CP-13467
Revision 3

PUREX EMERGENCY PLANNING HAZARDS ASSESSMENT

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

Contractor for the U.S. Department of Energy
under Contract DE-AC06-08RL14788

CH2MHILL
Plateau Remediation Company
P.O. Box 1600
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A. N. Jivelekas
CH2M HILL Plateau Remediation Company

Date Published
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Revision 3

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ACRONYMS

AMU	aqueous makeup
ARF	airborne release fraction
BED	Building Emergency Director
D&D	decontamination and demolition
DOE	U.S. Department of Energy
DR	damage ratio
DSA	Documented Safety Analysis
EAL	Emergency Action Level
ECMP	east crane maintenance platform
EPHA	Emergency Planning Hazards Assessment
EPZ	Emergency Planning Zone
FHA	Fire Hazards Analysis
HEPA	high-efficiency particulate air
HVAC	heating, ventilation, and air conditioning
LPF	leak path factor
MAR	material at risk
PAG	Protective Action Guide
P&O	piping and operating
PR	product removal
PUREX	Plutonium and Uranium Extraction
RF	respirable fraction
S&M	surveillance and maintenance
ST	source term
TED	total effective dose
TEL	threshold for early lethality
TRU	transuranic
UDAC	Unified Dose Assessment Center

METRIC UNIT CONVERSION CHART

Into Metric Units

If You Know	*Multiply By*	*To Get*
Length		
inches	25.4	millimeters
inches	2.54	centimeters
feet	0.305	meters
yards	0.914	meters
miles	1.609	kilometers
Area		
sq. inches	6.452	sq. centimeters
sq. feet	0.093	sq. meters
sq. yards	0.0836	sq. meters
sq. miles	2.6	sq. kilometers
acres	0.405	hectares
Mass (weight)		
ounces	28.35	grams
pounds	0.454	kilograms
ton	0.907	metric ton
Volume		
teaspoons	5	milliliters
tablespoons	15	milliliters
fluid ounces	30	milliliters
cups	0.24	liters
pints	0.47	liters
quarts	0.95	liters
gallons	3.8	liters
cubic feet	0.028	cubic meters
cubic yards	0.765	cubic meters
Temperature		
Fahrenheit	subtract 32, then multiply by 5/9	Celsius
Radioactivity		
picocuries	37	millibecquerel

Out of Metric Units

If You Know	*Multiply By*	*To Get*
Length		
millimeters	0.039	inches
centimeters	0.394	inches
meters	3.281	feet
meters	1.094	yards
kilometers	0.621	miles
Area		
sq. centimeters	0.155	sq. inches
sq. meters	10.76	sq. feet
sq. meters	1.196	sq. yards
sq. kilometers	0.4	sq. miles
hectares	2.47	acres
Mass (weight)		
grams	0.035	ounces
kilograms	2.205	pounds
metric ton	1.102	ton
Volume		
milliliters	0.033	fluid ounces
liters	2.1	pints
liters	1.057	quarts
liters	0.264	gallons
cubic meters	35.315	cubic feet
cubic meters	1.308	cubic yards
Temperature		
Celsius	multiply by 9/5, then add 32	Fahrenheit
Radioactivity		
millibecquerel	0.027	picocuries

Document Change Record

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3	June 2013	The document was updated to make consistent with the revised version of the *Plutonium-Uranium Extraction Facility Documented Safety Analysis*, CP-14977, Revision 6. The change to the EPHA does not require any changes to the emergency plan, ERPs, or site-level protective action procedures. There is no change to the EPZ or protective action recommendations. The EALs were revised based on the new analysis in Chapter 6.0. Editorial changes were made throughout the document to reflect the changes in the new revision of DOE-0223, RLEP 3.22. In addition, changes were made to provide consistency among all CH2M HILL Plateau Remediation Company EPHAs.	All

1.0 INTRODUCTION

This report documents the Emergency Planning Hazards Assessment (EPHA) for the Plutonium and Uranium Extraction (PUREX) Facility, located in the 200 East Area of the U.S. Department of Energy (DOE) Hanford Site. In accordance with Comprehensive Emergency Management, DOE Order 151.1C, Chapter IV, a facility/activity that uses or stores hazardous materials in amounts that exceed a screening threshold must develop and maintain an EPHA (DOE 2005). The PUREX Facility is unoccupied and deactivated in long-term surveillance and maintenance (S&M) mode. There are no process operations and therefore, no curtailment of operational activities or additional safety restrictions that need to be imposed. Should the determination be made that the mode of operation needs to be changed from S&M to preparation for decontamination and demolition (D&D), the EPHA will be revisited with respect to planned D&D activities.

During normal working hours, worker and supervisors are provided with the means to contact Building Emergency Directors (BEDs). The BEDs have been trained to determine whether the event or condition needs to be elevated. During off-normal working hours, the Emergency Operations Center Shift Office is provided with contact numbers for the on-call BED, and the Shift Office also serve as the back-up classification authority for the BEDs. The BEDs carry reference material from which they may make event classification.

1.1 MAINTENANCE/REVIEW OF THE HAZARDS ASSESSMENT

DOE Order 151.1C requires that the EPHA be updated every three years and prior to significant changes to the site/facility or to hazardous material inventories (DOE 2005). Routine editorial changes may be accumulated and updates issued when convenient. In addition, the facility manager (or delegate) is responsible to ensure the Emergency Action Levels (EALs) are reviewed at least once a year and revised if necessary. If the EAL review identifies changes are necessary, the EPHA should be reviewed and updated to provide consistency between the EALs and EPHA.

2.0 SITE AND FACILITY DESCRIPTION

Detailed descriptions of the 200E Area of the Hanford Site and the PUREX Facility are found in CP-14977, *Plutonium-Uranium Extraction Facility Documented Safety Analysis* (CP 2012) and CHPRC-01546, *Hazards Survey for Central Plateau Surveillance and Maintenance (CP S&M)* (CHPRC 2012).

2.1 FACILITY MISSION

The PUREX Facility was designed and operated to recover plutonium, uranium, and neptunium from irradiated fuel elements received from the 100-N Reactor and the single-pass reactors on the DOE Hanford Site. Construction of the facility began in 1952 and the facility began operating in 1956. The operation was shutdown in September 1972. The facility was maintained in wet-standby until 1978, with process and support equipment operating on a regular basis. Failed equipment was either upgraded or replaced. From 1978 to 1983, the facility progressed from wet-standby through cold start-up tests and resumed operations to recover plutonium from irradiated fuel in November 1983. The facility was operational until 1988 when it was shut down again. The facility began transitioning into cold-standby in October 1990. By September 1992, the facility was successfully placed in cold-standby. Planning to change the status of the facility from cold-standby to deactivation (or transition to shutdown) began in December 1992. Deactivation was completed in 1998 and the facility has been in S&M since that time.

The PUREX Facility is composed of the 202-A Canyon Building and several support structures, including two annex buildings (the office annex and the laboratory annex) located on the north side of the canyon. Two below-grade storage tunnels containing contaminated equipment extend southward from the east end of the 202-A Canyon Building. In addition, other facilities (Tank Farms, Cribs, and Retention Basins) were used to support the PUREX Facility during processing operations.

The PUREX Facility is currently unoccupied and deactivated in long-term S&M mode. The present mission is to maintain a passively safe and environmentally secure configuration and to preserve this configuration until the initiation of D&D activities.

2.2 LOCATION

The PUREX Facility is located in the southeast part of the 200E Area of DOE's Hanford Site (see Figure 2-1). The 200E Area is located on a plateau at an elevation ranging from approximately 190 to 245 m (620 to 800 ft) above mean sea level, near the middle of the Hanford Site. The facility (see Figure 2-2) is 11 km (6.8 mi) from the near bank of the Columbia River and 8.550 km (5.3 mi) to State Route Highway 240.

2.3 HANFORD SITE PHYSICAL DESCRIPTION

2.3.1 Location

Refer to CHPRC-01546 for the description of the Hanford Site physical description (CHPRC 2012). Figure 2-1 shows the location of the Hanford Site in Washington State.

2.3.2 Meteorology

Refer to CHPRC-01546 for the description of the Hanford Site meteorological profile (CHPRC 2012).

2.3.3 Flooding

Refer to CHPRC-01546 for the description of the Hanford Site flooding hazard profile (CHPRC 2012).

2.3.4 Winds and Tornados

Refer to CHPRC-01546 for the description of the Hanford Site winds and tornado hazard profile (CHPRC 2012).

2.3.5 Seismology

Refer to CHPRC-01546 for the description of the Hanford Site seismological profile (CHPRC 2012).

2.3.6 Ashfall

Refer to CHPRC-01546 for the description of the Hanford Site ashfall hazard profile (CHPRC 2012).

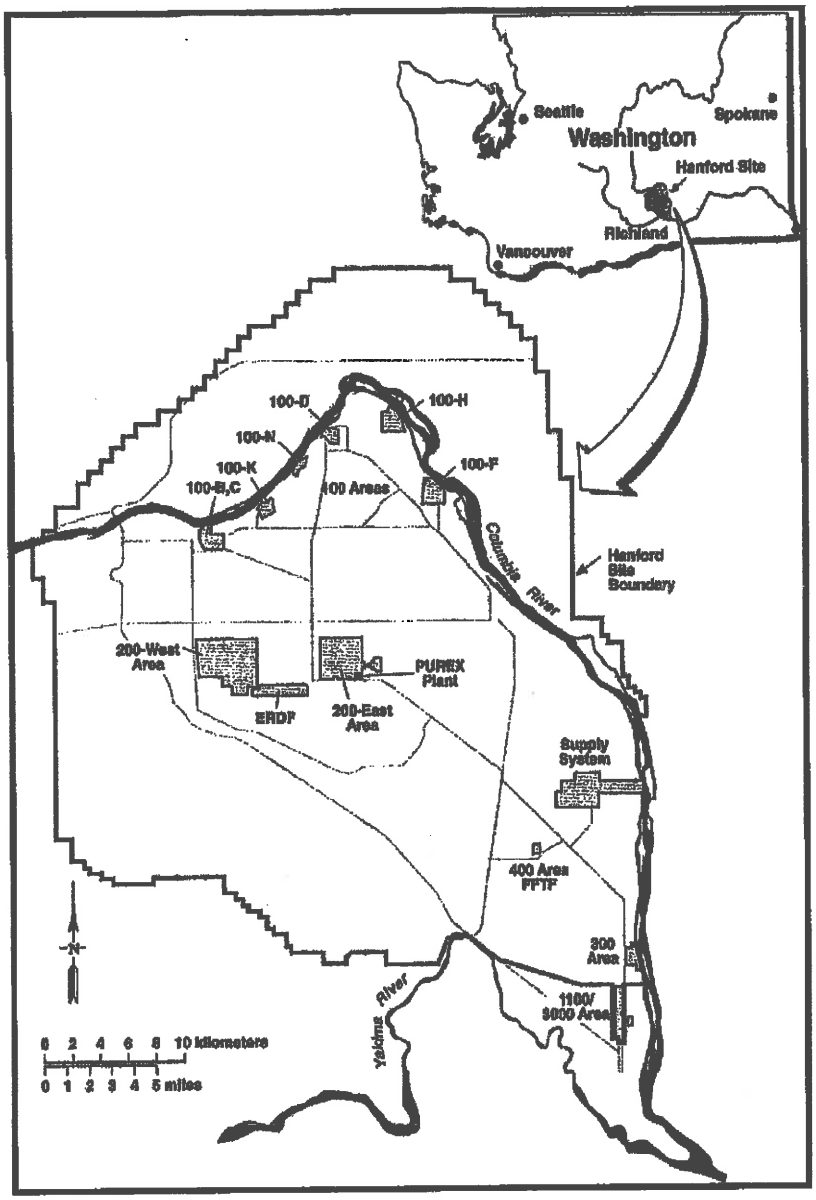

Figure 2-1. Location of the 200 East Area on the Hanford Site

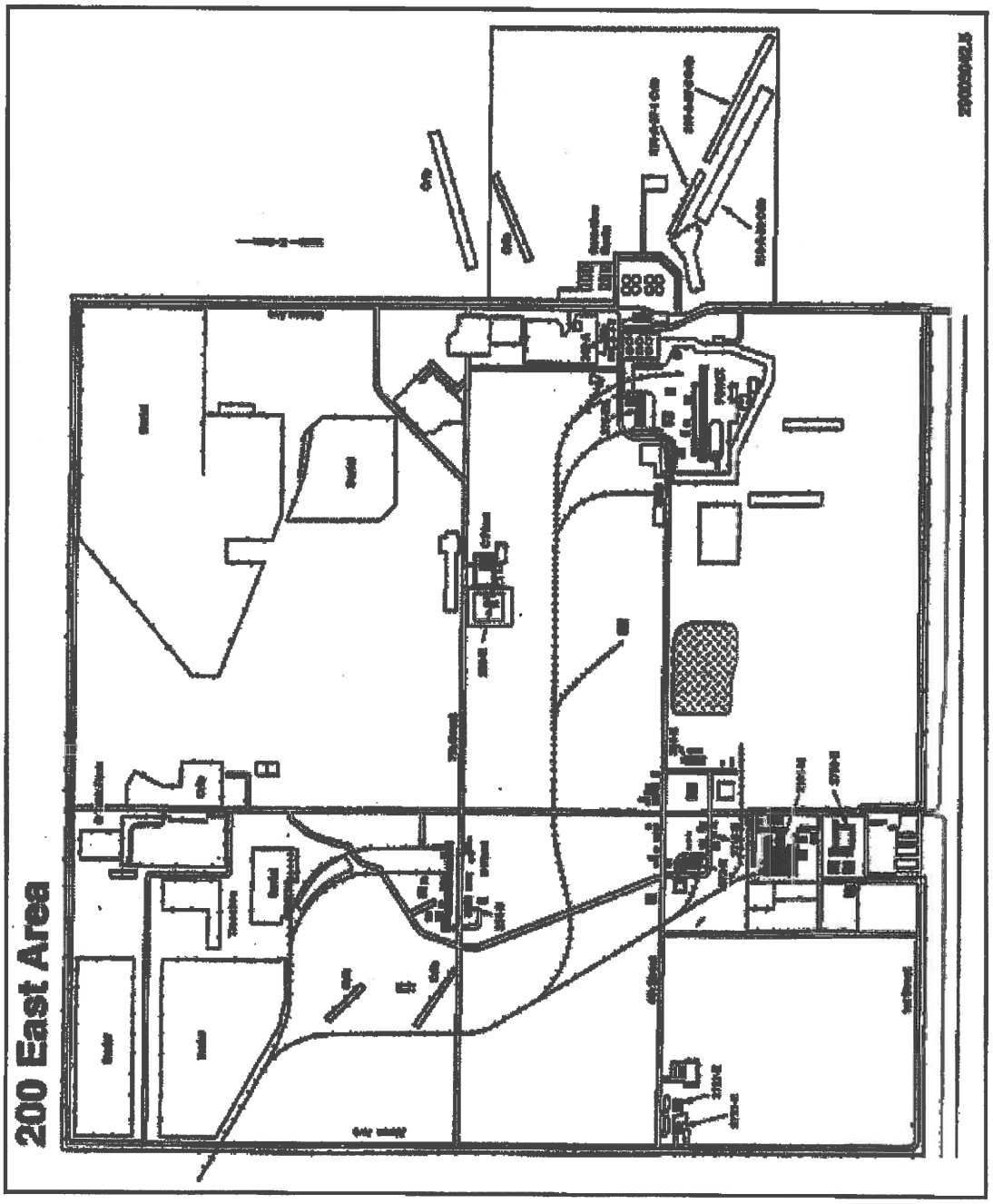

Figure 2-2. Location of the PUREX Facility in the 200 East Area

2.4 FACILITY DESCRIPTION

The PUREX Facility consists of the 202-A Canyon Building and a number of support buildings, including two annex buildings located on the north side of the canyon: the office annex and the laboratory annex (see Figure 2-3 for a layout of the PUREX Facility). The support buildings, including the office annex and the laboratory annex are, not included for analysis in this EPHA. The major portions consist of the building and storage tunnels and are described in the following subsections.

2.4.1.1 202-A Canyon Building

The 202-A Canyon Building consists of three main structural components: a thick-walled, heavily shielded concrete portion called the canyon, which contains the former processing equipment; a section comprised of three gallery levels parallel to and isolated from the canyon; and a steel and transite annex to the north of the gallery section that houses offices, the laboratory, and a number of building service areas.

The canyon area proper is a narrow structure that is 306.3 m (1,005 ft) long, 9.3 m (30.5 ft) wide, and 31.7 m (104 ft) high, with about 12.2 m (40 ft) of this height below grade. The canyon is subdivided into a single row of 12 process cells paralleled on the south side by a hot (radioactive) pipe trench with an air tunnel connected to the cells running underneath the pipe trench. East of the canyon, a railroad spur enters the facility below grade through a tunnel. At the east end of the canyon is an inactive fuel storage basin. All fuel was removed and the floor of the basin was stabilized during deactivation.

The east crane maintenance platform (ECMP) is an extension that was added to the existing 202-A Canyon Building in 1957. The extension is 21.7 m (71 ft 3 in.) tall, 11.0 m (36 ft) wide, and 18.7 m (61 ft 6 in.) deep, and is a reinforced concrete and steel beamed structure. The three exterior sides are made of 5 cm (2 in.) thick asbestos-cement board, which is covered with 23 cm (9 in.) precast concrete panels above the 222.8 m (731 ft) elevation and 10 cm (4 in.) precast concrete panels below the 222.8 m (731 ft) elevation. Three interior, 8 cm (3 in.) thick, steel-plate shielding doors separate the canyon from the ECMP. Below the 222.8 m (731 ft) elevation, 25 cm (10 in.) of concrete from the original building separate these structures.

The hot-pipe trench contains an array of pipe headers interconnecting the cells that permitted intercell transfers of radioactive solutions. In addition, the pipe trench contains the piping for transfers to facilities outside the 202-A Canyon Building that have been isolated.

The air tunnel, which lies directly below the pipe trench, exhausts the ventilation air from the individual cells (which in turn draws air from the canyon void above each cell and pipe trench coverblocks) to the main ventilation exhaust filters and from there to the main stack. The ventilation system is still in operation, as discussed in Section 2.6.1, Ventilation System.

A craneway runs nearly the length of the canyon for three (two master and one slave) bridge-type, 40-ton capacity cranes. The slave crane was remotely controlled from the other two cranes and used primarily to assist in removing large equipment items from cells.

Three gallery levels, located parallel to but isolated from the canyon on the north side of the structure, contain service piping and process instrumentation, equipment for process samples, and storage space for equipment and dry chemicals.

The piping and operating (P&O) gallery contains deactivated instrument racks, electrical motor controls, steam and cooling water supply lines, and the piping and associated valves for transferring non-radioactive solutions that served the in-cell equipment.

The sample gallery contains the remote samplers that were used for obtaining process samples from the cell equipment. A shielded pipe chase behind the remote sampler boxes contains header piping for recovered nitric acid, organic solvent, sampler drains, and sampler lines to and from the cell equipment.

The west end of the storage gallery is a separate area that was used for the Neptunium Purification and Loadout Facility (in Q cell), the plutonium product removal (PR) room, and the Plutonium Oxide Production Facility (in N cell). An equipment maintenance and decontamination area (in M cell) and a low-level contaminated equipment maintenance shop, which was used for maintenance of equipment removed from the canyon, are located at this level, but were not part of the storage gallery proper.

The service annex is adjacent to the galleries and consists of two separate areas. The larger main area contains:

- Maintenance shops
- Offices
- Lunchroom
- Locker room
- Radiation zone entry lobby
- Ventilation air and supply room
- Switchgear room
- Compressor room
- Central control room
- Aqueous Makeup (AMU) Facility

The smaller laboratory area contains the analytical laboratory, the head-end control room, and a switchgear room.

External to the 202-A Canyon Building are U and R cells, located on the north side of the structure. The U cell is just east of the laboratory area and contains the former recovered nitric acid storage tanks and laboratory waste tanks. The R cell is located west of the main area and contains process equipment for cleanup of process solvents.

2.4.1.2 PUREX Storage Tunnel No. 1

Storage Tunnel No. 1 was completed in 1956 as part of the PUREX Facility construction. The layout of the PUREX Storage Tunnels is shown in Figure 2-4. The storage tunnel is deactivated with no access provided. All utilities and ventilation systems are isolated or removed. Water was removed from the shielding door and the ventilation was deactivated (e.g., capped and de-energized).

Storage Tunnel No. 1 consists of the following three areas: the water-fillable door, the storage area, and the ventilation shaft.

The main portion of the storage tunnel is 109.1 m (358 ft) long and is composed of two sections. The inside dimensions of the storage tunnel, for both sections, are 6.7 m (22 ft) feet in height and

5.8 m (19 ft) wide. The east side of the first 31.4 m (103 ft) length of the storage tunnel closest to the PUREX Facility (northern part of the storage tunnel) is composed of a 0.91 m (3 ft) thick reinforced-concrete wall. The west wall and roof are both composed of timber. The reinforced-concrete wall-section allowed for the later construction of Storage Tunnel No. 2 without disturbing Storage Tunnel No. 1. The remaining 77.7 m (255 ft) length of storage tunnel (south portion) is composed of two timber walls and a timber roof. The same types of timbers are used in both sections.

All exterior surfaces of the timber structure are covered with mineral surfaced, 40.8 kg (90 lb) roofing. The entire structure is covered with earth fill to provide a minimum cover of 2.4 m (8 ft).

The vent shaft is located at the south end of the storage tunnel and provided a means of connecting a filter and fan to the storage area. The shaft has been sealed/capped to prevent the release of contamination.

The materials used in the storage tunnel and in the construction of the storage tunnel were controlled by the original drawings and specifications given in Specifications for Disposal Facility for Failed Equipment (GE 1995).

2.4.1.3 PUREX Storage Tunnel No. 2

Construction of Storage Tunnel No. 2 was started and completed in 1964. The storage tunnel is deactivated with no access provided. All utilities and ventilation systems are isolated or removed. Water was removed from the shielding door and the ventilation was deactivated (e.g., capped and de-energized).

Storage Tunnel No. 2 consists of the following three areas: the water-fillable door, the storage area, and the ventilation shaft.

The door has been drained and sealed. Figure 2-5 shows plan and sectional views of Storage Tunnel No. 2.

The storage area of Storage Tunnel No. 2 extends southward from the water-fillable door. This portion consists of a 10.4 m (34 ft) diameter steel semicircular-shaped roof of 0.5 cm (0.2 in.) thick steel plate. It is supported by internal I-beam wales that are attached to external reinforced-concrete arches. The interior and exterior surfaces of the steel roof are coated with a bituminous coating compound to inhibit corrosion. The entire storage area is covered with 2.4 m (8 ft) of earth fill to serve as radiation shielding.

The nominal inside dimensions of Storage Tunnel No. 2 are 514.5 m (1,688 ft) long, 7.9 m (26 ft) high, and 10.4 m (34 ft) wide. Commencing at the ends of the 2.4 m (8 ft) long ties, the earth floor is sloped upward on a 1 (vertical) to 1-1/2 (horizontal) grade. The tracks are on a 0.1 percent downgrade slope to the south to ensure the railcars remain in their storage position. A railcar bumper is located 2.4 m (8 ft) from the south end of the tracks to act as a stop. The nominal capacity of the storage area is forty 12.8 m (42 ft) long railcars; there are 28 railcars in Storage Tunnel No. 2.

The ventilation shaft is located at the south end of Storage Tunnel No. 2. Storage Tunnel No. 2 does not provide for an inlet air supply. The ventilation shaft has been sealed/capped and fans abandoned in place.

Potential degradation due to gamma radiation of the PUREX concrete storage tunnel structure was evaluated in memorandum 12-DWF&RS-NSL-015, *PUREX Railroad Storage Tunnels Extent of Condition Review for Concrete Degradation from Radiation Exposure*. Based on the dose calculations performed in CHPRC-1204181 the gamma radiation exposure to the storage tunnel structures was determined to be below the threshold of concern established in INEEL/EXT-04-02319, *Literature Review of the Effects of Radiation and Temperature on the Aging of Concrete*. Additionally, a concrete metal box (H-1-44980) was assessed in memorandum 12-DWF&RS-NSL-015 and found that the threshold of concern could exceed the limit within the next year (i.e., 2013). Because there are no operational stresses being applied to the box and any future plans to move or cause changes to the box will be subject to the USQ process, risk to this concrete box is low. The effects of neutron radiation were not evaluated; the source term in the storage tunnels is predominantly from fission products, most of which is gamma from Cs-137.

