E-10	NA
Ra_{228+1d}	NA	1.00E-10	NA
Rn_{222+4d}	NA	1.70E-12	NA
Sr_{90+1d}	NA	3.60E-11	NA
Tc_{99}	NA	1.30E-12	NA
Th_{228+7d}	NA	5.50E-11	NA
Th_{230}	3.40E+03	1.30E-11	4.41E-08
$Th_{232+10d}$	NA	1.70E-10	NA
U_{234}	3.53E+02	1.60E-11	5.64E-09
U_{235+1d}	NA	1.60E-11	NA
U_{238+2d}	NA	2.00E-11	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		2.86E-07

Table C.III–359
Summary of Intake Quantitation (chemicals) Alternative 6
Solid Waste Landfill with Federal Ownership: On–Property RME Resident Farmer (Adult)
Via Dermal Contact with Soil

Intake Equation = $\frac{CS \times EF \times ED \times CF \times ABS \times AF \times SA}{BW \times AT}$

SA	Surface area of exposed skin (50th percentile, hands only)	5750 cm^2/day
AF	Soil to skin adherence factor (RAGS, 1989)	1 mg/cm^2
ABS	chemicals specific absorbtion factor (see table below)	csv
CF	Conversion factor	1E–06 kg/mg
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in soil	

Chemical Concentrations

Compound	ABS	Concentrati	Units	Compound		Concentrati	Units
antimony	1.00E–02	1.33E+00	mg/kg	NA	NA	NA	mg/kg
arsenic	1.00E–03	NA	mg/kg	NA	NA	NA	mg/kg
beryllium	1.00E–02	NA	mg/kg	NA	NA	NA	mg/kg
uranium–total	1.00E–02	NA	mg/kg	NA	NA	NA	mg/kg
benzo(a)pyrene	3.00E–01	1.50E–03	mg/kg	NA	NA	NA	mg/kg
carbazole	3.00E–01	6.40E–03	mg/kg	NA	NA	NA	mg/kg
aroclor–1254	6.00E–02	NA	mg/kg	NA	NA	NA	mg/kg
aroclor–1260	6.00E–02	NA	mg/kg	NA	NA	NA	mg/kg
dieldrin	3.00E–01	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg				

References

000995

Table C.III-359 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Federal Ownership: On-Property RME Resident Farmer (Adult)
Via Dermal Contact with Soil

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	1.05E-06	6.00E-05	1.75E-02
arsenic	NA	2.85E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	NA	1.50E-04	NA
benzo(a)pyrene	3.54E-08	NA	NA
carbazole	1.51E-07	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	4.50E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	HQ Summation =		1.75E-02

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	1.05E-06	NA	NA
arsenic	NA	1.90E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	NA	NA	NA
benzo(a)pyrene	3.54E-08	NA	NA
carbazole	1.51E-07	2.22E-02	3.36E-09
aroclor-1254	NA	1.03E+01	NA
aroclor-1260	NA	1.03E+01	NA
dieldrin	NA	1.78E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	ILCR Summation =		3.36E-09

Table C.III-360
Summary of Intake Quantitation (chemicals) Alternative 6
Solid Waste Landfill with Federal Ownership: On-Property RME Resident Farmer (Adult)
Via Drinking Water Ingestion

Intake Equation = $\frac{CS \times EF \times ED \times IR}{BW \times AT}$

IR	Ingestion rate of groundwater (RAGS, 1989)	2 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in groundwater	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/l	NA	NA	mg/l
arsenic	NA	mg/l	NA	NA	mg/l
beryllium	NA	mg/l	NA	NA	mg/l
uranium-total	8.00E-05	mg/l	NA	NA	mg/l
benzo(a)pyrene	NA	mg/l	NA	NA	mg/l
carbazole	NA	mg/l	NA	NA	mg/l
aroclor-1254	NA	mg/l	NA	NA	mg/l
aroclor-1260	NA	mg/l	NA	NA	mg/l
dieldrin	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l			

References

000997

6646

Table C.III-360 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Federal Ownership: On-Property RME Resident Farmer (Adult)
Via Drinking Water Ingestion

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.00E-04	NA
arsenic	NA	3.00E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	2.19E-06	3.00E-03	7.31E-04
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.00E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			7.31E-04

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.75E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	2.19E-06	NA	NA
benzo(a)pyrene	NA	7.30E+00	NA
carbazole	NA	2.00E-02	NA
aroclor-1254	NA	7.70E+00	NA
aroclor-1260	NA	7.70E+00	NA
dieldrin	NA	1.60E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

Table C.III–361
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Solid Waste Landfill with Federal Ownership: On–Property RME Resident Farmer (Adult)
Via Ingestion of Drinking Water

Intake Equation = Cw X EF X EDn X FI X IR

IR	Ingestion rate of groundwater (RAGS, 1989)	2 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
FI	Fractional intake for radionuclides	1 (Unitless)
Cw	Concentration of radionuclides in groundwater	(see table below)

Cs_{137+1d}	NA	pCi/l	$Th_{232+10d}$	NA	pCi/l
Np_{237+1d}	NA	pCi/l	U_{234}	2.4E–02	pCi/l
Pu_{238}	NA	pCi/l	U_{235+1d}	1.2E–03	pCi/l
Ra_{226+8d}	NA	pCi/l	U_{238+2d}	2.6E–02	pCi/l
Ra_{228+1d}	NA	pCi/l	NA	NA	pCi/l
Rn_{222+4d}	NA	pCi/l	NA	NA	pCi/l
Sr_{90+1d}	NA	pCi/l	NA	NA	pCi/l
Tc_{99}	NA	pCi/l	NA	NA	pCi/l
Th_{228+7d}	NA	pCi/l	NA	NA	pCi/l
Th_{230}	NA	pCi/l	NA	NA	pCi/l

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	NA	2.2E–10	NA
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	NA	1.3E–11	NA
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	1.2E+03	1.6E–11	1.9E–08
U_{235+1d}	5.9E+01	1.6E–11	9.4E–10
U_{238+2d}	1.3E+03	2.0E–11	2.5E–08
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
ILCR Summation	=		4.5E–08

000999

Table C.III-362
Summary of Intake Quantitation (chemicals) Alternative 6
Solid Waste Landfill with Federal Ownership: On-Property RME Resident Farmer (Adult)
Via Dermal Contact while Bathing

Intake Equation = $\frac{DA \times EF \times ED \times SA}{BW \times AT}$

DA	Dermal absorbed dose	csv mg/cm^2-day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	25550 days
SA	Skin surface area available for contact	23000 cm^2

Chemical Concentrations

Compound	DA	Units	Compound	DA	Units
antimony	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
arsenic	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
beryllium	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
uranium-total	2.00E-11	mg/cm^2-day	NA	NA	mg/cm^2-day
benzo(a)pyrene	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
carbazole	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
aroclor-1254	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
aroclor-1260	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
dieldrin	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day			

References

Table C.III-362 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Federal Ownership: On-Property RME Resident Farmer (Adult)
Via Dermal Contact while Bathing

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	6.00E-05	NA
arsenic	NA	2.85E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	6.30E-09	1.50E-04	4.20E-05
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	4.50E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			4.20E-05

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.90E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	6.30E-09	NA	NA
benzo(a)pyrene	NA	NA	NA
carbazole	NA	2.22E-02	NA
aroclor-1254	NA	1.03E+01	NA
aroclor-1260	NA	1.03E+01	NA
dieldrin	NA	1.78E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

001001

Table C.III-363
Summary of Intake Quantitation (chemicals) Alternative 6
Solid Waste Landfill with Federal Ownership: On-Property RME Resident Farmer (Adult)
Via Inhalation of Particulates

Intake Equation = $\frac{CS \times EF \times ED \times IR}{BW \times AT}$

IR	Inhalation rate of gases (RAGS, 1989)	20 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in soil	(see table below)

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	3.5E-08	mg/m^3	NA	NA	mg/m^3
arsenic	NA	mg/m^3	NA	NA	mg/m^3
beryllium	NA	mg/m^3	NA	NA	mg/m^3
uranium-total	NA	mg/m^3	NA	NA	mg/m^3
benzo(a)pyrene	4.6E-11	mg/m^3	NA	NA	mg/m^3
carbazole	2.0E-10	mg/m^3	NA	NA	mg/m^3
aroclor-1254	NA	mg/m^3	NA	NA	mg/m^3
aroclor-1260	NA	mg/m^3	NA	NA	mg/m^3
dieldrin	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3			

References

Table C.III-363 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Federal Ownership: On-Property RME Resident Farmer (Adult)
Via Inhalation of Particulates

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	9.5E-09	NA	NA
arsenic	NA	NA	NA
beryllium	NA	NA	NA
uranium-total	NA	NA	NA
benzo(a)pyrene	1.3E-11	NA	NA
carbazole	5.4E-11	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
Hazard Quotient Sum =			NA

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	9.5E-09	NA	NA
arsenic	NA	1.5E+01	NA
beryllium	NA	8.4E+00	NA
uranium-total	NA	NA	NA
benzo(a)pyrene	1.3E-11	6.1E+00	7.7E-11
carbazole	5.4E-11	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			7.7E-11

Table C.III–364
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Solid Waste Landfill with Federal Ownership: On–Property RME Resident Farmer (Adult)
Via Inhalation of Gases and Particulates

Intake Equation = Ca X EF X EDn X IR

IR	Inhalation rate of gases (RAGS, 1989)	20 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Ca	Concentration of radionuclides in air	(see table below)

Cs_{137+1d}	NA	pCi/m^3	$Th_{232+10d}$	NA	pCi/m^3
Np_{237+1d}	1.3E–06	pCi/m^3	U_{234}	2.5E–06	pCi/m^3
Pu_{238}	6.2E–06	pCi/m^3	U_{235+1d}	NA	pCi/m^3
Ra_{226+8d}	NA	pCi/m^3	U_{238+2d}	NA	pCi/m^3
Ra_{228+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Rn_{222+4d}	NA	pCi/m^3	NA	NA	pCi/m^3
Sr_{90+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Tc_{99}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{228+7d}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{230}	2.4E–05	pCi/m^3	NA	NA	pCi/m^3

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	1.9E–11	NA
Np_{237+1d}	6.5E–01	2.9E–08	1.9E–08
Pu_{238}	3.0E+00	3.9E–08	1.2E–07
Ra_{226+8d}	NA	7.0E–09	NA
Ra_{228+1d}	NA	6.9E–10	NA
Rn_{222+4d}	NA	7.7E–12	NA
Sr_{90+1d}	NA	6.2E–11	NA
Tc_{99}	NA	8.3E–12	NA
Th_{228+7d}	NA	7.8E–08	NA
Th_{230}	1.2E+01	2.9E–08	3.4E–07
$Th_{232+10d}$	NA	1.1E–07	NA
U_{234}	1.2E+00	2.6E–08	3.1E–08
U_{235+1d}	NA	2.5E–08	NA
U_{238+2d}	NA	2.4E–08	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 5.0E–07

Table C.III–365
Summary of Intake Quantitation (chemicals) Alternative 6
Solid Waste Landfill with Federal Ownership: On–Property RME Resident Farmer (Adult)
Via Ingestion of Meat Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of meat	0.101 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in meat	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	2.7E–03	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium–total	8.0E–07	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	5.1E–05	mg/kg	NA	NA	mg/kg
carbazole	9.7E–06	mg/kg	NA	NA	mg/kg
aroclor–1254	NA	mg/kg	NA	NA	mg/kg
aroclor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

001903

0001006

Table C.III-365 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Federal Ownership: On-Property RME Resident Farmer (Adult)
Via Ingestion of Meat Products

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	2.8E-06	4.0E-04	6.9E-03
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	8.3E-10	3.0E-03	2.8E-07
benzo(a)pyrene	5.3E-08	NA	NA
carbazole	1.0E-08	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		6.9E-03

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	2.8E-06	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	8.3E-10	NA	NA
benzo(a)pyrene	5.3E-08	7.3E+00	3.9E-07
carbazole	1.0E-08	2.0E-02	2.0E-10
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		3.9E-07

Table C.III–366
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Solid Waste Landfill with Federal Ownership: On–Property RME Resident Farmer (Adult)
Via Ingestion of Meat Products

Intake Equation = Cf X EF X EDn X FI X IR

IR	Ingestion rate of meat	0.101 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cf	Concentration of radionuclides in meat	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	2.4E–03	pCi/kg	U_{234}	1.5E–02	pCi/kg
Pu_{238}	5.2E–05	pCi/kg	U_{235+1d}	1.2E–05	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	2.6E–04	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	NA	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	2.5E–03	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	4.4E+00	2.2E–10	9.7E–10
Pu_{238}	9.7E–02	2.2E–10	2.1E–11
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	4.7E+00	1.3E–11	6.1E–11
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	2.8E+01	1.6E–11	4.5E–10
U_{235+1d}	2.2E–02	1.6E–11	3.6E–13
U_{238+2d}	4.8E–01	2.0E–11	9.7E–12
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 1.5E–09

Table C.III-367
Summary of Intake Quantitation (chemicals) Alternative 6
Solid Waste Landfill with Federal Ownership: On-Property RME Resident Farmer (Adult)
Via Ingestion of Dairy Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of dairy products	0.4 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in animal products	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	2.7E-04	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium-total	4.7E-04	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor-1254	NA	mg/kg	NA	NA	mg/kg
aroclor-1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

Table C.III-367 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Federal Ownership: On-Property RME Resident Farmer (Adult)
Via Ingestion of Dairy Products

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	1.1E-06	4.0E-04	2.7E-03
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	1.9E-06	3.0E-03	6.5E-04
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			3.4E-03

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	1.1E-06	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	1.9E-06	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

0010093

Table C.III-368
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Solid Waste Landfill with Federal Ownership: On-Property RME Resident Farmer (Adult)
Via Ingestion of Dairy Products

Intake Equation = Cp X EF X EDn X FI X IR

IR	Ingestion rate of dairy products	0.4 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cp	Concentration of radionuclides in animal products	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	7.9E-05	pCi/kg	U_{234}	2.4E-02	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	3.6E-04	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	2.3E-02	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	2.4E+00	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	3.5E-04	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E-11	NA
Np_{237+1d}	5.8E-01	2.2E-10	1.3E-10
Pu_{238}	NA	2.2E-10	NA
Ra_{226+8d}	NA	7.8E-10	NA
Ra_{228+1d}	NA	1.0E-10	NA
Rn_{222+4d}	NA	1.7E-12	NA
Sr_{90+1d}	1.8E+04	3.6E-11	6.4E-07
Tc_{99}	NA	1.3E-12	NA
Th_{228+7d}	NA	5.5E-11	NA
Th_{230}	2.6E+00	1.3E-11	3.4E-11
$Th_{232+10d}$	NA	1.7E-10	NA
U_{234}	1.8E+02	1.6E-11	2.8E-09
U_{235+1d}	2.6E+00	1.6E-11	4.2E-11
U_{238+2d}	1.7E+02	2.0E-11	3.3E-09
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 6.4E-07

Table C.III–369
Summary of Intake Quantitation (chemicals) Alternative 6
Solid Waste Landfill with Federal Ownership: On–Property RME Resident Farmer (Adult)
Via Ingestion of Vegetables and Fruits

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of fruits or vegetables	0.122 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in vegetables	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	4.0E–02	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium–total	3.9E–04	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	1.7E–05	mg/kg	NA	NA	mg/kg
carbazole	2.3E–03	mg/kg	NA	NA	mg/kg
aroclor–1254	NA	mg/kg	NA	NA	mg/kg
aroclor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

001011

Table C.III-369 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Federal Ownership: On-Property RME Resident Farmer (Adult)
Via Ingestion of Vegetables and Fruits

Compound	HQ Calculation		
	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	6.7E-05	4.0E-04	1.7E-01
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	6.5E-07	3.0E-03	2.2E-04
benzo(a)pyrene	2.9E-08	NA	NA
carbazole	3.9E-06	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			1.7E-01

Compound	ILCR Calculation		
	CDI (mg/kg-day)	CSF (mg/kg-day)$^{-1}$	ILCR (unitless)
antimony	6.7E-05	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	6.5E-07	NA	NA
benzo(a)pyrene	2.9E-08	7.3E+00	2.1E-07
carbazole	3.9E-06	2.0E-02	7.7E-08
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			2.9E-07

Table C.III-370
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Solid Waste Landfill with Federal Ownership: On-Property RME Resident Farmer (Adult)
Via Ingestion of Vegetables and Fruits

Intake Equation = Cv X EF X EDn X FI X IR

IR	Ingestion rate of fruits or vegetables	0.122 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cv	Concentration of radionuclides in vegetables	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	4.3E-01	pCi/kg	U_{234}	8.0E-01	pCi/kg
Pu_{238}	9.6E-02	pCi/kg	U_{235+1d}	5.9E-03	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	1.3E-01	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	NA	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	6.8E-01	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E-11	NA
Np_{237+1d}	1.3E+03	2.2E-10	2.8E-07
Pu_{238}	2.9E+02	2.2E-10	6.3E-08
Ra_{226+8d}	NA	7.8E-10	NA
Ra_{228+1d}	NA	1.0E-10	NA
Rn_{222+4d}	NA	1.7E-12	NA
Sr_{90+1d}	NA	3.6E-11	NA
Tc_{99}	NA	1.3E-12	NA
Th_{228+7d}	NA	5.5E-11	NA
Th_{230}	2.0E+03	1.3E-11	2.7E-08
$Th_{232+10d}$	NA	1.7E-10	NA
U_{234}	2.4E+03	1.6E-11	3.8E-08
U_{235+1d}	1.8E+01	1.6E-11	2.8E-10
U_{238+2d}	3.8E+02	2.0E-11	7.6E-09
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA.
NA	NA	NA	NA

ILCR Summation = 4.2E-07

Table C.III-371
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Solid Waste Landfill with Federal Ownership: On-Property RME Resident Farmer (Adult)
Via External Radiation

Dose Equivalency Equat = $[DR \times EF \times EDn \times ET_i \times (1-SH_i)] + [DR \times EF \times EDn \times ET_o \times (1-SH_o)]$

EF	Fraction of year spent exposured	0.96 (unitless)
ED	Exposure duration	70 Year
ET_i	Fraction of day spent indoors	0.76 (unitless)
ET_o	Fraction of day spent outdoors	0.24 (unitless)
SH_i	Shield factor indoors	0.5 (unitless)
SH_o	Shield factor outdoors	NA (unitless)
DR	Radionuclide specific dose concentrations	(see table below)

Cs_{137+1d}	NA	pCi/g	$Th_{232+10d}$	NA	pCi/g
Np_{237+1d}	4.30E-02	pCi/g	U_{234}	8.00E-02	pCi/g
Pu_{238}	2.00E-01	pCi/g	U_{235+1d}	NA	pCi/g
Ra_{226+8d}	NA	pCi/g	U_{238+2d}	NA	pCi/g
Ra_{228+1d}	NA	pCi/g	NA	NA	pCi/g
Rn_{222+4d}	NA	pCi/g	NA	NA	pCi/g
Sr_{90+1d}	NA	pCi/g	NA	NA	pCi/g
Tc_{99}	NA	pCi/g	NA	NA	pCi/g
Th_{228+7d}	NA	pCi/g	NA	NA	pCi/g
Th_{230}	7.70E-01	pCi/g	NA	NA	pCi/g

Radionuclides	CDI (year pCi/g)	CSF $(g/pCi-year)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.0E-06	NA
Np_{237+1d}	1.8E+00	4.3E-07	7.7E-07
Pu_{238}	8.3E+00	2.8E-11	2.3E-10
Ra_{226+8d}	NA	6.0E-06	NA
Ra_{228+1d}	NA	2.9E-06	NA
Rn_{222+4d}	NA	5.9E-06	NA
Sr_{90+1d}	NA	NA	NA
Tc_{99}	NA	6.0E-13	NA
Th_{228+7d}	NA	5.6E-06	NA
Th_{230}	3.2E+01	5.4E-11	1.7E-09
$Th_{232+10d}$	NA	8.5E-06	NA
U_{234}	3.3E+00	3.0E-11	1.0E-10
U_{235+1d}	NA	2.4E-07	NA
U_{238+2d}	NA	5.1E-08	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 7.7E-07

Table C.III–372
Summary of Intake Quantitation (chemicals) Alternative 6
Solid Waste Landfill with Private Ownership: Off–Property Farmer (Child)
Via Incidental Ingestion of Soil

Intake Equation = $\frac{CS \times EF \times ED \times CF \times IR}{BW \times AT}$

IRs	Ingestion rate of soil (RAGS, 1989)	200 mg/day
CF	Conversion factor	1.0E–06 kg/mg
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in soil	(see table below)

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	1.3E+00	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium–total	NA	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	1.5E–03	mg/kg	NA	NA	mg/kg
carbazole	6.4E–03	mg/kg	NA	NA	mg/kg
aroclor–1254	NA	mg/kg	NA	NA	mg/kg
aroclor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

001015

Table C.III-372 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Child)
Via Incidental Ingestion of Soil

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	1.7E-05	4.0E-04	4.3E-02
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	NA	3.0E-03	NA
benzo(a)pyrene	1.9E-08	NA	NA
carbazole	8.2E-08	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			4.3E-02

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	1.5E-06	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	NA	NA	NA
benzo(a)pyrene	1.6E-09	7.3E+00	1.2E-08
carbazole	7.0E-09	2.0E-02	1.4E-10
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			1.2E-08

Table C.III-373
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Child)
Via Incidental Ingestion of Soil

Intake Equation = CS X EF X EDn X FI X IR

IRs	Ingestion rate of soil (RAGS, 1989)	200 mg/day
EF	Exposure frequency	350 days/year
EDn	Exposure Duration	6 Year
FI	Fractional Intake	1 (unitless)
CS	Concentration of radionuclides in soil	

Cs_{137+1d}	NA	pCi/mg	$Th_{232+10d}$	NA	pCi/mg
Np_{237+1d}	4.30E-05	pCi/mg	U_{234}	8.00E-05	pCi/mg
Pu_{238}	2.00E-04	pCi/mg	U_{235+1d}	NA	pCi/mg
Ra_{226+8d}	NA	pCi/mg	U_{238+2d}	NA	pCi/mg
Ra_{228+1d}	NA	pCi/mg	NA	NA	pCi/mg
Rn_{222+4d}	NA	pCi/mg	NA	NA	pCi/mg
Sr_{90+1d}	NA	pCi/mg	NA	NA	pCi/mg
Tc_{99}	NA	pCi/mg	NA	NA	pCi/mg
Th_{228+7d}	NA	pCi/mg	NA	NA	pCi/mg
Th_{230}	7.70E-04	pCi/mg	NA	NA	pCi/mg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.80E-11	NA
Np_{237+1d}	1.81E+01	2.20E-10	3.97E-09
Pu_{238}	8.40E+01	2.20E-10	1.85E-08
Ra_{226+8d}	NA	7.80E-10	NA
Ra_{228+1d}	NA	1.00E-10	NA
Rn_{222+4d}	NA	1.70E-12	NA
Sr_{90+1d}	NA	3.60E-11	NA
Tc_{99}	NA	1.30E-12	NA
Th_{228+7d}	NA	5.50E-11	NA
Th_{230}	3.23E+02	1.30E-11	4.20E-09
$Th_{232+10d}$	NA	1.70E-10	NA
U_{234}	3.36E+01	1.60E-11	5.38E-10
U_{235+1d}	NA	1.60E-11	NA
U_{238+2d}	NA	2.00E-11	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		2.72E-08

Table C.III-374
Summary of Intake Quantitation (chemicals) Alternative 6
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Child)
Via Dermal Contact with Soil

Intake Equation = $\frac{CS \times EF \times ED \times CF \times ABS \times AF \times SA}{BW \times AT}$

SA	Surface area of exposed skin (50th percentile, hands only)	2000 cm^2/day
AF	Soil to skin adherence factor (RAGS, 1989)	1 mg/cm^2
ABS	chemicals specific absorbtion factor (see table below)	csv
CF	Conversion factor	1E-06 kg/mg
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in soil	

Chemical Concentrations

Compound	ABS	Concentrati	Units	Compound		Concentrati	Units
antimony	1.00E-02	1.33E+00	mg/kg	NA	NA	NA	mg/kg
arsenic	1.00E-03	NA	mg/kg	NA	NA	NA	mg/kg
beryllium	1.00E-02	NA	mg/kg	NA	NA	NA	mg/kg
uranium-total	1.00E-02	NA	mg/kg	NA	NA	NA	mg/kg
benzo(a)pyrene	3.00E-01	1.50E-03	mg/kg	NA	NA	NA	mg/kg
carbazole	3.00E-01	6.40E-03	mg/kg	NA	NA	NA	mg/kg
aroclor-1254	6.00E-02	NA	mg/kg	NA	NA	NA	mg/kg
aroclor-1260	6.00E-02	NA	mg/kg	NA	NA	NA	mg/kg
dieldrin	3.00E-01	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg				

References

Table C.III-374 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Child)
Via Dermal Contact with Soil

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	1.70E-06	6.00E-05	2.83E-02
arsenic	NA	2.85E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	NA	1.50E-04	NA
benzo(a)pyrene	5.75E-08	NA	NA
carbazole	2.45E-07	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	4.50E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			2.83E-02

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	1.46E-07	NA	NA
arsenic	NA	1.90E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	NA	NA	NA
benzo(a)pyrene	4.93E-09	NA	NA
carbazole	2.10E-08	2.22E-02	4.68E-10
aroclor-1254	NA	1.03E+01	NA
aroclor-1260	NA	1.03E+01	NA
dieldrin	NA	1.78E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			4.68E-10

Table C.III-375
Summary of Intake Quantitation (chemicals) Alternative 6
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Child)
Via Drinking Water Ingestion

Intake Equation = $\frac{CS \times EF \times ED \times IR}{BW \times AT}$

IR	Ingestion rate of groundwater (RAGS, 1989)	1 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in groundwater	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/l	NA	NA	mg/l
arsenic	NA	mg/l	NA	NA	mg/l
beryllium	NA	mg/l	NA	NA	mg/l
uranium-total	8.00E-05	mg/l	NA	NA	mg/l
benzo(a)pyrene	NA	mg/l	NA	NA	mg/l
carbazole	NA	mg/l	NA	NA	mg/l
aroclor-1254	NA	mg/l	NA	NA	mg/l
aroclor-1260	NA	mg/l	NA	NA	mg/l
dieldrin	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l			

References

Table C.III-375 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Child)
Via Drinking Water Ingestion

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.00E-04	NA
arsenic	NA	3.00E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	5.11E-06	3.00E-03	1.70E-03
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.00E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		1.70E-03

Compound	ILCR Calculation CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.75E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	4.38E-07	NA	NA
benzo(a)pyrene	NA	7.30E+00	NA
carbazole	NA	2.00E-02	NA
aroclor-1254	NA	7.70E+00	NA
aroclor-1260	NA	7.70E+00	NA
dieldrin	NA	1.60E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

001021

Table C.III–376
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Solid Waste Landfill with Private Ownership: Off–Property Farmer (Child)
Via Ingestion of Drinking Water

Intake Equation = Cw X EF X EDn X FI X IR

IR	Ingestion rate of groundwater (RAGS, 1989)	1 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
FI	Fractional intake for radionuclides	1 (Unitless)
Cw	Concentration of radionuclides in groundwater	(see table below)

Cs_{137+1d}	NA	pCi/l	$Th_{232+10d}$	NA	pCi/l
Np_{237+1d}	NA	pCi/l	U_{234}	2.4E–02	pCi/l
Pu_{238}	NA	pCi/l	U_{235+1d}	1.2E–03	pCi/l
Ra_{226+8d}	NA	pCi/l	U_{238+2d}	2.6E–02	pCi/l
Ra_{228+1d}	NA	pCi/l	NA	NA	pCi/l
Rn_{222+4d}	NA	pCi/l	NA	NA	pCi/l
Sr_{90+1d}	NA	pCi/l	NA	NA	pCi/l
Tc_{99}	NA	pCi/l	NA	NA	pCi/l
Th_{228+7d}	NA	pCi/l	NA	NA	pCi/l
Th_{230}	NA	pCi/l	NA	NA	pCi/l

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	NA	2.2E–10	NA
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	NA	1.3E–11	NA
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	5.0E+01	1.6E–11	8.1E–10
U_{235+1d}	2.5E+00	1.6E–11	4.0E–11
U_{238+2d}	5.5E+01	2.0E–11	1.1E–09
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation	=	1.9E–09

001022

Table C.III-377
Summary of Intake Quantitation (chemicals) Alternative 6
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Child)
Via Dermal Contact while Bathing

Intake Equation = $\frac{DA \times EF \times ED \times SA}{BW \times AT}$

DA	Dermal absorbed dose	csv mg/cm^2-day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	2190 days
SA	Skin surface area available for contact	8000 cm^2

Chemical Concentrations

Compound	DA	Units	Compound	DA	Units
antimony	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
arsenic	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
beryllium	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
uranium-total	2.00E-11	mg/cm^2-day	NA	NA	mg/cm^2-day
benzo(a)pyrene	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
carbazole	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
aroclor-1254	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
aroclor-1260	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
dieldrin	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day			

References

001023

001024

Table C.III-377 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Child)
Via Dermal Contact while Bathing

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	6.00E-05	NA
arsenic	NA	2.85E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	1.02E-08	1.50E-04	6.82E-05
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	4.50E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		6.82E-05

Compound	ILCR Calculation CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.90E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	8.77E-10	NA	NA
benzo(a)pyrene	NA	NA	NA
carbazole	NA	2.22E-02	NA
aroclor-1254	NA	1.03E+01	NA
aroclor-1260	NA	1.03E+01	NA
dieldrin	NA	1.78E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

Table C.III-378
Summary of Intake Quantitation (chemicals) Alternative 6
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Child)
Via Inhalation of Particulates

Intake Equation = $\frac{CS \times EF \times ED \times IR}{BW \times AT}$

IR	Inhalation rate of gases (RAGS, 1989)	12 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in soil	(see table below)

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	3.5E-08	mg/m^3	NA	NA	mg/m^3
arsenic	NA	mg/m^3	NA	NA	mg/m^3
beryllium	NA	mg/m^3	NA	NA	mg/m^3
uranium-total	NA	mg/m^3	NA	NA	mg/m^3
benzo(a)pyrene	4.6E-11	mg/m^3	NA	NA	mg/m^3
carbazole	2.0E-10	mg/m^3	NA	NA	mg/m^3
aroclor-1254	NA	mg/m^3	NA	NA	mg/m^3
aroclor-1260	NA	mg/m^3	NA	NA	mg/m^3
dieldrin	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3			

References

Table C.III-378 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Child)
Via Inhalation of Particulates

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	2.7E-08	NA	NA
arsenic	NA	NA	NA
beryllium	NA	NA	NA
uranium-total	NA	NA	NA
benzo(a)pyrene	3.5E-11	NA	NA
carbazole	1.5E-10	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
Hazard Quotient Sum =			NA

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	2.3E-09	NA	NA
arsenic	NA	1.5E+01	NA
beryllium	NA	8.4E+00	NA
uranium-total	NA	NA	NA
benzo(a)pyrene	3.0E-12	6.1E+00	1.8E-11
carbazole	1.3E-11	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			1.8E-11

Table C.III–379
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Solid Waste Landfill with Private Ownership: Off–Property Farmer (Child)
Via Inhalation of Gases and Particulates

Intake Equation = Ca X EF X EDn X IR

IR	Inhalation rate of gases (RAGS, 1989)	12 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Ca	Concentration of radionuclides in air	(see table below)

Cs_{137+1d}	NA	pCi/m^3	$Th_{232+10d}$	NA	pCi/m^3
Np_{237+1d}	1.3E–06	pCi/m^3	U_{234}	2.5E–06	pCi/m^3
Pu_{238}	6.2E–06	pCi/m^3	U_{235+1d}	NA	pCi/m^3
Ra_{226+8d}	NA	pCi/m^3	U_{238+2d}	NA	pCi/m^3
Ra_{228+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Rn_{222+4d}	NA	pCi/m^3	NA	NA	pCi/m^3
Sr_{90+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Tc_{99}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{228+7d}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{230}	2.4E–05	pCi/m^3	NA	NA	pCi/m^3

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	1.9E–11	NA
Np_{237+1d}	3.3E–02	2.9E–08	9.6E–10
Pu_{238}	1.5E–01	3.9E–08	6.0E–09
Ra_{226+8d}	NA	7.0E–09	NA
Ra_{228+1d}	NA	6.9E–10	NA
Rn_{222+4d}	NA	7.7E–12	NA
Sr_{90+1d}	NA	6.2E–11	NA
Tc_{99}	NA	8.3E–12	NA
Th_{228+7d}	NA	7.8E–08	NA
Th_{230}	6.0E–01	2.9E–08	1.7E–08
$Th_{232+10d}$	NA	1.1E–07	NA
U_{234}	6.2E–02	2.6E–08	1.6E–09
U_{235+1d}	NA	2.5E–08	NA
U_{238+2d}	NA	2.4E–08	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation	=	2.6E–08

001027

Table C.III-380
Summary of Intake Quantitation (chemicals) Alternative 6
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Child)
Via Ingestion of Meat Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of meat	0.039 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in meat	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	2.7E-03	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium-total	8.0E-07	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	5.1E-05	mg/kg	NA	NA	mg/kg
carbazole	9.7E-06	mg/kg	NA	NA	mg/kg
aroclor-1254	NA	mg/kg	NA	NA	mg/kg
aroclor-1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

Table C.III-380 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Child)
Via Ingestion of Meat Products

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	5.0E-06	4.0E-04	1.2E-02
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	1.5E-09	3.0E-03	5.0E-07
benzo(a)pyrene	9.5E-08	NA	NA
carbazole	1.8E-08	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		1.2E-02

Compound	ILCR Calculation CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	4.3E-07	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	1.3E-10	NA	NA
benzo(a)pyrene	8.2E-09	7.3E+00	6.0E-08
carbazole	1.6E-09	2.0E-02	3.1E-11
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		6.0E-08

0001029

Table C.III-381
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Child)
Via Ingestion of Meat Products

Intake Equation = Cf X EF X EDn X FI X IR

IR	Ingestion rate of meat	0.039 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cf	Concentration of radionuclides in meat	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	2.4E-03	pCi/kg	U_{234}	1.5E-02	pCi/kg
Pu_{238}	5.2E-05	pCi/kg	U_{235+1d}	1.2E-05	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	2.6E-04	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	NA	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	2.5E-03	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E-11	NA
Np_{237+1d}	1.5E-01	2.2E-10	3.2E-11
Pu_{238}	3.2E-03	2.2E-10	7.1E-13
Ra_{226+8d}	NA	7.8E-10	NA
Ra_{228+1d}	NA	1.0E-10	NA
Rn_{222+4d}	NA	1.7E-12	NA
Sr_{90+1d}	NA	3.6E-11	NA
Tc_{99}	NA	1.3E-12	NA
Th_{228+7d}	NA	5.5E-11	NA
Th_{230}	1.5E-01	1.3E-11	2.0E-12
$Th_{232+10d}$	NA	1.7E-10	NA
U_{234}	9.3E-01	1.6E-11	1.5E-11
U_{235+1d}	7.4E-04	1.6E-11	1.2E-14
U_{238+2d}	1.6E-02	2.0E-11	3.2E-13
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		5.0E-11

001030

Table C.III-382
Summary of Intake Quantitation (chemicals) Alternative 6
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Child)
Via Ingestion of Dairy Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of dairy products	0.9 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in animal products	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	2.7E-04	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium-total	4.7E-04	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor-1254	NA	mg/kg	NA	NA	mg/kg
aroclor-1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

Table C.III-382 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Child)
Via Ingestion of Dairy Products

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	1.1E-05	4.0E-04	2.9E-02
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	2.0E-05	3.0E-03	6.8E-03
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		3.6E-02

Compound	ILCR Calculation CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	9.9E-07	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	1.8E-06	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

001032

Table C.III–383
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Solid Waste Landfill with Private Ownership: Off–Property Farmer (Child)
Via Ingestion of Dairy Products

ntake Equation = $Cp \times EF \times EDn \times FI \times IR$

IR	Ingestion rate of dairy products	0.9 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cp	Concentration of radionuclides in animal products	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	7.9E−05	pCi/kg	U_{234}	2.4E−02	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	3.6E−04	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	2.3E−02	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	2.4E+00	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	3.5E−04	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E−11	NA
Np_{237+1d}	1.1E−01	2.2E−10	2.5E−11
Pu_{238}	NA	2.2E−10	NA
Ra_{226+8d}	NA	7.8E−10	NA
Ra_{228+1d}	NA	1.0E−10	NA
Rn_{222+4d}	NA	1.7E−12	NA
Sr_{90+1d}	3.4E+03	3.6E−11	1.2E−07
Tc_{99}	NA	1.3E−12	NA
Th_{228+7d}	NA	5.5E−11	NA
Th_{230}	5.0E−01	1.3E−11	6.5E−12
$Th_{232+10d}$	NA	1.7E−10	NA
U_{234}	3.4E+01	1.6E−11	5.5E−10
U_{235+1d}	5.1E−01	1.6E−11	8.2E−12
U_{238+2d}	3.2E+01	2.0E−11	6.5E−10
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
ILCR Summation	=		1.2E−07

Table C.III-384
Summary of Intake Quantitation (chemicals) Alternative 6
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of fruits or vegetables	0.1 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in vegetables	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	4.0E-02	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium-total	3.9E-04	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	1.7E-05	mg/kg	NA	NA	mg/kg
carbazole	2.3E-03	mg/kg	NA	NA	mg/kg
aroclor-1254	NA	mg/kg	NA	NA	mg/kg
aroclor-1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

Table C.III-384 (continued)
Summary of Risk Characterization (chemicals)
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	2.6E-04	4.0E-04	6.4E-01
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	2.5E-06	3.0E-03	8.3E-04
benzo(a)pyrene	1.1E-07	NA	NA
carbazole	1.5E-05	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		6.4E-01

Compound	ILCR Calculation CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	2.2E-05	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	2.1E-07	NA	NA
benzo(a)pyrene	9.5E-09	7.3E+00	6.9E-08
carbazole	1.3E-06	2.0E-02	2.5E-08
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		9.5E-08

Table C.III–385
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Solid Waste Landfill with Private Ownership: Off–Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

Intake Equation = Cv X EF X EDn X FI X IR

IR	Ingestion rate of fruits or vegetables	0.1 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cv	Concentration of radionuclides in vegetables	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	4.3E−01	pCi/kg	U_{234}	8.0E−01	pCi/kg
Pu_{238}	9.6E−02	pCi/kg	U_{235+1d}	5.9E−03	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	1.3E−01	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	NA	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	6.8E−01	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E−11	NA
Np_{237+1d}	9.1E+01	2.2E−10	2.0E−08
Pu_{238}	2.0E+01	2.2E−10	4.4E−09
Ra_{226+8d}	NA	7.8E−10	NA
Ra_{228+1d}	NA	1.0E−10	NA
Rn_{222+4d}	NA	1.7E−12	NA
Sr_{90+1d}	NA	3.6E−11	NA
Tc_{99}	NA	1.3E−12	NA
Th_{228+7d}	NA	5.5E−11	NA
Th_{230}	1.4E+02	1.3E−11	1.9E−09
$Th_{232+10d}$	NA	1.7E−10	NA
U_{234}	1.7E+02	1.6E−11	2.7E−09
U_{235+1d}	1.2E+00	1.6E−11	2.0E−11
U_{238+2d}	2.7E+01	2.0E−11	5.5E−10
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		2.9E−08

Table C.III-386
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Solid Waste Landfill with Private Ownership: Off-Property Farmer (Child)
Via External Radiation

Dose Equivalency Equat = $[DR \times EF \times EDn \times ET_i \times (1-SH_i)] + [DR \times EF \times EDn \times ET_o \times (1-SH_o)]$

EF	Fraction of year spent exposured	0.96 (unitless)
ED	Exposure duration	6 Year
ET_i	Fraction of day spent indoors	0.92 (unitless)
ET_o	Fraction of day spent outdoors	0.08 (unitless)
SH_i	Shield factor indoors	0.5 (unitless)
SH_o	Shield factor outdoors	NA (unitless)
DR	Radionuclide specific dose concentrations	(see table below)

Cs_{137+1d}	NA	pCi/g	$Th_{232+10d}$	NA	pCi/g
Np_{237+1d}	4.30E-02	pCi/g	U_{234}	8.00E-02	pCi/g
Pu_{238}	2.00E-01	pCi/g	U_{235+1d}	NA	pCi/g
Ra_{226+8d}	NA	pCi/g	U_{238+2d}	NA	pCi/g
Ra_{228+1d}	NA	pCi/g	NA	NA	pCi/g
Rn_{222+4d}	NA	pCi/g	NA	NA	pCi/g
Sr_{90+1d}	NA	pCi/g	NA	NA	pCi/g
Tc_{99}	NA	pCi/g	NA	NA	pCi/g
Th_{228+7d}	NA	pCi/g	NA	NA	pCi/g
Th_{230}	7.70E-01	pCi/g	NA	NA	pCi/g

Radionuclides	CDI (year pCi/g)	CSF $(g/pCi-year)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.0E-06	NA
Np_{237+1d}	1.3E-01	4.3E-07	5.8E-08
Pu_{238}	6.2E-01	2.8E-11	1.7E-11
Ra_{226+8d}	NA	6.0E-06	NA
Ra_{228+1d}	NA	2.9E-06	NA
Rn_{222+4d}	NA	5.9E-06	NA
Sr_{90+1d}	NA	NA	NA
Tc_{99}	NA	6.0E-13	NA
Th_{228+7d}	NA	5.6E-06	NA
Th_{230}	2.4E+00	5.4E-11	1.3E-10
$Th_{232+10d}$	NA	8.5E-06	NA
U_{234}	2.5E-01	3.0E-11	7.5E-12
U_{235+1d}	NA	2.4E-07	NA
U_{238+2d}	NA	5.1E-08	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		5.8E-08

001037

Table C.III–387
Summary of Intake Quantitation (chemicals) Alternative 2
South Field Area with Federal Ownership: Expanded Trespasser
Via Incidental Ingestion of Soil/Sediment

Intake Equation

$$= \frac{CS \times EFa \times EDa \times CF \times IRa}{BWa \times ATa} + \frac{CS \times EFc \times EDc \times CF \times IRc}{BWc \times ATc}$$

IRa	Ingestion rate of soil (adult)	12.5 mg/day
IRc	Ingestion rate of soil (child)	12.5 mg/day
CF	*Conversion factor*	1.00E–06 kg/mg
EFa	Exposure frequency (adult)	40 days/year
EFc	Exposure frequency (child)	110 days/year
EDa	Exposure duration (adult)	32 Year
EDc	Exposure duration (child)	12 Year
BWa	Body weight (adult)	70 kg
BWc	Body weight (child)	43 kg
AT	Average time for carcinogens	25550 days
ATa	Average time for non–carcinogens (adult)	11680 days
ATc	Average time for non–carcinogens (child)	4380 days
CS	Concentration of chemicals in soil	(see table below)

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	2.9E+00	mg/kg	NA	NA	mg/kg
beryllium	2.2E–01	mg/kg	NA	NA	mg/kg
uranium–total	5.1E+01	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor–1254	1.1E–02	mg/kg	NA	NA	mg/kg
aroclor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

Table C.III-387 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Federal Ownership: Expanded Trespasser
Via Incidental Ingestion of Soil/Sediment

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	3.1E-07	3.0E-04	1.0E-03
beryllium	2.3E-08	5.0E-03	4.6E-06
uranium-total	5.5E-06	3.0E-03	1.8E-03
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	1.1E-09	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		2.9E-03

Compound	ILCR Calculation CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	7.0E-08	1.8E+00	1.2E-07
beryllium	5.2E-09	4.3E+00	2.2E-08
uranium-total	1.2E-06	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	2.5E-10	7.7E+00	2.0E-09
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		1.5E-07

001039

Table C.III–388
Summary of Intake and Risk Quantitation (radionuclides) Alternative 2
South Field Area with Federal Ownership: Expanded Trespasser
Via Incidental Ingestion of Soil/Sediment

Intake Equation = CS X EFa X EDa X FI X IRa + CS X EFc X EDc X FI X IRc

IRa	Ingestion rate of soil (adult)	12.5 mg/day
IRc	*Ingestion rate of soil (child)*	12.5 mg/day
EFa	Exposure frequency (adult)	40 days/year
EFc	Exposure frequency (child)	110 days/year
EDa	Exposure Duration	32 Year
EDc	Exposure Duration	12 Year
FI	Fractional Intake	1 (unitless)
CS	Concentration of radionuclides in soil	(see table below)

Cs_{137+1d}	NA	pCi/mg	$Th_{232+10d}$	NA	pCi/mg
Np_{237+1d}	2.0E−04	pCi/mg	U_{234}	4.2E−03	pCi/mg
Pu_{238}	NA	pCi/mg	U_{235+1d}	6.7E−04	pCi/mg
Ra_{226+8d}	2.1E−04	pCi/mg	U_{238+2d}	4.6E−03	pCi/mg
Ra_{228+1d}	6.5E−05	pCi/mg	NA	NA	pCi/mg
Rn_{222+4d}	NA	pCi/mg	NA	NA	pCi/mg
Sr_{90+1d}	1.1E−03	pCi/mg	NA	NA	pCi/mg
Tc_{99}	2.3E−04	pCi/mg	NA	NA	pCi/mg
Th_{228+7d}	NA	pCi/mg	NA	NA	pCi/mg
Th_{230}	9.5E−04	pCi/mg	NA	NA	pCi/mg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E−11	NA
Np_{237+1d}	6.4E+00	2.2E−10	1.4E−09
Pu_{238}	NA	2.2E−10	NA
Ra_{226+8d}	6.7E+00	7.8E−10	5.2E−09
Ra_{228+1d}	2.1E+00	1.0E−10	2.1E−10
Rn_{222+4d}	NA	1.7E−12	NA
Sr_{90+1d}	3.7E+01	3.6E−11	1.3E−09
Tc_{99}	7.6E+00	1.3E−12	9.8E−12
Th_{228+7d}	NA	5.5E−11	NA
Th_{230}	3.1E+01	1.3E−11	4.0E−10
$Th_{232+10d}$	NA	1.7E−10	NA
U_{234}	1.4E+02	1.6E−11	2.2E−09
U_{235+1d}	2.2E+01	1.6E−11	3.5E−10
U_{238+2d}	1.5E+02	2.0E−11	3.0E−09
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 1.4E−08

Table C.III–389
Summary of Intake Quantitation (chemicals) Alternative 2
South Field Area with Federal Ownership: Expanded Trespasser
Via Dermal Contact with Soil/Sediment

