TA 18

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Voluntary Corrective Action Plan for

Potential Release Sites
18-003(a-d, and g)
Septic Systems

Field Unit 2

Environmental
Restoration
Project

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A Department of Energy
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VOLUNTARY CORRECTIVE ACTION PLAN FOR POTENTIAL RELEASE SITES 18-003(a-d, and g) - SEPTIC SYSTEMS

1.0 INTRODUCTION

The potential release sites (PRSs) 18-003(a-d, and g) addressed in this voluntary corrective action (VCA) plan are located within TA-18, also known as Pajarito Site.

1.1 Site Description and Characterization Data

A description of the site location, environmental setting, history, geology, and the PRSs are included in the OU 1093 work plan (LANL 1993, 1085). The 1995 RFI report for OU 1093 (Environmental Restoration Project 1995, 1283) includes the results of the sampling conducted during the site investigation. Because the RFI report and its addendum discuss in detail the chemicals of potential concern (COPCs) and the degree of risk to human health and the environment, only a synopsis is presented in this VCA plan. See Annex 7.3 for a map of the PRS locations.

1.1.1 Operational History

PRS 18-003(a) is a concrete pit containing a removable steel catch tank. It has been used since 1947 to collect industrial wastewater from Building TA-18-23, a critical assembly building in the northwest part of TA-18. Solvents were used in the building, and uranium and plutonium are currently used in small fission experiments. Historically, the catch tank was emptied periodically. Any overflow from the catch tank would, however, enter the building's sanitary sewer line downstream from the septic tank. Because such discharge would reach the drainfield, water service to the building has been shut off and the catch tank's overflow line has been plugged. However, the concrete pit is open at the bottom, leaving a pathway to the soil for any leaks or spills from the tank.

PRS 18-003(b) is an abandoned sanitary septic system, placed in service in 1947, which serves a restroom in Building TA-18-23. The PRS consists of sewer lines, a septic tank, and a drainfield. Although water service to the building has been shut off and the doors to the restroom have been locked, the sewer lines have not been plugged. Solvents and beryllium were used in the building, and uranium and plutonium are currently used in small fission experiments.

PRS 18-003(c) is an abandoned sanitary septic system, placed in service in 1952, which serves a restroom in Building TA-18-32, the critical assembly building in the southwest part of TA-18. The PRS consists of sewer lines, a septic tank, a drainfield, and an outfall at the creek flowing from Three Mile Canyon. Although water service to the building has been shut off and the doors to the restroom have been locked, the sewer lines have not been plugged. Solvents and beryllium were used in the building, and uranium and plutonium are currently used in small fission experiments.

PRS 18-003(d) is an abandoned sanitary septic system, placed in service in 1960, which serves the restroom in Building TA-18-116. This PRS consists of sewer lines, a septic tank, and a drainfield. Although all sanitary facilities have been removed from Building TA-18-116, the sewer lines have not been plugged. Solvents and beryllium were used in the building, and uranium and plutonium are currently used in small fission experiments.

PRS 18-003(g) is an active sanitary septic system, placed in service in 1944, which serves Building TA-18-1. This PRS consists of sewer lines and a septic tank. The lines and tank associated with this PRS were the subject of an interim action to remove the tank contents and have since been returned to service. The outfall from the tank is piped directly to a sanitary waste treatment facility.

1.1.2 COPCs and Rationale for Proposed Remedial Action

The RFI investigation concluded that the septic tanks/pit contained COPCs. The settling pit, PRS 18-003(a), contained: volatile organic compounds (VOCs) including trichloroethene, tetrachloroethylene, and cis-1,2-dichloroethylene; semi-volatile organic compounds (SVOCs) including polycyclic aromatic hydrocarbons (PAHs); and, metals including beryllium, lead; and, uranium. The septic tank at PRS 18-003(b) contained beryllium and uranium. PRS 18-003(c) contained mercury, plutonium-239, and uranium while PRS 18-003(d) contained beryllium, VOCs as 1,1,2-trichloroethane and tichloroethene, and uranium. PRS 18-003(g) contained VOCs including trichloroethene and SVOCs as 4-methylphenol. Concentrations of potential contaminants detected in the soil surrounding the tanks were below EPA Region 9 preliminary remediation goals (PRGs). As part of the interim action (IA) conducted on the five septic tanks/seepage pit, the accumulated sludge and liquid was removed from each tank/pit. The interiors were pressure washed and pumped to remove the residual material. Additional sampling of the septic tanks/pit contents was performed during the IA for waste characterization purposes. Results of the IA sampling indicated each tank/pit contained mixed waste. The proposed remedial action includes additional cleaning of the tanks to remove any remaining residual waste, confirmatory sampling of the tank structure to ensure that any contamination that may have permeated the structural materials of the tanks do not present an unacceptable risk to human health, subsurface soil sampling immediately adjacent to the tanks/pit to confirm structure integrity and application of concrete to fill the tank and ports.

2.0 SITE CHARACTERIZATION

TA-18 is located in Pajarito Canyon and its tributary, Three Mile Canyon, which joins Pajarito Canyon at the southwest corner of TA-18. Small ephemeral streams in each canyon join at TA-18 and continue eastward down the length of Pajarito Canyon, through White Rock to the Rio Grande. Seasonal flow in the streams is maintained by snowmelt runoff, summer storms, and discharge from springs in Three Mile Canyon. The Y-shaped site consists of a main complex of buildings and three outlying nuclear criticality facilities, one to the northwest in Pajarito Canyon, another in Three Mile Canyon, and a third southeast of the main complex. Each facility has a septic tank and associated drainfield. The tanks have not been used for several years. The drainfields are within a few tens of yards of the creeks. Depth to groundwater is generally several feet below the clay tile pipes of the drainfields.

2.1 RFI Information/Other Decision Data

Sampling of the liquid and sludge contents of the five tanks was first conducted during the 1993 site characterization. COPCs were identified in each tank/pit while measured concentrations of potential contaminants in soils were generally below SALs except for some SVOCs at PRS 18-003(c). The comparison of the reported concentrations with industrial PRGs demonstrated that these chemicals did not present an unacceptable risk to human health. Groundwater samples collected from the drainfields and/or adjacent to the tanks/pit. Groundwater samples at PRSs 18-003 (c and d) indicated concentrations of 1-2 dichloroethane at or above the New Mexico Groundwater Standard of 10 µg/L. A groundwater sample at PRS 18-003(d) was in excess of the standard by 3 µg/L and therefore was the subject of a Corrective Action Report for TA-18 (Environmental Restoration Project, 1996, ER ID No. XXXX). The Corrective Action Report included the installation and sampling of five groundwater wells at PRS 18-003(d). Results of the RFI sampling and corrective measures effort are presented in the RFI report and its addendum and the Corrective Action Report for TA-18 respectively (Environmental Restoration Project, 1995, 1283; Environmental Restoration Project, 1996, ER ID No. XXXX).

In 1995, an IA was conducted to remove the contents of the tanks and pressure wash the interior of each tank/pit. Because of the preliminary indications of mixed waste, extensive analyses were done on the tank contents prior to the IA to further characterize the waste in accordance with the stringent waste acceptance criteria of the treatment, storage, and disposal facilities. In addition to the COPCs identified

during the RFI effort, concentrations of several VOCs and SVOCs above SALs were detected in the liquids or sludges in the tanks. The waste characterization data are summarized in Annex 7.2 of this VCA plan.

2.1.1 Data Quality Evaluation

The QA/QC assessment for the data from these PRSs is presented in Chapter 4 of the 1995 RFI report for OU 1093 (Environmental Restoration Project 1995, 1283) in conjunction with the data comparisons. The QA/QC data associated with the report indicated that a preponderance of the sample analytical data were acceptable and defensible. The QA/QC mechanisms were generally effective in ensuring reliability of measured data within expected limits of sampling and analytical error. At the same time, estimates of the precision and accuracy of measured data point to several potential limitations. Inorganic and organic data including tables for each of the septic tanks are included in the above referenced material.

2.1.2 Sample Results

The results of the screening assessment for the septic tank PRSs discussed in this VCA plan have been previously presented in the RFI report for 1093 (Environmental Restoration Project 1995, 1283). In summary, COPCs have been identified in the settling pit/septic tanks at PRSs 18-003(a-d and g). Analytical results generated during the IA waste characterization effort indicate each pit/septic tank contained solvents (primarily TCE). For a complete RFI data summary, refer to the 1995 RFI report for OU 1093 (Environmental Restoration Project 1995, 1283).

As part of the Phase I characterization of these sites, subsurface samples were collected from below the influent and effluent lines at PRSs 18-003(a and b) and below the effluent lines at PRSs 18-003(c,d, and g) (see Annex 7.2). The results of those samples indicated concentrations of COPCs below SALs and/or PRGs.

2.2 Nature and Extent of Contamination

The sludge and liquid from each septic tank was sampled before the contents were removed. The contamination found in the contents was a result of chemicals being poured into sinks and floor drains as well as sanitary waste from the restrooms. The extent of contamination as a result of these activities has been the subject of extensive study and sampling and is addressed in detail in the RFI Report for OU 1093 and the response to the NOD (Environmental Restoration Project 1995, 1283).

3.0 PROPOSED REMEDY FOR PRSs 18-003(a-d and g) - SEPTIC TANKS

3.1 Description of the Proposed Remedial Action

Due to the levels and nature of contamination found in the settling pit/septic tanks, the proposed remedial action consists of removing the tops of the structures to provide for thorough visual inspection; pressure-washing the interior of the tanks to remove any residual contamination; and sampling the final rinsate, the bottom of the tanks, and any internal structure (i.e., baffles) for verification of remediation goals. Subsurface samples will be collected immediately adjacent to the structures where supplemental information is needed to confirm tank integrity. The samples will be submitted to an offsite analytical laboratory for analysis. Analysis of the final rinsate will be compared to New Mexico Groundwater standards or drinking water standards in cases were groundwater standards do not exist. Results from the samples collected from the tank matrix and any baffles will be compared to Region 9 industrial PRGs for soils. If analytical results indicate concentrations of COPCs are below the water quality standards and PRGs, in the tank rinsate, adjacent soils and tank matrix, then the tank(s) will be backfilled with concrete. If the concentrations of COPCs within the tank matrix, adjacent soil, or rinsate are in excess of the PRGs or water quality standards, respectively, the process may be repeated until the analytical results indicate

the tank(s) have been successfully cleaned. If analytical results indicate the level of COPCs are sufficiently elevated and that additional cleaning will not be successful, then the tank(s) will be removed.

PRS 18-003(a)

This settling pit consists of a steel catch-tank, resting on a gravel bottom, surrounded by concrete walls that form the outer shell of the pit. Figure 3.1-1 is a cross-section of this settling pit and catch tank. A hinged steel lid covers the top of the pit and will be lifted manually to provide for visual inspection and cleaning. The catch tank and concrete wall of the pit will be pressure-washed to remove any residual contamination. Rinsate from the cleaning will be pumped, drummed, and sampled for waste characterization purposes. A final rinse of the tank interior will be collected and sampled for comparison to water quality standards. A representative sample will then be collected from the gravel bottom of the settling pit and submitted to a fixed analytical laboratory for analysis. Two boreholes will be drilled adjacent to the tank and sampled at a depth comparable to the pit floor and 3 feet deeper. If the sample results indicate remediation goals have been achieved, the settling pit will be backfilled with concrete effectively sealing the pit, and the influent and effluent lines.

PRS 18-003(b)

This septic tank is constructed of reinforced concrete and has a wooden baffle inside. Figure 3.1-2 is a cross-section of the tank construction for this septic tank, as well as for PRSs 18-003(c and g). The top will be removed with a backhoe to provide for visual inspection and cleaning. The septic tank will be pressure-washed to remove any residual contamination. Rinsate from the cleaning will be pumped, drummed, and sampled for waste characterization purposes. A final rinse of the tank interior will be collected and sampled for comparison to water quality standards. A representative sample will then be collected from the concrete bottom of the tank and the wooden baffle and submitted to a fixed analytical laboratory for analysis. Two boreholes will be drilled adjacent to the tank and sampled at a depth comparable to the tank floor and 3 feet deeper. An additional subsurface sample will be collected beneath the inlet line. If the sample results indicate remediation goals have been achieved, the septic tank will be backfilled with concrete effectively sealing the tank, and the influent and effluent lines.

PRS 18-003(c)

This septic tank is constructed of reinforced concrete. The top will be removed with a backhoe to provide for visual inspection and cleaning. The septic tank will be pressure-washed to remove any residual contamination. Rinsate from the cleaning will be pumped, drummed, and sampled for waste characterization purposes. A final rinse of the tank interior will be collected and sampled for comparison to water quality standards. A representative sample will then be collected from the concrete bottom of the tank and submitted to a fixed analytical laboratory for analysis. Two boreholes will be drilled adjacent to the tank and sampled at a depth comparable to the tank floor and 3 feet deeper. An additional subsurface sample will be collected beneath the inlet line. If the sample results indicate remediation goals have been achieved, the septic tank will be backfilled with concrete effectively sealing the tank and the influent and effluent lines.

PRS 18-003(d)

This septic tank is constructed of reinforced concrete. The top will be removed with a backhoe to provide for visual inspection and cleaning. The septic tank will be pressure-washed to remove any residual contamination. Rinsate from the cleaning will be pumped, drummed, and sampled for waste characterization purposes. A final rinse of the tank interior will be collected and sampled for comparison to water quality standards. A representative sample will then be collected from the concrete bottom of the tank and submitted to a fixed analytical laboratory for analysis. Two boreholes will be drilled adjacent to

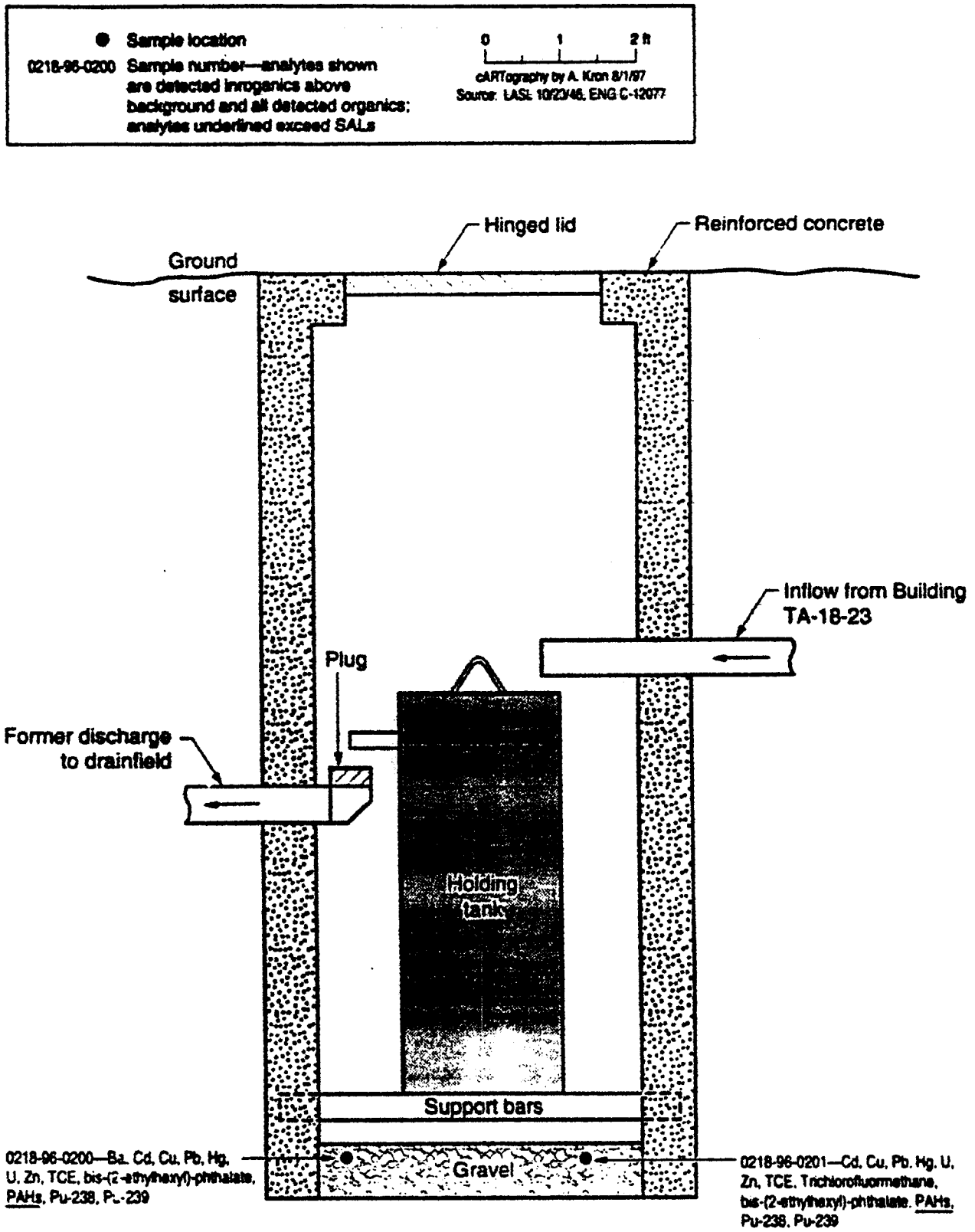

Figure 3.1-1. Cross section of settling pit and catch tank for PRS 18-003(a).

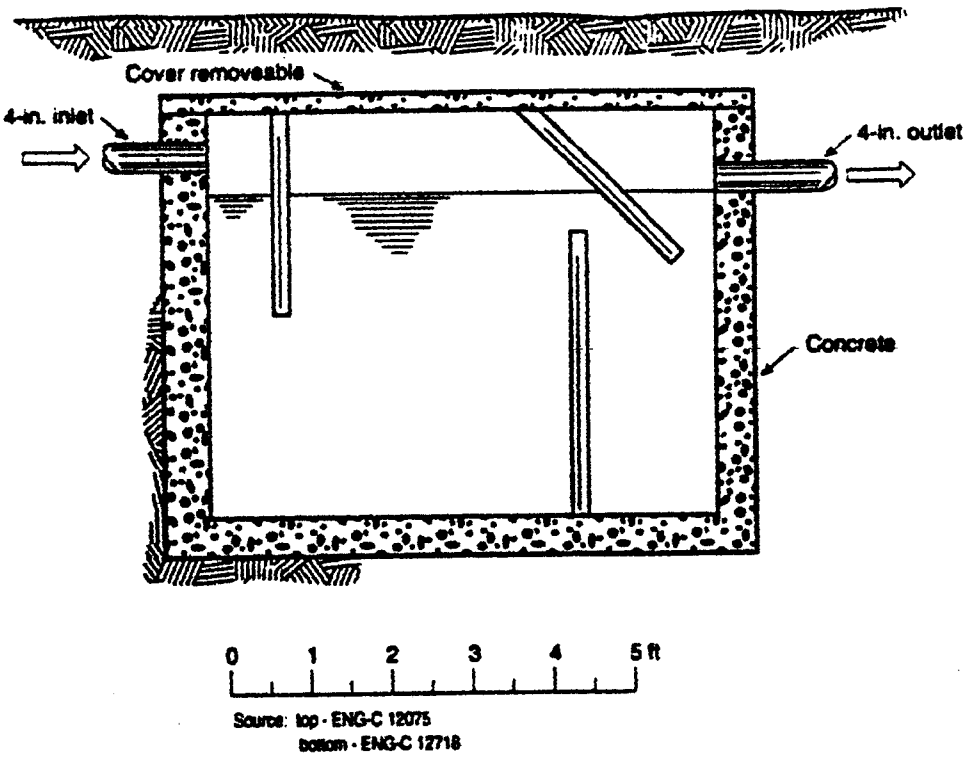

Figure 3.1-2. Cross section of septic tank construction for PRSs 18-003(b,c and g)

the tank and sampled at a depth comparable to the tank floor and 3 feet deeper. An additional subsurface sample will be collected beneath the inlet line. If the sample results indicate remediation goals have been achieved, the septic tank will be backfilled with concrete effectively sealing the tank, and the influent and effluent lines.

PRS 18-003(g)

This septic tank is constructed of reinforced concrete. At present, the effluent line drains to the SWSC treatment facility, rather than to a drainfield. This tank is still active and prior to the start of work, the utilities will be locked out. The tank contents will be pumped via vacuum truck and disposed appropriately. The top will be removed with a backhoe to provide for visual inspection and cleaning. The septic tank will be pressure-washed to remove any residual contamination. Rinsate from the cleaning will be pumped, drummed, and sampled for waste characterization purposes. A final rinse of the tank interior will be collected and sampled for comparison to water quality standards. A representative sample will then be collected from the concrete bottom of the tank and submitted to a fixed analytical laboratory for analysis. Two boreholes will be drilled adjacent to the tank and sampled at a depth comparable to the tank floor and 3 feet deeper. An additional subsurface sample will be collected beneath the inlet line. If the sample results indicate remediation goals have been achieved, the active line will be directly piped through the tank and the septic tank will be backfilled with concrete effectively sealing the tank, and the influent and effluent lines. Following this activity, utilities will be restore to the building.

Upon completion of the remedial activities, tools and equipment will be decontaminated, and the decon fluid will be stored in bung-top 55-gallon drums, sampled for waste characterization, and disposed of accordingly. Personal protective equipment (PPE) will be cleaned. Portions that are visibly contaminated or show radiological activity will be cut out and disposed of as waste. All drums will be stored onsite on pallets and will be covered by plastic sheets in a less-than-90-day storage area until the results of the waste characterization are received. When the results of the characterization are complete, the final disposition of the waste will be determined.

A LANL Spill Prevention, Control, and Countermeasures (SPCC) Plan has been written and approved for this activity.

3.2 Basis for Cleanup Levels

PRSs 18-003(a-d, and g) lie within DOE-owned land and are removed from public access roads. The anticipated future land use is expected to be exclusively for Laboratory operations (i.e., industrial land use only).

For those analytes detected in the tank sludge and retained as COPCs from the human health screening assessment, EPA Region 9 industrial PRGs will be used for determination of cleanup. These PRGs have been calculated using the standard default parameters presented in EPA's Region 9 PRG tables (EPA 1996, 1351). The derivation of human health risk-based cleanup levels for this VCA are based on an industrial exposure scenario and incorporate the ingestion, inhalation, and dermal exposure pathways. Those COPCs in the tank liquid are compared to either their respective groundwater quality standard or their drinking water quality standard if a ground water value is not available.

The PRGs and water quality standards for the analytes detected in the septic tank sludge or liquid and retained as COPCs during the Phase I investigation are presented in Tables 3.2-1 through 3.2-5. These tables present cleanup goals for the COPCs identified in either the sludge or the liquid sampled previously. Those COPCs originally identified in the tank liquid are compared to groundwater or, where groundwater standards do not exist, drinking water standards as indicated in the Table 3.2-1 footnotes. The PRGs are based on a one in one million cancer risk (10^{-6}) for carcinogens, and a hazard index of

TABLE 3.2-1

INDUSTRIAL PRGs FOR PRS 18-003(a)

COPC	Sample Value (mg/kg)	PRG (mg/kg)
Acenaphthylene	1.5	11,000[a]
Benzo(a)anthracene	66.7	2.6
Benzo(a)pyrene	53.7	0.26
Benzo(b)fluoranthene	101.3	0.26
Benzo(g,h,i)perylene	81.9	20,000[b]
Benzo(k)fluoranthene	11.8	26
Beryllium	3.9	1.1
Bis(2-ethylhexyl)phthalate	103.8	140
Dibenzo(a,h)anthracene	5.9	0.26
Dibenzofuran	51.4	140
cis-1,2-Dichloroethylene	4,000 µg/L	70 µg/L[c]
Indeno(1,2,3-cd)pyrene	52.8	2.6
Lead	740	1,000
Tetrachloroethylene	2,000 µg/L	20 µg/L[d]
Trichloroethene	409.8 µg/L	100 µg/L[d]
Uranium	236	1,172 pCi/g

[a]Toxicity criteria are not available for acenaphthylene; therefore, the toxicity criteria for acenaphthene were used as surrogates based on similarity in chemical structure.
[b]Toxicity criteria are not available for benzo(g,h,i)perylene; therefore, the toxicity criteria for pyrene were used as surrogates based on similarity in chemical structure.
[c]Value is the maximum contaminant level (MCL) for drinking water.
[d]Values are the New Mexico Groundwater Standards.

TABLE 3.2-2

INDUSTRIAL PRGs FOR PRS 18-003(b)

COPC	Sample Value (mg/kg)	PRG (mg/kg)
Beryllium	1.7	1.1
Uranium	32.9 µg/L	1,172 pCi/g

TABLE 3.2-3

INDUSTRIAL PRGs FOR PRS 18-003(c)

COPC	Sample Value (mg/kg)	PRG (mg/kg)
Mercury	253	510
Plutonium-239	62.2 pCi/g	1,064 pCi/g
Uranium	264 pCi/g	2,305 pCi/g

TABLE 3.2-4

INDUSTRIAL PRGs FOR PRS 18-003(d)

COPC	Sample Value (mg/kg)	PRG (mg/kg)
Beryllium	1.9	1.1
1,1-Dichloroethane	4,100 µg/L	25 µg/L[a]
cis-1,2-Dichloroethylene	740 µg/L	70 µg/L[b]
1,1,2-Trichloroethane	19 µg/L	10 µg/L[a]
Trichloroethene	1,000 µg/L	100 µg/L[a]
Uranium	20 pCi/g	1,172 pCi/g

[a] Values are the New Mexico Groundwater Standards.
[b] Value is the maximum contaminant level (MCL) for drinking water.

TABLE 3.2-5

INDUSTRIAL PRGs FOR PRS 18-003(g)

COPC	Sample Value (mg/kg)	PRG (mg/kg)
Benzene	9 µg/L	1.4 µg/L[a]
Bis(2-ethylhexyl)phthalate	14 µg/L	10 µg/L[a]
1,4-Dichlorobenzene	198.8	8.5
cis-1,2-Dichloroethylene	88 µg/L	70 µg/L[b]
4-Methylphenol	1,100 µg/L	5 µg/L (total phenols)
Trichloroethene	30 µg/L	100 µg/L[a]

[a] Values are the New Mexico Groundwater Standards.
[b] Value is the maximum contaminant level (MCL) for drinking water.

one for noncarcinogens. The water quality standards are not risk-based values, but are used as an indication of acceptable levels of contaminants because the septic tanks are near or below the water table at TA-18. The derivation of the PRGs for plutonium-239 and uranium were done using RESRAD version 5.70 and are based on an exposure of 15 mrem/yr. The assumptions and results of the RESRAD run for this plan are presented in Annex 7.1.