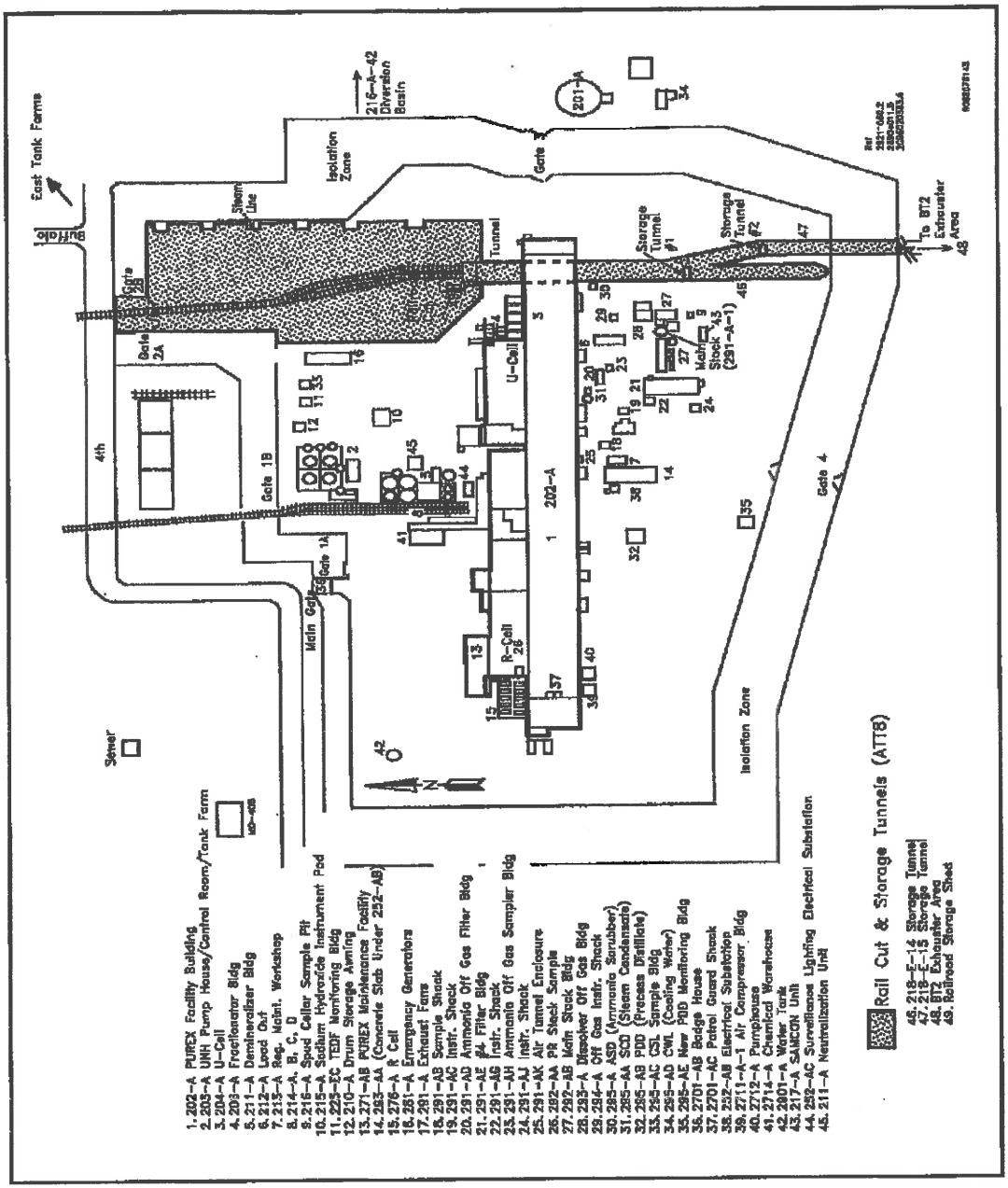

Figure 2-3. The PUREX Facility Layout

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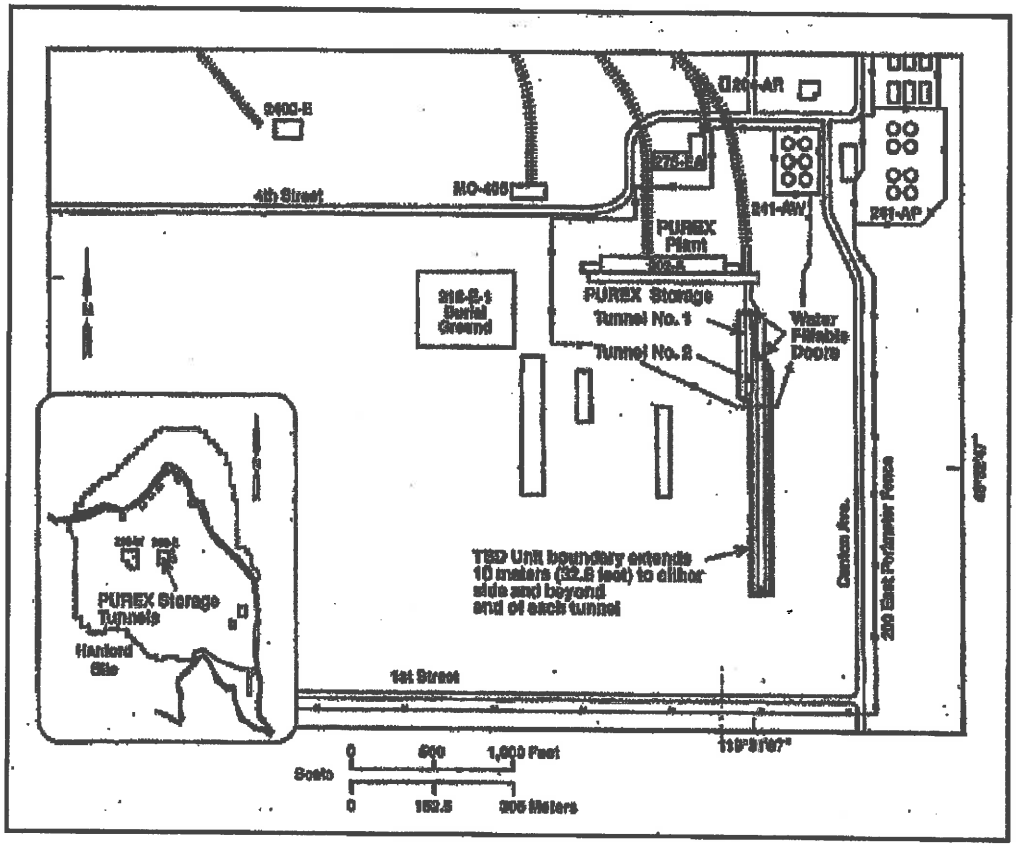

Figure 2-4. The PUREX Storage Tunnels

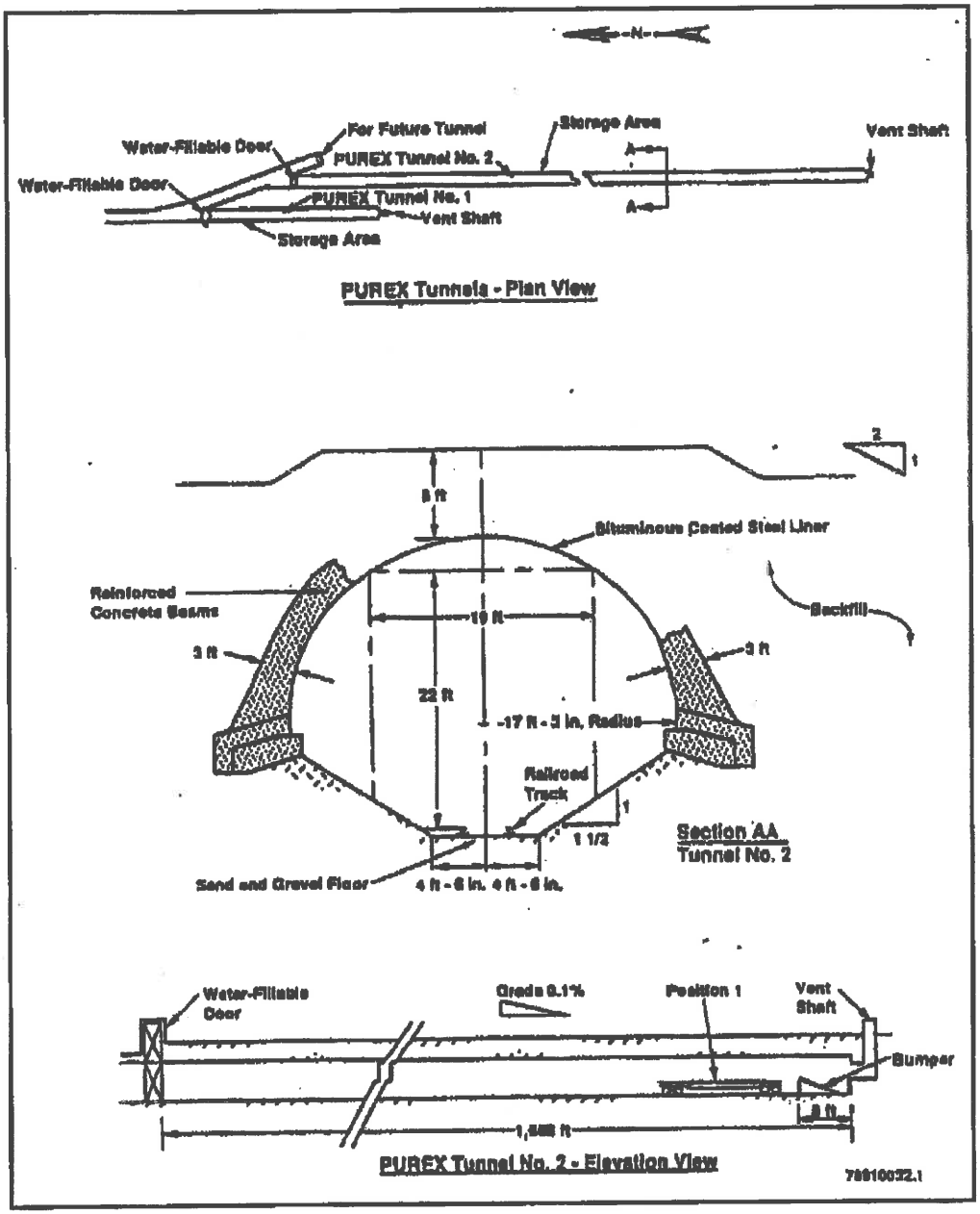

Figure 2-5. Plan and Sectional Views of PUREX Storage Tunnel No. 2

2.5 PROCESS DESCRIPTION

There are no current operating processes in the PUREX Facility, since it is in S&M mode. During the current facility life-cycle phase, planned activities will consist primarily of S&M. The storage of supplies and materials related to S&M activities and limited deactivation activities is authorized. Active facility systems are limited to electrical distribution, exhaust ventilation, instrumentation systems, and fire detection alarm systems in 252-AB and 217-A.

The scope of work includes S&M that maintains confinement of hazardous substances and protects the worker, pre-approved activities for surveillance of the facility, preventative maintenance of selected equipment, incidental storage of necessary supplies and equipment, and activities that are anticipated but not defined by pre-approved procedures. Examples of anticipated without pre-approved procedures include specific asbestos abatement actions, replacement or upgrade of postings and barriers, container management, demand repairs to structure, system, and components spill response, characterization, and response or investigation of non-typical surveillance reports.

2.6 STRUCTURES, SYSTEMS, AND COMPONENTS

2.6.1 Ventilation System

The PUREX Facility Deactivation Project reduced the four separate ventilation systems in the facility to one cascaded flow scheme. The 13 effluent points from the PUREX Facility and storage tunnels were reduced to one main exhaust stack. Of the 177 fans in the facility, only two main exhaust fans (one active and one on standby) continue to function. A third main exhaust fan has been abandoned in place. No supply fans are operational; therefore (with the exception of the active portions of the 202-A Canyon Building heating, ventilation, and air conditioning [HVAC] described here) all of the PUREX Facility ventilation systems (including high-efficiency particulate air [HEPA] filters and stacks) are capped/isolated to prevent unintended releases to the atmosphere.

HNF-SD-CP-CR-037, *PUREX Heating, Ventilation, and Air Conditioning Consolidation Document*, provides a more detailed description of the HVAC system in the deactivated PUREX Facility (HNF 1997).

The 202-A Canyon Building, including U and R cells, is ventilated by cascade systems into the canyon ventilation system. A negative pressure will continue to be maintained inside the 202-A Canyon Building with the exhaust through the 61 m (200 ft) stack. Airflow through the canyon galleries is routed to the canyon. Openings were made in existing gallery rooms and the associated closed ventilation duct systems so that a cascade-type airflow configuration could support the building exhaust ventilation system. As it stands, the ventilation system will continue to flow air from clean areas to progressively more contaminated areas.

The supply fans for the 202-A and 271-AB annexes were shut down as part of the facility deactivation process. Building ventilation air enters through the existing ventilation annex supply ducts into the P&O gallery, sample gallery, and storage galleries. The supply fans were disconnected and controlling dampers were installed on the inlets. One of the 291-A exhaust stack 2.4-kV motor-driven fans operates to draw air through the 202-A Canyon Building. One additional backup motor driven fan may be used should the first fan fail or otherwise be out of

service. The ventilation system flow rates for the modified system are in the nominal range of 30,000 to 45,000 cfm, about 15 percent of the original capacity.

The air flows into the P&O gallery in the center of the building, flows through the white room at the west end of the P&O gallery, and is routed to the canyon deck through the canyon lobby. The airflow into the sample gallery enters the center of the gallery and is routed to the canyon crane way via the stairwell at the northeast end of the building. The airflow into the storage gallery enters the center of the gallery, cascades through the Q cell, PR room, and N cell glovebox rooms, into the hot shop, and is tied into the air tunnel. Wherever possible, the engineered ventilation path cascades through portions of the existing ductwork and through as much of the building as possible. New ductwork and control louvers were installed to provide control and to maintain airflow, preventing contamination movement into the clean areas of the facility.

The air flowing into the canyon from the P&O and sample galleries flows downward into the process cells in the spaces around the coverblocks on the canyon deck. The air then flows into the air tunnel through air holes in the walls at the bottom of each cell, where it combines with the sample gallery airflow. The air tunnel exhausts through an underground duct to the No. 2 deep-bed filter, the No. 4 filter building, and the fan. The air tunnel then discharges through the 61 m (200 ft) main stack to the atmosphere. The No. 1 and No. 3 filter housings have been isolated and bypassed.

The major portions of the 202-A Canyon Building HVAC system that remain active are deep-bed Filter No. 2, portions of the No. 4 Filter bank (291-A-1 stack HEPA filters in the 291-AE Building), 291-A electric exhaust fans, air tunnels, 292-AB Building, and sampling instrumentation. Service areas, including the process and canyon blower rooms, the compressor room, office areas, and the AMU Facility are not ventilated. All ventilation to the laboratory area has been shut down.

A 2.4 m (8 ft) wide by 2.4 m (8 ft) high reinforced-concrete exhaust air duct connects the 202-A Canyon Building to deep-bed filter No. 1 (bypassed) and deep-bed filter No. 2 located in the south yard area and is comprised of below-grade concrete exhaust air treatment and discharge equipment. The overall dimensions of the deep-bed filter No. 2 area are 25.0 m (82 ft) by 15.9 m (52 ft) by 4.0 m (13 ft) deep.

Deep-bed filter No. 2 was designed to remove 99.9 percent of the particulates from the air stream. The filter area has two glass-fiber bed sections; the pre-filter and the cleanup filter. The pre-filter bed consists of five separate layers, each packed with a different density of fiberglass. The cleanup filter beds consist of 132 thick deep-bed filter units each 2.5 cm (1 in.) thick. The liquid condensate from the filter collects in catch tank V-11-10-1.

In 1999, a cover of shotcrete over deep-bed filter No. 2 was installed to minimize the infiltration due to run-on and run-off.

The 291-AE No. 4 filter building is a 37.5 m (123 ft) by 12.5 m (41 ft) by 5.2 m (17 ft) reinforced-concrete building, which houses 10 modular filter units, each with upstream and downstream isolation dampers. A typical modular filter unit consists of a stainless-steel housing containing an inlet damper, an in-place-filter testing assembly, a four-by-three array of HEPA filters, an in-place-filter testing assembly, and an outlet damper. During the S&M phase, three filter arrays will remain in operation, with one remaining in reserve. The remaining filter arrays are not generally ready to be placed into service.

Two reinforced-concrete air ducts are located below the 291-AE Building, parallel to each other and running in the north-south direction. The west duct is an inlet air duct connected to the underground air duct from the deep-bed filter No. 2. The east duct is the discharge air duct from the HEPA filter units and connects with the aboveground, reinforced-concrete exhaust air plenum. Attached to the south side of the building is a 7.3 m (24 ft) by 3.7 m (12 ft) by 2.7 m (9 ft) high metal building, which houses the mechanical and electrical equipment and is the entrance vestibule for the 291-AE Building.

The 291-A exhaust plenum and fan area consists of an underground air duct connected to the 291-AE discharge air duct and an aboveground segment that houses three electric-motor-driven ventilation fan units discussed above. The walls and floor are constructed of reinforced-concrete. The 2.4-kV motor-driven fans are located on the south side of the aboveground plenum segment.

The 291-A-1 main stack consists of reinforced-concrete construction and rises 61 m (200 ft) above grade. The stack has a free-standing, 2.1 m (7 ft) inner diameter, stainless steel liner. The top of the stack is covered to protect the annulus between the stack and the liner.

2.6.2 Electrical Power, Lighting, and Communications

All of the original facility power systems have been de-energized. Two newly installed electrical substations (252-AB and 252-AC) provide power to the PUREX Facility during the S&M period. One substation (252-AB) supplies 1,500 kVA of electrical power to each of two busses, which in turn provides power to the operating and standby canyon exhaust fans, the 292-AB stack monitoring building, the 291-AE No 4 Filter Building, the 291-A-1 monitoring system, and the SAMCONS instrument and control skid for surveillance and monitoring. The 252-AC station is powered from either of the two 1,500 kVA busses through an automatic transfer switch and supplies 750 kVA of electrical power to dedicated surveillance lighting throughout the facility. In addition, electric heat is provided to the 291-AE and 292-AB Buildings to protect instrumentation during cold weather. Cooling is provided to the 292-AB Building during warm weather to prevent the instrumentation from overheating.

2.6.3 Water System

All water systems have been isolated from the PUREX Facility with the exception of several fire hydrants as identified in CP-41822, *Fire Hazards Analysis for Plutonium-Uranium Extraction Plant* (CP 2009).

2.6.4 Fire Detection and Suppression System

No fire suppression systems are active in the facility. Fire detection/alarms systems are active in only the 252-AB and 217-A substations as discussed in CP-41822 (CP 2009).

3.0 IDENTIFICATION AND SCREENING OF HAZARDS

The PUREX Facility was screened against the criteria in DOE Order 151.1C (DOE 2005) to determine the radiological and non-radiological hazards of concern (see CHPRC-01546, *Hazards Survey for Central Plateau Surveillance and Maintenance [CP S&M]* [CHPRC 2012]). The results of the screening process are discussed in Sections 3.1 and 3.2 below.

3.1 RADIOLOGICAL MATERIALS

The screening of the radiological materials in CHPRC-01546 determined that the PUREX Facility radiological inventory cannot be eliminated from analysis in an EPHA (CHPRC 2012); therefore, the facility's radiological inventory will be analyzed in Chapter 6.0 of this document.

The PUREX Facility Deactivation Project removed, reduced, or stabilized the major radioactive sources and waste within the facility. Radiological contamination throughout the PUREX Facility consists of uranium, plutonium and other transuranics, and/or mixed fission products. The conservatisms used in developing the plutonium inventory bound any other transuranics (e.g., neptunium) that may be present. The radioactive material inventory remaining at the end of deactivation is primarily in the form of contaminated equipment and surfaces, dust and debris, with some remaining plutonium and oxide dust stabilized in gloveboxes. The facility and storage tunnels are identified as limited control facilities for criticality. See Chapter 4.0 for the PUREX Facility inventory.

3.2 NON-RADIOLOGICAL MATERIALS

All non-radiological materials at the PUREX Facility have been eliminated from analysis in CHPRC-01546 (CHPRC 2012).

4.0 HAZARD CHARACTERIZATION

The facility hazardous materials that were identified in Chapter 3.0 are characterized in this chapter to provide the information necessary to develop the release scenarios in Chapter 6.0.

4.1 RADIOLOGICAL INVENTORY

The PUREX Facility canyon walls, floors, and vessels are contaminated with residual radioactive materials. Based on the facility inventory and potential energy sources, all three facility segments (202-A Canyon Building and ventilation system, Storage Tunnel No. 1, and Storage Tunnel No. 2) are categorized as Hazard Category 2 nuclear facilities. Determination of the Hazard Category is presented in Section 3.2 of the PUREX Facility Documented Safety Analysis (DSA) (CP 2012). Other facilities (shops, sample stations, etc.) used to support the facility during processing operations are considered part of the 202-A segment.

A detailed development of the PUREX Facility inventory, including all three segments, can be found in Appendix C of the DSA (CP 2012). The below sections provides a breakdown of the inventory in each segments for use in Chapter 6.0.

4.1.1 202-A Canyon Building

Table 4-1 presents a summary of the 202-A Canyon Building inventory for the isotopes of concern (CP 2012). This inventory includes the ventilation system inventory.

Table 4-1. 202-A Canyon Building Inventory

Radionuclide	Total Inventory (g)
Pu-238	1.01E+01
Pu-239	1.20E+04
Pu-240	1.89E+03
Pu-241	6.60E+01
Pu-242	3.94+01
Am-241	3.50E+02
Sr-90	6.55E+01
Y-90	1.64E-02
Cs-137	1.26E+02

Table 4-2 presents a breakdown of the isotopic inventory in the 202-A Canyon Building by individual cells (CP 2012).

Table 4-2. Total Grams of Plutonium, Fission Products, and Am-241 in the PUREX Facility (Not Including Storage Tunnels)

Radionuclide	A Cell (g)	B Cell (g)	C Cell (g)	D Cell (g)	E Cell (excluding skip) (g)	E Cell Skip (g)	H Cell (g)	J Cell (J5A) (g)
Pu-238	5.00E-01	5.00E-01	5.00E-01	8.60E-01	5.70E-01	3.40E-01	2.90E-01	7.00E-02
Pu-239	6.00E+02	6.00E+02	6.00E+02	1.00E+03	6.90E+02	4.00E+02	3.40E+02	8.60E+01
Pu-240	9.40E+01	9.40E+01	9.40E+01	1.60E+02	1.10E+02	6.30E+01	5.40E+01	1.30E+01
Pu-241	3.30E+00	3.30E+00	3.30E+00	5.70E+00	3.80E+00	2.20E+00	1.90E+00	5.00E-01
Pu-242	2.00E+00	2.00E+00	2.00E+00	3.30E+00	2.20E+00	1.30E+00	1.10E+00	2.80E-01
Am-241	1.80E+01	1.80E+01	1.80E+01	3.00E+01	2.00E+01	1.20E+01	1.00E+01	2.50E+00
Sr-90	9.30E+00	9.30E+00	9.30E+00	1.60E+01	1.10E+01	0.00E+00	5.30E+00	0.00E+00
Y-90	2.30E-03	2.30E-03	2.30E-03	4.00E-03	2.70E-03	0.00E+00	1.30E-03	0.00E+00
Cs-137	1.80E+01	1.80E+01	1.80E+01	3.10E+01	2.10E+01	0.00E+00	1.00E+01	0.00E+00

Table 4-2. Total Grams of Plutonium, Fission Products, and Am-241 in the PUREX Facility (Not Including Storage Tunnels)

Radionuclide	J Cell (g)	L Cell (g)	White Room (g)	Deep Bed Filters (g)	N Cell (g)	PR Room (g)	Totals (g)
Pu-238	1.40E-01	3.26E+00	3.60E-01	2.90E-01	1.40E+00	1.00E+00	1.01E+01
Pu-239	1.70E+02	3.90E+03	4.30E+02	3.40E+02	1.60E+03	1.20E+03	1.20E+04
Pu-240	2.70E+01	6.10E+02	6.70E+01	5.40E+01	2.60E+02	1.90E+02	1.89E+03
Pu-241	1.00E+00	2.10E+01	2.40E+00	1.90E+00	9.10E+00	6.60E+00	6.60E+01
Pu-242	5.60E-01	1.30E+01	1.40E+00	1.10E+00	5.30E+00	3.90E+00	3.94E+01
Am-241	5.00E+00	1.10E+02	1.30E+01	1.00E+01	4.80E+01	3.50E+01	3.50E+02
Sr-90	0.00E+00	0.00E+00	0.00E+00	5.30E+00	0.00E+00	0.00E+00	6.55E+01
Y-90	0.00E+00	0.00E+00	0.00E+00	1.34E-03	0.00E+00	0.00E+00	1.64E-02
Cs-137	0.00E+00	0.00E+00	0.00E+00	1.00E+01	0.00E+00	0.00E+00	1.26E+02

4.1.2 PUREX Storage Tunnels

A summary of the total dispersible inventory of the tunnels, decayed to March 2003 values, is presented in Table 4-3. In addition, Table 4-4 presents the 324 Waste inventory located in Storage Tunnel No. 2, decayed to March 2003 values.

Table 4-3. PUREX Storage Tunnels No. 1 and 2 Inventories

Radionuclide	Tunnel No. 1 (g)	Tunnel No. 2 (g)
Pu-238	3.46E+00	4.52E+00
Pu-239	4.26E+03	4.71E+03
Pu-240	6.67E+02	7.37E+02
Pu-241	1.92E+01	6.42E+01
Pu-242	1.39E+01	1.53E+01
Am-241	1.29E+02	9.75E+01
Sr-90	5.99E+01	1.25E+03
Y-90	1.50E-02	3.13E-01
Cs-137	1.16E+02	3.79E+03

Table 4-4. PUREX Storage Tunnel 2 Waste Inventory (324 Waste)

Radionuclide[1]	Waste Inventory (g)
Sr-90	1.15E+03
Y-90	2.87E-01
Cs-137	3.60E+03

[1] This inventory includes trace quanities of plutonium that do not appreciable change the inventory or consequences (CP 2011).

5.0 CONSEQUENCE MODELS, RECEPTOR LOCATIONS, AND CLASSIFICATION CRITERIA

5.1 CONSEQUENCE MODELS

Radiological consequences are estimated using HotSpot, Version 2.07.2. HotSpot employs a straight-line Gaussian plume model and Pasquill-Gifford stability classes. The code meets the appropriate quality assurance requirements. Software quality assurance for HotSpot, Version 2.07.2, is documented in CHPRC-01042, Rev. 1, *HotSpot Software Management Plan* (HISI ID No. 2842) (CHPRC 2011). This code is the primary emergency planning tool for evaluating potential radiological releases on the Hanford Site and is used by emergency responders in the Unified Dose Assessment Center (UDAC) to conduct consequence assessment activities during an emergency.

The input parameters for Chapter 6.0 of this document are outlined in RLEP 3.22, *Emergency Planning Hazards Assessments, Appendix F, HotSpot User Input Parameters* (DOE 2013a). The following are the parameters used in all events.

- A mixture file for each scenario was developed using the dominating radionuclides and the source term (ST), as calculated in Chapter 6.0.
- Bases on the guidance in the PRC-STD-NS-8739 (*Hanford Safety Analysis and Risk Assessment Handbook [SARAH]*), the solubility class "M" was used for all radionuclides except for cesium where "F" is used (PRC 2011). See Appendix B for all the mixture files.
- The material at risk (MAR) is the ST calculated for each event in Chapter 6.0; therefore, the damage ratio (DR), leak path factor (LPF), airborne release fraction (ARF), and respirable fraction (RF) will all appear as 1.0, where applicable.
- A deposition velocity of 0.30 cm/sec will be used for all events.
- Receptor locations are outlined in Section 5.2, below. A receptor height of 1.5 m is used.
- The meteorological conditions are 5-year historical Hanford Site data (See Section 5.4).
- Standard terrain is used.
- Source Geometry is set to complex.
- The wind reference height is 10 m.
- A mixing layer of 140 m is use for 95th percentile values and 500 m for 50th percentile values.
- Ground Shine is included.
- Non-respirable deposition velocity of 8 cm/second is used.
- A breath rate of 3.33E-04 m^3/second is used.
- Contour values are set to 100 rem (inner), 1 rem (middle), and 0.1 rem (outer).
- FGR-13 values will be used.