Intake Equation = $\frac{CS \times EFa \times EDa \times CF \times ABS \times AF \times SAa}{BWa \times ATa}$ + $\frac{CS \times EFc \times EDc \times CF \times ABS \times AF \times SAc}{BWc \times ATc}$

SA	Surface area of exposed skin (adult)	5750 cm^2/day
SA	Surface area of exposed skin (child)	4200 cm^2/day
AF	Soil to skin adherence factor	1 mg/cm^2
ABS	chemicals specific absorbtion factor (see table below)	csv
CF	Conversion factor	1E–06 kg/mg
EFa	Exposure frequency (adult)	40 days/year
EFc	Exposure frequency (child)	110 days/year
EDa	Exposure duration (adult)	32 Year
EDc	Exposure duration (child)	12 Year
BWa	Body weight (adult)	70 kg
BWc	Body weight (child)	43 kg
AT	Average time for carcinogens	25550 days
ATa	Average time for non–carcinogens (adult)	11680 days
ATc	Average time for non–carcinogens (child)	4380 days
CS	Concentration of chemicals in soil	(see table below)

Chemical Concentrations

Compound	ABS	Concentrati	Units	Compound	ABS	Concentrati	Units
antimony	1.0E–02	NA	mg/kg	NA	NA	NA	mg/kg
arsenic	1.0E–03	2.9E+00	mg/kg	NA	NA	NA	mg/kg
beryllium	1.0E–02	2.2E–01	mg/kg	NA	NA	NA	mg/kg
uranium–total	1.0E–02	5.1E+01	mg/kg	NA	NA	NA	mg/kg
benzo(a)pyrene	3.0E–01	NA	mg/kg	NA	NA	NA	mg/kg
carbazole	3.0E–01	NA	mg/kg	NA	NA	NA	mg/kg
aroclor–1254	6.0E–02	1.1E–02	mg/kg	NA	NA	NA	mg/kg
aroclor–1260	6.0E–02	NA	mg/kg	NA	NA	NA	mg/kg
dieldrin	3.0E–01	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg				

References

0001041

Table C.III-389 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Federal Ownership: Expanded Trespasser
Via Dermal Contact with Soil/Sediment

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	6.0E-05	NA
arsenic	1.1E-07	2.9E-04	4.0E-04
beryllium	8.3E-08	5.0E-03	1.7E-05
uranium-total	2.0E-05	1.5E-04	1.3E-01
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	2.4E-08	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	4.5E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			1.3E-01

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	2.7E-08	1.9E+00	5.1E-08
beryllium	2.0E-08	4.3E+00	8.5E-08
uranium-total	4.7E-06	NA	NA
benzo(a)pyrene	NA	NA	NA
carbazole	NA	2.2E-02	NA
aroclor-1254	5.8E-09	1.0E+01	6.0E-08
aroclor-1260	NA	1.0E+01	NA
dieldrin	NA	1.8E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			2.0E-07

Table C.III–390
Summary of Intake Quantitation (chemicals) Alternative 2
South Field Area with Federal Ownership: Expanded Trespasser
Via Inhalation of Particulates

Intake Equation = $\frac{CS \times EFa \times EDa \times IR \times ETa}{BWa \times ATa}$ + $\frac{CS \times EFc \times EDc \times IR \times ETc}{BWc \times ATc}$

IR	*Inhalation rate of gases*	0.83 m^3/hour
ETa	Exposure time (adult)	1 hour/day
ETc	Exposure time (child)	2 hour/day
EFa	Exposure frequency (adult)	40 days/year
EFc	Exposure frequency (child)	110 days/year
EDa	Exposure duration (adult)	32 Year
EDc	Exposure duration (child)	12 Year
BWa	Body weight (adult)	70 kg
BWc	Body weight (child)	43 kg
AT	Average time for carcinogens	25550 days
ATa	Average time for non–carcinogens (adult)	11680 days
ATc	Average time for non–carcinogens (child)	4380 days
CS	Concentration of chemicals in particulate as modeled	(see table below)

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/m^3	NA	NA	mg/m^3
arsenic	6.1E–08	mg/m^3	NA	NA	mg/m^3
beryllium	4.6E–09	mg/m^3	NA	NA	mg/m^3
uranium–total	1.1E–06	mg/m^3	NA	NA	mg/m^3
benzo(a)pyrene	NA	mg/m^3	NA	NA	mg/m^3
carbazole	NA	mg/m^3	NA	NA	mg/m^3
aroclor–1254	2.3E–10	mg/m^3	NA	NA	mg/m^3
aroclor–1260	NA	mg/m^3	NA	NA	mg/m^3
dieldrin	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3			

References

001043

6646

Table C.III−390 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Federal Ownership: Expanded Trespasser
Via Inhalation of Particulates

Compound	HQ Calculation CDI (mg/kg−day)	RfD (mg/kg−day)	HQ (unitless)
antimony	NA	NA	NA
arsenic	7.9E−10	NA	NA
beryllium	5.9E−11	NA	NA
uranium−total	1.4E−08	NA	NA
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor−1254	3.0E−12	NA	NA
aroclor−1260	NA	NA	NA
dieldrin	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		NA

Compound	ILCR Calculation CDI (mg/kg−day)	CSF (mg/kg−day)$^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	1.6E−10	1.5E+01	2.4E−09
beryllium	1.2E−11	8.4E+00	1.0E−10
uranium−total	2.7E−09	NA	NA
benzo(a)pyrene	NA	6.1E+00	NA
carbazole	NA	NA	NA
aroclor−1254	6.0E−13	NA	NA
aroclor−1260	NA	NA	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		2.5E−09

0004054

Table C.III–391
Summary of Intake and Risk Quantitation (radionuclides) Alternative 2
South Field Area with Federal Ownership: Expanded Trespasser
Via Inhalation of Gases and Particulates

Intake Equation = CA X EFa X EDa X IR X ETa + CA X EFc EDc X IR X ETc

IR	Inhalation rate of gases	0.83 m^3/hour
EFa	Exposure frequency (adult)	40 days/year
EFc	Exposure frequency (child)	110 days/year
EDa	Exposure duration	32 Year
EDc	Exposure duration	12 Year
ETa	Exposure time (adult)	1 hour/day
ETc	Exposure time (child)	2 hour/day
CA	Concentration of radionuclides in air	(see table below)

Cs_{137+1d}	NA	pCi/m^3	$Th_{232+10d}$	NA	pCi/m^3
Np_{237+1d}	2.8E−06	pCi/m^3	U_{234}	9.1E−05	pCi/m^3
Pu_{238}	NA	pCi/m^3	U_{235+1d}	1.5E−05	pCi/m^3
Ra_{226+8d}	3.7E−06	pCi/m^3	U_{238+2d}	9.5E−05	pCi/m^3
Ra_{228+1d}	1.2E−06	pCi/m^3	NA	NA	pCi/m^3
Rn_{222+4d}	1.6E+00	pCi/m^3	NA	NA	pCi/m^3
Sr_{90+1d}	2.3E−05	pCi/m^3	NA	NA	pCi/m^3
Tc_{99}	5.1E−06	pCi/m^3	NA	NA	pCi/m^3
Th_{228+7d}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{230}	1.7E−05	pCi/m^3	NA	NA	pCi/m^3

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	1.9E−11	NA
Np_{237+1d}	9.2E−03	2.9E−08	2.7E−10
Pu_{238}	NA	3.9E−08	NA
Ra_{226+8d}	1.2E−02	7.0E−09	8.3E−11
Ra_{228+1d}	3.8E−03	6.9E−10	2.6E−12
Rn_{222+4d}	5.0E+03	7.7E−12	3.9E−08
Sr_{90+1d}	7.5E−02	6.2E−11	4.6E−12
Tc_{99}	1.6E−02	8.3E−12	1.4E−13
Th_{228+7d}	NA	7.8E−08	NA
Th_{230}	5.4E−02	2.9E−08	1.6E−09
$Th_{232+10d}$	NA	1.1E−07	NA
U_{234}	3.0E−01	2.6E−08	7.7E−09
U_{235+1d}	4.7E−02	2.5E−08	1.2E−09
U_{238+2d}	3.1E−01	2.4E−08	7.4E−09
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
ILCR Summation	=		5.7E−08

001045

Table C.III–392
Summary of Risk Quantitation (radionuclides) Alternative 2
South Field Area with Federal Ownership: Expanded Trespasser
Via External Radiation

Exposure Equation = $[CR \times EFa \times EDa \times ET_{oa} \times (1-SH_o)]+[CR \times EFc \times EDc \times ET_{oc} \times (1-SH_o)]$

EFa	Fraction of year spent exposured (adult)	0.11 (unitless)
EFc	Fraction of year spent exposured (child)	0.3 (unitless)
EDa	Exposure duration (adult)	32 Year
EDc	Exposure duration (child)	12 Year
ET_{oa}	Fraction of day spent outdoors (adult)	0.04 (unitless)
ET_{oc}	Fraction of day spent outdoors (child)	0.08 (unitless)
SH_o	Shield factor outdoors	NA (unitless)
CR	Radionuclide specific concentrations	(see table below)

Cs_{137+1d}	NA	pCi/g	$Th_{232+10d}$	NA	pCi/g
Np_{237+1d}	2.0E−01	pCi/g	U_{234}	4.2E+00	pCi/g
Pu_{238}	NA	pCi/g	U_{235+1d}	6.7E−01	pCi/g
Ra_{226+8d}	2.1E−01	pCi/g	U_{238+2d}	4.6E+00	pCi/g
Ra_{228+1d}	6.5E−02	pCi/g		NA	NA pCi/g
Rn_{222+4d}	NA	pCi/g		NA	NA pCi/g
Sr_{90+1d}	1.1E+00	pCi/g		NA	NA pCi/g
Tc_{99}	2.3E−01	pCi/g		NA	NA pCi/g
Th_{228+7d}	NA	pCi/g		NA	NA pCi/g
Th_{230}	9.5E−01	pCi/g		NA	NA pCi/g

Radionuclides	CDI (year pCi/g)	CSF $(g/pCi-year)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.0E−06	NA
Np_{237+1d}	8.4E−02	4.3E−07	3.6E−08
Pu_{238}	NA	2.8E−11	NA
Ra_{226+8d}	8.8E−02	6.0E−06	5.3E−07
Ra_{228+1d}	2.8E−02	2.9E−06	8.1E−08
Rn_{222+4d}	NA	5.9E−06	NA
Sr_{90+1d}	4.9E−01	NA	NA
Tc_{99}	1.0E−01	6.0E−13	6.0E−14
Th_{228+7d}	NA	5.6E−06	NA
Th_{230}	4.1E−01	5.4E−11	2.2E−11
$Th_{232+10d}$	NA	8.5E−06	NA
U_{234}	1.8E+00	3.0E−11	5.4E−11
U_{235+1d}	2.9E−01	2.4E−07	6.9E−08
U_{238+2d}	2.0E+00	5.1E−08	1.0E−07
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
		ILCR Summation =	8.2E−07

Table C.III–393
Summary of Intake Quantitation (chemicals) Alternative 2
South Field Area with Federal Ownership: Off–Property Farmer (Adult)
Via Drinking Water Ingestion

Intake Equation = $\frac{CS \times EF \times ED \times IR}{BW \times AT}$

IR	Ingestion rate of groundwater (RAGS, 1989)	2 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in groundwater	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/l	NA	NA	mg/l
arsenic	NA	mg/l	NA	NA	mg/l
beryllium	NA	mg/l	NA	NA	mg/l
uranium–total	1.48E–03	mg/l	NA	NA	mg/l
benzo(a)pyrene	NA	mg/l	NA	NA	mg/l
carbazole	NA	mg/l	NA	NA	mg/l
aroclor–1254	NA	mg/l	NA	NA	mg/l
aroclor–1260	NA	mg/l	NA	NA	mg/l
dieldrin	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l			

References

0010472

Table C.III-393 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Federal Ownership: Off-Property Farmer (Adult)
Via Drinking Water Ingestion

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.00E-04	NA
arsenic	NA	3.00E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	4.05E-05	3.00E-03	1.35E-02
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.00E-05	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
HQ Summation =			1.35E-02

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.75E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	4.05E-05	NA	NA
benzo(a)pyrene	NA	7.30E+00	NA
carbazole	NA	2.00E-02	NA
aroclor-1254	NA	7.70E+00	NA
aroclor-1260	NA	7.70E+00	NA
dieldrin	NA	1.60E+01	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
ILCR Summation =			NA

Table C.III–394
Summary of Intake and Risk Quantitation (radionuclides) Alternative 2
South Field Area with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Drinking Water

Intake Equation = Cw X EF X EDn X FI X IR

IR	Ingestion rate of groundwater (RAGS, 1989)	2 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
FI	Fractional intake for radionuclides	1 (Unitless)
Cw	Concentration of radionuclides in groundwater	(see table below)

Cs_{137+1d}	NA	pCi/l	$Th_{232+10d}$	NA	pCi/l
Np_{237+1d}	NA	pCi/l	U_{234}	4.5E–01	pCi/l
Pu_{238}	NA	pCi/l	U_{235+1d}	2.4E–02	pCi/l
Ra_{226+8d}	NA	pCi/l	U_{238+2d}	5.0E–01	pCi/l
Ra_{228+1d}	NA	pCi/l	NA	NA	pCi/l
Rn_{222+4d}	NA	pCi/l	NA	NA	pCi/l
Sr_{90+1d}	NA	pCi/l	NA	NA	pCi/l
Tc_{99}	NA	pCi/l	NA	NA	pCi/l
Th_{228+7d}	NA	pCi/l	NA	NA	pCi/l
Th_{230}	NA	pCi/l	NA	NA	pCi/l

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	NA	2.2E–10	NA
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	NA	1.3E–11	NA
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	2.2E+04	1.6E–11	3.5E–07
U_{235+1d}	1.2E+03	1.6E–11	1.9E–08
U_{238+2d}	2.4E+04	2.0E–11	4.9E–07
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation	=	8.6E–07

001049

Table C.III-395
Summary of Intake Quantitation (chemicals) Alternative 2
South Field Area with Federal Ownership: Off-Property Farmer (Adult)
Via Dermal Contact while Bathing

Intake Equation = $\frac{DA \times EF \times ED \times SA}{BW \times AT}$

DA	Dermal absorbed dose	csv mg/cm^2-day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	25550 days
SA	Skin surface area available for contact	23000 cm^2

Chemical Concentrations

Compound	DA	Units	Compound	DA	Units
antimony	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
arsenic	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
beryllium	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
uranium-total	3.70E-10	mg/cm^2-day	NA	NA	mg/cm^2-day
benzo(a)pyrene	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
carbazole	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
aroclor-1254	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
aroclor-1260	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
dieldrin	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day			

References

001050

Table C.III-395 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Federal Ownership: Off-Property Farmer (Adult)
Via Dermal Contact while Bathing

Compound	HQ Calculation: CDI (mg/kg-day)	HQ Calculation: RfD (mg/kg-day)	HQ Calculation: HQ (unitless)
antimony	NA	6.00E-05	NA
arsenic	NA	2.85E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	1.17E-07	1.50E-04	7.77E-04
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	4.50E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		7.77E-04

Compound	ILCR Calculation: CDI (mg/kg-day)	ILCR Calculation: CSF $(mg/kg\text{-}day)^{-1}$	ILCR Calculation: ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.90E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	1.17E-07	NA	NA
benzo(a)pyrene	NA	NA	NA
carbazole	NA	2.22E-02	NA
aroclor-1254	NA	1.03E+01	NA
aroclor-1260	NA	1.03E+01	NA
dieldrin	NA	1.78E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

Table C.III–396
Summary of Intake Quantitation (chemicals) Alternative 2
South Field Area with Federal Ownership: Off–Property Farmer (Adult)
Via Inhalation of Particulates

Intake Equation = $\frac{CS \times EF \times ED \times IR}{BW \times AT}$

IR	Inhalation rate of gases (RAGS, 1989)	20 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in soil	(see table below)

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/m^3	NA	NA	mg/m^3
arsenic	2.8E–09	mg/m^3	NA	NA	mg/m^3
beryllium	2.1E–10	mg/m^3	NA	NA	mg/m^3
uranium–total	5.2E–08	mg/m^3	NA	NA	mg/m^3
benzo(a)pyrene	NA	mg/m^3	NA	NA	mg/m^3
carbazole	NA	mg/m^3	NA	NA	mg/m^3
aroclor–1254	1.1E–11	mg/m^3	NA	NA	mg/m^3
aroclor–1260	NA	mg/m^3	NA	NA	mg/m^3
dieldrin	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3

References

Table C.III-396 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Federal Ownership: Off-Property Farmer (Adult)
Via Inhalation of Particulates

Compound	HQ Calculation		
	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	NA	NA
arsenic	7.8E-10	NA	NA
beryllium	5.8E-11	NA	NA
uranium-total	1.4E-08	NA	NA
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	2.9E-12	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	Hazard Quotient Sum =		NA

Compound	ILCR Calculation		
	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	7.8E-10	1.5E+01	1.2E-08
beryllium	5.8E-11	8.4E+00	4.9E-10
uranium-total	1.4E-08	NA	NA
benzo(a)pyrene	NA	6.1E+00	NA
carbazole	NA	NA	NA
aroclor-1254	2.9E-12	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		1.2E-08

6646

001053

Table C.III–397
Summary of Intake and Risk Quantitation (radionuclides) Alternative 2
South Field Area with Federal Ownership: Off–Property Farmer (Adult)
Via Inhalation of Gases and Particulates

Intake Equation = Ca X EF X EDn X IR

IR	Inhalation rate of gases (RAGS, 1989)	20 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Ca	Concentration of radionuclides in air	(see table below)

Cs_{137+1d}	NA	pCi/m^3	$Th_{232+10d}$	NA	pCi/m^3
Np_{237+1d}	1.8E–07	pCi/m^3	U_{234}	4.2E–06	pCi/m^3
Pu_{238}	NA	pCi/m^3	U_{235+1d}	6.7E–07	pCi/m^3
Ra_{226+8d}	1.9E–07	pCi/m^3	U_{238+2d}	4.6E–06	pCi/m^3
Ra_{228+1d}	6.1E–08	pCi/m^3	NA	NA	pCi/m^3
Rn_{222+4d}	8.0E–02	pCi/m^3	NA	NA	pCi/m^3
Sr_{90+1d}	1.1E–06	pCi/m^3	NA	NA	pCi/m^3
Tc_{99}	2.3E–07	pCi/m^3	NA	NA	pCi/m^3
Th_{228+7d}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{230}	8.6E–07	pCi/m^3	NA	NA	pCi/m^3

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	1.9E–11	NA
Np_{237+1d}	8.6E–02	2.9E–08	2.5E–09
Pu_{238}	NA	3.9E–08	NA
Ra_{226+8d}	9.3E–02	7.0E–09	6.5E–10
Ra_{228+1d}	3.0E–02	6.9E–10	2.1E–11
Rn_{222+4d}	3.9E+04	7.7E–12	3.0E–07
Sr_{90+1d}	5.5E–01	6.2E–11	3.4E–11
Tc_{99}	1.1E–01	8.3E–12	9.5E–13
Th_{228+7d}	NA	7.8E–08	NA
Th_{230}	4.2E–01	2.9E–08	1.2E–08
$Th_{232+10d}$	NA	1.1E–07	NA
U_{234}	2.1E+00	2.6E–08	5.4E–08
U_{235+1d}	3.3E–01	2.5E–08	8.2E–09
U_{238+2d}	2.2E+00	2.4E–08	5.4E–08
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		4.3E–07

001054

Table C.III–398
Summary of Intake Quantitation (chemicals) Alternative 2
South Field Area with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Meat Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of meat	0.101 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless).
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in meat	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	2.0E–06	mg/kg	NA	NA	mg/kg
beryllium	3.3E–08	mg/kg	NA	NA	mg/kg
uranium–total	1.6E–05	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor–1254	5.9E–08	mg/kg	NA	NA	mg/kg
aroclor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

001055

6646

001056

Table C.III-398 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Federal Ownership: Off-Property Farmer (Adult)
Via Ingestion of Meat Products

Compound	HQ Calculation		
	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	2.1E-09	3.0E-04	7.0E-06
beryllium	3.5E-11	5.0E-03	6.9E-09
uranium-total	1.6E-08	3.0E-03	5.4E-06
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	6.1E-11	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		1.2E-05

Compound	ILCR Calculation		
	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	2.1E-09	1.8E+00	3.7E-09
beryllium	3.5E-11	4.3E+00	1.5E-10
uranium-total	1.6E-08	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	6.1E-11	7.7E+00	4.7E-10
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		4.3E-09

Table C.III–399
Summary of Intake and Risk Quantitation (radionuclides) Alternative 2
South Field Area with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Meat Products

Intake Equation = Cf X EF X EDn X FI X IR

IR	Ingestion rate of meat	0.101 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cf	Concentration of radionuclides in meat	

Cs_{137+1d}	NANA	pCi/kg	$Th_{232+10d}$	NANA	pCi/kg
Np_{237+1d}	7.4E–07	pCi/kg	U_{234}	4.6E–03	pCi/kg
Pu_{238}	NANA	pCi/kg	U_{235+1d}	2.5E–04	pCi/kg
Ra_{226+8d}	6.2E–06	pCi/kg	U_{238+2d}	5.0E–03	pCi/kg
Ra_{228+1d}	1.2E–06	pCi/kg	NANA	NANA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NANA	NANA	pCi/kg
Sr_{90+1d}	9.9E–05	pCi/kg	NANA	NANA	pCi/kg
Tc_{99}	2.8E–04	pCi/kg	NANA	NANA	pCi/kg
Th_{228+7d}	NANA	pCi/kg	NANA	NANA	pCi/kg
Th_{230}	4.7E–07	pCi/kg	NANA	NANA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	1.4E–03	2.2E–10	3.0E–13
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	1.1E–02	7.8E–10	9.0E–12
Ra_{228+1d}	2.2E–03	1.0E–10	2.2E–13
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	1.8E–01	3.6E–11	6.6E–12
Tc_{99}	5.2E–01	1.3E–12	6.8E–13
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	8.7E–04	1.3E–11	1.1E–14
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	8.5E+00	1.6E–11	1.4E–10
U_{235+1d}	4.6E–01	1.6E–11	7.4E–12
U_{238+2d}	9.3E+00	2.0E–11	1.9E–10
NANA	NA	NA	NA
NANA	NA	NA	NA
NANA	NA	NA	NA
NANA	NA	NA	NA
NANA	NA	NA	NA
NANA	NA	NA	NA
ILCR Summation	=		3.5E–10

001057

Table C.III-400
Summary of Intake Quantitation (chemicals) Alternative 2
South Field Area with Federal Ownership: Off-Property Farmer (Adult)
Via Ingestion of Dairy Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of dairy products	0.4 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in animal products	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NANA	mg/kg	NA	NANA	mg/kg
arsenic	6.0E-08	mg/kg	NA	NANA	mg/kg
beryllium	3.0E-11	mg/kg	NA	NANA	mg/kg
uranium-total	5.6E-05	mg/kg	NA	NANA	mg/kg
benzo(a)pyrene	NANA	mg/kg	NA	NANA	mg/kg
carbazole	NANA	mg/kg	NA	NANA	mg/kg
aroclor-1254	1.9E-08	mg/kg	NA	NANA	mg/kg
aroclor-1260	NANA	mg/kg	NA	NANA	mg/kg
dieldrin	NANA	mg/kg	NA	NANA	mg/kg
NANA	NANA	mg/kg	NA	NANA	mg/kg
NANA	NANA	mg/kg	NA	NANA	mg/kg
NANA	NANA	mg/kg	NA	NANA	mg/kg
NANA	NANA	mg/kg	NA	NANA	mg/kg
NANA	NANA	mg/kg	NA	NANA	mg/kg
NANA	NANA	mg/kg	NA	NANA	mg/kg
NANA	NANA	mg/kg			

References

Table C.III-400 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Federal Ownership: Off-Property Farmer (Adult)
Via Ingestion of Dairy Products

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	2.5E-10	3.0E-04	8.3E-07
beryllium	1.2E-13	5.0E-03	2.5E-11
uranium-total	2.3E-07	3.0E-03	7.6E-05
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	7.6E-11	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			7.7E-05

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	2.5E-10	1.8E+00	4.3E-10
beryllium	1.2E-13	4.3E+00	5.3E-13
uranium-total	2.3E-07	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	7.6E-11	7.7E+00	5.9E-10
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			1.0E-09

001059

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Table C.III–401
Summary of Intake and Risk Quantitation (radionuclides) Alternative 2
South Field Area with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Dairy Products

Intake Equation = Cp X EF X EDn X FI X IR

IR	Ingestion rate of dairy products	0.4 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cp	Concentration of radionuclides in animal products	

Cs_{137+1d}	NANA	pCi/kg	$Th_{232+10d}$	NANA	pCi/kg
Np_{237+1d}	6.7E–08	pCi/kg	U_{234}	1.6E–02	pCi/kg
Pu_{238}	NANA	pCi/kg	U_{235+1d}	8.9E–04	pCi/kg
Ra_{226+8d}	1.1E–05	pCi/kg	U_{238+2d}	1.8E–02	pCi/kg
Ra_{228+1d}	2.1E–06	pCi/kg	NANA	NANA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NANA	NANA	pCi/kg
Sr_{90+1d}	5.0E–04	pCi/kg	NANA	NANA	pCi/kg
Tc_{99}	3.3E–04	pCi/kg	NANA	NANA	pCi/kg
Th_{228+7d}	NANA	pCi/kg	NANA	NANA	pCi/kg
Th_{230}	3.9E–07	pCi/kg	NANA	NANA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	5.0E–04	2.2E–10	1.1E–13
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	8.2E–02	7.8E–10	6.4E–11
Ra_{228+1d}	1.6E–02	1.0E–10	1.6E–12
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	3.6E+00	3.6E–11	1.3E–10
Tc_{99}	2.4E+00	1.3E–12	3.2E–12
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	2.9E–03	1.3E–11	3.7E–14
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	1.2E+02	1.6E–11	1.9E–09
U_{235+1d}	6.6E+00	1.6E–11	1.1E–10
U_{238+2d}	1.3E+02	2.0E–11	2.6E–09
NANA	NA	NA	NA
NANA	NA	NA	NA
NANA	NA	NA	NA
NANA	NA	NA	NA
NANA	NA	NA	NA
NANA	NA	NA	NA

ILCR Summation = 4.9E–09

001080

Table C.III–402
Summary of Intake Quantitation (chemicals) Alternative 2
South Field Area with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Vegetables and Fruits

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of fruits or vegetables	0.122 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in vegetables	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NANA	mg/kg	NA	NANA	mg/kg
arsenic	9.6E–06	mg/kg	NA	NANA	mg/kg
beryllium	3.6E–07	mg/kg	NA	NANA	mg/kg
uranium–total	7.3E–03	mg/kg	NA	NANA	mg/kg
benzo(a)pyrene	NANA	mg/kg	NA	NANA	mg/kg
carbazole	NANA	mg/kg	NA	NANA	mg/kg
aroclor–1254	2.2E–08	mg/kg	NA	NANA	mg/kg
aroclor–1260	NANA	mg/kg	NA	NANA	mg/kg
dieldrin	NANA	mg/kg	NA	NANA	mg/kg
NANA	NANA	mg/kg	NA	NANA	mg/kg
NANA	NANA	mg/kg	NA	NANA	mg/kg
NANA	NANA	mg/kg	NA	NANA	mg/kg
NANA	NANA	mg/kg	NA	NANA	mg/kg
NANA	NANA	mg/kg	NA	NANA	mg/kg
NANA	NANA	mg/kg	NA	NANA	mg/kg
NANA	NANA	mg/kg			

References

001061

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Table C.III-402 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Federal Ownership: Off-Property Farmer (Adult)
Via Ingestion of Vegetables and Fruits

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	1.6E-08	3.0E-04	5.3E-05
beryllium	6.0E-10	5.0E-03	1.2E-07
uranium-total	1.2E-05	3.0E-03	4.1E-03
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	3.7E-11	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		4.1E-03

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	1.6E-08	1.8E+00	2.8E-08
beryllium	6.0E-10	4.3E+00	2.6E-09
uranium-total	1.2E-05	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	3.7E-11	7.7E+00	2.9E-10
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		3.1E-08

Table C.III–403
Summary of Intake and Risk Quantitation (radionuclides) Alternative 2
South Field Area with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Vegetables and Fruits

Intake Equation = Cv X EF X EDn X FI X IR

IR	Ingestion rate of fruits or vegetables	0.122 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cv	Concentration of radionuclides in vegetables	

Cs_{137+1d}	NANA	pCi/kg	$Th_{232+10d}$	NANA	pCi/kg
Np_{237+1d}	1.7E–04	pCi/kg	U_{234}	2.2E+00	pCi/kg
Pu_{238}	NANA	pCi/kg	U_{235+1d}	1.2E–01	pCi/kg
Ra_{226+8d}	2.8E–04	pCi/kg	U_{238+2d}	2.4E+00	pCi/kg
Ra_{228+1d}	6.1E–05	pCi/kg	NANA	NANA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NANA	NANA	pCi/kg
Sr_{90+1d}	3.2E–03	pCi/kg	NANA	NANA	pCi/kg
Tc_{99}	3.6E–04	pCi/kg	NANA	NANA	pCi/kg
Th_{228+7d}	NANA	pCi/kg	NANA	NANA	pCi/kg
Th_{230}	9.6E–04	pCi/kg	NANA	NANA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	5.2E–01	2.2E–10	1.1E–10
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	8.2E–01	7.8E–10	6.4E–10
Ra_{228+1d}	1.8E–01	1.0E–10	1.8E–11
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	9.6E+00	3.6E–11	3.4E–10
Tc_{99}	1.1E+00	1.3E–12	1.4E–12
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	2.9E+00	1.3E–11	3.7E–11
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	6.6E+03	1.6E–11	1.1E–07
U_{235+1d}	3.5E+02	1.6E–11	5.6E–09
U_{238+2d}	7.3E+03	2.0E–11	1.5E–07
NANA	NA	NA	NA
NANA	NA	NA	NA
NANA	NA	NA	NA
NANA	NA	NA	NA
NANA	NA	NA	NA
NANA	NA	NA	NA
ILCR Summation	=		2.6E–07

001063

Table C.III-404
Summary of Intake Quantitation (chemicals) Alternative 2
South Field Area with Federal Ownership: Off-Property Farmer (Child)
Via Drinking Water Ingestion

Intake Equation = $\frac{CS \times EF \times ED \times IR}{BW \times AT}$

IR	Ingestion rate of groundwater (RAGS, 1989)	1 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in groundwater	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/l	NA	NA	mg/l
arsenic	NA	mg/l	NA	NA	mg/l
beryllium	NA	mg/l	NA	NA	mg/l
uranium-total	1.48E-03	mg/l	NA	NA	mg/l
benzo(a)pyrene	NA	mg/l	NA	NA	mg/l
carbazole	NA	mg/l	NA	NA	mg/l
aroclor-1254	NA	mg/l	NA	NA	mg/l
aroclor-1260	NA	mg/l	NA	NA	mg/l
dieldrin	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l			

References

Table C.III-404 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Federal Ownership: Off-Property Farmer (Child)
Via Drinking Water Ingestion

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.00E-04	NA
arsenic	NA	3.00E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	9.46E-05	3.00E-03	3.15E-02
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.00E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			3.15E-02

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.75E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	8.11E-06	NA	NA
benzo(a)pyrene	NA	7.30E+00	NA
carbazole	NA	2.00E-02	NA
aroclor-1254	NA	7.70E+00	NA
aroclor-1260	NA	7.70E+00	NA
dieldrin	NA	1.60E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

Table C.III–405
Summary of Intake and Risk Quantitation (radionuclides) Alternative 2
South Field Area with Federal Ownership: Off–Property Farmer (Child)
Via Ingestion of Drinking Water

Intake Equation = Cw X EF X EDn X FI X IR

IR	Ingestion rate of groundwater (RAGS, 1989)	1 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
FI	Fractional intake for radionuclides	1 (Unitless)
Cw	Concentration of radionuclides in groundwater	(see table below)

Cs_{137+1d}	NA	pCi/l	$Th_{232+10d}$	NA	pCi/l
Np_{237+1d}	NA	pCi/l	U_{234}	4.5E–01	pCi/l
Pu_{238}	NA	pCi/l	U_{235+1d}	2.4E–02	pCi/l
Ra_{226+8d}	NA	pCi/l	U_{238+2d}	5.0E–01	pCi/l
Ra_{228+1d}	NA	pCi/l		NA	NA pCi/l
Rn_{222+4d}	NA	pCi/l		NA	NA pCi/l
Sr_{90+1d}	NA	pCi/l		NA	NA pCi/l
Tc_{99}	NA	pCi/l		NA	NA pCi/l
Th_{228+7d}	NA	pCi/l		NA	NA pCi/l
Th_{230}	NA	pCi/l		NA	NA pCi/l

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	NA	2.2E–10	NA
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	NA	1.3E–11	NA
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	9.5E+02	1.6E–11	1.5E–08
U_{235+1d}	5.0E+01	1.6E–11	8.1E–10
U_{238+2d}	1.0E+03	2.0E–11	2.1E–08
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
		ILCR Summation =	3.7E–08

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Table C.III-406
Summary of Intake Quantitation (chemicals) Alternative 2
South Field Area with Federal Ownership: Off-Property Farmer (Child)
Via Dermal Contact while Bathing

Intake Equation = $\frac{DA \times EF \times ED \times SA}{BW \times AT}$

DA	Dermal absorbed dose	csv mg/cm^2-day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	2190 days
SA	Skin surface area available for contact	8000 cm^2

Chemical Concentrations

Compound	DA	Units	Compound	DA	Units
antimony	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
arsenic	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
beryllium	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
uranium-total	3.70E-10	mg/cm^2-day	NA	NA	mg/cm^2-day
benzo(a)pyrene	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
carbazole	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
aroclor-1254	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
aroclor-1260	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
dieldrin	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day			

References

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Table C.III-406 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Federal Ownership: Off-Property Farmer (Child)
Via Dermal Contact while Bathing

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	6.00E-05	NA
arsenic	NA	2.85E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	1.89E-07	1.50E-04	1.26E-03
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	4.50E-05	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
HQ Summation =			1.26E-03

Compound	ILCR Calculation CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.90E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	1.62E-08	NA	NA
benzo(a)pyrene	NA	NA	NA
carbazole	NA	2.22E-02	NA
aroclor-1254	NA	1.03E+01	NA
aroclor-1260	NA	1.03E+01	NA
dieldrin	NA	1.78E+01	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
ILCR Summation =			NA

Table C.III–407
Summary of Intake Quantitation (chemicals) Alternative 2
South Field Area with Federal Ownership: Off–Property Farmer (Child)
Via Inhalation of Particulates

Intake Equation = $\frac{CS \times EF \times ED \times IR}{BW \times AT}$

IR	Inhalation rate of gases (RAGS, 1989)	12 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in soil	(see table below)

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/m^3	NA	NA	mg/m^3
arsenic	2.8E–09	mg/m^3	NA	NA	mg/m^3
beryllium	2.1E–10	mg/m^3	NA	NA	mg/m^3
uranium–total	5.2E–08	mg/m^3	NA	NA	mg/m^3
benzo(a)pyrene	NA	mg/m^3	NA	NA	mg/m^3
carbazole	NA	mg/m^3	NA	NA	mg/m^3
aroclor–1254	1.1E–11	mg/m^3	NA	NA	mg/m^3
aroclor–1260	NA	mg/m^3	NA	NA	mg/m^3
dieldrin	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3			

References

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Table C.III-407 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Federal Ownership: Off-Property Farmer (Child)
Via Inhalation of Particulates

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	NA	NA
arsenic	2.2E-09	NA	NA
beryllium	1.6E-10	NA	NA
uranium-total	4.0E-08	NA	NA
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	8.1E-12	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
Hazard Quotient Sum =			NA

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	1.9E-10	1.5E+01	2.8E-09
beryllium	1.4E-11	8.4E+00	1.2E-10
uranium-total	3.4E-09	NA	NA
benzo(a)pyrene	NA	6.1E+00	NA
carbazole	NA	NA	NA
aroclor-1254	7.0E-13	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			2.9E-09

Table C.III–408
Summary of Intake and Risk Quantitation (radionuclides) Alternative 2
South Field Area with Federal Ownership: Off–Property Farmer (Child)
Via Inhalation of Gases and Particulates

Intake Equation = Ca X EF X EDn X IR

IR	Inhalation rate of gases (RAGS, 1989)	12 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Ca	Concentration of radionuclides in air	(see table below)

Cs_{137+1d}	NA	pCi/m^3	$Th_{232+10d}$	NA	pCi/m^3
Np_{237+1d}	1.8E–07	pCi/m^3	U_{234}	4.2E–06	pCi/m^3
Pu_{238}	NA	pCi/m^3	U_{235+1d}	6.7E–07	pCi/m^3
Ra_{226+8d}	1.9E–07	pCi/m^3	U_{238+2d}	4.6E–06	pCi/m^3
Ra_{228+1d}	6.1E–08	pCi/m^3	NA	NA	pCi/m^3
Rn_{222+4d}	8.0E–02	pCi/m^3	NA	NA	pCi/m^3
Sr_{90+1d}	1.1E–06	pCi/m^3	NA	NA	pCi/m^3
Tc_{99}	2.3E–07	pCi/m^3	NA	NA	pCi/m^3
Th_{228+7d}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{230}	8.6E–07	pCi/m^3	NA	NA	pCi/m^3

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	1.9E–11	NA
Np_{237+1d}	4.4E–03	2.9E–08	1.3E–10
Pu_{238}	NA	3.9E–08	NA
Ra_{226+8d}	4.8E–03	7.0E–09	3.4E–11
Ra_{228+1d}	1.5E–03	6.9E–10	1.1E–12
Rn_{222+4d}	2.0E+03	7.7E–12	1.6E–08
Sr_{90+1d}	2.8E–02	6.2E–11	1.7E–12
Tc_{99}	5.9E–03	8.3E–12	4.9E–14
Th_{228+7d}	NA	7.8E–08	NA
Th_{230}	2.2E–02	2.9E–08	6.3E–10
$Th_{232+10d}$	NA	1.1E–07	NA
U_{234}	1.1E–01	2.6E–08	2.8E–09
U_{235+1d}	1.7E–02	2.5E–08	4.2E–10
U_{238+2d}	1.1E–01	2.4E–08	2.8E–09
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		2.2E–08

Table C.III-409
Summary of Intake Quantitation (chemicals) Alternative 2
South Field Area with Federal Ownership: Off-Property Farmer (Child)
Via Ingestion of Meat Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of meat	0.039 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in meat	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	2.0E-06	mg/kg	NA	NA	mg/kg
beryllium	3.3E-08	mg/kg	NA	NA	mg/kg
uranium-total	1.6E-05	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor-1254	5.9E-08	mg/kg	NA	NA	mg/kg
aroclor-1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

001072

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Table C.III-409 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Federal Ownership: Off-Property Farmer (Child)
Via Ingestion of Meat Products

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	3.8E-09	3.0E-04	1.3E-05
beryllium	6.2E-11	5.0E-03	1.2E-08
uranium-total	2.9E-08	3.0E-03	9.7E-06
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	1.1E-10	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		2.2E-05

Compound	ILCR Calculation CDI (mg/kg-day)	CSF $(mg/kg\text{-}day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	3.2E-10	1.8E+00	5.6E-10
beryllium	5.3E-12	4.3E+00	2.3E-11
uranium-total	2.5E-09	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	9.4E-12	7.7E+00	7.2E-11
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		6.6E-10

0001073

Table C.III–410
Summary of Intake and Risk Quantitation (radionuclides) Alternative 2
South Field Area with Federal Ownership: Off–Property Farmer (Child)
Via Ingestion of Meat Products

Intake Equation = Cf X EF X EDn X FI X IR

IR	Ingestion rate of meat	0.039 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cf	Concentration of radionuclides in meat	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	7.4E–07	pCi/kg	U_{234}	4.6E–03	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	2.5E–04	pCi/kg
Ra_{226+8d}	6.2E–06	pCi/kg	U_{238+2d}	5.0E–03	pCi/kg
Ra_{228+1d}	1.2E–06	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	9.9E–05	pCi/kg	NA	NA	pCi/kg
Tc_{99}	2.8E–04	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	4.7E–07	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	4.6E–05	2.2E–10	1.0E–14
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	3.8E–04	7.8E–10	3.0E–13
Ra_{228+1d}	7.2E–05	1.0E–10	7.2E–15
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	6.1E–03	3.6E–11	2.2E–13
Tc_{99}	1.7E–02	1.3E–12	2.2E–14
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	2.9E–05	1.3E–11	3.7E–16
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	2.8E–01	1.6E–11	4.5E–12
U_{235+1d}	1.5E–02	1.6E–11	2.5E–13
U_{238+2d}	3.1E–01	2.0E–11	6.2E–12
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 1.1E–11

Table C.III-411
Summary of Intake Quantitation (chemicals) Alternative 2
South Field Area with Federal Ownership: Off-Property Farmer (Child)
Via Ingestion of Dairy Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of dairy products	0.9 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in animal products	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	6.0E-08	mg/kg	NA	NA	mg/kg
beryllium	3.0E-11	mg/kg	NA	NA	mg/kg
uranium-total	5.6E-05	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor-1254	1.9E-08	mg/kg	NA	NA	mg/kg
aroclor-1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

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Table C.III-411 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Federal Ownership: Off-Property Farmer (Child)
Via Ingestion of Dairy Products

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	2.6E-09	3.0E-04	8.7E-06
beryllium	1.3E-12	5.0E-03	2.6E-10
uranium-total	2.4E-06	3.0E-03	8.0E-04
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	8.0E-10	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			8.1E-04

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	2.2E-10	1.8E+00	3.9E-10
beryllium	1.1E-13	4.3E+00	4.8E-13
uranium-total	2.1E-07	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	6.9E-11	7.7E+00	5.3E-10
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			9.2E-10

Table C.III–412
Summary of Intake and Risk Quantitation (radionuclides) Alternative 2
South Field Area with Federal Ownership: Off–Property Farmer (Child)
Via Ingestion of Dairy Products

ntake Equation = Cp X EF X EDn X FI X IR

IR	Ingestion rate of dairy products	0.9 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cp	Concentration of radionuclides in animal products	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	6.7E–08	pCi/kg	U_{234}	1.6E–02	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	8.9E–04	pCi/kg
Ra_{226+8d}	1.1E–05	pCi/kg	U_{238+2d}	1.8E–02	pCi/kg
Ra_{228+1d}	2.1E–06	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	5.0E–04	pCi/kg	NA	NA	pCi/kg
Tc_{99}	3.3E–04	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	3.9E–07	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	9.6E–05	2.2E–10	2.1E–14
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	1.6E–02	7.8E–10	1.2E–11
Ra_{228+1d}	3.0E–03	1.0E–10	3.0E–13
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	7.0E–01	3.6E–11	2.5E–11
Tc_{99}	4.7E–01	1.3E–12	6.1E–13
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	5.5E–04	1.3E–11	7.2E–15
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	2.3E+01	1.6E–11	3.7E–10
U_{235+1d}	1.3E+00	1.6E–11	2.0E–11
U_{238+2d}	2.6E+01	2.0E–11	5.1E–10
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		9.4E–10

001077

Table C.III-413
Summary of Intake Quantitation (chemicals) Alternative 2
South Field Area with Federal Ownership: Off-Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of fruits or vegetables	0.1 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in vegetables	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	9.6E-06	mg/kg	NA	NA	mg/kg
beryllium	3.6E-07	mg/kg	NA	NA	mg/kg
uranium-total	7.3E-03	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor-1254	2.2E-08	mg/kg	NA	NA	mg/kg
aroclor-1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

001078

Table C.III-413 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Federal Ownership: Off-Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	6.1E-08	3.0E-04	2.0E-04
beryllium	2.3E-09	5.0E-03	4.6E-07
uranium-total	4.7E-05	3.0E-03	1.6E-02
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	1.4E-10	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			1.6E-02

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	5.2E-09	1.8E+00	9.2E-09
beryllium	2.0E-10	4.3E+00	8.4E-10
uranium-total	4.0E-06	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	1.2E-11	7.7E+00	9.4E-11
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			1.0E-08

001079

6646

Table C.III–414
Summary of Intake and Risk Quantitation (radionuclides) Alternative 2
South Field Area with Federal Ownership: Off–Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

Intake Equation = Cv X EF X EDn X FI X IR

IR	Ingestion rate of fruits or vegetables	0.1 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cv	Concentration of radionuclides in vegetables	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	1.7E–04	pCi/kg	U_{234}	2.2E+00	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	1.2E–01	pCi/kg
Ra_{226+8d}	2.8E–04	pCi/kg	U_{238+2d}	2.4E+00	pCi/kg
Ra_{228+1d}	6.1E–05	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	3.2E–03	pCi/kg	NA	NA	pCi/kg
Tc_{99}	3.6E–04	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	9.6E–04	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	3.7E–02	2.2E–10	8.0E–12
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	5.8E–02	7.8E–10	4.5E–11
Ra_{228+1d}	1.3E–02	1.0E–10	1.3E–12
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	6.7E–01	3.6E–11	2.4E–11
Tc_{99}	7.6E–02	1.3E–12	9.9E–14
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	2.0E–01	1.3E–11	2.6E–12
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	4.6E+02	1.6E–11	7.4E–09
U_{235+1d}	2.5E+01	1.6E–11	4.0E–10
U_{238+2d}	5.1E+02	2.0E–11	1.0E–08
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 1.8E–08

Table C.III–415
Summary of Intake Quantitation (chemicals) Alternative 3
South Field Area with Federal Ownership: Expanded Trespasser
Via Incidental Ingestion of Soil/Sediment

Intake Equation

$$= \frac{CS \times EFa \times EDa \times CF \times IRa}{BWa \times ATa} + \frac{CS \times EFc \times EDc \times CF \times IRc}{BWc \times ATc}$$

IRa	Ingestion rate of soil (adult)	12.5 mg/day
IRc	Ingestion rate of soil (child)	12.5 mg/day
CF	Conversion factor	1.00E–06 kg/mg
EFa	Exposure frequency (adult)	40 days/year
EFc	Exposure frequency (child)	110 days/year
EDa	Exposure duration (adult)	32 Year
EDc	Exposure duration (child)	12 Year
BWa	Body weight (adult)	70 kg
BWc	Body weight (child)	43 kg
AT	Average time for carcinogens	25550 days
ATa	Average time for non–carcinogens (adult)	11680 days
ATc	Average time for non–carcinogens (child)	4380 days
CS	Concentration of chemicals in soil	(see table below)

