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Engineering Design File

Project No. 25057

Soil Risk Assessment for TAN-607: Hot Shop Area

Idaho Cleanup Project

CH2M•WG Idaho, LLC is the Idaho Cleanup Project contractor for the U.S. Department of Energy

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5. Summary:

This Engineering Design File documents the results of a soil risk assessment for the Test Area North Maintenance and Assembly (TAN-607) Facility Hot Shop Area. This work was performed to support an environmental evaluation and cost analysis for the decontamination and decommissioning of the TAN-607 facility.

This assessment indicates that the risks to the resident from pathways of concern from soil exposure at TAN-607 are well below the regulatory risk limit of 1×10^{-4}. The maximum predicted risk is 1×10^{-6}. The soil pathway to the resident is not a pathway of concern for radionuclide contamination at TAN-607.

6. Review (R) and Approval (A) and Acceptance (Ac) Signatures:
(See instructions for definitions of terms and significance of signatures.)

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Soil Risk Assessment for TAN-607: Hot Shop Area

1. INTRODUCTION

This Engineering Design File (EDF) documents the results of a streamlined soil risk assessment for the Hot Shop and area around the Hot Shop in the Test Area North Maintenance and Assembly (TAN-607) facility. The area evaluated includes the Hot Shop, Hot Cell, Storage Pool, and ancillary areas. This work was performed to support an environmental evaluation and cost analysis (EE/CA) for the decontamination and decommissioning (D&D) of the TAN-607 facility. To support this assessment, risks from both exposure to the soil and groundwater at this site must be assessed. The groundwater assessment was performed in EDF-7515, "Groundwater Assessment for TAN-607: Hot Shop Area."

TAN-607 is a building at the Technical Support Facility (TSF) located at the north end of the Idaho National Laboratory (INL) in an area known as Test Area North (TAN). The facilities at TAN were established in the 1950s to support nuclear-powered aircraft research. Upon termination of this research, TAN facilities were converted to support a variety of other Department of Energy (DOE) -sponsored projects including reactor research-related programs, the primary purpose of the TSF. The TAN-607 floor plan is shown in Figures 1, 2, and 3. The TAN-607 concrete slab is 16 in. (0.4 m) thick. The TAN-607 facilities considered for this assessment are

- Hot Shop, including the Special Equipment Services (SES) area and tunnel – significant contributor to the inventory. The area is 60.5 m by 15.5 m or ~940 m^2.
- Hot Cell – significant contributor to inventory. The area is 3.0 m by 10.7 m or ~32 m^2.
- Storage Pool – significant contributor to inventory. The area is 14.6 m by 21.3 m or ~312 m^2.
- Warm Shop (or Cold Assembly Room) – no significant sources of radioactivity.
- Ancillary areas north and east of the Process Experimental Pilot Plant (PREPP, Room 140) north and east walls – no significant sources of radioactivity.

The total contaminated area is assumed to be the sum of the Hot Shop, Hot Cell, and Storage Pool areas, which are the significant contributors to the source inventory. The assumed contaminated area is ~1,285 m^2.