The PRG for lead in soil of 1,000 ppm has been adopted by the Laboratory for an industrial exposure scenario based on information obtained from EPA Region 6. This soil PRG considers the fetal effects when a pregnant worker is exposed. Under the industrial/commercial exposure scenario, a pregnant female adult worker is the reasonable maximum exposed individual.

The contents of the septic tanks at TA-18 have been found to contain COPCs at levels of concern. The tank contents were removed in 1996 under the IA field effort. Due to the elevated levels and nature of COPCs detected during the RFI and IA sampling, the tank/pit tops will be removed, the interiors visually inspected and cleaned to alleviate the potential for any residual materials to migrate into the shallow, alluvial aquifer. The tanks will subsequently be filled with concrete and the inlets and outlets plugged to prevent infiltration of materials into the septic tanks in the future. Should confirmatory sampling indicate that successful cleaning was not achieved, additional washing may be conducted. If analytical results indicate thorough cleaning is not likely, the tank(s) will be removed.

3.3 Site Restoration

Site restoration is not warranted for this VCA; all work will be within the confines of the septic tanks. Any overburden generated during the removal of the tank lids will be placed in the tank(s) prior to backfilling.

4.0 WASTE MANAGEMENT

4.1 Estimated Types and Volumes of Waste

The estimated waste types and volumes anticipated during the VCA are included in Table 4.1-1.

TABLE 4.1-1

ESTIMATED WASTE TYPES AND VOLUMES

Item	Waste Type	Anticipated Volume
Tank rinsate/decon waste	Liquid - potentially mixed	Less than 20 55-gallon drums
Sampling waste/PPE	Solid - potentially mixed	Less than 2 55-gallon drums
Sampling waste/PPE	Solid - potentially hazardous	Less than 2 55-gallon drums

A Characterization Strategy Form (CSF) has been approved by Groups EM/SWO and ESH-19. The CSF described the waste characterization/strategy requirements and all the uncertainties in the determination of the waste types and volumes summarized below.

Any water currently in the tanks as well as the rinsate generated during the pressure wash of the septic tanks, will be pumped into drums and classified as RCRA, mixed, radioactive, nonhazardous waste, based on the analytical results of a liquid grab sample. These samples will be analyzed for TCLP metals, VOCs, SVOCs, isotopic plutonium, and isotopic uranium.

Initially, visibly contaminated PPE and sampling equipment will be considered potential RCRA mixed waste, and will be packaged and stored accordingly. Depending on the field screening results, visibly uncontaminated items will be considered nonhazardous radioactive waste. The volume generated is expected to be one 55-gallon drum per septic tank. PPE/sampling equipment will not be directly sampled. It will be placed in sealed plastic bags and placed inside a 55-gallon drum.

Decontamination liquids consist of Liquinox® detergent, tap water, and distilled water. It is anticipated that a total volume of less than five gallons will be generated. Based on the analytical results of a liquid grab sample, the decontamination liquids will be classified as RCRA, mixed, radioactive, or nonhazardous waste. This sample will be analyzed for TCLP metals, HE, VOCs, SVOCs, isotopic and total uranium, and isotopic plutonium.

4.2 Method of Management and Disposal

Wastes will be stored at this PRS in a less-than-90-day storage area or permitted storage facility until chemical analyses are completed. A final RCRA determination will be made after the soil sample results are evaluated. This waste will then be disposed of as RCRA, mixed waste, radioactive waste, or nonhazardous waste.

Tank rinsate generated during the pressure wash will be managed as potential RCRA mixed waste pending fixed analytical laboratory results. They will be stored in a less-than-90-day storage area. The liquids will be segregated, labeled with the PRS number, and placed inside 55-gallon drums. The analytical results of the grab liquid sample will be used to determine the final hazard classification and disposal location of the liquid.

Visibly contaminated PPE and sampling equipment will be segregated and managed as RCRA mixed waste. The total volume expected is one 55-gallon drum. The PPE/sampling equipment will be placed in sealed plastic bags inside the 55-gallon drum. This waste will be disposed of in a manner similar to that which would be used for wastes containing the highest level of RCRA, mixed, or radioactive wastes because of the difficulties of sampling PPE.

Decontamination liquids will be managed as potential RCRA mixed waste. They will be stored in a less-than-90-day storage area. The liquids will be segregated, labeled with the PRS number, and placed inside 55-gallon drums. The analytical results of the grab liquid sample will be used to determine the final hazard classification and disposal location of the liquid.

EM/SWO and ESH-19 personnel will aid in the determination of the final disposal location for the waste and verify the availability of treatment, storage, or disposal (TSD) space, if it is needed. Offsite disposal of mixed waste will require further analyses to meet the waste acceptance criteria of Envirocare, a Utah mixed-waste disposal facility.

5.0 DESCRIPTION OF CONFIRMATORY/VERIFICATION SAMPLING

The proposed remedial actions for this PRS is to pressure wash and sample five septic tanks prior to rendering the tanks inoperable by backfilling the tanks with concrete. After the tanks have been thoroughly cleaned and pass a visual inspection, a final rinse of the tank interior will be collected and sampled. These results will be compared with New Mexico water quality standards or drinking water standards for verification of the success of the interior tank cleaning. Samples will also be collected from the bottom of the tank and baffles (if present). Boreholes will be drilled/hand augered adjacent to the tanks/pit and sampled at a depth comparable to the tank floor and 3 feet deeper. Comparisons will be made with the LANL background UTLs, SALs, and Region 9 PRGs.

The final rinse water collected from the tanks will be submitted to an offsite, fixed analytical laboratory for analysis of VOC, SVOC, TCLP metals, isotopic plutonium, and isotopic uranium. Samples collected from the tank bottoms and baffles will also be submitted for the same analytical suites. Soil samples will be sampled for the same suite with the exception of TAL metals which will be substituted for TCLP metals.

6.0 ESTIMATED TIME TO COMPLETE THE ACTION AND UNCERTAINTIES

The estimated time that is required to complete this VCA is 15 days. This estimate is based upon a one day mobilization, one day to remove the tops and place a temporary cover over all of the tanks, two days to pressure wash and sample the tanks, seven days for laboratory analysis of the tank samples, two days to fill the tanks with concrete, one day to replace the tops of the tanks, and one day to complete demobilization and sample shipping, etc. The analytical results from the waste characterization are

expected to be received within 7 days, and waste removal is expected within another 30 days. From mobilization to removal of waste, the total estimated timeframe is about 60 days.

There are few uncertainties with this cleanup. The amount of waste and equipment necessary is contingent on the successful cleaning of the tank and confirmation of tank integrity. The tank structures are described, however the ease in removing tanks/pit tops is not known. Should tanks require removal, waste estimates for this level of effort have not been included in this report. For the mixed waste estimate, adequate TSD capacity should exist. If, during the course of the removal, the waste volume exceeds 200% of the estimate, the effort will be stopped and re-evaluated.

7.0 ANNEXES

ANNEX 7.1

RISK-BASED CLEANUP LEVEL ASSUMPTIONS AND CALCULATIONS

The PRGs for plutonium-239 and uranium were calculated using the RESRAD model, version 5.70.

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ne = 0.000E+00 11
ne = 1.000E+00 12
ne = 3.000E+00 13
ne = 1.000E+01 14
ne = 3.000E+01 15
ne = 1.000E+02 16
ne = 3.000E+02 17
ne = 1.000E+03 18
Source Ratios Summed Over All Pathways 19
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Per Nuclide Summed Over All Pathways 20
oncentration Per Nuclide 21

Dose Conversion Factor (and Related) Parameter Summary
File: DOSFAC.BIN

Parameter	Current Value	Parameter Default	Name
Dose conversion factors for inhalation, mrem/pCi:			
Ac-227+D	6.720E+00	6.720E+00	DCF2(1)
Pa-231	1.280E+00	1.280E+00	DCF2(2)
Pb-210+D	2.320E-02	2.320E-02	DCF2(3)
Ra-226+D	8.600E-03	8.600E-03	DCF2(4)
Th-230	3.260E-01	3.260E-01	DCF2(5)
U-234	1.320E-01	1.320E-01	DCF2(6)
U-235+D	1.230E-01	1.230E-01	DCF2(7)
U-238+D	1.180E-01	1.180E-01	DCF2(8)
Dose conversion factors for ingestion, mrem/pCi:			
Ac-227+D	1.480E-02	1.480E-02	DCF3(1)
Pa-231	1.060E-02	1.060E-02	DCF3(2)
Pb-210+D	7.270E-03	7.270E-03	DCF3(3)
Ra-226+D	1.330E-03	1.330E-03	DCF3(4)
Th-230	5.480E-04	5.480E-04	DCF3(5)
U-234	2.830E-04	2.830E-04	DCF3(6)
U-235+D	2.670E-04	2.670E-04	DCF3(7)
U-238+D	2.690E-04	2.690E-04	DCF3(8)
Food transfer factors:			
Ac-227+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(1,1)
Ac-227+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-05	2.000E-05	RTF(1,2)
Ac-227+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-05	2.000E-05	RTF(1,3)
Pa-231 , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(2,1)
Pa-231 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	5.000E-03	5.000E-03	RTF(2,2)
Pa-231 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(2,3)
Pb-210+D , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(3,1)
Pb-210+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-04	8.000E-04	RTF(3,2)
Pb-210+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.000E-04	3.000E-04	RTF(3,3)
Ra-226+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(4,1)
Ra-226+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(4,2)
Ra-226+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(4,3)
Th-230 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(5,1)
Th-230 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(5,2)
Th-230 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(5,3)
U-234 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(6,1)
U-234 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(6,2)
U-234 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(6,3)
U-235+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(7,1)
U-235+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(7,2)
U-235+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(7,3)

Dose Conversion Factor (and Related) Parameter Summary (continued)
File: DOSFAC.BIN

Parameter	Current Value	Parameter Default	Name
J-238+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(8,1)
J-238+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(8,2)
J-238+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(8,3)
ioaccumulation factors, fresh water, L/kg:			
c-227+D , fish	1.500E+01	1.500E+01	BIOFAC(1,1)
c-227+D , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(1,2)
a-231 , fish	1.000E+01	1.000E+01	BIOFAC(2,1)
a-231 , crustacea and mollusks	1.100E+02	1.100E+02	BIOFAC(2,2)
b-210+D , fish	3.000E+02	3.000E+02	BIOFAC(3,1)
b-210+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(3,2)
a-226+D , fish	5.000E+01	5.000E+01	BIOFAC(4,1)
a-226+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(4,2)
h-230 , fish	1.000E+02	1.000E+02	BIOFAC(5,1)
h-230 , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(5,2)
J-234 , fish	1.000E+01	1.000E+01	BIOFAC(6,1)
J-234 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(6,2)
J-235+D , fish	1.000E+01	1.000E+01	BIOFAC(7,1)
J-235+D , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(7,2)
J-238+D , fish	1.000E+01	1.000E+01	BIOFAC(8,1)
J-238+D , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(8,2)

Site-Specific Parameter Summary

Parameter	User Input	Default	Used by RESRAD (if different from user input)	Parameter Name
Area of contaminated zone (m**2)	3.100E+00	1.000E+04	—	AREA
Thickness of contaminated zone (m)	1.800E+00	2.000E+00	—	THICK0
Length parallel to aquifer flow (m)	not used	1.000E+02	—	LCZPAQ
Basic radiation dose limit (mrem/yr)	3.000E+01	3.000E+01	—	BRDL
Time since placement of material (yr)	0.000E+00	0.000E+00	—	TI
Times for calculations (yr)	1.000E+00	1.000E+00	—	T(2)
Times for calculations (yr)	3.000E+00	3.000E+00	—	T(3)
Times for calculations (yr)	1.000E+01	1.000E+01	—	T(4)
Times for calculations (yr)	3.000E+01	3.000E+01	—	T(5)
Times for calculations (yr)	1.000E+02	1.000E+02	—	T(6)
Times for calculations (yr)	3.000E+02	3.000E+02	—	T(7)
Times for calculations (yr)	1.000E+03	1.000E+03	—	T(8)
Times for calculations (yr)	not used	0.000E+00	—	T(9)
Times for calculations (yr)	not used	0.000E+00	—	T(10)
Initial principal radionuclide (pCi/g): U-234	8.500E-02	0.000E+00	—	S1(6)
Initial principal radionuclide (pCi/g): U-235	1.400E-02	0.000E+00	—	S1(7)
Initial principal radionuclide (pCi/g): U-238	9.010E-01	0.000E+00	—	S1(8)
Concentration in groundwater (pCi/L): U-234	not used	0.000E+00	—	W1(6)
Concentration in groundwater (pCi/L): U-235	not used	0.000E+00	—	W1(7)
Concentration in groundwater (pCi/L): U-238	not used	0.000E+00	—	W1(8)
Cover depth (m)	0.000E+00	0.000E+00	—	COVER0
Density of cover material (g/cm**3)	not used	1.500E+00	—	DENSCV
Cover depth erosion rate (m/yr)	not used	1.000E-03	—	VCV
Density of contaminated zone (g/cm**3)	1.600E+00	1.500E+00	—	DENSCZ
Contaminated zone erosion rate (m/yr)	1.000E-03	1.000E-03	—	VCZ
Contaminated zone total porosity	4.000E-01	4.000E-01	—	TPCZ
Contaminated zone effective porosity	2.000E-01	2.000E-01	—	EPCZ
Contaminated zone hydraulic conductivity (m/yr)	4.400E+02	1.000E+01	—	HCCZ
Contaminated zone b parameter	4.050E+00	5.300E+00	—	BCZ
Humidity in air (g/cm**3)	not used	8.000E+00	—	HUMID
Evapotranspiration coefficient	9.990E-01	5.000E-01	—	EVAPTR
Precipitation (m/yr)	4.800E-01	1.000E+00	—	PRECIP
Irrigation (m/yr)	0.000E+00	2.000E-01	—	RI
Irrigation mode	overhead	overhead	—	IDITCH
Runoff coefficient	5.200E-01	2.000E-01	—	RUNOFF
Watershed area for nearby stream or pond (m**2)	not used	1.000E+06	—	WAREA
Accuracy for water/soil computations	not used	1.000E-03	—	EPS
Density of saturated zone (g/cm**3)	1.600E+00	1.500E+00	—	DENSAQ
Saturated zone total porosity	3.000E-01	4.000E-01	—	TPSZ
Saturated zone effective porosity	3.000E-01	2.000E-01	—	EPSZ
Saturated zone hydraulic conductivity (m/yr)	1.000E+02	1.000E+02	—	HCSZ
Saturated zone hydraulic gradient	2.000E-02	2.000E-02	—	HGWT
Saturated zone b parameter	4.050E+00	5.300E+00	—	BSZ
Water table drop rate (m/yr)	3.000E-01	1.000E-03	—	VWT
Well pump intake depth (m below water table)	1.000E+01	1.000E+01	—	DWIBWT
Model: Nondispersion (ND) or Mass-Balance (MB)	ND	ND	—	MODEL
Well pumping rate (m**3/yr)	2.500E+02	2.500E+02	—	UW

Site-Specific Parameter Summary (continued)

Parameter	User Input	Default	Used by RESRAD (if different from user input)	Parameter Name
Number of unsaturated zone strata	not used	1	—	NS
Unsat. zone 1, thickness (m)	not used	4.000E+00	—	H(1)
Unsat. zone 1, soil density (g/cm**3)	not used	1.500E+00	—	DENSUZ(1)
Unsat. zone 1, total porosity	not used	4.000E-01	—	TPUZ(1)
Unsat. zone 1, effective porosity	not used	2.000E-01	—	EPUZ(1)
Unsat. zone 1, soil-specific b parameter	not used	5.300E+00	—	BUZ(1)
Unsat. zone 1, hydraulic conductivity (m/yr)	not used	1.000E+01	—	HCUZ(1)
Unsat. zone 2, thickness (m)	not used	0.000E+00	—	H(2)
Unsat. zone 2, soil density (g/cm**3)	not used	1.500E+00	—	DENSUZ(2)
Unsat. zone 2, total porosity	not used	4.000E-01	—	TPUZ(2)
Unsat. zone 2, effective porosity	not used	2.000E-01	—	EPUZ(2)
Unsat. zone 2, soil-specific b parameter	not used	5.300E+00	—	BUZ(2)
Unsat. zone 2, hydraulic conductivity (m/yr)	not used	1.000E+01	—	HCUZ(2)
Distribution coefficients for U-234				
Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	—	DCNUCC(6)
Unsaturated zone 1 (cm**3/g)	not used	5.000E+01	—	DCNUCU(6,1)
Unsaturated zone 2 (cm**3/g)	not used	5.000E+01	—	DCNUCU(6,2)
Saturated zone (cm**3/g)	not used	5.000E+01	—	DCNUCS(6)
Leach rate (/yr)	0.000E+00	0.000E+00	1.598E-06	ALEACH(6)
Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(6)
Distribution coefficients for U-235				
Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	—	DCNUCC(7)
Unsaturated zone 1 (cm**3/g)	not used	5.000E+01	—	DCNUCU(7,1)
Unsaturated zone 2 (cm**3/g)	not used	5.000E+01	—	DCNUCU(7,2)
Saturated zone (cm**3/g)	not used	5.000E+01	—	DCNUCS(7)
Leach rate (/yr)	0.000E+00	0.000E+00	1.598E-06	ALEACH(7)
Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(7)
Distribution coefficients for U-238				
Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	—	DCNUCC(8)
Unsaturated zone 1 (cm**3/g)	not used	5.000E+01	—	DCNUCU(8,1)
Unsaturated zone 2 (cm**3/g)	not used	5.000E+01	—	DCNUCU(8,2)
Saturated zone (cm**3/g)	not used	5.000E+01	—	DCNUCS(8)
Leach rate (/yr)	0.000E+00	0.000E+00	1.598E-06	ALEACH(8)
Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(8)
Distribution coefficients for daughter Ac-227				
Contaminated zone (cm**3/g)	2.000E+01	2.000E+01	—	DCNUCC(1)
Unsaturated zone 1 (cm**3/g)	not used	2.000E+01	—	DCNUCU(1,1)
Unsaturated zone 2 (cm**3/g)	not used	2.000E+01	—	DCNUCU(1,2)
Saturated zone (cm**3/g)	not used	2.000E+01	—	DCNUCS(1)
Leach rate (/yr)	0.000E+00	0.000E+00	3.986E-06	ALEACH(1)
Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)

Site-Specific Parameter Summary (continued)

Parameter	User Input	Default	Used by RESRAD (if different from user input)	Parameter Name
Distribution coefficients for daughter Pa-231				
Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	—	DCNUCC(2)
Unsaturated zone 1 (cm**3/g)	not used	5.000E+01	—	DCNUCU(2,1)
Unsaturated zone 2 (cm**3/g)	not used	5.000E+01	—	DCNUCU(2,2)
Saturated zone (cm**3/g)	not used	5.000E+01	—	DCNUCS(2)
Leach rate (/yr)	0.000E+00	0.000E+00	1.598E-06	ALEACH(2)
Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
Distribution coefficients for daughter Pb-210				
Contaminated zone (cm**3/g)	1.000E+02	1.000E+02	—	DCNUCC(3)
Unsaturated zone 1 (cm**3/g)	not used	1.000E+02	—	DCNUCU(3,1)
Unsaturated zone 2 (cm**3/g)	not used	1.000E+02	—	DCNUCU(3,2)
Saturated zone (cm**3/g)	not used	1.000E+02	—	DCNUCS(3)
Leach rate (/yr)	0.000E+00	0.000E+00	7.994E-07	ALEACH(3)
Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(3)
Distribution coefficients for daughter Ra-226				
Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	—	DCNUCC(4)
Unsaturated zone 1 (cm**3/g)	not used	7.000E+01	—	DCNUCU(4,1)
Unsaturated zone 2 (cm**3/g)	not used	7.000E+01	—	DCNUCU(4,2)
Saturated zone (cm**3/g)	not used	7.000E+01	—	DCNUCS(4)
Leach rate (/yr)	0.000E+00	0.000E+00	1.142E-06	ALEACH(4)
Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(4)
Distribution coefficients for daughter Th-230				
Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	—	DCNUCC(5)
Unsaturated zone 1 (cm**3/g)	not used	6.000E+04	—	DCNUCU(5,1)
Unsaturated zone 2 (cm**3/g)	not used	6.000E+04	—	DCNUCU(5,2)
Saturated zone (cm**3/g)	not used	6.000E+04	—	DCNUCS(5)
Leach rate (/yr)	0.000E+00	0.000E+00	1.333E-09	ALEACH(5)
Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(5)
Inhalation rate (m**3/yr)	1.490E+04	8.400E+03	—	INHALR
Mass loading for inhalation (g/m**3)	9.000E-05	2.000E-04	—	MLINH
Dilution length for airborne dust, inhalation (m)	3.000E+00	3.000E+00	—	LM
Exposure duration	2.500E+01	3.000E+01	—	ED
Shielding factor, inhalation	4.000E-01	4.000E-01	—	SHF3
Shielding factor, external gamma	7.000E-01	7.000E-01	—	SHF1
Fraction of time spent indoors	1.840E-01	5.000E-01	—	FIND
Fraction of time spent outdoors (on site)	4.600E-02	2.500E-01	—	FOTD
Shape factor flag, external gamma	1.000E+00	1.000E+00	1 shows circular AREA.	FS

Site-Specific Parameter Summary (continued)

Parameter	User Input	Default	Used by RESRAD (if different from user input)	Parameter Name
Radii of shape factor array (used if FS = -1):				
Outer annular radius (m), ring 1:	not used	5.000E+01	—	RAD_SHAPE(1)
Outer annular radius (m), ring 2:	not used	7.071E+01	—	RAD_SHAPE(2)
Outer annular radius (m), ring 3:	not used	0.000E+00	—	RAD_SHAPE(3)
Outer annular radius (m), ring 4:	not used	0.000E+00	—	RAD_SHAPE(4)
Outer annular radius (m), ring 5:	not used	0.000E+00	—	RAD_SHAPE(5)
Outer annular radius (m), ring 6:	not used	0.000E+00	—	RAD_SHAPE(6)
Outer annular radius (m), ring 7:	not used	0.000E+00	—	RAD_SHAPE(7)
Outer annular radius (m), ring 8:	not used	0.000E+00	—	RAD_SHAPE(8)
Outer annular radius (m), ring 9:	not used	0.000E+00	—	RAD_SHAPE(9)
Outer annular radius (m), ring 10:	not used	0.000E+00	—	RAD_SHAPE(10)
Outer annular radius (m), ring 11:	not used	0.000E+00	—	RAD_SHAPE(11)
Outer annular radius (m), ring 12:	not used	0.000E+00	—	RAD_SHAPE(12)
Fractions of annular areas within AREA:				
Ring 1	not used	1.000E+00	—	FRACA(1)
Ring 2	not used	2.732E-01	—	FRACA(2)
Ring 3	not used	0.000E+00	—	FRACA(3)
Ring 4	not used	0.000E+00	—	FRACA(4)
Ring 5	not used	0.000E+00	—	FRACA(5)
Ring 6	not used	0.000E+00	—	FRACA(6)
Ring 7	not used	0.000E+00	—	FRACA(7)
Ring 8	not used	0.000E+00	—	FRACA(8)
Ring 9	not used	0.000E+00	—	FRACA(9)
Ring 10	not used	0.000E+00	—	FRACA(10)
Ring 11	not used	0.000E+00	—	FRACA(11)
Ring 12	not used	0.000E+00	—	FRACA(12)
Fruits, vegetables and grain consumption (kg/yr)	not used	1.600E+02	—	DIET(1)
Leafy vegetable consumption (kg/yr)	not used	1.400E+01	—	DIET(2)
Milk consumption (L/yr)	not used	9.200E+01	—	DIET(3)
Meat and poultry consumption (kg/yr)	not used	6.300E+01	—	DIET(4)
Fish consumption (kg/yr)	not used	5.400E+00	—	DIET(5)
Other seafood consumption (kg/yr)	not used	9.000E-01	—	DIET(6)
Soil ingestion rate (g/yr)	3.650E+01	3.650E+01	—	SOIL
Drinking water intake (L/yr)	not used	5.100E+02	—	DWI
Contamination fraction of drinking water	not used	1.000E+00	—	FDW
Contamination fraction of household water	not used	1.000E+00	—	FHHW
Contamination fraction of livestock water	not used	1.000E+00	—	FLW
Contamination fraction of irrigation water	not used	1.000E+00	—	FIRW
Contamination fraction of aquatic food	not used	5.000E-01	—	FR9
Contamination fraction of plant food	not used	-1	—	FPLANT
Contamination fraction of meat	not used	-1	—	FMEAT
Contamination fraction of milk	not used	-1	—	FMILK
Livestock fodder intake for meat (kg/day)	not used	6.800E+01	—	LFI5
Livestock fodder intake for milk (kg/day)	not used	5.500E+01	—	LFI6
Livestock water intake for meat (L/day)	not used	5.000E+01	—	LWI5
Livestock water intake for milk (L/day)	not used	1.600E+02	—	LWI6
Livestock soil intake (kg/day)	not used	5.000E-01	—	LSI
Mass loading for foliar deposition (g/m**3)	not used	1.000E-04	—	MLFD

Site-Specific Parameter Summary (continued)