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	2.6E+00	mg/kg	NA	NA	mg/kg
beryllium	2.4E–01	mg/kg	NA	NA	mg/kg
uranium–total	4.3E+00	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	4.4E–01	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor–1254	1.1E–01	mg/kg	NA	NA	mg/kg
aroclor–1260	9.3E–03	mg/kg	NA	NA	mg/kg
dieldrin	2.4E–03	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

001081

Table C.III-415 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Federal Ownership: Expanded Trespasser
Via Incidental Ingestion of Soil/Sediment

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	2.8E-07	3.0E-04	9.2E-04
beryllium	2.6E-08	5.0E-03	5.2E-06
uranium-total	4.6E-07	3.0E-03	1.5E-04
benzo(a)pyrene	4.7E-08	NA	NA
carbazole	NA	NA	NA
aroclor-1254	1.2E-08	NA	NA
aroclor-1260	1.0E-09	NA	NA
dieldrin	2.6E-10	5.0E-05	5.1E-06
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		1.1E-03

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg\text{-}day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	6.2E-08	1.8E+00	1.1E-07
beryllium	5.9E-09	4.3E+00	2.5E-08
uranium-total	1.0E-07	NA	NA
benzo(a)pyrene	1.1E-08	7.3E+00	7.7E-08
carbazole	NA	2.0E-02	NA
aroclor-1254	2.7E-09	7.7E+00	2.1E-08
aroclor-1260	2.2E-10	7.7E+00	1.7E-09
dieldrin	5.8E-11	1.6E+01	9.2E-10
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		2.3E-07

Table C.III–416
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
South Field Area with Federal Ownership: Expanded Trespasser
Via Incidental Ingestion of Soil/Sediment

Intake Equation = CS X EFa X EDa X FI X IRa + CS X EFc X EDc X FI X IRc

IRa	Ingestion rate of soil (adult)	12.5 mg/day
IRc	Ingestion rate of soil (child)	12.5 mg/day
EFa	Exposure frequency (adult)	40 days/year
EFc	Exposure frequency (child)	110 days/year
EDa	Exposure Duration	32 Year
EDc	Exposure Duration	12 Year
FI	Fractional Intake	1 (unitless)
CS	Concentration of radionuclides in soil	(see table below)

Cs_{137+1d}	NA	pCi/mg	$Th_{232+10d}$	3.4E–05	pCi/mg
Np_{237+1d}	1.9E–04	pCi/mg	U_{234}	1.4E–03	pCi/mg
Pu_{238}	NA	pCi/mg	U_{235+1d}	1.3E–03	pCi/mg
Ra_{226+8d}	1.7E–04	pCi/mg	U_{238+2d}	9.5E–04	pCi/mg
Ra_{228+1d}	2.2E–04	pCi/mg	NA	NA	pCi/mg
Rn_{222+4d}	NA	pCi/mg	NA	NA	pCi/mg
Sr_{90+1d}	1.3E–03	pCi/mg	NA	NA	pCi/mg
Tc_{99}	4.0E–04	pCi/mg	NA	NA	pCi/mg
Th_{228+7d}	9.1E–05	pCi/mg	NA	NA	pCi/mg
Th_{230}	3.6E–03	pCi/mg	NA	NA	pCi/mg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	6.1E+00	2.2E–10	1.3E–09
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	5.5E+00	7.8E–10	4.3E–09
Ra_{228+1d}	7.3E+00	1.0E–10	7.3E–10
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	4.1E+01	3.6E–11	1.5E–09
Tc_{99}	1.3E+01	1.3E–12	1.7E–11
Th_{228+7d}	2.9E+00	5.5E–11	1.6E–10
Th_{230}	1.2E+02	1.3E–11	1.5E–09
$Th_{232+10d}$	1.1E+00	1.7E–10	1.9E–10
U_{234}	4.7E+01	1.6E–11	7.5E–10
U_{235+1d}	4.2E+01	1.6E–11	6.7E–10
U_{238+2d}	3.1E+01	2.0E–11	6.2E–10
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 1.2E–08

001083

Table C.III-417
Summary of Intake Quantitation (chemicals) Alternative 3
South Field Area with Federal Ownership: Expanded Trespasser
Via Dermal Contact with Soil/Sediment

Intake Equation = $\frac{CS \times EFa \times EDa \times CF \times ABS \times AF \times SAa}{BWa \times ATa}$ + $\frac{CS \times EFc \times EDc \times CF \times ABS \times AF \times SAc}{BWc \times ATc}$

SA	Surface area of exposed skin (adult)	5750 cm^2/day
SA	Surface area of exposed skin (child)	4200 cm^2/day
AF	Soil to skin adherence factor	1 mg/cm^2
ABS	chemicals specific absorbtion factor (see table below)	csv
CF	Conversion factor	1E-06 kg/mg
EFa	Exposure frequency (adult)	40 days/year
EFc	Exposure frequency (child)	110 days/year
EDa	Exposure duration (adult)	32 Year
EDc	Exposure duration (child)	12 Year
BWa	Body weight (adult)	70 kg
BWc	Body weight (child)	43 kg
AT	Average time for carcinogens	25550 days
ATa	Average time for non-carcinogens (adult)	11680 days
ATc	Average time for non-carcinogens (child)	4380 days
CS	Concentration of chemicals in soil	(see table below)

Chemical Concentrations

Compound	ABS	Concentrati	Units	Compound	ABS	Concentrati	Units
antimony	1.0E-02	NA	mg/kg	NA	NA	NA	mg/kg
arsenic	1.0E-03	2.6E+00	mg/kg	NA	NA	NA	mg/kg
beryllium	1.0E-02	2.4E-01	mg/kg	NA	NA	NA	mg/kg
uranium-total	1.0E-02	4.3E+00	mg/kg	NA	NA	NA	mg/kg
benzo(a)pyrene	3.0E-01	4.4E-01	mg/kg	NA	NA	NA	mg/kg
carbazole	3.0E-01	NA	mg/kg	NA	NA	NA	mg/kg
aroclor-1254	6.0E-02	1.1E-01	mg/kg	NA	NA	NA	mg/kg
aroclor-1260	6.0E-02	9.3E-03	mg/kg	NA	NA	NA	mg/kg
dieldrin	3.0E-01	2.4E-03	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg				

References

Table C.III-417 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Federal Ownership: Expanded Trespasser
Via Dermal Contact with Soil/Sediment

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	6.0E-05	NA
arsenic	9.9E-08	2.9E-04	3.5E-04
beryllium	9.4E-08	5.0E-03	1.9E-05
uranium-total	1.6E-06	1.5E-04	1.1E-02
benzo(a)pyrene	5.1E-06	NA	NA
carbazole	NA	NA	NA
aroclor-1254	2.6E-07	NA	NA
aroclor-1260	2.1E-08	NA	NA
dieldrin	2.8E-08	4.5E-05	6.2E-04
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			1.2E-02

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	2.4E-08	1.9E+00	4.5E-08
beryllium	2.2E-08	4.3E+00	9.6E-08
uranium-total	3.9E-07	NA	NA
benzo(a)pyrene	1.2E-06	NA	NA
carbazole	NA	2.2E-02	NA
aroclor-1254	6.2E-08	1.0E+01	6.4E-07
aroclor-1260	5.1E-09	1.0E+01	5.2E-08
dieldrin	6.6E-09	1.8E+01	1.2E-07
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			9.5E-07

001085

Table C.III–418
Summary of Intake Quantitation (chemicals) Alternative 3
South Field Area with Federal Ownership: Expanded Trespasser
Via Inhalation of Gases and Particulates

Intake Equation = $\frac{CS \times EFa \times EDa \times IR \times ETa}{BWa \times ATa}$ + $\frac{CS \times EFc \times EDc \times IR \times ETc}{BWc \times ATc}$

IR	Inhalation rate of gases	0.83 m^3/hour
ETa	Exposure time (adult)	1 hour/day
ETc	Exposure time (child)	2 hour/day
EFa	Exposure frequency (adult)	40 days/year
EFc	Exposure frequency (child)	110 days/year
EDa	Exposure duration (adult)	32 Year
EDc	Exposure duration (child)	12 Year
BWa	Body weight (adult)	70 kg
BWc	Body weight (child)	43 kg
AT	Average time for carcinogens	25550 days
ATa	Average time for non–carcinogens (adult)	11680 days
ATc	Average time for non–carcinogens (child)	4380 days
CS	Concentration of chemicals in particulate as modeled	(see table below)

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/m^3	NA	NA	mg/m^3
arsenic	8.2E–08	mg/m^3	NA	NA	mg/m^3
beryllium	6.3E–09	mg/m^3	NA	NA	mg/m^3
uranium–total	7.0E–08	mg/m^3	NA	NA	mg/m^3
benzo(a)pyrene	1.3E–08	mg/m^3	NA	NA	mg/m^3
carbazole	NA	mg/m^3	NA	NA	mg/m^3
aroclor–1254	3.3E–09	mg/m^3	NA	NA	mg/m^3
aroclor–1260	2.8E–10	mg/m^3	NA	NA	mg/m^3
dieldrin	7.2E–11	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3			

References

Table C.III-418 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Federal Ownership: Expanded Trespasser
Via Inhalation of Gases and Particulates

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	NA	NA
arsenic	1.1E-09	NA	NA
beryllium	8.2E-11	NA	NA
uranium-total	9.1E-10	NA	NA
benzo(a)pyrene	1.7E-10	NA	NA
carbazole	NA	NA	NA
aroclor-1254	4.2E-11	NA	NA
aroclor-1260	3.6E-12	NA	NA
dieldrin	9.3E-13	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		NA

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	2.1E-10	1.5E+01	3.2E-09
beryllium	1.6E-11	8.4E+00	1.4E-10
uranium-total	1.8E-10	NA	NA
benzo(a)pyrene	3.4E-11	6.1E+00	2.1E-10
carbazole	NA	NA	NA
aroclor-1254	8.4E-12	NA	NA
aroclor-1260	7.3E-13	NA	NA
dieldrin	1.9E-13	1.6E+01	3.0E-12
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		3.5E-09

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Table C.III–419
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
South Field Area with Federal Ownership: Expanded Trespasser
Via Inhalation of Gases and Particulates

Intake Equation = CA X EFa X EDa X IR X ETa + CA X EFc EDc X IR X ETc

IR	Inhalation rate of gases	0.83 m^3/hour
EFa	Exposure frequency (adult)	40 days/year
EFc	Exposure frequency (child)	110 days/year
EDa	Exposure duration	32 Year
EDc	Exposure duration	12 Year
ETa	Exposure time (adult)	1 hour/day
ETc	Exposure time (child)	2 hour/day
CA	Concentration of radionuclides in air	(see table below)

Cs_{137+1d}	NA	pCi/m^3	$Th_{232+10d}$	1.0E−06	pCi/m^3
Np_{237+1d}	3.6E−06	pCi/m^3	U_{234}	3.1E−05	pCi/m^3
Pu_{238}	NA	pCi/m^3	U_{235+1d}	2.9E−05	pCi/m^3
Ra_{226+8d}	3.7E−06	pCi/m^3	U_{238+2d}	2.0E−05	pCi/m^3
Ra_{228+1d}	5.9E−06	pCi/m^3	NA	NA	pCi/m^3
Rn_{222+4d}	1.7E+00	pCi/m^3	NA	NA	pCi/m^3
Sr_{90+1d}	3.0E−05	pCi/m^3	NA	NA	pCi/m^3
Tc_{99}	8.7E−06	pCi/m^3	NA	NA	pCi/m^3
Th_{228+7d}	2.7E−06	pCi/m^3	NA	NA	pCi/m^3
Th_{230}	9.3E−05	pCi/m^3	NA	NA	pCi/m^3

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	1.9E−11	NA
Np_{237+1d}	1.2E−02	2.9E−08	3.4E−10
Pu_{238}	NA	3.9E−08	NA
Ra_{226+8d}	1.2E−02	7.0E−09	8.4E−11
Ra_{228+1d}	1.9E−02	6.9E−10	1.3E−11
Rn_{222+4d}	5.5E+03	7.7E−12	4.2E−08
Sr_{90+1d}	9.7E−02	6.2E−11	6.0E−12
Tc_{99}	2.8E−02	8.3E−12	2.3E−13
Th_{228+7d}	8.9E−03	7.8E−08	6.9E−10
Th_{230}	3.0E−01	2.9E−08	8.8E−09
$Th_{232+10d}$	3.4E−03	1.1E−07	3.7E−10
U_{234}	1.0E−01	2.6E−08	2.6E−09
U_{235+1d}	9.5E−02	2.5E−08	2.4E−09
U_{238+2d}	6.4E−02	2.4E−08	1.5E−09
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		5.9E−08

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Table C.III–420
Summary of Risk Quantitation (radionuclides) Alternative 3
South Field Area with Federal Ownership: Expanded Trespasser
Via External Radiation

Exposure Equation = $[CR \times EFa \times EDa \times ET_{oa} \times (1-SH_o)]+[CR \times EFc \times EDc \times ET_{oc} \times (1-SH_o)]$

EFa	Fraction of year spent exposured (adult)	0.11 (unitless)
EFc	Fraction of year spent exposured (child)	0.3 (unitless)
EDa	Exposure duration (adult)	32 Year
EDc	Exposure duration (child)	12 Year
ET_{oa}	Fraction of day spent outdoors (adult)	0.04 (unitless)
ET_{oc}	Fraction of day spent outdoors (child)	0.08 (unitless)
SH_o	Shield factor outdoors	NA (unitless)
CR	Radionuclide specific concentrations	(see table below)

Cs_{137+1d}	NA	pCi/g	$Th_{232+10d}$	3.4E−02	pCi/g
Np_{237+1d}	1.9E−01	pCi/g	U_{234}	1.4E+00	pCi/g
Pu_{238}	NA	pCi/g	U_{235+1d}	1.3E+00	pCi/g
Ra_{226+8d}	1.7E−01	pCi/g	U_{238+2d}	9.5E−01	pCi/g
Ra_{228+1d}	2.2E−01	pCi/g	NA	NA	pCi/g
Rn_{222+4d}	NA	pCi/g	NA	NA	pCi/g
Sr_{90+1d}	1.3E+00	pCi/g	NA	NA	pCi/g
Tc_{99}	4.0E−01	pCi/g	NA	NA	pCi/g
Th_{228+7d}	9.1E−02	pCi/g	NA	NA	pCi/g
Th_{230}	3.6E+00	pCi/g	NA	NA	pCi/g

Radionuclides	CDI (year pCi/g)	CSF $(g/pCi-year)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.0E−06	NA
Np_{237+1d}	8.1E−02	4.3E−07	3.5E−08
Pu_{238}	NA	2.8E−11	NA
Ra_{226+8d}	7.2E−02	6.0E−06	4.3E−07
Ra_{228+1d}	9.6E−02	2.9E−06	2.8E−07
Rn_{222+4d}	NA	5.9E−06	NA
Sr_{90+1d}	5.4E−01	NA	NA
Tc_{99}	1.7E−01	6.0E−13	1.0E−13
Th_{228+7d}	3.9E−02	5.6E−06	2.2E−07
Th_{230}	1.6E+00	5.4E−11	8.4E−11
$Th_{232+10d}$	1.5E−02	8.5E−06	1.3E−07
U_{234}	6.2E−01	3.0E−11	1.9E−11
U_{235+1d}	5.5E−01	2.4E−07	1.3E−07
U_{238+2d}	4.1E−01	5.1E−08	2.1E−08
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		1.2E−06

Table C.III–421
Summary of Intake Quantitation (chemicals) Alternative 3
South Field Area with Federal Ownership: Off–Property Farmer (Adult)
Via Drinking Water Ingestion

Intake Equation = $\frac{CS \times EF \times ED \times IR}{BW \times AT}$

IR	Ingestion rate of groundwater (RAGS, 1989)	2 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in groundwater	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/l	NA	NA	mg/l
arsenic	NA	mg/l	NA	NA	mg/l
beryllium	NA	mg/l	NA	NA	mg/l
uranium–total	2.16E–03	mg/l	NA	NA	mg/l
benzo(a)pyrene	NA	mg/l	NA	NA	mg/l
carbazole	NA	mg/l	NA	NA	mg/l
aroclor–1254	NA	mg/l	NA	NA	mg/l
aroclor–1260	NA	mg/l	NA	NA	mg/l
dieldrin	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l			

References

Table C.III-421 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Federal Ownership: Off-Property Farmer (Adult)
Via Drinking Water Ingestion

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.00E-04	NA
arsenic	NA	3.00E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	5.92E-05	3.00E-03	1.97E-02
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.00E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			1.97E-02

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.75E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	5.92E-05	NA	NA
benzo(a)pyrene	NA	7.30E+00	NA
carbazole	NA	2.00E-02	NA
aroclor-1254	NA	7.70E+00	NA
aroclor-1260	NA	7.70E+00	NA
dieldrin	NA	1.60E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

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Table C.III–422
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
South Field Area with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Drinking Water

Intake Equation = Cw X EF X EDn X FI X IR

IR	Ingestion rate of groundwater (RAGS, 1989)	2 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
FI	Fractional intake for radionuclides	1 (Unitless)
Cw	Concentration of radionuclides in groundwater	(see table below)

Cs_{137+1d}	NA	pCi/l	$Th_{232+10d}$	NA	pCi/l
Np_{237+1d}	NA	pCi/l	U_{234}	6.6E–01	pCi/l
Pu_{238}	NA	pCi/l	U_{235+1d}	3.5E–02	pCi/l
Ra_{226+8d}	NA	pCi/l	U_{238+2d}	7.2E–01	pCi/l
Ra_{228+1d}	NA	pCi/l	NA	NA	pCi/l
Rn_{222+4d}	NA	pCi/l	NA	NA	pCi/l
Sr_{90+1d}	NA	pCi/l	NA	NA	pCi/l
Tc_{99}	NA	pCi/l	NA	NA	pCi/l
Th_{228+7d}	NA	pCi/l	NA	NA	pCi/l
Th_{230}	NA	pCi/l	NA	NA	pCi/l

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	NA	2.2E–10	NA
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	NA	1.3E–11	NA
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	3.2E+04	1.6E–11	5.1E–07
U_{235+1d}	1.7E+03	1.6E–11	2.7E–08
U_{238+2d}	3.5E+04	2.0E–11	7.1E–07
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 1.2E–06

001092

Table C.III–423
Summary of Intake Quantitation (chemicals) Alternative 3
South Field Area with Federal Ownership: Off–Property Farmer (Adult)
Via Dermal Contact while Bathing

Intake Equation = $\frac{DA \times EF \times ED \times SA}{BW \times AT}$

DA	Dermal absorbed dose	csv mg/cm^2–day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
SA	Skin surface area available for contact	23000 cm^2

Chemical Concentrations

Compound	DA	Units	Compound	DA	Units
antimony	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
arsenic	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
beryllium	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
uranium–total	5.40E–10	mg/cm^2–day	NA	NA	mg/cm^2–day
benzo(a)pyrene	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
carbazole	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
aroclor–1254	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
aroclor–1260	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
dieldrin	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day			

References

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Table C.III-423 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Federal Ownership: Off-Property Farmer (Adult)
Via Dermal Contact while Bathing

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	6.00E-05	NA
arsenic	NA	2.85E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	1.70E-07	1.50E-04	1.13E-03
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	4.50E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		1.13E-03

Compound	ILCR Calculation CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.90E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	1.70E-07	NA	NA
benzo(a)pyrene	NA	NA	NA
carbazole	NA	2.22E-02	NA
aroclor-1254	NA	1.03E+01	NA
aroclor-1260	NA	1.03E+01	NA
dieldrin	NA	1.78E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

Table C.III–424
Summary of Intake Quantitation (chemicals) Alternative 3
South Field Area with Federal Ownership: Off–Property Farmer (Adult)
Via Inhalation of Particulates

Intake Equation = $\frac{CS \times EF \times ED \times IR}{BW \times AT}$

IR	Inhalation rate of gases (RAGS, 1989)	20 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in soil	(see table below)

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/m^3	NA	NA	mg/m^3
arsenic	4.3E–09	mg/m^3	NA	NA	mg/m^3
beryllium	3.2E–10	mg/m^3	NA	NA	mg/m^3
uranium–total	5.7E–09	mg/m^3	NA	NA	mg/m^3
benzo(a)pyrene	4.8E–10	mg/m^3	NA	NA	mg/m^3
carbazole	NA	mg/m^3	NA	NA	mg/m^3
aroclor–1254	1.2E–10	mg/m^3	NA	NA	mg/m^3
aroclor–1260	1.0E–11	mg/m^3	NA	NA	mg/m^3
dieldrin	2.6E–12	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3			

References

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Table C.III-424 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Federal Ownership: Off-Property Farmer (Adult)
Via Inhalation of Particulates

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	NA	NA
arsenic	1.2E-09	NA	NA
beryllium	8.8E-11	NA	NA
uranium-total	1.6E-09	NA	NA
benzo(a)pyrene	1.3E-10	NA	NA
carbazole	NA	NA	NA
aroclor-1254	3.4E-11	NA	NA
aroclor-1260	2.8E-12	NA	NA
dieldrin	7.0E-13	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
Hazard Quotient Sum =			NA

Compound	ILCR Calculation CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	1.2E-09	1.5E+01	1.8E-08
beryllium	8.8E-11	8.4E+00	7.4E-10
uranium-total	1.6E-09	NA	NA
benzo(a)pyrene	1.3E-10	6.1E+00	8.0E-10
carbazole	NA	NA	NA
aroclor-1254	3.4E-11	NA	NA
aroclor-1260	2.8E-12	NA	NA
dieldrin	7.0E-13	1.6E+01	1.1E-11
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
ILCR Summation =			1.9E-08

Table C.III–425
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
South Field Area with Federal Ownership: Off–Property Farmer (Adult)
Via Inhalation of Gases and Particulates

Intake Equation = Ca X EF X EDn X IR

IR	Inhalation rate of gases (RAGS, 1989)	20 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Ca	Concentration of radionuclides in air	(see table below)

Cs_{137+1d}	NA	pCi/m^3	$Th_{232+10d}$	3.7E–08	pCi/m^3
Np_{237+1d}	2.5E–07	pCi/m^3	U_{234}	1.7E–06	pCi/m^3
Pu_{238}	NA	pCi/m^3	U_{235+1d}	1.4E–06	pCi/m^3
Ra_{226+8d}	1.9E–07	pCi/m^3	U_{238+2d}	1.1E–06	pCi/m^3
Ra_{228+1d}	2.4E–07	pCi/m^3	NA	NA	pCi/m^3
Rn_{222+4d}	8.7E–02	pCi/m^3	NA	NA	pCi/m^3
Sr_{90+1d}	1.6E–06	pCi/m^3	NA	NA	pCi/m^3
Tc_{99}	4.4E–07	pCi/m^3	NA	NA	pCi/m^3
Th_{228+7d}	9.8E–08	pCi/m^3	NA	NA	pCi/m^3
Th_{230}	3.9E–06	pCi/m^3	NA	NA	pCi/m^3

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	1.9E–11	NA
Np_{237+1d}	1.2E–01	2.9E–08	3.6E–09
Pu_{238}	NA	3.9E–08	NA
Ra_{226+8d}	9.3E–02	7.0E–09	6.5E–10
Ra_{228+1d}	1.2E–01	6.9E–10	8.2E–11
Rn_{222+4d}	4.3E+04	7.7E–12	3.3E–07
Sr_{90+1d}	7.9E–01	6.2E–11	4.9E–11
Tc_{99}	2.2E–01	8.3E–12	1.8E–12
Th_{228+7d}	4.8E–02	7.8E–08	3.8E–09
Th_{230}	1.9E+00	2.9E–08	5.5E–08
$Th_{232+10d}$	1.8E–02	1.1E–07	2.0E–09
U_{234}	8.1E–01	2.6E–08	2.1E–08
U_{235+1d}	7.1E–01	2.5E–08	1.8E–08
U_{238+2d}	5.3E–01	2.4E–08	1.3E–08
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		4.5E–07

001097

Table C.III-426
Summary of Intake Quantitation (chemicals) Alternative 3
South Field Area with Federal Ownership: Off-Property Farmer (Adult)
Via Ingestion of Meat Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of meat	0.101 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in meat	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	3.0E-06	mg/kg	NA	NA	mg/kg
beryllium	5.0E-08	mg/kg	NA	NA	mg/kg
uranium-total	2.2E-05	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	1.9E-06	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor-1254	6.8E-07	mg/kg	NA	NA	mg/kg
aroclor-1260	9.9E-07	mg/kg	NA	NA	mg/kg
dieldrin	1.7E-10	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

Table C.III-426 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Federal Ownership: Off-Property Farmer (Adult)
Via Ingestion of Meat Products

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	3.1E-09	3.0E-04	1.0E-05
beryllium	5.2E-11	5.0E-03	1.0E-08
uranium-total	2.3E-08	3.0E-03	7.5E-06
benzo(a)pyrene	2.0E-09	NA	NA
carbazole	NA	NA	NA
aroclor-1254	7.1E-10	NA	NA
aroclor-1260	1.0E-09	NA	NA
dieldrin	1.8E-13	5.0E-05	3.6E-09
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		1.8E-05

Compound	ILCR Calculation CDI (mg/kg-day)	CSF (mg/kg-day)$^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	3.1E-09	1.8E+00	5.5E-09
beryllium	5.2E-11	4.3E+00	2.3E-10
uranium-total	2.3E-08	NA	NA
benzo(a)pyrene	2.0E-09	7.3E+00	1.4E-08
carbazole	NA	2.0E-02	NA
aroclor-1254	7.1E-10	7.7E+00	5.4E-09
aroclor-1260	1.0E-09	7.7E+00	7.9E-09
dieldrin	1.8E-13	1.6E+01	2.9E-12
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		3.3E-08

Table C.III–427
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
South Field Area with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Meat Products

Intake Equation = Cf X EF X EDn X FI X IR

IR	Ingestion rate of meat	0.101 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cf	Concentration of radionuclides in meat	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	2.0E–08	pCi/kg
Np_{237+1d}	1.1E–06	pCi/kg	U_{234}	6.6E–03	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	3.7E–04	pCi/kg
Ra_{226+8d}	6.2E–06	pCi/kg	U_{238+2d}	7.2E–03	pCi/kg
Ra_{228+1d}	4.7E–06	pCi/kg		NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg		NA	pCi/kg
Sr_{90+1d}	1.4E–04	pCi/kg		NA	pCi/kg
Tc_{99}	5.3E–04	pCi/kg		NA	pCi/kg
Th_{228+7d}	4.3E–08	pCi/kg		NA	pCi/kg
Th_{230}	2.1E–06	pCi/kg		NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	2.0E–03	2.2E–10	4.3E–13
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	1.1E–02	7.8E–10	8.9E–12
Ra_{228+1d}	8.7E–03	1.0E–10	8.7E–13
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	2.7E–01	3.6E–11	9.6E–12
Tc_{99}	9.9E–01	1.3E–12	1.3E–12
Th_{228+7d}	8.1E–05	5.5E–11	4.4E–15
Th_{230}	3.9E–03	1.3E–11	5.1E–14
$Th_{232+10d}$	3.7E–05	1.7E–10	6.3E–15
U_{234}	1.2E+01	1.6E–11	2.0E–10
U_{235+1d}	6.9E–01	1.6E–11	1.1E–11
U_{238+2d}	1.3E+01	2.0E–11	2.7E–10
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 5.0E–10

001100

Table C.III–428
Summary of Intake Quantitation (chemicals) Alternative 3
South Field Area with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Dairy Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of dairy products	0.4 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in animal products	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	9.0E–08	mg/kg	NA	NA	mg/kg
beryllium	4.5E–11	mg/kg	NA	NA	mg/kg
uranium–total	7.8E–05	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	6.0E–07	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor–1254	2.2E–07	mg/kg	NA	NA	mg/kg
aroclor–1260	3.1E–07	mg/kg	NA	NA	mg/kg
dieldrin	5.6E–11	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

001101

Table C.III-428 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Federal Ownership: Off-Property Farmer (Adult)
Via Ingestion of Dairy Products

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	3.7E-10	3.0E-04	1.2E-06
beryllium	1.9E-13	5.0E-03	3.7E-11
uranium-total	3.2E-07	3.0E-03	1.1E-04
benzo(a)pyrene	2.5E-09	NA	NA
carbazole	NA	NA	NA
aroclor-1254	8.8E-10	NA	NA
aroclor-1260	1.3E-09	NA	NA
dieldrin	2.3E-13	5.0E-05	4.6E-09
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	HQ Summation =		1.1E-04

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	3.7E-10	1.8E+00	6.5E-10
beryllium	1.9E-13	4.3E+00	8.0E-13
uranium-total	3.2E-07	NA	NA
benzo(a)pyrene	2.5E-09	7.3E+00	1.8E-08
carbazole	NA	2.0E-02	NA
aroclor-1254	8.8E-10	7.7E+00	6.8E-09
aroclor-1260	1.3E-09	7.7E+00	9.9E-09
dieldrin	2.3E-13	1.6E+01	3.7E-12
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	ILCR Summation =		3.5E-08

Table C.III–429
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
South Field Area with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Dairy Products

Intake Equation = Cp X EF X EDn X FI X IR

IR	Ingestion rate of dairy products	0.4 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cp	Concentration of radionuclides in animal products	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	1.7E–08	pCi/kg
Np_{237+1d}	9.6E–08	pCi/kg	U_{234}	2.4E–02	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	1.3E–03	pCi/kg
Ra_{226+8d}	1.1E–05	pCi/kg	U_{238+2d}	2.6E–02	pCi/kg
Ra_{228+1d}	8.5E–06	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	7.2E–04	pCi/kg	NA	NA	pCi/kg
Tc_{99}	6.3E–04	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	3.7E–08	pCi/kg	NA	NA	pCi/kg
Th_{230}	1.8E–06	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	7.1E–04	2.2E–10	1.6E–13
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	8.1E–02	7.8E–10	6.3E–11
Ra_{228+1d}	6.2E–02	1.0E–10	6.2E–12
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	5.3E+00	3.6E–11	1.9E–10
Tc_{99}	4.6E+00	1.3E–12	6.0E–12
Th_{228+7d}	2.7E–04	5.5E–11	1.5E–14
Th_{230}	1.3E–02	1.3E–11	1.7E–13
$Th_{232+10d}$	1.2E–04	1.7E–10	2.1E–14
U_{234}	1.7E+02	1.6E–11	2.8E–09
U_{235+1d}	9.7E+00	1.6E–11	1.6E–10
U_{238+2d}	1.9E+02	2.0E–11	3.8E–09
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 7.0E–09

001103

002107

Table C.III–430
Summary of Intake Quantitation (chemicals) Alternative 3
South Field Area with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Vegetables and Fruits

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of fruits or vegetables	0.122 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (*lifetime*)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in vegetables	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	1.4E–05	mg/kg	NA	NA	mg/kg
beryllium	5.4E–07	mg/kg	NA	NA	mg/kg
uranium–total	1.1E–02	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	7.7E–07	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor–1254	2.6E–07	mg/kg	NA	NA	mg/kg
aroclor–1260	2.7E–08	mg/kg	NA	NA	mg/kg
dieldrin	2.5E–09	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

Table C.III-430 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Federal Ownership: Off-Property Farmer (Adult)
Via Ingestion of Vegetables and Fruits

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	2.4E-08	3.0E-04	8.0E-05
beryllium	9.0E-10	5.0E-03	1.8E-07
uranium-total	1.8E-05	3.0E-03	5.9E-03
benzo(a)pyrene	1.3E-09	NA	NA
carbazole	NA	NA	NA
aroclor-1254	4.3E-10	NA	NA
aroclor-1260	4.6E-11	NA	NA
dieldrin	4.2E-12	5.0E-05	8.4E-08
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		6.0E-03

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	2.4E-08	1.8E+00	4.2E-08
beryllium	9.0E-10	4.3E+00	3.9E-09
uranium-total	1.8E-05	NA	NA
benzo(a)pyrene	1.3E-09	7.3E+00	9.4E-09
carbazole	NA	2.0E-02	NA
aroclor-1254	4.3E-10	7.7E+00	3.3E-09
aroclor-1260	4.6E-11	7.7E+00	3.5E-10
dieldrin	4.2E-12	1.6E+01	6.7E-11
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		5.9E-08

6646

001205

Table C.III–431
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
South Field Area with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Vegetables and Fruits

Intake Equation = Cv X EF X EDn X FI X IR

IR	Ingestion rate of fruits or vegetables	0.122 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cv	Concentration of radionuclides in vegetables	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	4.1E–05	pCi/kg
Np_{237+1d}	2.5E–04	pCi/kg	U_{234}	3.2E+00	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	1.7E–01	pCi/kg
Ra_{226+8d}	2.7E–04	pCi/kg	U_{238+2d}	3.5E+00	pCi/kg
Ra_{228+1d}	2.4E–04	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	4.6E–03	pCi/kg	NA	NA	pCi/kg
Tc_{99}	6.9E–04	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	9.6E–05	pCi/kg	NA	NA	pCi/kg
Th_{230}	4.3E–03	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	7.4E–01	2.2E–10	1.6E–10
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	8.2E–01	7.8E–10	6.4E–10
Ra_{228+1d}	7.3E–01	1.0E–10	7.3E–11
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	1.4E+01	3.6E–11	5.0E–10
Tc_{99}	2.0E+00	1.3E–12	2.7E–12
Th_{228+7d}	2.9E–01	5.5E–11	1.6E–11
Th_{230}	1.3E+01	1.3E–11	1.7E–10
$Th_{232+10d}$	1.2E–01	1.7E–10	2.1E–11
U_{234}	9.6E+03	1.6E–11	1.5E–07
U_{235+1d}	5.2E+02	1.6E–11	8.3E–09
U_{238+2d}	1.1E+04	2.0E–11	2.1E–07
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
		ILCR Summation =	3.7E–07

001106

Table C.III–432
Summary of Intake Quantitation (chemicals) Alternative 3
South Field Area with Federal Ownership: Off–Property Farmer (Child)
Via Drinking Water Ingestion

Intake Equation = $\frac{CS \times EF \times ED \times IR}{BW \times AT}$

IR	Ingestion rate of groundwater (RAGS, 1989)	1 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in groundwater	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/l	NA	NA	mg/l
arsenic	NA	mg/l	NA	NA	mg/l
beryllium	NA	mg/l	NA	NA	mg/l
uranium–total	2.16E–03	mg/l	NA	NA	mg/l
benzo(a)pyrene	NA	mg/l	NA	NA	mg/l
carbazole	NA	mg/l	NA	NA	mg/l
aroclor–1254	NA	mg/l	NA	NA	mg/l
aroclor–1260	NA	mg/l	NA	NA	mg/l
dieldrin	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l			

References

001107

Table C.III-432 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Federal Ownership: Off-Property Farmer (Child)
Via Drinking Water Ingestion

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.00E-04	NA
arsenic	NA	3.00E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	1.38E-04	3.00E-03	4.60E-02
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.00E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			4.60E-02

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.75E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	1.18E-05	NA	NA
benzo(a)pyrene	NA	7.30E+00	NA
carbazole	NA	2.00E-02	NA
aroclor-1254	NA	7.70E+00	NA
aroclor-1260	NA	7.70E+00	NA
dieldrin	NA	1.60E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

Table C.III–433
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
South Field Area with Federal Ownership: Off–Property Farmer (Child)
Via Ingestion of Drinking Water

Intake Equation = Cw X EF X EDn X FI X IR

IR	Ingestion rate of groundwater (RAGS, 1989)	1 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
FI	Fractional intake for radionuclides	1 (Unitless)
Cw	Concentration of radionuclides in groundwater	(see table below)

Cs_{137+1d}	NA	pCi/l	$Th_{232+10d}$	NA	pCi/l
Np_{237+1d}	NA	pCi/l	U_{234}	6.6E–01	pCi/l
Pu_{238}	NA	pCi/l	U_{235+1d}	3.5E–02	pCi/l
Ra_{226+8d}	NA	pCi/l	U_{238+2d}	7.2E–01	pCi/l
Ra_{228+1d}	NA	pCi/l	NA	NA	pCi/l
Rn_{222+4d}	NA	pCi/l	NA	NA	pCi/l
Sr_{90+1d}	NA	pCi/l	NA	NA	pCi/l
Tc_{99}	NA	pCi/l	NA	NA	pCi/l
Th_{228+7d}	NA	pCi/l	NA	NA	pCi/l
Th_{230}	NA	pCi/l	NA	NA	pCi/l

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	NA	2.2E–10	NA
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	NA	1.3E–11	NA
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	1.4E+03	1.6E–11	2.2E–08
U_{235+1d}	7.4E+01	1.6E–11	1.2E–09
U_{238+2d}	1.5E+03	2.0E–11	3.0E–08
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 5.3E–08

Table C.III–434
Summary of Intake Quantitation (chemicals) Alternative 3
South Field Area with Federal Ownership: Off–Property Farmer (Child)
Via Dermal Contact while Bathing

Intake Equation = $\frac{DA \times EF \times ED \times SA}{BW \times AT}$

DA	Dermal absorbed dose	csv mg/cm^2–day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	2190 days
SA	Skin surface area available for contact	8000 cm^2

Chemical Concentrations

Compound	DA	Units	Compound	DA	Units
antimony	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
arsenic	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
beryllium	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
uranium–total	5.40E–10	mg/cm^2–day	NA	NA	mg/cm^2–day
benzo(a)pyrene	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
carbazole	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
aroclor–1254	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
aroclor–1260	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
dieldrin	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day			

References

Table C.III-434 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Federal Ownership: Off-Property Farmer (Child)
Via Dermal Contact while Bathing

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	6.00E-05	NA
arsenic	NA	2.85E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	2.76E-07	1.50E-04	1.84E-03
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	4.50E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		1.84E-03

Compound	ILCR Calculation CDI (mg/kg-day)	CSF $(mg/kg\text{-}day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.90E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	2.37E-08	NA	NA
benzo(a)pyrene	NA	NA	NA
carbazole	NA	2.22E-02	NA
aroclor-1254	NA	1.03E+01	NA
aroclor-1260	NA	1.03E+01	NA
dieldrin	NA	1.78E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

Table C.III-435
Summary of Intake Quantitation (chemicals) Alternative 3
South Field Area with Federal Ownership: Off-Property Farmer (Child)
Via Inhalation of Particulates

Intake Equation $= \frac{CS \times EF \times ED \times IR}{BW \times AT}$

IR	Inhalation rate of gases (RAGS, 1989)	12 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in soil	(see table below)

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/m^3	NA	NA	mg/m^3
arsenic	4.3E-09	mg/m^3	NA	NA	mg/m^3
beryllium	3.2E-10	mg/m^3	NA	NA	mg/m^3
uranium-total	5.7E-09	mg/m^3	NA	NA	mg/m^3
benzo(a)pyrene	4.8E-10	mg/m^3	NA	NA	mg/m^3
carbazole	NA	mg/m^3	NA	NA	mg/m^3
aroclor-1254	1.2E-10	mg/m^3	NA	NA	mg/m^3
aroclor-1260	1.0E-11	mg/m^3	NA	NA	mg/m^3
dieldrin	2.6E-12	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3			

References

Table C.III-435 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Federal Ownership: Off-Property Farmer (Child)
Via Inhalation of Particulates

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	NA	NA
arsenic	3.3E-09	NA	NA
beryllium	2.5E-10	NA	NA
uranium-total	4.4E-09	NA	NA
benzo(a)pyrene	3.7E-10	NA	NA
carbazole	NA	NA	NA
aroclor-1254	9.4E-11	NA	NA
aroclor-1260	7.7E-12	NA	NA
dieldrin	2.0E-12	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	Hazard Quotient Sum =		NA

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	2.8E-10	1.5E+01	4.2E-09
beryllium	2.1E-11	8.4E+00	1.8E-10
uranium-total	3.8E-10	NA	NA
benzo(a)pyrene	3.1E-11	6.1E+00	1.9E-10
carbazole	NA	NA	NA
aroclor-1254	8.1E-12	NA	NA
aroclor-1260	6.6E-13	NA	NA
dieldrin	1.7E-13	1.6E+01	2.7E-12
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	ILCR Summation =		4.6E-09

00113
6646

Table C.III–436
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
South Field Area with Federal Ownership: Off–Property Farmer (Child)
Via Inhalation of Gases and Particulates

Intake Equation = Ca X EF X EDn X IR

IR	Inhalation rate of gases (RAGS, 1989)	12 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Ca	Concentration of radionuclides in air	(see table below)

Cs_{137+1d}	NA	pCi/m^3	$Th_{232+10d}$	3.7E–08	pCi/m^3
Np_{237+1d}	2.5E–07	pCi/m^3	U_{234}	1.7E–06	pCi/m^3
Pu_{238}	NA	pCi/m^3	U_{235+1d}	1.4E–06	pCi/m^3
Ra_{226+8d}	1.9E–07	pCi/m^3	U_{238+2d}	1.1E–06	pCi/m^3
Ra_{228+1d}	2.4E–07	pCi/m^3	NA	NA	pCi/m^3
Rn_{222+4d}	8.7E–02	pCi/m^3	NA	NA	pCi/m^3
Sr_{90+1d}	1.6E–06	pCi/m^3	NA	NA	pCi/m^3
Tc_{99}	4.4E–07	pCi/m^3	NA	NA	pCi/m^3
Th_{228+7d}	9.8E–08	pCi/m^3	NA	NA	pCi/m^3
Th_{230}	3.9E–06	pCi/m^3	NA	NA	pCi/m^3

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	1.9E–11	NA
Np_{237+1d}	6.3E–03	2.9E–08	1.8E–10
Pu_{238}	NA	3.9E–08	NA
Ra_{226+8d}	4.8E–03	7.0E–09	3.3E–11
Ra_{228+1d}	6.1E–03	6.9E–10	4.2E–12
Rn_{222+4d}	2.2E+03	7.7E–12	1.7E–08
Sr_{90+1d}	4.1E–02	6.2E–11	2.5E–12
Tc_{99}	1.1E–02	8.3E–12	9.3E–14
Th_{228+7d}	2.5E–03	7.8E–08	1.9E–10
Th_{230}	9.8E–02	2.9E–08	2.8E–09
$Th_{232+10d}$	9.4E–04	1.1E–07	1.0E–10
U_{234}	4.2E–02	2.6E–08	1.1E–09
U_{235+1d}	3.6E–02	2.5E–08	9.1E–10
U_{238+2d}	2.7E–02	2.4E–08	6.5E–10
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		2.3E–08

Table C.III-437
Summary of Intake Quantitation (chemicals) Alternative 3
South Field Area with Federal Ownership: Off-Property Farmer (Child)
Via Ingestion of Meat Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of meat	0.039 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in meat	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	3.0E-06	mg/kg	NA	NA	mg/kg
beryllium	5.0E-08	mg/kg	NA	NA	mg/kg
uranium-total	2.2E-05	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	1.2E-06	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor-1254	6.8E-07	mg/kg	NA	NA	mg/kg
aroclor-1260	9.9E-07	mg/kg	NA	NA	mg/kg
dieldrin	1.7E-10	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

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Table C.III-437 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Federal Ownership: Off-Property Farmer (Child)
Via Ingestion of Meat Products

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	5.6E-09	3.0E-04	1.9E-05
beryllium	9.4E-11	5.0E-03	1.9E-08
uranium-total	4.1E-08	3.0E-03	1.4E-05
benzo(a)pyrene	2.2E-09	NA	NA
carbazole	NA	NA	NA
aroclor-1254	1.3E-09	NA	NA
aroclor-1260	1.8E-09	NA	NA
dieldrin	3.3E-13	5.0E-05	6.5E-09
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		3.2E-05

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	4.8E-10	1.8E+00	8.5E-10
beryllium	8.1E-12	4.3E+00	3.5E-11
uranium-total	3.5E-09	NA	NA
benzo(a)pyrene	1.9E-10	7.3E+00	1.4E-09
carbazole	NA	2.0E-02	NA
aroclor-1254	1.1E-10	7.7E+00	8.4E-10
aroclor-1260	1.6E-10	7.7E+00	1.2E-09
dieldrin	2.8E-14	1.6E+01	4.5E-13
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		4.3E-09

Table C.III–438
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
South Field Area with Federal Ownership: Off–Property Farmer (Child)
Via Ingestion of Meat Products

Intake Equation = Cf X EF X EDn X FI X IR

IR	Ingestion rate of meat	0.039 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cf	Concentration of radionuclides in meat	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	2.0E–08	pCi/kg
Np_{237+1d}	1.1E–06	pCi/kg	U_{234}	6.6E–03	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	3.7E–04	pCi/kg
Ra_{226+8d}	6.2E–06	pCi/kg	U_{238+2d}	7.2E–03	pCi/kg
Ra_{228+1d}	4.7E–06	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	1.4E–04	pCi/kg	NA	NA	pCi/kg
Tc_{99}	5.3E–04	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	4.3E–08	pCi/kg	NA	NA	pCi/kg
Th_{230}	2.1E–06	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	6.5E–05	2.2E–10	1.4E–14
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	3.8E–04	7.8E–10	2.9E–13
Ra_{228+1d}	2.9E–04	1.0E–10	2.9E–14
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	8.8E–03	3.6E–11	3.2E–13
Tc_{99}	3.3E–02	1.3E–12	4.3E–14
Th_{228+7d}	2.7E–06	5.5E–11	1.5E–16
Th_{230}	1.3E–04	1.3E–11	1.7E–15
$Th_{232+10d}$	1.2E–06	1.7E–10	2.1E–16
U_{234}	4.0E–01	1.6E–11	6.5E–12
U_{235+1d}	2.3E–02	1.6E–11	3.7E–13
U_{238+2d}	4.4E–01	2.0E–11	8.9E–12
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 1.6E–11

001117

001113

Table C.III-439
Summary of Intake Quantitation (chemicals) Alternative 3
South Field Area with Federal Ownership: Off-Property Farmer (Child)
Via Ingestion of Dairy Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of dairy products	0.9 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in animal products	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	9.0E-08	mg/kg	NA	NA	mg/kg
beryllium	4.5E-11	mg/kg	NA	NA	mg/kg
uranium-total	7.8E-05	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	3.7E-07	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor-1254	2.2E-07	mg/kg	NA	NA	mg/kg
aroclor-1260	3.1E-07	mg/kg	NA	NA	mg/kg
dieldrin	5.6E-11	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg

References

Table C.III-439 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Federal Ownership: Off-Property Farmer (Child)
Via Ingestion of Dairy Products