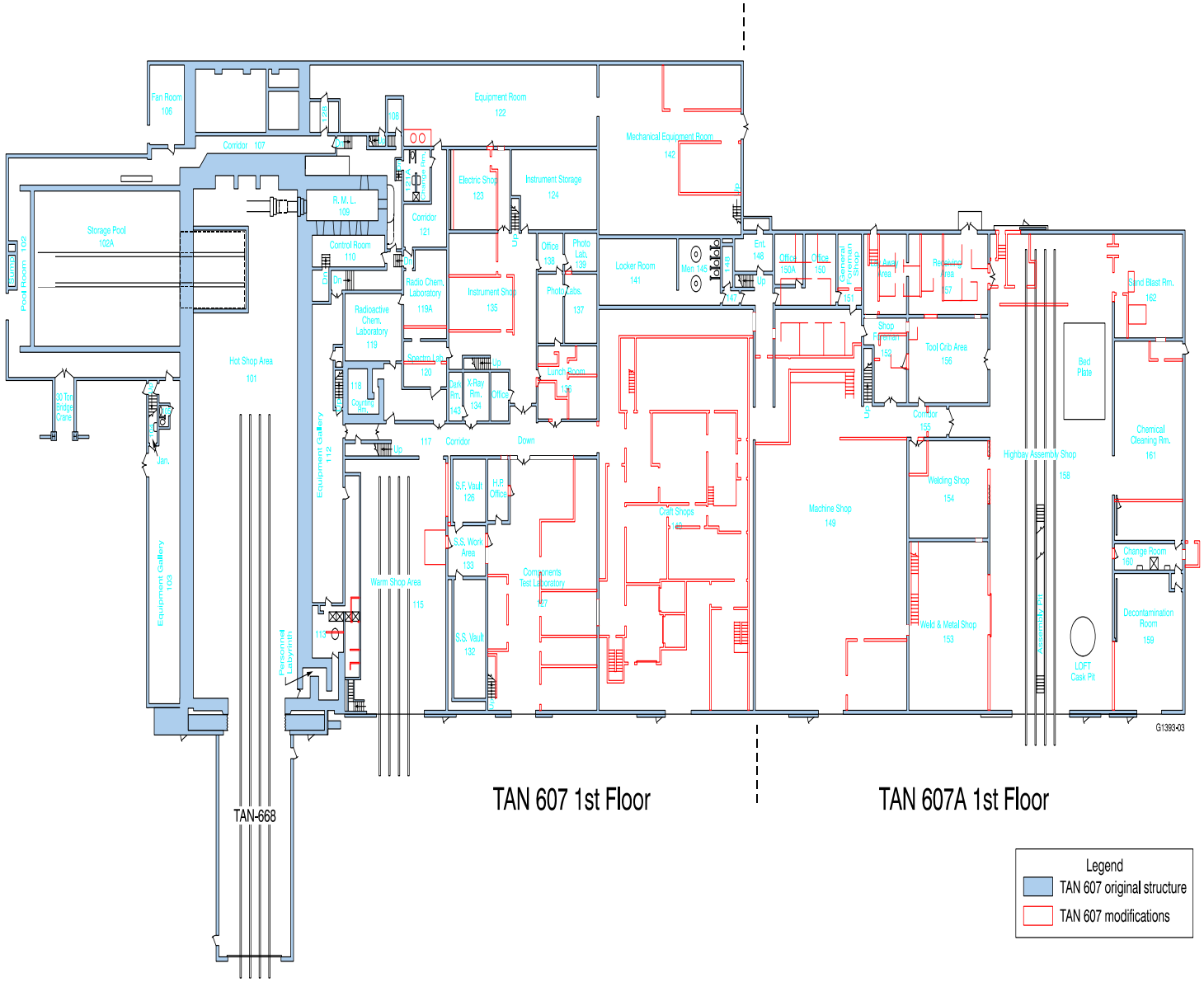

Figure 1. TAN-607 and TAN-607A floor plan, first floor (from Appendix A, EDF-7173).