A summarized version of the additional parameters used in this EPHA are in the below sections.

5.1.1 Fire Events

- The General Fire Model is used for fires: all outside fires or fires occurring inside without confinement. General Plume will be used for fires inside the facility with confinement.
- A sample time of 30 minutes will be used for the fires.

- The heat emission rate will be used for each fire. The heat emissions and release radius are provided in Chapter 6.0 for each event. The physical height of the fire is assumed to be 0 m and the air temperature is assumed to be 20°C.

5.1.2 Explosion Events

- The General Explosion Model is used for explosions.
- The default sample time of 10 minutes will be used for explosion.
- The equivalent pounds of TNT are developed in Chapter 6.0, when applicable.

5.1.3 Spills, Leaks, and Loss of Confinement Events

- The General Plume Model is used for spills, leaks, and loss of confinement events.
- The effective release height will be 0 m.
- A sample time of 15 minutes will be used for all spills, leaks, and loss of confinement events.

5.2 RECEPTOR LOCATIONS

The doses at two receptor locations are evaluated for comparison with the emergency classification criteria: a facility boundary receptor and an offsite receptor. Standard practice is to use a distance of 100 m (328 ft) as the facility boundary distance and the distance to the near side Columbia River shoreline (11,000 m [6.8 mi] in this case) as the emergency planning site boundary distance.

Other receptors of interest for this analysis include the closest point of approach of Highway 240 at 8,550 m (5.3 mi) and the Hanford Site boundary at 15,290 m (9.5 mi).

5.3 EMERGENCY CLASSIFICATION CRITERIA

A goal of the DOE emergency preparedness system is to quickly classify the severity of an accident involving quantities of hazardous substances that exceed DOE screening criteria. Preplanned actions are then implemented for each emergency classification. The emergency classification is based, in part, on projected dose and consequences values at the facility and Hanford Site boundaries for analyzed accident scenarios. Potential consequences of hazardous material releases are estimated to determine areas potentially affected, the need for personnel protective actions, and the time available to take protective actions. The consequences are determined for radiological releases (e.g., total effective dose [TED] or committed effective dose) to the following receptor locations relevant to the facility.

- The facility boundary (i.e., demarcation between the facility and the immediate vicinity) and the remainder of the Hanford Site:
  - The facility boundary definition figures prominently in the distinction between events that have only a local impact (i.e., on the facility occupants and associated workers at or near the scene of the event) and events that impact areas of the Hanford Site outside the immediate vicinity of the affected facility. The maximum onsite receptor is evaluated at 100 m (328 ft).
- The site boundary:
  - The site boundary is the nearest location to the facility where DOE does not have full ownership and control over access to the property. DOE/RL-94-02, *Hanford Emergency Management Plan*, defines the Hanford Site boundary as "For

emergency preparedness purposes, the Hanford Site is defined as the near (south and west) bank of the Columbia River from the intersection of the existing western most site boundary and the Columbia River, following the Columbia River to the south boundary of the 300 Area, and proceeding west and north along the existing site boundary" (DOE/RL 2011).

The emergency classification criteria are shown in Table 5-1.

Table 5-1. Radiological Release Criteria

Emergency Class	Criterion
Alert	≥100 mrem TED at the facility boundary
Site Area Emergency	≥1 rem TED at the facility boundary
General Emergency	≥1 rem TED at the site boundary

General criteria for emergency classification also exist in addition to the numerical values identified in Table 5-1. The threshold between reportable occurrences and the Alert classification is difficult to establish based solely on a numerical value. The following general criteria apply in addition to the airborne release concentration values specified in Table 5-1.

ALERT - An Alert shall be declared when events are in progress or have occurred which involve an actual or potential substantial degradation of the level of safety of the facility with an increased potential for a release.

In general, the Alert classification is appropriate when the severity and/or complexity of an event may exceed the capabilities of the normal operating organization to adequately manage the event and its consequences.

SITE AREA EMERGENCY - A Site Area Emergency shall be declared when events are in progress or have occurred which involve actual or likely major failures of facility functions needed for protection of workers and the public.

GENERAL EMERGENCY - A General Emergency shall be declared when events are in progress or have occurred that involves actual or imminent catastrophic failure of facility safety systems with a potential for loss of confinement or containment integrity.

Additional emergency classification guidance is provided in the *Emergency Management Guide on Event Classification and Emergency Action Levels* (DOE Guide 151.1-4, [DOE 2007]). The hazards assessment in Chapter 6.0 of this EPHA is based primarily on a comparison of calculated consequences with the numerical criteria in Table 5-1; however, some recommendations are provided based on the more general emergency classification criteria.

5.4 METEOROLOGICAL CONDITIONS

Five year historical Hanford Site meteorological data is used. This is a compilation of five years of meteorological data for the different Areas located on the Hanford Site. The 200 Area set of meteorological data is used in this EPHA (Bucci 2012). The 95th percentile and 50th percentile values are used for worst (adverse) case and average conditions, respectively.

6.0 SCENARIOS AND CONSEQUENCES

The radiological consequences using HotSpot v 2.07.2 for the analyzed events are included in Appendix A of this document.

Guidance to select accident scenarios is provided in DOE Guide 151.1-4, which states that the EPHA should postulate and analyze events covering the full range of possible initiators and severity levels, as well as any accident scenarios identified in the authorization basis documents (DOE 2007).

A broad range of scenarios were selected. The following accidents were analyzed in this EPHA.

- Seismic Event
- Partial Roof Collapse of the 202-A Canyon Building
- Partial Collapse of PUREX Storage Tunnel No. 1
- Partial Collapse of PUREX Storage Tunnel No. 2
- Contaminated Equipment Drop
- Fire in PUREX Storage Tunnel No. 1
- Fire in PUREX Storage Tunnel No. 2
- Staged Waste Fire involving Non-Equipment Waste

A majority of the above-analyzed events are considered operations events. The following beyond design basis events (i.e., severe events) were considered in the scenario development process:

- A beyond design basis seismic event is analyzed in this EPHA. A design basis seismic event is not analyzed in this EPHA because the consequences of the event are bounded by the operational events being analyzed (Partial Roof Collapse of the 202-A Canyon Building, Partial Collapse of PUREX Storage Tunnel No. 1, Partial Collapse of PUREX Storage Tunnel No. 2).
- Two facility events resulting from an aircraft impact analyzed below (Partial Collapse of the 202-A Canyon Building and Fire in PUREX Tunnel No. 1). A calculated impact analysis was not performed for the aircraft scenario; however, the following items were considered when developing the conservative assumptions: the exterior canyon concrete walls range in thickness between 4 – 5 feet; the concrete canyon roof is a minimum of 3 feet thick and capped with a metal roof; input from colleagues; studies of the World Trade Center disaster (Katayama 2004), and the general principles discussed in UCRL-ID-123577, *Structures, Systems, and Components Evaluation Technical Support Document DOE Standard, Accident Analysis for Aircraft Crash into Hazardous Facilities* (DOE 1997).
- High winds/tornado scenarios are not analyzed because the event would result in mainly structural damage.
- There is no probable flood that could directly affect the PUREX Facility or PUREX Storage Tunnels in the 200E Area (CHPRC 2012); therefore, a flooding event was not analyzed in this EPHA.
- There is a possibility that excess snow/ash load could breach the facility roof. Therefore, excess snow/ash load was included in the partial roof collapse event below.

The Fire Hazards Analysis (FHA) evaluated potential fire events within the 202-A Canyon Building. No fire event was found to challenge the building confinement or exhaust filters (CP 2009). The only way material could be released from the 202-A Canyon Building during a fire is if the doors are opened; therefore, the only fire inside the 202-A Canyon Building that will be analyzed is a fire that occurs when material is being transported outside the facility and the doors to the facility are opened.

For criticality, the facility is classified as a limited control facility. This means that greater than one-half of a minimum critical mass is present and criticality is not a credible scenario.

The canyon ventilation system maintains general air movement from the building interior to the deep-bed filter No. 2 before being HEPA filtered and released to the environment through the stack. The ventilation system provides a relative negative atmosphere inside the facility with only 10 percent of the total flow through N cell and each of the other main galleries. These airflows converge from throughout the facility into the air tunnel, which feeds the deep bed filter No. 2. The majority of the airflow enters through the north vacuum breaker to supply the canyon.

Since the canyon air space is very large in comparison to the amount of air exhausted through the stack, the interior air is nearly stagnant with no capture velocity for gasses or particulates. The effectiveness of the ventilation system in removing smoke or contaminants from these various areas has not been tested and therefore, the system's ability to mitigate an upset condition cannot be quantified. As a result, this EPHA credits no accident mitigation from operation of the canyon ventilation system.

6.1 SEISMIC EVENT

Facility structural damage could occur because of either local seismic activity or a facility mechanical structural failure from other natural phenomenon hazard events (snow/ash load, high winds). Based on the PUREX Facility design criteria, a Uniform Building Code seismic demand is expected to result in some structural damage (cracking, spalling, and minor structural damage) to facility structures. A more significant seismic event would be required to cause catastrophic failure of these structures. The assumptions and modeling for the seismic scenario are not changed by the updated seismic spectra given in RPP-RPT-27570, *Development of PC2 Surface Spectral for Double Shell Tank Facilities, DOE Hanford Site, in Washington State* (RPP 2006).

6.1.1 Scenario Development

A beyond design basis seismic event could cause total failure of the 202-A Canyon Building structure and Storage Tunnels No. 1 and 2 would result in a ground level release of material. For this magnitude of event, the entire building/storage tunnels and the entire inventory would be affected. The seismic event would not initiate a fire since electrical power is only energized during S&M activities and is isolated from the process cell areas. In addition, the non-fire seismic event bounds a seismic event with a fire because a fire would result in greater dispersion and dilution of the material released due to the heated plume rise of the fire.

6.1.2 Source Term Development

Tables 6-1 and 6-2 present the MAR in the 202-A Canyon Building and Storage Tunnels No. 1 and 2, respectively.

Table 6-1. MAR for 202-A Canyon Building

Radionuclide	Tanks and Equipment[1] (g)	Tanks and Equipment[1] (Ci)[2]	Fixed Inventory[3] (g)	Fixed Inventory[3] (Ci)[2]	Deep-Bed Filters (g)	Deep-Bed Filters (Ci)[2]
Pu-238	4.13E+00	7.06E+01	5.66E+00	9.68E+01	2.90E-01	4.96E+00
Pu-239	4.92E+03	3.05E+02	6.70E+03	4.16E+02	3.40E+02	2.11E+01
Pu-240	7.76E+02	1.76E+02	1.06E+03	2.41E+02	5.40E+01	1.23E+01
Pu-241	2.74E+01	2.82E+03	3.67E+01	3.78E+03	1.90E+00	1.96E+02
Pu-242	1.61E+01	6.34E-02	2.22E+01	8.72E-02	1.10E+00	4.32E-03
Am-241	1.47E+02	5.04E+02	1.93E+02	6.64E+02	1.00E+01	3.44E+01
Sr-90	6.02E+01	8.25E+03	0.00E+00	0.00E+00	5.30E+00	7.26E+02
Y-90	1.51E-02	8.19E+03	0.00E+00	0.00E+00	1.34E-03	7.29E+02
Cs-137	1.16E+02	1.00E+04	0.00E+00	0.00E+00	1.00E+01	8.65E+02

[1]The tanks and equipment MAR includes the inventory assigned to the following locations: A cell, B cell, C cell, D cell, E cell (Skip), E cell (excluding skip), H cell, J cell (J5A), J cell and the White Room.
[2]The inventory in Ci was calculated by multiplying the gram value by the specific activity for each radionuclide (ECS 1996).
[3]The fixed inventory is made up of L cell, N cell, and the PR Room.

Table 6-2. MAR for Storage Tunnels No. 1 and 2

Radionuclide	Tunnel No. 1 (g)	Tunnel No. 1 (Ci)[1]	Tunnel No. 2 (g)	Tunnel No. 2 (Ci)[1]	Total (Ci)
Pu-238	3.46E+00	5.92E+01	4.52E+00	7.74E+01	1.36E+02
Pu-239	4.26E+03	2.64E+02	4.71E+03	2.92E+02	5.57E+02
Pu-240	6.67E+02	1.52E+02	7.37E+02	1.68E+02	3.19E+02
Pu-241	1.92E+01	1.98E+03	6.42E+01	6.61E+03	8.59E+03
Pu-242	1.39E+01	5.46E-02	1.53E+01	6.01E-02	1.15E-01
Am-241	1.29E+02	4.43E+02	9.75E+01	3.35E+02	7.79E+02
Sr-90	5.99E+01	8.19E+03	1.25E+03	1.71E+05	1.79E+05
Y-90	1.50E-02	8.19E+03	3.13E-01	1.71E+05	1.78E+05
Cs-137	1.16E+02	1.01E+04	3.79E+03	3.30E+05	3.38E+05

[1]The inventory in Ci was calculated by multiplying the gram value by the specific activity for each radionuclide (ECS 1996).

The radiological material in the 202-A Canyon Building and the Storage Tunnels are conservatively assumed to be powder for this analysis. DOE-HDBK-3010-94 recommends a bounding ARF/RF for suspension of bulk powder due to vibration of substance from shock-impact to powder confinement (e.g., glovebox, cans) due to falling debris or external energy (e.g., seismic vibrations) of 1E-03/0.1; therefore, an ARF/RF of 1E-03/0.1 will be used for the seismic event (DOE 1994).

Since the majority of this material in the 202-A Canyon Building is within the equipment or on the cell floors below the coverblocks, evaluation of the potential for impact to this material was performed to determine if application of a DR is warranted. The use of these DRs was approved as part of the PUREX Facility roof upgrade analysis. Three DR categories were identified to address the potential for a release as a result of a seismic event affecting the 202-A Canyon Building. The applicable DR for the tanks and equipment, fixed inventory, and deep-bed filters were documented in HNF-11698, *PUREX Roof Collapse Accident Analysis* (HNF 2002). HNF-11698 states that a DR of 0.5 should be assumed for the tanks and equipment, 0.25 should be applied to the fixed inventory, and 1.0 for the deep-bed filters (HNF 2002).

A DR of 0.5 was applied to the material located in the storage tunnels. The DR is a result of the material being stored in stout, sealed containers. The containers would absorb the shock of falling objects and thereby reduced the motive force for re-suspending the material, which would mitigate and/or prevent the release of material from inside their respective confinement.

Due to the nature of the event, all structures are assumed to fail; therefore, the LPF is assumed to be 1.0.

Tables 6-3 and 6-4 present the ST calculations for the 202-A Canyon Building and Storage Tunnel portions of the Seismic Event, respectively.

Table 6-3. Seismic Event ST for 202-A Canyon Building

Radionuclide	MAR (Ci)	DR	ARF	RF	LPF	ST (Ci)
Tanks and Equipment						
Pu-238	7.06E+01	0.5	1E-03	0.1	1.0	3.53E-03
Pu-239	3.05E+02	0.5	1E-03	0.1	1.0	1.53E-02
Pu-240	1.76E+02	0.5	1E-03	0.1	1.0	8.81E-03
Pu-241	2.82E+03	0.5	1E-03	0.1	1.0	1.41E-01
Pu-242	6.34E-02	0.5	1E-03	0.1	1.0	3.17E-06
Am-241	5.04E+02	0.5	1E-03	0.1	1.0	2.52E-02
Sr-90	8.25E+03	0.5	1E-03	0.1	1.0	4.12E-01
Y-90	8.19E+03	0.5	1E-03	0.1	1.0	4.09E-01
Cs-137	1.00E+04	0.5	1E-03	0.1	1.0	5.02E-01
Fixed Inventory						
Pu-238	9.68E+01	0.25	1E-03	0.1	1.0	2.42E-03
Pu-239	4.16E+02	0.25	1E-03	0.1	1.0	1.04E-03
Pu-240	2.41E+02	0.25	1E-03	0.1	1.0	6.02E-03
Pu-241	3.78E+03	0.25	1E-03	0.1	1.0	9.45E-02
Pu-242	8.72E-02	0.25	1E-03	0.1	1.0	2.18E-06
Am-241	6.64E+02	0.25	1E-03	0.1	1.0	1.66E-02
Sr-90	0.00E+00	0.25	1E-03	0.1	1.0	0.00E+00
Y-90	0.00E+00	0.25	1E-03	0.1	1.0	0.00E+00
Cs-137	0.00E+00	0.25	1E-03	0.1	1.0	0.00E+00

Table 6-3. Seismic Event ST for 202-A Canyon Building

Radionuclide	MAR (Ci)	DR	ARF	RF	LPF	ST (Ci)
Deep-Bed Filters						
Pu-238	4.96E+00	1.0	1E-03	0.1	1.0	4.96E-04
Pu-239	2.11E+01	1.0	1E-03	0.1	1.0	2.11E-03
Pu-240	1.23E+01	1.0	1E-03	0.1	1.0	1.23E-03
Pu-241	1.96E+02	1.0	1E-03	0.1	1.0	1.96E-02
Pu-242	4.32E-03	1.0	1E-03	0.1	1.0	4.32E-07
Am-241	3.44E+01	1.0	1E-03	0.1	1.0	3.44E-03
Sr-90	7.26E+02	1.0	1E-03	0.1	1.0	7.26E-02
Y-90	7.29E+02	1.0	1E-03	0.1	1.0	7.29E-02
Cs-137	8.65E+02	1.0	1E-03	0.1	1.0	8.65E-02
Total						
Pu-238	--	--	--	--	--	6.45E-03
Pu-239	--	--	--	--	--	2.78E-02
Pu-240	--	--	--	--	--	1.60E-02
Pu-241	--	--	--	--	--	2.55E-01
Pu-242	--	--	--	--	--	5.78E-06
Am-241	--	--	--	--	--	4.52E-02
Sr-90	--	--	--	--	--	4.85E-01
Y-90	--	--	--	--	--	4.82E-01
Cs-137	--	--	--	--	--	5.88E-01

This release is modeled as a general plume, ground level release with a surface line source of 1,005 ft (306.3 m) (CP 2012).

Table 6-4. Seismic Event ST for the Storage Tunnels

Radionuclide	MAR (Ci)	DR	ARF	RF	LPF	ST (Ci)
Pu-238	1.36E+02	0.5	1E-03	0.1	1.0	6.82E-03
Pu-239	5.57E+02	0.5	1E-03	0.1	1.0	2.79E-02
Pu-240	3.19E+02	0.5	1E-03	0.1	1.0	1.59E-02
Pu-241	8.59E+03	0.5	1E-03	0.1	1.0	4.30E-01
Pu-242	1.15E-01	0.5	1E-03	0.1	1.0	5.74E-06
Am-241	7.79E+02	0.5	1E-03	0.1	1.0	3.90E-02
Sr-90	1.79E+05	0.5	1E-03	0.1	1.0	8.97E+00
Y-90	1.78E+05	0.5	1E-03	0.1	1.0	8.92E+00
Cs-137	3.38E+05	0.5	1E-03	0.1	1.0	1.69E+01

This release is modeled as a general plume, ground level release with a surface line source of 358 ft (109.1 m) (for conservatism the horizontal distance of Storage Tunnel No. 1 was used) (CP 2012).

6.1.3 Consequence Analysis

The calculated dose consequence at the facility boundary is 3.25E+01 rem assuming severe meteorological conditions. The severe meteorological results of this analysis indicate that this event should be declared a Site Area Emergency because the TED at the facility boundary is greater than 1 rem.

The results of this analysis and the doses at several additional distances for severe and for annual average meteorology are summarized in Table 6-19.

6.2 PARTIAL ROOF COLLAPSE OF THE 202-A CANYON BUILDING

A moderate seismic event, aircraft impact, or extreme malevolent act has the potential to cause a partial roof collapse of the facility. In addition, the use of a crane may be required at some point during the S&M phase to repair the roof structure or support other activities. As a result, a crane load drop is a potential accident that warrants evaluation. A single crane load drop would most likely result in a single location failure of the roof and not a complete collapse of the building structure.

6.2.1 Scenario Development

The ECMP is a less robust structure than the remainder of the 202-A Canyon Building. A single crane load drop could cause failure of the ECMP and adjoining roof structure. Similarly, a moderate seismic event, aircraft impact, extreme malevolent act or snow/ask loading could also result in comparable damage. For the analysis, it is assumed that such an accident at the 202-A Canyon Building would result in a localized failure.

6.2.2 Source Term Development

To bound this potential release, the failure is assumed to impact the three adjacent cells (A, B, and C) located in close proximity to the platform. Table 6-5 presents the MAR for the Partial Roof Collapse.

Table 6-5. MAR for the Partial Roof Collapse of the 202-A Canyon Building

Radionuclide	A Cell (g)	B Cell (g)	C Cell (g)	Total MAR (g)	Total MAR (Ci)[1]
Pu-238	5.00E-01	5.00E-01	5.00E-01	1.50E+00	2.57E+01
Pu-239	6.00E+02	6.00E+02	6.00E+02	1.80E+03	1.12E+02
Pu-240	9.40E+01	9.40E+01	9.40E+01	2.82E+02	6.40E+01
Pu-241	3.30E+00	3.30E+00	3.30E+00	9.90E+00	1.02E+03
Pu-242	2.00E+00	2.00E+00	2.00E+00	6.00E+00	2.36E-02
Am-241	1.80E+01	1.80E+01	1.80E+01	5.40E+01	1.86E+02
Sr-90	9.30E+00	9.30E+00	9.30E+00	2.79E+01	3.82E+03
Y-90	2.34E-03	2.34E-03	2.34E-03	7.02E-03	3.82E+03
Cs-137	1.80E+01	1.80E+01	1.80E+01	5.40E+01	4.67E+03

[1]The inventory in Ci was calculated by multiplying the gram value by the specific activity for each radionuclide (ECS 1996).

The radiological material in A, B, and C cells are conservatively assumed to be powder for this analysis. DOE-HDBK-3010-94 recommends a bounding ARF/RF for suspension of bulk powered due to vibration of substance from shock-impact to powder confinement (e.g., glovebox, cans) due to falling debris or external energy (e.g., seismic vibrations) of 1E-03/1.0; therefore, an ARF/RF of 1E-03/0.1 will be used for the seismic event (DOE 1994). Per HNF-11698, a DR of 0.5 should be assumed for a roof collapse effecting the tanks and equipment, which is consistent with the contents of A, B, and C cells (HNF 2002). An LPF of 1.0 is assumed since there is an open path to the environment.

Table 6-6 presents the ST for the Partial Roof Collapse of the 202-A Canyon Building.

Table 6-6. ST for Partial Roof Collapse of the 202-A Canyon Building

Radionuclide	MAR (Ci)	DR	ARF	RF	LPF	ST (Ci)
Pu-238	2.57E+01	0.5	1.0E-03	0.1	1.0	1.28E-03
Pu-239	1.12E+02	0.5	1.0E-03	0.1	1.0	5.59E-03
Pu-240	6.40E+01	0.5	1.0E-03	0.1	1.0	3.20E-03
Pu-241	1.02E+03	0.5	1.0E-03	0.1	1.0	5.10E-02
Pu-242	2.36E-02	0.5	1.0E-03	0.1	1.0	1.18E-06
Am-241	1.86E+02	0.5	1.0E-03	0.1	1.0	9.29E-03
Sr-90	3.82E+03	0.5	1.0E-03	0.1	1.0	1.91E-01
Y-90	3.82E+03	0.5	1.0E-03	0.1	1.0	1.91E-01
Cs-137	4.67E+03	0.5	1.0E-03	0.1	1.0	2.34E-01

This release is modeled as a general plume, ground level release with a surface area source of 61.3 ft (18.7 m) by 71.3 ft (21.7 m) (CP 2012).

6.2.3 Consequence Analysis

The calculated dose consequence at the facility boundary is 3.38E+00 rem assuming severe meteorological conditions. The severe meteorological results of this analysis indicate that this event should be declared a Site Area Emergency because the TED at the facility boundary is greater than 1 rem.

The results of this analysis and the doses at several additional distances for severe and for annual average meteorology are summarized in Table 6-19.

6.3 PARTIAL COLLAPSE OF A PUREX STORAGE TUNNEL

The use of a crane may be required at some point during the S&M phase to support activities. As a result, a crane load drop is a potential accident that would warrant an evaluation. In addition, a moderate seismic event, extreme malevolent act, vehicle impact or snow/ash loading could cause a partial collapse of the storage tunnels.

6.3.1 Scenario Development

A single crane load drop would most likely result in a partial failure of a Storage Tunnel. In addition, a moderate seismic or extreme malevolent event has the potential to cause a partial collapse of a Storage Tunnel.

6.3.2 Source Term Development

To evaluate the potential consequences of a partial collapse of a Storage Tunnel, it is assumed that a partial failure of a storage tunnel occurs. Since the MAR in the Storage Tunnels are different, a separate analysis will be performed for each Tunnel.

6.3.2.1 Partial Collapse of PUREX Storage Tunnel No. 1

It is assumed that a partial collapse of the storage tunnel would affect only a portion of the inventory in the storage tunnel. Since the material in the tunnel is spread-out throughout the tunnel, it is conservatively assumed that a fourth of the inventory in Storage Tunnel No. 1 is involved in the accident. Table 6-7 shows the MAR for a partial collapse of Tunnel No. 1.

Table 6-7. MAR for Partial Collapse of PUREX Tunnel No. 1

Radionuclide	Contaminated Equipment	
	(g)	(Ci)[1]
Pu-238	8.65E-01	1.48E+01
Pu-239	1.07E+03	6.61E+01
Pu-240	1.67E+02	3.79E+01
Pu-241	4.80E+00	4.94E+02
Pu-242	3.48E+00	1.37E-02
Am-241	3.23E+01	1.11E+02
Sr-90	1.50E+01	2.05E+03
Y-90	3.75E-03	2.04E+03
Cs-137	2.90E+01	2.51E+03

[1]The inventory in Ci was calculated by multiplying the gram value by the specific activity for each radionuclide (ECS 1996).

DOE-HDBK-3010-94 recommends a bounding ARF/RF for suspension of bulk powder due to vibration of substance from shock-impact to powder confinement (e.g., glovebox, cans) due to falling debris or external energy (e.g., seismic vibrations) of 1E-03/1.0; therefore, an ARF/RF of 1E-03/0.1 will be used for the seismic event (DOE 1994).

A DR of 0.5 was applied to the material located in the PUREX Storage Tunnel No. 1. The DR is due to the material being stored in stout, sealed containers. The containers would absorb the shock of falling objects and thereby reduced the motive force for re-suspending the material, which would mitigate and/or prevent the release of material from inside their respective confinement. No credit is taken for LPF.