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	3.9E-09	3.0E-04	1.3E-05
beryllium	2.0E-12	5.0E-03	3.9E-10
uranium-total	3.4E-06	3.0E-03	1.1E-03
benzo(a)pyrene	1.6E-08	NA	NA
carbazole	NA	NA	NA
aroclor-1254	9.3E-09	NA	NA
aroclor-1260	1.3E-08	NA	NA
dieldrin	2.4E-12	5.0E-05	4.8E-08
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	HQ Summation =		1.1E-03

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	3.3E-10	1.8E+00	5.9E-10
beryllium	1.7E-13	4.3E+00	7.2E-13
uranium-total	2.9E-07	NA	NA
benzo(a)pyrene	1.4E-09	7.3E+00	1.0E-08
carbazole	NA	2.0E-02	NA
aroclor-1254	8.0E-10	7.7E+00	6.1E-09
aroclor-1260	1.2E-09	7.7E+00	8.9E-09
dieldrin	2.1E-13	1.6E+01	3.3E-12
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	ILCR Summation =		2.6E-08

Table C.III–440
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
South Field Area with Federal Ownership: Off–Property Farmer (Child)
Via Ingestion of Dairy Products

Intake Equation = Cp X EF X EDn X FI X IR

IR	Ingestion rate of dairy products	0.9 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cp	Concentration of radionuclides in animal products	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	1.7E–08	pCi/kg
Np_{237+1d}	9.6E–08	pCi/kg	U_{234}	2.4E–02	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	1.3E–03	pCi/kg
Ra_{226+8d}	1.1E–05	pCi/kg	U_{238+2d}	2.6E–02	pCi/kg
Ra_{228+1d}	8.5E–06	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	7.2E–04	pCi/kg	NA	NA	pCi/kg
Tc_{99}	6.3E–04	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	3.7E–08	pCi/kg	NA	NA	pCi/kg
Th_{230}	1.8E–06	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	1.4E–04	2.2E–10	3.0E–14
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	1.6E–02	7.8E–10	1.2E–11
Ra_{228+1d}	1.2E–02	1.0E–10	1.2E–12
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	1.0E+00	3.6E–11	3.7E–11
Tc_{99}	8.9E–01	1.3E–12	1.2E–12
Th_{228+7d}	5.2E–05	5.5E–11	2.9E–15
Th_{230}	2.5E–03	1.3E–11	3.2E–14
$Th_{232+10d}$	2.4E–05	1.7E–10	4.0E–15
U_{234}	3.4E+01	1.6E–11	5.4E–10
U_{235+1d}	1.9E+00	1.6E–11	3.0E–11
U_{238+2d}	3.7E+01	2.0E–11	7.4E–10
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 1.4E–09

001120

Table C.III–441
Summary of Intake Quantitation (chemicals) Alternative 3
South Field Area with Federal Ownership: Off–Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of fruits or vegetables	0.1 kg/day
FI	*Fraction ingested from contaminated source*	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in vegetables	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	1.4E–05	mg/kg	NA	NA	mg/kg
beryllium	5.4E–07	mg/kg	NA	NA	mg/kg
uranium–total	1.1E–02	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	4.8E–07	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor–1254	2.6E–07	mg/kg	NA	NA	mg/kg
aroclor–1260	2.7E–08	mg/kg	NA	NA	mg/kg
dieldrin	2.5E–09	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

001121

Table C.III-441 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Federal Ownership: Off-Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	9.2E-08	3.0E-04	3.1E-04
beryllium	3.4E-09	5.0E-03	6.9E-07
uranium-total	6.8E-05	3.0E-03	2.3E-02
benzo(a)pyrene	3.1E-09	NA	NA
carbazole	NA	NA	NA
aroclor-1254	1.6E-09	NA	NA
aroclor-1260	1.8E-10	NA	NA
dieldrin	1.6E-11	5.0E-05	3.2E-07
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		2.3E-02

Compound	ILCR Calculation CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	7.9E-09	1.8E+00	1.4E-08
beryllium	3.0E-10	4.3E+00	1.3E-09
uranium-total	5.8E-06	NA	NA
benzo(a)pyrene	2.6E-10	7.3E+00	1.9E-09
carbazole	NA	2.0E-02	NA
aroclor-1254	1.4E-10	7.7E+00	1.1E-09
aroclor-1260	1.5E-11	7.7E+00	1.2E-10
dieldrin	1.4E-12	1.6E+01	2.2E-11
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		1.8E-08

0011122

6646

Table C.III–442
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
South Field Area with Federal Ownership: Off–Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

Intake Equation = Cv X EF X EDn X FI X IR

IR	Ingestion rate of fruits or vegetables	0.1 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cv	Concentration of radionuclides in vegetables	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	4.1E–05	pCi/kg
Np_{237+1d}	2.5E–04	pCi/kg	U_{234}	3.2E+00	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	1.7E–01	pCi/kg
Ra_{226+8d}	2.7E–04	pCi/kg	U_{238+2d}	3.5E+00	pCi/kg
Ra_{228+1d}	2.4E–04	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	4.6E–03	pCi/kg	NA	NA	pCi/kg
Tc_{99}	6.9E–04	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	9.6E–05	pCi/kg	NA	NA	pCi/kg
Th_{230}	4.3E–03	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	5.2E–02	2.2E–10	1.1E–11
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	5.8E–02	7.8E–10	4.5E–11
Ra_{228+1d}	5.1E–02	1.0E–10	5.1E–12
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	9.7E–01	3.6E–11	3.5E–11
Tc_{99}	1.4E–01	1.3E–12	1.9E–13
Th_{228+7d}	2.0E–02	5.5E–11	1.1E–12
Th_{230}	9.0E–01	1.3E–11	1.2E–11
$Th_{232+10d}$	8.6E–03	1.7E–10	1.5E–12
U_{234}	6.7E+02	1.6E–11	1.1E–08
U_{235+1d}	3.6E+01	1.6E–11	5.8E–10
U_{238+2d}	7.4E+02	2.0E–11	1.5E–08
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 2.6E–08

Table C.III-443
Summary of Intake Quantitation (chemicals) Alternative 3
South Field Area with Private Ownership: Off-Property Farmer (Adult)
Via Drinking Water Ingestion

Intake Equation

$$\text{Intake} = \frac{CS \times EF \times ED \times IR}{BW \times AT}$$

IR	Ingestion rate of groundwater (RAGS, 1989)	2 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in groundwater	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/l	NA	NA	mg/l
arsenic	NA	mg/l	NA	NA	mg/l
beryllium	NA	mg/l	NA	NA	mg/l
uranium-total	1.03E-04	mg/l	NA	NA	mg/l
benzo(a)pyrene	NA	mg/l	NA	NA	mg/l
carbazole	NA	mg/l	NA	NA	mg/l
aroclor-1254	NA	mg/l	NA	NA	mg/l
aroclor-1260	NA	mg/l	NA	NA	mg/l
dieldrin	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l			

References

Table C.III-443 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Private Ownership: Off-Property Farmer (Adult)
Via Drinking Water Ingestion

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.00E-04	NA
arsenic	NA	3.00E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	2.82E-06	3.00E-03	9.41E-04
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.00E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		9.41E-04

Compound	ILCR Calculation CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.75E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	2.82E-06	NA	NA
benzo(a)pyrene	NA	7.30E+00	NA
carbazole	NA	2.00E-02	NA
aroclor-1254	NA	7.70E+00	NA
aroclor-1260	NA	7.70E+00	NA
dieldrin	NA	1.60E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

001125

6646

Table C.III–444
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
South Field Area with Private Ownership: Off–Property Farmer (Adult)
Via Ingestion of Drinking Water

Intake Equation = Cw X EF X EDn X FI X IR

IR	Ingestion rate of groundwater (RAGS, 1989)	2 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
FI	Fractional intake for radionuclides	1 (Unitless)
Cw	Concentration of radionuclides in groundwater	(see table below)

Cs_{137+1d}	NA	pCi/l	$Th_{232+10d}$	NA	pCi/l
Np_{237+1d}	NA	pCi/l	U_{234}	3.1E–02	pCi/l
Pu_{238}	NA	pCi/l	U_{235+1d}	2.0E–03	pCi/l
Ra_{226+8d}	NA	pCi/l	U_{238+2d}	3.4E–02	pCi/l
Ra_{228+1d}	NA	pCi/l		NA	pCi/l
Rn_{222+4d}	NA	pCi/l		NA	pCi/l
Sr_{90+1d}	NA	pCi/l		NA	pCi/l
Tc_{99}	NA	pCi/l		NA	pCi/l
Th_{228+7d}	NA	pCi/l		NA	pCi/l
Th_{230}	NA	pCi/l		NA	pCi/l

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	NA	2.2E–10	NA
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	NA	1.3E–11	NA
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	1.5E+03	1.6E–11	2.4E–08
U_{235+1d}	9.8E+01	1.6E–11	1.6E–09
U_{238+2d}	1.7E+03	2.0E–11	3.3E–08
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
		ILCR Summation =	5.9E–08

001125

Table C.III–445
Summary of Intake Quantitation (chemicals) Alternative 3
South Field Area with Private Ownership: Off–Property Farmer (Adult)
Via Dermal Contact while Bathing

Intake Equation = $\frac{DA \times EF \times ED \times SA}{BW \times AT}$

DA	Dermal absorbed dose	csv mg/cm^2–day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
SA	Skin surface area available for contact	23000 cm^2

Chemical Concentrations

Compound	DA	Units
antimony	NA	mg/cm^2–day
arsenic	NA	mg/cm^2–day
beryllium	NA	mg/cm^2–day
uranium–total	2.58E–11	mg/cm^2–day
benzo(a)pyrene	NA	mg/cm^2–day
carbazole	NA	mg/cm^2–day
aroclor–1254	NA	mg/cm^2–day
aroclor–1260	NA	mg/cm^2–day
dieldrin	NA	mg/cm^2–day
NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day

Compound	DA	Units
NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day

References

001227

Table C.III-445 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Private Ownership: Off-Property Farmer (Adult)
Via Dermal Contact while Bathing

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	6.00E-05	NA
arsenic	NA	2.85E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	8.11E-09	1.50E-04	5.41E-05
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	4.50E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			5.41E-05

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.90E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	8.11E-09	NA	NA
benzo(a)pyrene	NA	NA	NA
carbazole	NA	2.22E-02	NA
aroclor-1254	NA	1.03E+01	NA
aroclor-1260	NA	1.03E+01	NA
dieldrin	NA	1.78E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

Table C.III–446
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
South Field Area with Private Ownership: Off–Property Farmer (Adult)
Via Inhalation of Gases and Particulates

Intake Equation = Ca X EF X EDn X IR

IR	Inhalation rate of gases (RAGS, 1989)	20 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Ca	Concentration of radionuclides in air	(see table below)

Cs_{137+1d}	NA	pCi/m^3	$Th_{232+10d}$	NA	pCi/m^3
Np_{237+1d}	3.3E–07	pCi/m^3	U_{234}	1.0E–06	pCi/m^3
Pu_{238}	NA	pCi/m^3	U_{235+1d}	NA	pCi/m^3
Ra_{226+8d}	NA	pCi/m^3	U_{238+2d}	8.8E–07	pCi/m^3
Ra_{228+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Rn_{222+4d}	NA	pCi/m^3	NA	NA	pCi/m^3
Sr_{90+1d}	2.2E–07	pCi/m^3	NA	NA	pCi/m^3
Tc_{99}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{228+7d}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{230}	2.8E–06	pCi/m^3	NA	NA	pCi/m^3

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	1.9E–11	NA
Np_{237+1d}	1.6E–01	2.9E–08	4.6E–09
Pu_{238}	NA	3.9E–08	NA
Ra_{226+8d}	NA	7.0E–09	NA
Ra_{228+1d}	NA	6.9E–10	NA
Rn_{222+4d}	NA	7.7E–12	NA
Sr_{90+1d}	1.1E–01	6.2E–11	6.6E–12
Tc_{99}	NA	8.3E–12	NA
Th_{228+7d}	NA	7.8E–08	NA
Th_{230}	1.4E+00	2.9E–08	3.9E–08
$Th_{232+10d}$	NA	1.1E–07	NA
U_{234}	4.9E–01	2.6E–08	1.3E–08
U_{235+1d}	NA	2.5E–08	NA
U_{238+2d}	4.3E–01	2.4E–08	1.0E–08
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation	=	6.7E–08

001129

Table C.III-447
Summary of Intake Quantitation (chemicals) Alternative 3
South Field Area with Private Ownership: Off-Property Farmer (Adult)
Via Ingestion of Meat Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of meat	0.101 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in meat	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium-total	1.3E-06	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor-1254	NA	mg/kg	NA	NA	mg/kg
aroclor-1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

Table C.III-447 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Private Ownership: Off-Property Farmer (Adult)
Via Ingestion of Meat Products

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	1.3E-09	3.0E-03	4.4E-07
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			4.4E-07

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	1.3E-09	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

001131

6646

Table C.III–448
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
South Field Area with Private Ownership: Off–Property Farmer (Adult)
Via Ingestion of Meat Products

Intake Equation = Cf X EF X EDn X FI X IR

IR	Ingestion rate of meat	0.101 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cf	Concentration of radionuclides in meat	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	1.4E–06	pCi/kg	U_{234}	3.3E–04	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	2.0E–05	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	3.5E–04	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	1.9E–05	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	1.5E–06	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	2.6E–03	2.2E–10	5.6E–13
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	3.6E–02	3.6E–11	1.3E–12
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	2.8E–03	1.3E–11	3.6E–14
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	6.0E–01	1.6E–11	9.7E–12
U_{235+1d}	3.7E–02	1.6E–11	5.9E–13
U_{238+2d}	6.6E–01	2.0E–11	1.3E–11
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 2.5E–11

Table C.III–449
Summary of Intake Quantitation (chemicals) Alternative 3
South Field Area with Private Ownership: Off–Property Farmer (Adult)
Via Ingestion of Dairy Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of dairy products	0.4 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in animal products	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium–total	4.4E–06	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor–1254	NA	mg/kg	NA	NA	mg/kg
aroclor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

001133

Table C.III−449 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Private Ownership: Off−Property Farmer (Adult)
Via Ingestion of Dairy Products

	HQ Calculation		
Compound	CDI (mg/kg−day)	RfD (mg/kg−day)	HQ (unitless)
antimony	NA	4.0E−04	NA
arsenic	NA	3.0E−04	NA
beryllium	NA	5.0E−03	NA
uranium−total	1.8E−08	3.0E−03	6.0E−06
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor−1254	NA	NA	NA
aroclor−1260	NA	NA	NA
dieldrin	NA	5.0E−05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		6.0E−06

	ILCR Calculation		
Compound	CDI (mg/kg−day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium−total	1.8E−08	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E−02	NA
aroclor−1254	NA	7.7E+00	NA
aroclor−1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

Table C.III–450
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
South Field Area with Private Ownership: Off–Property Farmer (Adult)
Via Ingestion of Dairy Products

Intake Equation = Cp X EF X EDn X FI X IR

IR	Ingestion rate of dairy products	0.4 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cp	Concentration of radionuclides in animal products	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	1.3E–07	pCi/kg	U_{234}	1.2E–03	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	7.2E–05	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	1.3E–03	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	9.6E–05	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	1.2E–06	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	9.2E–04	2.2E–10	2.0E–13
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	7.1E–01	3.6E–11	2.5E–11
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	9.1E–03	1.3E–11	1.2E–13
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	8.5E+00	1.6E–11	1.4E–10
U_{235+1d}	5.3E–01	1.6E–11	8.5E–12
U_{238+2d}	9.3E+00	2.0E–11	1.9E–10
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 3.6E–10

001135

Table C.III-451
Summary of Intake Quantitation (chemicals) Alternative 3
South Field Area with Private Ownership: Off-Property Farmer (Adult)
Via Ingestion of Vegetables and Fruits

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of fruits or vegetables	0.122 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in vegetables	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium-total	5.2E-04	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor-1254	NA	mg/kg	NA	NA	mg/kg
aroclor-1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

Table C.III-451 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Private Ownership: Off-Property Farmer (Adult)
Via Ingestion of Vegetables and Fruits

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	8.7E-07	3.0E-03	2.9E-04
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			2.9E-04

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	8.7E-07	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

Table C.III–452
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
South Field Area with Private Ownership: Off–Property Farmer (Adult)
Via Ingestion of Vegetables and Fruits

Intake Equation = Cv X EF X EDn X FI X IR

IR	Ingestion rate of fruits or vegetables	0.122 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cv	Concentration of radionuclides in vegetables	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	3.2E–04	pCi/kg	U_{234}	1.5E–01	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	9.8E–03	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	1.7E–01	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	6.2E–04	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	3.1E–03	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	9.7E–01	2.2E–10	2.1E–10
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	1.9E+00	3.6E–11	6.7E–11
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	9.1E+00	1.3E–11	1.2E–10
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	4.6E+02	1.6E–11	7.3E–09
U_{235+1d}	2.9E+01	1.6E–11	4.7E–10
U_{238+2d}	5.0E+02	2.0E–11	1.0E–08
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		1.8E–08

001138

Table C.III–453
Summary of Intake Quantitation (chemicals) Alternative 3
South Field Area with Private Ownership: Off–Property Farmer (Child)
Via Drinking Water Ingestion

Intake Equation = $\frac{CS \times EF \times ED \times IR}{BW \times AT}$

IR	Ingestion rate of groundwater (RAGS, 1989)	1 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in groundwater	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/l	NA	NA	mg/l
arsenic	NA	mg/l	NA	NA	mg/l
beryllium	NA	mg/l	NA	NA	mg/l
uranium–total	1.03E–04	mg/l	NA	NA	mg/l
benzo(a)pyrene	NA	mg/l	NA	NA	mg/l
carbazole	NA	mg/l	NA	NA	mg/l
aroclor–1254	NA	mg/l	NA	NA	mg/l
aroclor–1260	NA	mg/l	NA	NA	mg/l
dieldrin	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l			

References

001139

Table C.III-453 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Private Ownership: Off-Property Farmer (Child)
Via Drinking Water Ingestion

Compound	HQ Calculation		
	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.00E-04	NA
arsenic	NA	3.00E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	6.58E-06	3.00E-03	2.19E-03
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.00E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		2.19E-03

Compound	ILCR Calculation		
	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.75E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	5.64E-07	NA	NA
benzo(a)pyrene	NA	7.30E+00	NA
carbazole	NA	2.00E-02	NA
aroclor-1254	NA	7.70E+00	NA
aroclor-1260	NA	7.70E+00	NA
dieldrin	NA	1.60E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

001480

Table C.III–454
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
South Field Area with Private Ownership: Off–Property Farmer (Child)
Via Ingestion of Drinking Water

ntake Equation = Cw X EF X EDn X FI X IR

IR	Ingestion rate of groundwater (RAGS, 1989)	1 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
FI	Fractional intake for radionuclides	1 (Unitless)
Cw	Concentration of radionuclides in groundwater	(see table below)

Cs_{137+1d}	NA	pCi/l	$Th_{232+10d}$	NA	pCi/l
Np_{237+1d}	NA	pCi/l	U_{234}	3.1E–02	pCi/l
Pu_{238}	NA	pCi/l	U_{235+1d}	2.0E–03	pCi/l
Ra_{226+8d}	NA	pCi/l	U_{238+2d}	3.4E–02	pCi/l
Ra_{228+1d}	NA	pCi/l	NA	NA	pCi/l
Rn_{222+4d}	NA	pCi/l	NA	NA	pCi/l
Sr_{90+1d}	NA	pCi/l	NA	NA	pCi/l
Tc_{99}	NA	pCi/l	NA	NA	pCi/l
Th_{228+7d}	NA	pCi/l	NA	NA	pCi/l
Th_{230}	NA	pCi/l	NA	NA	pCi/l

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	NA	2.2E–10	NA
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	NA	1.3E–11	NA
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	6.5E+01	1.6E–11	1.0E–09
U_{235+1d}	4.2E+00	1.6E–11	6.7E–11
U_{238+2d}	7.1E+01	2.0E–11	1.4E–09
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
ILCR Summation	=		2.5E–09

001141

Table C.III-455
Summary of Intake Quantitation (chemicals) Alternative 3
South Field Area with Private Ownership: Off-Property Farmer (Child)
Via Dermal Contact while Bathing

Intake Equation = $\frac{DA \times EF \times ED \times SA}{BW \times AT}$

DA	Dermal absorbed dose	csv mg/cm^2-day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	2190 days
SA	Skin surface area available for contact	8000 cm^2

Chemical Concentrations

Compound	DA	Units	Compound	DA	Units
antimony	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
arsenic	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
beryllium	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
uranium-total	2.58E-11	mg/cm^2-day	NA	NA	mg/cm^2-day
benzo(a)pyrene	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
carbazole	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
aroclor-1254	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
aroclor-1260	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
dieldrin	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day			

References

Table C.III-455 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Private Ownership: Off-Property Farmer (Child)
Via Dermal Contact while Bathing

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	6.00E-05	NA
arsenic	NA	2.85E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	1.32E-08	1.50E-04	8.78E-05
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	4.50E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		8.78E-05

Compound	ILCR Calculation CDI (mg/kg-day)	CSF $(mg/kg\text{-}day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.90E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	1.13E-09	NA	NA
benzo(a)pyrene	NA	NA	NA
carbazole	NA	2.22E-02	NA
aroclor-1254	NA	1.03E+01	NA
aroclor-1260	NA	1.03E+01	NA
dieldrin	NA	1.78E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

0011443

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Table C.III–456
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
South Field Area with Private Ownership: Off–Property Farmer (Child)
Via Inhalation of Gases and Particulates

Intake Equation = Ca X EF X EDn X IR

IR	Inhalation rate of gases (RAGS, 1989)	12 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Ca	Concentration of radionuclides in air	(see table below)

Cs_{137+1d}	NA	pCi/m^3	$Th_{232+10d}$	NA	pCi/m^3
Np_{237+1d}	3.3E–07	pCi/m^3	U_{234}	1.0E–06	pCi/m^3
Pu_{238}	NA	pCi/m^3	U_{235+1d}	NA	pCi/m^3
Ra_{226+8d}	NA	pCi/m^3	U_{238+2d}	8.8E–07	pCi/m^3
Ra_{228+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Rn_{222+4d}	NA	pCi/m^3	NA	NA	pCi/m^3
Sr_{90+1d}	2.2E–07	pCi/m^3	NA	NA	pCi/m^3
Tc_{99}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{228+7d}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{230}	2.8E–06	pCi/m^3	NA	NA	pCi/m^3

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	1.9E–11	NA
Np_{237+1d}	8.2E–03	2.9E–08	2.4E–10
Pu_{238}	NA	3.9E–08	NA
Ra_{226+8d}	NA	7.0E–09	NA
Ra_{228+1d}	NA	6.9E–10	NA
Rn_{222+4d}	NA	7.7E–12	NA
Sr_{90+1d}	5.5E–03	6.2E–11	3.4E–13
Tc_{99}	NA	8.3E–12	NA
Th_{228+7d}	NA	7.8E–08	NA
Th_{230}	7.0E–02	2.9E–08	2.0E–09
$Th_{232+10d}$	NA	1.1E–07	NA
U_{234}	2.5E–02	2.6E–08	6.6E–10
U_{235+1d}	NA	2.5E–08	NA
U_{238+2d}	2.2E–02	2.4E–08	5.3E–10
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
		ILCR Summation =	3.4E–09

001117

Table C.III–457
Summary of Intake Quantitation (chemicals) Alternative 3
South Field Area with Private Ownership: Off–Property Farmer (Child)
Via Ingestion of Meat Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of meat	0.039 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	2190 days
CS	*Concentration of chemicals in meat*	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium–total	1.3E–06	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor–1254	NA	mg/kg	NA	NA	mg/kg
aroclor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

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Table C.III-457 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Private Ownership: Off-Property Farmer (Child)
Via Ingestion of Meat Products

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	2.4E-09	3.0E-03	7.8E-07
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			7.8E-07

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	2.0E-10	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

Table C.III–458
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
South Field Area with Private Ownership: Off–Property Farmer (Child)
Via Ingestion of Meat Products

Intake Equation = Cf X EF X EDn X FI X IR

IR	Ingestion rate of meat	0.039 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cf	Concentration of radionuclides in meat	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	1.4E–06	pCi/kg	U_{234}	3.3E–04	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	2.0E–05	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	3.5E–04	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	1.9E–05	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	1.5E–06	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	8.5E–05	2.2E–10	1.9E–14
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	1.2E–03	3.6E–11	4.2E–14
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	9.2E–05	1.3E–11	1.2E–15
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	2.0E–02	1.6E–11	3.2E–13
U_{235+1d}	1.2E–03	1.6E–11	2.0E–14
U_{238+2d}	2.2E–02	2.0E–11	4.3E–13
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 8.4E–13

001147

Table C.III–459
Summary of Intake Quantitation (chemicals) Alternative 3
South Field Area with Private Ownership: Off–Property Farmer (Child)
Via Ingestion of Dairy Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of dairy products	0.9 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in animal products	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium–total	4.4E–06	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor–1254	NA	mg/kg	NA	NA	mg/kg
aroclor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

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Table C.III-459 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Private Ownership: Off-Property Farmer (Child)
Via Ingestion of Dairy Products

Compound	HQ Calculation		
	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	1.9E-07	3.0E-03	6.3E-05
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		6.3E-05

Compound	ILCR Calculation		
	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	1.6E-08	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

000149

Table C.III–460
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
South Field Area with Private Ownership: Off–Property Farmer (Child)
Via Ingestion of Dairy Products

Intake Equation = Cp X EF X EDn X FI X IR

IR	Ingestion rate of dairy products	0.9 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cp	Concentration of radionuclides in animal products	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	1.3E–07	pCi/kg	U_{234}	1.2E–03	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	7.2E–05	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	1.3E–03	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	9.6E–05	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	1.2E–06	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	1.8E–04	2.2E–10	3.9E–14
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	1.4E–01	3.6E–11	4.9E–12
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	1.8E–03	1.3E–11	2.3E–14
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	1.6E+00	1.6E–11	2.6E–11
U_{235+1d}	1.0E–01	1.6E–11	1.6E–12
U_{238+2d}	1.8E+00	2.0E–11	3.6E–11
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		6.9E–11

001150

Table C.III–461
Summary of Intake Quantitation (chemicals) Alternative 3
South Field Area with Private Ownership: Off–Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of fruits or vegetables	0.1 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in vegetables	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium–total	5.2E–04	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor–1254	NA	mg/kg	NA	NA	mg/kg
aroclor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

001151

Table C.III-461 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Private Ownership: Off-Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	3.3E-06	3.0E-03	1.1E-03
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
HQ Summation =			1.1E-03

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	2.8E-07	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
ILCR Summation =			NA

Table C.III–462
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
South Field Area with Private Ownership: Off–Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

Intake Equation = Cv X EF X EDn X FI X IR

IR	Ingestion rate of fruits or vegetables	0.1 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cv	Concentration of radionuclides in vegetables	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	3.2E–04	pCi/kg	U_{234}	1.5E–01	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	9.8E–03	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	1.7E–01	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	6.2E–04	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	3.1E–03	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	6.8E–02	2.2E–10	1.5E–11
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	1.3E–01	3.6E–11	4.7E–12
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	6.4E–01	1.3E–11	8.3E–12
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	3.2E+01	1.6E–11	5.1E–10
U_{235+1d}	2.1E+00	1.6E–11	3.3E–11
U_{238+2d}	3.5E+01	2.0E–11	7.0E–10
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 1.3E–09

001453

Table C.III-463
Summary of Intake Quantitation (chemicals) Alternative 3
South Field Area with Federal Ownership: On-Property RME Resident Farmer (Adult)
Via Incidental Ingestion of Soil

Intake Equation = $\frac{CS \times EF \times ED \times CF \times IR}{BW \times AT}$

IRs	Ingestion rate of soil (RAGS, 1989)	180 mg/day
CF	Conversion factor	1.0E-06 kg/mg
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in soil	(see table below)

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium-total	7.9E-01	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor-1254	NA	mg/kg	NA	NA	mg/kg
aroclor-1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

Table C.III-463 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Federal Ownership: On-Property RME Resident Farmer (Adult)
Via Incidental Ingestion of Soil

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	2.0E-06	3.0E-03	6.5E-04
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		6.5E-04

Compound	ILCR Calculation CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	2.0E-06	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

6646

001155

Table C.III−464
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
South Field Area with Federal Ownership: On−Property RME Resident Farmer (Adult)
Via Incidental Ingestion of Soil

Intake Equation = CS X EF X EDn X FI X IR

IRs	Ingestion rate of soil (RAGS, 1989)	180 mg/day
EF	Exposure frequency	350 days/year
EDn	Exposure Duration	70 Year
FI	Fractional Intake	1 (unitless)
CS	Concentration of radionuclides in soil	

Cs_{137+1d}	NA	pCi/mg	$Th_{232+10d}$	NA	pCi/mg
Np_{237+1d}	1.55E−05	pCi/mg	U_{234}	3.06E−05	pCi/mg
Pu_{238}	NA	pCi/mg	U_{235+1d}	NA	pCi/mg
Ra_{226+8d}	NA	pCi/mg	U_{238+2d}	2.70E−05	pCi/mg
Ra_{228+1d}	NA	pCi/mg	NA	NA	pCi/mg
Rn_{222+4d}	NA	pCi/mg	NA	NA	pCi/mg
Sr_{90+1d}	1.28E−05	pCi/mg	NA	NA	pCi/mg
Tc_{99}	NA	pCi/mg	NA	NA	pCi/mg
Th_{228+7d}	NA	pCi/mg	NA	NA	pCi/mg
Th_{230}	1.19E−04	pCi/mg	NA	NA	pCi/mg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.80E−11	NA
Np_{237+1d}	6.84E+01	2.20E−10	1.50E−08
Pu_{238}	NA	2.20E−10	NA
Ra_{226+8d}	NA	7.80E−10	NA
Ra_{228+1d}	NA	1.00E−10	NA
Rn_{222+4d}	NA	1.70E−12	NA
Sr_{90+1d}	5.64E+01	3.60E−11	2.03E−09
Tc_{99}	NA	1.30E−12	NA
Th_{228+7d}	NA	5.50E−11	NA
Th_{230}	5.24E+02	1.30E−11	6.81E−09
$Th_{232+10d}$	NA	1.70E−10	NA
U_{234}	1.35E+02	1.60E−11	2.16E−09
U_{235+1d}	NA	1.60E−11	NA
U_{238+2d}	1.19E+02	2.00E−11	2.38E−09
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
		ILCR Summation =	2.84E−08

Table C.III–465
Summary of Intake Quantitation (chemicals) Alternative 3
South Field Area with Federal Ownership: On–Property RME Resident Farmer (Adult)
Via Dermal Contact with Soil

Intake Equation = $\frac{CS \times EF \times ED \times CF \times ABS \times AF \times SA}{BW \times AT}$

SA	Surface area of exposed skin (50th percentile, hands only)	5750 cm^2/day
AF	Soil to skin adherence factor (RAGS, 1989)	1 mg/cm^2
ABS	chemicals specific absorbtion factor (see table below)	csv
CF	Conversion factor	1E–06 kg/mg
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in soil	

Chemical Concentrations

Compound	ABS	Concentrati	Units	Compound		Concentrati	Units
antimony	1.00E–02	NA	mg/kg	NA	NA	NA	mg/kg
arsenic	1.00E–03	NA	mg/kg	NA	NA	NA	mg/kg
beryllium	1.00E–02	NA	mg/kg	NA	NA	NA	mg/kg
uranium–total	1.00E–02	7.94E–01	mg/kg	NA	NA	NA	mg/kg
benzo(a)pyrene	3.00E–01	NA	mg/kg	NA	NA	NA	mg/kg
carbazole	3.00E–01	NA	mg/kg	NA	NA	NA	mg/kg
aroclor–1254	6.00E–02	NA	mg/kg	NA	NA	NA	mg/kg
aroclor–1260	6.00E–02	NA	mg/kg	NA	NA	NA	mg/kg
dieldrin	3.00E–01	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg				

References

001457

Table C.III-465 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Federal Ownership: On-Property RME Resident Farmer (Adult)
Via Dermal Contact with Soil

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	6.00E-05	NA
arsenic	NA	2.85E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	6.26E-07	1.50E-04	4.17E-03
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	4.50E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		4.17E-03

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF (mg/kg-day)$^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.90E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	6.26E-07	NA	NA
benzo(a)pyrene	NA	NA	NA
carbazole	NA	2.22E-02	NA
aroclor-1254	NA	1.03E+01	NA
aroclor-1260	NA	1.03E+01	NA
dieldrin	NA	1.78E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

001458

Table C.III–466
Summary of Intake Quantitation (chemicals) Alternative 3
South Field Area with Federal Ownership: On–Property RME Resident Farmer (Adult)
Via Drinking Water Ingestion

Intake Equation = $\frac{CS \times EF \times ED \times IR}{BW \times AT}$

IR	Ingestion rate of groundwater (RAGS, 1989)	2 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in groundwater	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/l	NA	NA	mg/l
arsenic	NA	mg/l	NA	NA	mg/l
beryllium	NA	mg/l	NA	NA	mg/l
uranium–total	6.06E–04	mg/l	NA	NA	mg/l
benzo(a)pyrene	NA	mg/l	NA	NA	mg/l
carbazole	NA	mg/l	NA	NA	mg/l
aroclor–1254	NA	mg/l	NA	NA	mg/l
aroclor–1260	NA	mg/l	NA	NA	mg/l
dieldrin	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l			

References

001159

0014760

Table C.III-466 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Federal Ownership: On-Property RME Resident Farmer (Adult)
Via Drinking Water Ingestion

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.00E-04	NA
arsenic	NA	3.00E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	1.66E-05	3.00E-03	5.53E-03
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.00E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		5.53E-03

Compound	ILCR Calculation CDI (mg/kg-day)	CSF $(mg/kg\text{-}day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.75E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	1.66E-05	NA	NA
benzo(a)pyrene	NA	7.30E+00	NA
carbazole	NA	2.00E-02	NA
aroclor-1254	NA	7.70E+00	NA
aroclor-1260	NA	7.70E+00	NA
dieldrin	NA	1.60E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

Table C.III–467
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
South Field Area with Federal Ownership: On–Property RME Resident Farmer (Adult)
Via Ingestion of Drinking Water

Intake Equation = Cw X EF X EDn X FI X IR

IR	Ingestion rate of groundwater (*RAGS, 1989*)	2 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
FI	Fractional intake for radionuclides	1 (Unitless)
Cw	Concentration of radionuclides in groundwater	(see table below)

Cs_{137+1d}	NA	pCi/l	$Th_{232+10d}$	NA	pCi/l
Np_{237+1d}	NA	pCi/l	U_{234}	1.8E–01	pCi/l
Pu_{238}	NA	pCi/l	U_{235+1d}	1.0E–02	pCi/l
Ra_{226+8d}	NA	pCi/l	U_{238+2d}	2.0E–01	pCi/l
Ra_{228+1d}	NA	pCi/l	NA	NA	pCi/l
Rn_{222+4d}	NA	pCi/l	NA	NA	pCi/l
Sr_{90+1d}	NA	pCi/l	NA	NA	pCi/l
Tc_{99}	NA	pCi/l	NA	NA	pCi/l
Th_{228+7d}	NA	pCi/l	NA	NA	pCi/l
Th_{230}	NA	pCi/l	NA	NA	pCi/l

Radionuclides	*CDI* (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	NA	2.2E–10	NA
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	NA	1.3E–11	NA
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	9.0E+03	1.6E–11	1.4E–07
U_{235+1d}	4.9E+02	1.6E–11	7.8E–09
U_{238+2d}	9.9E+03	2.0E–11	2.0E–07
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		3.5E–07

001161

Table C.III-468(a)
Summary of Intake Quantitation (chemicals) Alternative 3
South Field Area with Federal Ownership: On-Property RME Resident Farmer (Adult)
Via Dermal Contact while Bathing

Intake Equation = $\frac{DA \times EF \times ED \times SA}{BW \times AT}$

DA	Dermal absorbed dose	csv mg/cm^2-day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	25550 days
SA	Skin surface area available for contact	23000 cm^2

Chemical Concentrations

Compound	DA	Units
antimony	NA	mg/cm^2-day
arsenic	NA	mg/cm^2-day
beryllium	NA	mg/cm^2-day
uranium-total	1.52E-10	mg/cm^2-day
benzo(a)pyrene	NA	mg/cm^2-day
carbazole	NA	mg/cm^2-day
aroclor-1254	NA	mg/cm^2-day
aroclor-1260	NA	mg/cm^2-day
dieldrin	NA	mg/cm^2-day
NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day

Compound	DA	Units
NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day

References

Table C.III-468(a) (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Federal Ownership: On-Property RME Résident Farmer (Adult)
Via Dermal Contact while Bathing

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	6.00E-05	NA
arsenic	NA	2.85E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	4.77E-08	1.50E-04	3.18E-04
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	4.50E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA-
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		3.18E-04

Compound	ILCR Calculation CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.90E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	4.77E-08	NA	NA
benzo(a)pyrene	NA	NA	NA
carbazole	NA	2.22E-02	NA
aroclor-1254	NA	1.03E+01	NA
aroclor-1260	NA	1.03E+01	NA
dieldrin	NA	1.78E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

001463

Table C.III–468(b)
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
South Field Area with Federal Ownership: On–Property RME Resident Farmer (Adult)
Via Inhalation of Gases and Particulates

Intake Equation = Ca X EF X EDn X IR

IR	Inhalation rate of gases (RAGS, 1989)	20 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Ca	Concentration of radionuclides in air	(see table below)

Cs_{137+1d}	NA	pCi/m^3	$Th_{232+10d}$	NA	pCi/m^3
Np_{237+1d}	4.3E–06	pCi/m^3	U_{234}	1.3E–05	pCi/m^3
Pu_{238}	NA	pCi/m^3	U_{235+1d}	NA	pCi/m^3
Ra_{226+8d}	NA	pCi/m^3	U_{238+2d}	1.1E–05	pCi/m^3
Ra_{228+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Rn_{222+4d}	NA	pCi/m^3	NA	NA	pCi/m^3
Sr_{90+1d}	3.1E–06	pCi/m^3	NA	NA	pCi/m^3
Tc_{99}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{228+7d}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{230}	6.6E–05	pCi/m^3	NA	NA	pCi/m^3

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	1.9E–11	NA
Np_{237+1d}	2.1E+00	2.9E–08	6.1E–08
Pu_{238}	NA	3.9E–08	NA
Ra_{226+8d}	NA	7.0E–09	NA
Ra_{228+1d}	NA	6.9E–10	NA
Rn_{222+4d}	NA	7.7E–12	NA
Sr_{90+1d}	1.5E+00	6.2E–11	9.4E–11
Tc_{99}	NA	8.3E–12	NA
Th_{228+7d}	NA	7.8E–08	NA
Th_{230}	3.2E+01	2.9E–08	9.4E–07
$Th_{232+10d}$	NA	1.1E–07	NA
U_{234}	6.4E+00	2.6E–08	1.7E–07
U_{235+1d}	NA	2.5E–08	NA
U_{238+2d}	5.6E+00	2.4E–08	1.3E–07
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation	=	1.3E–06

Table C.III–469
Summary of Intake Quantitation (chemicals) Alternative 3
South Field Area with Federal Ownership: On–Property RME Resident Farmer (Adult)
Via Ingestion of Meat Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of meat	0.101 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in meat	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium–total	1.6E–04	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor–1254	NA	mg/kg	NA	NA	mg/kg
aroclor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

001165

Table C.III-469 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Federal Ownership: On-Property RME Resident Farmer (Adult)
Via Ingestion of Meat Products

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	1.6E-07	3.0E-03	5.4E-05
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
HQ Summation =			5.4E-05

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	1.6E-07	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
ILCR Summation =			NA

Table C.III–470
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
South Field Area with Federal Ownership: On–Property RME Resident Farmer (Adult)
Via Ingestion of Meat Products

Intake Equation = Cf X EF X EDn X FI X IR

IR	Ingestion rate of meat	0.101 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cf	Concentration of radionuclides in meat	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	8.7E–04	pCi/kg	U_{234}	7.7E–03	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	1.0E–04	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	7.2E–03	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	4.8E–01	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	4.2E–04	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	1.6E+00	2.2E–10	3.6E–10
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	8.9E+02	3.6E–11	3.2E–08
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	7.8E–01	1.3E–11	1.0E–11
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	1.4E+01	1.6E–11	2.3E–10
U_{235+1d}	1.9E–01	1.6E–11	3.0E–12
U_{238+2d}	1.3E+01	2.0E–11	2.7E–10
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation	=	3.3E–08

Table C.III-471
Summary of Intake Quantitation (chemicals) Alternative 3
South Field Area with Federal Ownership: On-Property RME Resident Farmer (Adult)
Via Ingestion of Dairy Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of dairy products	0.4 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in animal products	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium-total	4.7E-04	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor-1254	NA	mg/kg	NA	NA	mg/kg
aroclor-1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

Table C.III-471 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Federal Ownership: On-Property RME Resident Farmer (Adult)
Via Ingestion of Dairy Products

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	1.9E-06	3.0E-03	6.5E-04
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			6.5E-04

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	1.9E-06	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

001169

6646

Table C.III–472
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
South Field Area with Federal Ownership: On–Property RME Resident Farmer (Adult)
Via Ingestion of Dairy Products

Intake Equation = Cp X EF X EDn X FI X IR

IR	Ingestion rate of dairy products	0.4 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cp	Concentration of radionuclides in animal products	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	7.9E–05	pCi/kg	U_{234}	2.4E–02	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	3.6E–04	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	2.3E–02	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	2.4E+00	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	3.5E–04	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	5.8E–01	2.2E–10	1.3E–10
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	1.8E+04	3.6E–11	6.4E–07
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	2.6E+00	1.3E–11	3.4E–11
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	1.8E+02	1.6E–11	2.8E–09
U_{235+1d}	2.6E+00	1.6E–11	4.2E–11
U_{238+2d}	1.7E+02	2.0E–11	3.3E–09
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation	=	6.4E–07

001170

Table C.III–473
Summary of Intake Quantitation (chemicals) Alternative 3
South Field Area with Federal Ownership: *On*–Property RME Resident Farmer (Adult)
Via Ingestion of Vegetables and Fruits

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of fruits or vegetables	0.122 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in vegetables	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium–total	1.0E–02	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor–1254	NA	mg/kg	NA	NA	mg/kg
aroclor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

001771

0001772

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Table C.III-473 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Federal Ownership: On-Property RME Resident Farmer (Adult)
Via Ingestion of Vegetables and Fruits

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	1.7E-05	3.0E-03	5.5E-03
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	HQ Summation =		5.5E-03

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	1.7E-05	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	NANA	NA	NA
	ILCR Summation =		NA

Table C.III–474
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
South Field Area with Federal Ownership: On–Property RME Resident Farmer (Adult)
Via Ingestion of Vegetables and Fruits

Intake Equation = Cv X EF X EDn X FI X IR

IR	Ingestion rate of fruits or vegetables	0.122 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cv	Concentration of radionuclides in vegetables	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	1.6E–01	pCi/kg	U_{234}	1.2E+00	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	4.9E–02	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	1.2E+00	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	3.2E+01	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	1.9E–01	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	4.8E+02	2.2E–10	1.0E–07
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	9.6E+04	3.6E–11	3.4E–06
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	5.5E+02	1.3E–11	7.2E–09
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	3.5E+03	1.6E–11	5.6E–08
U_{235+1d}	1.5E+02	1.6E–11	2.3E–09
U_{238+2d}	3.7E+03	2.0E–11	7.3E–08
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		3.7E–06

Table C.III–475
Summary of Intake and Risk Quantitation (radionuclides) Alternative 3
South Field Area with Federal Ownership: On–Property RME Resident Farmer (Adult)
Via External Radiation

Dose Equivalency Equat = $[DR \times EF \times EDn \times ET_i \times (1-SH_i)] + [DR \times EF \times EDn \times ET_o \times (1-SH_o)]$

EF	Fraction of year spent exposured	0.96 (unitless)
ED	Exposure duration	70 Year
ET_i	Fraction of day spent indoors	0.76 (unitless)
ET_o	Fraction of day spent outdoors	0.24 (unitless)
SH_i	Shield factor indoors	0.5 (unitless)
SH_o	Shield factor outdoors	NA (unitless)
DR	Radionuclide specific dose concentrations	(see table below)

Cs_{137+1d}	NA	pCi/g	$Th_{232+10d}$	NA	pCi/g
Np_{237+1d}	1.55E–02	pCi/g	U_{234}	3.06E–02	pCi/g
Pu_{238}	NA	pCi/g	U_{235+1d}	NA	pCi/g
Ra_{226+8d}	NA	pCi/g	U_{238+2d}	2.70E–02	pCi/g
Ra_{228+1d}	NA	pCi/g	NA	NA	pCi/g
Rn_{222+4d}	NA	pCi/g	NA	NA	pCi/g
Sr_{90+1d}	1.28E–02	pCi/g	NA	NA	pCi/g
Tc_{99}	NA	pCi/g	NA	NA	pCi/g
Th_{228+7d}	NA	pCi/g	NA	NA	pCi/g
Th_{230}	1.19E–01	pCi/g	NA	NA	pCi/g

Radionuclides	CDI (year pCi/g)	CSF $(g/pCi-year)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.0E–06	NA
Np_{237+1d}	6.5E–01	4.3E–07	2.8E–07
Pu_{238}	NA	2.8E–11	NA
Ra_{226+8d}	NA	6.0E–06	NA
Ra_{228+1d}	NA	2.9E–06	NA
Rn_{222+4d}	NA	5.9E–06	NA
Sr_{90+1d}	5.3E–01	NA	NA
Tc_{99}	NA	6.0E–13	NA
Th_{228+7d}	NA	5.6E–06	NA
Th_{230}	4.9E+00	5.4E–11	2.7E–10
$Th_{232+10d}$	NA	8.5E–06	NA
U_{234}	1.3E+00	3.0E–11	3.8E–11
U_{235+1d}	NA	2.4E–07	NA
U_{238+2d}	1.1E+00	5.1E–08	5.7E–08
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		3.4E–07

001174

Table C.III-476
Summary of Intake Quantitation (chemicals) Alternatives 3
South Field Area with Private Ownership: On-Property Farmer (Child)
Via Incidental Ingestion of Soil

Intake Equation = $\frac{CS \times EF \times ED \times CF \times IR}{BW \times AT}$

IRs	Ingestion rate of soil (RAGS, 1989)	200 mg/day
CF	Conversion factor	1.0E-06 kg/mg
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in soil	(see table below)

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium-total	7.9E-01	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor-1254	NA	mg/kg	NA	NA	mg/kg
aroclor-1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