Parameter	User Input	Default	Used by RESRAD (if different from user input)	Parameter Name
Depth of soil mixing layer (m)	1.500E-01	1.500E-01	—	DM
Depth of roots (m)	not used	9.000E-01	—	DROOT
Drinking water fraction from ground water	0.000E+00	1.000E+00	—	FGWDW
Household water fraction from ground water	not used	1.000E+00	—	FGWHH
Livestock water fraction from ground water	not used	1.000E+00	—	FGWLW
Irrigation fraction from ground water	not used	1.000E+00	—	FGWIR
C-12 concentration in water (g/cm**3)	not used	2.000E-05	—	C12WTR
C-12 concentration in contaminated soil (g/g)	not used	3.000E-02	—	C12CZ
Fraction of vegetation carbon from soil	not used	2.000E-02	—	CSOIL
Fraction of vegetation carbon from air	not used	9.800E-01	—	CAIR
C-14 evasion layer thickness in soil (m)	not used	3.000E-01	—	DMC
C-14 evasion flux rate from soil (1/sec)	not used	7.000E-07	—	EVSN
C-12 evasion flux rate from soil (1/sec)	not used	1.000E-10	—	REVSN
Fraction of grain in beef cattle feed	not used	8.000E-01	—	AVFG4
Fraction of grain in milk cow feed	not used	2.000E-01	—	AVFG5
Storage times of contaminated foodstuffs (days):				
Fruits, non-leafy vegetables, and grain	not used	1.400E+01	—	STOR_T(1)
Leafy vegetables	not used	1.000E+00	—	STOR_T(2)
Milk	not used	1.000E+00	—	STOR_T(3)
Meat and poultry	not used	2.000E+01	—	STOR_T(4)
Fish	not used	7.000E+00	—	STOR_T(5)
Crustacea and mollusks	not used	7.000E+00	—	STOR_T(6)
Well water	not used	1.000E+00	—	STOR_T(7)
Surface water	not used	1.000E+00	—	STOR_T(8)
Livestock fodder	not used	4.500E+01	—	STOR_T(9)
Thickness of building foundation (m)	not used	1.500E-01	—	FLOOR
Bulk density of building foundation (g/cm**3)	not used	2.400E+00	—	DENSFL
Total porosity of the cover material	not used	4.000E-01	—	TPCV
Total porosity of the building foundation	not used	1.000E-01	—	TPFL
Volumetric water content of the cover material	not used	5.000E-02	—	PH2OCV
Volumetric water content of the foundation	not used	3.000E-02	—	PH2OFL
Diffusion coefficient for radon gas (m/sec):				
in cover material	not used	2.000E-06	—	DIFCV
in foundation material	not used	3.000E-07	—	DIFFL
in contaminated zone soil	not used	2.000E-06	—	DIFCZ
Radon vertical dimension of mixing (m)	not used	2.000E+00	—	HMIX
Average annual wind speed (m/sec)	not used	2.000E+00	—	WIND
Average building air exchange rate (1/hr)	not used	5.000E-01	—	REXG
Height of the building (room) (m)	not used	2.500E+00	—	HRM
Building interior area factor	not used	0.000E+00	—	FAI
Building depth below ground surface (m)	not used	-1.000E+00	—	DMFL
Emanating power of Rn-222 gas	not used	2.500E-01	—	EMANA(1)
Emanating power of Rn-220 gas	not used	1.500E-01	—	EMANA(2)

Summary of Pathway Selections

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

ntaminated Zone Dimensions   Initial Soil Concentrations, pCi/g
AAAAAAAAAAAAAAAAAAAAAAAAAAAAA   AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA

rea:	3.10 square meters	U-234	8.500E-02
kness:	1.80 meters	U-235	1.400E-02
Depth:	0.00 meters	U-238	9.010E-01

Total Dose TDOSE(t), mrem/yr
Basic Radiation Dose Limit = 30 mrem/yr
Total Mixture Sum M(t) = Fraction of Basic Dose Limit Received at Time (t)
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA

ears):	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
OSE(t):	1.257E-02	1.257E-02	1.257E-02	1.257E-02	1.257E-02	1.258E-02	1.263E-02	1.281E-02
M(t):	4.190E-04	4.190E-04	4.190E-04	4.190E-04	4.191E-04	4.195E-04	4.209E-04	4.270E-04

num TDOSE(t): 1.281E-02 mrem/yr at t = 1.000E+03 years

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

Water Independent Pathways (Inhalation excludes radon)

Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
e mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
1.609E-06	0.0001	6.655E-04	0.0529	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.260E-07	0.0000
4.555E-04	0.0362	1.021E-04	0.0081	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.728E-08	0.0000
5.032E-03	0.4003	6.306E-03	0.5017	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.308E-06	0.0005
5.489E-03	0.4367	7.074E-03	0.5628	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.031E-06	0.0006

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

Water Dependent Pathways

Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
le mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.678E-04	0.0531
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.578E-04	0.0444
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.134E-02	0.9025
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.257E-02	1.0000

of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
e mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
1.609E-06	0.0001	6.655E-04	0.0529	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.260E-07	0.0000
4.555E-04	0.0362	1.022E-04	0.0081	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.736E-08	0.0000
5.032E-03	0.4003	6.306E-03	0.5017	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.308E-06	0.0005
5.489E-03	0.4367	7.074E-03	0.5628	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.031E-06	0.0006

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

Water Dependent Pathways

Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
le mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.678E-04	0.0531
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.578E-04	0.0444
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.134E-02	0.9025
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.257E-02	1.0000

of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
e mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
1.610E-06	0.0001	6.656E-04	0.0529	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.260E-07	0.0000
4.555E-04	0.0362	1.022E-04	0.0081	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.754E-08	0.0000
5.032E-03	0.4003	6.306E-03	0.5017	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.308E-06	0.0005
5.489E-03	0.4367	7.074E-03	0.5628	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.031E-06	0.0006

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

Water Dependent Pathways

Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
e mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.678E-04	0.0531
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.578E-04	0.0444
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.134E-02	0.9025
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.257E-02	1.0000

of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
e mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
1.617E-06	0.0001	6.658E-04	0.0530	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.261E-07	0.0000
4.556E-04	0.0362	1.025E-04	0.0082	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.826E-08	0.0000
5.032E-03	0.4003	6.306E-03	0.5017	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.308E-06	0.0005
5.489E-03	0.4367	7.075E-03	0.5628	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.032E-06	0.0006

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

Water Dependent Pathways

Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
e mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.679E-04	0.0531
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.582E-04	0.0444
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.134E-02	0.9025
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.257E-02	1.0000

of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
1.676E-06	0.0001	6.659E-04	0.0530	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.263E-07	0.0000
4.558E-04	0.0363	1.041E-04	0.0083	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.009E-07	0.0000
5.032E-03	0.4002	6.307E-03	0.5016	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.308E-06	0.0005
5.489E-03	0.4366	7.077E-03	0.5628	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.035E-06	0.0006

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

Water Dependent Pathways

Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.682E-04	0.0531
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.600E-04	0.0445
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.134E-02	0.9023
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.257E-02	1.0000

f all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
2.340E-06	0.0002	6.667E-04	0.0530	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.271E-07	0.0000
4.574E-04	0.0363	1.126E-04	0.0089	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.134E-07	0.0000
5.031E-03	0.3998	6.307E-03	0.5012	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.308E-06	0.0005
.491E-03	0.4363	7.087E-03	0.5631	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.049E-06	0.0006

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

Water Dependent Pathways

Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.697E-04	0.0532
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.702E-04	0.0453
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.135E-02	0.9015
).000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.258E-02	1.0000

f all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
de	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
4	7.975E-06	0.0006	6.691E-04	0.0530	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.311E-07	0.0000
5	4.627E-04	0.0366	1.404E-04	0.0111	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.522E-07	0.0000
8	5.030E-03	0.3984	6.309E-03	0.4997	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.310E-06	0.0005
	5.501E-03	0.4356	7.119E-03	0.5638	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.094E-06	0.0006

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
de	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
4	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.777E-04	0.0537
5	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.033E-04	0.0478
8	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.135E-02	0.8985
	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.263E-02	1.0000

1 of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years

Water Independent Pathways (Inhalation excludes radon)

o-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
de	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
4	6.555E-05	0.0051	6.775E-04	0.0529	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.646E-07	0.0001
5	4.811E-04	0.0376	2.372E-04	0.0185	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.871E-07	0.0000
8	5.025E-03	0.3923	6.316E-03	0.4931	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.317E-06	0.0005
	5.572E-03	0.4349	7.231E-03	0.5645	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.268E-06	0.0006

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years

Water Dependent Pathways

o-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
ide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
4	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.437E-04	0.0581
5	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.186E-04	0.0561
8	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.135E-02	0.8858
	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.281E-02	1.0000

n of all water independent and dependent pathways.

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

it	Product	Branch	DSR(j,t) (mrem/yr)/(pCi/g)								
(j)		Fraction	t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03	
	U-234	1.000E+00	7.856E-03	7.856E-03	7.856E-03	7.856E-03	7.855E-03	7.853E-03	7.846E-03	7.821E-03	
	Th-230	1.000E+00	0.000E+00	1.747E-07	5.241E-07	1.747E-06	5.240E-06	1.746E-05	5.230E-05	1.735E-04	
	Ra-226	1.000E+00	0.000E+00	8.689E-10	7.818E-09	8.678E-08	7.787E-07	8.562E-06	7.482E-05	7.523E-04	
	Pb-210	1.000E+00	0.000E+00	3.711E-14	9.864E-13	3.463E-11	8.095E-10	1.976E-08	2.522E-07	2.943E-06	
	SDSR(j)		7.856E-03	7.856E-03	7.856E-03	7.857E-03	7.861E-03	7.879E-03	7.973E-03	8.750E-03	
5	U-235	1.000E+00	3.984E-02	3.984E-02	3.984E-02	3.984E-02	3.984E-02	3.983E-02	3.982E-02	3.978E-02	
5	Pa-231	1.000E+00	0.000E+00	1.784E-06	5.351E-06	1.783E-05	5.349E-05	1.782E-04	5.332E-04	1.762E-03	
5	Ac-227	1.000E+00	0.000E+00	1.611E-07	1.420E-06	1.468E-05	1.092E-04	7.142E-04	2.738E-03	9.791E-03	
5	SDSR(j)		3.984E-02	3.984E-02	3.985E-02	3.987E-02	4.000E-02	4.073E-02	4.309E-02	5.133E-02	
8	U-238	1.000E+00	1.259E-02	1.259E-02	1.259E-02	1.259E-02	1.259E-02	1.259E-02	1.259E-02	1.257E-02	
8	U-234	1.000E+00	0.000E+00	2.227E-08	6.681E-08	2.227E-07	6.681E-07	2.226E-06	6.675E-06	2.220E-05	
8	Th-230	1.000E+00	0.000E+00	2.476E-13	2.229E-12	2.476E-11	2.228E-10	2.475E-09	2.225E-08	2.464E-07	
8	Ra-226	1.000E+00	0.000E+00	7.777E-16	2.207E-14	8.203E-13	2.210E-11	8.121E-10	2.145E-08	7.364E-07	
8	Pb-210	1.000E+00	0.000E+00	1.270E-19	2.392E-18	2.492E-16	1.797E-14	1.571E-12	6.608E-11	2.791E-09	
8	SDSR(j)		1.259E-02	1.259E-02	1.259E-02	1.259E-02	1.259E-02	1.259E-02	1.259E-02	1.259E-02	

ch Fraction is the cumulative factor for the j'th principal radionuclide daughter: CUMBRF(j) = BRF(1)*BRF(2)* ... BRF(j).
DSR includes contributions from associated (half-life ó 0.5 yr) daughters.

Single Radionuclide Soil Guidelines G(i,t) in pCi/g
Basic Radiation Dose Limit = 30 mrem/yr

de	t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
4	3.819E+03	3.819E+03	3.819E+03	3.818E+03	3.816E+03	3.808E+03	3.763E+03	3.429E+03
5	7.530E+02	7.530E+02	7.529E+02	7.524E+02	7.500E+02	7.366E+02	6.962E+02	5.845E+02
8	2.383E+03	2.383E+03	2.383E+03	2.383E+03	2.383E+03	2.383E+03	2.382E+03	2.382E+03

Summed Dose/Source Ratios DSR(i,t) in (mrem/yr)/(pCi/g)
and Single Radionuclide Soil Guidelines G(i,t) in pCi/g
at tmin = time of minimum single radionuclide soil guideline
nd at tmax = time of maximum total dose = 1.000E+03 years

ide	Initial pCi/g	tmin (years)	DSR(i,tmin) (pCi/g)	G(i,tmin) (pCi/g)	DSR(i,tmax) (pCi/g)	G(i,tmax) (pCi/g)
4	8.500E-02	1.000E+03	8.750E-03	3.429E+03	8.750E-03	3.429E+03
5	1.400E-02	1.000E+03	5.133E-02	5.845E+02	5.133E-02	5.845E+02
8	9.010E-01	1.000E+03	1.259E-02	2.382E+03	1.259E-02	2.382E+03

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

Nuclide (j)	Parent (i)	BRF(i)	DOSE(j,t), mrem/yr t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
U-234	U-234	1.000E+00	6.678E-04	6.678E-04	6.678E-04	6.677E-04	6.677E-04	6.675E-04	6.669E-04	6.648E-04
U-234	U-238	1.000E+00	0.000E+00	2.007E-08	6.020E-08	2.007E-07	6.019E-07	2.006E-06	6.015E-06	2.001E-05
U-234	aDOSE(j):		6.678E-04	6.678E-04	6.678E-04	6.679E-04	6.683E-04	6.695E-04	6.729E-04	6.848E-04
Th-230	U-234	1.000E+00	0.000E+00	1.485E-08	4.454E-08	1.485E-07	4.454E-07	1.484E-06	4.446E-06	1.475E-05
Th-230	U-238	1.000E+00	0.000E+00	2.231E-13	2.008E-12	2.231E-11	2.008E-10	2.230E-09	2.005E-08	2.220E-07
Th-230	aDOSE(j):		0.000E+00	1.485E-08	4.455E-08	1.485E-07	4.456E-07	1.486E-06	4.468E-06	1.497E-05
Ra-226	U-234	1.000E+00	0.000E+00	7.386E-11	6.645E-10	7.376E-09	6.619E-08	7.278E-07	6.360E-06	6.394E-05
Ra-226	U-238	1.000E+00	0.000E+00	7.007E-16	1.989E-14	7.390E-13	1.991E-11	7.317E-10	1.932E-08	6.635E-07
Ra-226	aDOSE(j):		0.000E+00	7.386E-11	6.645E-10	7.377E-09	6.621E-08	7.285E-07	6.379E-06	6.461E-05
Pb-210	U-234	1.000E+00	0.000E+00	3.154E-15	8.384E-14	2.943E-12	6.881E-11	1.680E-09	2.144E-08	2.501E-07
Pb-210	U-238	1.000E+00	0.000E+00	1.145E-19	2.155E-18	2.246E-16	1.619E-14	1.415E-12	5.953E-11	2.514E-09
Pb-210	aDOSE(j):		0.000E+00	3.154E-15	8.385E-14	2.944E-12	6.882E-11	1.681E-09	2.150E-08	2.526E-07
U-235	U-235	1.000E+00	5.578E-04	5.578E-04	5.577E-04	5.577E-04	5.577E-04	5.577E-04	5.575E-04	5.569E-04
Pa-231	U-235	1.000E+00	0.000E+00	2.497E-08	7.491E-08	2.497E-07	7.489E-07	2.494E-06	7.464E-06	2.467E-05
Ac-227	U-235	1.000E+00	0.000E+00	2.256E-09	1.988E-08	2.056E-07	1.528E-06	9.998E-06	3.633E-05	1.371E-04
U-238	U-238	1.000E+00	1.134E-02	1.134E-02	1.134E-02	1.134E-02	1.134E-02	1.134E-02	1.134E-02	1.133E-02

BRF(i) is the branch fraction of the parent nuclide.

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

le (j)	Parent (i)	BRF(i)	S(j,t), pCi/g t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
[illegible]	U-234	1.000E+00	8.500E-02	8.500E-02	8.500E-02	8.500E-02	8.499E-02	8.496E-02	8.489E-02	8.462E-02
[illegible]	U-238	1.000E+00	0.000E+00	2.554E-06	7.663E-06	2.554E-05	7.662E-05	2.554E-04	7.656E-04	2.547E-03
[illegible]	åS(j):		8.500E-02	8.500E-02	8.501E-02	8.502E-02	8.507E-02	8.522E-02	8.565E-02	8.717E-02
10	U-234	1.000E+00	0.000E+00	7.652E-07	2.295E-06	7.651E-06	2.295E-05	7.646E-05	2.291E-04	7.600E-04
10	U-238	1.000E+00	0.000E+00	1.150E-11	1.035E-10	1.150E-09	1.035E-08	1.149E-07	1.033E-06	1.144E-05
10	åS(j):		0.000E+00	7.652E-07	2.296E-06	7.652E-06	2.296E-05	7.658E-05	2.301E-04	7.715E-04
26	U-234	1.000E+00	0.000E+00	1.657E-10	1.491E-09	1.655E-08	1.485E-07	1.633E-06	1.427E-05	1.435E-04
26	U-238	1.000E+00	0.000E+00	1.572E-15	4.462E-14	1.658E-12	4.467E-11	1.642E-09	4.335E-08	1.489E-06
26	åS(j):		0.000E+00	1.657E-10	1.491E-09	1.655E-08	1.485E-07	1.635E-06	1.431E-05	1.450E-04
10	U-234	1.000E+00	0.000E+00	1.704E-12	4.529E-11	1.590E-09	3.717E-08	9.073E-07	1.158E-05	1.351E-04
10	U-238	1.000E+00	0.000E+00	6.183E-17	1.164E-15	1.213E-13	8.743E-12	7.645E-10	3.216E-08	1.358E-06
10	åS(j):		0.000E+00	1.704E-12	4.529E-11	1.590E-09	3.717E-08	9.081E-07	1.161E-05	1.365E-04
5	U-235	1.000E+00	1.400E-02	1.400E-02	1.400E-02	1.400E-02	1.400E-02	1.400E-02	1.399E-02	1.398E-02
31	U-235	1.000E+00	0.000E+00	2.962E-07	8.886E-07	2.962E-06	8.883E-06	2.959E-05	8.854E-05	2.926E-04
27	U-235	1.000E+00	0.000E+00	4.665E-09	4.112E-08	4.252E-07	3.161E-06	2.068E-05	7.929E-05	2.835E-04
8	U-238	1.000E+00	9.010E-01	9.010E-01	9.010E-01	9.010E-01	9.010E-01	9.009E-01	9.006E-01	8.996E-01

i) is the branch fraction of the parent nuclide.

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Dose Conversion Factor (and Related) Parameter Summary
File: DOSFAC.BIN

Parameter	Current Value	Parameter Default	Name
ose conversion factors for inhalation, mrem/pCi:			
c-227+D	6.720E+00	6.720E+00	DCF2(1)
a-231	1.280E+00	1.280E+00	DCF2(2)
b-210+D	2.320E-02	2.320E-02	DCF2(3)
a-226+D	8.600E-03	8.600E-03	DCF2(4)
h-230	3.260E-01	3.260E-01	DCF2(5)
-234	1.320E-01	1.320E-01	DCF2(6)
-235+D	1.230E-01	1.230E-01	DCF2(7)
-238+D	1.180E-01	1.180E-01	DCF2(8)
ose conversion factors for ingestion, mrem/pCi:			
c-227+D	1.480E-02	1.480E-02	DCF3(1)
a-231	1.060E-02	1.060E-02	DCF3(2)
b-210+D	7.270E-03	7.270E-03	DCF3(3)
a-226+D	1.330E-03	1.330E-03	DCF3(4)
h-230	5.480E-04	5.480E-04	DCF3(5)
-234	2.830E-04	2.830E-04	DCF3(6)
-235+D	2.670E-04	2.670E-04	DCF3(7)
-238+D	2.690E-04	2.690E-04	DCF3(8)
Food transfer factors:			
Ac-227+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(1,1)
Ac-227+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-05	2.000E-05	RTF(1,2)
Ac-227+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-05	2.000E-05	RTF(1,3)
Pa-231 , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(2,1)
Pa-231 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	5.000E-03	5.000E-03	RTF(2,2)
Pa-231 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(2,3)
Pb-210+D , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(3,1)
Pb-210+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-04	8.000E-04	RTF(3,2)
Pb-210+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.000E-04	3.000E-04	RTF(3,3)
Ra-226+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(4,1)
Ra-226+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(4,2)
Ra-226+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(4,3)
Th-230 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(5,1)
Th-230 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(5,2)
Th-230 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(5,3)
U-234 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(6,1)
U-234 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(6,2)
U-234 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(6,3)
U-235+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(7,1)
U-235+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(7,2)
U-235+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(7,3)

Dose Conversion Factor (and Related) Parameter Summary (continued)
File: DOSFAC.BIN

Parameter	Current Value	Parameter Default	Name
U-238+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(8,1)
U-238+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(8,2)
U-238+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(8,3)
Bioaccumulation factors, fresh water, L/kg:			
Ac-227+D , fish	1.500E+01	1.500E+01	BIOFAC(1,1)
Ac-227+D , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(1,2)
Pa-231 , fish	1.000E+01	1.000E+01	BIOFAC(2,1)
Pa-231 , crustacea and mollusks	1.100E+02	1.100E+02	BIOFAC(2,2)
Pb-210+D , fish	3.000E+02	3.000E+02	BIOFAC(3,1)
Pb-210+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(3,2)
Ra-226+D , fish	5.000E+01	5.000E+01	BIOFAC(4,1)
Ra-226+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(4,2)
Th-230 , fish	1.000E+02	1.000E+02	BIOFAC(5,1)
Th-230 , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(5,2)
U-234 , fish	1.000E+01	1.000E+01	BIOFAC(6,1)
U-234 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(6,2)
U-235+D , fish	1.000E+01	1.000E+01	BIOFAC(7,1)
U-235+D , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(7,2)
U-238+D , fish	1.000E+01	1.000E+01	BIOFAC(8,1)
U-238+D , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(8,2)

Site-Specific Parameter Summary

Parameter	User Input	Used by RESRAD Default	(if different from user input)	Parameter Name
Area of contaminated zone (m**2)	6.000E-01	1.000E+04	—	AREA
Thickness of contaminated zone (m)	2.300E+00	2.000E+00	—	THICK0
Length parallel to aquifer flow (m)	not used	1.000E+02	—	LCZPAQ
Basic radiation dose limit (mrem/yr)	3.000E+01	3.000E+01	—	BRDL
Time since placement of material (yr)	0.000E+00	0.000E+00	—	TI
Times for calculations (yr)	1.000E+00	1.000E+00	—	T(2)
Times for calculations (yr)	3.000E+00	3.000E+00	—	T(3)
Times for calculations (yr)	1.000E+01	1.000E+01	—	T(4)
Times for calculations (yr)	3.000E+01	3.000E+01	—	T(5)
Times for calculations (yr)	1.000E+02	1.000E+02	—	T(6)
Times for calculations (yr)	3.000E+02	3.000E+02	—	T(7)
Times for calculations (yr)	1.000E+03	1.000E+03	—	T(8)
Times for calculations (yr)	not used	0.000E+00	—	T(9)
Times for calculations (yr)	not used	0.000E+00	—	T(10)
Initial principal radionuclide (pCi/g): U-234	8.500E-02	0.000E+00	—	S1(6)
Initial principal radionuclide (pCi/g): U-235	1.400E-02	0.000E+00	—	S1(7)
Initial principal radionuclide (pCi/g): U-238	9.010E-01	0.000E+00	—	S1(8)
Concentration in groundwater (pCi/L): U-234	not used	0.000E+00	—	W1(6)
Concentration in groundwater (pCi/L): U-235	not used	0.000E+00	—	W1(7)
Concentration in groundwater (pCi/L): U-238	not used	0.000E+00	—	W1(8)
Cover depth (m)	0.000E+00	0.000E+00	—	COVER0
Density of cover material (g/cm**3)	not used	1.500E+00	—	DENSCV
Cover depth erosion rate (m/yr)	not used	1.000E-03	—	VCV
Density of contaminated zone (g/cm**3)	1.600E+00	1.500E+00	—	DENSCZ
Contaminated zone erosion rate (m/yr)	1.000E-03	1.000E-03	—	VCZ
Contaminated zone total porosity	4.000E-01	4.000E-01	—	TPCZ
Contaminated zone effective porosity	2.000E-01	2.000E-01	—	EPCZ
Contaminated zone hydraulic conductivity (m/yr)	4.400E+02	1.000E+01	—	HCCZ
Contaminated zone b parameter	4.050E+00	5.300E+00	—	BCZ
Humidity in air (g/cm**3)	not used	8.000E+00	—	HUMID
Evapotranspiration coefficient	9.990E-01	5.000E-01	—	EVAPTR
Precipitation (m/yr)	4.800E-01	1.000E+00	—	PRECIP
Irrigation (m/yr)	0.000E+00	2.000E-01	—	RI
Irrigation mode	overhead	overhead	—	IDITCH
Runoff coefficient	5.200E-01	2.000E-01	—	RUNOFF
Watershed area for nearby stream or pond (m**2)	not used	1.000E+06	—	WAREA
Accuracy for water/soil computations	not used	1.000E-03	—	EPS
Density of saturated zone (g/cm**3)	1.600E+00	1.500E+00	—	DENSAQ
Saturated zone total porosity	3.000E-01	4.000E-01	—	TPSZ
Saturated zone effective porosity	3.000E-01	2.000E-01	—	EPSZ
Saturated zone hydraulic conductivity (m/yr)	1.000E+02	1.000E+02	—	HCSZ
Saturated zone hydraulic gradient	2.000E-02	2.000E-02	—	HGWT
Saturated zone b parameter	4.050E+00	5.300E+00	—	BSZ
Water table drop rate (m/yr)	3.000E-01	1.000E-03	—	VWT
Well pump intake depth (m below water table)	1.000E+01	1.000E+01	—	DWIBWT
Model: Nondispersion (ND) or Mass-Balance (MB)	ND	ND	—	MODEL
Well pumping rate (m**3/yr)	2.500E+02	2.500E+02	—	UW

Site-Specific Parameter Summary (continued)