Table 6-8 presents the ST for the Partial Collapse of PUREX Storage Tunnel No. 1.

Table 6-8. ST for Partial Collapse of PUREX Storage Tunnel No. 1

Radionuclide	MAR (Ci)	DR	ARF	RF	LPF	ST (Ci)
Pu-238	1.48E+01	0.5	1.0E-03	1.0E-01	1.0	7.40E-04
Pu-239	6.61E+01	0.5	1.0E-03	1.0E-01	1.0	3.31E-03
Pu-240	3.79E+01	0.5	1.0E-03	1.0E-01	1.0	1.89E-03
Pu-241	4.94E+02	0.5	1.0E-03	1.0E-01	1.0	2.47E-02
Pu-242	1.37E-02	0.5	1.0E-03	1.0E-01	1.0	6.83E-07
Am-241	1.11E+02	0.5	1.0E-03	1.0E-01	1.0	5.55E-03
Sr-90	2.05E+03	0.5	1.0E-03	1.0E-01	1.0	1.03E-01
Y-90	2.04E+03	0.5	1.0E-03	1.0E-01	1.0	1.02E-01
Cs-137	2.51E+03	0.5	1.0E-03	1.0E-01	1.0	1.25E-01

This release is modeled as a general plume with point source geometry.

6.3.2.2 Partial Collapse of PUREX Storage Tunnel No. 2

The 324 Facility material inventory occupies approximately five of the forty positions in Storage Tunnel No. 2 (DAH 1995). It is conservatively assumed that all of the 324 material stored in Storage Tunnel No. 2 is at risk. The MAR is presented in Table 6-9.

Table 6-9. MAR for Partial Collapse of PUREX Tunnel No. 2

Radionuclide[1]	Tunnel No. 2 (g)	Tunnel No. 2 (Ci)[2]
Sr-90	1.15E+03	1.58E+05
Y-90	2.87E-01	1.56E+05
Cs-137	3.60E+03	3.11E+05

[1] This inventory includes trace quanities of plutonium that do not appreciable change the inventory or consequences (CP 2011).
[2] The inventory in Ci was calculated by multiplying the gram value by the specific activity for each radionuclide (ECS 1996).

DOE-HDBK-3010-94 recommends a bounding ARF/RF for suspension of bulk powder due to vibration of substance from shock-impact to powder confinement (e.g., glovebox, cans) due to falling debris or external energy (e.g., seismic vibrations) of 1E-03/1.0; therefore, an ARF/RF of 1E-03/0.1 will be used for the seismic event (DOE 1994).

A DR of 0.5 was applied to the material located in the PUREX Storage Tunnel No. 2. The DR is due to the material being stored in stout, sealed containers. The containers would absorb the shock of falling objects and thereby reduced the motive force for re-suspending the material, which would mitigate and/or prevent the release of material from inside their respective confinement. No credit is taken for LPF.

Table 6-10 presents the ST for the Partial Collapse of PUREX Storage Tunnel No. 2.

Table 6-10. ST for Partial Collapse of PUREX Storage Tunnel No. 2

Radionuclide	MAR (Ci)	DR	ARF	RF	LPF	ST (Ci)
Sr-90	1.58E+05	0.5	1.0E-03	1.0E-01	1.0	7.88E+00
Y-90	1.56E+05	0.5	1.0E-03	1.0E-01	1.0	7.81E+00
Cs-137	3.11E+05	0.5	1.0E-03	1.0E-01	1.0	1.56E+01

This release is modeled as a general plume with point source geometry.

6.3.3 Consequence Analysis

The calculated dose consequence at the facility boundary for the collapse of PUREX Storage Tunnel No. 1 is 1.96E+01 rem and 1.47E+01 rem for the collapse of PUREX Storage Tunnel No. 2 assuming severe meteorological conditions. The severe meteorological results of these analyses indicate that both events should be declared a Site Area Emergency because the TED at the facility boundary is greater than 1 rem.

The results of this analysis and the doses at several additional distances for severe and for annual average meteorology are summarized in Table 6-19.

6.4 CONTAMINATED EQUIPMENT/WASTER CONTAINER DROP

S&M activities generate contaminated waste. Typically, the waste packages are limited to incidental low-level waste (LLW) associated with contamination control of S&M activities. However, conditions may require risk-reduction activities for facility or personnel safety, which could lead to transuranic (TRU) waste from deactivated process components. This waste could generate waste packages staged for transport and disposal. The removed equipment can be stored on the outside waste storage pad. As a result, a contaminated equipment drop is a potential accident that would warrant evaluation.

6.4.1 Scenario Development

A bounding piece of equipment from the 202-A Canyon Building during S&M activities would contain 150 g of Pu-239. The scenario assumes the equipment was dropped during movement, which would result in a ground-level release of material.

Dose consequences for this event were calculated considering two different types of releases:

- A ground-level release without confinement.
- A ground-level release where some confinement is provided by the building structure. An LPF of 0.5 is assumed when confinement is considered.

6.4.2 Source Term Development

The isotopic distribution is based on A cell (750 g total). This is a conservative assessment of the distribution of materials within the 202-A Canyon Building. The MAR is assumed to include plutonium isotopes, americium, and other fission products for the distribution. To calculate the isotopic distribution, first, the MAR of the equipment is divided by the total MAR in A cell (186 g/750 g= 0.248). Next, the isotopic distribution of Cell A is multiplied by 0.248 to calculate the isotopic distribution of the equipment being dropped. The MAR for the contaminated equipment drop is presented in Table 6-11.

Table 6-11. Contaminated Equipment/Waste Container Drop MAR

Radionuclide	Contaminated Equipment	
	(g)	(Ci)[1]
Pu-238	1.24E-01	2.12E+00
Pu-239	1.49E+02	9.24E+00
Pu-240	2.33E+01	5.29E+00
Pu-241	8.21E-01	8.46E+01
Pu-242	4.84E-01	1.90E-03
Am-241	4.35E+00	1.50E+01
Sr-90	2.32E+00	3.17E+02
Y-90	5.80E-04	3.16E+02
Cs-137	4.48E+00	3.87E+02

[1]The inventory in Ci was calculated by multiplying the gram value by the specific activity for each radionuclide (ECS 1996).

The equipment/waste is packaged in a drum; therefore, the ARF/RF for material packaged in a relatively robust container that is opened or fails due to impact with floor (1E-03/0.1) is assumed for this analysis (DOE 1994). PRC-STD-NS-8739 states that a DR of 0.1 should be used for drums that are dropped < 13 m; based on the mode of transport of the drums and the distance that the drum will fall, a DR of 0.1 is assumed for this analysis (PRC 2011). An LPF of 1.0 is assumed when no credit is taken for confinement.

The ST for the Contaminated Equipment/Waste Container Drop is presented in Table 6-12.

Table 6-12. ST for Contaminated Equipment/ Waste Container Drop (without confinement)

Radionuclide	MAR (Ci)	DR	ARF	RF	LPF	ST (Ci)
Pu-238	2.12E+00	0.1	1E-03	0.1	1.0	2.12E-05
Pu-239	9.24E+00	0.1	1E-03	0.1	1.0	9.24E-05
Pu-240	5.29E+00	0.1	1E-03	0.1	1.0	5.29E-05
Pu-241	8.46E+01	0.1	1E-03	0.1	1.0	8.46E-04
Pu-242	1.90E-03	0.1	1E-03	0.1	1.0	1.90E-08
Am-241	1.50E+01	0.1	1E-03	0.1	1.0	1.50E-04
Sr-90	3.17E+02	0.1	1E-03	0.1	1.0	3.17E-03
Y-90	3.16E+02	0.1	1E-03	0.1	1.0	3.16E-03
Cs-137	3.87E+02	0.1	1E-03	0.1	1.0	3.87E-03

The drop without confinement is modeled as a general plume, ground level release with point source geometry. The drop with confinement is modeled as a general plume, ground level release with a surface area source of 61.3 ft (18.7 m) by 71.3 ft (21.7 m) (CP 2012).

6.4.3 Consequence Analysis

The calculated dose consequence at the facility boundary is 5.39E-01 rem without confinement and 2.77E-02 rem with confinement assuming severe meteorological conditions occur. For the without confinement case, the severe meteorological results of this analysis would indicate that this event should be declared an Alert because the TED at the facility boundary is greater than 100 mrem. For the with confinement, the severe meteorological results indicate that this event does not meet the classification criteria for the lowest level of Hazardous Material Operational Emergency without confinement or with confinement because the TED at the facility boundary is less than 100 mrem.

The results of this analysis and the doses at several additional distances for severe and for annual average meteorology are summarized in Table 6-19.

6.5 FIRE IN A PUREX STORAGE TUNNEL

As stated in the FHA, a fire in a PUREX Storage Tunnel would be ventilation limited due to the lack of oxygen available in the tunnel; in addition, the maximum possible fire in the tunnel would not burn through the tunnel to allow a release of material to the environment (CP 2009). Therefore, due to the fire being ventilation limited and no plausible release mechanism to the environment was identified, an operational fire was not modeled. However, it is possible for an aircraft to breach a PUREX Storage Tunnel and cause a fuel fire which is modeled below.

6.5.1 Scenario Development

For this analysis, a fire is postulated in PUREX Storage Tunnel No. 1 and No. 2. This accident could be initiated by an aircraft impact. It is assumed that the entire inventory of the storage tunnel would be at risk. The scenario assumes that the resulting fire would burn with sufficient energy that could result in a release of material to the environment.

6.5.2 Source Term Development

Since the MAR in the Storage Tunnels are different, a separate analysis will be performed for each Tunnel.

6.5.2.1 Fire in PUREX Storage Tunnel No. 1

The entire inventory in Storage Tunnel No. 1 is assumed in the fire. The MAR is presented in Table 6-13.

Table 6-13. PUREX Storage Tunnel No. 1 MAR

Radionuclide	Tunnel No. 1 (g)	Tunnel No. 1 (Ci)[1]
Pu-238	3.46E+00	5.92E+01
Pu-239	4.26E+03	2.65E+02
Pu-240	6.67E+02	1.51E+02
Pu-241	1.92E+01	1.98E+03
Pu-242	1.39E+01	5.46E-02
Am-241	1.29E+02	4.44E+02

Table 6-13. PUREX Storage Tunnel No. 1 MAR

Radionuclide	Tunnel No. 1 (g)	Tunnel No. 1 (Ci)[1]
Sr-90	5.99E+01	8.21E+03
Y-90	1.50E-02	8.16E+03
Cs-137	1.16E+02	1.00E+04

[1]The inventory in Ci was calculated by multiplying the gram value by the specific activity for each radionuclide (ECS 1996).

For Storage Tunnel No. 1 fire accident, no credit was taken for any fractional reduction in the MAR by the accident-generated conditions; therefore, a DR of 1.0 was used in the analysis. DOE-HDBK-3010 identifies ARF and RF as 6E-03 and 1E-02, respectively, for thermal stress of non-reactive compounds. No credit is taken for LPF.

The ST for the Fire in Storage Tunnel No. 1 is shown in Table 6-14.

Table 6-14. ST for Fire in PUREX Storage Tunnel No. 1

Radionuclide	MAR (Ci)	DR	ARF	RF	LPF	ST (Ci)
Pu-238	5.92E+01	1.0	6E-03	1E-02	1.0	3.55E-03
Pu-239	2.65E+02	1.0	6E-03	1E-02	1.0	1.59E-02
Pu-240	1.51E+02	1.0	6E-03	1E-02	1.0	9.08E-03
Pu-241	1.98E+03	1.0	6E-03	1E-02	1.0	1.19E-01
Pu-242	5.46E-02	1.0	6E-03	1E-02	1.0	3.28E-06
Am-241	4.44E+02	1.0	6E-03	1E-02	1.0	2.66E-02
Sr-90	8.21E+03	1.0	6E-03	1E-02	1.0	4.92E-01
Y-90	8.16E+03	1.0	6E-03	1E-02	1.0	4.90E-01
Cs-137	1.00E+04	1.0	6E-03	1E-02	1.0	6.02E-01

A malevolent act or aircraft impact would create an extremely hot fire. The largest jet liner expected to be flown near the Hanford site is the MD 83 which has a fuel capacity of 6,970 gallons (26,384 liters). The heat of combustion of jet fuel is 1.04E+04 cal/g (SFPE 1995). The fire is assumed to burn for 120 mins (SFPE 1995) since fire suppression activities could be hinder by limited access to the tunnels.

6.5.2.2 Fire in PUREX Storage Tunnel No. 2

The entire inventory in Storage Tunnel No. 2 is assumed in the fire. The MAR is presented in Table 6-15.

Table 6-15. PUREX Storage Tunnel No. 2 MAR

Radionuclide	Tunnel No. 2 (g)	Tunnel No. 2 (Ci)[1]
Pu-238	4.52E+00	7.73E+01
Pu-239	4.71E+03	2.92E+02
Pu-240	7.37E+02	1.67E+02
Pu-241	6.42E+01	6.61E+03
Pu-242	1.53E+01	6.01E-02
Am-241	9.75E+01	3.35E+02
Sr-90	1.25E+03	1.71E+05
Y-90	3.13E-01	1.70E+05
Cs-137	3.79E+03	3.28E+05

[1]The inventory in Ci was calculated by multiplying the gram value by the specific activity for each radionuclide (ECS 1996).

For Storage Tunnel No. 2 fire accident, no credit was taken for any fractional reduction in the MAR by the accident-generated conditions; therefore, a DR of 1.0 was used in the analysis. DOE-HDBK-3010 identifies ARF and RF as 6E-03 and 1E-02, respectively, for thermal stress of non-reactive compounds. No credit is taken for LPF.

The ST for the Fire in Storage Tunnel No. 2 is shown in Table 6-16.

Table 6-16. ST for Fire in PUREX Storage Tunnel No. 2

Radionuclide	MAR (Ci)	DR	ARF	RF	LPF	ST (Ci)
Pu-238	7.73E+01	1.0	6E-03	1E-02	1.0	4.64E-03
Pu-239	2.92E+02	1.0	6E-03	1E-02	1.0	1.75E-02
Pu-240	1.67E+02	1.0	6E-03	1E-02	1.0	1.00E-02
Pu-241	6.61E+03	1.0	6E-03	1E-02	1.0	3.97E-01
Pu-242	6.01E-02	1.0	6E-03	1E-02	1.0	3.61E-06
Am-241	3.35E+02	1.0	6E-03	1E-02	1.0	2.01E-02
Sr-90	1.71E+05	1.0	6E-03	1E-02	1.0	1.03E+01
Y-90	1.70E+05	1.0	6E-03	1E-02	1.0	1.02E+01
Cs-137	3.28E+05	1.0	6E-03	1E-02	1.0	1.97E+01

A malevolent act or aircraft impact would create an extremely hot fire. The largest jet liner expected to be flown near the Hanford site is the MD 83 which has a fuel capacity of 6,970 gallons (26,384 liters). The heat of combustion of jet fuel is 1.04E+04 cal/g (SFPE 1995). The fire is assumed to burn for 120 mins (SFPE 1995).

6.5.3 Consequence Analysis

The calculated dose consequence at the facility boundary for the fire in PUREX Storage Tunnel No. 1 is 4.40E-07 rem and 5.47E-07 rem for the fire in PUREX Storage Tunnel No. 2 assuming

severe meteorological conditions. The severe meteorological results of this analysis indicate that this event does not meet the classification criteria for the lowest level of Hazardous Material Operational Emergency without confinement or with confinement because the TED at the facility boundary is less than 100 mrem.

The results of this analysis and the doses at several additional distances for severe and for annual average meteorology are summarized in Table 6-19.

6.6 STAGED WASTE FIRE INVOLVING EQUIPMENT/WASTE CONTAINER

S&M activities generate contaminated waste. Typically, the waste packages are limited to incidental LLW associated with contamination control of S&M activities. However, conditions may require risk-reduction activities that could lead to TRU waste from deactivated process components. This waste could generate waste packages staged for transport and disposal. The inventory of a waste container containing step-off and contamination control waste would be expected to be below 1 g of radioactive material. To be conservative, the MAR inventory is assumed to be approximately 10 g with the isotopic weight distribution based on the distribution of A Cell. Per the FHA, the worst-case fire in the canyon building will not damage the exhaust system's HEPA filters and therefore there would be no release to the environment (CP 2009). In addition, the doors to the canyon would be closed during movement operations.

6.6.1 Scenario Development

For this analysis, a hypothetical waste container is being removed from the facility when the forklift malfunctions and catches fire setting the waste container on fire. It is assumed that the waste will be staged in a steel waste containers (e.g., steel waste disposal boxes, standard waste boxes) as provided by waste handling and disposal requirements. The hypothetical waste container is assumed to have an inventory of 10 g of radioactive material.

6.6.2 Source Term Development

The inventory of a waste container containing step-off and contamination control waste would be expected to be below 10 g of Pu-239. The isotopic distribution is based on A cell. This is a conservative assessment of the distribution of materials within the 202-A Canyon Building and results in the most conservative dose consequences. The MAR inventory is assumed to include plutonium isotopes, americium, and fission products for the distribution.

The MAR is presented in Table 6-17.

Table 6-17. Non-Equipment Staged Waste Fire MAR

Radionuclide	Contaminated Material	
	(g)	(Ci)[1]
Pe-238	8.27E-03	1.41E-01
Pu-239	9.92E+00	6.16E-01
Pu-240	1.55E+00	3.53E-01
Pu-241	5.47E-02	5.64E+00
Pu-242	3.22E-02	1.27E-04

Table 6-17. Non-Equipment Staged Waste Fire MAR

Radionuclide	Contaminated Material	
	(g)	(Ci)[1]
Am-241	2.90E-01	9.99E-01
Sr-90	1.54E-01	2.12E+01
Y-90	3.87E-05	2.10E+01
Cs-137	2.98E-01	2.58E+01

[1]The inventory in Ci was calculated by multiplying the gram value by the specific activity for each radionuclide (ECS 1996).

DOE-HDBK-3010-94 identifies a median ARF and RF (the median values are considered more reasonable than the bounding values given the type of materials and containers being postulated for this scenario) as 8E-05 and 1.0, respectively, for thermal stress for packaged waste (DOE 1994). For the waste fire accident, no credit was taken for primary confinement; therefore, a DR of 1.0 was used in the analysis. No credit is taken for LPF.

The ST for the Non-equipment Stages Waste Fire is shown in Table 6-18.

Table 6-18. ST for Non-Equipment Staged Waste Fire

Radionuclide	MAR (Ci)	DR	ARF	RF	LPF	ST (Ci)
Pu-238	1.41E-01	1.0	8E-05	1.0	1.0	1.13E-05
Pu-239	6.16E-01	1.0	8E-05	1.0	1.0	4.93E-05
Pu-240	3.53E-01	1.0	8E-05	1.0	1.0	2.82E-05
Pu-241	5.64E+00	1.0	8E-05	1.0	1.0	4.51E-04
Pu-242	1.27E-04	1.0	8E-05	1.0	1.0	1.01E-08
Am-241	9.99E-01	1.0	8E-05	1.0	1.0	7.99E-05
Sr-90	2.12E+01	1.0	8E-05	1.0	1.0	1.69E-03
Y-90	2.10E+01	1.0	8E-05	1.0	1.0	1.68E-03
Cs-137	2.58E+01	1.0	8E-05	1.0	1.0	2.07E-03

Based on the FHA, an outside fire involving the non-equipment staged waste would burn at 2.9 MW (6.93E+05 cal/sec) with a pool radius of 0.975 m (Syverson 2013). Note that the fuel loading of the forklift was not accounted for in the analysis. Including the forklift fuel load would produce a hotter fire which would loft the fire higher resulting in a less conservative analysis.

6.6.3 Consequence Analysis

The calculated dose consequence at the facility boundary is 1.19E-04 rem assuming severe meteorological conditions. The severe meteorological results of this analysis indicate that this event does not meet the classification criteria for the lowest level of Hazardous Material Operational Emergency because the TED at the facility boundary is less than 100 mrem.

The results of this analysis and the doses at several additional distances for severe and for annual average meteorology are summarized in Table 6-19.

Table 6-19. Accident Consequences Summary for the PUREX Facility

Release Scenario	Release Conditions	Met Condition	Dose (Rem – TED) at:				Distance (m) to:		Event Class
			Facility Boundary 100 m	Columbia River 11,000 m	Highway 240 8,550 m	Hanford Site Boundary 15,290 m	100 rem	1 rem	
Seismic Event Section 6.1	Without confinement	Severe - 95%	3.25E+01	5.68E-02	8.24E-02	3.14E-02	<100 m	1475	Site Area Emergency
		Annual Average	1.01E+01	1.94E-02	2.75E-02	1.22E-02	<100 m	650	Site Area Emergency
Partial Roof Collapse of the 202-A Canyon Building Section 6.2	Without confinement	Severe - 95%	3.38E+00	5.92E-03	8.70E-03	3.20E-03	<100 m	316	Site Area Emergency
		Annual Average	1.04E+00	1.97E-03	2.81E-03	1.25E-03	<100 m	103	Site Area Emergency
Partial Roof Collapse of PUREX Storage Tunnel No. 1 Section 6.3	Without confinement	Severe - 95%	1.96E+01	3.59E-03	5.35E-02	1.91E-03	<100 m	464	Site Area Emergency
		Annual Average	3.50E+00	1.19E-03	1.70E-03	7.47E-04	<100 m	197	Site Area Emergency
Partial Roof Collapse of PUREX Storage Tunnel No. 2 Section 6.3	Without confinement	Severe - 95%	1.47E+01	2.57E-03	3.83E-03	1.36E-03	<100 m	394	Site Area Emergency
		Annual Average	2.53E+00	8.49E-04	1.21E-03	5.34E-04	<100 m	165	Site Area Emergency

Table 6-19. Accident Consequences Summary for the PUREX Facility

Release Scenario	Release Conditions	Met Condition	Dose (Rem – TED) at:				Distance (m) to:		Event Class
			Facility Boundary 100 m	Columbia River 11,000 m	Highway 240 8,550 m	Hanford Site Boundary 15,290 m	100 rem	1 rem	
Contaminated Equipment/Waste Container Drop Section 6.4	Without confinement	Severe - 95%	5.39E-01	9.93E-05	1.48E-04	5.28E-05	<100 m	<100 m	Alert
		Annual Average	9.64E-02	3.28E-05	4.68E-05	2.06E-05	<100 m	<100 m	None
	With confinement	Severe - 95%	2.77E-02	4.85E-05	7.13E-05	2.62E-05	<100 m	<100 m	None
Fire in PUREX Storage Tunnel No. 1 Section 6.5	Without confinement	Severe - 95%	4.40E-07	7.55E-04	8.39E-04	6.41E-04	<100 m	<100 m	None
		Annual Average	1.82E-11	2.21E-04	2.15E-04	2.05E-04	<100 m	<100 m	None
Fire in PUREX Storage Tunnel No. 2 Section 6.5	Without confinement	Severe - 95%	5.47E-07	9.40E-04	1.04E-03	7.97E-04	<100 m	<100 m	None
		Annual Average	2.26E-11	2.75E-04	2.67E-04	2.55E-04	<100 m	<100 m	None
Staged Waste Fire Involving Equipment Waste/Waste Container Section 6.6	Without confinement	Severe - 95%	1.19E-04	2.60E-05	3.09E-05	1.99E-05	<100 m	<100 m	None
		Annual Average	0.00E+00*	7.43E-06	9.42E-06	5.49E-06	<100 m	<100 m	None

*Due to the low consequence, HotSpot could not produce a value.