Table C.III-476 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Private Ownership: On-Property Farmer (Child)
Via Incidental Ingestion of Soil

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	1.0E-05	3.0E-03	3.4E-03
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		3.4E-03

Compound	ILCR Calculation CDI (mg/kg-day)	CSF $(mg/kg\text{-}day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	8.7E-07	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

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Table C.III-477
Summary of Intake and Risk Quantitation (radionuclides) Alternatives 3
South Field Area with Private Ownership: On-Property Farmer (Child)
Via Incidental Ingestion of Soil

Intake Equation = CS X EF X EDn X FI X IR

IRs	Ingestion rate of soil (RAGS, 1989)	200 mg/day
EF	Exposure frequency	350 days/year
EDn	Exposure Duration	6 Year
FI	Fractional Intake	1 (unitless)
CS	Concentration of radionuclides in soil	

Cs_{137+1d}	NA	pCi/mg	$Th_{232+10d}$	NA	pCi/mg
Np_{237+1d}	1.55E-05	pCi/mg	U_{234}	3.06E-05	pCi/mg
Pu_{238}	NA	pCi/mg	U_{235+1d}	NA	pCi/mg
Ra_{226+8d}	NA	pCi/mg	U_{238+2d}	2.70E-05	pCi/mg
Ra_{228+1d}	NA	pCi/mg	NA	NA	pCi/mg
Rn_{222+4d}	NA	pCi/mg	NA	NA	pCi/mg
Sr_{90+1d}	1.28E-05	pCi/mg	NA	NA	pCi/mg
Tc_{99}	NA	pCi/mg	NA	NA	pCi/mg
Th_{228+7d}	NA	pCi/mg	NA	NA	pCi/mg
Th_{230}	1.19E-04	pCi/mg	NA	NA	pCi/mg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.80E-11	NA
Np_{237+1d}	6.51E+00	2.20E-10	1.43E-09
Pu_{238}	NA	2.20E-10	NA
Ra_{226+8d}	NA	7.80E-10	NA
Ra_{228+1d}	NA	1.00E-10	NA
Rn_{222+4d}	NA	1.70E-12	NA
Sr_{90+1d}	5.38E+00	3.60E-11	1.94E-10
Tc_{99}	NA	1.30E-12	NA
Th_{228+7d}	NA	5.50E-11	NA
Th_{230}	4.99E+01	1.30E-11	6.49E-10
$Th_{232+10d}$	NA	1.70E-10	NA
U_{234}	1.29E+01	1.60E-11	2.06E-10
U_{235+1d}	NA	1.60E-11	NA
U_{238+2d}	1.13E+01	2.00E-11	2.27E-10
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 2.71E-09

001177

Table C.III-478
Summary of Intake Quantitation (chemicals) Alternatives 3
South Field Area with Private Ownership: On-Property Farmer (Child)
Via *Dermal Contact with Soil*

Intake Equation = $\frac{CS \times EF \times ED \times CF \times ABS \times AF \times SA}{BW \times AT}$

SA	Surface area of exposed skin (50th percentile, hands only)	2000 cm^2/day
AF	Soil to skin adherence factor (RAGS, 1989)	1 mg/cm^2
ABS	chemicals specific absorbtion factor (see table below)	csv
CF	Conversion factor	1E-06 kg/mg
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg.
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in soil	

Chemical Concentrations

Compound	ABS	Concentrati	Units	Compound		Concentrati	Units
antimony	1.00E-02	NA	mg/kg	NA	NA	NA	mg/kg
arsenic	1.00E-03	NA	mg/kg	NA	NA	NA	mg/kg
beryllium	1.00E-02	NA	mg/kg	NA	NA	NA	mg/kg
uranium-total	1.00E-02	7.94E-01	mg/kg	NA	NA	NA	mg/kg
benzo(a)pyrene	3.00E-01	NA	mg/kg	NA	NA	NA	mg/kg
carbazole	3.00E-01	NA	mg/kg	NA	NA	NA	mg/kg
aroclor-1254	6.00E-02	NA	mg/kg	NA	NA	NA	mg/kg
aroclor-1260	6.00E-02	NA	mg/kg	NA	NA	NA	mg/kg
dieldrin	3.00E-01	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg				

References

Table C.III-478 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Private Ownership: On-Property Farmer (Child)
Via Dermal Contact with Soil

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	6.00E-05	NA
arsenic	NA	2.85E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	1.02E-06	1.50E-04	6.77E-03
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	4.50E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		6.77E-03

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.90E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	8.70E-08	NA	NA
benzo(a)pyrene	NA	NA	NA
carbazole	NA	2.22E-02	NA
aroclor-1254	NA	1.03E+01	NA
aroclor-1260	NA	1.03E+01	NA
dieldrin	NA	1.78E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

Table C.III-479
Summary of Intake Quantitation (chemicals) Alternatives 3
South Field Area with Private Ownership: On-Property Farmer (Child)
Via Drinking Water Ingestion

Intake Equation = $\frac{CS \times EF \times ED \times IR}{BW \times AT}$

IR	Ingestion rate of groundwater (RAGS, 1989)	1 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in groundwater	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/l	NA	NA	mg/l
arsenic	NA	mg/l	NA	NA	mg/l
beryllium	NA	mg/l	NA	NA	mg/l
uranium-total	6.06E-04	mg/l	NA	NA	mg/l
benzo(a)pyrene	NA	mg/l	NA	NA	mg/l
carbazole	NA	mg/l	NA	NA	mg/l
aroclor-1254	NA	mg/l	NA	NA	mg/l
aroclor-1260	NA	mg/l	NA	NA	mg/l
dieldrin	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l			

References

Table C.III-479 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Private Ownership: On-Property Farmer (Child)
Via Drinking Water Ingestion

Compound	HQ Calculation		
	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.00E-04	NA
arsenic	NA	3.00E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	3.87E-05	3.00E-03	1.29E-02
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.00E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		1.29E-02

Compound	ILCR Calculation		
	CDI (mg/kg-day)	CSF $(mg/kg\text{-}day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.75E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	3.32E-06	NA	NA
benzo(a)pyrene	NA	7.30E+00	NA
carbazole	NA	2.00E-02	NA
aroclor-1254	NA	7.70E+00	NA
aroclor-1260	NA	7.70E+00	NA
dieldrin	NA	1.60E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

Table C.III-480
Summary of Intake and Risk Quantitation (radionuclides) Alternatives 3
South Field Area with Private Ownership: On-Property Farmer (Child)
Via Ingestion of Drinking Water

Intake Equation = Cw X EF X EDn X FI X IR

IR	Ingestion rate of groundwater (RAGS, 1989)	1 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
FI	Fractional intake for radionuclides	1 (Unitless)
Cw	Concentration of radionuclides in groundwater	(see table below)

Cs_{137+1d}	NA	pCi/l	$Th_{232+10d}$	NA	pCi/l
Np_{237+1d}	NA	pCi/l	U_{234}	1.8E-01	pCi/l
Pu_{238}	NA	pCi/l	U_{235+1d}	1.0E-02	pCi/l
Ra_{226+8d}	NA	pCi/l	U_{238+2d}	2.0E-01	pCi/l
Ra_{228+1d}	NA	pCi/l	NA	NA	pCi/l
Rn_{222+4d}	NA	pCi/l	NA	NA	pCi/l
Sr_{90+1d}	NA	pCi/l	NA	NA	pCi/l
Tc_{99}	NA	pCi/l	NA	NA	pCi/l
Th_{228+7d}	NA	pCi/l	NA	NA	pCi/l
Th_{230}	NA	pCi/l	NA	NA	pCi/l

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E-11	NA
Np_{237+1d}	NA	2.2E-10	NA
Pu_{238}	NA	2.2E-10	NA
Ra_{226+8d}	NA	7.8E-10	NA
Ra_{228+1d}	NA	1.0E-10	NA
Rn_{222+4d}	NA	1.7E-12	NA
Sr_{90+1d}	NA	3.6E-11	NA
Tc_{99}	NA	1.3E-12	NA
Th_{228+7d}	NA	5.5E-11	NA
Th_{230}	NA	1.3E-11	NA
$Th_{232+10d}$	NA	1.7E-10	NA
U_{234}	3.9E+02	1.6E-11	6.2E-09
U_{235+1d}	2.1E+01	1.6E-11	3.4E-10
U_{238+2d}	4.2E+02	2.0E-11	8.5E-09
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 1.5E-08

001182

Table C.III–481
Summary of Intake Quantitation (chemicals) Alternatives 3
South Field Area with Private Ownership: On–Property Farmer (Child)
Via Dermal Contact while Bathing

Intake Equation = $\frac{DA \times EF \times ED \times SA}{BW \times AT}$

DA	Dermal absorbed dose	csv mg/cm^2–day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	2190 days
SA	Skin surface area available for contact	8000 cm^2

Chemical Concentrations

Compound	DA	Units	Compound	DA	Units
antimony	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
arsenic	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
beryllium	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
uranium–total	1.52E–10	mg/cm^2–day	NA	NA	mg/cm^2–day
benzo(a)pyrene	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
carbazole	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
aroclor–1254	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
aroclor–1260	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
dieldrin	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day			

References

001183

6646

Table C.III-481 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Private Ownership: On-Property Farmer (Child)
Via Dermal Contact while Bathing

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	6.00E-05	NA
arsenic	NA	2.85E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	7.75E-08	1.50E-04	5.17E-04
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	4.50E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			5.17E-04

Compound	ILCR Calculation CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.90E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	6.64E-09	NA	NA
benzo(a)pyrene	NA	NA	NA
carbazole	NA	2.22E-02	NA
aroclor-1254	NA	1.03E+01	NA
aroclor-1260	NA	1.03E+01	NA
dieldrin	NA	1.78E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

Table C.III–482
Summary of Intake and Risk Quantitation (radionuclides) Alternatives 3
South Field Area with Private Ownership: On–Property Farmer (Child)
Via Inhalation of Gases and Particulates

Intake Equation = Ca X EF X EDn X IR

IR	Inhalation rate of gases (RAGS, 1989)	12 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Ca	Concentration of radionuclides in air	(see table below)

Cs_{137+1d}	NA	pCi/m^3	$Th_{232+10d}$	NA	pCi/m^3
Np_{237+1d}	4.3E–06	pCi/m^3	U_{234}	1.3E–05	pCi/m^3
Pu_{238}	NA	pCi/m^3	U_{235+1d}	NA	pCi/m^3
Ra_{226+8d}	NA	pCi/m^3	U_{238+2d}	1.1E–05	pCi/m^3
Ra_{228+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Rn_{222+4d}	NA	pCi/m^3	NA	NA	pCi/m^3
Sr_{90+1d}	3.1E–06	pCi/m^3	NA	NA	pCi/m^3
Tc_{99}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{228+7d}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{230}	6.6E–05	pCi/m^3	NA	NA	pCi/m^3

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	1.9E–11	NA
Np_{237+1d}	1.1E–01	2.9E–08	3.1E–09
Pu_{238}	NA	3.9E–08	NA
Ra_{226+8d}	NA	7.0E–09	NA
Ra_{228+1d}	NA	6.9E–10	NA
Rn_{222+4d}	NA	7.7E–12	NA
Sr_{90+1d}	7.8E–02	6.2E–11	4.8E–12
Tc_{99}	NA	8.3E–12	NA
Th_{228+7d}	NA	7.8E–08	NA
Th_{230}	1.7E+00	2.9E–08	4.8E–08
$Th_{232+10d}$	NA	1.1E–07	NA
U_{234}	3.3E–01	2.6E–08	8.5E–09
U_{235+1d}	NA	2.5E–08	NA
U_{238+2d}	2.9E–01	2.4E–08	6.9E–09
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
		ILCR Summation =	6.7E–08

001185

Table C.III-483
Summary of Intake Quantitation (chemicals) Alternatives 3
South Field Area with Private Ownership: On-Property Farmer (Child)
Via Ingestion of Meat Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of meat	0.039 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in meat	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium-total	1.6E-04	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor-1254	NA	mg/kg	NA	NA	mg/kg
aroclor-1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

Table C.III–483 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Private Ownership: On–Property Farmer (Child)
Via Ingestion of Meat Products

Compound	HQ Calculation		
	CDI (mg/kg–day)	RfD (mg/kg–day)	HQ (unitless)
antimony	NA	4.0E–04	NA
arsenic	NA	3.0E–04	NA
beryllium	NA	5.0E–03	NA
uranium–total	2.9E–07	3.0E–03	9.8E–05
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor–1254	NA	NA	NA
aroclor–1260	NA	NA	NA
dieldrin	NA	5.0E–05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		9.8E–05

Compound	ILCR Calculation		
	CDI (mg/kg–day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium–total	2.5E–08	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E–02	NA
aroclor–1254	NA	7.7E+00	NA
aroclor–1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

001187

Table C.III–484
Summary of Intake and Risk Quantitation (radionuclides) Alternatives 3
South Field Area with Private Ownership: On–Property Farmer (Child)
Via Ingestion of Meat Products

Intake Equation = Cf X EF X EDn X FI X IR

IR	Ingestion rate of meat	0.039 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cf	Concentration of radionuclides in meat	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	8.7E–04	pCi/kg	U_{234}	7.7E–03	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	1.0E–04	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	7.2E–03	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	4.8E–01	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	4.2E–04	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	5.3E–02	2.2E–10	1.2E–11
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	3.0E+01	3.6E–11	1.1E–09
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	2.6E–02	1.3E–11	3.4E–13
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	4.7E–01	1.6E–11	7.6E–12
U_{235+1d}	6.1E–03	1.6E–11	9.8E–14
U_{238+2d}	4.4E–01	2.0E–11	8.8E–12
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		1.1E–09

001188

Table C.III–485
Summary of Intake Quantitation (chemicals) Alternatives 3
South Field Area with Private Ownership: On–Property Farmer (Child)
Via Ingestion of Dairy Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of dairy products	0.9 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in animal products	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium–total	4.7E–04	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor–1254	NA	mg/kg	NA	NA	mg/kg
aroclor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

001189

Table C.III-485 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Private Ownership: On-Property Farmer (Child)
Via Ingestion of Dairy Products

Compound	HQ Calculation		
	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	2.0E-05	3.0E-03	6.8E-03
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			6.8E-03

Compound	ILCR Calculation		
	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	1.8E-06	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

Table C.III–486
Summary of Intake and Risk Quantitation (radionuclides) Alternatives 3
South Field Area with Private Ownership: On–Property Farmer (Child)
Via Ingestion of Dairy Products

Intake Equation = Cp X EF X EDn X FI X IR

IR	Ingestion rate of dairy products	0.9 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cp	Concentration of radionuclides in animal products	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	7.9E–05	pCi/kg	U_{234}	2.4E–02	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	3.6E–04	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	2.3E–02	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	2.4E+00	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	3.5E–04	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	1.1E–01	2.2E–10	2.5E–11
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	3.4E+03	3.6E–11	1.2E–07
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	5.0E–01	1.3E–11	6.5E–12
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	3.4E+01	1.6E–11	5.5E–10
U_{235+1d}	5.1E–01	1.6E–11	8.2E–12
U_{238+2d}	3.2E+01	2.0E–11	6.5E–10
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 1.2E–07

001191

Table C.III-487
Summary of Intake Quantitation (chemicals) Alternatives 3
South Field Area with Private Ownership: On-Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of fruits or vegetables	0.1 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in vegetables	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium-total	1.0E-02	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor-1254	NA	mg/kg	NA	NA	mg/kg
aroclor-1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

001192

Table C.III-487 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Private Ownership: On-Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	6.4E-05	3.0E-03	2.1E-02
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		2.1E-02

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	5.5E-06	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

001193

Table C.III–488
Summary of Intake and Risk Quantitation (radionuclides) Alternatives 3
South Field Area with Private Ownership: On–Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

Intake Equation = Cv X EF X EDn X FI X IR

IR	Ingestion rate of fruits or vegetables	0.1 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cv	Concentration of radionuclides in vegetables	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	1.6E–01	pCi/kg	U_{234}	1.2E+00	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	4.9E–02	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	1.2E+00	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	3.2E+01	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	1.9E–01	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	3.3E+01	2.2E–10	7.4E–09
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	6.7E+03	3.6E–11	2.4E–07
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	3.9E+01	1.3E–11	5.1E–10
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	2.5E+02	1.6E–11	3.9E–09
U_{235+1d}	1.0E+01	1.6E–11	1.6E–10
U_{238+2d}	2.6E+02	2.0E–11	5.2E–09
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 2.6E–07

001194

Table C.III–489
Summary of Intake and Risk Quantitation (radionuclides) Alternatives 3
South Field Area with Private Ownership: On–Property Farmer (Child)
Via External Radiation

Dose Equivalency Equat = $[DR \times EF \times EDn \times ET_i \times (1-SH_i)] + [DR \times EF \times EDn \times ET_o \times (1-SH_o)]$

EF	Fraction of year spent exposured	0.96 (unitless)
ED	Exposure duration	6 Year
ET_i	Fraction of day spent indoors	0.92 (unitless)
ET_o	Fraction of day spent outdoors	0.08 (unitless)
SH_i	Shield factor indoors	0.5 (unitless)
SH_o	Shield factor outdoors	NA (unitless)
DR	Radionuclide specific dose concentrations	(see table below)

Cs_{137+1d}	NA	pCi/g	$Th_{232+10d}$	NA	pCi/g
Np_{237+1d}	1.55E–02	pCi/g	U_{234}	3.06E–02	pCi/g
Pu_{238}	NA	pCi/g	U_{235+1d}	NA	pCi/g
Ra_{226+8d}	NA	pCi/g	U_{238+2d}	2.70E–02	pCi/g
Ra_{228+1d}	NA	pCi/g	NA	NA	pCi/g
Rn_{222+4d}	NA	pCi/g	NA	NA	pCi/g
Sr_{90+1d}	1.28E–02	pCi/g	NA	NA	pCi/g
Tc_{99}	NA	pCi/g	NA	NA	pCi/g
Th_{228+7d}	NA	pCi/g	NA	NA	pCi/g
Th_{230}	1.19E–01	pCi/g	NA	NA	pCi/g

Radionuclides	CDI (year pCi/g)	CSF $(g/pCi-year)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.0E–06	NA
Np_{237+1d}	4.8E–02	4.3E–07	2.1E–08
Pu_{238}	NA	2.8E–11	NA
Ra_{226+8d}	NA	6.0E–06	NA
Ra_{228+1d}	NA	2.9E–06	NA
Rn_{222+4d}	NA	5.9E–06	NA
Sr_{90+1d}	4.0E–02	NA	NA
Tc_{99}	NA	6.0E–13	NA
Th_{228+7d}	NA	5.6E–06	NA
Th_{230}	3.7E–01	5.4E–11	2.0E–11
$Th_{232+10d}$	NA	8.5E–06	NA
U_{234}	9.5E–02	3.0E–11	2.9E–12
U_{235+1d}	NA	2.4E–07	NA
U_{238+2d}	8.4E–02	5.1E–08	4.3E–09
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 2.5E–08

001195

Table C.III-490
Summary of Intake Quantitation (chemicals) Alternative 6
South Field Area with Federal Ownership: Expanded Trespasser
Via Incidental Ingestion of Soil/Sediment

Intake Equation

$$= \frac{CS \times EFa \times EDa \times CF \times IRa}{BWa \times ATa} + \frac{CS \times EFc \times EDc \times CF \times IRc}{BWc \times ATc}$$

IRa	Ingestion rate of soil (adult)	12.5 mg/day
IRc	Ingestion rate of soil (child)	12.5 mg/day
CF	Conversion factor	1.00E-06 kg/mg
EFa	Exposure frequency (adult)	40 days/year
EFc	Exposure frequency (child)	110 days/year
EDa	Exposure duration (adult)	32 Year
EDc	Exposure duration (child)	12 Year
BWa	Body weight (adult)	70 kg
BWc	Body weight (child)	43 kg
AT	Average time for carcinogens	25550 days
ATa	Average time for non-carcinogens (adult)	11680 days
ATc	Average time for non-carcinogens (child)	4380 days
CS	Concentration of chemicals in soil	(see table below)

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	2.6E+00	mg/kg	NA	NA	mg/kg
beryllium	2.4E-01	mg/kg	NA	NA	mg/kg
uranium-total	4.3E+00	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	4.4E-01	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor-1254	1.1E-01	mg/kg	NA	NA	mg/kg
aroclor-1260	9.3E-03	mg/kg	NA	NA	mg/kg
dieldrin	2.4E-03	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

Table C.III-490 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Federal Ownership: Expanded Trespasser
Via Incidental Ingestion of Soil/Sediment

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	2.8E-07	3.0E-04	9.2E-04
beryllium	2.6E-08	5.0E-03	5.2E-06
uranium-total	4.6E-07	3.0E-03	1.5E-04
benzo(a)pyrene	4.7E-08	NA	NA
carbazole	NA	NA	NA
aroclor-1254	1.2E-08	NA	NA
aroclor-1260	1.0E-09	NA	NA
dieldrin	2.6E-10	5.0E-05	5.1E-06
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			1.1E-03

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	6.2E-08	1.8E+00	1.1E-07
beryllium	5.9E-09	4.3E+00	2.5E-08
uranium-total	1.0E-07	NA	NA
benzo(a)pyrene	1.1E-08	7.3E+00	7.7E-08
carbazole	NA	2.0E-02	NA
aroclor-1254	2.7E-09	7.7E+00	2.1E-08
aroclor-1260	2.2E-10	7.7E+00	1.7E-09
dieldrin	5.8E-11	1.6E+01	9.2E-10
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			2.3E-07

001192

6646

Table C.III–491
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
South Field Area with Federal Ownership: Expanded Trespasser
Via Incidental Ingestion of Soil/Sediment

Intake Equation = CS X EFa X EDa X FI X IRa + CS X EFc X EDc X FI X IRc

IRa	Ingestion rate of soil (adult)	12.5 mg/day
IRc	Ingestion rate of soil (child)	12.5 mg/day
EFa	Exposure frequency (adult)	40 days/year
EFc	Exposure frequency (child)	110 days/year
EDa	Exposure Duration	32 Year
EDc	Exposure Duration	12 Year
FI	Fractional Intake	1 (unitless)
CS	Concentration of radionuclides in soil	(see table below)

Cs_{137+1d}	NA	pCi/mg	$Th_{232+10d}$	3.4E–05	pCi/mg
Np_{237+1d}	1.9E–04	pCi/mg	U_{234}	1.4E–03	pCi/mg
Pu_{238}	NA	pCi/mg	U_{235+1d}	1.3E–03	pCi/mg
Ra_{226+8d}	1.7E–04	pCi/mg	U_{238+2d}	9.5E–04	pCi/mg
Ra_{228+1d}	2.2E–04	pCi/mg	NA	NA	pCi/mg
Rn_{222+4d}	NA	pCi/mg	NA	NA	pCi/mg
Sr_{90+1d}	1.3E–03	pCi/mg	NA	NA	pCi/mg
Tc_{99}	4.0E–04	pCi/mg	NA	NA	pCi/mg
Th_{228+7d}	9.1E–05	pCi/mg	NA	NA	pCi/mg
Th_{230}	3.6E–03	pCi/mg	NA	NA	pCi/mg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	6.1E+00	2.2E–10	1.3E–09
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	5.5E+00	7.8E–10	4.3E–09
Ra_{228+1d}	7.3E+00	1.0E–10	7.3E–10
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	4.1E+01	3.6E–11	1.5E–09
Tc_{99}	1.3E+01	1.3E–12	1.7E–11
Th_{228+7d}	2.9E+00	5.5E–11	1.6E–10
Th_{230}	1.2E+02	1.3E–11	1.5E–09
$Th_{232+10d}$	1.1E+00	1.7E–10	1.9E–10
U_{234}	4.7E+01	1.6E–11	7.5E–10
U_{235+1d}	4.2E+01	1.6E–11	6.7E–10
U_{238+2d}	3.1E+01	2.0E–11	6.2E–10
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 1.2E–08

001198

Table C.III-492
Summary of Intake Quantitation (chemicals) Alternative 6
South Field Area with Federal Ownership: Expanded Trespasser
Via Dermal Contact with Soil/Sediment

Intake Equation = $\frac{CS \times EFa \times EDa \times CF \times ABS \times AF \times SAa}{BWa \times ATa}$ + $\frac{CS \times EFc \times EDc \times CF \times ABS \times AF \times SAc}{BWc \times ATc}$

SA	Surface area of exposed skin (adult)	5750 cm^2/day
SA	Surface area of exposed skin (child)	4200 cm^2/day
AF	Soil to skin adherence factor	1 mg/cm^2
ABS	chemicals specific absorbtion factor (see table below)	csv
CF	Conversion factor	1E-06 kg/mg
EFa	Exposure frequency (adult)	40 days/year
EFc	Exposure frequency (child)	110 days/year
EDa	Exposure duration (adult)	32 Year
EDc	Exposure duration (child)	12 Year
BWa	Body weight (adult)	70 kg
BWc	Body weight (child)	43 kg
AT	Average time for carcinogens	25550 days
ATa	Average time for non-carcinogens (adult)	11680 days
ATc	Average time for non-carcinogens (child)	4380 days
CS	Concentration of chemicals in soil	(see table below)

Chemical Concentrations

Compound	ABS	Concentrati	Units	Compound	ABS	Concentrati	Units
antimony	1.0E-02	NA	mg/kg	NA	NA	NA	mg/kg
arsenic	1.0E-03	2.6E+00	mg/kg	NA	NA	NA	mg/kg
beryllium	1.0E-02	2.4E-01	mg/kg	NA	NA	NA	mg/kg
uranium-total	1.0E-02	4.3E+00	mg/kg	NA	NA	NA	mg/kg
benzo(a)pyrene	3.0E-01	4.4E-01	mg/kg	NA	NA	NA	mg/kg
carbazole	3.0E-01	NA	mg/kg	NA	NA	NA	mg/kg
aroclor-1254	6.0E-02	1.1E-01	mg/kg	NA	NA	NA	mg/kg
aroclor-1260	6.0E-02	9.3E-03	mg/kg	NA	NA	NA	mg/kg
dieldrin	3.0E-01	2.4E-03	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg				

References

001199

Table C.III-492 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Federal Ownership: Expanded Trespasser
Via Dermal Contact with Soil/Sediment

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	6.0E-05	NA
arsenic	9.9E-08	2.9E-04	3.5E-04
beryllium	9.4E-08	5.0E-03	1.9E-05
uranium-total	1.6E-06	1.5E-04	1.1E-02
benzo(a)pyrene	5.1E-06	NA	NA
carbazole	NA	NA	NA
aroclor-1254	2.6E-07	NA	NA
aroclor-1260	2.1E-08	NA	NA
dieldrin	2.8E-08	4.5E-05	6.2E-04
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			1.2E-02

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	2.4E-08	1.9E+00	4.5E-08
beryllium	2.2E-08	4.3E+00	9.6E-08
uranium-total	3.9E-07	NA	NA
benzo(a)pyrene	1.2E-06	NA	NA
carbazole	NA	2.2E-02	NA
aroclor-1254	6.2E-08	1.0E+01	6.4E-07
aroclor-1260	5.1E-09	1.0E+01	5.2E-08
dieldrin	6.6E-09	1.8E+01	1.2E-07
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			9.5E-07

Table C.III-493
Summary of Intake Quantitation (chemicals) Alternative 6
South Field Area with Federal Ownership: Expanded Trespasser
Via Inhalation of Gases and Particulates

Intake Equation = $\frac{CS \times EFa \times EDa \times IR \times ETa}{BWa \times ATa}$ + $\frac{CS \times EFc \times EDc \times IR \times ETc}{BWc \times ATc}$

IR	Inhalation rate of gases	0.83 m^3/hour
ETa	Exposure time (adult)	1 hour/day
ETc	Exposure time (child)	2 hour/day
EFa	Exposure frequency (adult)	40 days/year
EFc	Exposure frequency (child)	110 days/year
EDa	Exposure duration (adult)	32 Year
EDc	Exposure duration (child)	12 Year
BWa	Body weight (adult)	70 kg
BWc	Body weight (child)	43 kg
AT	Average time for carcinogens	25550 days
ATa	Average time for non-carcinogens (adult)	11680 days
ATc	Average time for non-carcinogens (child)	4380 days
CS	Concentration of chemicals in particulate as modeled	(see table below)

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/m^3	NA	NA	mg/m^3
arsenic	8.2E-08	mg/m^3	NA	NA	mg/m^3
beryllium	6.3E-09	mg/m^3	NA	NA	mg/m^3
uranium-total	7.0E-08	mg/m^3	NA	NA	mg/m^3
benzo(a)pyrene	1.3E-08	mg/m^3	NA	NA	mg/m^3
carbazole	NA	mg/m^3	NA	NA	mg/m^3
aroclor-1254	3.3E-09	mg/m^3	NA	NA	mg/m^3
aroclor-1260	2.8E-10	mg/m^3	NA	NA	mg/m^3
dieldrin	7.2E-11	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3			

References

001201

Table C.III–493 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Federal Ownership: Expanded Trespasser
Via Inhalation of Gases and Particulates

Compound	HQ Calculation		
	CDI (mg/kg–day)	RfD (mg/kg–day)	HQ (unitless)
antimony	NA	NA	NA
arsenic	1.1E–09	NA	NA
beryllium	8.2E–11	NA	NA
uranium–total	9.1E–10	NA	NA
benzo(a)pyrene	1.7E–10	NA	NA
carbazole	NA	NA	NA
aroclor–1254	4.2E–11	NA	NA
aroclor–1260	3.6E–12	NA	NA
dieldrin	9.3E–13	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		NA

Compound	ILCR Calculation		
	CDI (mg/kg–day)	CSF $(mg/kg–day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	2.1E–10	1.5E+01	3.2E–09
beryllium	1.6E–11	8.4E+00	1.4E–10
uranium–total	1.8E–10	NA	NA
benzo(a)pyrene	3.4E–11	6.1E+00	2.1E–10
carbazole	NA	NA	NA
aroclor–1254	8.4E–12	NA	NA
aroclor–1260	7.3E–13	NA	NA
dieldrin	1.9E–13	1.6E+01	3.0E–12
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		3.5E–09

000170

Table C.III–494
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
South Field Area with Federal Ownership: Expanded Trespasser
Via Inhalation of Gases and Particulates

Intake Equation = CA X EFa X EDa X IR X ETa + CA X EFc EDc X IR X ETc

IR	Inhalation rate of gases	0.83 m^3/hour
EFa	Exposure frequency (adult)	40 days/year
EFc	Exposure frequency (child)	110 days/year
EDa	Exposure duration	32 Year
EDc	Exposure duration	12 Year
ETa	Exposure time (adult)	1 hour/day
ETc	Exposure time (child)	2 hour/day
CA	Concentration of radionuclides in air	(see table below)

Cs_{137+1d}	NA	pCi/m^3	$Th_{232+10d}$	1.0E−06	pCi/m^3
Np_{237+1d}	3.6E−06	pCi/m^3	U_{234}	3.1E−05	pCi/m^3
Pu_{238}	NA	pCi/m^3	U_{235+1d}	2.9E−05	pCi/m^3
Ra_{226+8d}	3.7E−06	pCi/m^3	U_{238+2d}	2.0E−05	pCi/m^3
Ra_{228+1d}	5.9E−06	pCi/m^3	NA	NA	pCi/m^3
Rn_{222+4d}	1.7E+00	pCi/m^3	NA	NA	pCi/m^3
Sr_{90+1d}	3.0E−05	pCi/m^3	NA	NA	pCi/m^3
Tc_{99}	8.7E−06	pCi/m^3	NA	NA	pCi/m^3
Th_{228+7d}	2.7E−06	pCi/m^3	NA	NA	pCi/m^3
Th_{230}	9.3E−05	pCi/m^3	NA	NA	pCi/m^3

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	1.9E−11	NA
Np_{237+1d}	1.2E−02	2.9E−08	3.4E−10
Pu_{238}	NA	3.9E−08	NA
Ra_{226+8d}	1.2E−02	7.0E−09	8.4E−11
Ra_{228+1d}	1.9E−02	6.9E−10	1.3E−11
Rn_{222+4d}	5.5E+03	7.7E−12	4.2E−08
Sr_{90+1d}	9.7E−02	6.2E−11	6.0E−12
Tc_{99}	2.8E−02	8.3E−12	2.3E−13
Th_{228+7d}	8.9E−03	7.8E−08	6.9E−10
Th_{230}	3.0E−01	2.9E−08	8.8E−09
$Th_{232+10d}$	3.4E−03	1.1E−07	3.7E−10
U_{234}	1.0E−01	2.6E−08	2.6E−09
U_{235+1d}	9.5E−02	2.5E−08	2.4E−09
U_{238+2d}	6.4E−02	2.4E−08	1.5E−09
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		5.9E−08

Table C.III–495
Summary of Risk Quantitation (radionuclides) Alternative 6
South Field Area with Federal Ownership: Expanded Trespasser
Via External Radiation

Exposure Equation = $[CR \times EFa \times EDa \times ET_{oa} \times (1-SH_o)]+[CR \times EFc \times EDc \times ET_{oc} \times (1-SH_o)]$

EFa	Fraction of year spent exposured (adult)	0.11 (unitless)
EFc	Fraction of year spent exposured (child)	0.3 (unitless)
EDa	Exposure duration (adult)	32 Year
EDc	Exposure duration (child)	12 Year
ET_{oa}	Fraction of day spent outdoors (adult)	0.04 (unitless)
ET_{oc}	Fraction of day spent outdoors (child)	0.08 (unitless)
SH_o	Shield factor outdoors	NA (unitless)
CR	Radionuclide specific concentrations	(see table below)

Cs_{137+1d}	NA	pCi/g	$Th_{232+10d}$	3.4E−02	pCi/g
Np_{237+1d}	1.9E−01	pCi/g	U_{234}	1.4E+00	pCi/g
Pu_{238}	NA	pCi/g	U_{235+1d}	1.3E+00	pCi/g
Ra_{226+8d}	1.7E−01	pCi/g	U_{238+2d}	9.5E−01	pCi/g
Ra_{228+1d}	2.2E−01	pCi/g	NA	NA	pCi/g
Rn_{222+4d}	NA	pCi/g	NA	NA	pCi/g
Sr_{90+1d}	1.3E+00	pCi/g	NA	NA	pCi/g
Tc_{99}	4.0E−01	pCi/g	NA	NA	pCi/g
Th_{228+7d}	9.1E−02	pCi/g	NA	NA	pCi/g
Th_{230}	3.6E+00	pCi/g	NA	NA	pCi/g

Radionuclides	CDI (year pCi/g)	CSF $(g/pCi-year)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.0E−06	NA
Np_{237+1d}	8.1E−02	4.3E−07	3.5E−08
Pu_{238}	NA	2.8E−11	NA
Ra_{226+8d}	7.2E−02	6.0E−06	4.3E−07
Ra_{228+1d}	9.6E−02	2.9E−06	2.8E−07
Rn_{222+4d}	NA	5.9E−06	NA
Sr_{90+1d}	5.4E−01	NA	NA
Tc_{99}	1.7E−01	6.0E−13	1.0E−13
Th_{228+7d}	3.9E−02	5.6E−06	2.2E−07
Th_{230}	1.6E+00	5.4E−11	8.4E−11
$Th_{232+10d}$	1.5E−02	8.5E−06	1.3E−07
U_{234}	6.2E−01	3.0E−11	1.9E−11
U_{235+1d}	5.5E−01	2.4E−07	1.3E−07
U_{238+2d}	4.1E−01	5.1E−08	2.1E−08
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 1.2E−06

Table C.III–496
Summary of Intake Quantitation (chemicals) Alternative 6
South Field Area with Federal Ownership: Off–Property Farmer (Adult)
Via Drinking Water Ingestion

Intake Equation = $\frac{CS \times EF \times ED \times IR}{BW \times AT}$

IR	Ingestion rate of groundwater (RAGS, 1989)	2 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in groundwater	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/l	NA	NA	mg/l
arsenic	NA	mg/l	NA	NA	mg/l
beryllium	NA	mg/l	NA	NA	mg/l
uranium–total	2.16E–03	mg/l	NA	NA	mg/l
benzo(a)pyrene	NA	mg/l	NA	NA	mg/l
carbazole	NA	mg/l	NA	NA	mg/l
aroclor–1254	NA	mg/l	NA	NA	mg/l
aroclor–1260	NA	mg/l	NA	NA	mg/l
dieldrin	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l			

References

001205

Table C.III-496 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Federal Ownership: Off-Property Farmer (Adult)
Via Drinking Water Ingestion

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.00E-04	NA
arsenic	NA	3.00E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	5.92E-05	3.00E-03	1.97E-02
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.00E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			1.97E-02

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.75E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	5.92E-05	NA	NA
benzo(a)pyrene	NA	7.30E+00	NA
carbazole	NA	2.00E-02	NA
aroclor-1254	NA	7.70E+00	NA
aroclor-1260	NA	7.70E+00	NA
dieldrin	NA	1.60E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

Table C.III–497
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
South Field Area with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Drinking Water

Intake Equation = Cw X EF X EDn X FI X IR

IR	Ingestion rate of groundwater (RAGS, 1989)	2 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
FI	Fractional intake for radionuclides	1 (Unitless)
Cw	Concentration of radionuclides in groundwater	(see table below)

Cs_{137+1d}	NA	pCi/l	$Th_{232+10d}$	NA	pCi/l
Np_{237+1d}	NA	pCi/l	U_{234}	6.6E–01	pCi/l
Pu_{238}	NA	pCi/l	U_{235+1d}	3.5E–02	pCi/l
Ra_{226+8d}	NA	pCi/l	U_{238+2d}	7.2E–01	pCi/l
Ra_{228+1d}	NA	pCi/l	NA	NA	pCi/l
Rn_{222+4d}	NA	pCi/l	NA	NA	pCi/l
Sr_{90+1d}	NA	pCi/l	NA	NA	pCi/l
Tc_{99}	NA	pCi/l	NA	NA	pCi/l
Th_{228+7d}	NA	pCi/l	NA	NA	pCi/l
Th_{230}	NA	pCi/l	NA	NA	pCi/l

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	NA	2.2E–10	NA
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	NA	1.3E–11	NA
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	3.2E+04	1.6E–11	5.1E–07
U_{235+1d}	1.7E+03	1.6E–11	2.7E–08
U_{238+2d}	3.5E+04	2.0E–11	7.1E–07
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 1.2E–06

001207

Table C.III–498
Summary of Intake Quantitation (chemicals) Alternative 6
South Field Area with Federal Ownership: Off–Property Farmer (Adult)
Via Dermal Contact while Bathing

Intake Equation = $\frac{DA \times EF \times ED \times SA}{BW \times AT}$

DA	Dermal absorbed dose	csv mg/cm^2–day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
SA	Skin surface area available for contact	23000 cm^2

Chemical Concentrations

Compound	DA	Units	Compound	DA	Units
antimony	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
arsenic	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
beryllium	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
uranium–total	5.40E–10	mg/cm^2–day	NA	NA	mg/cm^2–day
benzo(a)pyrene	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
carbazole	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
aroclor–1254	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
aroclor–1260	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
dieldrin	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day			

References

Table C.III-498 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Federal Ownership: Off-Property Farmer (Adult)
Via Dermal Contact while Bathing

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	6.00E-05	NA
arsenic	NA	2.85E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	1.70E-07	1.50E-04	1.13E-03
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	4.50E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			1.13E-03

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.90E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	1.70E-07	NA	NA
benzo(a)pyrene	NA	NA	NA
carbazole	NA	2.22E-02	NA
aroclor-1254	NA	1.03E+01	NA
aroclor-1260	NA	1.03E+01	NA
dieldrin	NA	1.78E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

001209

Table C.III-499
Summary of Intake Quantitation (chemicals) Alternative 6
South Field Area with Federal Ownership: Off-Property Farmer (Adult)
Via Inhalation of Particulates

Intake Equation = $\frac{CS \times EF \times ED \times IR}{BW \times AT}$

IR	Inhalation rate of gases (RAGS, 1989)	20 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in soil	(see table below)

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/m^3	NA	NA	mg/m^3
arsenic	4.3E-09	mg/m^3	NA	NA	mg/m^3
beryllium	3.2E-10	mg/m^3	NA	NA	mg/m^3
uranium-total	5.7E-09	mg/m^3	NA	NA	mg/m^3
benzo(a)pyrene	4.8E-10	mg/m^3	NA	NA	mg/m^3
carbazole	NA	mg/m^3	NA	NA	mg/m^3
aroclor-1254	1.2E-10	mg/m^3	NA	NA	mg/m^3
aroclor-1260	1.0E-11	mg/m^3	NA	NA	mg/m^3
dieldrin	2.6E-12	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3			

References

001210

Table C.III-499 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Federal Ownership: Off-Property Farmer (Adult)
Via Inhalation of Particulates

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	NA	NA
arsenic	1.2E-09	NA	NA
beryllium	8.8E-11	NA	NA
uranium-total	1.6E-09	NA	NA
benzo(a)pyrene	1.3E-10	NA	NA
carbazole	NA	NA	NA
aroclor-1254	3.4E-11	NA	NA
aroclor-1260	2.8E-12	NA	NA
dieldrin	7.0E-13	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
Hazard Quotient Sum =			NA

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	1.2E-09	1.5E+01	1.8E-08
beryllium	8.8E-11	8.4E+00	7.4E-10
uranium-total	1.6E-09	NA	NA
benzo(a)pyrene	1.3E-10	6.1E+00	8.0E-10
carbazole	NA	NA	NA
aroclor-1254	3.4E-11	NA	NA
aroclor-1260	2.8E-12	NA	NA
dieldrin	7.0E-13	1.6E+01	1.1E-11
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
ILCR Summation =			1.9E-08

001211

Table C.III–500
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
South Field Area with Federal Ownership: Off–Property Farmer (Adult)
Via Inhalation of Gases and Particulates

Intake Equation = Ca X EF X EDn X IR

IR	Inhalation rate of gases (RAGS, 1989)	20 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Ca	Concentration of radionuclides in air	(see table below)

Cs_{137+1d}	NA	pCi/m^3	$Th_{232+10d}$	3.7E–08	pCi/m^3
Np_{237+1d}	2.5E–07	pCi/m^3	U_{234}	1.7E–06	pCi/m^3
Pu_{238}	NA	pCi/m^3	U_{235+1d}	1.4E–06	pCi/m^3
Ra_{226+8d}	1.9E–07	pCi/m^3	U_{238+2d}	1.1E–06	pCi/m^3
Ra_{228+1d}	2.4E–07	pCi/m^3	NA	NA	pCi/m^3
Rn_{222+4d}	8.7E–02	pCi/m^3	NA	NA	pCi/m^3
Sr_{90+1d}	1.6E–06	pCi/m^3	NA	NA	pCi/m^3
Tc_{99}	4.4E–07	pCi/m^3	NA	NA	pCi/m^3
Th_{228+7d}	9.8E–08	pCi/m^3	NA	NA	pCi/m^3
Th_{230}	3.9E–06	pCi/m^3	NA	NA	pCi/m^3

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	1.9E–11	NA
Np_{237+1d}	1.2E–01	2.9E–08	3.6E–09
Pu_{238}	NA	3.9E–08	NA
Ra_{226+8d}	9.3E–02	7.0E–09	6.5E–10
Ra_{228+1d}	1.2E–01	6.9E–10	8.2E–11
Rn_{222+4d}	4.3E+04	7.7E–12	3.3E–07
Sr_{90+1d}	7.9E–01	6.2E–11	4.9E–11
Tc_{99}	2.2E–01	8.3E–12	1.8E–12
Th_{228+7d}	4.8E–02	7.8E–08	3.8E–09
Th_{230}	1.9E+00	2.9E–08	5.5E–08
$Th_{232+10d}$	1.8E–02	1.1E–07	2.0E–09
U_{234}	8.1E–01	2.6E–08	2.1E–08
U_{235+1d}	7.1E–01	2.5E–08	1.8E–08
U_{238+2d}	5.3E–01	2.4E–08	1.3E–08
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
		ILCR Summation =	4.5E–07

Table C.III–501
Summary of Intake Quantitation (chemicals) Alternative 6
South Field Area with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Meat Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of meat	0.101 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in meat	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	3.0E–06	mg/kg	NA	NA	mg/kg
beryllium	5.0E–08	mg/kg	NA	NA	mg/kg
uranium–total	2.2E–05	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	1.9E–06	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor–1254	6.8E–07	mg/kg	NA	NA	mg/kg
aroclor–1260	9.9E–07	mg/kg	NA	NA	mg/kg
dieldrin	1.7E–10	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

001213

001014

Table C.III−501 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Federal Ownership: Off−Property Farmer (Adult)
Via Ingestion of Meat Products

Compound	HQ Calculation CDI (mg/kg−day)	RfD (mg/kg−day)	HQ (unitless)
antimony	NA	4.0E−04	NA
arsenic	3.1E−09	3.0E−04	1.0E−05
beryllium	5.2E−11	5.0E−03	1.0E−08
uranium−total	2.3E−08	3.0E−03	7.5E−06
benzo(a)pyrene	2.0E−09	NA	NA
carbazole	NA	NA	NA
aroclor−1254	7.1E−10	NA	NA
aroclor−1260	1.0E−09	NA	NA
dieldrin	1.8E−13	5.0E−05	3.6E−09
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		1.8E−05

Compound	ILCR Calculation CDI (mg/kg−day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	3.1E−09	1.8E+00	5.5E−09
beryllium	5.2E−11	4.3E+00	2.3E−10
uranium−total	2.3E−08	NA	NA
benzo(a)pyrene	2.0E−09	7.3E+00	1.4E−08
carbazole	NA	2.0E−02	NA
aroclor−1254	7.1E−10	7.7E+00	5.4E−09
aroclor−1260	1.0E−09	7.7E+00	7.9E−09
dieldrin	1.8E−13	1.6E+01	2.9E−12
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		3.3E−08

Table C.III–502
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
South Field Area with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Meat Products