Parameter	User Input	Default	Used by RESRAD (if different from user input)	Parameter Name
Number of unsaturated zone strata	not used	1	—	NS
Unsat. zone 1, thickness (m)	not used	4.000E+00	—	H(1)
Unsat. zone 1, soil density (g/cm**3)	not used	1.500E+00	—	DENSUZ(1)
Unsat. zone 1, total porosity	not used	4.000E-01	—	TPUZ(1)
Unsat. zone 1, effective porosity	not used	2.000E-01	—	EPUZ(1)
Unsat. zone 1, soil-specific b parameter	not used	5.300E+00	—	BUZ(1)
Unsat. zone 1, hydraulic conductivity (m/yr)	not used	1.000E+01	—	HCUZ(1)
Unsat. zone 2, thickness (m)	not used	0.000E+00	—	H(2)
Unsat. zone 2, soil density (g/cm**3)	not used	1.500E+00	—	DENSUZ(2)
Unsat. zone 2, total porosity	not used	4.000E-01	—	TPUZ(2)
Unsat. zone 2, effective porosity	not used	2.000E-01	—	EPUZ(2)
Unsat. zone 2, soil-specific b parameter	not used	5.300E+00	—	BUZ(2)
Unsat. zone 2, hydraulic conductivity (m/yr)	not used	1.000E+01	—	HCUZ(2)
Distribution coefficients for U-234				
Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	—	DCNUCC(6)
Unsaturated zone 1 (cm**3/g)	not used	5.000E+01	—	DCNUCU(6,1)
Unsaturated zone 2 (cm**3/g)	not used	5.000E+01	—	DCNUCU(6,2)
Saturated zone (cm**3/g)	not used	5.000E+01	—	DCNUCS(6)
Leach rate (/yr)	0.000E+00	0.000E+00	1.250E-06	ALEACH(6)
Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(6)
Distribution coefficients for U-235				
Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	—	DCNUCC(7)
Unsaturated zone 1 (cm**3/g)	not used	5.000E+01	—	DCNUCU(7,1)
Unsaturated zone 2 (cm**3/g)	not used	5.000E+01	—	DCNUCU(7,2)
Saturated zone (cm**3/g)	not used	5.000E+01	—	DCNUCS(7)
Leach rate (/yr)	0.000E+00	0.000E+00	1.250E-06	ALEACH(7)
Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(7)
Distribution coefficients for U-238				
Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	—	DCNUCC(8)
Unsaturated zone 1 (cm**3/g)	not used	5.000E+01	—	DCNUCU(8,1)
Unsaturated zone 2 (cm**3/g)	not used	5.000E+01	—	DCNUCU(8,2)
Saturated zone (cm**3/g)	not used	5.000E+01	—	DCNUCS(8)
Leach rate (/yr)	0.000E+00	0.000E+00	1.250E-06	ALEACH(8)
Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(8)
Distribution coefficients for daughter Ac-227				
Contaminated zone (cm**3/g)	2.000E+01	2.000E+01	—	DCNUCC(1)
Unsaturated zone 1 (cm**3/g)	not used	2.000E+01	—	DCNUCU(1,1)
Unsaturated zone 2 (cm**3/g)	not used	2.000E+01	—	DCNUCU(1,2)
Saturated zone (cm**3/g)	not used	2.000E+01	—	DCNUCS(1)
Leach rate (/yr)	0.000E+00	0.000E+00	3.120E-06	ALEACH(1)
Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)

Site-Specific Parameter Summary (continued)

Parameter	User Input	Default	Used by RESRAD (if different from user input)	Parameter Name
Distribution coefficients for daughter Pa-231				
Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	—	DCNUCC(2)
Unsaturated zone 1 (cm**3/g)	not used	5.000E+01	—	DCNUCU(2,1)
Unsaturated zone 2 (cm**3/g)	not used	5.000E+01	—	DCNUCU(2,2)
Saturated zone (cm**3/g)	not used	5.000E+01	—	DCNUCS(2)
Leach rate (/yr)	0.000E+00	0.000E+00	1.250E-06	ALEACH(2)
Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
Distribution coefficients for daughter Pb-210				
Contaminated zone (cm**3/g)	1.000E+02	1.000E+02	—	DCNUCC(3)
Unsaturated zone 1 (cm**3/g)	not used	1.000E+02	—	DCNUCU(3,1)
Unsaturated zone 2 (cm**3/g)	not used	1.000E+02	—	DCNUCU(3,2)
Saturated zone (cm**3/g)	not used	1.000E+02	—	DCNUCS(3)
Leach rate (/yr)	0.000E+00	0.000E+00	8.257E-07	ALEACH(3)
Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(3)
Distribution coefficients for daughter Ra-226				
Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	—	DCNUCC(4)
Unsaturated zone 1 (cm**3/g)	not used	7.000E+01	—	DCNUCU(4,1)
Unsaturated zone 2 (cm**3/g)	not used	7.000E+01	—	DCNUCU(4,2)
Saturated zone (cm**3/g)	not used	7.000E+01	—	DCNUCS(4)
Leach rate (/yr)	0.000E+00	0.000E+00	8.935E-07	ALEACH(4)
Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(4)
Distribution coefficients for daughter Th-230				
Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	—	DCNUCC(5)
Unsaturated zone 1 (cm**3/g)	not used	6.000E+04	—	DCNUCU(5,1)
Unsaturated zone 2 (cm**3/g)	not used	6.000E+04	—	DCNUCU(5,2)
Saturated zone (cm**3/g)	not used	6.000E+04	—	DCNUCS(5)
Leach rate (/yr)	0.000E+00	0.000E+00	1.043E-09	ALEACH(5)
Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(5)
Inhalation rate (m**3/yr)	1.490E+04	8.400E+03	—	INHALR
Mass loading for inhalation (g/m**3)	9.000E-05	2.000E-04	—	MLINH
Dilution length for airborne dust, inhalation (m)	3.000E+00	3.000E+00	—	LM
Exposure duration	2.500E+01	3.000E+01	—	ED
Shielding factor, inhalation	4.000E-01	4.000E-01	—	SHF3
Shielding factor, external gamma	7.000E-01	7.000E-01	—	SHF1
Fraction of time spent indoors	1.840E-01	5.000E-01	—	FIND
Fraction of time spent outdoors (on site)	4.600E-02	2.500E-01	—	FOTD
Shape factor flag, external gamma	1.000E+00	1.000E+00	1 shows circular AREA.	FS

Site-Specific Parameter Summary (continued)

Parameter	User input	Default	Used by RESRAD (if different from user input)	Parameter Name
Radii of shape factor array (used if FS = -1):				
Outer annular radius (m), ring 1:	not used	5.000E+01	—	RAD_SHAPE(1)
Outer annular radius (m), ring 2:	not used	7.071E+01	—	RAD_SHAPE(2)
Outer annular radius (m), ring 3:	not used	0.000E+00	—	RAD_SHAPE(3)
Outer annular radius (m), ring 4:	not used	0.000E+00	—	RAD_SHAPE(4)
Outer annular radius (m), ring 5:	not used	0.000E+00	—	RAD_SHAPE(5)
Outer annular radius (m), ring 6:	not used	0.000E+00	—	RAD_SHAPE(6)
Outer annular radius (m), ring 7:	not used	0.000E+00	—	RAD_SHAPE(7)
Outer annular radius (m), ring 8:	not used	0.000E+00	—	RAD_SHAPE(8)
Outer annular radius (m), ring 9:	not used	0.000E+00	—	RAD_SHAPE(9)
Outer annular radius (m), ring 10:	not used	0.000E+00	—	RAD_SHAPE(10)
Outer annular radius (m), ring 11:	not used	0.000E+00	—	RAD_SHAPE(11)
Outer annular radius (m), ring 12:	not used	0.000E+00	—	RAD_SHAPE(12)
Fractions of annular areas within AREA:				
Ring 1	not used	1.000E+00	—	FRACA(1)
Ring 2	not used	2.732E-01	—	FRACA(2)
Ring 3	not used	0.000E+00	—	FRACA(3)
Ring 4	not used	0.000E+00	—	FRACA(4)
Ring 5	not used	0.000E+00	—	FRACA(5)
Ring 6	not used	0.000E+00	—	FRACA(6)
Ring 7	not used	0.000E+00	—	FRACA(7)
Ring 8	not used	0.000E+00	—	FRACA(8)
Ring 9	not used	0.000E+00	—	FRACA(9)
Ring 10	not used	0.000E+00	—	FRACA(10)
Ring 11	not used	0.000E+00	—	FRACA(11)
Ring 12	not used	0.000E+00	—	FRACA(12)
Fruits, vegetables and grain consumption (kg/yr)	not used	1.600E+02	—	DIET(1)
Leafy vegetable consumption (kg/yr)	not used	1.400E+01	—	DIET(2)
Milk consumption (L/yr)	not used	9.200E+01	—	DIET(3)
Meat and poultry consumption (kg/yr)	not used	6.300E+01	—	DIET(4)
Fish consumption (kg/yr)	not used	5.400E+00	—	DIET(5)
Other seafood consumption (kg/yr)	not used	9.000E-01	—	DIET(6)
Soil ingestion rate (g/yr)	3.650E+01	3.650E+01	—	SOIL
Drinking water intake (L/yr)	not used	5.100E+02	—	DWI
Contamination fraction of drinking water	not used	1.000E+00	—	FDW
Contamination fraction of household water	not used	1.000E+00	—	FHHW
Contamination fraction of livestock water	not used	1.000E+00	—	FLW
Contamination fraction of irrigation water	not used	1.000E+00	—	FIRW
Contamination fraction of aquatic food	not used	5.000E-01	—	FR9
Contamination fraction of plant food	not used	-1	—	FPLANT
Contamination fraction of meat	not used	-1	—	FMEAT
Contamination fraction of milk	not used	-1	—	FMILK
Livestock fodder intake for meat (kg/day)	not used	6.800E+01	—	LFI5
Livestock fodder intake for milk (kg/day)	not used	5.500E+01	—	LFI6
Livestock water intake for meat (L/day)	not used	5.000E+01	—	LWI5
Livestock water intake for milk (L/day)	not used	1.600E+02	—	LWI6
Livestock soil intake (kg/day)	not used	5.000E-01	—	LSI
Mass loadin[illegible] foliar deposition (g/m**3)	not used	1.000E-04	—	MLFD

Site-Specific Parameter Summary (continued)

Parameter	User Input	Default	Used by RESRAD (if different from user input)	Parameter Name
Depth of soil mixing layer (m)	1.500E-01	1.500E-01	—	DM
Depth of roots (m)	not used	9.000E-01	—	DROOT
Drinking water fraction from ground water	0.000E+00	1.000E+00	—	FGWDW
Household water fraction from ground water	not used	1.000E+00	—	FGWHH
Livestock water fraction from ground water	not used	1.000E+00	—	FGWLW
Irrigation fraction from ground water	not used	1.000E+00	—	FGWIR
C-12 concentration in water (g/cm**3)	not used	2.000E-05	—	C12WTR
C-12 concentration in contaminated soil (g/g)	not used	3.000E-02	—	C12CZ
Fraction of vegetation carbon from soil	not used	2.000E-02	—	CSOIL
Fraction of vegetation carbon from air	not used	9.800E-01	—	CAIR
C-14 evasion layer thickness in soil (m)	not used	3.000E-01	—	DMC
C-14 evasion flux rate from soil (1/sec)	not used	7.000E-07	—	EVSN
C-12 evasion flux rate from soil (1/sec)	not used	1.000E-10	—	REVSN
Fraction of grain in beef cattle feed	not used	8.000E-01	—	AVFG4
Fraction of grain in milk cow feed	not used	2.000E-01	—	AVFG5
R Storage times of contaminated foodstuffs (days):				
R Fruits, non-leafy vegetables, and grain	not used	1.400E+01	—	STOR_T(1)
R Leafy vegetables	not used	1.000E+00	—	STOR_T(2)
R Milk	not used	1.000E+00	—	STOR_T(3)
R Meat and poultry	not used	2.000E+01	—	STOR_T(4)
R Fish	not used	7.000E+00	—	STOR_T(5)
R Crustacea and mollusks	not used	7.000E+00	—	STOR_T(6)
R Well water	not used	1.000E+00	—	STOR_T(7)
R Surface water	not used	1.000E+00	—	STOR_T(8)
R Livestock fodder	not used	4.500E+01	—	STOR_T(9)
Thickness of building foundation (m)	not used	1.500E-01	—	FLOOR
Bulk density of building foundation (g/cm**3)	not used	2.400E+00	—	DENSFL
Total porosity of the cover material	not used	4.000E-01	—	TPCV
Total porosity of the building foundation	not used	1.000E-01	—	TPFL
Volumetric water content of the cover material	not used	5.000E-02	—	PH2OCV
Volumetric water content of the foundation	not used	3.000E-02	—	PH2OFL
Diffusion coefficient for radon gas (m/sec):				
in cover material	not used	2.000E-06	—	DIFCV
in foundation material	not used	3.000E-07	—	DIFFL
in contaminated zone soil	not used	2.000E-06	—	DIFCZ
Radon vertical dimension of mixing (m)	not used	2.000E+00	—	HMIX
Average annual wind speed (m/sec)	not used	2.000E+00	—	WIND
Average building air exchange rate (1/hr)	not used	5.000E-01	—	REXG
Height of the building (room) (m)	not used	2.500E+00	—	HRM
Building interior area factor	not used	0.000E+00	—	FAI
Building depth below ground surface (m)	not used	-1.000E+00	—	DMFL
Emanating power of Rn-222 gas	not used	2.500E-01	—	EMANA(1)
Emanating power of Rn-220 gas	not used	1.500E-01	—	EMANA(2)

Summary of Pathway Selections

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

taminated Zone Dimensions		Initial Soil Concentrations, pCi/g	
ea:	0.60 square meters	U-234	8.500E-02
ness:	2.30 meters	U-235	1.400E-02
Depth:	0.00 meters	U-238	9.010E-01

Total Dose TDOSE(t), mrem/yr
Basic Radiation Dose Limit = 30 mrem/yr
Total Mixture Sum M(t) = Fraction of Basic Dose Limit Received at Time (t)

ars):	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
)SE(t):	6.384E-03	6.384E-03	6.384E-03	6.384E-03	6.385E-03	6.392E-03	6.414E-03	6.510E-03
I(t):	2.128E-04	2.128E-04	2.128E-04	2.128E-04	2.128E-04	2.131E-04	2.138E-04	2.170E-04

ıum TDOSE(t): 6.510E-03 mrem/yr at t = 1.000E+03 years

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

Water Independent Pathways (Inhalaion excludes radon)

Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
le mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
7.676E-07	0.0001	3.693E-04	0.0578	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.212E-07	0.0000
2.057E-04	0.0322	5.668E-05	0.0089	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.883E-08	0.0000
2.251E-03	0.3526	3.499E-03	0.5481	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.221E-06	0.0002
2.457E-03	0.3849	3.925E-03	0.6149	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.361E-06	0.0002

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

Water Dependent Pathways

Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
de mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.702E-04	0.0580
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.624E-04	0.0411
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.751E-03	0.9009
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.384E-03	1.0000

ı of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
e mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
7.676E-07	0.0001	3.693E-04	0.0578	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.212E-07	0.0000
2.057E-04	0.0322	5.669E-05	0.0089	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.884E-08	0.0000
2.251E-03	0.3526	3.499E-03	0.5481	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.221E-06	0.0002
2.457E-03	0.3849	3.925E-03	0.6149	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.361E-06	0.0002

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

Water Dependent Pathways

Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
le mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.702E-04	0.0580
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.624E-04	0.0411
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.751E-03	0.9009
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.384E-03	1.0000

of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
e mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
7.679E-07	0.0001	3.693E-04	0.0578	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.212E-07	0.0000
2.057E-04	0.0322	5.672E-05	0.0089	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.888E-08	0.0000
2.251E-03	0.3526	3.499E-03	0.5481	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.221E-06	0.0002
2.457E-03	0.3849	3.925E-03	0.6149	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.361E-06	0.0002

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

Water Dependent Pathways

Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
le mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.702E-04	0.0580
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.625E-04	0.0411
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.751E-03	0.9009
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.384E-03	1.0000

of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
7.710E-07	0.0001	3.693E-04	0.0579	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.212E-07	0.0000
2.058E-04	0.0322	5.689E-05	0.0089	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.902E-08	0.0000
2.251E-03	0.3526	3.499E-03	0.5481	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.221E-06	0.0002
2.457E-03	0.3849	3.926E-03	0.6149	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.361E-06	0.0002

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

Water Dependent Pathways

Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.702E-04	0.0580
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.627E-04	0.0411
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.751E-03	0.9009
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.384E-03	1.0000

of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
e mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
7.971E-07	0.0001	3.695E-04	0.0579	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.212E-07	0.0000
2.059E-04	0.0322	5.775E-05	0.0090	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.954E-08	0.0000
2.251E-03	0.3525	3.499E-03	0.5480	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.221E-06	0.0002
2.457E-03	0.3848	3.927E-03	0.6149	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.362E-06	0.0002

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

Water Dependent Pathways

Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
le mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.704E-04	0.0580
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.637E-04	0.0413
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.751E-03	0.9007
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.385E-03	1.0000

of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
1.089E-06	0.0002	3.700E-04	0.0579	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.214E-07	0.0000
2.066E-04	0.0323	6.249E-05	0.0098	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.195E-08	0.0000
2.251E-03	0.3521	3.500E-03	0.5475	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.221E-06	0.0002
2.458E-03	0.3846	3.932E-03	0.6152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.364E-06	0.0002

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

Water Dependent Pathways

Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.712E-04	0.0581
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.691E-04	0.0421
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.752E-03	0.8998
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.392E-03	1.0000

of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
3.568E-06	0.0006	3.713E-04	0.0579	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.222E-07	0.0000
2.090E-04	0.0326	7.792E-05	0.0121	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.946E-08	0.0000
2.250E-03	0.3508	3.501E-03	0.5458	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.221E-06	0.0002
2.463E-03	0.3839	3.950E-03	0.6159	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.373E-06	0.0002

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years

Water Dependent Pathways

Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.750E-04	0.0585
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.870E-04	0.0447
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.752E-03	0.8968
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.414E-03	1.0000

ıf all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years

Water Independent Pathways (Inhalation excludes radon)

Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
2.890E-05	0.0044	3.761E-04	0.0578	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.287E-07	0.0000
2.174E-04	0.0334	1.317E-04	0.0202	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.558E-08	0.0000
2.248E-03	0.3454	3.506E-03	0.5386	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.223E-06	0.0002
.495E-03	0.3832	4.014E-03	0.6166	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.407E-06	0.0002

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years

Water Dependent Pathways

Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.051E-04	0.0622
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.491E-04	0.0536
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.756E-03	0.8841
).000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.510E-03	1.0000

f all water independent and dependent pathways.

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

it	Product	Branch	DSR(i,t) (mrem/yr)/(pCi/g)							
(i)	Fraction	t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
AAAA	AAAAAAAA	AAAAAAAAA	AAAAAAAAA	AAAAAAAAA	AAAAAAAAA	AAAAAAAAA	AAAAAAAAA	AAAAAAAAA	AAAAAAAAA
1	U-234	1.000E+00	4.355E-03	4.355E-03	4.355E-03	4.355E-03	4.354E-03	4.353E-03	4.350E-03	4.337E-03
1	Th-230	1.000E+00	0.000E+00	9.684E-08	2.905E-07	9.683E-07	2.905E-06	9.678E-06	2.899E-05	9.621E-05
1	Ra-226	1.000E+00	0.000E+00	3.822E-10	3.439E-09	3.817E-08	3.425E-07	3.767E-06	3.292E-05	3.310E-04
1	Pb-210	1.000E+00	0.000E+00	1.881E-14	5.001E-13	1.756E-11	4.104E-10	1.002E-08	1.279E-07	1.492E-06
1	aDSR(i)		4.355E-03	4.355E-03	4.355E-03	4.356E-03	4.358E-03	4.367E-03	4.412E-03	4.766E-03
5	U-235	1.000E+00	1.875E-02	1.875E-02	1.875E-02	1.875E-02	1.874E-02	1.874E-02	1.874E-02	1.872E-02
5	Pa-231	1.000E+00	0.000E+00	9.696E-07	2.909E-06	9.695E-06	2.908E-05	9.685E-05	2.899E-04	9.582E-04
5	Ac-227	1.000E+00	0.000E+00	8.643E-08	7.617E-07	7.876E-06	5.856E-05	3.831E-04	1.469E-03	5.254E-03
5	aDSR(i)		1.875E-02	1.875E-02	1.875E-02	1.876E-02	1.883E-02	1.922E-02	2.050E-02	2.493E-02
8	U-238	1.000E+00	6.383E-03	6.383E-03	6.383E-03	6.383E-03	6.383E-03	6.382E-03	6.381E-03	6.375E-03
8	U-234	1.000E+00	0.000E+00	1.235E-08	3.704E-08	1.235E-07	3.704E-07	1.234E-06	3.701E-06	1.231E-05
8	Th-230	1.000E+00	0.000E+00	1.373E-13	1.235E-12	1.373E-11	1.235E-10	1.372E-09	1.234E-08	1.366E-07
8	Ra-226	1.000E+00	0.000E+00	3.462E-16	9.710E-15	3.608E-13	9.722E-12	3.573E-10	9.435E-09	3.240E-07
8	Pb-210	1.000E+00	0.000E+00	0.000E+00	1.142E-18	1.264E-16	9.108E-15	7.965E-13	3.350E-11	1.415E-09
8	aDSR(i)		6.383E-03	6.383E-03	6.383E-03	6.383E-03	6.383E-03	6.384E-03	6.385E-03	6.388E-03

ch Fraction is the cumulative factor for the i'th principal radionuclide daughter: CUMBRF(i) = BRF(1)*BRF(2)* ,.. BRF(i).
DSR includes contributions from associated (half-life ó 0.5 yr) daughters.

Single Radionuclide Soil Guidelines G(i,t) in pCi/g
Basic Radiation Dose Limit = 30 mrem/yr

ide	t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
AAAA	AAAAAAAAA	AAAAAAAAA	AAAAAAAAA	AAAAAAAAA	AAAAAAAAA	AAAAAAAAA	AAAAAAAAA	AAAAAAAAA
4	6.889E+03	6.889E+03	6.888E+03	6.887E+03	6.884E+03	6.870E+03	6.800E+03	6.295E+03
5	1.600E+03	1.600E+03	1.600E+03	1.599E+03	1.593E+03	1.561E+03	1.464E+03	1.203E+03
8	4.700E+03	4.700E+03	4.700E+03	4.700E+03	4.700E+03	4.700E+03	4.699E+03	4.696E+03

Summed Dose/Source Ratios DSR(i,t) in (mrem/yr)/(pCi/g)
and Single Radionuclide Soil Guidelines G(i,t) in pCi/g
at tmin = time of minimum single radionuclide soil guideline
nd at tmax = time of maximum total dose = 1.000E+03 years

ide	Initial pCi/g	tmin (years)	DSR(i,tmin) (pCi/g)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax)
AAAA	AAAAAAAAA	AAAAAAAAAAAAAAA	AAAAAAAAA	AAAAAAAAA	AAAAAAAAA	AAAAAAAAA
34	8.500E-02	1.000E+03	4.766E-03	6.295E+03	4.766E-03	6.295E+03
35	1.400E-02	1.000E+03	2.493E-02	1.203E+03	2.493E-02	1.203E+03
38	9.010E-01	1.000E+03	6.388E-03	4.696E+03	6.388E-03	4.696E+03

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

le Parent (i)	BRF(i)	DOSE(j,t), mrem/yr t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
AAAA AAAAAAA AAAAAAAAA		AAAAAAAAA	AAAAAAAAA	AAAAAAAAA	AAAAAAAAA	AAAAAAAAA	AAAAAAAAA	AAAAAAAAA	AAAAAAAAA
	U-234	1.000E+00	3.702E-04	3.702E-04	3.702E-04	3.702E-04	3.701E-04	3.700E-04	3.697E-04	3.687E-04
	U-238	1.000E+00	0.000E+00	1.112E-08	3.337E-08	1.112E-07	3.337E-07	1.112E-06	3.334E-06	1.109E-05
	&DOSE(j):		3.702E-04	3.702E-04	3.702E-04	3.703E-04	3.705E-04	3.711E-04	3.731E-04	3.798E-04
0	U-234	1.000E+00	0.000E+00	8.231E-09	2.469E-08	8.231E-08	2.469E-07	8.226E-07	2.465E-06	8.178E-06
0	U-238	1.000E+00	0.000E+00	1.237E-13	1.113E-12	1.237E-11	1.113E-10	1.236E-09	1.112E-08	1.231E-07
0	&DOSE(j):		0.000E+00	8.231E-09	2.469E-08	8.232E-08	2.470E-07	8.238E-07	2.476E-06	8.301E-06
26	U-234	1.000E+00	0.000E+00	3.249E-11	2.923E-10	3.245E-09	2.912E-08	3.202E-07	2.798E-06	2.814E-05
26	U-238	1.000E+00	0.000E+00	3.119E-16	8.749E-15	3.251E-13	8.759E-12	3.219E-10	8.501E-09	2.920E-07
26	&DOSE(j):		0.000E+00	3.249E-11	2.923E-10	3.245E-09	2.912E-08	3.205E-07	2.808E-06	2.843E-05
10	U-234	1.000E+00	0.000E+00	1.599E-15	4.251E-14	1.492E-12	3.488E-11	8.516E-10	1.087E-08	1.268E-07
10	U-238	1.000E+00	0.000E+00	0.000E+00	1.029E-18	1.138E-16	8.207E-15	7.176E-13	3.019E-11	1.275E-09
10	&DOSE(j):		0.000E+00	1.599E-15	4.251E-14	1.492E-12	3.489E-11	8.523E-10	1.090E-08	1.281E-07
5	U-235	1.000E+00	2.624E-04	2.624E-04	2.624E-04	2.624E-04	2.624E-04	2.624E-04	2.623E-04	2.621E-04
31	U-235	1.000E+00	0.000E+00	1.357E-08	4.072E-08	1.357E-07	4.071E-07	1.356E-06	4.058E-06	1.342E-05
27	U-235	1.000E+00	0.000E+00	1.210E-09	1.066E-08	1.103E-07	8.199E-07	5.364E-06	2.057E-05	7.356E-05
8	U-238	1.000E+00	5.751E-03	5.751E-03	5.751E-03	5.751E-03	5.751E-03	5.751E-03	5.749E-03	5.744E-03

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(i) is the branch fraction of the parent nuclide.

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

de	Parent (i)	BRF(i)	S(j,t), pCi/g t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
4	U-234	1.000E+00	8.500E-02	8.500E-02	8.500E-02	8.500E-02	8.499E-02	8.497E-02	8.490E-02	8.465E-02
4	U-238	1.000E+00	0.000E+00	2.554E-06	7.663E-06	2.554E-05	7.662E-05	2.554E-04	7.657E-04	2.547E-03
4	äS(j):		8.500E-02	8.500E-02	8.501E-02	8.502E-02	8.507E-02	8.522E-02	8.566E-02	8.720E-02
30	U-234	1.000E+00	0.000E+00	7.652E-07	2.295E-06	7.651E-06	2.295E-05	7.647E-05	2.291E-04	7.602E-04
30	U-238	1.000E+00	0.000E+00	1.150E-11	1.035E-10	1.150E-09	1.035E-08	1.149E-07	1.033E-06	1.144E-05
30	äS(j):		0.000E+00	7.652E-07	2.296E-06	7.652E-06	2.296E-05	7.658E-05	2.301E-04	7.716E-04
26	U-234	1.000E+00	0.000E+00	1.657E-10	1.491E-09	1.655E-08	1.485E-07	1.633E-06	1.427E-05	1.435E-04
26	U-238	1.000E+00	0.000E+00	1.591E-15	4.462E-14	1.658E-12	4.467E-11	1.642E-09	4.336E-08	1.489E-06
26	äS(j):		0.000E+00	1.657E-10	1.491E-09	1.655E-08	1.485E-07	1.635E-06	1.431E-05	1.450E-04
10	U-234	1.000E+00	0.000E+00	1.704E-12	4.529E-11	1.590E-09	3.717E-08	9.073E-07	1.158E-05	1.351E-04
10	U-238	1.000E+00	0.000E+00	0.000E+00	1.096E-15	1.213E-13	8.743E-12	7.646E-10	3.216E-08	1.359E-06
10	äS(j):		0.000E+00	1.704E-12	4.529E-11	1.590E-09	3.717E-08	9.081E-07	1.161E-05	1.365E-04
5	U-235	1.000E+00	1.400E-02	1.400E-02	1.400E-02	1.400E-02	1.400E-02	1.400E-02	1.399E-02	1.398E-02
31	U-235	1.000E+00	0.000E+00	2.962E-07	8.886E-07	2.962E-06	8.883E-06	2.959E-05	8.855E-05	2.927E-04
27	U-235	1.000E+00	0.000E+00	4.665E-09	4.112E-08	4.252E-07	3.161E-06	2.068E-05	7.930E-05	2.836E-04
8	U-238	1.000E+00	9.010E-01	9.010E-01	9.010E-01	9.010E-01	9.010E-01	9.009E-01	9.007E-01	8.999E-01

(i) is the branch fraction of the parent nuclide.