Table 6-20. The PUREX Facility UDAC ST Summary

Scenario	Model Used and Modeling Parameters	Height of Release (m)	Radionuclide	ST (Ci)	Dose Equivalent Curie (DE-Ci) Value – Pu^{239}
Seismic Event A beyond design basis seismic event could cause total failure of the 202-A Canyon Building structure and Storage Tunnels No. 1 and 2 which would result in a ground level release of material. For this magnitude of event, the entire building/storage tunnels and the entire inventory would be affected. The seismic event would not initiate a fire since electrical power is only energized during S&M activities and is isolated from the process cell areas. Section 6.1	HotSpot was used for the modeling of this event. This release is modeled as a general plume, ground level release with a surface line source of 1,005 ft (306.3 m).	0 m	202-A Canyon Building		Not applicable
			Pu-238	6.45E-03	
			Pu-239	2.78E-02	
			Pu-240	1.60E-02	
			Pu-241	2.55E-01	
			Pu-242	5.78E-06	
			Am-241	4.52E-02	
			Sr-90	4.85E-01	
			Y-90	4.82E-01	
			Cs-137	5.88E-01	
	--		PUREX Storage Tunnels		
	HotSpot was used for the modeling of this event. This release is modeled as a general plume, ground level release with a surface line source of 358 ft (109.1 m).		Pu-238	6.82E-03	
			Pu-239	2.79E-02	
			Pu-240	1.59E-02	
			Pu-241	4.30E-01	
			Pu-242	5.74E-06	
			Am-241	3.90E-02	
			Sr-90	8.97E+00	
			Y-90	8.92E+00	
			Cs-137	1.69E+01	

Table 6-20. The PUREX Facility UDAC ST Summary

Scenario	Model Used and Modeling Parameters	Height of Release (m)	Radionuclide	ST (Ci)	Dose Equivalent Curie (DE-Ci) Value – Pu^{239}
Partial Roof Collapse of the 202-A Canyon Building The ECMP is a less robust structure than the remainder of the 202-A Canyon Building. A single crane load drop could cause failure of the ECMP and adjoining roof structure. Similarly, a moderate seismic event, aircraft impact, or extreme malevolent act could also result in comparable damage. For the analysis, it is assumed that such an accident at the 202-A Canyon Building would result in a localized failure. Section 6.2	HotSpot was used for the modeling of this event. This release is modeled as a general plume, ground level release with a surface area of 61.3 ft (18.7 m) by 71.3 ft (21.7 m).	0 m	Pu-238	1.28E-03	Not applicable
			Pu-239	5.59E-03	
			Pu-240	3.20E-03	
			Pu-241	5.10E-02	
			Pu-242	1.18E-06	
			Am-241	9.29E-03	
			Sr-90	1.91E-01	
			Y-90	1.91E-01	
			Cs-137	2.34E-01	
Partial Roof Collapse of PUREX Storage Tunnel No. 1 The use of a crane may be required at some point during the S&M phase to support activities. As a result, a crane load drop is a potential accident that would warrant an evaluation. A single crane load drop would most likely result in a partial failure of a Storage Tunnel. In addition, a moderate seismic or extreme malevolent event has the potential to cause a partial collapse of a Storage Tunnel. Section 6.3	HotSpot was used for the modeling of this event. This release is modeled as a general plume, ground level release with a surface area of 119.3 ft (36.4 m) by 22 ft (6.7 m).	0 m	Pu-238	1.64E+01	Not applicable
			Pu-239	6.77E+01	
			Pu-240	3.95E+01	
			Pu-241	4.97E+02	
			Pu-242	3.61E+00	
			Am-241	1.16E+02	
			Sr-90	2.06E+03	
			Y-90	2.05E+03	
			Cs-137	2.52E+03	

Table 6-20. The PUREX Facility UDAC ST Summary

Scenario	Model Used and Modeling Parameters	Height of Release (m)	Radionuclide	ST (Ci)	Dose Equivalent Curie (DE-Ci) Value – Pu^{239}
Partial Roof Collapse of PUREX Storage Tunnel No. 2 The use of a crane may be required at some point during the S&M phase to support activities. As a result, a crane load drop is a potential accident that would warrant an evaluation. A single crane load drop would most likely result in a partial failure of a Storage Tunnel. In addition, a moderate seismic or extreme malevolent event has the potential to cause a partial collapse of a Storage Tunnel. Section 6.3	HotSpot was used for the modeling of this event. This release is modeled as a general plume, ground level release with a surface area of 562.7 ft (171.5 m) by 26 ft (7.9 m).	0 m	Sr-90	7.88E+00	Not applicable
			Y-90	7.81E+00	
			Cs-137	1.56E+01	
Contaminated Equipment/Waste Container Drop A removed bounding piece of equipment from the 202-A Canyon Building during S&M activities would contain 150 g of Pu-239. The scenario assumes the equipment was dropped during movement, which would result in a ground-level release of material. Section 6.4	HotSpot was used for the modeling of this event. The drop without confinement is modeled as a general plume, ground level release with point source geometry. The drop with confinement is modeled as a general plume, ground level release with a surface area source of 61.3 ft (18.7 m) by 71.3 ft (21.7 m) (CP 2012).	0 m	Pu-238	2.12E-05	Not applicable
			Pu-239	9.24E-05	
			Pu-240	5.29E-05	
			Pu-241	8.46E-04	
			Pu-242	1.90E-08	
			Am-241	1.50E-04	
			Sr-90	3.17E-03	
			Y-90	3.16E-03	
			Cs-137	3.87E-03	

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Table 6-20. The PUREX Facility UDAC ST Summary

Scenario	Model Used and Modeling Parameters	Height of Release (m)	Radionuclide	ST (Ci)	Dose Equivalent Curie (DE-Ci) Value – Pu^{239}
Fire in PUREX Storage Tunnel No. 1 For this analysis, a fire is postulated in PUREX Storage Tunnel No. 1. This accident could be initiated by an aircraft impact or extreme malevolent act. It is assumed that the entire inventory of the storage tunnel would be at risk. The scenario assumes that the resulting fire would burn with sufficient energy that could result in a release of material to the environment. Section 6.5	HotSpot was used for the modeling of this event. The release is modeling using the fire model; a fire involving the PUREX Storage Tunnel No. 1 would burn at 19.5 MW (4.66E+06 cal/sec) with a pool radius of 1.00 m (3.28 ft)	0 m	Pu-238	3.55E-03	Not applicable
			Pu-239	1.59E-02	
			Pu-240	9.08E-03	
			Pu-241	1.19E-01	
			Pu-242	3.28E-06	
			Am-241	2.66E-02	
			Sr-90	4.92E-01	
			Y-90	4.90E-01	
			Cs-137	6.02E-01	
Fire in PUREX Storage Tunnel No. 2 For this analysis, a fire is postulated in PUREX Storage Tunnel No. 2. This accident could be initiated by an aircraft impact or extreme malevolent act. It is assumed that the entire inventory of the storage tunnel would be at risk. The scenario assumes that the resulting fire would burn with sufficient energy that could result in a release of material to the environment. Section 6.5	HotSpot was used for the modeling of this event. The release is modeling using the fire model; a fire involving the PUREX Storage Tunnel No. 2 would burn at 19.5 MW (4.66E+06 cal/sec) with a pool radius of 1.00 m (3.28 ft)	0 m	Pu-238	4.64E-03	Not applicable
			Pu-239	1.75E-02	
			Pu-240	1.00E-02	
			Pu-241	3.97E-01	
			Pu-242	3.61E-06	
			Am-241	2.01E-02	
			Sr-90	1.03E+01	
			Y-90	1.02E+01	
			Cs-137	1.97E+01	

Table 6-20. The PUREX Facility UDAC ST Summary

Scenario	Model Used and Modeling Parameters	Height of Release (m)	Radionuclide	ST (Ci)	Dose Equivalent Curie (DE-Ci) Value – Pu^{239}
Staged Waste Fire Involving Equipment/Waste Container This accident is identical to Section 6.6 with the exception that low level (step-off pad) waste is analyzed. Section 6.6	HotSpot was used for the modeling of this event. The outside release is modeling using the fire model; a fire involving equipment waste would burn at 2.9 MW (6.93E+05 cal/sec) with a pool radius of 1.95 m (6.40 ft). A general plume with point source geometry is used for the inside fire.	0 m	Pu-238	1.13E-05	Not applicable
			Pu-239	4.93E-05	
			Pu-240	2.82E-05	
			Pu-241	4.51E-04	
			Pu-242	1.01E-08	
			Am-241	7.99E-05	
			Sr-90	1.69E-03	
			Y-90	1.68E-03	
			Cs-137	2.07E-03	
High Winds/Tornado A high wind/tornado event was not analyzed in this EPHA. A high wind/tornado event would have similar impacts to the facility as the seismic event; therefore, the seismic event was used for EAL determination for a high wind/tornado event. Section 6.1	See Seismic Event for model used and parameters (Section 6.1)	0 m	See Seismic Event for the radionuclide distribution (Section 6.1)		Not applicable

Table 6-20. The PUREX Facility UDAC ST Summary

Scenario	Model Used and Modeling Parameters	Height of Release (m)	Radionuclide	ST (Ci)	Dose Equivalent Curie (DE-Ci) Value – Pu^{239}
Aircraft Crash An initiator for the Partial Roof Collapse of the 202-A Canyon Building and Fire in PUREX Storage Tunnel No.1 is an extreme malevolent act or aircraft impact. The 202-A Canyon Building/Deep-Bed Filter Fire and Fire in PUREX Storage Tunnel No.1 were used for EAL determination for the aircraft crash event. Sections 6.2 and 6.5	See 202-A Canyon Building/Deep-Bed Filter Fire and Fire in PUREX Storage Tunnel No.1for model used and parameters (Sections 6.5 and 6.6)	0 m	See Partial Roof Collapse of the 202-A Canyon Building, Partial Roof Collapse of PUREX Storage Tunnel No.1 or No. 2 for the radionuclide distribution (Sections 6.2 and 6.5)		Not applicable
Explosive Device A detonation of an explosive device was not analyzed in this EPHA. An explosive device would have similar impacts to the facility as a partial roof collapse of the 202-A Canyon Building, Partial Roof Collapse of PUREX Storage Tunnel No. 1, or Partial Roof Collapse of PUREX Storage Tunnel No. 2; therefore, the Partial Roof Collapse the 202-A Canyon Building, Partial Roof Collapse of PUREX Storage Tunnel No. 1, or Partial Roof Collapse of PUREX Storage Tunnel No. 2 was used for EAL determination for an explosive device event. Sections 6.2 and 6.3	See Partial Roof Collapse of the 202-A Canyon Building, Partial Roof Collapse of PUREX Storage Tunnel No. 1, or Partial Roof Collapse of PUREX Storage Tunnel No. 2 for model used and parameters (Sections 6.2 and 6.3)	0 m	See Partial Roof Collapse of the 202-A Canyon Building, Partial Roof Collapse of PUREX Storage Tunnel No. 1, or Partial Roof Collapse of PUREX Storage Tunnel No. 2 for the radionuclide distribution (Sections 6.2 and 6.3)		Not applicable

7.0 SUGGESTED EMERGENCY ACTION LEVEL

None of the PUREX Facility buildings are occupied at this time. Detection of emergencies in all buildings would be based on direct observations and reports of these observations. The PUREX Facility is easily visible from occupied buildings on 4th and Canton Streets during normal working hours and the area is frequently patrolled by Hanford Patrol during all hours.

Several accident scenarios were analyzed to cover a spectrum of emergency events that could occur at the PUREX Facility during the long-term S&M mission. The results of the analyses show that the worst-case event would be a Site Area Emergency. The threshold of early lethality (TEL) was not exceeded and the downwind protective action distance is 1.48 km (0.917 mi) for the worst accident.

This analysis of potential emergency conditions is organized into three major groups according to how abnormal conditions are most likely to be recognized or perceived: Facility Events (fire, explosion, process upsets), Natural Emergencies and External Events (seismic event, high winds/tornado, aircraft crash, abnormal roof loading), and Security Contingencies (bomb threat/explosive device, sabotage, hostage situation/armed intruder). Most events and conditions analyzed in Chapter 6.0 are "Facility Events." For events not analyzed in Chapter 6.0, the DOE Policy, as established in DOE-0223, RLEP 3.21, is used as guidance in developing recommended EALs (DOE 2012). In addition, the events not analyzed are bounded by or have similar consequences as the events analyzed in Chapter 6.0.

The following are suggested EALs for the analyzed scenarios and the bases for the recommendations. The EALs presented in this section are suggested and may not reflect the exact wording of the final EALs in the implementing procedure.

7.1 FACILITY EMERGENCIES

The following facility emergencies were analyzed in this EPHA.

- Seismic Event
- Partial Roof Collapse of the 202-A Canyon Building
- Partial Roof Collapse of PUREX Storage Tunnel No. 1
- Partial Roof Collapse of PUREX Storage Tunnel No. 2
- Contaminated Equipment Drop
- Fire in PUREX Storage Tunnel No. 1
- Fire in PUREX Storage Tunnel No. 2
- Staged Waste Fire Involving Non-Equipment Waste

7.1.1 Facility Fires

The three fires analyzed in Chapter 6.0 of this EPHA are Fire in PUREX Tunnel No. 1, Fire in PUREX Tunnel No. 2, and Staged Waste Fire involving Non-Equipment Waste. As shown in Chapter 6.0, none of the fires analyzed produce consequences that reach an Operational Emergency classification. Therefore, there are no EALs for a fire.

7.1.1.1 General Emergency

There are no EALs for this subcategory.

7.1.1.2 Site Area Emergency

There are no EALs for this subcategory.

7.1.1.3 Alert

There are no EALs for this subcategory.

7.1.2 Explosion

There are no identified process explosion scenarios for the facility; however, DOE-0223, RLEP 3.21, *Emergency Action Levels*, requires that facilities have an explosion EAL to cover unexpected conditions; therefore, a generic explosion classification is recommended.

7.1.2.1 General Emergency

There are no EALs for this subcategory.

7.1.2.2 Site Area Emergency

There are no EALs for this subcategory.

7.1.2.3 Alert

One condition should be classified as an Alert.

Recommended EALs:

Visible or audible confirmation of an explosion inside the 202-A Canyon Building or a PUREX Storage Tunnel and damages the confinement structure.

Basis: An explosion in the 202-A Canyon Building or a PUREX Storage Tunnel may occur in areas where radioactive material is present or could be perceived as a potential degradation of facility safety. This could present a potential threat to the confinement structure with the potential to release radioactive material to the environment and expose workers.

Protective action guidance: The isolation zone size and downwind protective action distance are at the discretion of the incident commander.

Basis: By definition, an Alert is that which could result in doses exceeding 100 mrem, but less than 1 rem at 100 m; therefore, doses that exceed the TEL (100 rem) and PAG (1 rem) are within 100 m, if exceeded at all.

7.1.3 Equipment Handling/Operational Accident/ Loss of Confinement Structure

Heavy object drops may occur during heavy equipment operation, work activities, or demolition of structures. Heavy object drops were postulated and analyzed in Sections 6.2 and 6.3 of this EPHA. In addition, a contaminated equipment removal scenario was postulated and analyzed in Section 6.4 of this EPHA and emergency classifications were determined based on the consequences.

7.1.3.1 General Emergency

There are no EALs for this subcategory.

7.1.3.2 Site Area Emergency

One condition should be classified a Site Area Emergency.

Recommended EALs:

Visual confirmation of a partial collapse of roof or exterior walls of the 202-A Canyon Building or a PUREX Storage Tunnel.

Basis: Failure of the confinement structure has the potential to allow the release of radiological material to the environment and expose workers. As shown in Chapter 6.0, the Partial Roof Collapse of the 202-A Canyon Building, Partial Roof Collapse of PUREX Storage Tunnel No. 1 or No. 2 would result in the declaration of a Site Area Emergency.

Protective action guidance: The isolation zone size is at the discretion of the incident commander since the threshold of early lethality does not exceed 100 m under the worst-case release assumptions. For conservatism, the downwind protective action distance for a partial collapse of PUREX Storage Tunnel No. 1 will be used for a breach of the 202-A Canyon Building or a PUREX Storage Tunnel; the downwind protective action distance for a partial collapse of PUREX Storage Tunnel No. 1 is 0.29 mi (464 m).

Basis: The distance to the TEL does not exceed 100 m for any of the analyzed accidents. As shown in Chapter 6.0, the downwind protective action distance for the Partial Roof Collapse of PUREX Storage Tunnel No. 1 is 0.29 mi (464 m).

7.1.3.3 Alert

Two conditions should be classified as an Alert.

Recommended EALs:

1. Any event or accident that results in visible facility damage that threatens a confinement structure (cracks in the roof or exterior walls) of the 202-A Canyon Building or a PUREX Storage Tunnel.
2. Outside TRU waste container accident with visual evidence that material has been released to the environment and the container(s) are, or believed to be greater than 6 DE-Ci

Basis: The analyses in Section 6.4 demonstrate that a Contaminated Equipment/Waste Container Drop without confinement would produce a classification of an Alert. The MAR and dose at 100 meters were initially ratioed to determine the minimum MAR for classification, but the ratio process does not yield the minimum value when working with smaller MARs and checked with modeling, e.g., [(10 grams / 547 mrem) *100 mrem) = 1.83 grams]. The 1.83 grams was converted to DE-Ci using the conversion factor in the DSA [(0.062 Ci/g)*(1.83 g) = 0.113 DE-Ci]; however, 0.113 DE-Ci is insufficient MAR to produce an Alert emergency. Through HotSpot modeling, 6 DE-Ci was determined to be the minimum MAR required to reach an Alert classification.

Protective action guidance: The isolation zone size and downwind protective action distance are at the discretion of the incident commander.

Basis: By definition, an Alert is that which could result in doses exceeding 100 mrem, but less than 1 rem at 100 m; therefore, doses that exceed the TEL (100 rem) and PAG (1 rem) are within 100 m, if exceeded at all.

7.2 NATURAL EMERGENCIES AND EXTERNAL EVENTS

Severe natural phenomena may affect several facilities on the Hanford Site, however the analysis presented here is only based on actual or potential damage to the PUREX Facility and does not consider the effects of the natural phenomena on other facilities, infrastructure, or emergency response capabilities.

7.2.1 Seismic Events

7.2.1.1 General Emergency

There are no EALs for this subcategory.

7.2.1.2 Site Area Emergency

One condition should be classified a Site Area Emergency.

Recommended EALs:

A seismic event that causes catastrophic failure of confinement structures (i.e., total or partial collapse of roof or exterior walls) of the 202-A Canyon Building, a PUREX Storage Tunnel or Deep Bed Filters.

Basis: Section 6.1 analyzes total structural failures of the 202-A Canyon Building and the PUREX Storage Tunnels No. 1 and 2 as possible initiators for the release of radioactive contamination to the environment. In addition, the separate output files from HotSpot indicate that the complete collapse of both the 202-A Canyon Building or Storage Tunnel No. 2 would constitute a Site Area Emergency declaration (see Appendix A.1); therefore, the Seismic Event should be declared a Site Area Emergency.

Protective action guidance: The isolation zone size is at the discretion of the incident commander since the threshold of early lethality does not exceed 100 m and the downwind protective action distance is 0.917 mi (1,475 m).

Basis: The downwind protective action distance for the worst-case unmitigated seismic event is 0.917 mi (1,475 m). Since the TEL does not exceed 100 m, the isolation zone is at the discretion of the Incident Commander.

7.2.1.3 Alert

One condition should be classified as an Alert.

Recommended EALs:

Seismic event resulting in visible damage (i.e., cracking and spalling of the roof or exterior walls) to the confinement structure of the 202-A Canyon Building or a PUREX Storage Tunnel.

Basis: This declaration is entirely precautionary. Because the seismic response of some support systems, structures, and components cannot be easily predicted, prudence dictates that a seismic event that causes visible significant structural damage or damage that is determined to be significant enough to potentially result in partial structural failures should be declared an Alert. This EAL is consistent with DOE policy as established in DOE-0223, RLEP 3.21 (DOE 2013b).

Protective action guidance: The isolation zone size and the downwind protective action distance are at the discretion of the Incident Commander.

Basis: By definition, an Alert is that which could result in doses exceeding 100 mrem, but less than 1 rem at 100 m; therefore, doses that exceed the TEL (100 rem) and PAG (1 rem) are within 100 m, if exceeded at all.

7.2.2 High Winds/Tornado

Some damage is expected to occur if high winds or a tornado strikes the 202-A Canyon Building or the PUREX Storage Tunnels. The potential release of radiological material was derived from the seismic event, but it is recognized the actual dose consequences could be considerably less due to dispersion of the radiological material from the winds associate with the event.

7.2.2.1 General Emergency

There are no EALs for this subcategory.

7.2.2.2 Site Area Emergency

One condition should be classified a Site Area Emergency.

Recommended EAL:

High winds or a tornado causes catastrophic failure of confinement structures (total or partial collapse of roof or exterior walls) at the 202-A Canyon Building or a PUREX Storage Tunnel.

Basis: High winds/tornado damage has not been analyzed in this EPHA for this facility. In extreme cases, the expected damage could be similar to that caused by a large earthquake. Therefore, this event could be similar to the earthquake analyzed in Section 6.1.

Protective action guidance: The isolation zone size is at the discretion of the incident commander since the TEL is not exceeded at 100 meters and the downwind protective action distance is 0.917 mi (1,475 m).

Basis: The downwind protective action distance for the worst-case Seismic Event is 0.917 mi (1,475 m). Since the TEL does not exceed 100 m, the isolation zone is at the discretion of the Incident Commander.

7.2.2.3 Alert

One condition should be classified as an Alert.

Recommended EALs:

High winds or a tornado causes visible damage to the confinement structures (i.e., cracking and spalling of the roof or exterior walls) at the 202-A Canyon Building or a PUREX Storage Tunnel.

Basis: High winds/tornado damage has not been analyzed in this EPHA for this facility. An EAL for high winds/tornado is consistent with DOE policy as established in DOE-0223, RLEP 3.21 (DOE 2013b). High winds or tornados are not expected to cause significant damage; however, this event may result in structural damage consistent with a less severe seismic event.

Protective Action Guidance: The isolation zone and the downwind protective action distance are at the discretion of the Incident Commander.

Basis: By definition, an Alert is that which could result in doses exceeding 100 mrem, but less than 1 rem at 100 m; therefore, doses that exceed the TEL (100 rem) and PAG (1 rem) are within 100 m, if exceeded at all.

7.2.3 Aircraft Crash

7.2.3.1 General Emergency

There are no EALs for this subcategory.

7.2.3.2 Site Area Emergency

One condition should be classified a Site Area Emergency.

Recommended EALs:

Aircraft crash causes partial collapse to the confinement structures (roof or exterior walls) at the 202-A Canyon Building.

Basis: If an aircraft strikes the 202-A Canyon Building, it is likely that the aircraft would puncture the roof or walls of the facility; however, the likelihood that the impact would collapse the entire roof or exterior walls or cause a fire inside the 202-A Canyon Building is low. The Site Area Emergency classification would be appropriate for an aircraft crash that results in penetration of the PUREX Facility Canyon roof/walls. In addition, the actual integrity of the facility structure may not be easily determined for a period of time; therefore, this classification would be similar to the failures described for the Partial Roof Collapse of the 202-A Canyon Building.

Protective action guidance: The isolation zone size is at the discretion of the incident commander since the TEL does not exceed 100 m and the downwind protective action distance is 0.20 mi (316 m).

Basis: This event could be similar to the Partial Roof Collapse of the 202-A Canyon Building analyzed in Section 6.2, with projected dose criteria that meet the Site Area Emergency.

7.2.3.3 Alert

One condition should be classified as an Alert.

Recommended EALs:

Aircraft crash with fire causes partial collapse to the confinement structures (roof or exterior walls) of the PUREX Storage Tunnels.

Basis: Due to the construction of the PUREX Storage Tunnels, it is likely that an aircraft impact would result in a collapse of the tunnel and fire due to fuel burning. As shown in Section 6.6, a fire in PUREX Storage Tunnel No. 1 would not produce a classifiable operation emergency; however, based on DOE- 0223, RLEP 3.21, this structure qualifies for developing an Alert level EAL.

Protective action guidance: The isolation zone size and downwind protective action distance are at the discretion of the incident commander.

Basis: By definition, an Alert is that which could result in doses exceeding 100 mrem, but less than 1 rem at 100 m; therefore, doses that exceed the TEL (100 rem) and PAG (1 rem) are within 100 m, if exceeded at all.

7.2.4 Abnormal Roof Loading

Facility roof failure could occur from snow/ash loading or age-related structural failure. Section 7.1.2, "Equipment Handling Accidents," EAL covers actual failure. A separate EAL for the threat of roof failure from abnormal loading is not recommended, as there would be time to evaluate the situation and take corrective actions. Appropriate life safety precautions should be taken if the roof integrity is suspect.

7.3 SECURITY CONTINGENCIES

7.3.1 Explosive Device

The facility collapse due to a seismic event or a crane drop accident could cause facility damage similar to that from the detonation of an explosive device. However, the size of an explosive device would need to be extremely large to produce consequences similar to these events because of the robust construction of the Canyon Building and the earth cover on most of the tunnels. Therefore, an explosion in the contaminated portion of the Canyon Building or Tunnels would warrant classification as an Alert.

7.3.1.1 General Emergency

There are no EALs for this subcategory.

7.3.1.2 Site Area Emergency

There are no EALs for this subcategory.

7.3.1.3 Alert

Two conditions should be classified as an Alert.

Recommended EALs:

1. Discovery of a confirmed explosive device that threatens dispersal of radiological material.
2. An explosive device has detonated in or near the PUREX Canyon or Storage Tunnels that causes the actual or potential dispersal of radiological material to the outside environment.

Basis: Actual or threatened detonation of an explosive device in or near the 202-A Canyon Building or a PUREX Storage Tunnel may warrant classification if there is the potential for the dispersal of radioactive material. The location and size of the explosive device must be a consideration for classification purposes. Detonation or discovery of an explosive device where it might disperse hazardous materials or damage safety-related equipment represents a serious degradation of safety. Both malevolent intent and the means to maximize any potential hazardous material release should be assumed. This EAL is consistent with DOE Policy as established in DOE-0223, RLEP 3.21 (DOE 2013b).

Protective action guidance: The isolation zone size and downwind protective action distance are at the discretion of the incident commander.

Basis: By definition, an Alert is that which could result in doses exceeding 100 mrem, but less than 1 rem at 100 m; therefore, doses that exceed the TEL (100 rem) and PAG (1 rem) are within 100 m, if exceeded at all.

7.3.2 Sabotage

Sabotage is defined as physical damage to facility structures or systems with the intent to cause the release of hazardous material. Per DOE Policy, as established in DOE-0223, RLEP 3.21, sabotage is categorized as a Base Program Operational Emergency and an actual release caused by sabotage will be classified based on the known or potential severity of the release (DOE 2013b).

7.3.3 Hostage Situation/Armed Intruder

A confirmed armed intruder or hostage situation at the 202-A Canyon Building or PUREX Storage Tunnels will be reviewed for a Base Program Operational Emergency or Abnormal Event categorization. The facility is normally unoccupied and the hazardous material inventory is not in a form that is readily accessible or dispersible. In view of the status of the facility and the form of hazardous material, an EAL is not considered warranted for a hostage/armed intruder event.

8.0 EMERGENCY PLANNING ZONE DETERMINATION

The Emergency Planning Zone (EPZ) is an area within which special planning and preparedness efforts are warranted. The EPHA documents the technical basis for the EPZ, which must be, at a minimum, large enough to encompass a circle defined by the distance to the TEL. The TEL is defined by a radiological dose of 100 rem TED. DOE Order 151.1C endorses the EPZ concept and requires that the choice of an EPZ for each facility be based on an objective analyses of the hazards associated with the facility (DOE 2005). The *Emergency Management Guide* (DOE Guide 151.1-2) provides guidance on establishing the size of the EPZ and states that the maximum should not exceed a nominal radius of 10 mi (16 km) (DOE 2007).

The results of this EPHA determined the EPZmin to be less than <100 m (<0.062 miles) and the EPZmax to be 0.917 mi (1,475 m) based on the Seismic Event in Section 6.1. Both the EPZmin and EPZmax are within the current composite area EPZ.