Intake Equation = Cf X EF X EDn X FI X IR

IR	Ingestion rate of meat	0.101 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cf	Concentration of radionuclides in meat	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	2.0E−08	pCi/kg
Np_{237+1d}	1.1E−06	pCi/kg	U_{234}	6.6E−03	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	3.7E−04	pCi/kg
Ra_{226+8d}	6.2E−06	pCi/kg	U_{238+2d}	7.2E−03	pCi/kg
Ra_{228+1d}	4.7E−06	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	1.4E−04	pCi/kg	NA	NA	pCi/kg
Tc_{99}	5.3E−04	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	4.3E−08	pCi/kg	NA	NA	pCi/kg
Th_{230}	2.1E−06	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E−11	NA
Np_{237+1d}	2.0E−03	2.2E−10	4.3E−13
Pu_{238}	NA	2.2E−10	NA
Ra_{226+8d}	1.1E−02	7.8E−10	8.9E−12
Ra_{228+1d}	8.7E−03	1.0E−10	8.7E−13
Rn_{222+4d}	NA	1.7E−12	NA
Sr_{90+1d}	2.7E−01	3.6E−11	9.6E−12
Tc_{99}	9.9E−01	1.3E−12	1.3E−12
Th_{228+7d}	8.1E−05	5.5E−11	4.4E−15
Th_{230}	3.9E−03	1.3E−11	5.1E−14
$Th_{232+10d}$	3.7E−05	1.7E−10	6.3E−15
U_{234}	1.2E+01	1.6E−11	2.0E−10
U_{235+1d}	6.9E−01	1.6E−11	1.1E−11
U_{238+2d}	1.3E+01	2.0E−11	2.7E−10
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 5.0E−10

001215

Table C.III–503
Summary of Intake Quantitation (chemicals) Alternative 6
South Field Area with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Dairy Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of dairy products	0.4 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in animal products	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	9.0E–08	mg/kg	NA	NA	mg/kg
beryllium	4.5E–11	mg/kg	NA	NA	mg/kg
uranium–total	7.8E–05	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	6.0E–07	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor–1254	2.2E–07	mg/kg	NA	NA	mg/kg
aroclor–1260	3.1E–07	mg/kg	NA	NA	mg/kg
dieldrin	5.6E–11	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

Table C.III-503 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Federal Ownership: Off-Property Farmer (Adult)
Via Ingestion of Dairy Products

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	3.7E-10	3.0E-04	1.2E-06
beryllium	1.9E-13	5.0E-03	3.7E-11
uranium-total	3.2E-07	3.0E-03	1.1E-04
benzo(a)pyrene	2.5E-09	NA	NA
carbazole	NA	NA	NA
aroclor-1254	8.8E-10	NA	NA
aroclor-1260	1.3E-09	NA	NA
dieldrin	2.3E-13	5.0E-05	4.6E-09
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		1.1E-04

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	3.7E-10	1.8E+00	6.5E-10
beryllium	1.9E-13	4.3E+00	8.0E-13
uranium-total	3.2E-07	NA	NA
benzo(a)pyrene	2.5E-09	7.3E+00	1.8E-08
carbazole	NA	2.0E-02	NA
aroclor-1254	8.8E-10	7.7E+00	6.8E-09
aroclor-1260	1.3E-09	7.7E+00	9.9E-09
dieldrin	2.3E-13	1.6E+01	3.7E-12
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		3.5E-08

6646

001217

Table C.III–504
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
South Field Area with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Dairy Products

Intake Equation = Cp X EF X EDn X FI X IR

IR	Ingestion rate of dairy products	0.4 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cp	Concentration of radionuclides in animal products	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	1.7E–08	pCi/kg
Np_{237+1d}	9.6E–08	pCi/kg	U_{234}	2.4E–02	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	1.3E–03	pCi/kg
Ra_{226+8d}	1.1E–05	pCi/kg	U_{238+2d}	2.6E–02	pCi/kg
Ra_{228+1d}	8.5E–06	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	7.2E–04	pCi/kg	NA	NA	pCi/kg
Tc_{99}	6.3E–04	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	3.7E–08	pCi/kg	NA	NA	pCi/kg
Th_{230}	1.8E–06	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	7.1E–04	2.2E–10	1.6E–13
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	8.1E–02	7.8E–10	6.3E–11
Ra_{228+1d}	6.2E–02	1.0E–10	6.2E–12
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	5.3E+00	3.6E–11	1.9E–10
Tc_{99}	4.6E+00	1.3E–12	6.0E–12
Th_{228+7d}	2.7E–04	5.5E–11	1.5E–14
Th_{230}	1.3E–02	1.3E–11	1.7E–13
$Th_{232+10d}$	1.2E–04	1.7E–10	2.1E–14
U_{234}	1.7E+02	1.6E–11	2.8E–09
U_{235+1d}	9.7E+00	1.6E–11	1.6E–10
U_{238+2d}	1.9E+02	2.0E–11	3.8E–09
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation	=	7.0E–09

001218

Table C.III–505
Summary of Intake Quantitation (chemicals) Alternative 6
South Field Area with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Vegetables and Fruits

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of fruits or vegetables	0.122 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in vegetables	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	1.4E–05	mg/kg	NA	NA	mg/kg
beryllium	5.4E–07	mg/kg	NA	NA	mg/kg
uranium–total	1.1E–02	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	7.7E–07	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor–1254	2.6E–07	mg/kg	NA	NA	mg/kg
aroclor–1260	2.7E–08	mg/kg	NA	NA	mg/kg
dieldrin	2.5E–09	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

001219

Table C.III-505 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Federal Ownership: Off-Property Farmer (Adult)
Via Ingestion of Vegetables and Fruits

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	2.4E-08	3.0E-04	8.0E-05
beryllium	9.0E-10	5.0E-03	1.8E-07
uranium-total	1.8E-05	3.0E-03	5.9E-03
benzo(a)pyrene	1.3E-09	NA	NA
carbazole	NA	NA	NA
aroclor-1254	4.3E-10	NA	NA
aroclor-1260	4.6E-11	NA	NA
dieldrin	4.2E-12	5.0E-05	8.4E-08
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			6.0E-03

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	2.4E-08	1.8E+00	4.2E-08
beryllium	9.0E-10	4.3E+00	3.9E-09
uranium-total	1.8E-05	NA	NA
benzo(a)pyrene	1.3E-09	7.3E+00	9.4E-09
carbazole	NA	2.0E-02	NA
aroclor-1254	4.3E-10	7.7E+00	3.3E-09
aroclor-1260	4.6E-11	7.7E+00	3.5E-10
dieldrin	4.2E-12	1.6E+01	6.7E-11
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			5.9E-08

Table C.III–506
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
South Field Area with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Vegetables and Fruits

Intake Equation = Cv X EF X EDn X FI X IR

IR	Ingestion rate of fruits or vegetables	0.122 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cv	Concentration of radionuclides in vegetables	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	4.1E–05	pCi/kg
Np_{237+1d}	2.5E–04	pCi/kg	U_{234}	3.2E+00	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	1.7E–01	pCi/kg
Ra_{226+8d}	2.7E–04	pCi/kg	U_{238+2d}	3.5E+00	pCi/kg
Ra_{228+1d}	2.4E–04	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	4.6E–03	pCi/kg	NA	NA	pCi/kg
Tc_{99}	6.9E–04	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	9.6E–05	pCi/kg	NA	NA	pCi/kg
Th_{230}	4.3E–03	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	7.4E–01	2.2E–10	1.6E–10
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	8.2E–01	7.8E–10	6.4E–10
Ra_{228+1d}	7.3E–01	1.0E–10	7.3E–11
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	1.4E+01	3.6E–11	5.0E–10
Tc_{99}	2.0E+00	1.3E–12	2.7E–12
Th_{228+7d}	2.9E–01	5.5E–11	1.6E–11
Th_{230}	1.3E+01	1.3E–11	1.7E–10
$Th_{232+10d}$	1.2E–01	1.7E–10	2.1E–11
U_{234}	9.6E+03	1.6E–11	1.5E–07
U_{235+1d}	5.2E+02	1.6E–11	8.3E–09
U_{238+2d}	1.1E+04	2.0E–11	2.1E–07
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation	=	3.7E–07

001221

Table C.III-507
Summary of Intake Quantitation (chemicals) Alternative 6
South Field Area with Federal Ownership: Off-Property Farmer (Child)
Via Drinking Water Ingestion

Intake Equation = $\frac{CS \times EF \times ED \times IR}{BW \times AT}$

IR	Ingestion rate of groundwater (RAGS, 1989)	1 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in groundwater	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/l	NA	NA	mg/l
arsenic	NA	mg/l	NA	NA	mg/l
beryllium	NA	mg/l	NA	NA	mg/l
uranium-total	2.16E-03	mg/l	NA	NA	mg/l
benzo(a)pyrene	NA	mg/l	NA	NA	mg/l
carbazole	NA	mg/l	NA	NA	mg/l
aroclor-1254	NA	mg/l	NA	NA	mg/l
aroclor-1260	NA	mg/l	NA	NA	mg/l
dieldrin	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l			

References

Table C.III-507 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Federal Ownership: Off-Property Farmer (Child)
Via Drinking Water Ingestion

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.00E-04	NA
arsenic	NA	3.00E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	1.38E-04	3.00E-03	4.60E-02
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.00E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		4.60E-02

Compound	ILCR Calculation CDI (mg/kg-day)	CSF $(mg/kg\text{-}day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.75E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	1.18E-05	NA	NA
benzo(a)pyrene	NA	7.30E+00	NA
carbazole	NA	2.00E-02	NA
aroclor-1254	NA	7.70E+00	NA
aroclor-1260	NA	7.70E+00	NA
dieldrin	NA	1.60E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

001223

6646

Table C.III–508
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
South Field Area with Federal Ownership: Off–Property Farmer (Child)
Via Ingestion of Drinking Water

Intake Equation = Cw X EF X EDn X FI X IR

IR	Ingestion rate of groundwater (RAGS, 1989)	1 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
FI	Fractional intake for radionuclides	1 (Unitless)
Cw	Concentration of radionuclides in groundwater	(see table below)

Cs_{137+1d}	NA	pCi/l	$Th_{232+10d}$	NA	pCi/l
Np_{237+1d}	NA	pCi/l	U_{234}	6.6E–01	pCi/l
Pu_{238}	NA	pCi/l	U_{235+1d}	3.5E–02	pCi/l
Ra_{226+8d}	NA	pCi/l	U_{238+2d}	7.2E–01	pCi/l
Ra_{228+1d}	NA	pCi/l	NA	NA	pCi/l
Rn_{222+4d}	NA	pCi/l	NA	NA	pCi/l
Sr_{90+1d}	NA	pCi/l	NA	NA	pCi/l
Tc_{99}	NA	pCi/l	NA	NA	pCi/l
Th_{228+7d}	NA	pCi/l	NA	NA	pCi/l
Th_{230}	NA	pCi/l	NA	NA	pCi/l

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	NA	2.2E–10	NA
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	NA	1.3E–11	NA
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	1.4E+03	1.6E–11	2.2E–08
U_{235+1d}	7.4E+01	1.6E–11	1.2E–09
U_{238+2d}	1.5E+03	2.0E–11	3.0E–08
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
		ILCR Summation =	5.3E–08

Table C.III–509
Summary of Intake Quantitation (chemicals) Alternative 6
South Field Area with Federal Ownership: Off–Property Farmer (Child)
Via Dermal Contact while Bathing

Intake Equation = $\frac{DA \times EF \times ED \times SA}{BW \times AT}$

DA	Dermal absorbed dose	csv mg/cm^2–day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	2190 days
SA	Skin surface area available for contact	8000 cm^2

Chemical Concentrations

Compound	DA	Units	Compound	DA	Units
antimony	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
arsenic	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
beryllium	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
uranium–total	5.40E–10	mg/cm^2–day	NA	NA	mg/cm^2–day
benzo(a)pyrene	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
carbazole	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
aroclor–1254	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
aroclor–1260	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
dieldrin	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day			

References

001225

0041326

Table C.III–509 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Federal Ownership: Off–Property Farmer (Child)
Via Dermal Contact while Bathing

	HQ Calculation		
Compound	CDI (mg/kg–day)	RfD (mg/kg–day)	HQ (unitless)
antimony	NA	6.00E–05	NA
arsenic	NA	2.85E–04	NA
beryllium	NA	5.00E–03	NA
uranium–total	2.76E–07	1.50E–04	1.84E–03
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor–1254	NA	NA	NA
aroclor–1260	NA	NA	NA
dieldrin	NA	4.50E–05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		1.84E–03

	ILCR Calculation		
Compound	CDI (mg/kg–day)	CSF $(mg/kg–day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.90E+00	NA
beryllium	NA	4.30E+00	NA
uranium–total	2.37E–08	NA	NA
benzo(a)pyrene	NA	NA	NA
carbazole	NA	2.22E–02	NA
aroclor–1254	NA	1.03E+01	NA
aroclor–1260	NA	1.03E+01	NA
dieldrin	NA	1.78E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

Table C.III–510
Summary of Intake Quantitation (chemicals) Alternative 6
South Field Area with Federal Ownership: Off–Property Farmer (Child)
Via Inhalation of Particulates

Intake Equation = $\frac{CS \times EF \times ED \times IR}{BW \times AT}$

IR	Inhalation rate of gases (RAGS, 1989)	12 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in soil	(see table below)

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/m^3	NA	NA	mg/m^3
arsenic	4.3E–09	mg/m^3	NA	NA	mg/m^3
beryllium	3.2E–10	mg/m^3	NA	NA	mg/m^3
uranium–total	5.7E–09	mg/m^3	NA	NA	mg/m^3
benzo(a)pyrene	4.8E–10	mg/m^3	NA	NA	mg/m^3
carbazole	NA	mg/m^3	NA	NA	mg/m^3
aroclor–1254	1.2E–10	mg/m^3	NA	NA	mg/m^3
aroclor–1260	1.0E–11	mg/m^3	NA	NA	mg/m^3
dieldrin	2.6E–12	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3	NA	NA	mg/m^3
NA	NA	mg/m^3			

References

001227

Table C.III-510 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Federal Ownership: Off-Property Farmer (Child)
Via Inhalation of Particulates

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	NA	NA
arsenic	3.3E-09	NA	NA
beryllium	2.5E-10	NA	NA
uranium-total	4.4E-09	NA	NA
benzo(a)pyrene	3.7E-10	NA	NA
carbazole	NA	NA	NA
aroclor-1254	9.4E-11	NA	NA
aroclor-1260	7.7E-12	NA	NA
dieldrin	2.0E-12	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
Hazard Quotient Sum =			NA

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	2.8E-10	1.5E+01	4.2E-09
beryllium	2.1E-11	8.4E+00	1.8E-10
uranium-total	3.8E-10	NA	NA
benzo(a)pyrene	3.1E-11	6.1E+00	1.9E-10
carbazole	NA	NA	NA
aroclor-1254	8.1E-12	NA	NA
aroclor-1260	6.6E-13	NA	NA
dieldrin	1.7E-13	1.6E+01	2.7E-12
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			4.6E-09

Table C.III–511
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
South Field Area with Federal Ownership: Off–Property Farmer (Child)
Via Inhalation of Gases and Particulates

Intake Equation = Ca X EF X EDn X IR

IR	Inhalation rate of gases (RAGS, 1989)	12 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Ca	Concentration of radionuclides in air	(see table below)

Cs_{137+1d}	NA	pCi/m^3	$Th_{232+10d}$	3.7E–08	pCi/m^3
Np_{237+1d}	2.5E–07	pCi/m^3	U_{234}	1.7E–06	pCi/m^3
Pu_{238}	NA	pCi/m^3	U_{235+1d}	1.4E–06	pCi/m^3
Ra_{226+8d}	1.9E–07	pCi/m^3	U_{238+2d}	1.1E–06	pCi/m^3
Ra_{228+1d}	2.4E–07	pCi/m^3	NA	NA	pCi/m^3
Rn_{222+4d}	8.7E–02	pCi/m^3	NA	NA	pCi/m^3
Sr_{90+1d}	1.6E–06	pCi/m^3	NA	NA	pCi/m^3
Tc_{99}	4.4E–07	pCi/m^3	NA	NA	pCi/m^3
Th_{228+7d}	9.8E–08	pCi/m^3	NA	NA	pCi/m^3
Th_{230}	3.9E–06	pCi/m^3	NA	NA	pCi/m^3

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	1.9E–11	NA
Np_{237+1d}	6.3E–03	2.9E–08	1.8E–10
Pu_{238}	NA	3.9E–08	NA
Ra_{226+8d}	4.8E–03	7.0E–09	3.3E–11
Ra_{228+1d}	6.1E–03	6.9E–10	4.2E–12
Rn_{222+4d}	2.2E+03	7.7E–12	1.7E–08
Sr_{90+1d}	4.1E–02	6.2E–11	2.5E–12
Tc_{99}	1.1E–02	8.3E–12	9.3E–14
Th_{228+7d}	2.5E–03	7.8E–08	1.9E–10
Th_{230}	9.8E–02	2.9E–08	2.8E–09
$Th_{232+10d}$	9.4E–04	1.1E–07	1.0E–10
U_{234}	4.2E–02	2.6E–08	1.1E–09
U_{235+1d}	3.6E–02	2.5E–08	9.1E–10
U_{238+2d}	2.7E–02	2.4E–08	6.5E–10
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 2.3E–08

001229

Table C.III–512
Summary of Intake Quantitation (chemicals) Alternative 6
South Field Area with Federal Ownership: Off–Property Farmer (Child)
Via Ingestion of Meat Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of meat	0.039 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in meat	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	3.0E–06	mg/kg	NA	NA	mg/kg
beryllium	5.0E–08	mg/kg	NA	NA	mg/kg
uranium–total	2.2E–05	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	1.2E–06	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor–1254	6.8E–07	mg/kg	NA	NA	mg/kg
aroclor–1260	9.9E–07	mg/kg	NA	NA	mg/kg
dieldrin	1.7E–10	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

Table C.III-512 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Federal Ownership: Off-Property Farmer (Child)
Via Ingestion of Meat Products

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	5.6E-09	3.0E-04	1.9E-05
beryllium	9.4E-11	5.0E-03	1.9E-08
uranium-total	4.1E-08	3.0E-03	1.4E-05
benzo(a)pyrene	2.2E-09	NA	NA
carbazole	NA	NA	NA
aroclor-1254	1.3E-09	NA	NA
aroclor-1260	1.8E-09	NA	NA
dieldrin	3.3E-13	5.0E-05	6.5E-09
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		3.2E-05

Compound	ILCR Calculation CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	4.8E-10	1.8E+00	8.5E-10
beryllium	8.1E-12	4.3E+00	3.5E-11
uranium-total	3.5E-09	NA	NA
benzo(a)pyrene	1.9E-10	7.3E+00	1.4E-09
carbazole	NA	2.0E-02	NA
aroclor-1254	1.1E-10	7.7E+00	8.4E-10
aroclor-1260	1.6E-10	7.7E+00	1.2E-09
dieldrin	2.8E-14	1.6E+01	4.5E-13
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		4.3E-09

6646

001231

Table C.III-513
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
South Field Area with Federal Ownership: Off-Property Farmer (Child)
Via Ingestion of Meat Products

Intake Equation = Cf X EF X EDn X FI X IR

IR	Ingestion rate of meat	0.039 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cf	Concentration of radionuclides in meat	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	2.0E-08	pCi/kg
Np_{237+1d}	1.1E-06	pCi/kg	U_{234}	6.6E-03	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	3.7E-04	pCi/kg
Ra_{226+8d}	6.2E-06	pCi/kg	U_{238+2d}	7.2E-03	pCi/kg
Ra_{228+1d}	4.7E-06	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	1.4E-04	pCi/kg	NA	NA	pCi/kg
Tc_{99}	5.3E-04	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	4.3E-08	pCi/kg	NA	NA	pCi/kg
Th_{230}	2.1E-06	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E-11	NA
Np_{237+1d}	6.5E-05	2.2E-10	1.4E-14
Pu_{238}	NA	2.2E-10	NA
Ra_{226+8d}	3.8E-04	7.8E-10	2.9E-13
Ra_{228+1d}	2.9E-04	1.0E-10	2.9E-14
Rn_{222+4d}	NA	1.7E-12	NA
Sr_{90+1d}	8.8E-03	3.6E-11	3.2E-13
Tc_{99}	3.3E-02	1.3E-12	4.3E-14
Th_{228+7d}	2.7E-06	5.5E-11	1.5E-16
Th_{230}	1.3E-04	1.3E-11	1.7E-15
$Th_{232+10d}$	1.2E-06	1.7E-10	2.1E-16
U_{234}	4.0E-01	1.6E-11	6.5E-12
U_{235+1d}	2.3E-02	1.6E-11	3.7E-13
U_{238+2d}	4.4E-01	2.0E-11	8.9E-12
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 1.6E-11

001232

Table C.III–514
Summary of Intake Quantitation (chemicals) Alternative 6
South Field Area with Federal Ownership: Off–Property Farmer (Child)
Via Ingestion of Dairy Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of dairy products	0.9 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in animal products	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	9.0E–08	mg/kg	NA	NA	mg/kg
beryllium	4.5E–11	mg/kg	NA	NA	mg/kg
uranium–total	7.8E–05	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	3.7E–07	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor–1254	2.2E–07	mg/kg	NA	NA	mg/kg
aroclor–1260	3.1E–07	mg/kg	NA	NA	mg/kg
dieldrin	5.6E–11	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg

References

001233

Table C.III-514 (contiuued)
Summary of Risk Characterization (chemicals)
South Field Area with Federal Ownership: Off-Property Farmer (Child)
Via Ingestion of Dairy Products

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	3.9E-09	3.0E-04	1.3E-05
beryllium	2.0E-12	5.0E-03	3.9E-10
uranium-total	3.4E-06	3.0E-03	1.1E-03
benzo(a)pyrene	1.6E-08	NA	NA
carbazole	NA	NA	NA
aroclor-1254	9.3E-09	NA	NA
aroclor-1260	1.3E-08	NA	NA
dieldrin	2.4E-12	5.0E-05	4.8E-08
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		1.1E-03

Compound	ILCR Calculation CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	3.3E-10	1.8E+00	5.9E-10
beryllium	1.7E-13	4.3E+00	7.2E-13
uranium-total	2.9E-07	NA	NA
benzo(a)pyrene	1.4E-09	7.3E+00	1.0E-08
carbazole	NA	2.0E-02	NA
aroclor-1254	8.0E-10	7.7E+00	6.1E-09
aroclor-1260	1.2E-09	7.7E+00	8.9E-09
dieldrin	2.1E-13	1.6E+01	3.3E-12
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		2.6E-08

001234

Table C.III–515
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
South Field Area with Federal Ownership: Off–Property Farmer (Child)
Via Ingestion of Dairy Products

Intake Equation = Cp X EF X EDn X FI X IR

IR	Ingestion rate of dairy products	0.9 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cp	Concentration of radionuclides in animal products	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	1.7E–08	pCi/kg
Np_{237+1d}	9.6E–08	pCi/kg	U_{234}	2.4E–02	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	1.3E–03	pCi/kg
Ra_{226+8d}	1.1E–05	pCi/kg	U_{238+2d}	2.6E–02	pCi/kg
Ra_{228+1d}	8.5E–06	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	7.2E–04	pCi/kg	NA	NA	pCi/kg
Tc_{99}	6.3E–04	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	3.7E–08	pCi/kg	NA	NA	pCi/kg
Th_{230}	1.8E–06	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	1.4E–04	2.2E–10	3.0E–14
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	1.6E–02	7.8E–10	1.2E–11
Ra_{228+1d}	1.2E–02	1.0E–10	1.2E–12
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	1.0E+00	3.6E–11	3.7E–11
Tc_{99}	8.9E–01	1.3E–12	1.2E–12
Th_{228+7d}	5.2E–05	5.5E–11	2.9E–15
Th_{230}	2.5E–03	1.3E–11	3.2E–14
$Th_{232+10d}$	2.4E–05	1.7E–10	4.0E–15
U_{234}	3.4E+01	1.6E–11	5.4E–10
U_{235+1d}	1.9E+00	1.6E–11	3.0E–11
U_{238+2d}	3.7E+01	2.0E–11	7.4E–10
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		1.4E–09

001235

Table C.III-516
Summary of Intake Quantitation (chemicals) Alternative 6
South Field Area with Federal Ownership: Off-Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of fruits or vegetables	0.1 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in vegetables	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	1.4E-05	mg/kg	NA	NA	mg/kg
beryllium	5.4E-07	mg/kg	NA	NA	mg/kg
uranium-total	1.1E-02	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	4.8E-07	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor-1254	2.6E-07	mg/kg	NA	NA	mg/kg
aroclor-1260	2.7E-08	mg/kg	NA	NA	mg/kg
dieldrin	2.5E-09	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

Table C.III-516 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Federal Ownership: Off-Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	9.2E-08	3.0E-04	3.1E-04
beryllium	3.4E-09	5.0E-03	6.9E-07
uranium-total	6.8E-05	3.0E-03	2.3E-02
benzo(a)pyrene	3.1E-09	NA	NA
carbazole	NA	NA	NA
aroclor-1254	1.6E-09	NA	NA
aroclor-1260	1.8E-10	NA	NA
dieldrin	1.6E-11	5.0E-05	3.2E-07
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	HQ Summation =		2.3E-02

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	7.9E-09	1.8E+00	1.4E-08
beryllium	3.0E-10	4.3E+00	1.3E-09
uranium-total	5.8E-06	NA	NA
benzo(a)pyrene	2.6E-10	7.3E+00	1.9E-09
carbazole	NA	2.0E-02	NA
aroclor-1254	1.4E-10	7.7E+00	1.1E-09
aroclor-1260	1.5E-11	7.7E+00	1.2E-10
dieldrin	1.4E-12	1.6E+01	2.2E-11
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	ILCR Summation =		1.8E-08

001232

Table C.III–517
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
South Field Area with Federal Ownership: Off–Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

Intake Equation = Cv X EF X EDn X FI X IR

IR	Ingestion rate of fruits or vegetables	0.1 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cv	Concentration of radionuclides in vegetables	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	4.1E–05	pCi/kg
Np_{237+1d}	2.5E–04	pCi/kg	U_{234}	3.2E+00	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	1.7E–01	pCi/kg
Ra_{226+8d}	2.7E–04	pCi/kg	U_{238+2d}	3.5E+00	pCi/kg
Ra_{228+1d}	2.4E–04	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	4.6E–03	pCi/kg	NA	NA	pCi/kg
Tc_{99}	6.9E–04	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	9.6E–05	pCi/kg	NA	NA	pCi/kg
Th_{230}	4.3E–03	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	5.2E–02	2.2E–10	1.1E–11
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	5.8E–02	7.8E–10	4.5E–11
Ra_{228+1d}	5.1E–02	1.0E–10	5.1E–12
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	9.7E–01	3.6E–11	3.5E–11
Tc_{99}	1.4E–01	1.3E–12	1.9E–13
Th_{228+7d}	2.0E–02	5.5E–11	1.1E–12
Th_{230}	9.0E–01	1.3E–11	1.2E–11
$Th_{232+10d}$	8.6E–03	1.7E–10	1.5E–12
U_{234}	6.7E+02	1.6E–11	1.1E–08
U_{235+1d}	3.6E+01	1.6E–11	5.8E–10
U_{238+2d}	7.4E+02	2.0E–11	1.5E–08
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
		ILCR Summation =	2.6E–08

001538

Table C.III–518
Summary of Intake Quantitation (chemicals) Alternative 6
South Field Area with Private Ownership: Off–Property Farmer (Adult)
Via Drinking Water Ingestion

Intake Equation = $\frac{CS \times EF \times ED \times IR}{BW \times AT}$

IR	Ingestion rate of groundwater (RAGS, 1989)	2 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in groundwater	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/l	NA	NA	mg/l
arsenic	NA	mg/l	NA	NA	mg/l
beryllium	NA	mg/l	NA	NA	mg/l
uranium–total	1.03E–04	mg/l	NA	NA	mg/l
benzo(a)pyrene	NA	mg/l	NA	NA	mg/l
carbazole	NA	mg/l	NA	NA	mg/l
aroclor–1254	NA	mg/l	NA	NA	mg/l
aroclor–1260	NA	mg/l	NA	NA	mg/l
dieldrin	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l

References

001239

004240

Table C.III-518 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Private Ownership: Off-Property Farmer (Adult)
Via Drinking Water Ingestion

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.00E-04	NA
arsenic	NA	3.00E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	2.82E-06	3.00E-03	9.41E-04
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.00E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		9.41E-04

Compound	ILCR Calculation CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.75E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	2.82E-06	NA	NA
benzo(a)pyrene	NA	7.30E+00	NA
carbazole	NA	2.00E-02	NA
aroclor-1254	NA	7.70E+00	NA
aroclor-1260	NA	7.70E+00	NA
dieldrin	NA	1.60E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

Table C.III–519
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
South Field Area with Private Ownership: Off–Property Farmer (Adult)
Via Ingestion of Drinking Water

Intake Equation = Cw X EF X EDn X FI X IR

IR	Ingestion rate of groundwater (RAGS, 1989)	2 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
FI	Fractional intake for radionuclides	1 (Unitless)
Cw	Concentration of radionuclides in groundwater	(see table below)

Cs_{137+1d}	NA	pCi/l	$Th_{232+10d}$	NA	pCi/l
Np_{237+1d}	NA	pCi/l	U_{234}	3.1E–02	pCi/l
Pu_{238}	NA	pCi/l	U_{235+1d}	2.0E–03	pCi/l
Ra_{226+8d}	NA	pCi/l	U_{238+2d}	3.4E–02	pCi/l
Ra_{228+1d}	NA	pCi/l	NA	NA	pCi/l
Rn_{222+4d}	NA	pCi/l	NA	NA	pCi/l
Sr_{90+1d}	NA	pCi/l	NA	NA	pCi/l
Tc_{99}	NA	pCi/l	NA	NA	pCi/l
Th_{228+7d}	NA	pCi/l	NA	NA	pCi/l
Th_{230}	NA	pCi/l	NA	NA	pCi/l

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	NA	2.2E–10	NA
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	NA	1.3E–11	NA
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	1.5E+03	1.6E–11	2.4E–08
U_{235+1d}	9.8E+01	1.6E–11	1.6E–09
U_{238+2d}	1.7E+03	2.0E–11	3.3E–08
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 5.9E–08

Table C.III–520
Summary of Intake Quantitation (chemicals) Alternative 6
South Field Area with Private Ownership: Off–Property Farmer (Adult)
Via Dermal Contact while Bathing

Intake Equation = $\frac{DA \times EF \times ED \times SA}{BW \times AT}$

DA	Dermal absorbed dose	csv mg/cm^2–day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
SA	Skin surface area available for contact	23000 cm^2

Chemical Concentrations

Compound	DA	Units	Compound	DA	Units
antimony	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
arsenic	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
beryllium	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
uranium–total	2.58E–11	mg/cm^2–day	NA	NA	mg/cm^2–day
benzo(a)pyrene	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
carbazole	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
aroclor–1254	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
aroclor–1260	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
dieldrin	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day			

References

Table C.III–520 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Private Ownership: Off–Property Farmer (Adult)
Via Dermal Contact while Bathing

	HQ Calculation		
Compound	CDI (mg/kg–day)	RfD (mg/kg–day)	HQ (unitless)
antimony	NA	6.00E–05	NA
arsenic	NA	2.85E–04	NA
beryllium	NA	5.00E–03	NA
uranium–total	8.11E–09	1.50E–04	5.41E–05
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor–1254	NA	NA	NA
aroclor–1260	NA	NA	NA
dieldrin	NA	4.50E–05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			5.41E–05

	ILCR Calculation		
Compound	CDI (mg/kg–day)	CSF $(mg/kg–day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.90E+00	NA
beryllium	NA	4.30E+00	NA
uranium–total	8.11E–09	NA	NA
benzo(a)pyrene	NA	NA	NA
carbazole	NA	2.22E–02	NA
aroclor–1254	NA	1.03E+01	NA
aroclor–1260	NA	1.03E+01	NA
dieldrin	NA	1.78E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

001243

Table C.III-521
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
South Field Area with Private Ownership: Off-Property Farmer (Adult)
Via Inhalation of Gases and Particulates

Intake Equation = Ca X EF X EDn X IR

IR	Inhalation rate of gases (RAGS, 1989)	20 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Ca	Concentration of radionuclides in air	(see table below)

Cs_{137+1d}	NA	pCi/m^3	$Th_{232+10d}$	NA	pCi/m^3
Np_{237+1d}	3.3E-07	pCi/m^3	U_{234}	1.0E-06	pCi/m^3
Pu_{238}	NA	pCi/m^3	U_{235+1d}	NA	pCi/m^3
Ra_{226+8d}	NA	pCi/m^3	U_{238+2d}	8.8E-07	pCi/m^3
Ra_{228+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Rn_{222+4d}	NA	pCi/m^3	NA	NA	pCi/m^3
Sr_{90+1d}	2.2E-07	pCi/m^3	NA	NA	pCi/m^3
Tc_{99}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{228+7d}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{230}	2.8E-06	pCi/m^3	NA	NA	pCi/m^3

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	1.9E-11	NA
Np_{237+1d}	1.6E-01	2.9E-08	4.6E-09
Pu_{238}	NA	3.9E-08	NA
Ra_{226+8d}	NA	7.0E-09	NA
Ra_{228+1d}	NA	6.9E-10	NA
Rn_{222+4d}	NA	7.7E-12	NA
Sr_{90+1d}	1.1E-01	6.2E-11	6.6E-12
Tc_{99}	NA	8.3E-12	NA
Th_{228+7d}	NA	7.8E-08	NA
Th_{230}	1.4E+00	2.9E-08	3.9E-08
$Th_{232+10d}$	NA	1.1E-07	NA
U_{234}	4.9E-01	2.6E-08	1.3E-08
U_{235+1d}	NA	2.5E-08	NA
U_{238+2d}	4.3E-01	2.4E-08	1.0E-08
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
		ILCR Summation =	6.7E-08

001344

Table C.III–522
Summary of Intake Quantitation (chemicals) Alternative 6
South Field Area with Private Ownership: Off–Property Farmer (Adult)
Via Ingestion of Meat Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of meat	0.101 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in meat	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium–total	1.3E–06	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor–1254	NA	mg/kg	NA	NA	mg/kg
aroclor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

001245

Table C.III-522 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Private Ownership: Off-Property Farmer (Adult)
Via Ingestion of Meat Products

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	1.3E-09	3.0E-03	4.4E-07
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		4.4E-07

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg\text{-}day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	1.3E-09	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

Table C.III–523
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
South Field Area with Private Ownership: Off–Property Farmer (Adult)
Via Ingestion of Meat Products

Intake Equation = Cf X EF X EDn X FI X IR

IR	Ingestion rate of meat	0.101 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cf	Concentration of radionuclides in meat	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	1.4E–06	pCi/kg	U_{234}	3.3E–04	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	2.0E–05	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	3.5E–04	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	1.9E–05	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	1.5E–06	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	2.6E–03	2.2E–10	5.6E–13
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	3.6E–02	3.6E–11	1.3E–12
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	2.8E–03	1.3E–11	3.6E–14
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	6.0E–01	1.6E–11	9.7E–12
U_{235+1d}	3.7E–02	1.6E–11	5.9E–13
U_{238+2d}	6.6E–01	2.0E–11	1.3E–11
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 2.5E–11

001247

Table C.III–524
Summary of Intake Quantitation (chemicals) Alternative 6
South Field Area with Private Ownership: Off–Property Farmer (Adult)
Via Ingestion of Dairy Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of dairy products	0.4 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in animal products	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium–total	4.4E–06	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor–1254	NA	mg/kg	NA	NA	mg/kg
aroclor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

Table C.III-524 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Private Ownership: Off-Property Farmer (Adult)
Via Ingestion of Dairy Products

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	1.8E-08	3.0E-03	6.0E-06
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	HQ Summation =		6.0E-06

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	1.8E-08	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	ILCR Summation =		NA

001249

Table C.III–525
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
South Field Area with Private Ownership: Off–Property Farmer (Adult)
Via Ingestion of Dairy Products

Intake Equation = Cp X EF X EDn X FI X IR

IR	Ingestion rate of dairy products	0.4 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	*Exposure duration*	70 Year
Cp	Concentration of radionuclides in animal products	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	1.3E–07	pCi/kg	U_{234}	1.2E–03	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	7.2E–05	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	1.3E–03	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	9.6E–05	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	1.2E–06	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	9.2E–04	2.2E–10	2.0E–13
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	7.1E–01	3.6E–11	2.5E–11
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	9.1E–03	1.3E–11	1.2E–13
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	8.5E+00	1.6E–11	1.4E–10
U_{235+1d}	5.3E–01	1.6E–11	8.5E–12
U_{238+2d}	9.3E+00	2.0E–11	1.9E–10
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation	=	3.6E–10

001250

Table C.III–526
Summary of Intake Quantitation (chemicals) Alternative 6
South Field Area with Private Ownership: Off–Property Farmer (Adult)
Via Ingestion of Vegetables and Fruits

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of fruits or vegetables	0.122 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in vegetables	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium–total	5.2E–04	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor–1254	NA	mg/kg	NA	NA	mg/kg
aroclor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

001251

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Table C.III-526 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Private Ownership: Off-Property Farmer (Adult)
Via Ingestion of Vegetables and Fruits

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	8.7E-07	3.0E-03	2.9E-04
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		2.9E-04

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg\text{-}day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	8.7E-07	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

Table C.III-527
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
South Field Area with Private Ownership: Off-Property Farmer (Adult)
Via Ingestion of Vegetables and Fruits

ntake Equation = Cv X EF X EDn X FI X IR

IR	Ingestion rate of fruits or vegetables	0.122 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cv	Concentration of radionuclides in vegetables	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	3.2E-04	pCi/kg	U_{234}	1.5E-01	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	9.8E-03	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	1.7E-01	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	6.2E-04	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	3.1E-03	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E-11	NA
Np_{237+1d}	9.7E-01	2.2E-10	2.1E-10
Pu_{238}	NA	2.2E-10	NA
Ra_{226+8d}	NA	7.8E-10	NA
Ra_{228+1d}	NA	1.0E-10	NA
Rn_{222+4d}	NA	1.7E-12	NA
Sr_{90+1d}	1.9E+00	3.6E-11	6.7E-11
Tc_{99}	NA	1.3E-12	NA
Th_{228+7d}	NA	5.5E-11	NA
Th_{230}	9.1E+00	1.3E-11	1.2E-10
$Th_{232+10d}$	NA	1.7E-10	NA
U_{234}	4.6E+02	1.6E-11	7.3E-09
U_{235+1d}	2.9E+01	1.6E-11	4.7E-10
U_{238+2d}	5.0E+02	2.0E-11	1.0E-08
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 1.8E-08

Table C.III-528
Summary of Intake Quantitation (chemicals) Alternative 6
South Field Area with Private Ownership: Off-Property Farmer (Child)
Via Drinking Water Ingestion

Intake Equation = $\frac{CS \times EF \times ED \times IR}{BW \times AT}$

IR	Ingestion rate of groundwater (RAGS, 1989)	1 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in groundwater	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/l	NA	NA	mg/l
arsenic	NA	mg/l	NA	NA	mg/l
beryllium	NA	mg/l	NA	NA	mg/l
uranium-total	1.03E-04	mg/l	NA	NA	mg/l
benzo(a)pyrene	NA	mg/l	NA	NA	mg/l
carbazole	NA	mg/l	NA	NA	mg/l
aroclor-1254	NA	mg/l	NA	NA	mg/l
aroclor-1260	NA	mg/l	NA	NA	mg/l
dieldrin	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l			

References

Table C.III-528 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Private Ownership: Off-Property Farmer (Child)
Via Drinking Water Ingestion

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.00E-04	NA
arsenic	NA	3.00E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	6.58E-06	3.00E-03	2.19E-03
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.00E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			2.19E-03

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.75E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	5.64E-07	NA	NA
benzo(a)pyrene	NA	7.30E+00	NA
carbazole	NA	2.00E-02	NA
aroclor-1254	NA	7.70E+00	NA
aroclor-1260	NA	7.70E+00	NA
dieldrin	NA	1.60E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

001255

Table C.III–529
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
South Field Area with Private Ownership: Off–Property Farmer (Child)
Via Ingestion of Drinking Water

Intake Equation = Cw X EF X EDn X FI X IR

IR	Ingestion rate of groundwater (RAGS, 1989)	1 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
FI	Fractional intake for radionuclides	1 (Unitless)
Cw	Concentration of radionuclides in groundwater	(see table below)

Cs_{137+1d}	NA	pCi/l	$Th_{232+10d}$	NA	pCi/l
Np_{237+1d}	NA	pCi/l	U_{234}	3.1E–02	pCi/l
Pu_{238}	NA	pCi/l	U_{235+1d}	2.0E–03	pCi/l
Ra_{226+8d}	NA	pCi/l	U_{238+2d}	3.4E–02	pCi/l
Ra_{228+1d}	NA	pCi/l	NA	NA	pCi/l
Rn_{222+4d}	NA	pCi/l	NA	NA	pCi/l
Sr_{90+1d}	NA	pCi/l	NA	NA	pCi/l
Tc_{99}	NA	pCi/l	NA	NA	pCi/l
Th_{228+7d}	NA	pCi/l	NA	NA	pCi/l
Th_{230}	NA	pCi/l	NA	NA	pCi/l

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	NA	2.2E–10	NA
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	NA	1.3E–11	NA
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	6.5E+01	1.6E–11	1.0E–09
U_{235+1d}	4.2E+00	1.6E–11	6.7E–11
U_{238+2d}	7.1E+01	2.0E–11	1.4E–09
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation	=	2.5E–09

001256

Table C.III–530
Summary of Intake Quantitation (chemicals) Alternative 6
South Field Area with Private Ownership: Off–Property Farmer (Child)
Via Dermal Contact while Bathing

Intake Equation = $\frac{DA \times EF \times ED \times SA}{BW \times AT}$

DA	Dermal absorbed dose	csv mg/cm^2–day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	2190 days
SA	Skin surface area available for contact	8000 cm^2

Chemical Concentrations

Compound	DA	Units	Compound	DA	Units
antimony	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
arsenic	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
beryllium	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
uranium–total	2.58E–11	mg/cm^2–day	NA	NA	mg/cm^2–day
benzo(a)pyrene	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
carbazole	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
aroclor–1254	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
aroclor–1260	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
dieldrin	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day			

References

001257

Table C.III-530 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Private Ownership: Off-Property Farmer (Child)
Via Dermal Contact while Bathing

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	6.00E-05	NA
arsenic	NA	2.85E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	1.32E-08	1.50E-04	8.78E-05
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	4.50E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	HQ Summation =		8.78E-05

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.90E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	1.13E-09	NA	NA
benzo(a)pyrene	NA	NA	NA
carbazole	NA	2.22E-02	NA
aroclor-1254	NA	1.03E+01	NA
aroclor-1260.	NA	1.03E+01	NA
dieldrin	NA	1.78E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	ILCR Summation =		NA

Table C.III–531
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
South Field Area with Private Ownership: Off–Property Farmer (Child)
Via Inhalation of Gases and Particulates

Intake Equation = Ca X EF X EDn X IR

IR	Inhalation rate of gases (RAGS, 1989)	12 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Ca	Concentration of radionuclides in air	(see table below)

Cs_{137+1d}	NA	pCi/m^3	$Th_{232+10d}$	NA	pCi/m^3
Np_{237+1d}	3.3E–07	pCi/m^3	U_{234}	1.0E–06	pCi/m^3
Pu_{238}	NA	pCi/m^3	U_{235+1d}	NA	pCi/m^3
Ra_{226+8d}	NA	pCi/m^3	U_{238+2d}	8.8E–07	pCi/m^3
Ra_{228+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Rn_{222+4d}	NA	pCi/m^3	NA	NA	pCi/m^3
Sr_{90+1d}	2.2E–07	pCi/m^3	NA	NA	pCi/m^3
Tc_{99}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{228+7d}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{230}	2.8E–06	pCi/m^3	NA	NA	pCi/m^3

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	1.9E–11	NA
Np_{237+1d}	8.2E–03	2.9E–08	2.4E–10
Pu_{238}	NA	3.9E–08	NA
Ra_{226+8d}	NA	7.0E–09	NA
Ra_{228+1d}	NA	6.9E–10	NA
Rn_{222+4d}	NA	7.7E–12	NA
Sr_{90+1d}	5.5E–03	6.2E–11	3.4E–13
Tc_{99}	NA	8.3E–12	NA
Th_{228+7d}	NA	7.8E–08	NA
Th_{230}	7.0E–02	2.9E–08	2.0E–09
$Th_{232+10d}$	NA	1.1E–07	NA
U_{234}	2.5E–02	2.6E–08	6.6E–10
U_{235+1d}	NA	2.5E–08	NA
U_{238+2d}	2.2E–02	2.4E–08	5.3E–10
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
ILCR Summation	=		3.4E–09

001259

Table C.III-532
Summary of Intake Quantitation (chemicals) Alternative 6
South Field Area with Private Ownership: Off-Property Farmer (Child)
Via Ingestion of Meat Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of meat	0.039 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in meat	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium-total	1.3E-06	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor-1254	NA	mg/kg	NA	NA	mg/kg
aroclor-1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

Table C.III-532 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Private Ownership: Off-Property Farmer (Child)
Via Ingestion of Meat Products

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	2.4E-09	3.0E-03	7.8E-07
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			7.8E-07

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	2.0E-10	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

001261

Table C.III–533
Summary of Intake and Risk Quantitation (radionuclides) Alternate 6
South Field Area with Private Ownership: Off–Property Farmer (Child)
Via Ingestion of Meat Products

Intake Equation = Cf X EF X EDn X FI X IR

IR	Ingestion rate of meat	0.039 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cf	Concentration of radionuclides in meat	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	1.4E–06	pCi/kg	U_{234}	3.3E–04	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	2.0E–05	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	3.5E–04	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	1.9E–05	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	1.5E–06	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	8.5E–05	2.2E–10	1.9E–14
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	1.2E–03	3.6E–11	4.2E–14
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	9.2E–05	1.3E–11	1.2E–15
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	2.0E–02	1.6E–11	3.2E–13
U_{235+1d}	1.2E–03	1.6E–11	2.0E–14
U_{238+2d}	2.2E–02	2.0E–11	4.3E–13
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
		ILCR Summation =	8.4E–13

001202

Table C.III–534
Summary of Intake Quantitation (chemicals) Alternative 6
South Field Area with Private Ownership: Off–Property Farmer (Child)
Via Ingestion of Dairy Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of dairy products	0.9 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in animal products	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium–total	4.4E–06	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor–1254	NA	mg/kg	NA	NA	mg/kg
aroclor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

001263

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Table C.III-534 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Private Ownership: Off-Property Farmer (Child)
Via Ingestion of Dairy Products

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	1.9E-07	3.0E-03	6.3E-05
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		6.3E-05

Compound	ILCR Calculation CDI (mg/kg-day)	CSF $(mg/kg\text{-}day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	1.6E-08	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

Table C.III–535
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
South Field Area with Private Ownership: Off–Property Farmer (Child)
Via Ingestion of Dairy Products