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Dose Conversion Factor (and Related) Parameter Summary
File: DOSFAC.BIN

Parameter	Current Value	Parameter Default	Name
Dose conversion factors for inhalation, mrem/pCi:			
Ac-227+D	6.720E+00	6.720E+00	DCF2(1)
Pa-231	1.280E+00	1.280E+00	DCF2(2)
Pu-239	4.290E-01	4.290E-01	DCF2(3)
U-235+D	1.230E-01	1.230E-01	DCF2(4)
Dose conversion factors for ingestion, mrem/pCi:			
Ac-227+D	1.480E-02	1.480E-02	DCF3(1)
Pa-231	1.060E-02	1.060E-02	DCF3(2)
Pu-239	3.540E-03	3.540E-03	DCF3(3)
U-235+D	2.670E-04	2.670E-04	DCF3(4)
Food transfer factors:			
Ac-227+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(1,1)
Ac-227+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-05	2.000E-05	RTF(1,2)
Ac-227+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-05	2.000E-05	RTF(1,3)
Pa-231 , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(2,1)
Pa-231 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	5.000E-03	5.000E-03	RTF(2,2)
Pa-231 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(2,3)
Pu-239 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(3,1)
Pu-239 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(3,2)
Pu-239 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-06	1.000E-06	RTF(3,3)
U-235+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(4,1)
U-235+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(4,2)
U-235+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(4,3)
Bioaccumulation factors, fresh water, L/kg:			
Ac-227+D , fish	1.500E+01	1.500E+01	BIOFAC(1,1)
Ac-227+D , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(1,2)
Pa-231 , fish	1.000E+01	1.000E+01	BIOFAC(2,1)
Pa-231 , crustacea and mollusks	1.100E+02	1.100E+02	BIOFAC(2,2)
Pu-239 , fish	3.000E+01	3.000E+01	BIOFAC(3,1)
Pu-239 , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(3,2)
U-235+D , fish	1.000E+01	1.000E+01	BIOFAC(4,1)
U-235+D , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(4,2)

Site-Specific Parameter Summary

Parameter	User Input	Default	Used by RESRAD (if different from user input)	Parameter Name
Area of contaminated zone (m**2)	8.000E-01	1.000E+04	—	AREA
Thickness of contaminated zone (m)	2.300E+00	2.000E+00	—	THICK0
Length parallel to aquifer flow (m)	not used	1.000E+02	—	LCZPAQ
Basic radiation dose limit (mrem/yr)	3.000E+01	3.000E+01	—	BRDL
Time since placement of material (yr)	0.000E+00	0.000E+00	—	TI
Times for calculations (yr)	1.000E+00	1.000E+00	—	T(2)
Times for calculations (yr)	3.000E+00	3.000E+00	—	T(3)
Times for calculations (yr)	1.000E+01	1.000E+01	—	T(4)
Times for calculations (yr)	3.000E+01	3.000E+01	—	T(5)
Times for calculations (yr)	1.000E+02	1.000E+02	—	T(6)
Times for calculations (yr)	3.000E+02	3.000E+02	—	T(7)
Times for calculations (yr)	1.000E+03	1.000E+03	—	T(8)
Times for calculations (yr)	not used	0.000E+00	—	T(9)
Times for calculations (yr)	not used	0.000E+00	—	T(10)
Initial principal radionuclide (pCi/g): Pu-239	1.000E+00	0.000E+00	—	S1(3)
Concentration in groundwater (pCi/L): Pu-239	not used	0.000E+00	—	W1(3)
Cover depth (m)	0.000E+00	0.000E+00	—	COVER0
Density of cover material (g/cm**3)	not used	1.500E+00	—	DENSCV
Cover depth erosion rate (m/yr)	not used	1.000E-03	—	VCV
Density of contaminated zone (g/cm**3)	1.600E+00	1.500E+00	—	DENSCZ
Contaminated zone erosion rate (m/yr)	1.000E-03	1.000E-03	—	VCZ
Contaminated zone total porosity	4.000E-01	4.000E-01	—	TPCZ
Contaminated zone effective porosity	2.000E-01	2.000E-01	—	EPCZ
Contaminated zone hydraulic conductivity (m/yr)	4.400E+02	1.000E+01	—	HCCZ
Contaminated zone b parameter	4.050E+00	5.300E+00	—	BCZ
Humidity in air (g/cm**3)	not used	8.000E+00	—	HUMID
Evapotranspiration coefficient	9.990E-01	5.000E-01	—	EVAPTR
Precipitation (m/yr)	4.800E-01	1.000E+00	—	PRECIP
Irrigation (m/yr)	0.000E+00	2.000E-01	—	RI
Irrigation mode	overhead	overhead	—	IDITCH
Runoff coefficient	5.200E-01	2.000E-01	—	RUNOFF
Watershed area for nearby stream or pond (m**2)	not used	1.000E+06	—	WAREA
Accuracy for water/soil computations	not used	1.000E-03	—	EPS
Density of saturated zone (g/cm**3)	1.600E+00	1.500E+00	—	DENSAQ
Saturated zone total porosity	3.000E-01	4.000E-01	—	TPSZ
Saturated zone effective porosity	3.000E-01	2.000E-01	—	EPSZ
Saturated zone hydraulic conductivity (m/yr)	1.000E+02	1.000E+02	—	HCSZ
Saturated zone hydraulic gradient	2.000E-02	2.000E-02	—	HGWT
Saturated zone b parameter	4.050E+00	5.300E+00	—	BSZ
Water table drop rate (m/yr)	3.000E-01	1.000E-03	—	VWT
Well pump intake depth (m below water table)	1.000E+01	1.000E+01	—	DWIBWT
Model: Nondispersion (ND) or Mass-Balance (MB)	ND	ND	—	MODEL
Well pumping rate (m**3/yr)	2.500E+02	2.500E+02	—	UW
Number of unsaturated zone strata	not used	1	—	NS

Site-Specific Parameter Summary (continued)

Parameter	User Input	Default	Used by RESRAD (if different from user input)	Parameter Name
Unsat. zone 1, thickness (m)	not used	4.000E+00	—	H(1)
Unsat. zone 1, soil density (g/cm**3)	not used	1.500E+00	—	DENSUZ(1)
Unsat. zone 1, total porosity	not used	4.000E-01	—	TPUZ(1)
Unsat. zone 1, effective porosity	not used	2.000E-01	—	EPUZ(1)
Unsat. zone 1, soil-specific b parameter	not used	5.300E+00	—	BUZ(1)
Unsat. zone 1, hydraulic conductivity (m/yr)	not used	1.000E+01	—	HCUZ(1)
Unsat. zone 2, thickness (m)	not used	0.000E+00	—	H(2)
Unsat. zone 2, soil density (g/cm**3)	not used	1.500E+00	—	DENSUZ(2)
Unsat. zone 2, total porosity	not used	4.000E-01	—	TPUZ(2)
Unsat. zone 2, effective porosity	not used	2.000E-01	—	EPUZ(2)
Unsat. zone 2, soil-specific b parameter	not used	5.300E+00	—	BUZ(2)
Unsat. zone 2, hydraulic conductivity (m/yr)	not used	1.000E+01	—	HCUZ(2)
Distribution coefficients for Pu-239				
Contaminated zone (cm**3/g)	2.000E+03	2.000E+03	—	DCNUCC(3)
Unsaturated zone 1 (cm**3/g)	not used	2.000E+03	—	DCNUCU(3,1)
Unsaturated zone 2 (cm**3/g)	not used	2.000E+03	—	DCNUCU(3,2)
Saturated zone (cm**3/g)	not used	2.000E+03	—	DCNUCS(3)
Leach rate (/yr)	0.000E+00	0.000E+00	3.130E-08	ALEACH(3)
Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(3)
Distribution coefficients for daughter Ac-227				
Contaminated zone (cm**3/g)	2.000E+01	2.000E+01	—	DCNUCC(1)
Unsaturated zone 1 (cm**3/g)	not used	2.000E+01	—	DCNUCU(1,1)
Unsaturated zone 2 (cm**3/g)	not used	2.000E+01	—	DCNUCU(1,2)
Saturated zone (cm**3/g)	not used	2.000E+01	—	DCNUCS(1)
Leach rate (/yr)	0.000E+00	0.000E+00	3.120E-06	ALEACH(1)
Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
Distribution coefficients for daughter Pa-231				
Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	—	DCNUCC(2)
Unsaturated zone 1 (cm**3/g)	not used	5.000E+01	—	DCNUCU(2,1)
Unsaturated zone 2 (cm**3/g)	not used	5.000E+01	—	DCNUCU(2,2)
Saturated zone (cm**3/g)	not used	5.000E+01	—	DCNUCS(2)
Leach rate (/yr)	0.000E+00	0.000E+00	1.250E-06	ALEACH(2)
Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
Distribution coefficients for daughter U-235				
Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	—	DCNUCC(4)
Unsaturated zone 1 (cm**3/g)	not used	5.000E+01	—	DCNUCU(4,1)
Unsaturated zone 2 (cm**3/g)	not used	5.000E+01	—	DCNUCU(4,2)
Saturated zone (cm**3/g)	not used	5.000E+01	—	DCNUCS(4)
Leach rate (/yr)	0.000E+00	0.000E+00	1.250E-06	ALEACH(4)
Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(4)
Inhalation rate (m**3/yr)	1.490E+04	8.400E+03	—	INHALR
Mass loading for inhalation (g/m**3)	9.000E-05	2.000E-04	—	MLINH
Dilution length for airborne dust, inhalation (m)	3.000E+00	3.000E+00	—	LM
Exposure duration	2.500E+01	3.000E+01	—	ED
Shielding fa[illegible] inhalation	4.000E-01	4.000E-01	—	SHF3

Site-Specific Parameter Summary (continued)

Parameter	User Input	Default	Used by RESRAD (if different from user input)	Parameter Name
Shielding factor, external gamma	7.000E-01	7.000E-01	—	SHF1
Fraction of time spent indoors	1.840E-01	5.000E-01	—	FIND
Fraction of time spent outdoors (on site)	4.600E-02	2.500E-01	—	FOTD
Shape factor flag, external gamma	1.000E+00	1.000E+00	1 shows circular AREA.	FS
Radii of shape factor array (used if FS = -1):				
Outer annular radius (m), ring 1:	not used	5.000E+01	—	RAD_SHAPE(1)
Outer annular radius (m), ring 2:	not used	7.071E+01	—	RAD_SHAPE(2)
Outer annular radius (m), ring 3:	not used	0.000E+00	—	RAD_SHAPE(3)
Outer annular radius (m), ring 4:	not used	0.000E+00	—	RAD_SHAPE(4)
Outer annular radius (m), ring 5:	not used	0.000E+00	—	RAD_SHAPE(5)
Outer annular radius (m), ring 6:	not used	0.000E+00	—	RAD_SHAPE(6)
Outer annular radius (m), ring 7:	not used	0.000E+00	—	RAD_SHAPE(7)
Outer annular radius (m), ring 8:	not used	0.000E+00	—	RAD_SHAPE(8)
Outer annular radius (m), ring 9:	not used	0.000E+00	—	RAD_SHAPE(9)
Outer annular radius (m), ring 10:	not used	0.000E+00	—	RAD_SHAPE(10)
Outer annular radius (m), ring 11:	not used	0.000E+00	—	RAD_SHAPE(11)
Outer annular radius (m), ring 12:	not used	0.000E+00	—	RAD_SHAPE(12)
Fractions of annular areas within AREA:				
Ring 1	not used	1.000E+00	—	FRACA(1)
Ring 2	not used	2.732E-01	—	FRACA(2)
Ring 3	not used	0.000E+00	—	FRACA(3)
Ring 4	not used	0.000E+00	—	FRACA(4)
Ring 5	not used	0.000E+00	—	FRACA(5)
Ring 6	not used	0.000E+00	—	FRACA(6)
Ring 7	not used	0.000E+00	—	FRACA(7)
Ring 8	not used	0.000E+00	—	FRACA(8)
Ring 9	not used	0.000E+00	—	FRACA(9)
Ring 10	not used	0.000E+00	—	FRACA(10)
Ring 11	not used	0.000E+00	—	FRACA(11)
Ring 12	not used	0.000E+00	—	FRACA(12)
Fruits, vegetables and grain consumption (kg/yr)	not used	1.600E+02	—	DIET(1)
Leafy vegetable consumption (kg/yr)	not used	1.400E+01	—	DIET(2)
Milk consumption (L/yr)	not used	9.200E+01	—	DIET(3)
Meat and poultry consumption (kg/yr)	not used	6.300E+01	—	DIET(4)
Fish consumption (kg/yr)	not used	5.400E+00	—	DIET(5)
Other seafood consumption (kg/yr)	not used	9.000E-01	—	DIET(6)
Soil ingestion rate (g/yr)	3.650E+01	3.650E+01	—	SOIL
Drinking water intake (L/yr)	not used	5.100E+02	—	DWI
Contamination fraction of drinking water	not used	1.000E+00	—	FDW
Contamination fraction of household water	not used	1.000E+00	—	FHHW
Contamination fraction of livestock water	not used	1.000E+00	—	FLW
Contamination fraction of irrigation water	not used	1.000E+00	—	FIRW
Contamination fraction of aquatic food	not used	5.000E-01	—	FR9
Contamination fraction of plant food	not used	-1	—	FPLANT
Contamination fraction of meat	not used	-1	—	FMEAT
Contamination fraction of milk	not used	-1	—	FMILK
Livestock fodder intake for meat (kg/day)	not used	6.800E+01	—	LFI5
Livestock fodder intake for milk (kg/day)	not used	5.500E+01	—	LFI6

Site-Specific Parameter Summary (continued)

Parameter	User Input	Default	Used by RESRAD (if different from user input)	Parameter Name
vestock water intake for meat (L/day)	not used	5.000E+01	—	LWI5
vestock water intake for milk (L/day)	not used	1.600E+02	—	LWI6
vestock soil intake (kg/day)	not used	5.000E-01	—	LSI
lass loading for foliar deposition (g/m**3)	not used	1.000E-04	—	MLFD
epth of soil mixing layer (m)	1.500E-01	1.500E-01	—	DM
epth of roots (m)	not used	9.000E-01	—	DROOT
rinking water fraction from ground water	0.000E+00	1.000E+00	—	FGWDW
ousehold water fraction from ground water	not used	1.000E+00	—	FGWHH
ivestock water fraction from ground water	not used	1.000E+00	—	FGWLW
rigation fraction from ground water	not used	1.000E+00	—	FGWIR
-12 concentration in water (g/cm**3)	not used	2.000E-05	—	C12WTR
-12 concentration in contaminated soil (g/g)	not used	3.000E-02	—	C12CZ
raction of vegetation carbon from soil	not used	2.000E-02	—	CSOIL
raction of vegetation carbon from air	not used	9.800E-01	—	CAIR
-14 evasion layer thickness in soil (m)	not used	3.000E-01	—	DMC
-14 evasion flux rate from soil (1/sec)	not used	7.000E-07	—	EVSN
-12 evasion flux rate from soil (1/sec)	not used	1.000E-10	—	REVSN
raction of grain in beef cattle feed	not used	8.000E-01	—	AVFG4
raction of grain in milk cow feed	not used	2.000E-01	—	AVFG5
Storage times of contaminated foodstuffs (days):				
Fruits, non-leafy vegetables, and grain	not used	1.400E+01	—	STOR_T(1)
Leafy vegetables	not used	1.000E+00	—	STOR_T(2)
Milk	not used	1.000E+00	—	STOR_T(3)
Meat and poultry	not used	2.000E+01	—	STOR_T(4)
Fish	not used	7.000E+00	—	STOR_T(5)
Crustacea and mollusks	not used	7.000E+00	—	STOR_T(6)
Well water	not used	1.000E+00	—	STOR_T(7)
Surface water	not used	1.000E+00	—	STOR_T(8)
Livestock fodder	not used	4.500E+01	—	STOR_T(9)
Thickness of building foundation (m)	not used	1.500E-01	—	FLOOR
Bulk density of building foundation (g/cm**3)	not used	2.400E+00	—	DENSFL
Total porosity of the cover material	not used	4.000E-01	—	TPCV
Total porosity of the building foundation	not used	1.000E-01	—	TPFL
Volumetric water content of the cover material	not used	5.000E-02	—	PH2OCV
Volumetric water content of the foundation	not used	3.000E-02	—	PH2OFL
Diffusion coefficient for radon gas (m/sec):				
in cover material	not used	2.000E-06	—	DIFCV
in foundation material	not used	3.000E-07	—	DIFFL
in contaminated zone soil	not used	2.000E-06	—	DIFCZ
Radon vertical dimension of mixing (m)	not used	2.000E+00	—	HMIX
Average annual wind speed (m/sec)	not used	2.000E+00	—	WIND
Average building air exchange rate (1/hr)	not used	5.000E-01	—	REXG
Height of the building (room) (m)	not used	2.500E+00	—	HRM
Building interior area factor	not used	0.000E+00	—	FAI
Building depth below ground surface (m)	not used	-1.000E+00	—	DMFL
Emanating power of Rn-222 gas	not used	2.500E-01	—	EMANA(1)
Emanating power of Rn-220 gas	not used	1.500E-01	—	EMANA(2)

Summary of Pathway Selections

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

ıtaminated Zone Dimensions Initial Soil Concentrations, pCi/g
AAAAAAAAAAAAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA

ea: 0.60 square meters Pu-239 1.000E+00
ness: 2.30 meters
Depth: 0.00 meters

Total Dose TDOSE(t), mrem/yr
Basic Radiation Dose Limit = 30 mrem/yr
Total Mixture Sum M(t) = Fraction of Basic Dose Limit Received at Time (t)
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA

ars):	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
)SE(t):	1.414E-02	1.414E-02	1.414E-02	1.414E-02	1.413E-02	1.410E-02	1.402E-02	1.374E-02
I(t):	4.715E-04	4.715E-04	4.714E-04	4.713E-04	4.711E-04	4.701E-04	4.674E-04	4.581E-04

ıum TDOSE(t): 1.414E-02 mrem/yr at t = 0.000E+00 years

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

Water Independent Pathways (Inhalation excludes radon)

Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
ide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
99	6.480E-06	0.0005	1.412E-02	0.9983	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.783E-05	0.0013
	6.480E-06	0.0005	1.412E-02	0.9983	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.783E-05	0.0013

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

Water Dependent Pathways

Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
ide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
99	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.414E-02	1.0000
	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.414E-02	1.0000

of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
ie	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
9	6.480E-06	0.0005	1.412E-02	0.9983	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.783E-05	0.0013
	6.480E-06	0.0005	1.412E-02	0.9983	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.783E-05	0.0013

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

Water Dependent Pathways

Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
ie	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
9	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.414E-02	1.0000
	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.414E-02	1.0000

of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
e mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
9 6.480E-06	0.0005	1.412E-02	0.9983	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.783E-05	0.0013
6.480E-06	0.0005	1.412E-02	0.9983	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.783E-05	0.0013

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

Water Dependent Pathways

Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
le mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
9 0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.414E-02	1.0000
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.414E-02	1.0000

of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
e mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
9 6.478E-06	0.0005	1.412E-02	0.9983	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.783E-05	0.0013
6.478E-06	0.0005	1.412E-02	0.9983	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.783E-05	0.0013

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

Water Dependent Pathways

Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
le mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
9 0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.414E-02	1.0000
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.414E-02	1.0000

of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Ground		Inhalation		Radon		Plant		Meat		Milk		Soil			
e	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	
9	6.475E-06	0.0005	1.411E-02	0.9983	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.782E-05	0.0013	
	6.475E-06	0.0005	1.411E-02	0.9983	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.782E-05	0.0013	

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

Water Dependent Pathways

Water		Fish		Radon		Plant		Meat		Milk		All Pathways*			
le	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	
9	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.413E-02	1.0000	
	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.413E-02	1.0000	

of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
6.463E-06	0.0005	1.408E-02	0.9983	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.778E-05	0.0013
6.463E-06	0.0005	1.408E-02	0.9983	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.778E-05	0.0013

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

Water Dependent Pathways

Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.410E-02	1.0000
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.410E-02	1.0000

of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
6.429E-06	0.0005	1.400E-02	0.9983	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.768E-05	0.0013
6.429E-06	0.0005	1.400E-02	0.9983	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.768E-05	0.0013

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years

Water Dependent Pathways

Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.402E-02	1.0000
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.402E-02	1.0000

of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years

Water Independent Pathways (Inhalation excludes radon)

Ground	Inhalation	Radon	Plant	Meat	Milk	Soil
mrem/yr fract.	mrem/yr fract.	mrem/yr fract.	mrem/yr fract.	mrem/yr fract.	mrem/yr fract.	mrem/yr fract.
6.311E-06 0.0005	1.372E-02 0.9983	0.000E+00 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	1.732E-05 0.0013
6.311E-06 0.0005	1.372E-02 0.9983	0.000E+00 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	1.732E-05 0.0013

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years

Water Dependent Pathways

Water	Fish	Radon	Plant	Meat	Milk	All Pathways*
mrem/yr fract.	mrem/yr fract.	mrem/yr fract.	mrem/yr fract.	mrem/yr fract.	mrem/yr fract.	mrem/yr fract.
0.000E+00 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	1.374E-02 1.0000
0.000E+00 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	0.000E+00 0.0000	1.374E-02 1.0000

of all water independent and dependent pathways.

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

Product	Branch Fraction	DSR(i,t) (mrem/yr)/(pCi/g) t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Pu-239	1.000E+00	1.414E-02	1.414E-02	1.414E-02	1.414E-02	1.413E-02	1.410E-02	1.402E-02	1.374E-02
U-235	1.000E+00	0.000E+00	1.846E-11	5.538E-11	1.846E-10	5.536E-10	1.843E-09	5.514E-09	1.819E-08
Pa-231	1.000E+00	0.000E+00	4.775E-16	4.297E-15	4.774E-14	4.295E-13	4.766E-12	4.275E-11	4.692E-10
Ac-227	1.000E+00	0.000E+00	2.844E-17	7.561E-16	2.653E-14	6.195E-13	1.513E-11	1.968E-10	2.495E-09
SDSR(t)		1.414E-02	1.414E-02	1.414E-02	1.414E-02	1.413E-02	1.410E-02	1.402E-02	1.374E-02

Fraction is the cumulative factor for the i'th principal radionuclide daughter: CUMBRF(i) = BRF(1)*BRF(2)* ... BRF(i).
R includes contributions from associated (half-life ó 0.5 yr) daughters.

Single Radionuclide Soil Guidelines G(i,t) in pCi/g
Basic Radiation Dose Limit = 30 mrem/yr

	t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
	2.121E+03	2.121E+03	2.121E+03	2.122E+03	2.123E+03	2.127E+03	2.139E+03	2.183E+03

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

e	initial pCi/g	tmin (years)	DSR(i,tmin) (pCi/g)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax)
	1.000E+00	0.000E+00	1.414E-02	2.121E+03	1.414E-02	2.121E+03

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

Parent	BRF(i)	DOSE(i,t), mrem/yr							
	t=	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
AA AAAAAAA AAAAAAAAA AAAAAAAAA AAAAAAAAA AAAAAAAAA AAAAAAAAA AAAAAAAAA AAAAAAAAA AAAAAAAAA AAAAAAAAA AAAAAAAAA									
Pu-239	1.000E+00	1.414E-02	1.414E-02	1.414E-02	1.414E-02	1.413E-02	1.410E-02	1.402E-02	1.374E-02
Pu-239	1.000E+00	0.000E+00	1.848E-11	5.538E-11	1.846E-10	5.536E-10	1.843E-09	5.514E-09	1.819E-08
Pu-239	1.000E+00	0.000E+00	4.775E-16	4.297E-15	4.774E-14	4.295E-13	4.766E-12	4.275E-11	4.692E-10
Pu-239	1.000E+00	0.000E+00	2.844E-17	7.561E-16	2.653E-14	6.195E-13	1.513E-11	1.966E-10	2.495E-09
ii iiiiiiii iiiiiiii iiiiiiii iiiiiiii iiiiiiii iiiiiiii iiiiiiii iiiiiiii iiiiiiii iiiiiiii iiiiiiii iiiiiiii									

s the branch fraction of the parent nuclide.

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Parent	BRF(i)	S(i,t), pCi/g							
	t=	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
AA AAAAAAA AAAAAAAAA AAAAAAAAA AAAAAAAAA AAAAAAAAA AAAAAAAAA AAAAAAAAA AAAAAAAAA AAAAAAAAA AAAAAAAAA AAAAAAAAA									
Pu-239	1.000E+00	1.000E+00	1.000E+00	9.999E-01	9.997E-01	9.991E-01	9.971E-01	9.914E-01	9.716E-01
Pu-239	1.000E+00	0.000E+00	9.848E-10	2.954E-09	9.847E-09	2.953E-08	9.834E-08	2.941E-07	9.702E-07
Pu-239	1.000E+00	0.000E+00	1.042E-14	9.377E-14	1.042E-12	9.372E-12	1.040E-10	9.328E-10	1.024E-08
Pu-239	1.000E+00	0.000E+00	1.097E-16	2.815E-15	1.023E-13	2.389E-12	5.835E-11	7.582E-10	9.620E-09
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s the branch fraction of the parent nuclide.