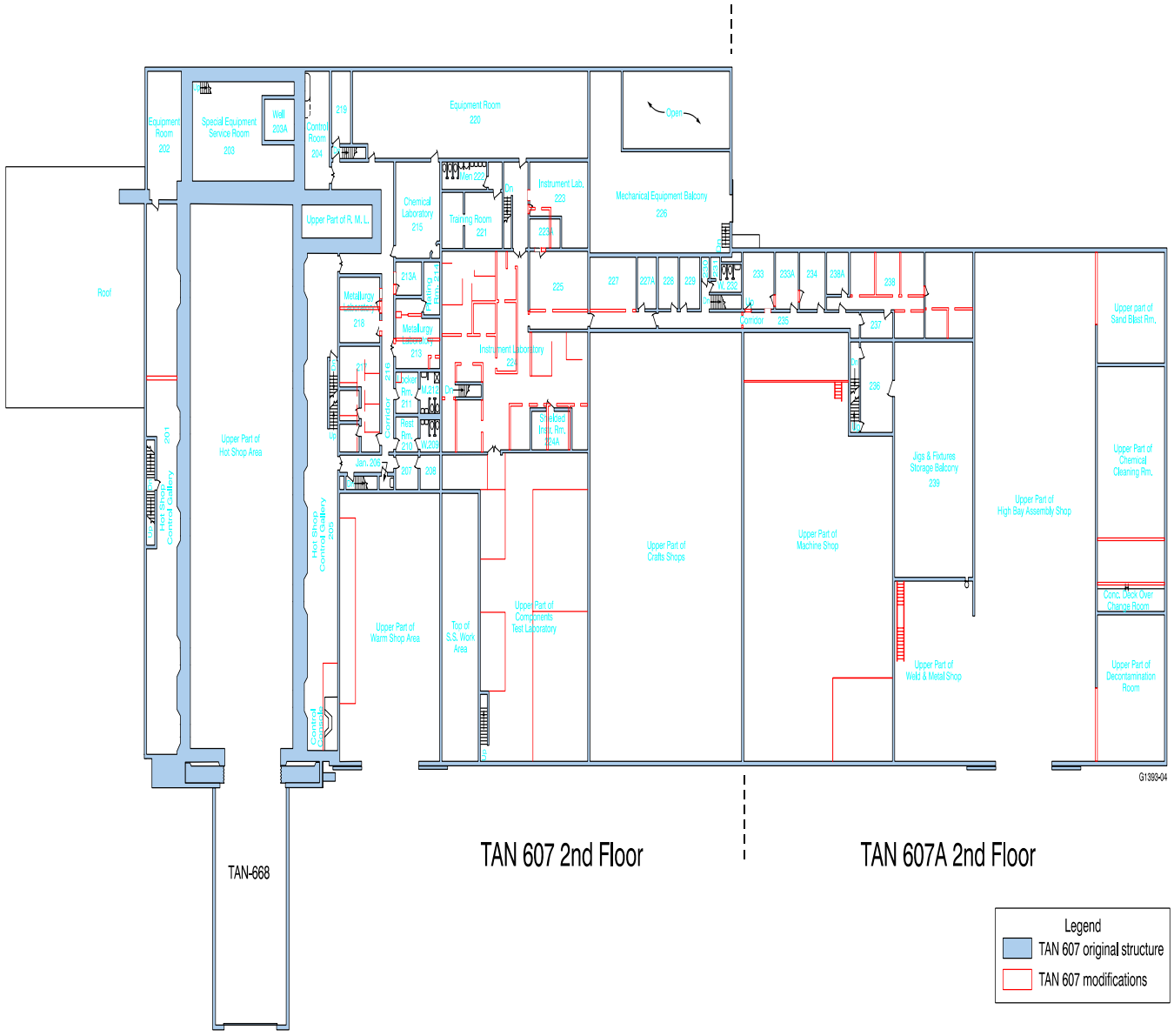

Figure 2. TAN-607 and TAN-607A floor plan, second floor (from Appendix A, EDF-7173).