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Appendix A
Hotspot Output Files

HotSpot Output Files

Seismic Event (202-A Canyon Building Portion) (no confinement) - 95th percentile

HotSpot Version 2.07.2 General Plume
Oct 08, 2012 02:11 PM
Met File:C:\Documents and Settings\h8353746\Application Data\HotSpot20\MetData\HotSpot 200a 07-11.inp
Meteorological Input file processed as MACCS2 - wind FROM sector
Total meteorological observations : 43490

Source Term : PUREX_Seismic Event_202A.mix (Mixture Scale Factor = 1.0000E+00)
Wind Speed Ref. Height : 10.0 m
Horizontal Length : 3.06E+02 m
Receptor Height : 1.5 m
Inversion Layer Height : 140 m
Sample Time : 15.000 min
Terrain : Standard
Breathing Rate : 3.33E-04 m3/sec
Include Plume Passage Inhalation and Submersion
Include Ground Shine (Weathering Correction Factor : None)
Exposure Window:(Start: 0.00 days; Duration: 4.00 days) [100% stay time].
Initial Deposition and Dose Rate shown
Ground Roughness Correction Factor: 1.000

Wind Speed Groups	Group Frequency
Group 0: 0.10 <= u <= 0.50	3.30 %
Group 1: 0.50 < u <= 1.00	8.17 %
Group 2: 1.00 < u <= 2.00	25.64 %
Group 3: 2.00 < u <= 3.00	24.15 %
Group 4: 3.00 < u <= 4.00	15.33 %
Group 5: 4.00 < u <= 5.00	11.27 %
Group 6: 5.00 <= u <= 6.00	4.63 %
Group 7: 6.00 < u <= 8.00	5.17 %
Group 8: u > 8.00	2.35 %
Total Sum:	100.00 %

Compass Direction is the Direction the Wind/Plume is Moving Towards
[Sector Centerline Distance of 0.100 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	2.79E+00	7.42E+00	8.62E+00	1.01E+01	1.07E+01

[Sector Centerline Distance of 11.000 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	1.17E-02	2.16E-02	2.62E-02	2.88E-02	

[Sector Centerline Distance of 8.550 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	1.51E-02	3.25E-02	3.76E-02	3.94E-02	3.96E-02

[Sector Centerline Distance of 15.290 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	7.86E-03	1.32E-02	1.47E-02	1.82E-02	

[Sector Centerline Distance of 1.475 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	1.23E-01	3.45E-01	3.71E-01	3.73E-01	

HotSpot Output Files

Seismic Event (202-A Canyon Building Portion) (no confinement) - 50th percentile

HotSpot Version 2.07.2 General Plume
Oct 08, 2012 02:13 PM
Met File:C:\Documents and Settings\h8353746\Application Data\HotSpot20\MetData\HotSpot 200a 07-11.inp
Meteorological Input file processed as MACCS2 - wind FROM sector
Total meteorological observations : 43490

Source Term : PUREX_Seismic Event_202A.mix (Mixture Scale Factor = 1.0000E+00)
Wind Speed Ref. Height : 10.0 m
Horizontal Length : 3.06E+02 m
Receptor Height : 1.5 m
Inversion Layer Height : 500 m
Sample Time : 15.000 min
Terrain : Standard
Breathing Rate : 3.33E-04 m3/sec
Include Plume Passage Inhalation and Submersion
Include Ground Shine (Weathering Correction Factor : None)
Exposure Window:(Start: 0.00 days; Duration: 4.00 days) [100% stay time].
Initial Deposition and Dose Rate shown
Ground Roughness Correction Factor: 1.000

Wind Speed Groups	Group Frequency
Group 0: 0.10 <= u <= 0.50	3.30 %
Group 1: 0.50 < u <= 1.00	8.17 %
Group 2: 1.00 < u <= 2.00	25.64 %
Group 3: 2.00 < u <= 3.00	24.15 %
Group 4: 3.00 < u <= 4.00	15.33 %
Group 5: 4.00 < u <= 5.00	11.27 %
Group 6: 5.00 <= u <= 6.00	4.63 %
Group 7: 6.00 < u <= 8.00	5.17 %
Group 8: u > 8.00	2.35 %
Total Sum:	100.00 %

Compass Direction is the Direction the Wind/Plume is Moving Towards
[Sector Centerline Distance of 0.100 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	2.79E+00	7.42E+00	8.63E+00	1.01E+01	1.07E+01

[Sector Centerline Distance of 11.000 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	9.13E-03	2.16E-02	2.63E-02	2.88E-02	

[Sector Centerline Distance of 8.550 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	1.28E-02	3.25E-02	3.76E-02	3.94E-02	3.96E-02

HotSpot Output Files

[Sector Centerline Distance of 15.290 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	5.77E-03	1.25E-02	1.43E-02	1.82E-02	

[Sector Centerline Distance of 0.650 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	3.67E-01	1.02E+00	1.08E+00	1.09E+00	

HotSpot Output Files

Seismic Event (Storage Tunnels No. 1 and 2 Portion) (no confinement) - 95th percentile

HotSpot Version 2.07.2 General Plume
Oct 08, 2012 02:14 PM
Met File:C:\Documents and Settings\h8353746\Application Data\HotSpot20\MetData\HotSpot 200a 07-11.inp
Meteorological Input file processed as MACCS2 - wind FROM sector
Total meteorological observations : 43490

Source Term : PUREX_Seismic Event_Tunnels.mix (Mixture Scale Factor = 1.0000E+00)
Wind Speed Ref. Height : 10.0 m
Horizontal Length : 1.09E+02 m
Receptor Height : 1.5 m
Inversion Layer Height : 140 m
Sample Time : 15.000 min
Terrain : Standard
Breathing Rate : 3.33E-04 m3/sec
Include Plume Passage Inhalation and Submersion
Include Ground Shine (Weathering Correction Factor : None)
Exposure Window:(Start: 0.00 days; Duration: 4.00 days) [100% stay time].
Initial Deposition and Dose Rate shown
Ground Roughness Correction Factor: 1.000

Wind Speed Groups	Group Frequency
Group 0: 0.10 <= u <= 0.50	3.30 %
Group 1: 0.50 < u <= 1.00	8.17 %
Group 2: 1.00 < u <= 2.00	25.64 %
Group 3: 2.00 < u <= 3.00	24.15 %
Group 4: 3.00 < u <= 4.00	15.33 %
Group 5: 4.00 < u <= 5.00	11.27 %
Group 6: 5.00 <= u <= 6.00	4.63 %
Group 7: 6.00 < u <= 8.00	5.17 %
Group 8: u > 8.00	2.35 %
Total Sum:	100.00 %

Compass Direction is the Direction the Wind/Plume is Moving Towards
[Sector Centerline Distance of 0.100 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	7.27E+00	1.98E+01	2.39E+01	2.70E+01	2.84E+01

[Sector Centerline Distance of 11.000 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	1.32E-02	2.52E-02	3.06E-02	3.35E-02	3.36E-02

[Sector Centerline Distance of 8.550 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	1.74E-02	3.88E-02	4.48E-02	4.71E-02	4.73E-02

HotSpot Output Files

[Sector Centerline Distance of 15.290 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	8.76E-03	1.46E-02	1.67E-02	2.07E-02	

[Sector Centerline Distance of 1.475 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	1.72E-01	5.76E-01	6.20E-01	6.23E-01	

HotSpot Output Files

Seismic Event (Storage Tunnels No. 1 and 2 Portion) (no confinement) - 50th percentile

HotSpot Version 2.07.2 General Plume
Oct 08, 2012 02:15 PM
Met File:C:\Documents and Settings\h8353746\Application Data\HotSpot20\MetData\HotSpot 200a 07-11.inp
Meteorological Input file processed as MACCS2 - wind FROM sector
Total meteorological observations : 43490

Source Term : PUREX_Seismic Event_Tunnels.mix (Mixture Scale Factor = 1.0000E+00)
Wind Speed Ref. Height : 10.0 m
Horizontal Length : 1.09E+02 m
Receptor Height : 1.5 m
Inversion Layer Height : 500 m
Sample Time : 15.000 min
Terrain : Standard
Breathing Rate : 3.33E-04 m3/sec
Include Plume Passage Inhalation and Submersion
Include Ground Shine (Weathering Correction Factor : None)
Exposure Window:(Start: 0.00 days; Duration: 4.00 days) [100% stay time].
Initial Deposition and Dose Rate shown
Ground Roughness Correction Factor: 1.000

Wind Speed Groups	Group Frequency
Group 0: 0.10 <= u <= 0.50	3.30 %
Group 1: 0.50 < u <= 1.00	8.17 %
Group 2: 1.00 < u <= 2.00	25.64 %
Group 3: 2.00 < u <= 3.00	24.15 %
Group 4: 3.00 < u <= 4.00	15.33 %
Group 5: 4.00 < u <= 5.00	11.27 %
Group 6: 5.00 <= u <= 6.00	4.63 %
Group 7: 6.00 < u <= 8.00	5.17 %
Group 8: u > 8.00	2.35 %
Total Sum:	100.00 %

Compass Direction is the Direction the Wind/Plume is Moving Towards
[Sector Centerline Distance of 0.100 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	7.27E+00	1.98E+01	2.39E+01	2.70E+01	2.84E+01

[Sector Centerline Distance of 11.000 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	1.03E-02	2.52E-02	3.06E-02	3.35E-02	3.36E-02

[Sector Centerline Distance of 8.550 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	1.47E-02	3.88E-02	4.48E-02	4.71E-02	4.73E-02

HotSpot Output Files

[Sector Centerline Distance of 15.290 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	6.47E-03	1.40E-02	1.63E-02	2.07E-02	

[Sector Centerline Distance of 0.650 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	6.18E-01	2.09E+00	2.22E+00	2.24E+00	2.25E+00

HotSpot Output Files

Partial Roof Collapse of the 202-A Canyon Building (no confinement) - 95th percentile

HotSpot Version 2.07.2 General Plume
Oct 09, 2012 08:05 AM
Met File:C:\Documents and Settings\h8353746\Application Data\HotSpot20\MetData\HotSpot 200a 07-11.inp
Meteorological Input file processed as MACCS2 - wind FROM sector
Total meteorological observations : 43490

Source Term : PUREX_Partial Roof Collapse of 202A.mix (Mixture Scale Factor = 1.0000E+00)
Wind Speed Ref. Height : 10.0 m
Horizontal Width : 1.87E+01 m
Receptor Height : 1.5 m
Inversion Layer Height : 140 m
Sample Time : 15.000 min
Terrain : Standard
Breathing Rate : 3.33E-04 m3/sec
Include Plume Passage Inhalation and Submersion
Include Ground Shine (Weathering Correction Factor : None)
Exposure Window:(Start: 0.00 days; Duration: 4.00 days) [100% stay time].
Initial Deposition and Dose Rate shown
Ground Roughness Correction Factor: 1.000

Wind Speed Groups	Group Frequency
Group 0: 0.10 <= u <= 0.50	3.30 %
Group 1: 0.50 < u <= 1.00	8.17 %
Group 2: 1.00 < u <= 2.00	25.64 %
Group 3: 2.00 < u <= 3.00	24.15 %
Group 4: 3.00 < u <= 4.00	15.33 %
Group 5: 4.00 < u <= 5.00	11.27 %
Group 6: 5.00 <= u <= 6.00	4.63 %
Group 7: 6.00 < u <= 8.00	5.17 %
Group 8: u > 8.00	2.35 %
Total Sum:	100.00 %

Compass Direction is the Direction the Wind/Plume is Moving Towards
[Sector Centerline Distance of 0.100 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	1.04E+00	3.10E+00	3.38E+00	3.99E+00	4.20E+00

[Sector Centerline Distance of 11.000 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	2.54E-03	4.88E-03	5.92E-03	6.49E-03	6.50E-03

[Sector Centerline Distance of 8.550 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	3.36E-03	7.54E-03	8.70E-03	9.14E-03	9.18E-03

[Sector Centerline Distance of 15.290 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	1.68E-03	2.81E-03	3.20E-03	3.98E-03	4.00E-03

[Sector Centerline Distance of 0.316 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	2.89E-01	9.31E-01	1.00E+00	1.05E+00	1.07E+00

HotSpot Output Files

Partial Roof Collapse of the 202-A Canyon Building (no confinement) - 50th percentile

HotSpot Version 2.07.2 General Plume
Oct 09, 2012 08:12 AM
Met File:C:\Documents and Settings\h8353746\Application Data\HotSpot20\MetData\HotSpot 200a 07-11.inp
Meteorological Input file processed as MACCS2 - wind FROM sector
Total meteorological observations : 43490

Source Term : PUREX_Partial Roof Collapse of 202A.mix (Mixture Scale Factor = 1.0000E+00)
Wind Speed Ref. Height : 10.0 m
Horizontal Width : 1.87E+01 m
Receptor Height : 1.5 m
Inversion Layer Height : 500 m
Sample Time : 15.000 min
Terrain : Standard
Breathing Rate : 3.33E-04 m3/sec
Include Plume Passage Inhalation and Submersion
Include Ground Shine (Weathering Correction Factor : None)
Exposure Window:(Start: 0.00 days; Duration: 4.00 days) [100% stay time].
Initial Deposition and Dose Rate shown
Ground Roughness Correction Factor: 1.000

Wind Speed Groups	Group Frequency
Group 0: 0.10 <= u <= 0.50	3.30 %
Group 1: 0.50 < u <= 1.00	8.17 %
Group 2: 1.00 < u <= 2.00	25.64 %
Group 3: 2.00 < u <= 3.00	24.15 %
Group 4: 3.00 < u <= 4.00	15.33 %
Group 5: 4.00 < u <= 5.00	11.27 %
Group 6: 5.00 <= u <= 6.00	4.63 %
Group 7: 6.00 < u <= 8.00	5.17 %
Group 8: u > 8.00	2.35 %
Total Sum:	100.00 %

Compass Direction is the Direction the Wind/Plume is Moving Towards
[Sector Centerline Distance of 0.100 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	1.04E+00	3.10E+00	3.38E+00	3.99E+00	4.20E+00

[Sector Centerline Distance of 11.000 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	1.97E-03	4.88E-03	5.92E-03	6.49E-03	6.50E-03

[Sector Centerline Distance of 8.550 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	2.81E-03	7.54E-03	8.70E-03	9.14E-03	9.18E-03

[Sector Centerline Distance of 15.290 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	1.25E-03	2.68E-03	3.14E-03	3.98E-03	4.00E-03

[Sector Centerline Distance of 0.103 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	1.01E+00	3.01E+00	3.29E+00	3.88E+00	4.08E+00

HotSpot Output Files

Partial Collapse of PUREX Storage Tunnel No. 1 (no confinement) - 95th percentile

HotSpot Version 2.07.2 General Plume
Nov 20, 2012 03:19 PM
Met File:C:\Documents and Settings\h8353746\Application Data\HotSpot20\MetData\HotSpot 200a 07-11.inp
Meteorological Input file processed as MACCS2 - wind FROM sector
Total meteorological observations : 43490

Source Term : PUREX_ Partial Roof Collapse of Tunnel 1.mix (Mixture Scale Factor = 1.0000E+00)
Wind Speed Ref. Height : 10.0 m
Receptor Height : 1.5 m
Inversion Layer Height : 140 m
Sample Time : 15.000 min
Terrain : Standard
Breathing Rate : 3.33E-04 m3/sec
Include Plume Passage Inhalation and Submersion
Include Ground Shine (Weathering Correction Factor : None)
Include Resuspension (Resuspension Factor : Maxwell-Anspaugh)
Exposure Window:(Start: 0.00 days; Duration: 4.00 days) [100% stay time].
Initial Deposition and Dose Rate shown
Ground Roughness Correction Factor: 1.000

Wind Speed Groups	Group Frequency
Group 0: 0.10 <= u <= 0.50	3.30 %
Group 1: 0.50 < u <= 1.00	8.17 %
Group 2: 1.00 < u <= 2.00	25.64 %
Group 3: 2.00 < u <= 3.00	24.15 %
Group 4: 3.00 < u <= 4.00	15.33 %
Group 5: 4.00 < u <= 5.00	11.27 %
Group 6: 5.00 <= u <= 6.00	4.63 %
Group 7: 6.00 < u <= 8.00	5.17 %
Group 8: u > 8.00	2.35 %
Total Sum:	100.00 %

Compass Direction is the Direction the Wind/Plume is Moving Towards
[Sector Centerline Distance of 0.100 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	3.50E+00	1.67E+01	1.96E+01	2.15E+01	2.16E+01

[Sector Centerline Distance of 11.000 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	1.53E-03	2.96E-03	3.59E-03	3.94E-03	3.95E-03

[Sector Centerline Distance of 8.550 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	2.03E-03	4.63E-03	5.35E-03	5.62E-03	5.64E-03

[Sector Centerline Distance of 15.290 km]

HotSpot Output Files

Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	1.00E-03	1.67E-03	1.91E-03	2.40E-03	

[Sector Centerline Distance of 0.464 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	1.90E-01	9.40E-01	1.00E+00	1.03E+00	

HotSpot Output Files

Partial Roof Collapse of PUREX Storage Tunnel No. 1 (no confinement) – 50th percentile

HotSpot Version 2.07.2 General Plume
Nov 20, 2012 03:23 PM
Met File:C:\Documents and Settings\h8353746\Application Data\HotSpot20\MetData\HotSpot 200a 07-11.inp
Meteorological Input file processed as MACCS2 - wind FROM sector
Total meteorological observations : 43490

Source Term : PUREX_ Partial Roof Collapse of Tunnel 1.mix (Mixture Scale Factor = 1.0000E+00)
Wind Speed Ref. Height : 10.0 m
Receptor Height : 1.5 m
Inversion Layer Height : 500 m
Sample Time : 15.000 min
Terrain : Standard
Breathing Rate : 3.33E-04 m3/sec
Include Plume Passage Inhalation and Submersion
Include Ground Shine (Weathering Correction Factor : None)
Include Resuspension (Resuspension Factor : Maxwell-Anspaugh)
Exposure Window:(Start: 0.00 days; Duration: 4.00 days) [100% stay time].
Initial Deposition and Dose Rate shown
Ground Roughness Correction Factor: 1.000

Wind Speed Groups	Group Frequency
Group 0: 0.10 <= u <= 0.50	3.30 %
Group 1: 0.50 < u <= 1.00	8.17 %
Group 2: 1.00 < u <= 2.00	25.64 %
Group 3: 2.00 < u <= 3.00	24.15 %
Group 4: 3.00 < u <= 4.00	15.33 %
Group 5: 4.00 < u <= 5.00	11.27 %
Group 6: 5.00 <= u <= 6.00	4.63 %
Group 7: 6.00 < u <= 8.00	5.17 %
Group 8: u > 8.00	2.35 %
Total Sum:	100.00 %

Compass Direction is the Direction the Wind/Plume is Moving Towards
[Sector Centerline Distance of 0.100 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	3.50E+00	1.67E+01	1.96E+01	2.15E+01	2.16E+01

[Sector Centerline Distance of 11.000 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	1.19E-03	2.96E-03	3.59E-03	3.94E-03	3.95E-03

[Sector Centerline Distance of 8.550 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	1.70E-03	4.63E-03	5.35E-03	5.62E-03	5.64E-03

HotSpot Output Files

[Sector Centerline Distance of 15.290 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	7.47E-04	1.60E-03	1.89E-03	2.40E-03	

[Sector Centerline Distance of 0.197 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	1.00E+00	5.18E+00	5.67E+00	6.16E+00	6.22E+00

HotSpot Output Files

Partial Collapse of PUREX Storage Tunnel No. 2 (no confinement) - 95th percentile

HotSpot Version 2.07.2 General Plume
Nov 20, 2012 02:42 PM
Met File:C:\Documents and Settings\h8353746\Application Data\HotSpot20\MetData\HotSpot 200a 07-11.inp
Meteorological Input file processed as MACCS2 - wind FROM sector
Total meteorological observations : 43490

Source Term : PUREX_ Partial Roof Collapse of Tunnel 2.mix (Mixture Scale Factor = 1.0000E+00)
7.88
Wind Speed Ref. Height : 10.0 m
Receptor Height : 1.5 m
Inversion Layer Height : 140 m
Sample Time : 15.000 min
Terrain : Standard
Breathing Rate : 3.33E-04 m3/sec
Include Plume Passage Inhalation and Submersion
Include Ground Shine (Weathering Correction Factor : None)
Include Resuspension (Resuspension Factor : Maxwell-Anspaugh)
Exposure Window:(Start: 0.00 days; Duration: 4.00 days) [100% stay time].
Initial Deposition and Dose Rate shown
Ground Roughness Correction Factor: 1.000

Wind Speed Groups	Group Frequency
Group 0: 0.10 <= u <= 0.50	3.30 %
Group 1: 0.50 < u <= 1.00	8.17 %
Group 2: 1.00 < u <= 2.00	25.64 %
Group 3: 2.00 < u <= 3.00	24.15 %
Group 4: 3.00 < u <= 4.00	15.33 %
Group 5: 4.00 < u <= 5.00	11.27 %
Group 6: 5.00 <= u <= 6.00	4.63 %
Group 7: 6.00 < u <= 8.00	5.17 %
Group 8: u > 8.00	2.35 %
Total Sum:	100.00 %

Compass Direction is the Direction the Wind/Plume is Moving Towards
[Sector Centerline Distance of 0.100 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	2.53E+00	1.21E+01	1.47E+01	1.61E+01	

[Sector Centerline Distance of 11.000 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	1.09E-03	2.12E-03	2.57E-03	2.82E-03	2.83E-03

[Sector Centerline Distance of 8.550 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	1.45E-03	3.31E-03	3.83E-03	4.02E-03	4.04E-03

HotSpot Output Files

[Sector Centerline Distance of 15.290 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	7.18E-04	1.19E-03	1.36E-03	1.71E-03	1.72E-03

[Sector Centerline Distance of 0.394 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	1.89E-01	9.35E-01	1.00E+00	1.05E+00	

HotSpot Output Files

Partial Roof Collapse of PUREX Storage Tunnel No. 2 (no confinement) – 50th percentile

HotSpot Version 2.07.2 General Plume
Nov 20, 2012 02:57 PM
Met File:C:\Documents and Settings\h8353746\Application Data\HotSpot20\MetData\HotSpot 200a 07-11.inp
Meteorological Input file processed as MACCS2 - wind FROM sector
Total meteorological observations : 43490

Source Term : PUREX_ Partial Roof Collapse of Tunnel 2.mix (Mixture Scale Factor = 1.0000E+00)
7.88
Wind Speed Ref. Height : 10.0 m
Receptor Height : 1.5 m
Inversion Layer Height : 500 m
Sample Time : 15.000 min
Terrain : Standard
Breathing Rate : 3.33E-04 m3/sec

Include Plume Passage Inhalation and Submersion
Include Ground Shine (Weathering Correction Factor : None)
Include Resuspension (Resuspension Factor : Maxwell-Anspaugh)
Exposure Window:(Start: 0.00 days; Duration: 4.00 days) [100% stay time].
Initial Deposition and Dose Rate shown
Ground Roughness Correction Factor: 1.000

Wind Speed Groups	Group Frequency
Group 0: 0.10 <= u <= 0.50	3.30 %
Group 1: 0.50 < u <= 1.00	8.17 %
Group 2: 1.00 < u <= 2.00	25.64 %
Group 3: 2.00 < u <= 3.00	24.15 %
Group 4: 3.00 < u <= 4.00	15.33 %
Group 5: 4.00 < u <= 5.00	11.27 %
Group 6: 5.00 <= u <= 6.00	4.63 %
Group 7: 6.00 < u <= 8.00	5.17 %
Group 8: u > 8.00	2.35 %
Total Sum:	100.00 %

Compass Direction is the Direction the Wind/Plume is Moving Towards
[Sector Centerline Distance of 0.100 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	2.53E+00	1.21E+01	1.47E+01	1.61E+01	

[Sector Centerline Distance of 11.000 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	8.49E-04	2.12E-03	2.57E-03	2.82E-03	2.83E-03

[Sector Centerline Distance of 8.550 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	1.21E-03	3.31E-03	3.83E-03	4.02E-03	4.04E-03

[Sector Centerline Distance of 15.290 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	5.34E-04	1.14E-03	1.35E-03	1.71E-03	1.72E-03

[Sector Centerline Distance of 0.165 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	1.01E+00	5.19E+00	5.99E+00	6.39E+00	6.45E+00

HotSpot Output Files

Contaminated Equipment Drop (no confinement) - 95th percentile

HotSpot Version 2.07.2 General Plume
Apr 15, 2013 12:47 PM
Met File:C:\Documents and Settings\h8353746\Application Data\HotSpot20\MetData\HotSpot 200a 07-11.inp
Meteorological Input file processed as MACCS2 - wind FROM sector
Total meteorological observations : 43490

Source Term : PUREX\PUREX_ Equipment Drop.mix (Mixture Scale Factor = 1.0000E+00)
Wind Speed Ref. Height : 10.0 m
Receptor Height : 1.5 m
Inversion Layer Height : 140 m
Sample Time : 15.000 min
Terrain : Standard
Breathing Rate : 3.33E-04 m3/sec
Include Plume Passage Inhalation and Submersion
Include Ground Shine (Weathering Correction Factor : None)
Exposure Window:(Start: 0.00 days; Duration: 4.00 days) [100% stay time].
Initial Deposition and Dose Rate shown
Ground Roughness Correction Factor: 1.000

Wind Speed Groups	Group Frequency
Group 0: 0.10 <= u <= 0.50	3.30 %
Group 1: 0.50 < u <= 1.00	8.17 %
Group 2: 1.00 < u <= 2.00	25.64 %
Group 3: 2.00 < u <= 3.00	24.15 %
Group 4: 3.00 < u <= 4.00	15.33 %
Group 5: 4.00 < u <= 5.00	11.27 %
Group 6: 5.00 <= u <= 6.00	4.63 %
Group 7: 6.00 < u <= 8.00	5.17 %
Group 8: u > 8.00	2.35 %
Total Sum:	100.00 %

Compass Direction is the Direction the Wind/Plume is Moving Towards
[Sector Centerline Distance of 0.100 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	9.64E-02	4.62E-01	5.39E-01	5.90E-01	5.93E-01

[Sector Centerline Distance of 11.000 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	4.22E-05	8.19E-05	9.93E-05	1.09E-04	

[Sector Centerline Distance of 8.550 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	5.60E-05	1.28E-04	1.48E-04	1.55E-04	1.56E-04

HotSpot Output Files

[Sector Centerline Distance of 15.290 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	2.77E-05	4.62E-05	5.28E-05	6.62E-05	6.64E-05

HotSpot Output Files

Contaminated Equipment Drop (no confinement) - 50th percentile

HotSpot Version 2.07.2 General Plume
Apr 15, 2013 12:47 PM
Met File:C:\Documents and Settings\h8353746\Application Data\HotSpot20\MetData\HotSpot 200a 07-11.inp
Meteorological Input file processed as MACCS2 - wind FROM sector
Total meteorological observations : 43490

Source Term : PUREX\PUREX_ Equipment Drop.mix (Mixture Scale Factor = 1.0000E+00)
Wind Speed Ref. Height : 10.0 m
Receptor Height : 1.5 m
Inversion Layer Height : 500 m
Sample Time : 15,000 min
Terrain : Standard
Breathing Rate : 3.33E-04 m3/sec
Include Plume Passage Inhalation and Submersion
Include Ground Shine (Weathering Correction Factor : None)
Exposure Window:(Start: 0.00 days; Duration: 4.00 days) [100% stay time].
Initial Deposition and Dose Rate shown
Ground Roughness Correction Factor: 1.000