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Dose Conversion Factor (and Related) Parameter Summary
File: DOSFAC.BIN

Parameter	Current Value	Parameter Default	Name
Dose conversion factors for inhalation, mrem/pCi:			
Ac-227+D	6.720E+00	6.720E+00	DCF2(1)
Pa-231	1.280E+00	1.280E+00	DCF2(2)
Pb-210+D	2.320E-02	2.320E-02	DCF2(3)
Ra-226+D	8.600E-03	8.600E-03	DCF2(4)
Th-230	3.260E-01	3.260E-01	DCF2(5)
U-234	1.320E-01	1.320E-01	DCF2(6)
U-235+D	1.230E-01	1.230E-01	DCF2(7)
U-238+D	1.180E-01	1.180E-01	DCF2(8)
Dose conversion factors for ingestion, mrem/pCi:			
Ac-227+D	1.480E-02	1.480E-02	DCF3(1)
Pa-231	1.060E-02	1.060E-02	DCF3(2)
Pb-210+D	7.270E-03	7.270E-03	DCF3(3)
Ra-226+D	1.330E-03	1.330E-03	DCF3(4)
Th-230	5.480E-04	5.480E-04	DCF3(5)
U-234	2.830E-04	2.830E-04	DCF3(6)
U-235+D	2.670E-04	2.670E-04	DCF3(7)
U-238+D	2.690E-04	2.690E-04	DCF3(8)
Food transfer factors:			
Ac-227+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(1,1)
Ac-227+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-05	2.000E-05	RTF(1,2)
Ac-227+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-05	2.000E-05	RTF(1,3)
Pa-231 , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(2,1)
Pa-231 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	5.000E-03	5.000E-03	RTF(2,2)
Pa-231 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(2,3)
Pb-210+D , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(3,1)
Pb-210+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-04	8.000E-04	RTF(3,2)
Pb-210+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.000E-04	3.000E-04	RTF(3,3)
Ra-226+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(4,1)
Ra-226+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(4,2)
Ra-226+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(4,3)
Th-230 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(5,1)
Th-230 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(5,2)
Th-230 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(5,3)
U-234 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(6,1)
U-234 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(6,2)
U-234 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(6,3)
U-235+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(7,1)
U-235+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(7,2)
U-235+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(7,3)

Dose Conversion Factor (and Related) Parameter Summary (continued)
File: DOSFAC.BIN

Parameter	Current Value	Parameter Default	Name
U-238+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(8,1)
U-238+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(8,2)
U-238+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(8,3)
Bioaccumulation factors, fresh water, L/kg:			
Ac-227+D , fish	1.500E+01	1.500E+01	BIOFAC(1,1)
Ac-227+D , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(1,2)
Pa-231 , fish	1.000E+01	1.000E+01	BIOFAC(2,1)
Pa-231 , crustacea and mollusks	1.100E+02	1.100E+02	BIOFAC(2,2)
Pb-210+D , fish	3.000E+02	3.000E+02	BIOFAC(3,1)
Pb-210+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(3,2)
Ra-226+D , fish	5.000E+01	5.000E+01	BIOFAC(4,1)
Ra-226+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(4,2)
Th-230 , fish	1.000E+02	1.000E+02	BIOFAC(5,1)
Th-230 , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(5,2)
U-234 , fish	1.000E+01	1.000E+01	BIOFAC(6,1)
U-234 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(6,2)
U-235+D , fish	1.000E+01	1.000E+01	BIOFAC(7,1)
U-235+D , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(7,2)
U-238+D , fish	1.000E+01	1.000E+01	BIOFAC(8,1)
U-238+D , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(8,2)

Site-Specific Parameter Summary

Parameter	User Input	Default	Used by RESRAD (if different from user input)	Parameter Name
Area of contaminated zone (m**2)	3.100E+00	1.000E+04	—	AREA
Thickness of contaminated zone (m)	4.000E+00	2.000E+00	—	THICK0
Length parallel to aquifer flow (m)	not used	1.000E+02	—	LCZPAQ
Basic radiation dose limit (mrem/yr)	3.000E+01	3.000E+01	—	BRDL
Time since placement of material (yr)	0.000E+00	0.000E+00	—	TI
Times for calculations (yr)	1.000E+00	1.000E+00	—	T(2)
Times for calculations (yr)	3.000E+00	3.000E+00	—	T(3)
Times for calculations (yr)	1.000E+01	1.000E+01	—	T(4)
Times for calculations (yr)	3.000E+01	3.000E+01	—	T(5)
Times for calculations (yr)	1.000E+02	1.000E+02	—	T(6)
Times for calculations (yr)	3.000E+02	3.000E+02	—	T(7)
Times for calculations (yr)	1.000E+03	1.000E+03	—	T(8)
Times for calculations (yr)	not used	0.000E+00	—	T(9)
Times for calculations (yr)	not used	0.000E+00	—	T(10)
Initial principal radionuclide (pCi/g): U-234	8.500E-02	0.000E+00	—	S1(6)
Initial principal radionuclide (pCi/g): U-235	1.400E-02	0.000E+00	—	S1(7)
Initial principal radionuclide (pCi/g): U-238	9.010E-01	0.000E+00	—	S1(8)
Concentration in groundwater (pCi/L): U-234	not used	0.000E+00	—	W1(6)
Concentration in groundwater (pCi/L): U-235	not used	0.000E+00	—	W1(7)
Concentration in groundwater (pCi/L): U-238	not used	0.000E+00	—	W1(8)
Cover depth (m)	0.000E+00	0.000E+00	—	COVER0
Density of cover material (g/cm**3)	not used	1.500E+00	—	DENSCV
Cover depth erosion rate (m/yr)	not used	1.000E-03	—	VCV
Density of contaminated zone (g/cm**3)	1.600E+00	1.500E+00	—	DENSCZ
Contaminated zone erosion rate (m/yr)	1.000E-03	1.000E-03	—	VCZ
Contaminated zone total porosity	4.000E-01	4.000E-01	—	TPCZ
Contaminated zone effective porosity	2.000E-01	2.000E-01	—	EPCZ
Contaminated zone hydraulic conductivity (m/yr)	4.400E+02	1.000E+01	—	HCCZ
Contaminated zone b parameter	4.050E+00	5.300E+00	—	BCZ
Humidity in air (g/cm**3)	not used	8.000E+00	—	HUMID
Evapotranspiration coefficient	9.990E-01	5.000E-01	—	EVAPTR
Precipitation (m/yr)	4.800E-01	1.000E+00	—	PRECIP
Irrigation (m/yr)	0.000E+00	2.000E-01	—	RI
Irrigation mode	overhead	overhead	—	IDITCH
Runoff coefficient	5.200E-01	2.000E-01	—	RUNOFF
Watershed area for nearby stream or pond (m**2)	not used	1.000E+06	—	WAREA
Accuracy for water/soil computations	not used	1.000E-03	—	EPS
Density of saturated zone (g/cm**3)	1.600E+00	1.500E+00	—	DENSAQ
Saturated zone total porosity	3.000E-01	4.000E-01	—	TPSZ
Saturated zone effective porosity	3.000E-01	2.000E-01	—	EPSZ
Saturated zone hydraulic conductivity (m/yr)	1.000E+02	1.000E+02	—	HCSZ
Saturated zone hydraulic gradient	2.000E-02	2.000E-02	—	HGWT
Saturated zone b parameter	4.050E+00	5.300E+00	—	BSZ
Water table drop rate (m/yr)	3.000E-01	1.000E-03	—	VWT
Well pump intake depth (m below water table)	1.000E+01	1.000E+01	—	DWIBWT
Model: Nondispersion (ND) or Mass-Balance (MB)	ND	ND	—	MODEL
Well pumping rate (m**3/yr)	2.500E+02	2.500E+02	—	UW

Site-Specific Parameter Summary (continued)

Parameter	User Input	Default	Used by RESRAD (if different from user input)	Parameter Name
Number of unsaturated zone strata	not used	1	—	NS
Unsat. zone 1, thickness (m)	not used	4.000E+00	—	H(1)
Unsat. zone 1, soil density (g/cm**3)	not used	1.500E+00	—	DENSUZ(1)
Unsat. zone 1, total porosity	not used	4.000E-01	—	TPUZ(1)
Unsat. zone 1, effective porosity	not used	2.000E-01	—	EPUZ(1)
Unsat. zone 1, soil-specific b parameter	not used	5.300E+00	—	BUZ(1)
Unsat. zone 1, hydraulic conductivity (m/yr)	not used	1.000E+01	—	HCUZ(1)
Unsat. zone 2, thickness (m)	not used	0.000E+00	—	H(2)
Unsat. zone 2, soil density (g/cm**3)	not used	1.500E+00	—	DENSUZ(2)
Unsat. zone 2, total porosity	not used	4.000E-01	—	TPUZ(2)
Unsat. zone 2, effective porosity	not used	2.000E-01	—	EPUZ(2)
Unsat. zone 2, soil-specific b parameter	not used	5.300E+00	—	BUZ(2)
Unsat. zone 2, hydraulic conductivity (m/yr)	not used	1.000E+01	—	HCUZ(2)
Distribution coefficients for U-234				
Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	—	DCNUCC(6)
Unsaturated zone 1 (cm**3/g)	not used	5.000E+01	—	DCNUCU(6,1)
Unsaturated zone 2 (cm**3/g)	not used	5.000E+01	—	DCNUCU(6,2)
Saturated zone (cm**3/g)	not used	5.000E+01	—	DCNUCS(6)
Leach rate (/yr)	0.000E+00	0.000E+00	7.190E-07	ALEACH(6)
Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(6)
Distribution coefficients for U-235				
Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	—	DCNUCC(7)
Unsaturated zone 1 (cm**3/g)	not used	5.000E+01	—	DCNUCU(7,1)
Unsaturated zone 2 (cm**3/g)	not used	5.000E+01	—	DCNUCU(7,2)
Saturated zone (cm**3/g)	not used	5.000E+01	—	DCNUCS(7)
Leach rate (/yr)	0.000E+00	0.000E+00	7.190E-07	ALEACH(7)
Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(7)
Distribution coefficients for U-238				
Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	—	DCNUCC(8)
Unsaturated zone 1 (cm**3/g)	not used	5.000E+01	—	DCNUCU(8,1)
Unsaturated zone 2 (cm**3/g)	not used	5.000E+01	—	DCNUCU(8,2)
Saturated zone (cm**3/g)	not used	5.000E+01	—	DCNUCS(8)
Leach rate (/yr)	0.000E+00	0.000E+00	7.190E-07	ALEACH(8)
Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(8)
Distribution coefficients for daughter Ac-227				
Contaminated zone (cm**3/g)	2.000E+01	2.000E+01	—	DCNUCC(1)
Unsaturated zone 1 (cm**3/g)	not used	2.000E+01	—	DCNUCU(1,1)
Unsaturated zone 2 (cm**3/g)	not used	2.000E+01	—	DCNUCU(1,2)
Saturated zone (cm**3/g)	not used	2.000E+01	—	DCNUCS(1)
Leach rate (/yr)	0.000E+00	0.000E+00	1.794E-06	ALEACH(1)
Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)

Site-Specific Parameter Summary (continued)

Parameter	User Input	Default	Used by RESRAD (if different from user input)	Parameter Name
Distribution coefficients for daughter Pa-231				
Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	—	DCNUCC(2)
Unsaturated zone 1 (cm**3/g)	not used	5.000E+01	—	DCNUCU(2,1)
Unsaturated zone 2 (cm**3/g)	not used	5.000E+01	—	DCNUCU(2,2)
Saturated zone (cm**3/g)	not used	5.000E+01	—	DCNUCS(2)
Leach rate (/yr)	0.000E+00	0.000E+00	7.190E-07	ALEACH(2)
Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
Distribution coefficients for daughter Pb-210				
Contaminated zone (cm**3/g)	1.000E+02	1.000E+02	—	DCNUCC(3)
Unsaturated zone 1 (cm**3/g)	not used	1.000E+02	—	DCNUCU(3,1)
Unsaturated zone 2 (cm**3/g)	not used	1.000E+02	—	DCNUCU(3,2)
Saturated zone (cm**3/g)	not used	1.000E+02	—	DCNUCS(3)
Leach rate (/yr)	0.000E+00	0.000E+00	3.598E-07	ALEACH(3)
Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(3)
Distribution coefficients for daughter Ra-226				
Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	—	DCNUCC(4)
Unsaturated zone 1 (cm**3/g)	not used	7.000E+01	—	DCNUCU(4,1)
Unsaturated zone 2 (cm**3/g)	not used	7.000E+01	—	DCNUCU(4,2)
Saturated zone (cm**3/g)	not used	7.000E+01	—	DCNUCS(4)
Leach rate (/yr)	0.000E+00	0.000E+00	5.138E-07	ALEACH(4)
Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(4)
Distribution coefficients for daughter Th-230				
Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	—	DCNUCC(5)
Unsaturated zone 1 (cm**3/g)	not used	6.000E+04	—	DCNUCU(5,1)
Unsaturated zone 2 (cm**3/g)	not used	6.000E+04	—	DCNUCU(5,2)
Saturated zone (cm**3/g)	not used	6.000E+04	—	DCNUCS(5)
Leach rate (/yr)	0.000E+00	0.000E+00	6.000E-10	ALEACH(5)
Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(5)
Inhalation rate (m**3/yr)	1.490E+04	8.400E+03	—	INHALR
Mass loading for inhalation (g/m**3)	9.000E-05	2.000E-04	—	MLINH
Dilution length for airborne dust, inhalation (m)	3.000E+00	3.000E+00	—	LM
Exposure duration	2.500E+01	3.000E+01	—	ED
Shielding factor, inhalation	4.000E-01	4.000E-01	—	SHF3
Shielding factor, external gamma	7.000E-01	7.000E-01	—	SHF1
Fraction of time spent indoors	1.840E-01	5.000E-01	—	FIND
Fraction of time spent outdoors (on site)	4.600E-02	2.500E-01	—	FOTD
Shape factor flag, external gamma	1.000E+00	1.000E+00	1 shows circular AREA.	FS

Site-Specific Parameter Summary (continued)

Parameter	User Input	Default	Used by RESRAD (if different from user input)	Parameter Name
Radii of shape factor array (used if FS = -1):				
Outer annular radius (m), ring 1:	not used	5.000E+01	—	RAD_SHAPE(1)
Outer annular radius (m), ring 2:	not used	7.071E+01	—	RAD_SHAPE(2)
Outer annular radius (m), ring 3:	not used	0.000E+00	—	RAD_SHAPE(3)
Outer annular radius (m), ring 4:	not used	0.000E+00	—	RAD_SHAPE(4)
Outer annular radius (m), ring 5:	not used	0.000E+00	—	RAD_SHAPE(5)
Outer annular radius (m), ring 6:	not used	0.000E+00	—	RAD_SHAPE(6)
Outer annular radius (m), ring 7:	not used	0.000E+00	—	RAD_SHAPE(7)
Outer annular radius (m), ring 8:	not used	0.000E+00	—	RAD_SHAPE(8)
Outer annular radius (m), ring 9:	not used	0.000E+00	—	RAD_SHAPE(9)
Outer annular radius (m), ring 10:	not used	0.000E+00	—	RAD_SHAPE(10)
Outer annular radius (m), ring 11:	not used	0.000E+00	—	RAD_SHAPE(11)
Outer annular radius (m), ring 12:	not used	0.000E+00	—	RAD_SHAPE(12)
Fractions of annular areas within AREA:				
Ring 1	not used	1.000E+00	—	FRACA(1)
Ring 2	not used	2.732E-01	—	FRACA(2)
Ring 3	not used	0.000E+00	—	FRACA(3)
Ring 4	not used	0.000E+00	—	FRACA(4)
Ring 5	not used	0.000E+00	—	FRACA(5)
Ring 6	not used	0.000E+00	—	FRACA(6)
Ring 7	not used	0.000E+00	—	FRACA(7)
Ring 8	not used	0.000E+00	—	FRACA(8)
Ring 9	not used	0.000E+00	—	FRACA(9)
Ring 10	not used	0.000E+00	—	FRACA(10)
Ring 11	not used	0.000E+00	—	FRACA(11)
Ring 12	not used	0.000E+00	—	FRACA(12)
Fruits, vegetables and grain consumption (kg/yr)	not used	1.600E+02	—	DIET(1)
Leafy vegetable consumption (kg/yr)	not used	1.400E+01	—	DIET(2)
Milk consumption (L/yr)	not used	9.200E+01	—	DIET(3)
Meat and poultry consumption (kg/yr)	not used	6.300E+01	—	DIET(4)
Fish consumption (kg/yr)	not used	5.400E+00	—	DIET(5)
Other seafood consumption (kg/yr)	not used	9.000E-01	—	DIET(6)
Soil ingestion rate (g/yr)	3.650E+01	3.650E+01	—	SOIL
Drinking water intake (L/yr)	not used	5.100E+02	—	DWI
Contamination fraction of drinking water	not used	1.000E+00	—	FDW
Contamination fraction of household water	not used	1.000E+00	—	FHHW
Contamination fraction of livestock water	not used	1.000E+00	—	FLW
Contamination fraction of irrigation water	not used	1.000E+00	—	FIRW
Contamination fraction of aquatic food	not used	5.000E-01	—	FR9
Contamination fraction of plant food	not used	-1	—	FPLANT
Contamination fraction of meat	not used	-1	—	FMEAT
Contamination fraction of milk	not used	-1	—	FMILK
Livestock fodder intake for meat (kg/day)	not used	6.800E+01	—	LFI5
Livestock fodder intake for milk (kg/day)	not used	5.500E+01	—	LFI6
Livestock water intake for meat (L/day)	not used	5.000E+01	—	LWI5
Livestock water intake for milk (L/day)	not used	1.600E+02	—	LWI6
Livestock soil intake (kg/day)	not used	5.000E-01	—	LSI
Mass loading for foliar deposition (g/m**3)	not used	1.000E-04	—	MLFD

Site-Specific Parameter Summary (continued)

Parameter	User Input	Default	Used by RESRAD (if different from user input)	Parameter Name
Depth of soil mixing layer (m)	1.500E-01	1.500E-01	—	DM
Depth of roots (m)	not used	9.000E-01	—	DROOT
Drinking water fraction from ground water	0.000E+00	1.000E+00	—	FGWDW
Household water fraction from ground water	not used	1.000E+00	—	FGWHH
Livestock water fraction from ground water	not used	1.000E+00	—	FGWLW
Irrigation fraction from ground water	not used	1.000E+00	—	FGWIR
C-12 concentration in water (g/cm**3)	not used	2.000E-05	—	C12WTR
C-12 concentration in contaminated soil (g/g)	not used	3.000E-02	—	C12CZ
Fraction of vegetation carbon from soil	not used	2.000E-02	—	CSOIL
Fraction of vegetation carbon from air	not used	9.800E-01	—	CAIR
C-14 evasion layer thickness in soil (m)	not used	3.000E-01	—	DMC
C-14 evasion flux rate from soil (1/sec)	not used	7.000E-07	—	EVSN
C-12 evasion flux rate from soil (1/sec)	not used	1.000E-10	—	REVSN
Fraction of grain in beef cattle feed	not used	8.000E-01	—	AVFG4
Fraction of grain in milk cow feed	not used	2.000E-01	—	AVFG5
Storage times of contaminated foodstuffs (days):				
Fruits, non-leafy vegetables, and grain	not used	1.400E+01	—	STOR_T(1)
Leafy vegetables	not used	1.000E+00	—	STOR_T(2)
Milk	not used	1.000E+00	—	STOR_T(3)
Meat and poultry	not used	2.000E+01	—	STOR_T(4)
Fish	not used	7.000E+00	—	STOR_T(5)
Crustacea and mollusks	not used	7.000E+00	—	STOR_T(6)
Well water	not used	1.000E+00	—	STOR_T(7)
Surface water	not used	1.000E+00	—	STOR_T(8)
Livestock fodder	not used	4.500E+01	—	STOR_T(9)
Thickness of building foundation (m)	not used	1.500E-01	—	FLOOR
Bulk density of building foundation (g/cm**3)	not used	2.400E+00	—	DENSFL
Total porosity of the cover material	not used	4.000E-01	—	TPCV
Total porosity of the building foundation	not used	1.000E-01	—	TPFL
Volumetric water content of the cover material	not used	5.000E-02	—	PH2OCV
Volumetric water content of the foundation	not used	3.000E-02	—	PH2OFL
Diffusion coefficient for radon gas (m/sec):				
in cover material	not used	2.000E-06	—	DIFCV
in foundation material	not used	3.000E-07	—	DIFFL
in contaminated zone soil	not used	2.000E-06	—	DIFCZ
Radon vertical dimension of mixing (m)	not used	2.000E+00	—	HMIX
Average annual wind speed (m/sec)	not used	2.000E+00	—	WIND
Average building air exchange rate (1/hr)	not used	5.000E-01	—	REXG
Height of the building (room) (m)	not used	2.500E+00	—	HRM
Building interior area factor	not used	0.000E+00	—	FAI
Building depth below ground surface (m)	not used	-1.000E+00	—	DMFL
Emanating power of Rn-222 gas	not used	2.500E-01	—	EMANA(1)
Emanating power of Rn-220 gas	not used	1.500E-01	—	EMANA(2)

Summary of Pathway Selections

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

laminated Zone Dimensions
ea: 3.10 square meters
ness: 4.00 meters
Depth: 0.00 meters

Initial Soil Concentrations, pCi/g

U-234	8.500E-02
U-235	1.400E-02
U-238	9.010E-01

Total Dose TDOSE(t), mrem/yr
Basic Radiation Dose Limit = 30 mrem/yr
Total Mixture Sum M(t) = Fraction of Basic Dose Limit Received at Time (t)

rs):	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
SE(t):	1.257E-02	1.257E-02	1.257E-02	1.257E-02	1.257E-02	1.259E-02	1.263E-02	1.282E-02
(t):	4.190E-04	4.190E-04	4.190E-04	4.190E-04	4.191E-04	4.195E-04	4.210E-04	4.274E-04

um TDOSE(t): 1.282E-02 mrem/yr at t = 1.000E+03 years

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

Water Independent Pathways (Inhalation excludes radon)

Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
1.609E-06	0.0001	6.655E-04	0.0529	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.260E-07	0.0000
4.555E-04	0.0362	1.021E-04	0.0081	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.728E-08	0.0000
5.032E-03	0.4003	6.306E-03	0.5017	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.308E-06	0.0005
.489E-03	0.4367	7.074E-03	0.5628	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.031E-06	0.0006

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

Water Dependent Pathways

Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.678E-04	0.0531
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.578E-04	0.0444
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.134E-02	0.9025
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.257E-02	1.0000

f all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
1.609E-06	0.0001	6.655E-04	0.0529	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.260E-07	0.0000
4.555E-04	0.0362	1.022E-04	0.0081	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.736E-08	0.0000
5.032E-03	0.4003	6.306E-03	0.5017	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.308E-06	0.0005
5.489E-03	0.4367	7.074E-03	0.5628	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.031E-06	0.0006

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

Water Dependent Pathways

Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.678E-04	0.0531
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.578E-04	0.0444
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.134E-02	0.9025
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.257E-02	1.0000

of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
1.610E-06	0.0001	6.656E-04	0.0529	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.260E-07	0.0000
4.555E-04	0.0362	1.022E-04	0.0081	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.754E-08	0.0000
5.032E-03	0.4003	6.306E-03	0.5017	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.308E-06	0.0005
5.489E-03	0.4367	7.074E-03	0.5628	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.031E-06	0.0006

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

Water Dependent Pathways

Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.678E-04	0.0531
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.578E-04	0.0444
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.134E-02	0.9025
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.257E-02	1.0000

f all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
1.617E-06	0.0001	6.656E-04	0.0530	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.261E-07	0.0000
4.556E-04	0.0362	1.025E-04	0.0082	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.826E-08	0.0000
5.032E-03	0.4003	6.307E-03	0.5017	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.308E-06	0.0005
5.489E-03	0.4367	7.075E-03	0.5628	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.032E-06	0.0006

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

Water Dependent Pathways

Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.679E-04	0.0531
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.582E-04	0.0444
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.134E-02	0.9025
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.257E-02	1.0000

of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
o-	AAAAAAAAAAAAAAAA		AAAAAAAAAAAAAAAA		AAAAAAAAAAAAAAAA		AAAAAAAAAAAAAAAA		AAAAAAAAAAAAAAAA		AAAAAAAAAAAAAAAA		AAAAAAAAAAAAAAAA	
de	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
	AAAA	AAAAAAAAA	AAAAAA	AAAAAAAAA	AAAAAA	AAAAAAAAA	AAAAAA	AAAAAAAAA	AAAAAA	AAAAAAAAA	AAAAAA	AAAAAAAAA	AAAAAA	AAAAAAAA
4	1.676E-06	0.0001	6.659E-04	0.0530	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.263E-07	0.0000
5	4.558E-04	0.0363	1.041E-04	0.0083	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.009E-07	0.0000
8	5.032E-03	0.4002	6.307E-03	0.5016	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.308E-06	0.0005
	5.490E-03	0.4366	7.077E-03	0.5628	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.035E-06	0.0006

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

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
o-	AAAAAAAAAAAAAAAA		AAAAAAAAAAAAAAAA		AAAAAAAAAAAAAAAA		AAAAAAAAAAAAAAAA		AAAAAAAAAAAAAAAA		AAAAAAAAAAAAAAAA		AAAAAAAAAAAAAAAA	
ide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
	AAAA	AAAAAAAAA	AAAAAA	AAAAAAAAA	AAAAAA	AAAAAAAAA	AAAAAA	AAAAAAAAA	AAAAAA	AAAAAAAAA	AAAAAA	AAAAAAAAA	AAAAAA	AAAAAAAA
4	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.682E-04	0.0531
5	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.600E-04	0.0445
8	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.135E-02	0.9023
l	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.257E-02	1.0000

n of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
le mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
2.340E-06	0.0002	6.668E-04	0.0530	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.271E-07	0.0000
4.575E-04	0.0363	1.126E-04	0.0089	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.134E-07	0.0000
5.032E-03	0.3998	6.308E-03	0.5012	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.309E-06	0.0005
5.492E-03	0.4363	7.087E-03	0.5631	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.049E-06	0.0006

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

Water Dependent Pathways

Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
le mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.697E-04	0.0532
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.702E-04	0.0453
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.135E-02	0.9015
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.259E-02	1.0000

of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

de	Ground mrem/yr	fract.	Inhalation mrem/yr	fract.	Radon mrem/yr	fract.	Plant mrem/yr	fract.	Meat mrem/yr	fract.	Milk mrem/yr	fract.	Soil mrem/yr	fract.
4	7.977E-06	0.0006	6.693E-04	0.0530	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.313E-07	0.0000
5	4.628E-04	0.0366	1.405E-04	0.0111	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.522E-07	0.0000
8	5.031E-03	0.3984	6.311E-03	0.4997	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.312E-06	0.0005
	5.502E-03	0.4356	7.121E-03	0.5638	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.095E-06	0.0006

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years

Water Dependent Pathways

de	Water mrem/yr	fract.	Fish mrem/yr	fract.	Radon mrem/yr	fract.	Plant mrem/yr	fract.	Meat mrem/yr	fract.	Milk mrem/yr	fract.	All Pathways* mrem/yr	fract.
4	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.779E-04	0.0537
5	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.034E-04	0.0478
8	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.135E-02	0.8985
	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.263E-02	1.0000

1 of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years

Water Independent Pathways (Inhalation excludes radon)

Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
de mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
6.558E-05	0.0051	6.781E-04	0.0529	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.652E-07	0.0001
4.815E-04	0.0376	2.374E-04	0.0185	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.873E-07	0.0000
5.029E-03	0.3923	6.322E-03	0.4931	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.322E-06	0.0005
5.576E-03	0.4349	7.238E-03	0.5645	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.275E-06	0.0006

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years

Water Dependent Pathways

Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
de mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.444E-04	0.0581
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.192E-04	0.0561
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.136E-02	0.8858
0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.282E-02	1.0000

of all water independent and dependent pathways.