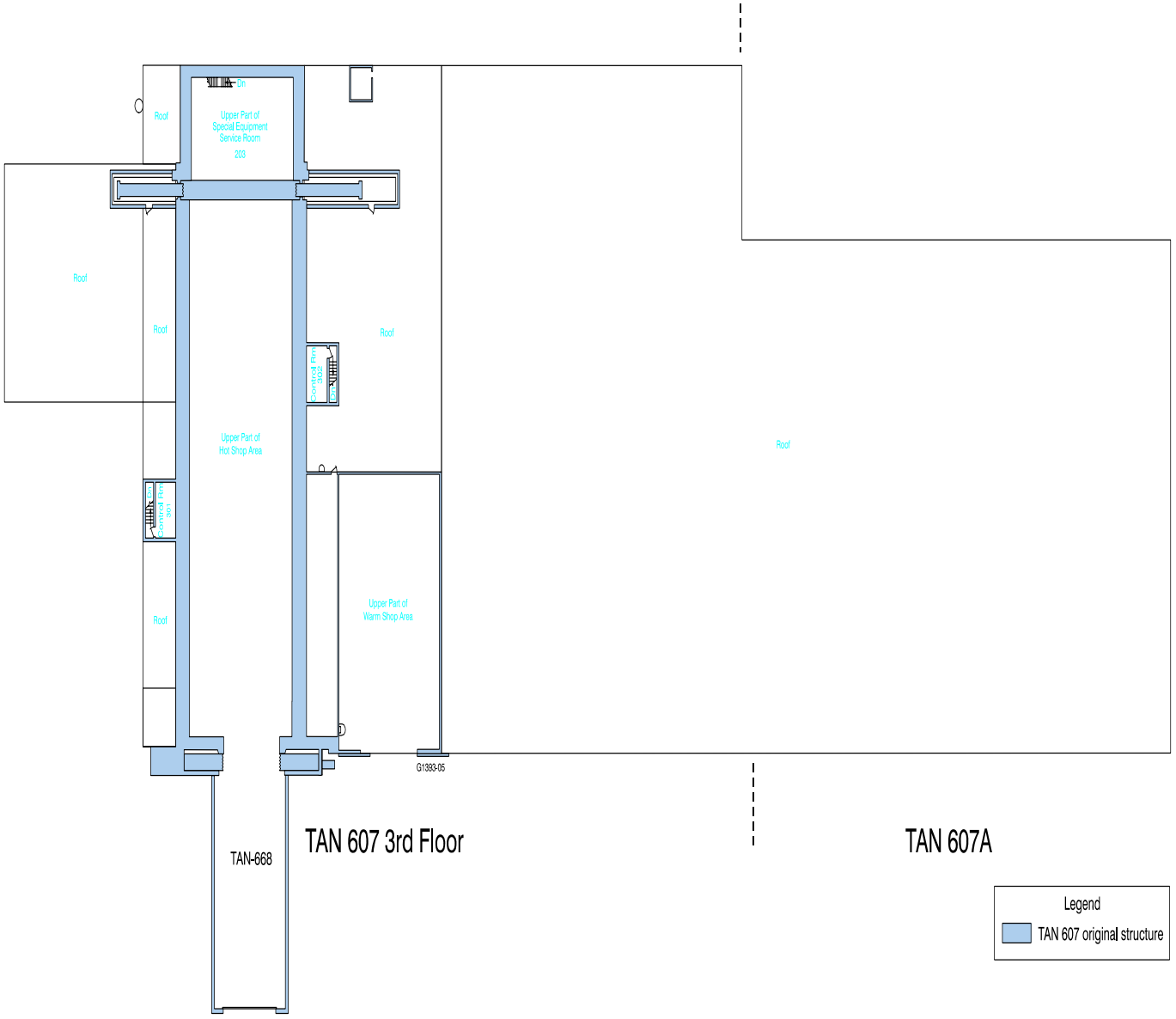

Figure 3. TAN-607 and TAN-607A floor plan, third floor (from Appendix A, EDF-7173).

2. RADIONUCLIDE INVENTORY AND CONCENTRATIONS

The radionuclide inventory used for the streamlined soil risk assessment for TAN-607 is summarized in EDF-7173 and also the associated groundwater risk assessment EDF-7515. Table 1 is a duplicate of Table 9 in EDF-7173, which summarizes the estimated total inventory at TAN-607. The values presented in this table were used to develop a concentration in the soil to assess the soil risk. For purposes of this analysis, the radionuclide contamination is assumed to be in soil accessible to a future resident.

To develop this concentration, it is assumed that the contamination is distributed in a soil volume equal to the product of area assumed. Concentrations are presented in Appendix A and were calculated as follows:

$$Soil\ Concentration = \left(\frac{(Total\ Curies * CF)}{Density\ of\ soil * (Length\ of\ site * width\ of\ site * depth\ of\ site)} \right) \quad (1)$$

where:

Soil Concentration	=	Concentration of soil (contaminant-specific pCi/g)
Length of site	=	35.8 m from EDF-7515
Width of site	=	35.8 m from EDF-7515
Depth of site	=	3 m (Track 2 default (DOE-ID 1994))
Density of soil	=	1.5E+06 g/m^3 (Track 2 default (DOE-ID 1994))
CF	=	conversion factor, curies to pCi (1E+12 pCi/Ci)

Table 1. Summary of radiological activity in TAN-607 (curies) in 2006 and decayed to 2095 (exact copy of Table 9 in EDF-7173).

Isotope	Tables 3–5 Hot Shop and Tunnel	Table 6 Storage Pool	Table 7 TAN Hot Cell	Table 8 Hot Shop Sumps/Drains	TOTAL 2006 Curies
Ag-108m	—[a]	—	—	5.58E-04	5.58E-04
Am-241	5.99E-02	7.92E-02	9.50E-03	4.48E-01	5.97E-01
C-14	—	—	—	2.74E-04	2.74E-04
Cl-36[b]	—	—	—	—	—
Cm-242	—	—	4.28E-07	—	4.28E-07
Cm-244	—	—	1.35E-03	—	1.35E-03
Co-60	5.30E-01	7.01E-01	7.76E-04	1.05E-01	1.34E+00
Cs-137	6.17E+00	8.18E+00	1.15E-01	1.56E+01	3.01E+01
Eu-152	—	—	1.43E-03	—	1.43E-03
Eu-154	—	—	2.47E-03	—	2.47E-03
Eu-155	—	—	4.60E-04	—	4.60E-04
H-3	2.81E-02	3.72E-02	—	6.24E-02	1.28E-01
I-129[c]	—	1.38E-04	—	—	1.38E-04
Ni-63	1.39E-01	1.84E-01	—	4.19E-01	7.42E-01
Np-237	—	—	2.18E-06	—	2.18E-06
Pu-238	1.14E-02	1.51E-02	6.92E-03	4.37E-02	7.71E-02
Pu-239	4.49E-02	5.94E-02	4.87E-03	4.22E-01	5.31E-01

Table 1. (continued).