Wind Speed Groups	Group Frequency
Group 0: 0.10 <= u <= 0.50	3.30 %
Group 1: 0.50 < u <= 1.00	8.17 %
Group 2: 1.00 < u <= 2.00	25.64 %
Group 3: 2.00 < u <= 3.00	24.15 %
Group 4: 3.00 < u <= 4.00	15.33 %
Group 5: 4.00 < u <= 5.00	11.27 %
Group 6: 5.00 <= u <= 6.00	4.63 %
Group 7: 6.00 < u <= 8.00	5.17 %
Group 8: u > 8.00	2.35 %
Total Sum:	100.00 %

Compass Direction is the Direction the Wind/Plume is Moving Towards
Sector Centerline Distance of 0.100 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	9.64E-02	4.62E-01	5.39E-01	5.90E-01	5.93E-01

[Sector Centerline Distance of 11.000 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	3.28E-05	8.19E-05	9.93E-05	1.09E-04	

[Sector Centerline Distance of 8.550 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	4.68E-05	1.28E-04	1.48E-04	1.55E-04	1.56E-04

[Sector Centerline Distance of 15.290 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	2.06E-05	4.42E-05	5.22E-05	6.62E-05	6.64E-05

HotSpot Output Files

Contaminated Equipment Drop (with confinement) - 95th percentile

HotSpot Version 2.07.2 General Plume
Apr 10, 2013 09:47 AM
Met File:C:\Documents and Settings\h8353746\Application Data\HotSpot20\MetData\HotSpot 200a 07-11.inp
Meteorological Input file processed as MACCS2 - wind FROM sector
Total meteorological observations : 43434

Source Term : PUREX_ Equipment Drop.mix (Mixture Scale Factor = 1.0000E+00)
Wind Speed Ref. Height : 10.0 m
Horizontal Width : 1.87E+01 m
Receptor Height : 1.5 m
Inversion Layer Height : 140 m
Sample Time : 15.000 min
Terrain : Standard
Breathing Rate : 3.33E-04 m3/sec
Include Plume Passage Inhalation and Submersion
Include Ground Shine (Weathering Correction Factor : None)
Exposure Window:(Start: 0.00 days; Duration: 4.00 days) [100% stay time].
Initial Deposition and Dose Rate shown
Ground Roughness Correction Factor: 1.000

Wind Speed Groups	Group Frequency
Group 0: 0.10 <= u <= 0.50	3.38 %
Group 1: 0.50 < u <= 1.00	7.96 %
Group 2: 1.00 < u <= 2.00	25.38 %
Group 3: 2.00 < u <= 3.00	23.87 %
Group 4: 3.00 < u <= 4.00	15.28 %
Group 5: 4.00 < u <= 5.00	11.51 %
Group 6: 5.00 <= u <= 6.00	4.60 %
Group 7: 6.00 < u <= 8.00	5.27 %
Group 8: u > 8.00	2.74 %
Total Sum:	100.00 %

Compass Direction is the Direction the Wind/Plume is Moving Towards
[Sector Centerline Distance of 0.100 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	8.52E-03	2.54E-02	2.77E-02	3.29E-02	3.44E-02

[Sector Centerline Distance of 11.000 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	2.08E-05	4.00E-05	4.85E-05	5.32E-05	5.33E-05

[Sector Centerline Distance of 8.550 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	2.75E-05	6.17E-05	7.13E-05	7.52E-05	

HotSpot Output Files

[Sector Centerline Distance of 15.290 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	1.38E-05	2.30E-05	2.62E-05	3.27E-05	3.28E-05

HotSpot Output Files

Fire in PUREX Storage Tunnel No. 1 (no confinement) - 95th percentile

HotSpot Version 2.07.2 General Fire
Apr 15, 2013 01:09 PM
Met File:C:\Documents and Settings\h8353746\Application Data\HotSpot20\MetData\HotSpot 200a 07-11.inp
Meteorological Input file processed as MACCS2 - wind FROM sector
Total meteorological observations : 43490

Source Term : PUREX\PUREX_Tunnel Fire.mix (Mixture Scale Factor = 1.0000E+00)
Wind Speed Ref. Height : 10.0 m
Fuel : 6.97E+03 gal
Fire Duration : 1.20E+02 min
Release Radius : 2.00E+01 m
Cloud Top : 0.00 m
Receptor Height : 1.5 m
Inversion Layer Height : 140 m
Sample Time : 120.000 min
Terrain : Standard
Breathing Rate : 3.33E-04 m3/sec
Include Plume Passage Inhalation and Submersion
Include Ground Shine (Weathering Correction Factor : None)
Exposure Window:(Start: 0.00 days; Duration: 4.00 days) [100% stay time].
Initial Deposition and Dose Rate shown
Ground Roughness Correction Factor: 1.000

Wind Speed Groups	Group Frequency
Group 0: 0.10 <= u <= 0.50	3.30 %
Group 1: 0.50 < u <= 1.00	8.17 %
Group 2: 1.00 < u <= 2.00	25.64 %
Group 3: 2.00 < u <= 3.00	24.15 %
Group 4: 3.00 < u <= 4.00	15.33 %
Group 5: 4.00 < u <= 5.00	11.27 %
Group 6: 5.00 <= u <= 6.00	4.63 %
Group 7: 6.00 < u <= 8.00	5.17 %
Group 8: u > 8.00	2.35 %
Total Sum:	100.00 %

Compass Direction is the Direction the Wind/Plume is Moving Towards
[Sector Centerline Distance of 0.100 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	1.82E-11	5.80E-08	4.40E-07	1.39E-05	2.91E-05

[Sector Centerline Distance of 11.000 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	1.94E-04	7.30E-04	7.55E-04	8.06E-04	8.22E-04

HotSpot Output Files

[Sector Centerline Distance of 8.550 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	1.94E-04	8.31E-04	8.39E-04	8.47E-04	8.67E-04

[Sector Centerline Distance of 15.290 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	1.81E-04	6.35E-04	6.41E-04	7.21E-04	7.31E-04

HotSpot Output Files

Fire in PUREX Storage Tunnel No. 1 (no confinement) - 50th percentile

HotSpot Version 2.07.2 General Fire
Apr 15, 2013 01:11 PM
Met File:C:\Documents and Settings\h8353746\Application Data\HotSpot20\MetData\HotSpot 200a 07-11.inp
Meteorological Input file processed as MACCS2 - wind FROM sector
Total meteorological observations : 43490

Source Term : PUREX\PUREX_Tunnel Fire.mix (Mixture Scale Factor = 1.0000E+00)
Wind Speed Ref. Height : 10.0 m
Fuel : 6970 gal
Fire Duration : 120 min
Release Radius : 2.00E+01 m
Cloud Top : 0.00 m
Receptor Height : 1.5 m
Inversion Layer Height : 500 m
Sample Time : 120.000 min
Terrain : Standard
Breathing Rate : 3.33E-04 m3/sec
Include Plume Passage Inhalation and Submersion
Include Ground Shine (Weathering Correction Factor : None)
Exposure Window:(Start: 0.00 days; Duration: 4.00 days) [100% stay time].
Initial Deposition and Dose Rate shown
Ground Roughness Correction Factor: 1.000

Wind Speed Groups	Group Frequency
Group 0: 0.10 <= u <= 0.50	3.30 %
Group 1: 0.50 < u <= 1.00	8.17 %
Group 2: 1.00 < u <= 2.00	25.64 %
Group 3: 2.00 < u <= 3.00	24.15 %
Group 4: 3.00 < u <= 4.00	15.33 %
Group 5: 4.00 < u <= 5.00	11.27 %
Group 6: 5.00 <= u <= 6.00	4.63 %
Group 7: 6.00 < u <= 8.00	5.17 %
Group 8: u > 8.00	2.35 %
Total Sum:	100.00 %

Compass Direction is the Direction the Wind/Plume is Moving Towards
[Sector Centerline Distance of 0.100 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	1.82E-11	5.80E-08	4.40E-07	1.39E-05	2.91E-05

Sector Centerline Distance of 11.000 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	2.21E-04	7.30E-04	7.55E-04	8.06E-04	8.22E-04

HotSpot Output Files

[Sector Centerline Distance of 8.550 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	2.15E-04	8.31E-04	8.39E-04	8.47E-04	8.67E-04

[Sector Centerline Distance of 15.290 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	2.05E-04	6.35E-04	6.41E-04	7.21E-04	7.31E-04

HotSpot Output Files

Fire in PUREX Storage Tunnel No. 2 (no confinement) - 95th percentile

HotSpot Version 2.07.2 General Fire
Apr 04, 2013 10:11 AM
Met File:C:\Documents and Settings\h8353746\Application Data\HotSpot20\MetData\HotSpot 200a 07-11.inp
Meteorological Input file processed as MACCS2 - wind FROM sector
Total meteorological observations : 43490

Source Term : PUREX_Tunnel Fire No 2.mix (Mixture Scale Factor = 1.0000E+00)
Wind Speed Ref. Height : 10.0 m
Fuel : 6970 gal
Fire Duration : 120 min
Release Radius : 2.00E+01 m
Receptor Height : 1.5 m
Inversion Layer Height : 140 m
Sample Time : 120.000 min
Terrain : Standard
Breathing Rate : 3.33E-04 m3/sec
Include Ground Shine (Weathering Correction Factor : None)
Exposure Window:(Start: 0.00 days; Duration: 4.00 days) [100% stay time].
Initial Deposition and Dose Rate shown
Ground Roughness Correction Factor: 1.000

Wind Speed Groups	Group Frequency
Group 0: 0.10 <= u <= 0.50	3.30 %
Group 1: 0.50 < u <= 1.00	8.17 %
Group 2: 1.00 < u <= 2.00	25.64 %
Group 3: 2.00 < u <= 3.00	24.15 %
Group 4: 3.00 < u <= 4.00	15.33 %
Group 5: 4.00 < u <= 5.00	11.27 %
Group 6: 5.00 <= u <= 6.00	4.63 %
Group 7: 6.00 < u <= 8.00	5.17 %
Group 8: u > 8.00	2.35 %
Total Sum:	100.00 %

Compass Direction is the Direction the Wind/Plume is Moving Towards
[Sector Centerline Distance of 0.100 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	2.26E-11	7.22E-08	5.47E-07	1.72E-05	3.62E-05

[Sector Centerline Distance of 11.000 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	2.41E-04	9.08E-04	9.40E-04	1.00E-03	1.02E-03

[Sector Centerline Distance of 8.550 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	2.42E-04	1.03E-03	1.04E-03	1.05E-03	1.08E-03

[Sector Centerline Distance of 15.290 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	2.25E-04	7.90E-04	7.97E-04	8.97E-04	9.09E-04

HotSpot Output Files

Fire in PUREX Storage Tunnel No. 2 (no confinement) - 50th percentile

HotSpot Version 2.07.2 General Fire
Apr 04, 2013 10:10 AM
Met File:C:\Documents and Settings\h8353746\Application Data\HotSpot20\MetData\HotSpot 200a 07-11.inp
Meteorological Input file processed as MACCS2 - wind FROM sector
Total meteorological observations : 43490

Source Term : PUREX_Tunnel Fire No 2.mix (Mixture Scale Factor = 1.0000E+00)
Wind Speed Ref. Height : 10.0 m
Fuel : 6970 gal
Fire Duration : 120 min
Release Radius : 2.00E+01 m
Receptor Height : 1.5 m
Inversion Layer Height : 500 m
Sample Time : 120.000 min
Terrain : Standard
Breathing Rate : 3.33E-04 m3/sec
Include Plume Passage Inhalation and Submersion
Include Ground Shine (Weathering Correction Factor : None)
Exposure Window:(Start: 0.00 days; Duration: 4.00 days) [100% stay time].
Initial Deposition and Dose Rate shown
Ground Roughness Correction Factor: 1.000

Wind Speed Groups	Group Frequency
Group 0: 0.10 <= u <= 0.50	3.30 %
Group 1: 0.50 < u <= 1.00	8.17 %
Group 2: 1.00 < u <= 2.00	25.64 %
Group 3: 2.00 < u <= 3.00	24.15 %
Group 4: 3.00 < u <= 4.00	15.33 %
Group 5: 4.00 < u <= 5.00	11.27 %
Group 6: 5.00 <= u <= 6.00	4.63 %
Group 7: 6.00 < u <= 8.00	5.17 %
Group 8: u > 8.00	2.35 %
Total Sum:	100.00 %

Compass Direction is the Direction the Wind/Plume is Moving Towards
[Sector Centerline Distance of 0.100 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	2.26E-11	7.22E-08	5.47E-07	1.72E-05	3.62E-05

[Sector Centerline Distance of 11.000 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	2.75E-04	9.08E-04	9.40E-04	1.00E-03	1.02E-03

[Sector Centerline Distance of 8.550 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	2.67E-04	1.03E-03	1.04E-03	1.05E-03	1.08E-03

HotSpot Output Files

[Sector Centerline Distance of 15.290 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	2.55E-04	7.90E-04	7.97E-04	8.97E-04	9.09E-04

HotSpot Output Files

Staged Waste Fire – Non-Equipment Waste - 95th percentile

HotSpot Version 2.07.2 General Fire
Feb 19, 2013 04:17 PM
Met File:C:\Documents and Settings\h8353746\Application Data\HotSpot20\MetData\HotSpot 200a 07-11.inp
Meteorological Input file processed as MACCS2 - wind FROM sector
Total meteorological observations : 43490

Source Term : B Plant_Staged Waste (Step Off Pad) Fire.mix (Mixture Scale Factor = 1.0000E+00)
Wind Speed Ref. Height : 10.0 m
Heat Emission : 6.93E+05 cal/s
Release Radius : 1.00E+00 m
Receptor Height : 1.5 m
Inversion Layer Height : 140 m
Sample Time : 30.000 min
Terrain : Standard
Breathing Rate : 3.33E-04 m3/sec
Include Plume Passage Inhalation and Submersion
Include Ground Shine (Weathering Correction Factor : None)
Exposure Window:(Start: 0.00 days; Duration: 4.00 days) [100% stay time].
Initial Deposition and Dose Rate shown
Ground Roughness Correction Factor: 1.000

Wind Speed Groups	Group Frequency
Group 0: 0.10 <= u <= 0.50	3.30 %
Group 1: 0.50 < u <= 1.00	8.17 %
Group 2: 1.00 < u <= 2.00	25.64 %
Group 3: 2.00 < u <= 3.00	24.15 %
Group 4: 3.00 < u <= 4.00	15.33 %
Group 5: 4.00 < u <= 5.00	11.27 %
Group 6: 5.00 <= u <= 6.00	4.63 %
Group 7: 6.00 < u <= 8.00	5.17 %
Group 8: u > 8.00	2.35 %
Total Sum:	100.00 %

Compass Direction is the Direction the Wind/Plume is Moving Towards
[Sector Centerline Distance of 0.100 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	0.00E+00	4.79E-05	1.19E-04	2.33E-04	2.49E-04

[Sector Centerline Distance of 11.000 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	8.61E-06	2.24E-05	2.60E-05	2.91E-05	2.93E-05

[Sector Centerline Distance of 8.550 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	1.05E-05	2.66E-05	3.09E-05	3.30E-05	3.47E-05

[Sector Centerline Distance of 15.290 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	6.52E-06	1.72E-05	1.99E-05	2.35E-05	2.39E-05

HotSpot Output Files

Staged Waste Fire – Non-Equipment Waste - 50th percentile

HotSpot Version 2.07.2 General Fire
Feb 19, 2013 04:30 PM
Met File:C:\Documents and Settings\h8353746\Application Data\HotSpot20\MetData\HotSpot 200a 07-11.inp
Meteorological Input file processed as MACCS2 - wind FROM sector
Total meteorological observations : 43490

Source Term : B Plant_Staged Waste (Step Off Pad) Fire.mix (Mixture Scale Factor = 1.0000E+00)
Wind Speed Ref. Height : 10.0 m
Heat Emission : 6.93E+05 cal/s
Release Radius : 1.00E+00 m
Receptor Height : 1.5 m
Inversion Layer Height : 500 m
Sample Time : 30.000 min
Terrain : Standard
Breathing Rate : 3.33E-04 m3/sec
Include Plume Passage Inhalation and Submersion
Include Ground Shine (Weathering Correction Factor : None)
Exposure Window:(Start: 0.00 days; Duration: 4.00 days) [100% stay time].
Initial Deposition and Dose Rate shown
Ground Roughness Correction Factor: 1.000

Wind Speed Groups	Group Frequency
Group 0: 0.10 <= u <= 0.50	3.30 %
Group 1: 0.50 < u <= 1.00	8.17 %
Group 2: 1.00 < u <= 2.00	25.64 %
Group 3: 2.00 < u <= 3.00	24.15 %
Group 4: 3.00 < u <= 4.00	15.33 %
Group 5: 4.00 < u <= 5.00	11.27 %
Group 6: 5.00 <= u <= 6.00	4.63 %
Group 7: 6.00 < u <= 8.00	5.17 %
Group 8: u > 8.00	2.35 %
Total Sum:	100.00 %

Compass Direction is the Direction the Wind/Plume is Moving Towards
[Sector Centerline Distance of 0.100 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	0.00E+00	4.79E-05	1.19E-04	2.33E-04	2.49E-04

[Sector Centerline Distance of 11.000 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	7.43E-06	2.24E-05	2.60E-05	2.91E-05	2.93E-05

[Sector Centerline Distance of 8.550 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	9.42E-06	2.66E-05	3.09E-05	3.30E-05	3.47E-05

HotSpot Output Files

[Sector Centerline Distance of 15.290 km]
Total Effective Dose (TED) Percentiles

Compass Sector	Compass Direction	50.0 (rem)	90.0 (rem)	95.0 (rem)	99.0 (rem)	99.5 (rem)
1-16	ALL	5.49E-06	1.72E-05	1.99E-05	2.35E-05	2.39E-05

Appendix B
Hotspot Mixture Files

HotSpot Mixture Files

Seismic Event (202-A Canyon Building Portion)

HotSpot User Mixture Database
User Mixture Name : PUREX_Seismic Event_202A.mix

Mixture Scale Factor : 1.0000E+00

Nuclide [02] : Pu-239 M 24065y
Halflife (Years) : 2.4065E+04
Inhalation 50-yr CEDE (Sv/Bq) : 5.0200E-05
Submersion (Sv-m3)/(Bq-sec) : 3.7700E-18
Ground Shine (Sv-m2)/(Bq-sec) : 3.0600E-19
Total Activity Released (Ci) : 2.7800E-02
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

Nuclide [03] : Pu-240 M 6537y
Halflife (Years) : 6.5370E+03
Inhalation 50-yr CEDE (Sv/Bq) : 5.0200E-05
Submersion (Sv-m3)/(Bq-sec) : 3.2900E-18
Ground Shine (Sv-m2)/(Bq-sec) : 5.6800E-19
Total Activity Released (Ci) : 1.6000E-02
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

Nuclide [04] : Pu-241 M 14.4y
Halflife (Years) : 1.4400E+01
Inhalation 50-yr CEDE (Sv/Bq) : 9.0100E-07
Submersion (Sv-m3)/(Bq-sec) : 6.1500E-20
Ground Shine (Sv-m2)/(Bq-sec) : 1.4300E-21
Total Activity Released (Ci) : 2.5500E-01
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

Nuclide [05] : Pu-242 M 3.763E5y
Halflife (Years) : 3.7630E+05
Inhalation 50-yr CEDE (Sv/Bq) : 4.7600E-05
Submersion (Sv-m3)/(Bq-sec) : 6.4300E-18
Ground Shine (Sv-m2)/(Bq-sec) : 5.5600E-19
Total Activity Released (Ci) : 5.7800E-06
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

Nuclide [06] : Am-241 M 432.2y
Halflife (Years) : 4.3220E+02
Inhalation 50-yr CEDE (Sv/Bq) : 4.1700E-05
Submersion (Sv-m3)/(Bq-sec) : 6.7200E-16
Ground Shine (Sv-m2)/(Bq-sec) : 2.1800E-17
Total Activity Released (Ci) : 4.5200E-02
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

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HotSpot Mixture Files

Nuclide [07] : Sr-90 M 29.12y
Halflife (Years) : 2.9120E+01
Inhalation 50-yr CEDE (Sv/Bq) : 3.5600E-08
Submersion (Sv-m3)/(Bq-sec) : 8.8900E-16
Ground Shine (Sv-m2)/(Bq-sec) : 1.1200E-16
Total Activity Released (Ci) : 4.8500E-01
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

Nuclide [08] : Y-90 M 64.0h
Halflife (Years) : 7.3059E-03
Inhalation 50-yr CEDE (Sv/Bq) : 1.3900E-09
Submersion (Sv-m3)/(Bq-sec) : 7.9100E-16
Ground Shine (Sv-m2)/(Bq-sec) : 1.1000E-16
Total Activity Released (Ci) : 4.8200E-01
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

Nuclide [09] : Cs-137 F 30.0y
Halflife (Years) : 3.0000E+01
Inhalation 50-yr CEDE (Sv/Bq) : 4.6700E-09
Submersion (Sv-m3)/(Bq-sec) : 2.5500E-14
Ground Shine (Sv-m2)/(Bq-sec) : 5.4900E-16
Total Activity Released (Ci) : 5.8800E-01
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

Nuclide [10] : Pu-238 M 87.74y
Halflife (Years) : 8.7740E+01
Inhalation 50-yr CEDE (Sv/Bq) : 4.6200E-05
Submersion (Sv-m3)/(Bq-sec) : 3.3600E-18
Ground Shine (Sv-m2)/(Bq-sec) : 5.9900E-19
Total Activity Released (Ci) : 6.4500E-03
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

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HotSpot Mixture Files

202-A Canyon Building Seismic Event (Storage Tunnels No. 1 and 2 Portion)

HotSpot User Mixture Database
User Mixture Name : PUREX_Seismic Event_Tunnels.mix

Mixture Scale Factor : 1.0000E+00

Nuclide [01] : Pu-238 M 87.74y
Halflife (Years): 8.7740E+01
Inhalation 50-yr CEDE (Sv/Bq): 4.6200E-05
Submersion (Sv-m3)/(Bq-sec): 3.3600E-18
Ground Shine (Sv-m2)/(Bq-sec): 5.9900E-19
Total Activity Released (Ci) : 6.8200E-03
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

Nuclide [02] : Pu-239 M 24065y
Halflife (Years) : 2.4065E+04
Inhalation 50-yr CEDE (Sv/Bq) : 5.0200E-05
Submersion (Sv-m3)/(Bq-sec) : 3.7700E-18
Ground Shine (Sv-m2)/(Bq-sec) : 3.0600E-19
Total Activity Released (Ci) : 2.7900E-02
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

Nuclide [03] : Pu-240 M 6537y
Halflife (Years) : 6.5370E+03
Inhalation 50-yr CEDE (Sv/Bq) : 5.0200E-05
Submersion (Sv-m3)/(Bq-sec) : 3.2900E-18
Ground Shine (Sv-m2)/(Bq-sec) : 5.6800E-19
Total Activity Released (Ci) : 1.5900E-02
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

Nuclide [04] : Pu-241 M 14.4y
Halflife (Years) : 1.4400E+01
Inhalation 50-yr CEDE (Sv/Bq) : 9.0100E-07
Submersion (Sv-m3)/(Bq-sec) : 6.1500E-20
Ground Shine (Sv-m2)/(Bq-sec) : 1.4300E-21
Total Activity Released (Ci) : 4.3000E-01
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

Nuclide [05] : Pu-242 M 3.763E5y
Halflife (Years) : 3.7630E+05
Inhalation 50-yr CEDE (Sv/Bq) : 4.7600E-05
Submersion (Sv-m3)/(Bq-sec) : 6.4300E-18
Ground Shine (Sv-m2)/(Bq-sec) : 5.5600E-19
Total Activity Released (Ci) : 5.7400E-06
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

HotSpot Mixture Files

Nuclide [06] : Am-241 M 432.2y
Halflife (Years) : 4.3220E+02
Inhalation 50-yr CEDE (Sv/Bq) : 4.1700E-05
Submersion (Sv-m3)/(Bq-sec) : 6.7200E-16
Ground Shine (Sv-m2)/(Bq-sec) : 2.1800E-17
Total Activity Released (Ci) : 3.9000E-02
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

Nuclide [07] : Sr-90 M 29.12y
Halflife (Years) : 2.9120E+01
Inhalation 50-yr CEDE (Sv/Bq) : 3.5600E-08
Submersion (Sv-m3)/(Bq-sec) : 8.8900E-16
Ground Shine (Sv-m2)/(Bq-sec) : 1.1200E-16
Total Activity Released (Ci) : 8.9700E+00
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

Nuclide [08] : Y-90 M 64.0h
Halflife (Years) : 7.3059E-03
Inhalation 50-yr CEDE (Sv/Bq) : 1.3900E-09
Submersion (Sv-m3)/(Bq-sec) : 7.9100E-16
Ground Shine (Sv-m2)/(Bq-sec) : 1.1000E-16
Total Activity Released (Ci) : 8.9200E+00
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

Nuclide [09] : Cs-137 F 30.0y
Halflife (Years) : 3.0000E+01
Inhalation 50-yr CEDE (Sv/Bq) : 4.6700E-09
Submersion (Sv-m3)/(Bq-sec) : 2.5500E-14
Ground Shine (Sv-m2)/(Bq-sec) : 5.4900E-16
Total Activity Released (Ci) : 1.6900E+01
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

Partial Roof Collapse of the 202-A Canyon Building

HotSpot User Mixture Database
User Mixture Name : PUREX_ Partial Roof Collapse of 202A.mix

Mixture Scale Factor : 1.0000E+00

Nuclide [01] : Pu-238 M 87.74y
Halflife (Years): 8.7740E+01
Inhalation 50-yr CEDE (Sv/Bq): 4.6200E-05
Submersion (Sv-m3)/(Bq-sec): 3.3600E-18
Ground Shine (Sv-m2)/(Bq-sec): 5.9900E-19
Total Activity Released (Ci) : 1.2800E-03
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

Nuclide [02] : Pu-239 M 24065y
Halflife (Years) : 2.4065E+04
Inhalation 50-yr CEDE (Sv/Bq) : 5.0200E-05
Submersion (Sv-m3)/(Bq-sec) : 3.7700E-18
Ground Shine (Sv-m2)/(Bq-sec) : 3.0600E-19
Total Activity Released (Ci) : 5.5900E-03
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

Nuclide [03] : Pu-240 M 6537y
Halflife (Years) : 6.5370E+03
Inhalation 50-yr CEDE (Sv/Bq) : 5.0200E-05
Submersion (Sv-m3)/(Bq-sec) : 3.2900E-18
Ground Shine (Sv-m2)/(Bq-sec) : 5.6800E-19
Total Activity Released (Ci) : 3.2000E-03
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