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

Product	Branch	DSR(i,t) (mrem/yr)/(pCi/g)							
(j)	Fraction	t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
U-234	1.000E+00	7.856E-03	7.856E-03	7.856E-03	7.856E-03	7.855E-03	7.853E-03	7.848E-03	7.828E-03
Th-230	1.000E+00	0.000E+00	1.747E-07	5.241E-07	1.747E-06	5.240E-06	1.746E-05	5.231E-05	1.736E-04
Ra-226	1.000E+00	0.000E+00	8.689E-10	7.818E-09	8.678E-08	7.787E-07	8.563E-06	7.483E-05	7.527E-04
Pb-210	1.000E+00	0.000E+00	3.711E-14	9.864E-13	3.463E-11	8.095E-10	1.976E-08	2.523E-07	2.944E-06
aDSR(j)		7.856E-03	7.856E-03	7.856E-03	7.858E-03	7.861E-03	7.879E-03	7.975E-03	8.757E-03
U-235	1.000E+00	3.984E-02	3.984E-02	3.984E-02	3.984E-02	3.984E-02	3.984E-02	3.983E-02	3.981E-02
Pa-231	1.000E+00	0.000E+00	1.784E-06	5.351E-06	1.783E-05	5.349E-05	1.782E-04	5.333E-04	1.764E-03
Ac-227	1.000E+00	0.000E+00	1.611E-07	1.420E-06	1.468E-05	1.092E-04	7.142E-04	2.739E-03	9.800E-03
aDSR(j)		3.984E-02	3.984E-02	3.985E-02	3.987E-02	4.000E-02	4.073E-02	4.310E-02	5.137E-02
U-238	1.000E+00	1.259E-02	1.259E-02	1.259E-02	1.259E-02	1.259E-02	1.259E-02	1.259E-02	1.258E-02
U-234	1.000E+00	0.000E+00	2.227E-08	6.681E-08	2.227E-07	6.681E-07	2.227E-06	6.677E-06	2.222E-05
Th-230	1.000E+00	0.000E+00	2.476E-13	2.229E-12	2.476E-11	2.228E-10	2.475E-09	2.226E-08	2.465E-07
Ra-226	1.000E+00	0.000E+00	8.912E-16	2.221E-14	8.204E-13	2.210E-11	8.121E-10	2.145E-08	7.369E-07
Pb-210	1.000E+00	0.000E+00	0.000E+00	2.222E-18	2.494E-16	1.797E-14	1.571E-12	6.609E-11	2.792E-09
aDSR(j)		1.259E-02	1.259E-02	1.259E-02	1.259E-02	1.259E-02	1.259E-02	1.260E-02	1.261E-02

h Fraction is the cumulative factor for the j'th principal radionuclide daughter: CUMBRF(j) = BRF(1)*BRF(2)* ... BRF(j).
SR includes contributions from associated (half-life ó 0.5 yr) daughters.

Single Radionuclide Soil Guidelines G(i,t) in pCi/g
Basic Radiation Dose Limit = 30 mrem/yr

le								
t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
3.819E+03	3.819E+03	3.819E+03	3.818E+03	3.816E+03	3.807E+03	3.762E+03	3.426E+03
7.530E+02	7.530E+02	7.529E+02	7.524E+02	7.500E+02	7.366E+02	6.960E+02	5.840E+02
2.383E+03	2.383E+03	2.383E+03	2.383E+03	2.382E+03	2.382E+03	2.382E+03	2.380E+03

Summed Dose/Source Ratios DSR(i,t) in (mrem/yr)/(pCi/g)
and Single Radionuclide Soil Guidelines G(i,t) in pCi/g
at tmin = time of minimum single radionuclide soil guideline
d at tmax = time of maximum total dose = 1.000E+03 years

de	Initial pCi/g	tmin (years)	DSR(i,tmin) (pCi/g)	G(i,tmin)	DSR(i,tmax) (pCi/g)	G(i,tmax)
4	8.500E-02	1.000E+03	8.757E-03	3.426E+03	8.757E-03	3.426E+03
5	1.400E-02	1.000E+03	5.137E-02	5.840E+02	5.137E-02	5.840E+02
3	9.010E-01	1.000E+03	1.261E-02	2.380E+03	1.261E-02	2.380E+03

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

Parent	BRF(i)	DOSE(j,t), mrem/yr							
		t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
AAA AAAAAAA AAAAAAAAA		AAAAAAAAA AAAAAAAAA AAAAAAAAA AAAAAAAAA AAAAAAAAA AAAAAAAAA AAAAAAAAA AAAAAAAAA AAAAAAAAA							
U-234	1.000E+00	6.678E-04	6.678E-04	6.678E-04	6.677E-04	6.677E-04	6.675E-04	6.670E-04	6.654E-04
U-238	1.000E+00	0.000E+00	2.007E-08	6.020E-08	2.007E-07	6.020E-07	2.006E-06	6.016E-06	2.002E-05
ΣDOSE(j):		6.678E-04	6.678E-04	6.678E-04	6.679E-04	6.683E-04	6.695E-04	6.731E-04	6.854E-04
U-234	1.000E+00	0.000E+00	1.485E-08	4.454E-08	1.485E-07	4.454E-07	1.484E-06	4.446E-06	1.476E-05
U-238	1.000E+00	0.000E+00	2.231E-13	2.008E-12	2.231E-11	2.008E-10	2.230E-09	2.005E-08	2.221E-07
ΣDOSE(j):		0.000E+00	1.485E-08	4.455E-08	1.485E-07	4.456E-07	1.486E-06	4.466E-06	1.498E-05
U-234	1.000E+00	0.000E+00	7.386E-11	6.645E-10	7.376E-09	6.619E-08	7.278E-07	6.361E-06	6.398E-05
U-238	1.000E+00	0.000E+00	8.030E-16	2.001E-14	7.392E-13	1.991E-11	7.317E-10	1.933E-08	6.639E-07
ΣDOSE(j):		0.000E+00	7.386E-11	6.645E-10	7.377E-09	6.621E-08	7.286E-07	6.380E-06	6.464E-05
U-234	1.000E+00	0.000E+00	3.154E-15	8.384E-14	2.943E-12	6.881E-11	1.680E-09	2.144E-08	2.502E-07
U-238	1.000E+00	0.000E+00	0.000E+00	2.002E-18	2.247E-16	1.619E-14	1.415E-12	5.955E-11	2.516E-09
ΣDOSE(j):		0.000E+00	3.154E-15	8.385E-14	2.944E-12	6.882E-11	1.681E-09	2.150E-08	2.528E-07
U-235	1.000E+00	5.578E-04	5.578E-04	5.578E-04	5.577E-04	5.577E-04	5.577E-04	5.576E-04	5.574E-04
U-235	1.000E+00	0.000E+00	2.497E-08	7.491E-08	2.497E-07	7.489E-07	2.494E-06	7.466E-06	2.469E-05
U-235	1.000E+00	0.000E+00	2.256E-09	1.988E-08	2.056E-07	1.528E-06	9.999E-06	3.834E-05	1.372E-04
U-238	1.000E+00	1.134E-02	1.134E-02	1.134E-02	1.134E-02	1.134E-02	1.134E-02	1.134E-02	1.134E-02

is the branch fraction of the parent nuclide.

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

; Parent (i)	BRF(i)	S(j,t), pCi/g t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
U-234	1.000E+00	8.500E-02	8.500E-02	8.500E-02	8.500E-02	8.499E-02	8.497E-02	8.491E-02	8.470E-02
U-238	1.000E+00	0.000E+00	2.554E-06	7.663E-06	2.554E-05	7.662E-05	2.554E-04	7.658E-04	2.549E-03
âS(j):		8.500E-02	8.500E-02	8.501E-02	8.502E-02	8.507E-02	8.523E-02	8.568E-02	8.725E-02
) U-234	1.000E+00	0.000E+00	7.652E-07	2.295E-06	7.651E-06	2.295E-05	7.647E-05	2.291E-04	7.604E-04
) U-238	1.000E+00	0.000E+00	1.150E-11	1.035E-10	1.150E-09	1.035E-08	1.149E-07	1.033E-06	1.145E-05
) âS(j):		0.000E+00	7.652E-07	2.296E-06	7.652E-06	2.296E-05	7.658E-05	2.302E-04	7.718E-04
3 U-234	1.000E+00	0.000E+00	1.657E-10	1.491E-09	1.655E-08	1.485E-07	1.633E-06	1.427E-05	1.435E-04
3 U-238	1.000E+00	0.000E+00	1.802E-15	4.489E-14	1.658E-12	4.468E-11	1.642E-09	4.336E-08	1.490E-06
3 âS(j):		0.000E+00	1.657E-10	1.491E-09	1.655E-08	1.485E-07	1.635E-06	1.432E-05	1.450E-04
) U-234	1.000E+00	0.000E+00	1.704E-12	4.529E-11	1.590E-09	3.717E-08	9.074E-07	1.158E-05	1.352E-04
) U-238	1.000E+00	0.000E+00	0.000E+00	1.081E-15	1.214E-13	8.744E-12	7.646E-10	3.216E-08	1.359E-06
) âS(j):		0.000E+00	1.704E-12	4.529E-11	1.590E-09	3.718E-08	9.081E-07	1.161E-05	1.365E-04
U-235	1.000E+00	1.400E-02	1.400E-02	1.400E-02	1.400E-02	1.400E-02	1.400E-02	1.400E-02	1.399E-02
I U-235	1.000E+00	0.000E+00	2.962E-07	8.886E-07	2.962E-06	8.883E-06	2.959E-05	8.856E-05	2.929E-04
/ U-235	1.000E+00	0.000E+00	4.665E-09	4.112E-08	4.252E-07	3.161E-06	2.068E-05	7.931E-05	2.838E-04
U-238	1.000E+00	9.010E-01	9.010E-01	9.010E-01	9.010E-01	9.010E-01	9.009E-01	9.008E-01	9.004E-01

ı is the branch fraction of the parent nuclide.

ANNEX 7.2

RFI ANALYTICAL RESULTS

All analytical data are available on FIMAD. If FIMAD is not accessible, data will be provided upon request. A hard copy of the data is available in the RFI report (Environmental Restoration Project 1995, 1283). Additional information regarding the 1996 IA waste characterization effort is presented in the "Response to NOD for RFI Report for Potential Release Sites in Technical Areas 18 & 27"(Environmental Restoration Project 1997, ER ID No. XXXX). Additional information is also available on PRS 18-003(d) in the Corrective Action Report for TA-18 (Environmental Restoration Report 1996, ER ID No. XXXX).

ANNEX 7.3

SITE MAP

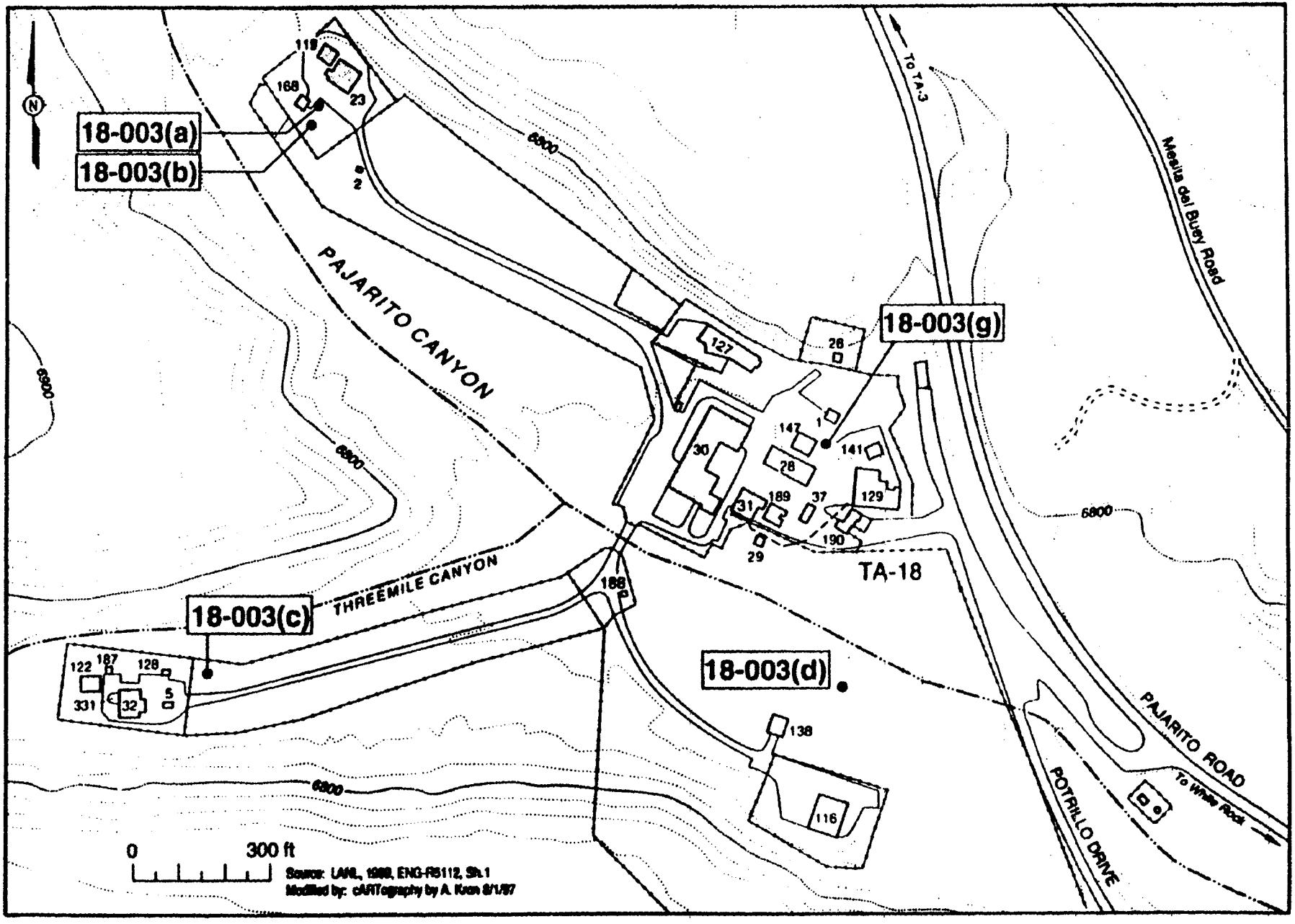

Figure 7.3-1. Locations of septic systems at TA-18.

ANNEX 7.4

IMPLEMENTATION SOPS

See Environmental Restoration Standard Operating Procedures, Volumes I and II, November 17, 1993, Los Alamos National Laboratory.

ANNEX 7.5

QUALITY ASSURANCE PLAN

See Quality Program Plan and Quality Assurance Project Plan for Environmental Restoration, February 1995 revision, Los Alamos National Laboratory.

ANNEX 7.6

SITE-SPECIFIC HEALTH AND SAFETY PLAN

Prior to initiation of any work, a completed Site Specific Health and Safety Plan (SSHASP) will be approved by LANL representatives.

The SSHASP will be developed for the Environmental Restoration (ER) Project at LANL to comply with applicable federal and state occupational health and safety (HS) requirements, including those of the US Department of Energy (DOE). The DOE requires the Laboratory to comply with the federal Occupational Safety and Health Administration (OSHA) requirements, even though operations at the Laboratory are not subject to the jurisdiction of OSHA. The ER Project has developed a generic Health and Safety Plan, the ER Project Health and Safety Plan (HASP), which establishes HS information and requirements applicable to ER field operations projectwide. The SSHASP establishes site-specific HS information and requirements applicable to the scope of work described in Section 2.

ER participants are responsible for conducting work in accordance with applicable regulations. The term "ER participants" refers to anyone performing ER work, including Laboratory personnel, subcontractors to the Laboratory and their lower-tier contractors, consultants, and agents. In some cases within this document, the Laboratory has chosen to invoke OSHA and Laboratory requirements that ordinarily may not apply to ER field operations (e.g., OSHA's general industry standards in Part 1910 of Title 29 of the Code of Federal Regulations [29 CFR 1910]). These choices were made on a case-by-case basis to maintain consistency with LANL's as low as reasonably achievable (ALARA) policy and to clarify the Laboratory's expectations with regard to interpretable requirements of the multiple agencies governing ER work. Where there is concern that implementation of work orders or HS requirements would conflict with contract terms, or that they could unreasonably compromise the safety or health of an individual or the environment, such concerns should immediately be brought to the attention of the Contract Administrator and the Field Unit HS Representative. Failure to comply with terms of HS plans may constitute cause to stop an activity or to issue a stop work order, as specified in Section 3.4.2 of the HASP, without cost or penalty to the Laboratory.

This SSHASP shall be reviewed and approved in accordance with Section 1.2 of the HASP. When this SSHASP has been approved, revisions will be tracked using a SSHASP modification form (Appendix B of the HASP) per Section 1.3 of the HASP. Modifications to this SSHASP may result in a change to the terms or scope of a subcontract. Completion of an SSHASP modification form is <u>not</u> the means for modifying the scope or terms of the project contract. To modify a contract, the Subcontractor shall notify the Contract Administrator and Field Unit HS Representative under the changes clause and shall not make the change until a change order has been mutually agreed upon by all parties, or unless unilateral direction is given by the Contract Administrator.

The SSHASP will be presented in a format similar to this example:

1.0 Introduction

2.0 Background Information

Table 2-1 Site Description(s)
Table 2-2 Scope of Work

3.0 Organization, Responsibilities and Authority

4.0 Hazard Analysis
4.1 Personnel by Task
4.2 Hazard Substances of Occupational Health Concern
4.3 Hazard Assessment and Administrative/Engineering Controls

5.0 Site Controls

6.0 Exposure Monitoring and Corresponding Actions
6.1 Direct-Reading Monitoring
6.2 Personal Dosimetry
6.3 Area Sampling

7.0 Personal Protective Equipment

8.0 Decontamination

9.0 Emergency/Incident Action Plan

10.0 Training

11.0 Medical Surveillance

12.0 Quality Control and Quality Assurance (QC/QA)

13.0 Recordkeeping

Appendixes
A Map(s) of Site Locations and Site Control Zones/Facilities
B Hazardous Substance - Hazard Assessment
C Chemical, Physical, and Toxicological Properties of Hazardous Chemical Substances
D Emergency Contacts and Route(s) to Medical Services

ANNEX 7.7

WASTE MANAGEMENT CHECKLIST

WASTE CHARACTERIZATION STRATEGY FORM

OU Number/FU	PRS/SWMU Number	Title
1093/FU2	18-003(a, b, c & d)	Inactive Septic Tanks
All Waste Types or Wastestreams: Residual and rinse liquids from tanks, final rinse of tanks, PPE and sampling equipment, and decontamination liquids		

Completed By J W Heyser	Date August 21, 1997
FPL T E. Gene Gould	WMC Jeff Bingham, EES-15
Type of Activity (site investigation, EC, etc) VCA	

Description of the Activity (e.g., drilling, surface sampling, excavation and recontouring, soil washing, etc)

VCA Activities The purpose of the VCA sampling is to characterize the residual liquid in these septic tanks, rinse them again, and then fill each tank with concrete (Flowcrete) Earlier the liquid and sludge contents were removed from the following four septic tanks, PRSs 18-003(a, b, c & d) The insides of the tanks were then decontaminated with three rinses of water Since then each tank has accumulated additional liquid (attributed to groundwater, which varies from a trace volume to approximately 200 gal) After the residual liquid is removed, each tank will be rinsed again and this rinse water will be combined with the residual tank liquid This liquid will be sampled for VOCs, SVOCs, TAL metals, isotopic uranium, isotopic plutonium, and tritium A final rinse will then be performed and this liquid will be put in separate drums The final rinse liquid will be sampled for VOCs, SVOCs, TAL metals, and isotopic uranium Liquid sample results will be used solely for the purpose of characterizing the liquid wastes Additional analyses may be required by the TSDs that accept these wastes

Concrete samples will then be removed from the floor of each tank at three locations and sampled for the same analytes listed above, except for tritium If hazardous or radioactive materials in the concrete samples are in excess of EPA's Region 9 Preliminary Remediation Goals (PRGs) that tank will not be filled with Flowcrete Wastes generated during the VCA include the combined residual and rinse liquids, final rinse liquids, PPE and sampling equipment, and the decontamination liquids used on the PPE/sampling equipment The residual and rinse liquids, final rinse liquids, and decontamination liquids for the PPE/sampling equipment will be stored onsite for later disposed an approved TSD

Acceptable Knowledge Site Description, Site History, and Historical Waste Generating Processes or Activities (Include dates for site history) The septic tanks in PRSs 18-003 (b, c, & d) had their inlet lines plugged in 1995 The PRS 18-003(a) tank inlet was plugged in 1997

PRS 18-003(a) [Settling Pit TA-18-105] served Kiva 1 and was first used in 1947 It is 5 3 ft wide x 5 3 ft long x 12 ft high and holds 2,500 gal The acid sinks from Kiva 1 drained into this settling pit and its water contained radionuclides

PRS 18-003(b) [Septic Tank TA-18-39] served the sanitary sewer system of Kiva 1 and was first used in 1947 Its dimensions are 4 ft wide x 7 ft long x 5 5 ft high with a 524 gal capacity

PRS 18-003(c) [Septic Tank TA-18-42] served the sanitary sewer system of Kiva 2 and was first used in 1952 The tank measures 6 ft in diameter x 7 ft in length and has a 587 gal capacity This tank reportedly only received sanitary waste from Kiva 2

PRS 18-003(d) [Septic Tank TA-18-120] served the sanitary sewer system in Kiva 3 and was first used in 1960 The tank has an estimated capacity of 500 gal A high oil content was reported in this septic tank in 1982 (1093 RFI Report, November 1995)

WASTE CHARACTERIZATION STRATEGY FORM

OU Number/FU	PRS/SWMU Number	Title
1093/FU2	18-003(a, b, c & d)	Inactive Septic Tanks
All Waste Types or Wastestreams: Residual and rinse liquids from tanks, final rinse of tanks, PPE, and sampling equipment, and decontamination liquids		

Previous Invesugation Analytical Results (Report the analytical methods and results above background levels) In Phase I, tank liquids were sampled for metals, total uranium, isotopic plutonium, and VOCs (18-003(d) only) Tank sludges were sampled for VOCs, SVOCs, metals, total uranium, and /or isotopic uranium Ground water, subsurface soils, and surface soils were sampled for some or all of the following VOCs SVOCs, meals, chloride, nitrate, total uranium, isotopic plutonium, and by a gamma scan The following results are for the contents of the tanks before they were removed The empty tanks were then decontaminated with three rinses Generally, the tank sludges had the highest concentrations of contaminants. The second and third rinses of 18-003(d) were sampled for VOCs

In PRS 18-003(a) the sludge had maximum values for cadmium (14 7 mg/kg), chromium (24 4 mg/kg), lead (740 mg/kg), mercury (20 mg/kg) and silver (5 2 mg/kg) Organics included several PAHs, acetone (1,300 µg/l), tetrachloroethylene (2,000 µg/l), and trichloroethene (409,800 µg/l). Maximum radionuclides in the sludge were Pu-238 (2 97 pCi/g), Pu-239 (6 87 pCi/g), and total U (590 mg/kg)

In PRS 18-003(b) the sludge had maximum values for barium (400 mg/kg), beryllium (1 7 mg/kg), cadmium (3 2 mg/kg), chromium (22 mg/kg), lead (110 mg/kg), mercury (12 mg/kg) and silver (1 8 mg/kg) Organics included 1,2-dichloroethane (10 µg/l), and di-N-butyl-phthalate (12 2 µg/l) in the associated groundwater Maximum radionuclides in the sludge were Pu-238 (0.2 pCi/g), PU-239 (0 2 pCi/g), and total U (28 1 mg/kg) U-235 was 0 52 pCi/g in the adjacent subsurface soil

In PRS 18-003(c), the sludge had maximum values for barium (960 mg/kg), cadmium (11 5 mg/kg), chromium (12 2 mg/kg), lead (133 mg/kg) mercury (253 mg/kg), and silver (4 1 mg/kg) Organics included acetone (26 1 µg/l) and 1,2-dichloroethane (7 0 µg/l) in associated groundwater. Subsurface soil organics included 2,4 dinitrotoluene (6 6 mg/kg), hexachloroethane (0 92 mg/kg), pentachlorophenol (6 6 mg/kg), and 2,4,6-trichlorophenol (5 3 mg/kg) Maximum radionuclides in the sludge were Pu-238 (1 6 pCi/g) Pu-239 (62 2 pCi/g), and total U (660 mg/kg)

In PRS 18-003(d), the sludge had maximum values for barium (58 mg/kg), beryllium (1 9 mg/kg), cadmium (6 6 mg/kg), chromium (14 8 mg/kg), lead (138 mg/kg), mercury (17 mg/kg), and silver (170 mg/kg) Organics included acetone (260 µg/l), chloroethane (2,000 µg/l), and trichloroethene (1,000 µg/l) in the sludge, and 1,2-dichloroethane (13 µg/l) and cis-1,2-dichlororethylene (740 µg/l) in the water Maximum radionuclides in the sludge were Pu-238 (0 425 pCi/g), Pu-239 (0 97 pCi/g) and total U (50 mg/kg) The combined second and third rinses liquids contained trans-1,1-dichloroethene (56 µg/l), cis-1,2-dichloroethene (17 µg/l) and trichloroethene (530 µg/l)

The residual liquid in PRS 18-003(d) was sampled for VOCs, SVOCs TAL metals and iso-U in July 1997 Organics detected were chloroethane (5 µg/l), methylene chloride (14 µg/l), 1,1-dichloroethane (55 µg/l), cis-1,2-dichloroethene (21 µg/l), 1,1,1-trichloroethane (160 µg/l), and trichloroethene (21 µg/l) The only TAL metals detected were barium (56 1 µg/l) and selenium (3 6 µg/l) Isotopic uranium levels by alpha spectroscopy were U-234 (2 98 pCi/l), U-235 (0 092 pCi/l) and U-238 (0 106 pCi/l)

Above results are from the 1093 RFI Report (November 1995), 1093 RFI Report Addendum (April 1996), and subsequent analyses taken in 18-003(d) in July 1997

WASTE CHARACTERIZATION STRATEGY FORM

OU Number/FU	PRS/SWMU Number	Title
1093/FU2	18-003(a, b, c, & d)	Inactive Septic Tanks
Specific Waste Type Residual and rinse liquids from tanks		

Waste Description

Description of Waste Type, Potential Contaminants, Volume Estimate, and Waste Packaging

Waste Type Description Residual tank liquids and rinse liquids
Potential Regulatory Status RCRA or mixed waste
Volume Estimate Up to four 55-gal drums per tank for a total of 16 55-gal drums
Waste Packaging The residual liquid and rinse liquid for each tank will be placed in 55-gal drums and stored onsite until all liquid samples from the drums are evaluated to determine their RCRA status

Characterization Strategy

Description of Strategy

After the liquid and sludge was removed from each septic tank in an earlier effort, the tank was then rinsed three times The residual liquid present in the tanks is probably from groundwater as all tanks are situated below the groundwater table After the residual liquid is removed, each tank will be rinsed again (in effect a fourth rinse). Residual and rinse liquids will be combined and stored in 55-gal drums The residual liquids will be analyzed before they are diluted by the initial rinse liquids for VOCs, SVOCs, TAL metals, isotopic uranium, isotopic plutonium and tritium The rinse liquids will be given the same waste classification as the residual tank liquids Additional analyses may be required by the TSD that accepts these wastes

Waste Sampling* (If sampling will be used, indicate how many grab or composite samples will be collected per container or volume of waste and whether the waste is considered homogeneous or heterogeneous)
One grab sample for each septic tank is considered representative because both the residual liquid and rinse liquid should relatively homogenous.