Isotope	Tables 3–5 Hot Shop and Tunnel	Table 6 Storage Pool	Table 7 TAN Hot Cell	Table 8 Hot Shop Sumps/Drains	TOTAL 2006 Curies
Pu-240	4.49E-02	5.94E-02	—	—	1.04E-01
Pu-241	7.78E-01	1.03E+00	1.23E-01	3.71E+00	5.64E+00
Sr-90	5.48E+00	7.26E+00	1.77E-01	2.48E+01	3.77E+01
Tc-99	—	—	3.60E-05	—	3.60E-05
U-233	1.99E-03	2.63E-03	—	2.05E-03	6.67E-03
U-234	1.99E-03	2.63E-03	1.25E-04	2.05E-03	6.80E-03
U-235	1.32E-04	1.75E-04	6.70E-06	5.23E-04	8.37E-04
U-238	3.30E-04	4.38E-04	7.11E-06	9.24E-04	1.70E-03
TOTAL	1.33E+01	1.76E+01	4.43E-01	4.56E+01	7.70E+01

a. — = no inventory identified.
b. Cl-36 has not been identified in historical documentation of analyses for TAN.
c. I-129 is scaled in at abundance listed in EDF-4820 per INEEL (2002).

Notes:

Cs-137 and Sr-90 daughters Ba-137m and Y-90 not reported.

2006 isotopes decayed to 2095 in Microshield v. 6.20 licensed to INL.

3. STREAMLINED RISK APPROACH FOR SOIL

3.1 Human Health

This assessment is very conservative since it assumes that all the radiological contamination will be released at once from the TAN-607 Hot Shop Area at the end of the INL institutional control period in the year 2095. The streamlined risk assessment for human health will use the residential soil land use equations and default values (including slope factors) as presented on the Environmental Protection Agency (EPA) website Preliminary Remediation Goals for Radionuclides (EPA 2006a). The assumptions used in the EPA approach are consistent with the INL Track 2 Guidance Manual, *Track 2 Sites: Guidance for Assessing Low Probability Hazard Sites at the INEL* (DOE-ID 1994). The scenario used in the assessment assumes someone will build a house at the site in the year 2095. It is assumed that the person will live at the site for 30 years, including 6 years of childhood. The residential soil land use equations, presented here, contain the following exposure routes:

- Incidental ingestion of soil.
- Inhalation of particulates emitted from soil.
- External exposure to ionizing radiation.
- Consumption of fruits and vegetables. The exposed and root vegetable consumption rates were combined to represent total vegetable consumption.

The intermediate soil concentration calculations, slope factors, and uptake factors are presented in Appendix A. The calculated risk results are presented in Table 2.

Table 2. Radiological estimated risk results for human health.

Radionuclide	Soil Exposure Estimated Risk (unitless)
Ag-108m	2E-06
Am-241	4E-05
C-14	1E-07
Cl-36	0E+00
Cm-242	7E-131
Cm-244	7E-11
Co-60	2E-12
Cs-137+D	2E-03
Eu-152	1E-09
Eu-154	1E-11
Eu-155	4E-19
H-3	1E-10
I-129	4E-08
Ni-63	4E-07
Np-237+D	2E-07
Pu-238	1E-06

Table 2. (continued).

Radionuclide	Soil Exposure Estimated Risk (unitless)
Pu-239	4E-05
Pu-240	7E-06
Pu-241	9E-10
Sr-90+D	6E-04
Tc-99	2E-08
U-233	3E-07
U-234	3E-07
U-235+D	7E-07
U-238+D	4E-07

The overall risk is calculated using the equation as follows:

$$Risk = (SoilConcentration) * (ED_{Res}) * (e^{-\lambda ED_{Res}}) * (SoilIngestion + FoodIngestion + ExternalExposure + Inhalation) \quad (2)$$

where

$Soil\ Concentration$	=	Concentration of soil (contaminant-specific pCi/g)
ED_{Res}	=	Exposure duration-residential (30 yr)
T_{scen}	=	Time until beginning of scenario (88 yr [years from 2007 to 2095])
λ	=	0.693 / half-life (contaminant-specific year^{-1}).

The radionuclide soil ingestion intake factor equations for the residential scenario is presented below in Equations (3) and (4).

$$Soil\ Ingestion\ residential = SF_{oral} * IRSOIL\_Res * EF * (0.0001g/mg) \quad (3)$$

where

$$IRSoil\_Res = \left(\frac{(IR_{Soil\text{-}Ch} * ED_{Res\text{-}Ch}) + (IR_{Soil\text{-}Ad} * ED_{Res\text{-}Ad})}{ED_{Res}} \right) \quad (4)$$

and

EF_{Res}	=	Exposure frequency-residential (350 day/yr)
SF_{Soil}	=	Slope factor - soil ingestion (contaminant-specific risk/pCi)
ED_{Res}	=	Exposure duration-residential (30 yr)
$ED_{Res\text{-}Ad}$	=	Exposure duration-residential-adult (24 yr)
$ED_{Res\text{-}Ch}$	=	Exposure duration-residential-child (6 yr)
$IR_{Soil\text{-}Ad}$	=	Ingestion rate - soil - adult (100 mg/d)
$IR_{Soil\text{-}Ch}$	=	Ingestion rate - soil - child (200 mg/d).