Nuclide [04] : Pu-241 M 14.4y
Halflife (Years) : 1.4400E+01
Inhalation 50-yr CEDE (Sv/Bq) : 9.0100E-07
Submersion (Sv-m3)/(Bq-sec) : 6.1500E-20
Ground Shine (Sv-m2)/(Bq-sec) : 1.4300E-21
Total Activity Released (Ci) : 5.1000E-02
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

Nuclide [05] : Pu-242 M 3.763E5y
Halflife (Years) : 3.7630E+05
Inhalation 50-yr CEDE (Sv/Bq) : 4.7600E-05
Submersion (Sv-m3)/(Bq-sec) : 6.4300E-18
Ground Shine (Sv-m2)/(Bq-sec) : 5.5600E-19
Total Activity Released (Ci) : 1.1800E-06
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

HotSpot Mixture Files

Nuclide [06] : Am-241 M 432.2y
Halflife (Years) : 4.3220E+02
Inhalation 50-yr CEDE (Sv/Bq) : 4.1700E-05
Submersion (Sv-m3)/(Bq-sec) : 6.7200E-16
Ground Shine (Sv-m2)/(Bq-sec) : 2.1800E-17
Total Activity Released (Ci) : 9.2900E-03
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

Nuclide [07] : Sr-90 M 29.12y
Halflife (Years) : 2.9120E+01
Inhalation 50-yr CEDE (Sv/Bq) : 3.5600E-08
Submersion (Sv-m3)/(Bq-sec) : 8.8900E-16
Ground Shine (Sv-m2)/(Bq-sec) : 1.1200E-16
Total Activity Released (Ci) : 1.9100E-01
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

Nuclide [08] : Y-90 M 64.0h
Halflife (Years) : 7.3059E-03
Inhalation 50-yr CEDE (Sv/Bq) : 1.3900E-09
Submersion (Sv-m3)/(Bq-sec) : 7.9100E-16
Ground Shine (Sv-m2)/(Bq-sec) : 1.1000E-16
Total Activity Released (Ci) : 1.9100E-01
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

Nuclide [09] : Cs-137 F 30.0y
Halflife (Years) : 3.0000E+01
Inhalation 50-yr CEDE (Sv/Bq) : 4.6700E-09
Submersion (Sv-m3)/(Bq-sec) : 2.5500E-14
Ground Shine (Sv-m2)/(Bq-sec) : 5.4900E-16
Total Activity Released (Ci) : 2.3400E-01
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

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Partial Collapse of PUREX Storage Tunnel No. 1

HotSpot User Mixture Database
User Mixture Name : PUREX_ Partial Roof Collapse of Tunnel 1.mix

Mixture Scale Factor : 1.0000E+00

Nuclide [01] : Pu-238 M 87.74y
Halflife (Years): 8.7740E+01
Inhalation 50-yr CEDE (Sv/Bq): 4.6200E-05
Submersion (Sv-m3)/(Bq-sec): 3.3600E-18
Ground Shine (Sv-m2)/(Bq-sec): 5.9900E-19
Total Activity Released (Ci) : 7.4000E-04
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

Nuclide [02] : Pu-239 M 24065y
Halflife (Years) : 2.4065E+04
Inhalation 50-yr CEDE (Sv/Bq) : 5.0200E-05
Submersion (Sv-m3)/(Bq-sec) : 3.7700E-18
Ground Shine (Sv-m2)/(Bq-sec) : 3.0600E-19
Total Activity Released (Ci) : 3.3100E-03
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

Nuclide [03] : Pu-240 M 6537y
Halflife (Years) : 6.5370E+03
Inhalation 50-yr CEDE (Sv/Bq) : 5.0200E-05
Submersion (Sv-m3)/(Bq-sec) : 3.2900E-18
Ground Shine (Sv-m2)/(Bq-sec) : 5.6800E-19
Total Activity Released (Ci) : 1.8900E-03
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

Nuclide [04] : Pu-241 M 14.4y
Halflife (Years) : 1.4400E+01
Inhalation 50-yr CEDE (Sv/Bq) : 9.0100E-07
Submersion (Sv-m3)/(Bq-sec) : 6.1500E-20
Ground Shine (Sv-m2)/(Bq-sec) : 1.4300E-21
Total Activity Released (Ci) : 2.4700E-02
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

Nuclide [05] : Pu-242 M 3.763E5y
Halflife (Years) : 3.7630E+05
Inhalation 50-yr CEDE (Sv/Bq) : 4.7600E-05
Submersion (Sv-m3)/(Bq-sec) : 6.4300E-18
Ground Shine (Sv-m2)/(Bq-sec) : 5.5600E-19
Total Activity Released (Ci) : 6.8300E-07
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

HotSpot Mixture Files

Nuclide [06] : Am-241 M 432.2y
Halflife (Years) : 4.3220E+02
Inhalation 50-yr CEDE (Sv/Bq) : 4.1700E-05
Submersion (Sv-m3)/(Bq-sec) : 6.7200E-16
Ground Shine (Sv-m2)/(Bq-sec) : 2.1800E-17
Total Activity Released (Ci) : 5.5500E-03
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

Nuclide [07] : Sr-90 M 29.12y
Halflife (Years) : 2.9120E+01
Inhalation 50-yr CEDE (Sv/Bq) : 3.5600E-08
Submersion (Sv-m3)/(Bq-sec) : 8.8900E-16
Ground Shine (Sv-m2)/(Bq-sec) : 1.1200E-16
Total Activity Released (Ci) : 1.0300E-01
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

Nuclide [08] : Y-90 M 64.0h
Halflife (Years) : 7.3059E-03
Inhalation 50-yr CEDE (Sv/Bq) : 1.3900E-09
Submersion (Sv-m3)/(Bq-sec) : 7.9100E-16
Ground Shine (Sv-m2)/(Bq-sec) : 1.1000E-16
Total Activity Released (Ci) : 1.0200E-01
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

Nuclide [09] : Cs-137 F 30.0y
Halflife (Years) : 3.0000E+01
Inhalation 50-yr CEDE (Sv/Bq) : 4.6700E-09
Submersion (Sv-m3)/(Bq-sec) : 2.5500E-14
Ground Shine (Sv-m2)/(Bq-sec) : 5.4900E-16
Total Activity Released (Ci) : 1.2500E-01
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

Partial Collapse of PUREX Storage Tunnel No. 2

HotSpot User Mixture Database
User Mixture Name : PUREX_ Partial Roof Collapse of Tunnel 2.mix
7.88
Mixture Scale Factor : 1.0000E+00

Nuclide [01] : Sr-90 M 29.12y
Halflife (Years): 2.9120E+01
Inhalation 50-yr CEDE (Sv/Bq): 3.5600E-08
Submersion (Sv-m3)/(Bq-sec): 8.8900E-16
Ground Shine (Sv-m2)/(Bq-sec): 1.1200E-16
Total Activity Released (Ci) : 7.8800E+00
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

Nuclide [02] : Y-90 M 64.0h
Halflife (Years) : 7.3059E-03
Inhalation 50-yr CEDE (Sv/Bq) : 1.3900E-09
Submersion (Sv-m3)/(Bq-sec) : 7.9100E-16
Ground Shine (Sv-m2)/(Bq-sec) : 1.1000E-16
Total Activity Released (Ci) : 7.8100E+00
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

Nuclide [03] : Cs-137 F 30.0y
Halflife (Years) : 3.0000E+01
Inhalation 50-yr CEDE (Sv/Bq) : 4.6700E-09
Submersion (Sv-m3)/(Bq-sec) : 2.5500E-14
Ground Shine (Sv-m2)/(Bq-sec) : 5.4900E-16
Total Activity Released (Ci) : 1.5600E+01
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

HotSpot Mixture Files

Contaminated Equipment Drop

HotSpot User Mixture Database
User Mixture Name : PUREX_ Equipment Drop.mix

Mixture Scale Factor : 1.0000E+00

Nuclide [01] : Pu-238 M 87.74y
Halflife (Years): 8.7740E+01
Inhalation 50-yr CEDE (Sv/Bq): 4.6200E-05
Submersion (Sv-m3)/(Bq-sec): 3.3600E-18
Ground Shine (Sv-m2)/(Bq-sec): 5.9900E-19
Total Activity Released (Ci) : 2.1200E-05
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

Nuclide [02] : Pu-239 M 24065y
Halflife (Years) : 2.4065E+04
Inhalation 50-yr CEDE (Sv/Bq) : 5.0200E-05
Submersion (Sv-m3)/(Bq-sec) : 3.7700E-18
Ground Shine (Sv-m2)/(Bq-sec) : 3.0600E-19
Total Activity Released (Ci) : 9.2400E-05
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

Nuclide [03] : Pu-240 M 6537y
Halflife (Years) : 6.5370E+03
Inhalation 50-yr CEDE (Sv/Bq) : 5.0200E-05
Submersion (Sv-m3)/(Bq-sec) : 3.2900E-18
Ground Shine (Sv-m2)/(Bq-sec) : 5.6800E-19
Total Activity Released (Ci) : 5.2900E-05
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

Nuclide [04] : Pu-241 M 14.4y
Halflife (Years) : 1.4400E+01
Inhalation 50-yr CEDE (Sv/Bq) : 9.0100E-07
Submersion (Sv-m3)/(Bq-sec) : 6.1500E-20
Ground Shine (Sv-m2)/(Bq-sec) : 1.4300E-21
Total Activity Released (Ci) : 8.4600E-04
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

Nuclide [05] : Pu-242 M 3.763E5y
Halflife (Years) : 3.7630E+05
Inhalation 50-yr CEDE (Sv/Bq) : 4.7600E-05
Submersion (Sv-m3)/(Bq-sec) : 6.4300E-18
Ground Shine (Sv-m2)/(Bq-sec) : 5.5600E-19
Total Activity Released (Ci) : 1.9000E-08
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

Nuclide [06] : Am-241 M 432.2y
Halflife (Years) : 4.3220E+02
Inhalation 50-yr CEDE (Sv/Bq) : 4.1700E-05
Submersion (Sv-m3)/(Bq-sec) : 6.7200E-16
Ground Shine (Sv-m2)/(Bq-sec) : 2.1800E-17
Total Activity Released (Ci) : 1.5000E-04
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

Nuclide [07] : Sr-90 M 29.12y
Halflife (Years) : 2.9120E+01
Inhalation 50-yr CEDE (Sv/Bq) : 3.5600E-08
Submersion (Sv-m3)/(Bq-sec) : 8.8900E-16
Ground Shine (Sv-m2)/(Bq-sec) : 1.1200E-16
Total Activity Released (Ci) : 3.1700E-03
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

Nuclide [08] : Y-90 M 64.0h
Halflife (Years) : 7.3059E-03
Inhalation 50-yr CEDE (Sv/Bq) : 1.3900E-09
Submersion (Sv-m3)/(Bq-sec) : 7.9100E-16
Ground Shine (Sv-m2)/(Bq-sec) : 1.1000E-16
Total Activity Released (Ci) : 3.1600E-03
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

Nuclide [10] : Cs-137 F 30.0y
Halflife (Years) : 3.0000E+01
Inhalation 50-yr CEDE (Sv/Bq) : 4.6700E-09
Submersion (Sv-m3)/(Bq-sec) : 2.5500E-14
Ground Shine (Sv-m2)/(Bq-sec) : 5.4900E-16
Total Activity Released (Ci) : 3.8700E-03
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

HotSpot Mixture Files

Fire in PUREX Storage Tunnel No. 1

HotSpot User Mixture Database
User Mixture Name : PUREX_Tunnel Fire.mix

Mixture Scale Factor : 1.0000E+00

Nuclide [01] : Pu-238 M 87.74y
Halflife (Years): 8.7740E+01
Inhalation 50-yr CEDE (Sv/Bq): 4.6200E-05
Submersion (Sv-m3)/(Bq-sec): 3.3600E-18
Ground Shine (Sv-m2)/(Bq-sec): 5.9900E-19
Total Activity Released (Ci) : 3.5500E-03
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

Nuclide [02] : Pu-239 M 24065y
Halflife (Years) : 2.4065E+04
Inhalation 50-yr CEDE (Sv/Bq) : 5.0200E-05
Submersion (Sv-m3)/(Bq-sec) : 3.7700E-18
Ground Shine (Sv-m2)/(Bq-sec) : 3.0600E-19
Total Activity Released (Ci) : 1.5900E-02
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

Nuclide [03] : Pu-240 M 6537y
Halflife (Years) : 6.5370E+03
Inhalation 50-yr CEDE (Sv/Bq) : 5.0200E-05
Submersion (Sv-m3)/(Bq-sec) : 3.2900E-18
Ground Shine (Sv-m2)/(Bq-sec) : 5.6800E-19
Total Activity Released (Ci) : 9.0800E-03
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

Nuclide [04] : Pu-241 M 14.4y
Halflife (Years) : 1.4400E+01
Inhalation 50-yr CEDE (Sv/Bq) : 9.0100E-07
Submersion (Sv-m3)/(Bq-sec) : 6.1500E-20
Ground Shine (Sv-m2)/(Bq-sec) : 1.4300E-21
Total Activity Released (Ci) : 1.1900E-01
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

Nuclide [05] : Pu-242 M 3.763E5y
Halflife (Years) : 3.7630E+05
Inhalation 50-yr CEDE (Sv/Bq) : 4.7600E-05
Submersion (Sv-m3)/(Bq-sec) : 6.4300E-18
Ground Shine (Sv-m2)/(Bq-sec) : 5.5600E-19
Total Activity Released (Ci) : 3.2800E-06
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

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Nuclide [06] : Am-241 M 432.2y
Halflife (Years) : 4.3220E+02
Inhalation 50-yr CEDE (Sv/Bq) : 4.1700E-05
Submersion (Sv-m3)/(Bq-sec) : 6.7200E-16
Ground Shine (Sv-m2)/(Bq-sec) : 2.1800E-17
Total Activity Released (Ci) : 2.6600E-02
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

Nuclide [07] : Sr-90 M 29.12y
Halflife (Years) : 2.9120E+01
Inhalation 50-yr CEDE (Sv/Bq) : 3.5600E-08
Submersion (Sv-m3)/(Bq-sec) : 8.8900E-16
Ground Shine (Sv-m2)/(Bq-sec) : 1.1200E-16
Total Activity Released (Ci) : 4.9200E-01
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

Nuclide [08] : Y-90 M 64.0h
Halflife (Years) : 7.3059E-03
Inhalation 50-yr CEDE (Sv/Bq) : 1.3900E-09
Submersion (Sv-m3)/(Bq-sec) : 7.9100E-16
Ground Shine (Sv-m2)/(Bq-sec) : 1.1000E-16
Total Activity Released (Ci) : 4.9000E-01
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

Nuclide [09] : Cs-137 F 30.0y
Halflife (Years) : 3.0000E+01
Inhalation 50-yr CEDE (Sv/Bq) : 4.6700E-09
Submersion (Sv-m3)/(Bq-sec) : 2.5500E-14
Ground Shine (Sv-m2)/(Bq-sec) : 5.4900E-16
Total Activity Released (Ci) : 6.0200E-01
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

HotSpot Mixture Files

Fire in PUREX Storage Tunnel No. 2

HotSpot User Mixture Database
User Mixture Name : PUREX_Tunnel Fire No 2.mix

Mixture Scale Factor : 1.0000E+00

Nuclide [01] : Pu-238 M 87.74y
Halflife (Years): 8.7740E+01
Inhalation 50-yr CEDE (Sv/Bq): 4.6200E-05
Submersion (Sv-m3)/(Bq-sec): 3.3600E-18
Ground Shine (Sv-m2)/(Bq-sec): 5.9900E-19
Total Activity Released (Ci) : 4.6400E-03
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

Nuclide [02] : Pu-239 M 24065y
Halflife (Years) : 2.4065E+04
Inhalation 50-yr CEDE (Sv/Bq) : 5.0200E-05
Submersion (Sv-m3)/(Bq-sec) : 3.7700E-18
Ground Shine (Sv-m2)/(Bq-sec) : 3.0600E-19
Total Activity Released (Ci) : 1.7500E-02
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

Nuclide [03] : Pu-240 M 6537y
Halflife (Years) : 6.5370E+03
Inhalation 50-yr CEDE (Sv/Bq) : 5.0200E-05
Submersion (Sv-m3)/(Bq-sec) : 3.2900E-18
Ground Shine (Sv-m2)/(Bq-sec) : 5.6800E-19
Total Activity Released (Ci) : 1.0000E-02
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

Nuclide [04] : Pu-241 M 14.4y
Halflife (Years) : 1.4400E+01
Inhalation 50-yr CEDE (Sv/Bq) : 9.0100E-07
Submersion (Sv-m3)/(Bq-sec) : 6.1500E-20
Ground Shine (Sv-m2)/(Bq-sec) : 1.4300E-21
Total Activity Released (Ci) : 3.9700E-01
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

Nuclide [05] : Pu-242 M 3.763E5y
Halflife (Years) : 3.7630E+05
Inhalation 50-yr CEDE (Sv/Bq) : 4.7600E-05
Submersion (Sv-m3)/(Bq-sec) : 6.4300E-18
Ground Shine (Sv-m2)/(Bq-sec) : 5.5600E-19
Total Activity Released (Ci) : 3.6100E-06
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

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Nuclide [07] : Am-241 M 432.2y
Halflife (Years) : 4.3220E+02
Inhalation 50-yr CEDE (Sv/Bq) : 4.1700E-05
Submersion (Sv-m3)/(Bq-sec) : 6.7200E-16
Ground Shine (Sv-m2)/(Bq-sec) : 2.1800E-17
Total Activity Released (Ci) : 2.0100E-02
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

Nuclide [08] : Sr-90 M 29.12y
Halflife (Years) : 2.9120E+01
Inhalation 50-yr CEDE (Sv/Bq) : 3.5600E-08
Submersion (Sv-m3)/(Bq-sec) : 8.8900E-16
Ground Shine (Sv-m2)/(Bq-sec) : 1.1200E-16
Total Activity Released (Ci) : 1.0300E+01
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

Nuclide [09] : Y-90 M 64.0h
Halflife (Years) : 7.3059E-03
Inhalation 50-yr CEDE (Sv/Bq) : 1.3900E-09
Submersion (Sv-m3)/(Bq-sec) : 7.9100E-16
Ground Shine (Sv-m2)/(Bq-sec) : 1.1000E-16
Total Activity Released (Ci) : 1.0200E+01
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

Nuclide [10] : Cs-137 F 30.0y
Halflife (Years) : 3.0000E+01
Inhalation 50-yr CEDE (Sv/Bq) : 4.6700E-09
Submersion (Sv-m3)/(Bq-sec) : 2.5500E-14
Ground Shine (Sv-m2)/(Bq-sec) : 5.4900E-16
Total Activity Released (Ci) : 1.9700E+01
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

HotSpot Mixture Files

Staged Waste Fire – Equipment/Component

HotSpot User Mixture Database
User Mixture Name : PUREX_ Equipment Waste Frie.mix

Mixture Scale Factor : 1.0000E+00

Nuclide [01] : Pu-238 M 87.74y
Halflife (Years): 8.7740E+01
Inhalation 50-yr CEDE (Sv/Bq): 4.6200E-05
Submersion (Sv-m3)/(Bq-sec): 3.3600E-18
Ground Shine (Sv-m2)/(Bq-sec): 5.9900E-19
Total Activity Released (Ci) : 1.1300E-04
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

Nuclide [02] : Pu-239 M 24065y
Halflife (Years) : 2.4065E+04
Inhalation 50-yr CEDE (Sv/Bq) : 5.0200E-05
Submersion (Sv-m3)/(Bq-sec) : 3.7700E-18
Ground Shine (Sv-m2)/(Bq-sec) : 3.0600E-19
Total Activity Released (Ci) : 4.9300E-04
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

Nuclide [03] : Pu-240 M 6537y
Halflife (Years) : 6.5370E+03
Inhalation 50-yr CEDE (Sv/Bq) : 5.0200E-05
Submersion (Sv-m3)/(Bq-sec) : 3.2900E-18
Ground Shine (Sv-m2)/(Bq-sec) : 5.6800E-19
Total Activity Released (Ci) : 2.8200E-04
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

Nuclide [04] : Pu-241 M 14.4y
Halflife (Years) : 1.4400E+01
Inhalation 50-yr CEDE (Sv/Bq) : 9.0100E-07
Submersion (Sv-m3)/(Bq-sec) : 6.1500E-20
Ground Shine (Sv-m2)/(Bq-sec) : 1.4300E-21
Total Activity Released (Ci) : 4.5100E-03
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

Nuclide [05] : Pu-242 M 3.763E5y
Halflife (Years) : 3.7630E+05
Inhalation 50-yr CEDE (Sv/Bq) : 4.7600E-05
Submersion (Sv-m3)/(Bq-sec) : 6.4300E-18
Ground Shine (Sv-m2)/(Bq-sec) : 5.5600E-19
Total Activity Released (Ci) : 1.0100E-07
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

Nuclide [06] : Am-241 M 432.2y
Halflife (Years) : 4.3220E+02
Inhalation 50-yr CEDE (Sv/Bq) : 4.1700E-05
Submersion (Sv-m3)/(Bq-sec) : 6.7200E-16
Ground Shine (Sv-m2)/(Bq-sec) : 2.1800E-17
Total Activity Released (Ci) : 7.9900E-04
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

Nuclide [07] : Sr-90 M 29.12y
Halflife (Years) : 2.9120E+01
Inhalation 50-yr CEDE (Sv/Bq) : 3.5600E-08
Submersion (Sv-m3)/(Bq-sec) : 8.8900E-16
Ground Shine (Sv-m2)/(Bq-sec) : 1.1200E-16
Total Activity Released (Ci) : 1.6900E-02
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

Nuclide [08] : Y-90 M 64.0h
Halflife (Years) : 7.3059E-03
Inhalation 50-yr CEDE (Sv/Bq) : 1.3900E-09
Submersion (Sv-m3)/(Bq-sec) : 7.9100E-16
Ground Shine (Sv-m2)/(Bq-sec) : 1.1000E-16
Total Activity Released (Ci) : 1.6800E-02
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

Nuclide [09] : Cs-137 F 30.0y
Halflife (Years) : 3.0000E+01
Inhalation 50-yr CEDE (Sv/Bq) : 4.6700E-09
Submersion (Sv-m3)/(Bq-sec) : 2.5500E-14
Ground Shine (Sv-m2)/(Bq-sec) : 5.4900E-16
Total Activity Released (Ci) : 2.0700E-02
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

HotSpot Mixture Files

Stages Waste Fire – Non-Equipment Waste

HotSpot User Mixture Database
User Mixture Name : PUREX_ NonEquipment Waste Frie.mix

Mixture Scale Factor : 1.0000E+00

Nuclide [01] : Pu-238 M 87.74y
Halflife (Years): 8.7740E+01
Inhalation 50-yr CEDE (Sv/Bq): 4.6200E-05
Submersion (Sv-m3)/(Bq-sec): 3.3600E-18
Ground Shine (Sv-m2)/(Bq-sec): 5.9900E-19
Total Activity Released (Ci) : 1.1300E-05
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

Nuclide [02] : Pu-239 M 24065y
Halflife (Years) : 2.4065E+04
Inhalation 50-yr CEDE (Sv/Bq) : 5.0200E-05
Submersion (Sv-m3)/(Bq-sec) : 3.7700E-18
Ground Shine (Sv-m2)/(Bq-sec) : 3.0600E-19
Total Activity Released (Ci) : 4.9300E-05
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

Nuclide [03] : Pu-240 M 6537y
Halflife (Years) : 6.5370E+03
Inhalation 50-yr CEDE (Sv/Bq) : 5.0200E-05
Submersion (Sv-m3)/(Bq-sec) : 3.2900E-18
Ground Shine (Sv-m2)/(Bq-sec) : 5.6800E-19
Total Activity Released (Ci) : 2.8200E-05
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

Nuclide [04] : Pu-241 M 14.4y
Halflife (Years) : 1.4400E+01
Inhalation 50-yr CEDE (Sv/Bq) : 9.0100E-07
Submersion (Sv-m3)/(Bq-sec) : 6.1500E-20
Ground Shine (Sv-m2)/(Bq-sec) : 1.4300E-21
Total Activity Released (Ci) : 4.5100E-04
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

Nuclide [05] : Pu-242 M 3.763E5y
Halflife (Years) : 3.7630E+05
Inhalation 50-yr CEDE (Sv/Bq) : 4.7600E-05
Submersion (Sv-m3)/(Bq-sec) : 6.4300E-18
Ground Shine (Sv-m2)/(Bq-sec) : 5.5600E-19
Total Activity Released (Ci) : 1.0100E-08
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

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Nuclide [06] : Am-241 M 432.2y
Halflife (Years) : 4.3220E+02
Inhalation 50-yr CEDE (Sv/Bq) : 4.1700E-05
Submersion (Sv-m3)/(Bq-sec) : 6.7200E-16
Ground Shine (Sv-m2)/(Bq-sec) : 2.1800E-17
Total Activity Released (Ci) : 7.9900E-05
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

Nuclide [07] : Sr-90 M 29.12y
Halflife (Years) : 2.9120E+01
Inhalation 50-yr CEDE (Sv/Bq) : 3.5600E-08
Submersion (Sv-m3)/(Bq-sec) : 8.8900E-16
Ground Shine (Sv-m2)/(Bq-sec) : 1.1200E-16
Total Activity Released (Ci) : 1.6900E-03
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

Nuclide [08] : Y-90 M 64.0h
Halflife (Years) : 7.3059E-03
Inhalation 50-yr CEDE (Sv/Bq) : 1.3900E-09
Submersion (Sv-m3)/(Bq-sec) : 7.9100E-16
Ground Shine (Sv-m2)/(Bq-sec) : 1.1000E-16
Total Activity Released (Ci) : 1.6800E-03
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00

Nuclide [09] : Cs-137 F 30.0y
Halflife (Years) : 3.0000E+01
Inhalation 50-yr CEDE (Sv/Bq) : 4.6700E-09
Submersion (Sv-m3)/(Bq-sec) : 2.5500E-14
Ground Shine (Sv-m2)/(Bq-sec) : 5.4900E-16
Total Activity Released (Ci) : 2.0700E-03
Airborne Fraction : 1.0000E+00
Respirable Fraction : 1.0000E+00
Respirable Deposition Velocity (cm/sec) : 3.0000E-01
Non-resp. Deposition Velocity (cm/sec) : 8.0000E+00