Intake Equation = Cp X EF X EDn X FI X IR

IR	Ingestion rate of dairy products	0.9 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cp	Concentration of radionuclides in animal products	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	1.3E–07	pCi/kg	U_{234}	1.2E–03	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	7.2E–05	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	1.3E–03	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	9.6E–05	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	1.2E–06	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	1.8E–04	2.2E–10	3.9E–14
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	1.4E–01	3.6E–11	4.9E–12
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	1.8E–03	1.3E–11	2.3E–14
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	1.6E+00	1.6E–11	2.6E–11
U_{235+1d}	1.0E–01	1.6E–11	1.6E–12
U_{238+2d}	1.8E+00	2.0E–11	3.6E–11
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		6.9E–11

Table C.III-536
Summary of Intake Quantitation (chemicals) Alternative 6
South Field Area with Private Ownership: Off-Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of fruits or vegetables	0.1 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in vegetables	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium-total	5.2E-04	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor-1254	NA	mg/kg	NA	NA	mg/kg
aroclor-1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

Table C.III-536 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Private Ownership: Off-Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	3.3E-06	3.0E-03	1.1E-03
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			1.1E-03

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	2.8E-07	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

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Table C.III–537
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
South Field Area with Private Ownership: Off–Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

Intake Equation = Cv X EF X EDn X FI X IR

IR	Ingestion rate of fruits or vegetables	0.1 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cv	Concentration of radionuclides in vegetables	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	3.2E–04	pCi/kg	U_{234}	1.5E–01	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	9.8E–03	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	1.7E–01	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	6.2E–04	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	3.1E–03	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	6.8E–02	2.2E–10	1.5E–11
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	1.3E–01	3.6E–11	4.7E–12
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	6.4E–01	1.3E–11	8.3E–12
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	3.2E+01	1.6E–11	5.1E–10
U_{235+1d}	2.1E+00	1.6E–11	3.3E–11
U_{238+2d}	3.5E+01	2.0E–11	7.0E–10
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation	=	1.3E–09

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Table C.III–538
Summary of Intake Quantitation (chemicals) Alternative 6
South Field Area with Federal Ownership: On–Property RME Resident Farmer (Adult)
Via Incidental Ingestion of Soil

Intake Equation = $\frac{CS \times EF \times ED \times CF \times IR}{BW \times AT}$

IRs	Ingestion rate of soil (RAGS, 1989)	180 mg/day
CF	Conversion factor	1.0E–06 kg/mg
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in soil	(see table below)

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium–total	7.9E–01	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor–1254	NA	mg/kg	NA	NA	mg/kg
aroclor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

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Table C.III-538 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Federal Ownership: On-Property RME Resident Farmer (Adult)
Via Incidental Ingestion of Soil

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	2.0E-06	3.0E-03	6.5E-04
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			6.5E-04

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	2.0E-06	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

Table C.III-539
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
South Field Area with Federal Ownership: On-Property RME Resident Farmer (Adult)
Via Incidental Ingestion of Soil

Intake Equation = CS X EF X EDn X FI X IR

IRs	Ingestion rate of soil (RAGS, 1989)	180 mg/day
EF	Exposure frequency	350 days/year
EDn	Exposure Duration	70 Year
FI	Fractional Intake	1 (unitless)
CS	Concentration of radionuclides in soil	

Cs_{137+1d}	NA	pCi/mg	$Th_{232+10d}$	NA	pCi/mg
Np_{237+1d}	1.55E-05	pCi/mg	U_{234}	3.06E-05	pCi/mg
Pu_{238}	NA	pCi/mg	U_{235+1d}	NA	pCi/mg
Ra_{226+8d}	NA	pCi/mg	U_{238+2d}	2.70E-05	pCi/mg
Ra_{228+1d}	NA	pCi/mg	NA	NA	pCi/mg
Rn_{222+4d}	NA	pCi/mg	NA	NA	pCi/mg
Sr_{90+1d}	1.28E-05	pCi/mg	NA	NA	pCi/mg
Tc_{99}	NA	pCi/mg	NA	NA	pCi/mg
Th_{228+7d}	NA	pCi/mg	NA	NA	pCi/mg
Th_{230}	1.19E-04	pCi/mg	NA	NA	pCi/mg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.80E-11	NA
Np_{237+1d}	6.84E+01	2.20E-10	1.50E-08
Pu_{238}	NA	2.20E-10	NA
Ra_{226+8d}	NA	7.80E-10	NA
Ra_{228+1d}	NA	1.00E-10	NA
Rn_{222+4d}	NA	1.70E-12	NA
Sr_{90+1d}	5.64E+01	3.60E-11	2.03E-09
Tc_{99}	NA	1.30E-12	NA
Th_{228+7d}	NA	5.50E-11	NA
Th_{230}	5.24E+02	1.30E-11	6.81E-09
$Th_{232+10d}$	NA	1.70E-10	NA
U_{234}	1.35E+02	1.60E-11	2.16E-09
U_{235+1d}	NA	1.60E-11	NA
U_{238+2d}	1.19E+02	2.00E-11	2.38E-09
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
ILCR Summation	=		2.84E-08

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Table C.III-540
Summary of Intake Quantitation (chemicals) Alternative 6
South Field Area with Federal Ownership: On-Property RME Resident Farmer (Adult)
Via Dermal Contact with Soil

Intake Equation = $\frac{CS \times EF \times ED \times CF \times ABS \times AF \times SA}{BW \times AT}$

SA	Surface area of exposed skin (50th percentile, hands only)	5750 cm^2/day
AF	Soil to skin adherence factor (RAGS, 1989)	1 mg/cm^2
ABS	chemicals specific absorbtion factor (see table below)	csv
CF	Conversion factor	1E-06 kg/mg
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in soil	

Chemical Concentrations

Compound	ABS	Concentrati	Units	Compound		Concentrati	Units
antimony	1.00E-02	NA	mg/kg	NA	NA	NA	mg/kg
arsenic	1.00E-03	NA	mg/kg	NA	NA	NA	mg/kg
beryllium	1.00E-02	NA	mg/kg	NA	NA	NA	mg/kg
uranium-total	1.00E-02	7.94E-01	mg/kg	NA	NA	NA	mg/kg
benzo(a)pyrene	3.00E-01	NA	mg/kg	NA	NA	NA	mg/kg
carbazole	3.00E-01	NA	mg/kg	NA	NA	NA	mg/kg
aroclor-1254	6.00E-02	NA	mg/kg	NA	NA	NA	mg/kg
aroclor-1260	6.00E-02	NA	mg/kg	NA	NA	NA	mg/kg
dieldrin	3.00E-01	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg				

References

Table C.III-540 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Federal Ownership: On-Property RME Resident Farmer (Adult)
Via Dermal Contact with Soil

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	6.00E-05	NA
arsenic	NA	2.85E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	6.26E-07	1.50E-04	4.17E-03
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	4.50E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	HQ Summation =		4.17E-03

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.90E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	6.26E-07	NA	NA
benzo(a)pyrene	NA	NA	NA
carbazole	NA	2.22E-02	NA
aroclor-1254	NA	1.03E+01	NA
aroclor-1260	NA	1.03E+01	NA
dieldrin	NA	1.78E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	ILCR Summation =		NA

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Table C.III–541
Summary of Intake Quantitation (chemicals) Alternative 6
South Field Area with Federal Ownership: On–Property RME Resident Farmer (Adult)
Via Drinking Water Ingestion

Intake Equation = $\frac{CS \times EF \times ED \times IR}{BW \times AT}$

IR	Ingestion rate of groundwater (RAGS, 1989)	2 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in groundwater	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/l	NA	NA	mg/l
arsenic	NA	mg/l	NA	NA	mg/l
beryllium	NA	mg/l	NA	NA	mg/l
uranium–total	6.06E–04	mg/l	NA	NA	mg/l
benzo(a)pyrene	NA	mg/l	NA	NA	mg/l
carbazole	NA	mg/l	NA	NA	mg/l
aroclor–1254	NA	mg/l	NA	NA	mg/l
aroclor–1260	NA	mg/l	NA	NA	mg/l
dieldrin	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l			

References

Table C.III-541 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Federal Ownership: On-Property RME Resident Farmer (Adult)
Via Drinking Water Ingestion

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.00E-04	NA
arsenic	NA	3.00E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	1.66E-05	3.00E-03	5.53E-03
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.00E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		5.53E-03

Compound	ILCR Calculation CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.75E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	1.66E-05	NA	NA
benzo(a)pyrene	NA	7.30E+00	NA
carbazole	NA	2.00E-02	NA
aroclor-1254	NA	7.70E+00	NA
aroclor-1260	NA	7.70E+00	NA
dieldrin	NA	1.60E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

6646

001275

Table C.III–542
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
South Field Area with Federal Ownership: On–Property RME Resident Farmer (Adult)
Via Ingestion of Drinking Water

Intake Equation = Cw X EF X EDn X FI X IR

IR	Ingestion rate of groundwater (RAGS, 1989)	2 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
FI	Fractional intake for radionuclides	1 (Unitless)
Cw	Concentration of radionuclides in groundwater	(see table below)

Cs_{137+1d}	NA	pCi/l	$Th_{232+10d}$	NA	pCi/l
Np_{237+1d}	NA	pCi/l	U_{234}	1.8E–01	pCi/l
Pu_{238}	NA	pCi/l	U_{235+1d}	1.0E–02	pCi/l
Ra_{226+8d}	NA	pCi/l	U_{238+2d}	2.0E–01	pCi/l
Ra_{228+1d}	NA	pCi/l	NA	NA	pCi/l
Rn_{222+4d}	NA	pCi/l	NA	NA	pCi/l
Sr_{90+1d}	NA	pCi/l	NA	NA	pCi/l
Tc_{99}	NA	pCi/l	NA	NA	pCi/l
Th_{228+7d}	NA	pCi/l	NA	NA	pCi/l
Th_{230}	NA	pCi/l	NA	NA	pCi/l

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	NA	2.2E–10	NA
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	NA	1.3E–11	NA
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	9.0E+03	1.6E–11	1.4E–07
U_{235+1d}	4.9E+02	1.6E–11	7.8E–09
U_{238+2d}	9.9E+03	2.0E–11	2.0E–07
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
		ILCR Summation =	3.5E–07

001276

Table C.III–543
Summary of Intake Quantitation (chemicals) Alternative 6
South Field Area with Federal Ownership: On–Property RME Resident Farmer (Adult)
Via Dermal Contact while Bathing

Intake Equation = $\frac{DA \times EF \times ED \times SA}{BW \times AT}$

DA	Dermal absorbed dose	csv mg/cm^2–day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
SA	Skin surface area available for contact	23000 cm^2

Chemical Concentrations

Compound	DA	Units	Compound	DA	Units
antimony	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
arsenic	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
beryllium	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
uranium–total	1.52E–10	mg/cm^2–day	NA	NA	mg/cm^2–day
benzo(a)pyrene	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
carbazole	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
aroclor–1254	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
aroclor–1260	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
dieldrin	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day			

References

Table C.III-543 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Federal Ownership: On-Property RME Resident Farmer (Adult)
Via Dermal Contact while Bathing

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	6.00E-05	NA
arsenic	NA	2.85E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	4.77E-08	1.50E-04	3.18E-04
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	4.50E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		3.18E-04

Compound	ILCR Calculation CDI (mg/kg-day)	CSF (mg/kg-day)$^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.90E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	4.77E-08	NA	NA
benzo(a)pyrene	NA	NA	NA
carbazole	NA	2.22E-02	NA
aroclor-1254	NA	1.03E+01	NA
aroclor-1260	NA	1.03E+01	NA
dieldrin	NA	1.78E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

001578

Table C.III–544
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
South Field Area with Federal Ownership: On–Property RME Resident Farmer (Adult)
Via Inhalation of Gases and Particulates

Intake Equation = Ca X EF X EDn X IR

IR	Inhalation rate of gases (RAGS, 1989)	20 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Ca	Concentration of radionuclides in air	(see table below)

Cs_{137+1d}	NA	pCi/m^3	$Th_{232+10d}$	NA	pCi/m^3
Np_{237+1d}	4.3E–06	pCi/m^3	U_{234}	1.3E–05	pCi/m^3
Pu_{238}	NA	pCi/m^3	U_{235+1d}	NA	pCi/m^3
Ra_{226+8d}	NA	pCi/m^3	U_{238+2d}	1.1E–05	pCi/m^3
Ra_{228+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Rn_{222+4d}	NA	pCi/m^3	NA	NA	pCi/m^3
Sr_{90+1d}	3.1E–06	pCi/m^3	NA	NA	pCi/m^3
Tc_{99}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{228+7d}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{230}	6.6E–05	pCi/m^3	NA	NA	pCi/m^3

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	1.9E–11	NA
Np_{237+1d}	2.1E+00	2.9E–08	6.1E–08
Pu_{238}	NA	3.9E–08	NA
Ra_{226+8d}	NA	7.0E–09	NA
Ra_{228+1d}	NA	6.9E–10	NA
Rn_{222+4d}	NA	7.7E–12	NA
Sr_{90+1d}	1.5E+00	6.2E–11	9.4E–11
Tc_{99}	NA	8.3E–12	NA
Th_{228+7d}	NA	7.8E–08	NA
Th_{230}	3.2E+01	2.9E–08	9.4E–07
$Th_{232+10d}$	NA	1.1E–07	NA
U_{234}	6.4E+00	2.6E–08	1.7E–07
U_{235+1d}	NA	2.5E–08	NA
U_{238+2d}	5.6E+00	2.4E–08	1.3E–07
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		1.3E–06

001279

Table C.III-545
Summary of Intake Quantitation (chemicals) Alternative 6
South Field Area with Federal Ownership: On-Property RME Resident Farmer (Adult)
Via Ingestion of Meat Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of meat	0.101 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in meat	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium-total	1.6E-04	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor-1254	NA	mg/kg	NA	NA	mg/kg
aroclor-1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

Table C.III-545 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Federal Ownership: On-Property RME Resident Farmer (Adult)
Via Ingestion of Meat Products

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	1.6E-07	3.0E-03	5.4E-05
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			5.4E-05

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	1.6E-07	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

001281

Table C.III–546
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
South Field Area with Federal Ownership: On–Property RME Resident Farmer (Adult)
Via Ingestion of Meat Products

Intake Equation = Cf X EF X EDn X FI X IR

IR	Ingestion rate of meat	0.101 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cf	Concentration of radionuclides in meat	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	8.7E–04	pCi/kg	U_{234}	7.7E–03	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	1.0E–04	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	7.2E–03	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	4.8E–01	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	4.2E–04	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	1.6E+00	2.2E–10	3.6E–10
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	8.9E+02	3.6E–11	3.2E–08
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	7.8E–01	1.3E–11	1.0E–11
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	1.4E+01	1.6E–11	2.3E–10
U_{235+1d}	1.9E–01	1.6E–11	3.0E–12
U_{238+2d}	1.3E+01	2.0E–11	2.7E–10
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 3.3E–08

001282

Table C.III–547
Summary of Intake Quantitation (chemicals) Alternative 6
South Field Area with Federal Ownership: On–Property RME Resident Farmer (Adult)
Via Ingestion of Dairy Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of dairy products	0.4 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in animal products	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium–total	4.7E–04	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor–1254	NA	mg/kg	NA	NA	mg/kg
aroclor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

001283

Table C.III-547 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Federal Ownership: On-Property RME Resident Farmer (Adult)
Via Ingestion of Dairy Products

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	1.9E-06	3.0E-03	6.5E-04
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		6.5E-04

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	1.9E-06	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

Table C.III–548
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
South Field Area with Federal Ownership: On–Property RME Resident Farmer (Adult)
Via Ingestion of Dairy Products

Intake Equation = Cp X EF X EDn X FI X IR

IR	Ingestion rate of dairy products	0.4 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cp	Concentration of radionuclides in animal products	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	7.9E–05	pCi/kg	U_{234}	2.4E–02	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	3.6E–04	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	2.3E–02	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	2.4E+00	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	3.5E–04	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	5.8E–01	2.2E–10	1.3E–10
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	1.8E+04	3.6E–11	6.4E–07
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	2.6E+00	1.3E–11	3.4E–11
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	1.8E+02	1.6E–11	2.8E–09
U_{235+1d}	2.6E+00	1.6E–11	4.2E–11
U_{238+2d}	1.7E+02	2.0E–11	3.3E–09
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
ILCR Summation	=		6.4E–07

Table C.III-549
Summary of Intake Quantitation (chemicals) Alternative 6
South Field Area with Federal Ownership: On-Property RME Resident Farmer (Adult)
Via Ingestion of Vegetables and Fruits

Intake Equation $= \frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of fruits or vegetables	0.122 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	25550 days
CS	*Concentration of chemicals in vegetables*	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium-total	1.0E-02	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor-1254	NA	mg/kg	NA	NA	mg/kg
aroclor-1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

Table C.III-549 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Federal Ownership: On-Property RME Resident Farmer (Adult)
Via Ingestion of Vegetables and Fruits

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	1.7E-05	3.0E-03	5.5E-03
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		5.5E-03

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg\text{-}day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	1.7E-05	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

001287

Table C.III–550
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
South Field Area with Federal Ownership: On–Property RME Resident Farmer (Adult)
Via Ingestion of Vegetables and Fruits

Intake Equation = Cv X EF X EDn X FI X IR

IR	Ingestion rate of fruits or vegetables	0.122 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cv	Concentration of radionuclides in vegetables	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	1.6E–01	pCi/kg	U_{234}	1.2E+00	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	4.9E–02	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	1.2E+00	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	3.2E+01	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	1.9E–01	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	4.8E+02	2.2E–10	1.0E–07
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	9.6E+04	3.6E–11	3.4E–06
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	5.5E+02	1.3E–11	7.2E–09
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	3.5E+03	1.6E–11	5.6E–08
U_{235+1d}	1.5E+02	1.6E–11	2.3E–09
U_{238+2d}	3.7E+03	2.0E–11	7.3E–08
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 3.7E–06

Table C.III-551
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
South Field Area with Federal Ownership: On-Property RME Resident Farmer (Adult)
Via External Radiation

Dose Equivalency Equat = $[DR \times EF \times EDn \times ET_i \times (1-SH_i)] + [DR \times EF \times EDn \times ET_o \times (1-SH_o)]$

EF	Fraction of year spent exposured	0.96 (unitless)
ED	Exposure duration	70 Year
ET_i	Fraction of day spent indoors	0.76 (unitless)
ET_o	Fraction of day spent outdoors	0.24 (unitless)
SH_i	Shield factor indoors	0.5 (unitless)
SH_o	Shield factor outdoors	NA (unitless)
DR	Radionuclide specific dose concentrations	(see table below)

Cs_{137+1d}	NA	pCi/g	$Th_{232+10d}$	NA	pCi/g
Np_{237+1d}	1.55E-02	pCi/g	U_{234}	3.06E-02	pCi/g
Pu_{238}	NA	pCi/g	U_{235+1d}	NA	pCi/g
Ra_{226+8d}	NA	pCi/g	U_{238+2d}	2.70E-02	pCi/g
Ra_{228+1d}	NA	pCi/g	NA	NA	pCi/g
Rn_{222+4d}	NA	pCi/g	NA	NA	pCi/g
Sr_{90+1d}	1.28E-02	pCi/g	NA	NA	pCi/g
Tc_{99}	NA	pCi/g	NA	NA	pCi/g
Th_{228+7d}	NA	pCi/g	NA	NA	pCi/g
Th_{230}	1.19E-01	pCi/g	NA	NA	pCi/g

Radionuclides	CDI (year pCi/g)	CSF $(g/pCi-year)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.0E-06	NA
Np_{237+1d}	6.5E-01	4.3E-07	2.8E-07
Pu_{238}	NA	2.8E-11	NA
Ra_{226+8d}	NA	6.0E-06	NA
Ra_{228+1d}	NA	2.9E-06	NA
Rn_{222+4d}	NA	5.9E-06	NA
Sr_{90+1d}	5.3E-01	NA	NA
Tc_{99}	NA	6.0E-13	NA
Th_{228+7d}	NA	5.6E-06	NA
Th_{230}	4.9E+00	5.4E-11	2.7E-10
$Th_{232+10d}$	NA	8.5E-06	NA
U_{234}	1.3E+00	3.0E-11	3.8E-11
U_{235+1d}	NA	2.4E-07	NA
U_{238+2d}	1.1E+00	5.1E-08	5.7E-08
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
ILCR Summation	=		3.4E-07

001289

Table C.III-552
Summary of Intake Quantitation (chemicals) Alternative 6
South Field Area with Private Ownership: On-Property Farmer (Child)
Via Incidental Ingestion of Soil

Intake Equation = $\frac{CS \times EF \times ED \times CF \times IR}{BW \times AT}$

IRs	Ingestion rate of soil (RAGS, 1989)	200 mg/day
CF	Conversion factor	1.0E-06 kg/mg
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in soil	(see table below)

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium-total	7.9E-01	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor-1254	NA	mg/kg	NA	NA	mg/kg
aroclor-1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

001590

6646

Table C.III-552 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Private Ownership: On-Property Farmer (Child)
Via Incidental Ingestion of Soil

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	1.0E-05	3.0E-03	3.4E-03
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		3.4E-03

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	8.7E-07	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

0012291

Table C.III-553
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
South Field Area with Private Ownership: On-Property Farmer (Child)
Via Incidental Ingestion of Soil

Intake Equation = CS X EF X EDn X FI X IR

IRs	Ingestion rate of soil (RAGS, 1989)	200 mg/day
EF	Exposure frequency	350 days/year
EDn	Exposure Duration	6 Year
FI	Fractional Intake	1 (unitless)
CS	Concentration of radionuclides in soil	

Cs_{137+1d}	NA	pCi/mg	$Th_{232+10d}$	NA	pCi/mg
Np_{237+1d}	1.55E-05	pCi/mg	U_{234}	3.06E-05	pCi/mg
Pu_{238}	NA	pCi/mg	U_{235+1d}	NA	pCi/mg
Ra_{226+8d}	NA	pCi/mg	U_{238+2d}	2.70E-05	pCi/mg
Ra_{228+1d}	NA	pCi/mg	NA	NA	pCi/mg
Rn_{222+4d}	NA	pCi/mg	NA	NA	pCi/mg
Sr_{90+1d}	1.28E-05	pCi/mg	NA	NA	pCi/mg
Tc_{99}	NA	pCi/mg	NA	NA	pCi/mg
Th_{228+7d}	NA	pCi/mg	NA	NA	pCi/mg
Th_{230}	1.19E-04	pCi/mg	NA	NA	pCi/mg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.80E-11	NA
Np_{237+1d}	6.51E+00	2.20E-10	1.43E-09
Pu_{238}	NA	2.20E-10	NA
Ra_{226+8d}	NA	7.80E-10	NA
Ra_{228+1d}	NA	1.00E-10	NA
Rn_{222+4d}	NA	1.70E-12	NA
Sr_{90+1d}	5.38E+00	3.60E-11	1.94E-10
Tc_{99}	NA	1.30E-12	NA
Th_{228+7d}	NA	5.50E-11	NA
Th_{230}	4.99E+01	1.30E-11	6.49E-10
$Th_{232+10d}$	NA	1.70E-10	NA
U_{234}	1.29E+01	1.60E-11	2.06E-10
U_{235+1d}	NA	1.60E-11	NA
U_{238+2d}	1.13E+01	2.00E-11	2.27E-10
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 2.71E-09

Table C.III–554
Summary of Intake Quantitation (chemicals) Alternative 6
South Field Area with Private Ownership: On–Property Farmer (Child)
Via Dermal Contact with Soil

Intake Equation = $\frac{CS \times EF \times ED \times CF \times ABS \times AF \times SA}{BW \times AT}$

SA	Surface area of exposed skin (50th percentile, hands only)	2000 cm^2/day
AF	Soil to skin adherence factor (RAGS, 1989)	1 mg/cm^2
ABS	chemicals specific absorbtion factor (see table below)	csv
CF	Conversion factor	1E–06 kg/mg
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in soil	

Chemical Concentrations

Compound	ABS	Concentrati	Units	Compound		Concentrati	Units
antimony	1.00E–02	NA	mg/kg	NA	NA	NA	mg/kg
arsenic	1.00E–03	NA	mg/kg	NA	NA	NA	mg/kg
beryllium	1.00E–02	NA	mg/kg	NA	NA	NA	mg/kg
uranium–total	1.00E–02	7.94E–01	mg/kg	NA	NA	NA	mg/kg
benzo(a)pyrene	3.00E–01	NA	mg/kg	NA	NA	NA	mg/kg
carbazole	3.00E–01	NA	mg/kg	NA	NA	NA	mg/kg
aroclor–1254	6.00E–02	NA	mg/kg	NA	NA	NA	mg/kg
aroclor–1260	6.00E–02	NA	mg/kg	NA	NA	NA	mg/kg
dieldrin	3.00E–01	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg	NA	NA	NA	mg/kg
NA	NA	NA	mg/kg				

References

001293

Table C.III–554 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Private Ownership: On–Property Farmer (Child)
Via Dermal Contact with Soil

	HQ Calculation		
Compound	CDI (mg/kg–day)	RfD (mg/kg–day)	HQ (unitless)
antimony	NA	6.00E–05	NA
arsenic	NA	2.85E–04	NA
beryllium	NA	5.00E–03	NA
uranium–total	1.02E–06	1.50E–04	6.77E–03
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor–1254	NA	NA	NA
aroclor–1260	NA	NA	NA
dieldrin	NA	4.50E–05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	HQ Summation =		6.77E–03

	ILCR Calculation		
Compound	CDI (mg/kg–day)	CSF $(mg/kg–day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.90E+00	NA
beryllium	NA	4.30E+00	NA
uranium–total	8.70E–08	NA	NA
benzo(a)pyrene	NA	NA	NA
carbazole	NA	2.22E–02	NA
aroclor–1254	NA	1.03E+01	NA
aroclor–1260	NA	1.03E+01	NA
dieldrin	NA	1.78E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	ILCR Summation =		NA

Table C.III–555
Summary of Intake Quantitation (chemicals) Alternative 6
South Field Area with Private Ownership: On–Property Farmer (Child)
Via Drinking Water Ingestion

Intake Equation = $\frac{CS \times EF \times ED \times IR}{BW \times AT}$

IR	Ingestion rate of groundwater (RAGS, 1989)	1 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in groundwater	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/l	NA	NA	mg/l
arsenic	NA	mg/l	NA	NA	mg/l
beryllium	NA	mg/l	NA	NA	mg/l
uranium–total	6.06E–04	mg/l	NA	NA	mg/l
benzo(a)pyrene	NA	mg/l	NA	NA	mg/l
carbazole	NA	mg/l	NA	NA	mg/l
aroclor–1254	NA	mg/l	NA	NA	mg/l
aroclor–1260	NA	mg/l	NA	NA	mg/l
dieldrin	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l			

References

001295

Table C.III-555 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Private Ownership: On-Property Farmer (Child)
Via Drinking Water Ingestion

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.00E-04	NA
arsenic	NA	3.00E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	3.87E-05	3.00E-03	1.29E-02
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.00E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			1.29E-02

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.75E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	3.32E-06	NA	NA
benzo(a)pyrene	NA	7.30E+00	NA
carbazole	NA	2.00E-02	NA
aroclor-1254	NA	7.70E+00	NA
aroclor-1260	NA	7.70E+00	NA
dieldrin	NA	1.60E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

Table C.III–556
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
South Field Area with Private Ownership: On–Property Farmer (Child)
Via Ingestion of Drinking Water

Intake Equation = Cw X EF X EDn X FI X IR

IR	Ingestion rate of groundwater (RAGS, 1989)	1 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
FI	Fractional intake for radionuclides	1 (Unitless)
Cw	Concentration of radionuclides in groundwater	(see table below)

Cs_{137+1d}	NA	pCi/l	$Th_{232+10d}$	NA	pCi/l
Np_{237+1d}	NA	pCi/l	U_{234}	1.8E–01	pCi/l
Pu_{238}	NA	pCi/l	U_{235+1d}	1.0E–02	pCi/l
Ra_{226+8d}	NA	pCi/l	U_{238+2d}	2.0E–01	pCi/l
Ra_{228+1d}	NA	pCi/l	NA	NA	pCi/l
Rn_{222+4d}	NA	pCi/l	NA	NA	pCi/l
Sr_{90+1d}	NA	pCi/l	NA	NA	pCi/l
Tc_{99}	NA	pCi/l	NA	NA	pCi/l
Th_{228+7d}	NA	pCi/l	NA	NA	pCi/l
Th_{230}	NA	pCi/l	NA	NA	pCi/l

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	NA	2.2E–10	NA
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	NA	1.3E–11	NA
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	3.9E+02	1.6E–11	6.2E–09
U_{235+1d}	2.1E+01	1.6E–11	3.4E–10
U_{238+2d}	4.2E+02	2.0E–11	8.5E–09
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
		ILCR Summation =	1.5E–08

001297

Table C.III-557
Summary of Intake Quantitation (chemicals) Alternative 6
South Field Area with Private Ownership: On-Property Farmer (Child)
Via Dermal Contact while Bathing

Intake Equation = $\frac{DA \times EF \times ED \times SA}{BW \times AT}$

DA	Dermal absorbed dose	csv mg/cm^2-day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	2190 days
SA	Skin surface area available for contact	8000 cm^2

Chemical Concentrations

Compound	DA	Units	Compound	DA	Units
antimony	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
arsenic	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
beryllium	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
uranium-total	1.52E-10	mg/cm^2-day	NA	NA	mg/cm^2-day
benzo(a)pyrene	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
carbazole	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
aroclor-1254	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
aroclor-1260	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
dieldrin	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day	NA	NA	mg/cm^2-day
NA	NA	mg/cm^2-day			

References

001298

Table C.III-557 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Private Ownership: On-Property Farmer (Child)
Via Dermal Contact while Bathing

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	6.00E-05	NA
arsenic	NA	2.85E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	7.75E-08	1.50E-04	5.17E-04
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	4.50E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			5.17E-04

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.90E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	6.64E-09	NA	NA
benzo(a)pyrene	NA	NA	NA
carbazole	NA	2.22E-02	NA
aroclor-1254	NA	1.03E+01	NA
aroclor-1260	NA	1.03E+01	NA
dieldrin	NA	1.78E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

Table C.III–558
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
South Field Area with Private Ownership: On–Property Farmer (Child)
Via Inhalation of Gases and Particulates

Intake Equation = Ca X EF X EDn X IR

IR	Inhalation rate of gases (RAGS, 1989)	12 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Ca	Concentration of radionuclides in air	(see table below)

Cs_{137+1d}	NA	pCi/m^3	$Th_{232+10d}$	NA	pCi/m^3
Np_{237+1d}	4.3E–06	pCi/m^3	U_{234}	1.3E–05	pCi/m^3
Pu_{238}	NA	pCi/m^3	U_{235+1d}	NA	pCi/m^3
Ra_{226+8d}	NA	pCi/m^3	U_{238+2d}	1.1E–05	pCi/m^3
Ra_{228+1d}	NA	pCi/m^3		NA	pCi/m^3
Rn_{222+4d}	NA	pCi/m^3		NA	pCi/m^3
Sr_{90+1d}	3.1E–06	pCi/m^3		NA	pCi/m^3
Tc_{99}	NA	pCi/m^3		NA	pCi/m^3
Th_{228+7d}	NA	pCi/m^3		NA	pCi/m^3
Th_{230}	6.6E–05	pCi/m^3		NA	pCi/m^3

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	1.9E–11	NA
Np_{237+1d}	1.1E–01	2.9E–08	3.1E–09
Pu_{238}	NA	3.9E–08	NA
Ra_{226+8d}	NA	7.0E–09	NA
Ra_{228+1d}	NA	6.9E–10	NA
Rn_{222+4d}	NA	7.7E–12	NA
Sr_{90+1d}	7.8E–02	6.2E–11	4.8E–12
Tc_{99}	NA	8.3E–12	NA
Th_{228+7d}	NA	7.8E–08	NA
Th_{230}	1.7E+00	2.9E–08	4.8E–08
$Th_{232+10d}$	NA	1.1E–07	NA
U_{234}	3.3E–01	2.6E–08	8.5E–09
U_{235+1d}	NA	2.5E–08	NA
U_{238+2d}	2.9E–01	2.4E–08	6.9E–09
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
		ILCR Summation =	6.7E–08

001200

Table C.III–559
Summary of Intake Quantitation (chemicals) Alternative 6
South Field Area with Private Ownership: On–Property Farmer (Child)
Via Ingestion of Meat Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of meat	0.039 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in meat	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium–total	1.6E–04	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor–1254	NA	mg/kg	NA	NA	mg/kg
aroclor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

001301

Table C.III-559 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Private Ownership: On-Property Farmer (Child)
Via Ingestion of Meat Products

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	2.9E-07	3.0E-03	9.8E-05
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			9.8E-05

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	2.5E-08	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

Table C.III–560
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
South Field Area with Private Ownership: On–Property Farmer (Child)
Via Ingestion of Meat Products

Intake Equation = Cf X EF X EDn X FI X IR

IR	Ingestion rate of meat	0.039 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cf	Concentration of radionuclides in meat	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	8.7E–04	pCi/kg	U_{234}	7.7E–03	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	1.0E–04	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	7.2E–03	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	4.8E–01	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	4.2E–04	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	5.3E–02	2.2E–10	1.2E–11
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	3.0E+01	3.6E–11	1.1E–09
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	2.6E–02	1.3E–11	3.4E–13
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	4.7E–01	1.6E–11	7.6E–12
U_{235+1d}	6.1E–03	1.6E–11	9.8E–14
U_{238+2d}	4.4E–01	2.0E–11	8.8E–12
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 1.1E–09

001303

Table C.III-561
Summary of Intake Quantitation (chemicals) Alternative 6
South Field Area with Private Ownership: On-Property Farmer (Child)
Via Ingestion of Dairy Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of dairy products	0.9 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in animal products	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium-total	4.7E-04	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor-1254	NA	mg/kg	NA	NA	mg/kg
aroclor-1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

Table C.III-561 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Private Ownership: On-Property Farmer (Child)
Via Ingestion of Dairy Products

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	2.0E-05	3.0E-03	6.8E-03
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			6.8E-03

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	1.8E-06	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

001303

6646

Table C.III–562
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
South Field Area with Private Ownership: On–Property Farmer (Child)
Via Ingestion of Dairy Products

Intake Equation = Cp X EF X EDn X FI X IR

IR	Ingestion rate of dairy products	0.9 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cp	Concentration of radionuclides in animal products	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	7.9E–05	pCi/kg	U_{234}	2.4E–02	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	3.6E–04	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	2.3E–02	pCi/kg
Ra_{228+1d}	NA	pCi/kg		NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg		NA	pCi/kg
Sr_{90+1d}	2.4E+00	pCi/kg		NA	pCi/kg
Tc_{99}	NA	pCi/kg		NA	pCi/kg
Th_{228+7d}	NA	pCi/kg		NA	pCi/kg
Th_{230}	3.5E–04	pCi/kg		NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	1.1E–01	2.2E–10	2.5E–11
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	3.4E+03	3.6E–11	1.2E–07
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	5.0E–01	1.3E–11	6.5E–12
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	3.4E+01	1.6E–11	5.5E–10
U_{235+1d}	5.1E–01	1.6E–11	8.2E–12
U_{238+2d}	3.2E+01	2.0E–11	6.5E–10
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
		ILCR Summation =	1.2E–07

001206

Table C.III–563
Summary of Intake Quantitation (chemicals) Alternative 6
South Field Area with Private Ownership: On–Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of fruits or vegetables	0.1 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in vegetables	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium–total	1.0E–02	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor–1254	NA	mg/kg	NA	NA	mg/kg
aroclor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

001302

Table C.III-563 (continued)
Summary of Risk Characterization (chemicals)
South Field Area with Private Ownership: On-Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	6.4E-05	3.0E-03	2.1E-02
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			2.1E-02

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	5.5E-06	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

Table C.III–564
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
South Field Area with Private Ownership: On–Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

Intake Equation = Cv X EF X EDn X FI X IR

IR	Ingestion rate of fruits or vegetables	0.1 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cv	Concentration of radionuclides in vegetables	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	1.6E–01	pCi/kg	U_{234}	1.2E+00	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	4.9E–02	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	1.2E+00	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	3.2E+01	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	1.9E–01	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	3.3E+01	2.2E–10	7.4E–09
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	6.7E+03	3.6E–11	2.4E–07
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	3.9E+01	1.3E–11	5.1E–10
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	2.5E+02	1.6E–11	3.9E–09
U_{235+1d}	1.0E+01	1.6E–11	1.6E–10
U_{238+2d}	2.6E+02	2.0E–11	5.2E–09
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		2.6E–07

Table C.III-565
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
South Field Area with Private Ownership: On-Property Farmer (Child)
Via External Radiation

Dose Equivalency Equat = $[DR \times EF \times EDn \times ET_i \times (1-SH_i)] + [DR \times EF \times EDn \times ET_o \times (1-SH_o)]$

EF	Fraction of year spent exposured	0.96 (unitless)
ED	Exposure duration	6 Year
ET_i	Fraction of day spent indoors	0.92 (unitless)
ET_o	Fraction of day spent outdoors	0.08 (unitless)
SH_i	Shield factor indoors	0.5 (unitless)
SH_o	Shield factor outdoors	NA (unitless)
DR	Radionuclide specific dose concentrations	(see table below)

Cs_{137+1d}	NA	pCi/g	$Th_{232+10d}$	NA	pCi/g
Np_{237+1d}	1.55E-02	pCi/g	U_{234}	3.06E-02	pCi/g
Pu_{238}	NA	pCi/g	U_{235+1d}	NA	pCi/g
Ra_{226+8d}	NA	pCi/g	U_{238+2d}	2.70E-02	pCi/g
Ra_{228+1d}	NA	pCi/g	NA	NA	pCi/g
Rn_{222+4d}	NA	pCi/g	NA	NA	pCi/g
Sr_{90+1d}	1.28E-02	pCi/g	NA	NA	pCi/g
Tc_{99}	NA	pCi/g	NA	NA	pCi/g
Th_{228+7d}	NA	pCi/g	NA	NA	pCi/g
Th_{230}	1.19E-01	pCi/g	NA	NA	pCi/g

Radionuclides	CDI (year pCi/g)	CSF $(g/pCi-year)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.0E-06	NA
Np_{237+1d}	4.8E-02	4.3E-07	2.1E-08
Pu_{238}	NA	2.8E-11	NA
Ra_{226+8d}	NA	6.0E-06	NA
Ra_{228+1d}	NA	2.9E-06	NA
Rn_{222+4d}	NA	5.9E-06	NA
Sr_{90+1d}	4.0E-02	NA	NA
Tc_{99}	NA	6.0E-13	NA
Th_{228+7d}	NA	5.6E-06	NA
Th_{230}	3.7E-01	5.4E-11	2.0E-11
$Th_{232+10d}$	NA	8.5E-06	NA
U_{234}	9.5E-02	3.0E-11	2.9E-12
U_{235+1d}	NA	2.4E-07	NA
U_{238+2d}	8.4E-02	5.1E-08	4.3E-09
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		2.5E-08

001210

Table C.III–566
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Disposal Cell with Federal Ownership: Expanded Trespasser
Via Inhalation of Gases and Particulates

Intake Equation = CA X EFa X EDa X IR X ETa + CA X EFc EDc X IR X ETc

IR	Inhalation rate of gases	0.83 m^3/hour
EFa	Exposure frequency (adult)	40 days/year
EFc	Exposure frequency (child)	110 days/year
EDa	Exposure duration	32 Year
EDc	Exposure duration	12 Year
ETa	Exposure time (adult)	1 hour/day
ETc	Exposure time (child)	2 hour/day
CA	Concentration of radionuclides in air	(see table below)

Cs_{137+1d}	NA	pCi/m^3	$Th_{232+10d}$	NA	pCi/m^3
Np_{237+1d}	NA	pCi/m^3	U_{234}	NA	pCi/m^3
Pu_{238}	NA	pCi/m^3	U_{235+1d}	NA	pCi/m^3
Ra_{226+8d}	NA	pCi/m^3	U_{238+2d}	NA	pCi/m^3
Ra_{228+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Rn_{222+4d}	5.6E–06	pCi/m^3	NA	NA	pCi/m^3
Sr_{90+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Tc_{99}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{228+7d}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{230}	NA	pCi/m^3	NA	NA	pCi/m^3

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	1.9E–11	NA
Np_{237+1d}	NA	2.9E–08	NA
Pu_{238}	NA	3.9E–08	NA
Ra_{226+8d}	NA	7.0E–09	NA
Ra_{228+1d}	NA	6.9E–10	NA
Rn_{222+4d}	1.8E–02	7.7E–12	1.4E–13
Sr_{90+1d}	NA	6.2E–11	NA
Tc_{99}	NA	8.3E–12	NA
Th_{228+7d}	NA	7.8E–08	NA
Th_{230}	NA	2.9E–08	NA
$Th_{232+10d}$	NA	1.1E–07	NA
U_{234}	NA	2.6E–08	NA
U_{235+1d}	NA	2.5E–08	NA
U_{238+2d}	NA	2.4E–08	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 1.4E–13

001311

Table C.III-567
Summary of Intake Quantitation (chemicals) Alternative 6
Disposal Cell with Federal Ownership: Off-Property Farmer (Adult)
Via Drinking Water Ingestion

Intake Equation = $\frac{CS \times EF \times ED \times IR}{BW \times AT}$

IR	Ingestion rate of groundwater (RAGS, 1989)	2 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in groundwater	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/l	NA	NA	mg/l
arsenic	NA	mg/l	NA	NA	mg/l
beryllium	NA	mg/l	NA	NA	mg/l
uranium-total	2.09E-03	mg/l	NA	NA	mg/l
benzo(a)pyrene	NA	mg/l	NA	NA	mg/l
carbazole	NA	mg/l	NA	NA	mg/l
aroclor-1254	NA	mg/l	NA	NA	mg/l
aroclor-1260	NA	mg/l	NA	NA	mg/l
dieldrin	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l			

References

Table C.III-567 (continued)
Summary of Risk Characterization (chemicals)
Disposal Cell with Federal Ownership: Off-Property Farmer (Adult)
Via Drinking Water Ingestion

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.00E-04	NA
arsenic	NA	3.00E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	5.71E-05	3.00E-03	1.90E-02
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.00E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		1.90E-02

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.75E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	5.71E-05	NA	NA
benzo(a)pyrene	NA	7.30E+00	NA
carbazole	NA	2.00E-02	NA
aroclor-1254	NA	7.70E+00	NA
aroclor-1260	NA	7.70E+00	NA
dieldrin	NA	1.60E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

001313

Table C.III–568
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Disposal Cell with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Drinking Water

Intake Equation = Cw X EF X EDn X FI X IR

IR	Ingestion rate of groundwater (RAGS, 1989)	2 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
FI	Fractional intake for radionuclides	1 (Unitless)
Cw	Concentration of radionuclides in groundwater	(see table below)

Cs_{137+1d}	NA	pCi/l	$Th_{232+10d}$	NA	pCi/l
Np_{237+1d}	NA	pCi/l	U_{234}	6.3E–01	pCi/l
Pu_{238}	NA	pCi/l	U_{235+1d}	3.3E–02	pCi/l
Ra_{226+8d}	NA	pCi/l	U_{238+2d}	7.0E–01	pCi/l
Ra_{228+1d}	NA	pCi/l	NA	NA	pCi/l
Rn_{222+4d}	NA	pCi/l	NA	NA	pCi/l
Sr_{90+1d}	NA	pCi/l	NA	NA	pCi/l
Tc_{99}	NA	pCi/l	NA	NA	pCi/l
Th_{228+7d}	NA	pCi/l	NA	NA	pCi/l
Th_{230}	NA	pCi/l	NA	NA	pCi/l

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	NA	2.2E–10	NA
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	NA	1.3E–11	NA
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	3.1E+04	1.6E–11	5.0E–07
U_{235+1d}	1.6E+03	1.6E–11	2.6E–08
U_{238+2d}	3.4E+04	2.0E–11	6.8E–07
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation	=	1.2E–06

Table C.III–569
Summary of Intake Quantitation (chemicals) Alternative 6
Disposal Cell with Federal Ownership: Off–Property Farmer (Adult)
Via Dermal Contact while Bathing

Intake Equation = $\frac{DA \times EF \times ED \times SA}{BW \times AT}$

DA	Dermal absorbed dose	csv mg/cm^2–day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
SA	Skin surface area available for contact	23000 cm^2

Chemical Concentrations

Compound	DA	Units	Compound	DA	Units
antimony	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
arsenic	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
beryllium	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
uranium–total	5.21E–10	mg/cm^2–day	NA	NA	mg/cm^2–day
benzo(a)pyrene	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
carbazole	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
aroclor–1254	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
aroclor–1260	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
dieldrin	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day			

References

001315

Table C.III-569 (continued)
Summary of Risk Characterization (chemicals)
Disposal Cell with Federal Ownership: Off-Property Farmer (Adult)
Via Dermal Contact while Showering

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	6.00E-05	NA
arsenic	NA	2.85E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	1.64E-07	1.50E-04	1.09E-03
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	4.50E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		1.09E-03

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.90E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	1.64E-07	NA	NA
benzo(a)pyrene	NA	NA	NA
carbazole	NA	2.22E-02	NA
aroclor-1254	NA	1.03E+01	NA
aroclor-1260	NA	1.03E+01	NA
dieldrin	NA	1.78E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

Table C.III–570
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Disposal Cell with Federal Ownership: Off–Property Farmer (Adult)
Via Inhalation of Gases and Particulates

Intake Equation = Ca X EF X EDn X IR

IR	Inhalation rate of gases (RAGS, 1989)	20 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Ca	Concentration of radionuclides in air	(see table below)

Cs_{137+1d}	NA	pCi/m^3	$Th_{232+10d}$	NA	pCi/m^3
Np_{237+1d}	NA	pCi/m^3	U_{234}	NA	pCi/m^3
Pu_{238}	NA	pCi/m^3	U_{235+1d}	NA	pCi/m^3
Ra_{226+8d}	NA	pCi/m^3	U_{238+2d}	NA	pCi/m^3
Ra_{228+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Rn_{222+4d}	2.0E–06	pCi/m^3	NA	NA	pCi/m^3
Sr_{90+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Tc_{99}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{228+7d}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{230}	NA	pCi/m^3	NA	NA	pCi/m^3