Food Ingestion

The food ingestion exposure route includes an evaluation of contaminant concentrations in plants (fruits and vegetables) caused by root uptake. Finally, concentrations of contaminants of potential concern in affected homegrown produce are calculated using the following equation:

$$FoodIngestion = (SF_{food}) * (CR_f + CR_v) * TF_{soiltoplant}) * (CPF) * (1000 g / kg) \quad (5)$$

where

$$CR_f = \frac{(ED_{Res-Ch} * CR_{Fruit-ch}) + (ED_{Res-Ad} * CR_{Fruit-Ad})}{ED_{Res}} \quad (6)$$

and

$$CR_v = \frac{(ED_{Res-Ch} * CR_{Veg-ch}) + (ED_{Res-Ad} * CR_{Veg-Ad})}{ED_{Res}} \quad (7)$$

and

CPF	=	Contaminated plant fraction (0.25 unitless)
$CR_{Fruit\text{-}Ad}$	=	Consumption rate-fruit-adult (20.5 kg/yr)
$CR_{Fruit\text{-}Ch}$	=	Consumption rate-fruit-child (5.4 kg/yr)
$CR_{Veg\text{-}Ad}$	=	Consumption rate-vegetable-adult (10.4 kg/yr)
$CR_{Veg\text{-}Ch}$	=	Consumption rate-vegetable-child (3.8 kg/yr)
ED_{Res}	=	Exposure duration-residential (30 yr)
$ED_{Res\text{-}Ad}$	=	Exposure duration-residential-adult (24 yr)
$ED_{Res\text{-}Ch}$	=	Exposure duration-residential-child (6 yr)
EF_{Res}	=	Exposure frequency-residential (350 day/yr)
SF_{Food}	=	Slope factor - food ingestion (contaminant-specific risk/pCi)
$TF_{Soil\ to\ Plant}$	=	Soil to plant transfer coefficient (contaminant-specific pCi/g plant per pCi/g soil).

External Radiation

For the external radiation exposure route, standard EPA protocols are used to estimate risk. The thickness of the source, its depth, and the type of radiation all have an effect on external dose. In this assessment, all the radioactive material is available for exposure. Usually, the depth of the contaminant is taken into account with contamination below 4 ft in depth being assumed to be shielded by the top soils. The external exposure is calculated as follows:

$$External\ Exposure = ((SF_{Ext}) * (ACF) * (\frac{EF_{Res}}{365\ d/year}) * ET_{out} + (ET_{in} * GSF)) \quad (8)$$

where

ET_{in}	=	Exposure time fraction-residential-indoor (0.683 unitless)
ET_{out}	=	Exposure time fraction-residential-outdoor (0.073 unitless)
GSF	=	Gamma shielding factor (0.4 unitless)
SF_{Ext}	=	Slope factor - external exposure (contaminant-specific risk/yr per pCi/g)
ED_{Res}	=	Exposure duration-residential (30 yr)
ACF	=	Area correction factor (0.9 unitless).

Inhalation

All the contamination at the site is assumed to be available to be released into the inhalation exposure route. Both inhalation of fugitive dust and inhalations of volatiles are evaluated for inhalation. Since most radionuclides (with limited exceptions) are not considered volatile, only the fugitive dust exposure will be assessed. The equation below presents the calculation for inhalation of dust:

$$Inhalation = (SF_{Inh}) * (Inh) * (EF_{Res}) * \frac{(1000\,g/kg)}{PEF} * (ET_{out} + (ET_{in} * DF_i)) \quad (9)$$

where

$$Inh = \frac{(ED_{Res-Ch} * Inh_{Ch}) + (ED_{Res-Ad} * Inh_{Ad})}{ED_{Res}} \quad (10)$$

Df_i = Indoor dilution factor (0.4 unitless)
EF_{Res} = Exposure frequency-residential (350 day/yr)
ET_{In} = Exposure time fraction-residential-indoor (0.683 unitless)
ET_{Out} = Exposure time fraction-residential-outdoor (0.073 unitless)
Inh_{Ad} = Inhalation rate - adult (20 m^3/day)
Inh_{Ch} = Inhalation rate - child (10 m^3/day)
PEF = Particulate emission factor (1.36E+09 m^3/kg-default)
SF_{Inh} = Slope factor - inhalation (contaminant-specific risk/pCi).

3.2 Ecological Risk

To assess risk to ecological receptors, the streamlined soil screening will compare concentrations calculated to ecologically based screening levels (EBSLs) or other ecological benchmarks. Details for EBSL development and EBSL values are documented in Appendix D2 of the *Work Plan for Waste Area Groups 6 and 10 Operable Unit 10-04 Comprehensive Remedial Investigation/Feasibility Study* (DOE-ID 1999). Table 3 presents the comparison of EBSLs to the maximum concentration calculated to be present in the soil in the future.