* Grab sampling is appropriate for wastes that are fairly homogeneous, such as liquid wastes
* Composite sampling is appropriate for wastes that are heterogeneous, such as soil, sediment, and debris.

Analytical Strategy

Analyte Category	Analytical Method	May be Present (yes, no, unknown)	Direct Sampling of Containerized Waste	Acceptable Knowledge Existing Information	Acceptable Knowledge Data from Proposed Site Characterization
Volatile Organic Constituents	SW 846 8260	Unk	X		
Semivolatile Constituents	SW 846	Unk	X		
Organic Pesticides		No		X	
Organic Herbicides		No		X	
Pesticides and PCBs		No		X	
PCBs		No		X	

WASTE CHARACTERIZATION STRATEGY FORM

OU Number/FU	PRS/SWMU Number	Title
1093/FU2	18-003(a, b, c, & d)	Inactive Septic Tanks
Specific Waste Type: Residual and rinse liquids from tanks		

Analytical Strategy (Continued)

Analyte Category	Analytical Method	May be Present (yes, no, unknown)	Direct Sampling of Containerized Waste	Acceptable Knowledge Existing Information	Acceptable Knowledge Data from Proposed Site Characterization
Total Metals	SW 846 6010	Unk	X		
Total Cyanide		No		X	
Other Inorganic Constit. (specify)		No		X	
High Explosive Constituents		No		X	
Asbestos		No		X	
TPH		No		X	
TCLP Metals		Unk		X	
TCLP Organics		No		X	
TCLP Pest. & Herb		No		X	
Gross Alpha	Field				X
Gross Beta	Screen				X
Gross Gamma	"				X
Tritium[1]		No	X		
Gamma Spectro		No		X	
Isotopic Plutonium		Unk	X		
Total Plutonium		Unk		X	
Isotopic Uranium		Unk	X		
Total Uranium		Unk		X	
Strontium-90		No		X	
Americium-241		No		X	

[1] If tritium is not expected, attach a statement signed by the FPL stating that, based on a review of the available information and professional judgment, it is not necessary to sample for tritium at this site

WASTE CHARACTERIZATION STRATEGY FORM

OU Number/FU	PRS/SWMU Number	Title
1093/FU2	18-003(a, b, c, & d)	Inactive Sepuc Tanks
Specific Waste Type: Residual and rinse liquids from tanks		

Preliminary RCRA Determination

Based on available information, indicate the waste and whether it could potentially be any of the wastes as defined in 40 CFR 261. List the F-, D-, K-, P-, or U- category and number.

These liquids may be RCRA or mixed waste because residual contaminates may remain even though the tanks were rinsed three times after the original liquids and sludge were removed. Residual water is probably due to groundwater entering the tank through the inlet and outlet pipes because the tanks sit below the groundwater table at TA-18. A final RCRA determination of the status of these liquids will be based on the liquid sample results for each tank.

Preliminary RCRA Status

_____ Non-RCRA (No 90-Day Storage Requirement)
Describe how waste will be stored/handled

__X__ RCRA (90-Day Storage Requirement)
Waste will be stored/handled in accordance with 20 NMAC Generator Requirements
The liquid wastes will be stored onsite in sealed 55-gal. drums until a final RCRA determination is made.

Preliminary Determination for Radioactivity

Based on available information, indicate the amount and type of radiation contamination expected in the waste.

The liquids are expected to be non-radioactive, because the tanks were rinsed three times after the original liquid and sludge were removed. However, a final determination of their radioactive status will be based on an evaluation of the analytical results for each tank.

Preliminary Radioactivity Status

_____ Material is not radioactive
Describe how waste will be stored/handled

__X__ Material is radioactive
Describe the controlled area, labeling, and protection against inadvertent contamination
The liquids will be stored in sealed 55-gal. drums onsite until their final radioactive status is determined. The storage area will be labeled as a storage area for radioactive materials.

WASTE CHARACTERIZATION STRATEGY FORM

OU Number/FU	PRS/SWMU Number	Title
1093/FU2	18-003(a, b, c, & d)	Inactive Septic Tanks
Specific Waste Type Final rinse of tanks		

Waste Description

Description of Waste Type, Potential Contaminants, Volume Estimate, and Waste Packaging

Waste Type Description Liquid used in final rinse of tanks
Potential Regulatory Status Non-hazardous and non-radioactive
Volume Estimate Two 55-gal drums per tank for a total of 8 55-gal drums
Waste Packaging The final rinse liquid from each tank will be stored onsite in sealed 55-gal drums until a final RCRA determination is made

Characterization Strategy

Description of Strategy

After the residual liquid and initial rinses are removed from each tank, a final rinse will be performed and this liquid will be segregated These liquids are expected to be non-hazardous and non-radioactive, however, the following analyses will be used to determine their waste status: VOCs, SVOCs, TAL metals, and isotopic uranium The analyses performed on the residual tank liquid and initial rinses (combined in the same drums) will also provide additional information on the waste classification of this final rinse liquid The analyses performed on the final rinse liquid will be compared with those for the residual liquid and initial rinses to determine the effectiveness of this cleanup Additional analyses may be required by the TSD that accepts these wastes

Waste Sampling*. (If sampling will be used, indicate how many grab or composite samples will be collected per container or volume of waste and whether the waste is considered homogeneous or heterogeneous)
One grab sample for the final rinse liquid from each septic tank is considered representative because this liquid should be relatively homogenous

* Grab sampling is appropriate for wastes that are fairly homogeneous, such as liquid wastes
* Composite sampling is appropriate for wastes that are heterogeneous, such as soil, sediment, and debris

Analytical Strategy

Analyte Category	Analytical Method	May be Present (yes, no, unknown)	Direct Sampling of Containerized Waste	Acceptable Knowledge Existing Information	Acceptable Knowledge Data from Proposed Site Characterization
Volatile Organic Constituents	SW 846 8260	Unk	X		
Semivolatile Constituents	SW 846 8270	Unk	X		
Organic Pesticides		No		X	
Organic Herbicides		No		X	
Pesticides and PCBs		No		X	
PCBs		No		X	

WASTE CHARACTERIZATION STRATEGY FORM

OU Number/FU	PRS/SWMU Number	Title
1093/FU2	18-003(a, b, c, & d)	Inactive Septic Tanks
Specific Waste Type: Final rinse of tanks		

Analytical Strategy (Continued)					
Analyte Category	Analytical Method	May be Present (yes, no, unknown)	Direct Sampling of Containerized Waste	Acceptable Knowledge Existing Information	Acceptable Knowledge Data from Proposed Site Characterization
Total Metals	SW 846 6010	Unk	X		
Total Cyanide		No		X	
Other Inorganic Constit. (specify)		No		X	
High Explosive Constituents		No		X	
Asbestos		No		X	
TPH		No		X	
TCLP Metals		Unk		X	
TCLP Organics		No		X	
TCLP Pest. & Herb		No		X	
Gross Alpha	Field	Unk			X
Gross Beta	Screen	Unk			X
Gross Gamma	"	Unk			X
Tritium*		Unk			X
Gamma Spectro		Unk		X	
Isotopic Plutonium		Unk			X
Total Plutonium		Unk		X	
Isotopic Uranium	HASL 300	Unk	X		
Total Uranium		Unk		X	
Strontium-90		No		X	
Americium-241		No		X	

* If tritium is not expected, attach a statement signed by the FPL stating that, based on a review of the available information and professional judgment, it is not necessary to sample for tritium at this site.

WASTE CHARACTERIZATION STRATEGY FORM

OU Number/FU	PRS/SWMU Number	Title
1093/FU2	18-003(a, b, c, & d)	Inactive Septic Tanks
Specific Waste Type: Final rinse of tanks		

Preliminary RCRA Determination

Based on available information, indicate the waste and whether it could potentially be any of the wastes as defined in 40 CFR 261. List the F-, D-, K-, P-, or U- category and number.

The original liquids and sludges in these tanks were mixed waste due to the presence of organics, plutonium and/or uranium. After these were taken from the tanks, three rinses were performed to remove residual debris. Since then liquid (suspected groundwater) has entered each tank. After this liquid is removed, an initial rinse will be done and then this final rinse will be performed. This final rinse liquid is expected to be non-hazardous and non-radioactive. A final RCRA determination of the status of these liquids will be based on an evaluation of the analytical results for each tank.

Preliminary RCRA Status

__X__ Non-RCRA: (No 90-Day Storage Requirement)
Describe how waste will be stored/handled:
The liquids will be stored onsite in sealed 55-gal. drums until their analytical results are evaluated

_____ RCRA: (90-Day Storage Requirement)
Waste will be stored/handled in accordance with 20 NMAC Generator Requirements

Preliminary Determination for Radioactivity

Based on available information, indicate the amount and type of radiation contamination expected in the waste.

As stated above, this final rinse will be at least the fifth rinse and is not expected to have above background levels of radiation. A final determination as to its radioactive status will be made after the sample results for each tank are evaluated.

Preliminary Radioactivity Status

__X__ Material is not radioactive
Describe how waste will be stored/handled
The liquids will be stored onsite in sealed 55-gal. drums

_____ Material is radioactive
Describe the controlled area, labeling, and protection against inadvertent contamination

WASTE CHARACTERIZATION STRATEGY FORM

OU Number/FU	PRS/SWMU Number	Title
1093/FU2	18-003(a, b, c & d)	Inactive Septic Tanks
Specific Waste Type: PPE and sampling equipment		

Waste Description

Description of Waste Type, Potential Contaminants, Volume Estimate, and Waste Packaging

Waste Type Description: PPE & sampling equipment
Potential Regulatory Status: Visibly contaminated items will be initially considered RCRA or mixed waste (based on the radiological field screening results). Visibly uncontaminated items will be considered non-hazardous or radioactive waste based on similar field screening results.
Volume Estimate: The volume generated will be four 55-gal. drums.
Waste Packaging: The PPE will be placed in sealed and labeled plastic bags that are segregated into visibly contaminated and uncontaminated categories. The sealed bags will be stored in 55-gal. drums at the PRS.

Characterization Strategy

Description of Strategy

If possible, the PPE/sampling equipment will be decontaminated prior to disposal. After decontamination, the PPE/sampling equipment will be field screened for gross alpha, gross beta and gross gamma radiation in accordance with LANL-ER-SOP-10.07, "Field Monitoring for Surface and Volume Radioactivity Levels." Gross alpha radiation will be screened using an alpha probe, gross beta radiation will be screened using a beta/gamma probe, and gross gamma radiation will be screened using a Ludlum Model 2221 Scaler/Ratemeter with a Ludlum Model 44-10 2" x 2" Gamma Scintillator (SPA-3), which is equivalent to micro-R. The waste will be inspected to determine if there is any visible contamination. If it is not visibly contaminated and does not have readings above background radioactivity, it will be disposed as non-hazardous waste.
If the PPE/sampling equipment is not decontaminated or if decontamination is not effective, the contaminated piece(s) will be placed in separate plastic bags, segregated by PRS. Each plastic bag will be labeled with the PRS number. The RCRA and radioactivity status of the contaminated items will be based on the analytical results of residual liquid and tank rinse samples (analyzed for VOCs, SVOCs, TAL metals, isotopic uranium, isotopic plutonium, and tritium). The visibly contaminated PPE/sampling equipment will be assumed to have a similar level of contamination as the highest level reported in a single liquid sample at the PRS where this waste was generated.
Waste Sampling* (If sampling will be used, indicate how many grab or composite samples will be collected per container or volume of waste and whether the waste is considered homogeneous or heterogeneous.)
The PPE/sampling equipment will not be directly sampled, but will be characterized based on the soil and liquid results as described above.

* Grab sampling is appropriate for wastes that are fairly homogeneous, such as liquid wastes.
* Composite sampling is appropriate for wastes that are heterogeneous, such as soil, sediment, and debris.

WASTE CHARACTERIZATION STRATEGY FORM

OU Number/FU	PRS/SWMU Number	Title
1093/FU2	18-003(a, b, c & d)	Inactive Septic Tanks
Specific Waste Type: PPE and sampling equipment		

Analytical Strategy

Analyte Category	Analytical Method	May be Present (yes, no, unknown)	Direct Sampling of Containerized Waste	Acceptable Knowledge Existing Information	Acceptable Knowledge Data from Proposed Site Characterization
Volatile Organic Constituents		Unk			X
Semivolatile Constituents		Unk			X
Organic Pesticides		No		X	
Organic Herbicides		No		X	
Pesticides and PCBs		No			
PCBs		No			
Total Metals		Unk			X
Total Cyanide		No		X	
Other Inorganic Constit (specify)		No		X	
High Explosive Con		No		X	
Asbestos		No		X	
TPH		No		X	
TCLP Metals		Unk		X	
TCLP Organics		No		X	
TCLP Pest. & Herb		No		X	
Gross Alpha	Field	Unk	X		
Gross Beta	Screen	Unk	X		
Gross Gamma	"	Unk	X		
Tritium[1]		Unk			X
Gamma Spectroscopy		Unk		X	
Isotopic Plutonium		Unk			X
Total Plutonium		No		X	
Isotopic Uranium		Unk			X
Total Uranium		No		X	
Strontium-90		No		X	
Americium-241		No		X	

[1] If tritium is not expected, attach a statement signed by the FPL stating that, based on a review of the available information and professional judgment, it is not necessary to sample for tritium at this site

WASTE CHARACTERIZATION STRATEGY FORM

OU Number/FU	PRS/SWMU Number	Title
1093/FU2	18-003(a, b, c & d)	Inactive Septic Tanks
Specific Waste Type: PPE and sampling equipment		

Preliminary RCRA Determination

Based on available information, indicate the waste and whether it could potentially be any of the wastes as defined in 40 CFR 261. List the F-, D-, K-, P-, or U- category and number

During Phase I sampling of the septic tank liquids and sludges, metals, organics and radionuclides were present. The liquids and sludges were removed and the tanks were cleaned so these hazardous constituents should already be removed. PPE/sampling equipment will be segregated according to the PRS where they were used. Visibly uncontaminated PPE/sampling equipment with no elevated readings will be considered non-hazardous waste. Visibly contaminated PPE/sampling equipment will be disposed based on the sample results for the residual and rinse liquids from each septic tank. A final RCRA determination for the visibly contaminated PPE/sampling equipment will be based on an evaluation of the corresponding sample results for the tank where they were used.

Preliminary RCRA Status

__X__ Non-RCRA (No 90-Day Storage Requirement)

Describe how waste will be stored/handled

Visibly uncontaminated PPE/sampling equipment will be managed as non-RCRA waste and disposed as non-hazardous waste

__X__ RCRA (90-Day Storage Requirement)

Waste will be stored/handled in accordance with 20 NMAC Generator Requirements

Visibly contaminated PPE/sampling equipment will be managed as potential RCRA waste and stored onsite until the soil and liquid analytical results are evaluated and a final RCRA determination is made

Preliminary Determination for Radioactivity

Based on available information, indicate the amount and type of radiation contamination expected in the waste

Low-levels of Pu-238, Pu-239 and uranium were present in the tank liquids and sludges. However these were removed and the tanks were cleaned with three rinses. Visibly contaminated PPE/sampling equipment may be low-level radioactive. A final determination will be based on the analytical results of the residual liquid and rinse samples

Preliminary Radioactivity Status

__X__ Material is not radioactive

Describe how waste will be stored/handled

Visibly uncontaminated waste with no elevated radiation readings will be managed as non-radioactive waste

__X__ Material is radioactive

Describe the controlled area, labeling, and protection against inadvertent contamination

Visibly contaminated waste with elevated radiation readings will be stored onsite in labeled drums in an area designated as a storage area for radioactive materials until a final radioactive determination is made

WASTE CHARACTERIZATION STRATEGY FORM

OU Number/FU	PRS/SWMU Number	Title
1093/FU2	18-003(a, b, c & d)	Inactive Septic Tanks
Specific Waste Type: Decontamination liquids		

Waste Description

Description of Waste Type, Potential Contaminants, Volume Estimate, and Waste Packaging

Waste Type Description: Decontamination liquids consist of Liquinox® detergent, tap water and distilled water
Potential Regulatory Status: Non-hazardous waste
Volume Estimate: A total volume of less than four 55-gal drums
Waste Packaging: The liquids will be placed inside 55-gallon drums. Decontamination liquids generated during VCA activities will be disposed at TA-46, TA-50 or other approved TSD

Characterization Strategy

Description of Strategy

The decontamination liquids will be characterized for RCRA based on the results of an analysis of residual septic tank liquid and rinse samples. The decon liquids will be stored onsite until they are disposed at an approved TSD. Their final waste classification will be based on the corresponding liquid analytical results for each PRS. Further analyses may be required to meet the waste acceptance criteria of the TSD after the hazard and radioactive determination is made

Waste Sampling* (If sampling will be used, indicate how many grab or composite samples will be collected per container or volume of waste and whether the waste is considered homogeneous or heterogeneous.)
The decon liquids will not be directly sampled, but will be characterized based on the results of the corresponding liquid samples

* Grab sampling is appropriate for wastes that are fairly homogeneous, such as liquid wastes
* Composite sampling is appropriate for wastes that are heterogeneous, such as soil, sediment, and debris

Analytical Strategy

Analyte Category	Analytical Method	May be Present (yes, no, unknown)	Direct Sampling of Containerized Waste	Acceptable Knowledge Existing Information	Acceptable Knowledge Data from Proposed Site Characterization
Volatile Organic Con		Unk			X
Semivolatile Cons		Unk			X
Organic Pesticides		No		X	
Organic Herbicides		No		X	
Pesticides and PCBs		No		X	
PCBs		No		X	

WASTE CHARACTERIZATION STRATEGY FORM

OU Number/FU	PRS/SWMU Number	Title
1093/FU2	18-003(a, b, c & d)	Inactive Septic Tanks
Specific Waste Type: Decontamination Liquids		

Analytical Strategy (Continued)

Analyte Category	Analytical Method	May be Present (yes, no, unknown)	Direct Sampling of Containerized Waste	Acceptable Knowledge Existing Information	Acceptable Knowledge Data from Proposed Site Characterization
Total Metals		Unk			X
Total Cyanide		No		X	
Other Inorganic Constit. (specify)		No		X	
High Explosive Con.		No		X	
Asbestos		No		X	
TPH		No		X	
TCLP Metals		Unk		X	
TCLP Organics		No			
TCLP Pesticides and Herbicides		No			
Gross Alpha	Field	Unk			X
Gross Beta	Screen	Unk			X
Gross Gamma	"	Unk			X
Tritium[1]		Unk			X
Gamma Spectroscopy		Unk		X	
Isotopic Plutonium		Unk			X
Total Plutonium		Unk		X	
Isotopic Uranium		Unk			X
Total Uranium		Unk		X	
Stronium-90		No		X	
Americium-241		No		X	

[1] If tritium is not expected, attach a statement signed by the FPL stating that, based on a review of the available information and professional judgment, it is not necessary to sample for tritium at this site

WASTE CHARACTERIZATION STRATEGY FORM

OU Number/FU	PRS/SWMU Number	Title
1093/FU2	18-003(a, b, c & d)	Inactive Septic Tanks
Specific Waste Type: Decontamination liquids		

Preliminary RCRA Determination

Based on available information, indicate the waste and whether it could potentially be any of the wastes as defined in 40 CFR 261. List the F-, D-, K-, P-, or U- category and number.

During Phase I sampling, metals, organics, and radionuclides were present in the septic tank liquids and sludges. These wastes were removed and the insides of the tanks were rinsed three times. The decontamination liquids used on the PPE/sampling equipment are expected to be non-hazardous and non-radioactive. However, a final RCRA determination will be made after the samples for the soil and tank liquid rinses are evaluated.

Preliminary RCRA Status

__X__ Non-RCRA (No 90-Day Storage Requirement)
Describe how waste will be stored/handled:
Decon. liquids generated during the VCA will be stored onsite in sealed containers until a final RCRA determination is made.

_____ RCRA: (90-Day Storage Requirement)
Waste will be stored/handled in accordance with 20 NMAC Generator Requirements.

Preliminary Determination for Radioactivity

Based on available information, indicate the amount and type of radiation contamination expected in the waste.

Decon. liquids are not expected to be radioactive because the contaminated liquid and sludge wastes were removed and the tanks were rinsed earlier. These liquids will have their final radioactive status determined by the results for the corresponding residual and rinse liquids in each tank.

Preliminary Radioactivity Status

__X__ Material is not radioactive
Describe how waste will be stored/handled:
VCA decon. liquids will be stored onsite in sealed containers.

_____ Material is radioactive
Describe the controlled area, labeling, and protection against inadvertent contamination.

WASTE CHARACTERIZATION STRATEGY FORM

OU Number/FU	PRS/SWMU Number	Title
1093/FU2	18-003(a, b, c & d)	Inactive Septic Tanks
Waste Types or Wastestreams: Residual and rinse liquids from tanks, final rinse of tanks, PPE and sampling equipment, and Decontamination liquids		

Signatures:

Field Team Leader _____

Field Team Waste Management Coordinator Jill Bingham 8-21-97

Waste Management Representative Mary Jane Weil 8/18/97

ANNEX 7.8

VCA CHECKLIST AND FIELD WORK AUTHORIZATION FORM

Voluntary Corrective Action (VCA)
Checklist and Fieldwork Authorization Form

PRS No. 18-003(a,b,c,d, and g) HSWA or AOC

√ COPC(s) defined.

√ Nature and extent defined or field screening method available to guide where not defined.

√ Remedy is obvious.

√ Time for removal is less than 6 months.

√ Remedy is final.

√ Land use assumptions straightforward.

√ Treatment, Storage, Disposal Facilities are available for waste type and volume.

√ Cleanup cost is reasonable for the planned action, and meets accelerated decision logic criterion for decision to proceed with VCA.

Explain criteria not checked above._____

_____

_____

Through reviewing the above criteria associated with this site, I believe that a VCA is the appropriate Accelerated Cleanup approach.

FPL _____ Date _____

FPC _____ Date _____

The undersigned have reviewed the final plan and believe that it fully satisfies the appropriate Accelerated Cleanup approach.

FPL _____ Date _____

FPC _____ Date _____

Through reviewing the VCA Plan, for site(s) 18-003(a,b,c,d,and g) and believing that the above criteria have been met, I authorize the fieldwork to proceed.

DOE ER Program Manager_____ Date_____

ANNEX 7.9

COST ESTIMATE

The total cost for this VCA is projected to be $191,800. (A detailed cost breakdown will be provided in the final report.)

Activity	$ Amount
Plan Development	$ 15,000
Mobilization	$ 3,000
Cleanup	$ 15,000
Verification Sampling	$ 48,000
Waste Disposal	$ 90,000
Field Screening	$ 1,500
Demobilization/restore site	$ 7,300
Reporting	$ 12,000
Total Estimated Cost	$191,800

8.0 REFERENCES

Environmental Restoration Project, October 1995. "RFI Report for Potential Release Sites 18-002(a-c), 18-003(a-h), 18-004(a,b), 18-005(a), 18-008, 18-010(b-f), 18-011, 18-012(a-c), 18-013, 27-002 (located in former Operable Unit 1093), Field Unit 2," Volumes I and II, Los Alamos National Laboratory Report LA-UR-95-3833, ER ID Nos. 52183 and 51854, Los Alamos, New Mexico. (Environmental Restoration Project 1995, 1283)

Environmental Restoration Project, 1997. "Response to NOD for RFI Report for Potential Release Sites in Technical Areas 18 & 27" (Environmental Restoration Project 1997, ER ID No. XXXX).

Environmental Restoration Project, 1996. "Corrective Action Report for TA-18". (Environmental Restoration Project, 1996, ER ID No. XXXX).

EPA (US Environmental Protection Agency), August 1, 1996. "Region 9 Preliminary Remediation Goals (PRGs)," San Francisco, California. (EPA 1996, 1351)

LANL (Los Alamos National Laboratory), May 1993. "RFI Work Plan for Operable Unit 1093," Los Alamos National Laboratory Report LA-UR-93-422, Los Alamos, New Mexico. (LANL 1993, 1085)