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	1.9E–11	NA
Np_{237+1d}	NA	2.9E–08	NA
Pu_{238}	NA	3.9E–08	NA
Ra_{226+8d}	NA	7.0E–09	NA
Ra_{228+1d}	NA	6.9E–10	NA
Rn_{222+4d}	9.9E–01	7.7E–12	7.7E–12
Sr_{90+1d}	NA	6.2E–11	NA
Tc_{99}	NA	8.3E–12	NA
Th_{228+7d}	NA	7.8E–08	NA
Th_{230}	NA	2.9E–08	NA
$Th_{232+10d}$	NA	1.1E–07	NA
U_{234}	NA	2.6E–08	NA
U_{235+1d}	NA	2.5E–08	NA
U_{238+2d}	NA	2.4E–08	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation	=	7.7E–12

001317

Table C.III-571a
Summary of Intake Quantitation (chemicals) Alternative 6
Disposal Cell with Federal Ownership: Off-Property Farmer (Adult)
Via Ingestion of Meat Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of meat	0.101 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in meat	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium-total	2.1E-05	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor-1254	NA	mg/kg	NA	NA	mg/kg
aroclor-1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

Table C.III-571a (continued)
Summary of Risk Characterization (chemicals)
Disposal Cell with Federal Ownership: Off-Property Farmer (Adult)
Via Ingestion of Meat Products

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	2.2E-08	3.0E-03	7.2E-06
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		7.2E-06

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	2.2E-08	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

Table C.III–571b
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Disposal Cell with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Meat Products

Intake Equation = Cf X EF X EDn X FI X IR

IR	Ingestion rate of meat	0.101 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cf	Concentration of radionuclides in meat	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	NA	pCi/kg	U_{234}	6.3E–03	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	3.3E–04	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	6.9E–03	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	NA	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	NA	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	NA	2.2E–10	NA
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	NA	1.3E–11	NA
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	1.2E+01	1.6E–11	1.9E–10
U_{235+1d}	6.1E–01	1.6E–11	9.8E–12
U_{238+2d}	1.3E+01	2.0E–11	2.6E–10
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		4.6E–10

Table C.III–572
Summary of Intake Quantitation (chemicals) Alternative 6
Disposal Cell with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Dairy Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of dairy products	0.4 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in animal products	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium–total	7.5E–05	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor–1254	NA	mg/kg	NA	NA	mg/kg
aroclor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

001321

Table C.III–572 (continued)
Summary of Risk Characterization (chemicals)
Disposal Cell with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Dairy Products

	HQ Calculation		
Compound	CDI (mg/kg–day)	RfD (mg/kg–day)	HQ (unitless)
antimony	NA	4.0E–04	NA
arsenic	NA	3.0E–04	NA
beryllium	NA	5.0E–03	NA
uranium–total	3.1E–07	3.0E–03	1.0E–04
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor–1254	NA	NA	NA
aroclor–1260	NA	NA	NA
dieldrin	NA	5.0E–05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	HQ Summation =		1.0E–04

	ILCR Calculation		
Compound	CDI (mg/kg–day)	CSF $(mg/kg–day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium–total	3.1E–07	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E–02	NA
aroclor–1254	NA	7.7E+00	NA
aroclor–1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	ILCR Summation =		NA

Table C.III-573
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Disposal Cell with Federal Ownership: Off-Property Farmer (Adult)
Via Ingestion of Dairy Products

Intake Equation = Cp X EF X EDn X FI X IR

IR	Ingestion rate of dairy products	0.4 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cp	Concentration of radionuclides in animal products	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	NA	pCi/kg	U_{234}	2.3E-02	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	1.2E-03	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	2.5E-02	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	NA	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	NA	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E-11	NA
Np_{237+1d}	NA	2.2E-10	NA
Pu_{238}	NA	2.2E-10	NA
Ra_{226+8d}	NA	7.8E-10	NA
Ra_{228+1d}	NA	1.0E-10	NA
Rn_{222+4d}	NA	1.7E-12	NA
Sr_{90+1d}	NA	3.6E-11	NA
Tc_{99}	NA	1.3E-12	NA
Th_{228+7d}	NA	5.5E-11	NA
Th_{230}	NA	1.3E-11	NA
$Th_{232+10d}$	NA	1.7E-10	NA
U_{234}	1.7E+02	1.6E-11	2.7E-09
U_{235+1d}	8.7E+00	1.6E-11	1.4E-10
U_{238+2d}	1.8E+02	2.0E-11	3.7E-09
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation	=	6.5E-09

001323

Table C.III-574
Summary of Risk Characterization (chemicals)
Disposal Cell with Federal Ownership: Off-Property Farmer (Adult)
Via Ingestion of Vegetables and Fruits

Intake Equation $= \frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of fruits or vegetables	0.122 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in vegetables	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium-total	1.0E-02	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor-1254	NA	mg/kg	NA	NA	mg/kg
aroclor-1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

001024

C-III-903

Table C.III-574 (continued)
Summary of Risk Characterization (chemicals)
Disposal Cell with Federal Ownership: Off-Property Farmer (Adult)
Via Ingestion of Vegetables and Fruits

Compound	HQ Calculation		
	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	1.7E-05	3.0E-03	5.7E-03
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		5.7E-03

Compound	ILCR Calculation		
	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	1.7E-05	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

001325

6646

Table C.III–575
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Disposal Cell with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Vegetables and Fruits

Intake Equation = Cv X EF X EDn X FI X IR

IR	Ingestion rate of fruits or vegetables	0.122 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cv	Concentration of radionuclides in vegetables	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	NA	pCi/kg	U_{234}	3.1E+00	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	1.6E–01	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	3.4E+00	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	NA	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	NA	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	NA	2.2E–10	NA
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	NA	1.3E–11	NA
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	9.3E+03	1.6E–11	1.5E–07
U_{235+1d}	4.8E+02	1.6E–11	7.7E–09
U_{238+2d}	1.0E+04	2.0E–11	2.0E–07
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
		ILCR Summation =	3.6E–07

001126

Table C.III–576
Summary of Intake Quantitation (chemicals) Alternative 6
Disposal Cell with Federal Ownership: Off–Property Farmer (Child)
Via Drinking Water Ingestion

Intake Equation = $\frac{CS \times EF \times ED \times IR}{BW \times AT}$

IR	Ingestion rate of groundwater (RAGS, 1989)	1 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in groundwater	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/l	NA	NA	mg/l
arsenic	NA	mg/l	NA	NA	mg/l
beryllium	NA	mg/l	NA	NA	mg/l
uranium–total	2.09E–03	mg/l	NA	NA	mg/l
benzo(a)pyrene	NA	mg/l	NA	NA	mg/l
carbazole	NA	mg/l	NA	NA	mg/l
aroclor–1254	NA	mg/l	NA	NA	mg/l
aroclor–1260	NA	mg/l	NA	NA	mg/l
dieldrin	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l			

References

001222

6646

Table C.III-576 (continued)
Summary of Risk Characterization (chemicals)
Disposal Cell with Federal Ownership: Off-Property Farmer (Child)
Via Drinking Water Ingestion

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.00E-04	NA
arsenic	NA	3.00E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	1.33E-04	3.00E-03	4.44E-02
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.00E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			4.44E-02

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.75E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	1.14E-05	NA	NA
benzo(a)pyrene	NA	7.30E+00	NA
carbazole	NA	2.00E-02	NA
aroclor-1254	NA	7.70E+00	NA
aroclor-1260	NA	7.70E+00	NA
dieldrin	NA	1.60E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

Table C.III–577
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Disposal Cell with Federal Ownership: Off–Property Farmer (Child)
Via Ingestion of Drinking Water

Intake Equation = Cw X EF X EDn X FI X IR

IR	Ingestion rate of groundwater (RAGS, 1989)	1 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
FI	Fractional intake for radionuclides	1 (Unitless)
Cw	Concentration of radionuclides in groundwater	(see table below)

Cs_{137+1d}	NA	pCi/l	$Th_{232+10d}$	NA	pCi/l
Np_{237+1d}	NA	pCi/l	U_{234}	6.3E–01	pCi/l
Pu_{238}	NA	pCi/l	U_{235+1d}	3.3E–02	pCi/l
Ra_{226+8d}	NA	pCi/l	U_{238+2d}	7.0E–01	pCi/l
Ra_{228+1d}	NA	pCi/l	NA	NA	pCi/l
Rn_{222+4d}	NA	pCi/l	NA	NA	pCi/l
Sr_{90+1d}	NA	pCi/l	NA	NA	pCi/l
Tc_{99}	NA	pCi/l	NA	NA	pCi/l
Th_{228+7d}	NA	pCi/l	NA	NA	pCi/l
Th_{230}	NA	pCi/l	NA	NA	pCi/l

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	NA	2.2E–10	NA
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	NA	1.3E–11	NA
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	1.3E+03	1.6E–11	2.1E–08
U_{235+1d}	6.9E+01	1.6E–11	1.1E–09
U_{238+2d}	1.5E+03	2.0E–11	2.9E–08
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		5.2E–08

001329

Table C.III–578
Summary of Intake Quantitation (chemicals) Alternative 6
Disposal Cell with Federal Ownership: Off–Property Farmer (Child)
Via Dermal Contact while Bathing

Intake Equation = $\frac{DA \times EF \times ED \times SA}{BW \times AT}$

DA	Dermal absorbed dose	csv mg/cm^2–day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	2190 days
SA	Skin surface area available for contact	8000 cm^2

Chemical Concentrations

Compound	DA	Units	Compound	DA	Units
antimony	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
arsenic	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
beryllium	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
uranium–total	5.21E–10	mg/cm^2–day	NA	NA	mg/cm^2–day
benzo(a)pyrene	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
carbazole	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
aroclor–1254	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
aroclor–1260	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
dieldrin	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day			

References

Table C.III-578 (continued)
Summary of Risk Characterization (chemicals)
Disposal Cell with Federal Ownership: Off-Property Farmer.(Child)
Via Dermal Contact while Bathing

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	6.00E-05	NA
arsenic	NA	2.85E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total.	2.67E-07	1.50E-04	1.78E-03
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	4.50E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			1.78E-03

Compound	ILCR Calculation CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.90E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	2.28E-08	NA	NA
benzo(a)pyrene	NA	NA	NA
carbazole	NA	2.22E-02	NA
aroclor-1254	NA	1.03E+01	NA
aroclor-1260	NA	1.03E+01	NA
dieldrin	NA	1.78E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

001331

6646

Table C.III–579
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Disposal Cell with Federal Ownership: Off–Property Farmer (Child)
Via Inhalation of Gases and Particulates

Intake Equation = Ca X EF X EDn X IR

IR	Inhalation rate of gases (RAGS, 1989)	12 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Ca	Concentration of radionuclides in air	(see table below)

Cs_{137+1d}	NA	pCi/m^3	$Th_{232+10d}$	NA	pCi/m^3
Np_{237+1d}	NA	pCi/m^3	U_{234}	NA	pCi/m^3
Pu_{238}	NA	pCi/m^3	U_{235+1d}	NA	pCi/m^3
Ra_{226+8d}	NA	pCi/m^3	U_{238+2d}	NA	pCi/m^3
Ra_{228+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Rn_{222+4d}	2.0E–06	pCi/m^3	NA	NA	pCi/m^3
Sr_{90+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Tc_{99}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{228+7d}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{230}	NA	pCi/m^3	NA	NA	pCi/m^3

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	1.9E–11	NA
Np_{237+1d}	NA	2.9E–08	NA
Pu_{238}	NA	3.9E–08	NA
Ra_{226+8d}	NA	7.0E–09	NA
Ra_{228+1d}	NA	6.9E–10	NA
Rn_{222+4d}	5.1E–02	7.7E–12	3.9E–13
Sr_{90+1d}	NA	6.2E–11	NA
Tc_{99}	NA	8.3E–12	NA
Th_{228+7d}	NA	7.8E–08	NA
Th_{230}	NA	2.9E–08	NA
$Th_{232+10d}$	NA	1.1E–07	NA
U_{234}	NA	2.6E–08	NA
U_{235+1d}	NA	2.5E–08	NA
U_{238+2d}	NA	2.4E–08	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 3.9E–13

001332

Table C.III–580
Summary of Intake Quantitation (chemicals) Alternative 6
Disposal Cell with Federal Ownership: Off–Property Farmer (Child)
Via Ingestion of Meat Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of meat	0.039 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in meat	

Chemical Concentrations

Compound	Concentration	Units
antimony	NA	mg/kg
arsenic	NA	mg/kg
beryllium	NA	mg/kg
uranium–total	2.1E–05	mg/kg
benzo(a)pyrene	NA	mg/kg
carbazole	NA	mg/kg
aroclor–1254	NA	mg/kg
aroclor–1260	NA	mg/kg
dieldrin	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg

Compound	Concentration	Units
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg
NA	NA	mg/kg

References

001333

001334

C-III-912

Table C.III-580 (continued)
Summary of Risk Characterization (chemicals)
Disposal Cell with Federal Ownership: Off-Property Farmer (Child)
Via Ingestion of Meat Products

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	3.9E-08	3.0E-03	1.3E-05
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		1.3E-05

Compound	ILCR Calculation CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	3.3E-09	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

Table C.III–581
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Disposal Cell with Federal Ownership: Off–Property Farmer (Child)
Via Ingestion of Meat Products

Intake Equation = Cf X EF X EDn X FI X IR

IR	Ingestion rate of meat	0.039 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cf	Concentration of radionuclides in meat	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	NA	pCi/kg	U_{234}	6.3E–03	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	3.3E–04	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	6.9E–03	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	NA	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	NA	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	NA	2.2E–10	NA
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	NA	1.3E–11	NA
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	3.9E–01	1.6E–11	6.2E–12
U_{235+1d}	2.0E–02	1.6E–11	3.2E–13
U_{238+2d}	4.3E–01	2.0E–11	8.5E–12
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation	=	1.5E–11

001335

Table C.III-582
Summary of Intake Quantitation (chemicals) Alternative 6
Disposal Cell with Federal Ownership: Off-Property Farmer (Child)
Via Ingestion of Dairy Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of dairy products	0.9 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in animal products	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium-total	7.5E-05	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor-1254	NA	mg/kg	NA	NA	mg/kg
aroclor-1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

Table C.III-582 (continued)
Summary of Risk Characterization (chemicals)
Disposal Cell with Federal Ownership: Off-Property Farmer (Child)
Via Ingestion of Dairy Products

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	3.2E-06	3.0E-03	1.1E-03
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	HQ Summation =		1.1E-03

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	2.8E-07	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	ILCR Summation =		NA

001337

Table C.III-583
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Disposal Cell with Federal Ownership: Off-Property Farmer (Child)
Via Ingestion of Dairy Products

Intake Equation = Cp X EF X EDn X FI X IR

IR	Ingestion rate of dairy products	0.9 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cp	Concentration of radionuclides in animal products	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	NA	pCi/kg	U_{234}	2.3E-02	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	1.2E-03	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	2.5E-02	pCi/kg
Ra_{228+1d}	NA	pCi/kg		NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg		NA	pCi/kg
Sr_{90+1d}	NA	pCi/kg		NA	pCi/kg
Tc_{99}	NA	pCi/kg		NA	pCi/kg
Th_{228+7d}	NA	pCi/kg		NA	pCi/kg
Th_{230}	NA	pCi/kg		NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E-11	NA
Np_{237+1d}	NA	2.2E-10	NA
Pu_{238}	NA	2.2E-10	NA
Ra_{226+8d}	NA	7.8E-10	NA
Ra_{228+1d}	NA	1.0E-10	NA
Rn_{222+4d}	NA	1.7E-12	NA
Sr_{90+1d}	NA	3.6E-11	NA
Tc_{99}	NA	1.3E-12	NA
Th_{228+7d}	NA	5.5E-11	NA
Th_{230}	NA	1.3E-11	NA
$Th_{232+10d}$	NA	1.7E-10	NA
U_{234}	3.2E+01	1.6E-11	5.2E-10
U_{235+1d}	1.7E+00	1.6E-11	2.7E-11
U_{238+2d}	3.5E+01	2.0E-11	7.1E-10
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
		ILCR Summation =	1.3E-09

001338

Table C.III-584
Summary of Intake Quantitation (chemicals) Alternative 6
Disposal Cell with Federal Ownership: Off-Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of fruits or vegetables	0.1 kg/day
FI	*Fraction ingested from contaminated source*	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	2190 days
CS	*Concentration of chemicals in vegetables*	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium-total	1.0E-02	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor-1254	NA	mg/kg	NA	NA	mg/kg
aroclor-1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

001339

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001340

Table C.III-584 (continued)
Summary of Risk Characterization (chemicals)
Disposal Cell with Federal Ownership: Off-Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

Compound	HQ Calculation CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	6.5E-05	3.0E-03	2.2E-02
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		2.2E-02

Compound	ILCR Calculation CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	5.6E-06	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

Table C.III–585
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Disposal Cell with Federal Ownership: Off–Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

Intake Equation = Cv X EF X EDn X FI X IR

IR	Ingestion rate of fruits or vegetables	0.1 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cv	Concentration of radionuclides in vegetables	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	NA	pCi/kg	U_{234}	3.1E+00	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	1.6E–01	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	3.4E+00	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	NA	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	NA	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	NA	2.2E–10	NA
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	NA	1.3E–11	NA
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	6.5E+02	1.6E–11	1.0E–08
U_{235+1d}	3.4E+01	1.6E–11	5.4E–10
U_{238+2d}	7.1E+02	2.0E–11	1.4E–08
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation	=	2.5E–08

001341

Table C.III–586
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Disposal Cell with Private Ownership: Expanded Trespasser
Via Inhalation of Gases and Particulates

Intake Equation = CA X EFa X EDa X IR X ETa + CA X EFc EDc X IR X ETc

IR	Inhalation rate of gases	0.83 m^3/hour
EFa	Exposure frequency (adult)	40 days/year
EFc	Exposure frequency (child)	110 days/year
EDa	Exposure duration	32 Year
EDc	Exposure duration	12 Year
ETa	Exposure time (adult)	1 hour/day
ETc	Exposure time (child)	2 hour/day
CA	Concentration of radionuclides in air	(see table below)

Cs_{137+1d}	NA	pCi/m^3	$Th_{232+10d}$	NA	pCi/m^3
Np_{237+1d}	NA	pCi/m^3	U_{234}	NA	pCi/m^3
Pu_{238}	NA	pCi/m^3	U_{235+1d}	NA	pCi/m^3
Ra_{226+8d}	NA	pCi/m^3	U_{238+2d}	NA	pCi/m^3
Ra_{228+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Rn_{222+4d}	2.9E−06	pCi/m^3	NA	NA	pCi/m^3
Sr_{90+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Tc_{99}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{228+7d}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{230}	NA	pCi/m^3	NA	NA	pCi/m^3

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	1.9E−11	NA
Np_{237+1d}	NA	2.9E−08	NA
Pu_{238}	NA	3.9E−08	NA
Ra_{226+8d}	NA	7.0E−09	NA
Ra_{228+1d}	NA	6.9E−10	NA
Rn_{222+4d}	9.4E−03	7.7E−12	7.3E−14
Sr_{90+1d}	NA	6.2E−11	NA
Tc_{99}	NA	8.3E−12	NA
Th_{228+7d}	NA	7.8E−08	NA
Th_{230}	NA	2.9E−08	NA
$Th_{232+10d}$	NA	1.1E−07	NA
U_{234}	NA	2.6E−08	NA
U_{235+1d}	NA	2.5E−08	NA
U_{238+2d}	NA	2.4E−08	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 7.3E−14

001342

Table C.III–587
Summary of Intake Quantitation (chemicals) Alternative 6
Disposal cell with Federal Ownership: Off–Property Farmer (Adult)
Via Drinking Water Ingestion

Intake Equation = $\frac{CS \times EF \times ED \times IR}{BW \times AT}$

IR	Ingestion rate of groundwater (RAGS, 1989)	2 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in groundwater	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/l	NA	NA	mg/l
arsenic	NA	mg/l	NA	NA	mg/l
beryllium	NA	mg/l	NA	NA	mg/l
uranium–total	2.09E–03	mg/l	NA	NA	mg/l
benzo(a)pyrene	NA	mg/l	NA	NA	mg/l
carbazole	NA	mg/l	NA	NA	mg/l
aroclor–1254	NA	mg/l	NA	NA	mg/l
aroclor–1260	NA	mg/l	NA	NA	mg/l
dieldrin	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l			

References

001343

Table C.III-587 (continued)
Summary of Risk Characterization (chemicals)
Disposal cell with Federal Ownership: Off-Property Farmer (Adult)
Via Drinking Water Ingestion

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.00E-04	NA
arsenic	NA	3.00E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	5.71E-05	3.00E-03	1.90E-02
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.00E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		1.90E-02

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.75E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	5.71E-05	NA	NA
benzo(a)pyrene	NA	7.30E+00	NA
carbazole	NA	2.00E-02	NA
aroclor-1254	NA	7.70E+00	NA
aroclor-1260	NA	7.70E+00	NA
dieldrin	NA	1.60E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

Table C.III–588
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Disposal cell with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Drinking Water

Intake Equation = Cw X EF X EDn X FI X IR

IR	Ingestion rate of groundwater (RAGS, 1989)	2 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
FI	Fractional intake for radionuclides	1 (Unitless)
Cw	Concentration of radionuclides in groundwater	(see table below)

Cs_{137+1d}	NA	pCi/l	$Th_{232+10d}$	NA	pCi/l
Np_{237+1d}	NA	pCi/l	U_{234}	6.3E–01	pCi/l
Pu_{238}	NA	pCi/l	U_{235+1d}	3.3E–02	pCi/l
Ra_{226+8d}	NA	pCi/l	U_{238+2d}	7.0E–01	pCi/l
Ra_{228+1d}	NA	pCi/l	NA	NA	pCi/l
Rn_{222+4d}	NA	pCi/l	NA	NA	pCi/l
Sr_{90+1d}	NA	pCi/l	NA	NA	pCi/l
Tc_{99}	NA	pCi/l	NA	NA	pCi/l
Th_{228+7d}	NA	pCi/l	NA	NA	pCi/l
Th_{230}	NA	pCi/l	NA	NA	pCi/l

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	NA	2.2E–10	NA
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	NA	1.3E–11	NA
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	3.1E+04	1.6E–11	5.0E–07
U_{235+1d}	1.6E+03	1.6E–11	2.6E–08
U_{238+2d}	3.4E+04	2.0E–11	6.8E–07
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation	=	1.2E–06

001345

Table C.III–589
Summary of Intake Quantitation (chemicals) Alternative 6
Disposal cell with Federal Ownership: Off–Property Farmer (Adult)
Via Dermal Contact while Bathing

Intake Equation $= \frac{DA \times EF \times ED \times SA}{BW \times AT}$

DA	Dermal absorbed dose	csv mg/cm^2–day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
SA	Skin surface area available for contact	23000 cm^2

Chemical Concentrations

Compound	DA	Units	Compound	DA	Units
antimony	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
arsenic	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
beryllium	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
uranium–total	5.21E–10	mg/cm^2–day	NA	NA	mg/cm^2–day
benzo(a)pyrene	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
carbazole	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
aroclor–1254	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
aroclor–1260	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
dieldrin	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day			

References

001346

Table C.III-589 (continued)
Summary of Risk Characterization (chemicals)
Disposal cell with Federal Ownership: Off-Property Farmer (Adult)
Via Dermal Contact while Bathing

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	6.00E-05	NA
arsenic	NA	2.85E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	1.64E-07	1.50E-04	1.09E-03
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	4.50E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		1.09E-03

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.90E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	1.64E-07	NA	NA
benzo(a)pyrene	NA	NA	NA
carbazole	NA	2.22E-02	NA
aroclor-1254	NA	1.03E+01	NA
aroclor-1260	NA	1.03E+01	NA
dieldrin	NA	1.78E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

Table C.III–590
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Disposal cell with Federal Ownership: Off–Property Farmer (Adult)
Via Inhalation of Gases and Particulates

Intake Equation = Ca X EF X EDn X IR

IR	Inhalation rate of gases (RAGS, 1989)	20 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Ca	Concentration of radionuclides in air	(see table below)

Cs_{137+1d}	NA	pCi/m^3	$Th_{232+10d}$	NA	pCi/m^3
Np_{237+1d}	NA	pCi/m^3	U_{234}	NA	pCi/m^3
Pu_{238}	NA	pCi/m^3	U_{235+1d}	NA	pCi/m^3
Ra_{226+8d}	NA	pCi/m^3	U_{238+2d}	NA	pCi/m^3
Ra_{228+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Rn_{222+4d}	1.1E–06	pCi/m^3	NA	NA	pCi/m^3
Sr_{90+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Tc_{99}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{228+7d}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{230}	NA	pCi/m^3	NA	NA	pCi/m^3

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	1.9E–11	NA
Np_{237+1d}	NA	2.9E–08	NA
Pu_{238}	NA	3.9E–08	NA
Ra_{226+8d}	NA	7.0E–09	NA
Ra_{228+1d}	NA	6.9E–10	NA
Rn_{222+4d}	5.1E–01	7.7E–12	4.0E–12
Sr_{90+1d}	NA	6.2E–11	NA
Tc_{99}	NA	8.3E–12	NA
Th_{228+7d}	NA	7.8E–08	NA
Th_{230}	NA	2.9E–08	NA
$Th_{232+10d}$	NA	1.1E–07	NA
U_{234}	NA	2.6E–08	NA
U_{235+1d}	NA	2.5E–08	NA
U_{238+2d}	NA	2.4E–08	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
		ILCR Summation =	4.0E–12

001348

Table C.III–591
Summary of Intake Quantitation (chemicals) Alternative 6
Disposal cell with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Meat Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of meat	0.101 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in meat	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium–total	2.1E–05	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor–1254	NA	mg/kg	NA	NA	mg/kg
aroclor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

001349

6646

Table C.III-591 (continued)
Summary of Risk Characterization (chemicals)
Disposal cell with Federal Ownership: Off-Property Farmer (Adult)
Via Ingestion of Meat Products

Compound	HQ Calculation		
	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	2.2E-08	3.0E-03	7.2E-06
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		7.2E-06

Compound	ILCR Calculation		
	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	2.2E-08	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

Table C.III–592
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Disposal cell with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Meat Products

Intake Equation = Cf X EF X EDn X FI X IR

IR	Ingestion rate of meat	0.101 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cf	Concentration of radionuclides in meat	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	NA	pCi/kg	U_{234}	6.3E–03	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	3.3E–04	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	6.9E–03	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	NA	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	NA	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	NA	2.2E–10	NA
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	NA	1.3E–11	NA
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	1.2E+01	1.6E–11	1.9E–10
U_{235+1d}	6.1E–01	1.6E–11	9.8E–12
U_{238+2d}	1.3E+01	2.0E–11	2.6E–10
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
ILCR Summation	=		4.6E–10

Table C.III-593
Summary of Intake Quantitation (chemicals) Alternative 6
Disposal cell with Federal Ownership: Off-Property Farmer (Adult)
Via Ingestion of Dairy Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of dairy products	0.4 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in animal products	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium-total	7.5E-05	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor-1254	NA	mg/kg	NA	NA	mg/kg
aroclor-1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

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Table C.III–593 (*continued*)
Summary of Risk Characterization (chemicals)
Disposal cell with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Dairy Products

	HQ Calculation		
Compound	CDI (mg/kg–day)	RfD (mg/kg–day)	HQ (unitless)
antimony	NA	4.0E–04	NA
arsenic	NA	3.0E–04	NA
beryllium	NA	5.0E–03	NA
uranium–total	3.1E–07	3.0E–03	1.0E–04
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor–1254	NA	NA	NA
aroclor–1260	NA	NA	NA
dieldrin	NA	5.0E–05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			1.0E–04

	ILCR Calculation		
Compound	CDI (mg/kg–day)	CSF $(mg/kg–day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium–total	3.1E–07	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E–02	NA
aroclor–1254	NA	7.7E+00	NA
aroclor–1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

001353

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Table C.III–594
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Disposal cell with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Dairy Products

Intake Equation = Cp X EF X EDn X FI X IR

IR	Ingestion rate of dairy products	0.4 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cp	Concentration of radionuclides in animal products	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	NA	pCi/kg	U_{234}	2.3E–02	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	1.2E–03	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	2.5E–02	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	NA	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	NA	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	NA	2.2E–10	NA
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	NA	1.3E–11	NA
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	1.7E+02	1.6E–11	2.7E–09
U_{235+1d}	8.7E+00	1.6E–11	1.4E–10
U_{238+2d}	1.8E+02	2.0E–11	3.7E–09
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation	=	6.5E–09

001354

Table C.III–595
Summary of Risk Characterization (chemicals)
Disposal cell with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Vegetables and Fruits

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of fruits or vegetables	0.122 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	70 Year
EDc	Exposure duration for carcinogens	70 Year
BW	Body weight	70 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	25550 days
CS	Concentration of chemicals in vegetables	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium–total	1.0E–02	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor–1254	NA	mg/kg	NA	NA	mg/kg
aroclor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg

References

001355

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Table C.III-595 (continued)
Summary of Risk Characterization (chemicals)
Disposal cell with Federal Ownership: Off-Property Farmer (Adult)
Via Ingestion of Vegetables and Fruits

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	1.7E-05	3.0E-03	5.7E-03
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			5.7E-03

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	1.7E-05	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

Table C.III–596
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Disposal cell with Federal Ownership: Off–Property Farmer (Adult)
Via Ingestion of Vegetables and Fruits

Intake Equation = Cv X EF X EDn X FI X IR

IR	Ingestion rate of fruits or vegetables	0.122 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	70 Year
Cv	Concentration of radionuclides in vegetables	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	NA	pCi/kg	U_{234}	3.1E+00	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	1.6E−01	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	3.4E+00	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	NA	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	NA	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E−11	NA
Np_{237+1d}	NA	2.2E−10	NA
Pu_{238}	NA	2.2E−10	NA
Ra_{226+8d}	NA	7.8E−10	NA
Ra_{228+1d}	NA	1.0E−10	NA
Rn_{222+4d}	NA	1.7E−12	NA
Sr_{90+1d}	NA	3.6E−11	NA
Tc_{99}	NA	1.3E−12	NA
Th_{228+7d}	NA	5.5E−11	NA
Th_{230}	NA	1.3E−11	NA
$Th_{232+10d}$	NA	1.7E−10	NA
U_{234}	9.3E+03	1.6E−11	1.5E−07
U_{235+1d}	4.8E+02	1.6E−11	7.7E−09
U_{238+2d}	1.0E+04	2.0E−11	2.0E−07
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		3.6E−07

001357

Table C.III-597
Summary of Intake Quantitation (chemicals) Alternative 6
Disposal cell with Federal Ownership: Off-Property Farmer (Child)
Via Drinking Water Ingestion

Intake Equation = $\frac{CS \times EF \times ED \times IR}{BW \times AT}$

IR	Ingestion rate of groundwater (RAGS, 1989)	1 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in groundwater	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/l	NA	NA	mg/l
arsenic	NA	mg/l	NA	NA	mg/l
beryllium	NA	mg/l	NA	NA	mg/l
uranium-total	2.09E-03	mg/l	NA	NA	mg/l
benzo(a)pyrene	NA	mg/l	NA	NA	mg/l
carbazole	NA	mg/l	NA	NA	mg/l
aroclor-1254	NA	mg/l	NA	NA	mg/l
aroclor-1260	NA	mg/l	NA	NA	mg/l
dieldrin	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l	NA	NA	mg/l
NA	NA	mg/l			

References

Table C.III-597 (continued)
Summary of Risk Characterization (chemicals)
Disposal cell with Federal Ownership: Off-Property Farmer (Child)
Via Drinking Water Ingestion

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.00E-04	NA
arsenic	NA	3.00E-04	NA
beryllium	NA	5.00E-03	NA
uranium-total	1.33E-04	3.00E-03	4.44E-02
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.00E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		4.44E-02

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.75E+00	NA
beryllium	NA	4.30E+00	NA
uranium-total	1.14E-05	NA	NA
benzo(a)pyrene	NA	7.30E+00	NA
carbazole	NA	2.00E-02	NA
aroclor-1254	NA	7.70E+00	NA
aroclor-1260	NA	7.70E+00	NA
dieldrin	NA	1.60E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

001359

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Table C.III–598
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Disposal cell with Federal Ownership: Off–Property Farmer (Child)
Via Ingestion of Drinking Water

Intake Equation = Cw X EF X EDn X FI X IR

IR	Ingestion rate of groundwater (RAGS, 1989)	1 l/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
FI	Fractional intake for radionuclides	1 (Unitless)
Cw	Concentration of radionuclides in groundwater	(see table below)

Cs_{137+1d}	NA	pCi/l	$Th_{232+10d}$	NA	pCi/l
Np_{237+1d}	NA	pCi/l	U_{234}	6.3E–01	pCi/l
Pu_{238}	NA	pCi/l	U_{235+1d}	3.3E–02	pCi/l
Ra_{226+8d}	NA	pCi/l	U_{238+2d}	7.0E–01	pCi/l
Ra_{228+1d}	NA	pCi/l	NA	NA	pCi/l
Rn_{222+4d}	NA	pCi/l	NA	NA	pCi/l
Sr_{90+1d}	NA	pCi/l	NA	NA	pCi/l
Tc_{99}	NA	pCi/l	NA	NA	pCi/l
Th_{228+7d}	NA	pCi/l	NA	NA	pCi/l
Th_{230}	NA	pCi/l	NA	NA	pCi/l

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E–11	NA
Np_{237+1d}	NA	2.2E–10	NA
Pu_{238}	NA	2.2E–10	NA
Ra_{226+8d}	NA	7.8E–10	NA
Ra_{228+1d}	NA	1.0E–10	NA
Rn_{222+4d}	NA	1.7E–12	NA
Sr_{90+1d}	NA	3.6E–11	NA
Tc_{99}	NA	1.3E–12	NA
Th_{228+7d}	NA	5.5E–11	NA
Th_{230}	NA	1.3E–11	NA
$Th_{232+10d}$	NA	1.7E–10	NA
U_{234}	1.3E+03	1.6E–11	2.1E–08
U_{235+1d}	6.9E+01	1.6E–11	1.1E–09
U_{238+2d}	1.5E+03	2.0E–11	2.9E–08
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation	=	5.2E–08

001360

Table C.III–599
Summary of Intake Quantitation (chemicals) Alternative 6
Disposal cell with Federal Ownership: Off–Property Farmer (Child)
Via Dermal Contact while Bathing

Intake Equation = $\frac{DA \times EF \times ED \times SA}{BW \times AT}$

DA	Dermal absorbed dose	csv mg/cm^2–day
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	2190 days
SA	Skin surface area available for contact	8000 cm^2

Chemical Concentrations

Compound	DA	Units	Compound	DA	Units
antimony	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
arsenic	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
beryllium	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
uranium–total	5.21E–10	mg/cm^2–day	NA	NA	mg/cm^2–day
benzo(a)pyrene	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
carbazole	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
aroclor–1254	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
aroclor–1260	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
dieldrin	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day	NA	NA	mg/cm^2–day
NA	NA	mg/cm^2–day			

References

0011361

0013362

C-III-940

Table C.III−599 (continued)
Summary of Risk Characterization (chemicals)
Disposal cell with Federal Ownership: Off−Property Farmer (Child)
Via Dermal Contact while Bathing

Compound	HQ Calculation		
	CDI (mg/kg−day)	RfD (mg/kg−day)	HQ (unitless)
antimony	NA	6.00E−05	NA
arsenic	NA	2.85E−04	NA
beryllium	NA	5.00E−03	NA
uranium−total	2.67E−07	1.50E−04	1.78E−03
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor−1254	NA	NA	NA
aroclor−1260	NA	NA	NA
dieldrin	NA	4.50E−05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		1.78E−03

Compound	ILCR Calculation		
	CDI (mg/kg−day)	CSF (mg/kg−day)$^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.90E+00	NA
beryllium	NA	4.30E+00	NA
uranium−total	2.28E−08	NA	NA
benzo(a)pyrene	NA	NA	NA
carbazole	NA	2.22E−02	NA
aroclor−1254	NA	1.03E+01	NA
aroclor−1260	NA	1.03E+01	NA
dieldrin	NA	1.78E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

Table C.III–600
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Disposal cell with Federal Ownership: Off–Property Farmer (Child)
Via Inhalation of Gases and Particulates

Intake Equation = Ca X EF X EDn X IR

IR	Inhalation rate of gases (RAGS, 1989)	12 m^3/day
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Ca	Concentration of radionuclides in air	(see table below)

Cs_{137+1d}	NA	pCi/m^3	$Th_{232+10d}$	NA	pCi/m^3
Np_{237+1d}	NA	pCi/m^3	U_{234}	NA	pCi/m^3
Pu_{238}	NA	pCi/m^3	U_{235+1d}	NA	pCi/m^3
Ra_{226+8d}	NA	pCi/m^3	U_{238+2d}	NA	pCi/m^3
Ra_{228+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Rn_{222+4d}	1.1E–06	pCi/m^3	NA	NA	pCi/m^3
Sr_{90+1d}	NA	pCi/m^3	NA	NA	pCi/m^3
Tc_{99}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{228+7d}	NA	pCi/m^3	NA	NA	pCi/m^3
Th_{230}	NA	pCi/m^3	NA	NA	pCi/m^3

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	1.9E–11	NA
Np_{237+1d}	NA	2.9E–08	NA
Pu_{238}	NA	3.9E–08	NA
Ra_{226+8d}	NA	7.0E–09	NA
Ra_{228+1d}	NA	6.9E–10	NA
Rn_{222+4d}	2.6E–02	7.7E–12	2.0E–13
Sr_{90+1d}	NA	6.2E–11	NA
Tc_{99}	NA	8.3E–12	NA
Th_{228+7d}	NA	7.8E–08	NA
Th_{230}	NA	2.9E–08	NA
$Th_{232+10d}$	NA	1.1E–07	NA
U_{234}	NA	2.6E–08	NA
U_{235+1d}	NA	2.5E–08	NA
U_{238+2d}	NA	2.4E–08	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

ILCR Summation = 2.0E–13

001363

Table C.III-601
Summary of Intake Quantitation (chemicals) Alternative 6
Disposal cell with Federal Ownership: Off-Property Farmer (Child)
Via Ingestion of Meat Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of meat	0.039 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in meat	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium-total	2.1E-05	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor-1254	NA	mg/kg	NA	NA	mg/kg
aroclor-1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

Table C.III-601 (continued)
Summary of Risk Characterization (chemicals)
Disposal cell with Federal Ownership: Off-Property Farmer (Child)
Via Ingestion of Meat Products

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	3.9E-08	3.0E-03	1.3E-05
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	HQ Summation =		1.3E-05

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	3.3E-09	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	ILCR Summation =		NA

001365

Table C.III-602
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Disposal cell with Federal Ownership: Off-Property Farmer (Child)
Via Ingestion of Meat Products

Intake Equation = Cf X EF X EDn X FI X IR

IR	Ingestion rate of meat	0.039 kg/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cf	Concentration of radionuclides in meat	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	NA	pCi/kg	U_{234}	6.3E-03	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	3.3E-04	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	6.9E-03	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	NA	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	NA	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E-11	NA
Np_{237+1d}	NA	2.2E-10	NA
Pu_{238}	NA	2.2E-10	NA
Ra_{226+8d}	NA	7.8E-10	NA
Ra_{228+1d}	NA	1.0E-10	NA
Rn_{222+4d}	NA	1.7E-12	NA
Sr_{90+1d}	NA	3.6E-11	NA
Tc_{99}	NA	1.3E-12	NA
Th_{228+7d}	NA	5.5E-11	NA
Th_{230}	NA	1.3E-11	NA
$Th_{232+10d}$	NA	1.7E-10	NA
U_{234}	3.9E-01	1.6E-11	6.2E-12
U_{235+1d}	2.0E-02	1.6E-11	3.2E-13
U_{238+2d}	4.3E-01	2.0E-11	8.5E-12
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		1.5E-11

001366

Table C.III–603
Summary of Intake Quantitation (chemicals) Alternative 6
Disposal cell with Federal Ownership: Off–Property Farmer (Child)
Via Ingestion of Dairy Products

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of dairy products	0.9 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non–carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non–carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in animal products	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium–total	7.5E–05	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor–1254	NA	mg/kg	NA	NA	mg/kg
aroclor–1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

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Table C.III-603 (continued)
Summary of Risk Characterization (chemicals)
Disposal cell with Federal Ownership: Off-Property Farmer (Child)
Via Ingestion of Dairy Products

Compound	HQ Calculation		
	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	3.2E-06	3.0E-03	1.1E-03
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
HQ Summation =			1.1E-03

Compound	ILCR Calculation		
	CDI (mg/kg-day)	CSF (mg/kg-day)$^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	2.8E-07	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
	NA	NA	NA
ILCR Summation =			NA

Table C.III–606
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Disposal cell with Federal Ownership: Off–Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

ntake Equation = Cv X EF X EDn X FI X IR

IR	Ingestion rate of fruits or vegetables	0.1 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cv	Concentration of radionuclides in vegetables	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	NA	pCi/kg	U_{234}	3.1E+00	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	1.6E−01	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	3.4E+00	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	NA	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	NA	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E−11	NA
Np_{237+1d}	NA	2.2E−10	NA
Pu_{238}	NA	2.2E−10	NA
Ra_{226+8d}	NA	7.8E−10	NA
Ra_{228+1d}	NA	1.0E−10	NA
Rn_{222+4d}	NA	1.7E−12	NA
Sr_{90+1d}	NA	3.6E−11	NA
Tc_{99}	NA	1.3E−12	NA
Th_{228+7d}	NA	5.5E−11	NA
Th_{230}	NA	1.3E−11	NA
$Th_{232+10d}$	NA	1.7E−10	NA
U_{234}	6.5E+02	1.6E−11	1.0E−08
U_{235+1d}	3.4E+01	1.6E−11	5.4E−10
U_{238+2d}	7.1E+02	2.0E−11	1.4E−08
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		2.5E−08

001372

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Table C.III-605 (continued)
Summary of Risk Characterization (chemicals)
Disposal cell with Federal Ownership: Off-Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

	HQ Calculation		
Compound	CDI (mg/kg-day)	RfD (mg/kg-day)	HQ (unitless)
antimony	NA	4.0E-04	NA
arsenic	NA	3.0E-04	NA
beryllium	NA	5.0E-03	NA
uranium-total	6.5E-05	3.0E-03	2.2E-02
benzo(a)pyrene	NA	NA	NA
carbazole	NA	NA	NA
aroclor-1254	NA	NA	NA
aroclor-1260	NA	NA	NA
dieldrin	NA	5.0E-05	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	HQ Summation =		2.2E-02

	ILCR Calculation		
Compound	CDI (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	ILCR (unitless)
antimony	NA	NA	NA
arsenic	NA	1.8E+00	NA
beryllium	NA	4.3E+00	NA
uranium-total	5.6E-06	NA	NA
benzo(a)pyrene	NA	7.3E+00	NA
carbazole	NA	2.0E-02	NA
aroclor-1254	NA	7.7E+00	NA
aroclor-1260	NA	7.7E+00	NA
dieldrin	NA	1.6E+01	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation =		NA

6640

001371

Table C.III-605
Summary of Risk Characterization (chemicals) Alternative 6
Disposal cell with Federal Ownership: Off-Property Farmer (Child)
Via Ingestion of Vegetables and Fruits

Intake Equation = $\frac{CS \times EF \times ED \times FI \times IR}{BW \times AT}$

IR	Ingestion rate of fruits or vegetables	0.1 kg/day
FI	Fraction ingested from contaminated source	1 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration for non-carcinogens	6 Year
EDc	Exposure duration for carcinogens	6 Year
BW	Body weight	15 kg
ATc	Average time for carcinogens (lifetime)	25550 days
ATn	Average time for non-carcinogens (EDn x 365)	2190 days
CS	Concentration of chemicals in vegetables	

Chemical Concentrations

Compound	Concentration	Units	Compound	Concentration	Units
antimony	NA	mg/kg	NA	NA	mg/kg
arsenic	NA	mg/kg	NA	NA	mg/kg
beryllium	NA	mg/kg	NA	NA	mg/kg
uranium-total	1.0E-02	mg/kg	NA	NA	mg/kg
benzo(a)pyrene	NA	mg/kg	NA	NA	mg/kg
carbazole	NA	mg/kg	NA	NA	mg/kg
aroclor-1254	NA	mg/kg	NA	NA	mg/kg
aroclor-1260	NA	mg/kg	NA	NA	mg/kg
dieldrin	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg	NA	NA	mg/kg
NA	NA	mg/kg			

References

001370

Table C.III-604
Summary of Intake and Risk Quantitation (radionuclides) Alternative 6
Disposal cell with Federal Ownership: Off-Property Farmer (Child)
Via Ingestion of Dairy Products

Intake Equation = Cp X EF X EDn X FI X IR

IR	Ingestion rate of dairy products	0.9 l/day
FI	Fraction ingested from contaminated source	0.75 (Unitless)
EF	Exposure frequency	350 days/year
EDn	Exposure duration	6 Year
Cp	Concentration of radionuclides in animal products	

Cs_{137+1d}	NA	pCi/kg	$Th_{232+10d}$	NA	pCi/kg
Np_{237+1d}	NA	pCi/kg	U_{234}	2.3E-02	pCi/kg
Pu_{238}	NA	pCi/kg	U_{235+1d}	1.2E-03	pCi/kg
Ra_{226+8d}	NA	pCi/kg	U_{238+2d}	2.5E-02	pCi/kg
Ra_{228+1d}	NA	pCi/kg	NA	NA	pCi/kg
Rn_{222+4d}	ERR	pCi/kg	NA	NA	pCi/kg
Sr_{90+1d}	NA	pCi/kg	NA	NA	pCi/kg
Tc_{99}	NA	pCi/kg	NA	NA	pCi/kg
Th_{228+7d}	NA	pCi/kg	NA	NA	pCi/kg
Th_{230}	NA	pCi/kg	NA	NA	pCi/kg

Radionuclides	CDI (pCi)	CSF $(pCi)^{-1}$	ILCR (unitless)
Cs_{137+1d}	NA	2.8E-11	NA
Np_{237+1d}	NA	2.2E-10	NA
Pu_{238}	NA	2.2E-10	NA
Ra_{226+8d}	NA	7.8E-10	NA
Ra_{228+1d}	NA	1.0E-10	NA
Rn_{222+4d}	NA	1.7E-12	NA
Sr_{90+1d}	NA	3.6E-11	NA
Tc_{99}	NA	1.3E-12	NA
Th_{228+7d}	NA	5.5E-11	NA
Th_{230}	NA	1.3E-11	NA
$Th_{232+10d}$	NA	1.7E-10	NA
U_{234}	3.2E+01	1.6E-11	5.2E-10
U_{235+1d}	1.7E+00	1.6E-11	2.7E-11
U_{238+2d}	3.5E+01	2.0E-11	7.1E-10
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA
	ILCR Summation	=	1.3E-09

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