Table 3. Comparison of calculated soil concentrations to ecologically based screening level.[a]

Radionuclide	Calculated Concentration in 100 Years (pCi/g)	EBSL (pCi/g)	Maximum Concentration > Screening Values?
Ag-108m	6.02E-02	1.82E+03	No
Am-241	8.98E+01	1.78E+01	Yes
C-14	4.70E-02	3.94E+04	No
Cl-36	0.00E+00	7.84E+03	No
Cm-242	8.59E-65	1.60E+01	No
Cm-244	7.75E-03	1.68E+01	No
Co-60	1.92E-03	1.18E+03	No
Cs-137	6.71E+02	4.95E+03	No
Eu-152	2.55E-03	2.18E+03	No
Eu-154	3.26E-04	2.48E+03	No
Eu-155	1.64E-07	3.25E+04	No

Table 3. (continued).

Radionuclide	Calculated Concentration in 100 Years (pCi/g)	EBSL (pCi/g)	Maximum Concentration > Screening Values?
H-3	1.48E-01	3.43E+05	No
I-129	2.39E-02	4.76E+04	No
Ni-63	6.94E+01	1.14E+05	No
Np-237	2.77E-02	1.94E+01	No
Pu-238	6.62+00	1.78E+01	No
Pu-239	9.18E+01	1.89E+01	Yes
Pu-240	1.80E+01	1.89E+01	No
Pu-241	1.35E+01	3.73E+05	No
Sr-90	7.66E+02	3.34E+03	No
Tc-99	6.24E-03	1.60E+04	No
U-233	1.16E+00	2.05E+01	No
U-234	1.18E+00	2.05E+01	No
U-235	1.45E-01	2.27E+01	No
U-238	2.95E-01	2.32E+01	No

a. EBSLs taken from DOE-ID (1999).

4. RESULTS

This streamlined soil risk assessment was performed to support an EE/CA for the D&D of the TAN-607 facility. To support this assessment, risks to human and ecological receptors from exposure to soil must be assessed. Since the building is assumed to remain in place with no modification, very conservative assumptions were used in the development of concentrations in the soil. As is shown in Table 2, both Cs-137+D and Sr-90 exceed the 1E-04 risk level for human health using a residential land use scenario. Both Am-241 and Pu-239 exceed initial screening values used for ecological receptors.

5. REFERENCES

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Appendix A

Supporting Risk Assessment Information

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Appendix A

Supporting Risk Assessment Information

Table A-1. Calculations to develop soil concentrations.

Nuclide	Half-Life (yr)	2006 Activity (pCi)	2095 Activity (pCi)	Calculated Soil Concentration[a] (pCi/g)	Curies from EDF-7173
Ag-108m	130	5.58E+08	3.47E+08	6.02E-02	5.58E-04
Am-241	432.7	5.97E+11	5.18E+11	8.98E+01	5.97E-01
C-14	5715	2.74E+08	2.71E+08	4.70E-02	2.74E-04
Cl-36	301,000	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cm-242	0.447	4.28E+05	4.95E-55	8.59E-65	4.28E-07
Cm-244	18.1	1.35E+09	4.47E+07	7.75E-03	1.35E-03
Co-60	5.27	1.34E+12	1.10E+07	1.92E-03	1.34E+00
Cs-137+D	30.07	3.01E+13	3.87E+12	6.71E+02	3.01E+01
Eu-152	13.48	1.43E+09	1.47E+07	2.55E-03	1.43E-03
Eu-154	8.59	2.47E+09	1.88E+06	3.26E-04	2.47E-03
Eu-155	4.71	4.60E+08	9.43E+02	1.64E-07	4.60E-04
H-3	12.32	1.28E+11	8.56E+08	1.48E-01	1.28E-01
I-129	15,700,000	1.38E+08	1.38E+08	2.39E-02	1.38E-04
Ni-63	100	7.42E+11	4.00E+11	6.94E+01	7.42E-01
Np-237+D	2,140,000	1.60E+08	1.60E+08	2.77E-02	1.60E-04
Pu-238	87.8	7.71E+10	3.82E+10	6.62E+00	7.71E-02
Pu-239	24,100	5.31E+11	5.30E+11	9.18E+01	0.531
Pu-240	24,100	1.04E+11	1.04E+11	1.80E+01	0.104
Pu-241	14.4	5.64E+12	7.78E+10	1.35E+01	5.64
Sr-90+D	28.78	3.77E+13	4.42E+12	7.66E+02	37.7
Tc-99	213,000	3.60E+07	3.60E+07	6.24E-03	3.60E-05
U-233	159,000	6.67E+09	6.67E+09	1.16E+00	6.67E-03
U-234	246,000	6.83E+09	6.83E+09	1.18E+00	6.83E-03
U-235+D	704,000,000	8.37E+08	8.37E+08	1.45E-01	8.37E-04
U-238+D	4,470,000,000	1.70E+09	1.70E+09	2.95E-01	1.70E-03

a. The curies for each contaminant in the inventory were assumed to be evenly distributed across the width, length, and depth of the site. Concentration was calculated as ((picocuries *35.8 m * 35.8 m * 3 m)/1.5E+06 g/m^3).

Table A-2. Contaminant-specific slope factors and uptake factors used to evaluate risk.

	Toxicity [a]						
Isotope	Soil Ingestion Slope Factor-Adult (risk/pCi) SF-Soil	Food Ingestion Slope Factor (risk/pCi) SF-Food Ing	Inhalation Slope Factor (risk/pCi) SF-Inh	External Exposure Slope Factor (risk/y per pCi/g) SF-Ext Exp	Half-Life (yr) $t_{1/2}$	Decay Coefficient (yr^{-1})	Soil to Plant Transfer Factor $TF_{Soil\ to\ Plant}$
Am-241	2.17E-10	1.34E-10	2.81E-08	2.76E-08	432.7	1.60E-03	1.00E-03
C-14	2.79E-12	2.00E-12	7.07E-12	7.83E-12	5,715	1.21E-04	5.5
Cs-137+D	4.33E-11	3.74E-11	1.19E-11	2.55E-06	30.07	2.31E-02	4.00E-02
Co-60	4.03E-11	2.23E-11	3.58E-11	1.24E-05	5.27E+00	1.32E-01	8.00E-02
Cm-242	1.05E-10	5.48E-11	1.51E-08	7.73E-11	4.47E-01	1.55E+00	1.00E-03
Cm-244	1.81E-10	1.08E-10	2.53E-08	4.85E-11	1.81E+01	3.83E-02	1.00E-03
Eu-152	1.62E-11	8.70E-12	9.10E-11	5.30E-06	1.35E+01	5.14E-02	2.50E-03
Eu-154	2.85E-11	1.49E-11	1.15E-10	5.83E-06	8.59E+00	8.07E-02	2.50E-03
Eu-155	5.40E-12	2.77E-12	1.48E-11	1.24E-07	4.71E+00	1.47E-01	2.50E-03
H-3	2.20E-13	1.44E-13	1.99E-13	0.00E+00	1.23E+01	5.63E-02	4.80E+00
I-129	2.71E-10	3.22E-10	6.07E-11	6.10E-09	1.57E+07	4.41E-08	0.02
Np-237+D	1.62E-10	9.10E-11	1.77E-08	7.97E-07	2.14E+06	3.24E-07	0.02
Ni-63	1.79E-12	9.51E-13	1.64E-12	0.00E+00	1.00E+02	6.93E-03	5.00E-02
Pu-238	2.72E-10	1.69E-10	3.36E-08	7.22E-11	8.77E+01	7.90E-03	1.00E-03
Pu-239	2.76E-10	1.74E-10	3.33E-08	2.00E-10	2.41E+04	2.88E-05	1.00E-03
Pu-240	2.77E-10	1.74E-10	3.33E-08	6.98E-11	2.41E+04	2.88E-05	1.00E-03
Pu-241	3.29E-12	2.28E-12	3.34E-10	4.11E-12	1.44E+01	4.81E-02	1.00E-03
Ag-108m	1.92E-11	1.12E-11	2.67E-11	7.18E-06	1.30E+02	5.33E-03	1.50E-01
Sr-90+D	1.44E-10	9.53E-11	1.13E-10	1.96E-08	2.88E+01	2.41E-02	3.00E-01
Tc-99	7.66E-12	4.00E-12	1.41E-11	8.14E-11	2.13E+05	3.25E-06	5
U-233	1.60E-10	9.69E-11	1.16E-08	9.82E-10	1.59E+05	4.36E-06	2.50E-03
U-234	1.58E-10	9.55E-11	1.14E-08	2.52E-10	2.46E+05	2.82E-06	2.50E-03
U-235+D	1.63E-10	9.76E-11	1.01E-08	5.43E-07	7.04E+08	9.85E-10	2.50E-03
U-238+D	2.10E-10	1.21E-10	9.35E-09	1.14E-07	4.47E+09	1.55E-10	2.50E-03

a. Values taken from EPA Radionuclide PRG website (EPA 2006b).