DISTRIBUTION SHEET

To	From	Page 1 of 1
Distribution	Emergency Preparedness	Date 1/3/95
Project Title/Work Order		EDT No. 608146
233-S HAZARDS ASSESSMENT		ECN No.

Name	MSIN	Text With All Attach.	Text Only	Attach./ Appendix Only	EDT/ECN Only
R. E. Broz	A3-05	X			
L. R. Campbell	A3-05	X			
G. J. Carter	R3-35	X			
G. B. Cislo	X0-34	X			
V. G. Edens	H4-87	X			
D. A. Marsh (2)	A3-05	X			
L. N. Sutton	R2-58	X			
OSTI (2)	L8-07	X			
Central Files (2)	L8-04	X			

DISCLAIMER

Portions of this document may be illegible in electronic image products. Images are produced from the best available original document.

Sta.21
JAN 04 1995 38

ENGINEERING DATA TRANSMITTAL

Page 1 of 1

1. EDT 608146

2. To: (Receiving Organization) Distribution	3. From: (Originating Organization) Emergency Preparedness	4. Related EDT No.: N/A
5. Proj./Prog./Dept./Div.: Hanford Hazards Assessment	6. Cog. Engr.: R. E. Broz	7. Purchase Order No.: N/A
8. Originator Remarks: Emergency Preparedness Hazards Assessment for the 233-S Plutonium Concentration Facility		9. Equip./Component No.: N/A
		10. System/Bldg./Facility: 233-S
11. Receiver Remarks:		12. Major Assm. Dwg. No.:
		13. Permit/Permit Application No.:
		14. Required Response Date:

15. DATA TRANSMITTED

(A) Item No.	(B) Document/Drawing No.	(C) Sheet No.	(D) Rev. No.	(E) Title or Description of Data Transmitted	(F) Approval Designator	(G) Reason for Transmittal	(H) Originator Disposition	(I) Receiver Disposition
1	WHC-SD-PRP-HA-017		0	233-S Plutonium Concentration Facility	S	1/2	1	

16. KEY

Approval Designator (F)	Reason for Transmittal (G)	Disposition (H) & (I)
E, S, Q, D or N/A (see WHC-CM-3-5, Sec.12.7)	1. Approval 2. Release 3. Information 4. Review 5. Post-Review 6. Dist. (Receipt Acknow. Required)	1. Approved 2. Approved w/comment 3. Disapproved w/comment 4. Reviewed no/comment 5. Reviewed w/comment 6. Receipt acknowledged

17. SIGNATURE/DISTRIBUTION (See Approval Designator for required signatures)

(G) Reason	(H) Disp.	(J) Name	(K) Signature (M) MSIN	(L) Date	(J) Name	(K) Signature (M) MSIN	(L) Date	(G) Reason	(H) Disp.
4,1		Cog.Eng. R. E. Broz	A3-05 [signature]	12/20/94					
		Cog. Mgr. D. A. Marsh	A3-05 [signature]	12/20/94					
		Operations G. J. Carter	R3-35 [signature]	1/3/94					
		Safety G. B. Cislo	X0-34 [signature]	12/27/94					
		Env.							

18.	19.	20.	21. DOE APPROVAL (if required)
R. E. Broz [signature] 12/20/94 Signature of EDT Originator Date	Authorized Representative for Receiving Organization Date	D. A. Marsh [signature] 12/20/94 Cognizant Manager Date	Ctrl. No. [] Approved [] Approved w/comments [] Disapproved w/comments

BD-7400-172-2 (04/94) GEF097

BD-7400-172-1 (07/91)

RELEASE AUTHORIZATION

Document Number:	WHC-SD-PRP-HA-017 Rev. 0
Document Title:	233-S Plutonium Concentration Facility Hazards Assessment
Release Date:	January 4, 1995

This document was reviewed following the procedures described in WHC-CM-3-4 and is:

APPROVED FOR PUBLIC RELEASE

WHC Information Release Administration Specialist:

V. L. Birkland (signature) — January 4, 1994

V.L. Birkland

SUPPORTING DOCUMENT

1. Total Pages 23

2. Title	3. Number	4. Rev No.
233-S Plutonium Concentration Facility Hazards Assessment	WHC-SD-PRP-HA-017	0

5. Key Words	6. Author
Emergency Preparedness, 233-S Plutonium Concentration Facility, Hazards Assessment	Name: R.E. Broz [signature] Signature Organization/Charge Code 3A200/MD5EP

7. Abstract

This document establishes the technical basis in support of Emergency Planning activities for the 233-S Plutonium Concentration Facility on the Hanford Site. The document represents an acceptable interpretation of the implementing guidance document for DOE ORDER 5500.3A. Through this document, the technical basis for the development of facility specific Emergency Action Levels and the Emergency Planning Zone is demonstrated.

8. RELEASE STAMP

OFFICIAL RELEASE 38
BY WHC
DATE JAN 04 1995
Sta. 21

A-6400-073 (08/94) WEF124

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

MASTER

233-S PLUTONIUM CONCENTRATION FACILITY HAZARDS ASSESSMENT

R. E. Broz

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1.0 INTRODUCTION

The U.S. Department of Energy (DOE) Order 5500.3A, Emergency Planning and Preparedness for Operational Emergencies, requires that a facility specific hazards assessment be performed to support Emergency Planning activities. The Hazard Assessment establishes the technical basis for the Emergency Action Levels (EALs) and the Emergency Planning Zone (EPZ). Emergency Planning activities are provided under contract to DOE through the Westinghouse Hanford Company (WHC). This document represents the facility specific hazards assessment for the Hanford Site 233-S as interpreted from DOE guidance, Emergency Management Guide, Hazards Assessment (June 26, 1992). [Note: The scope of this effort is limited by DOE Order 5500.3A exclusively.]

2.0 FACILITY DESCRIPTION

2.1 Location

The 233-S Plutonium Concentration Facility is located on the Hanford Site in the southern end of the 200 West Area on 10th Street between Beloit Avenue and Dayton Avenues. Figure 2.1 shows the location of Hanford Site in relationship to the State of Washington. Figure 2.2 shows the location of 233-S on the Hanford Site. Figure 2.3 shows the 233-S building complex, which is adjacent to the 202-S complex. 233-S is located adjacent to and north of the Reduction-Oxidation Plant (REDOX).

2.2 Mission

The facility was built in 1955 to concentrate the plutonium nitrate product solution from the REDOX facility. An anion exchange purification process was installed within the process hood, and one plutonium concentrator converted for neptunium use in 1962.

An additional modification, completed in April 1958, provided for the building of another storage room, to the north of the existing storage room, as well as a larger truck unloading dock. Such a procedure for the storage of re-work material from PFP had not been in place when the original 233-S Building was constructed. The new storage facilities more than doubled the storage capacity of the 233-S Building. Project CGC-913 was begun in late 1960 with actual construction taking place during 1961-62. The most major piece of new equipment installed in the 233-S Building during Project CGC-913 was the L-18 Plutonium Anion Exchange Contactor. It consisted of an 5.5 m tall, 0.6 m wide, flanged loop of 0.1 m pipe. The receiver section extended above one leg of the loop by an additional 1.8 m. The greenhouse portion of the 233-S Building was extended on the east end by 0.8 m by 1.1 m by 9.8 m (height), and the contactor was mounted vertically in the greenhouse. Other new equipment included the L-1 feed tank, a 0.2 m (diameter) vertical pipe, 6.1 m long, that replaced the previous, 0.9 m diameter feed tank that could not provided criticality safety in the new system. Also new was the L-3 Product Concentrator, a four-piece flanged concentrator loop and de-entrainment tower made of titanium. Removable, titanium tube bundles encased in a stainless steel shell within the tower actually performed final concentration of the Pu from the L-18 Higgins contactor. A new L-16 Recycle Tank (three vertical pipes 0.2 m in diameter by 1.4 m tall) received any recycle (off-standard) Pu solutions that needed re-working.

Extensive piping changes also were made during Project CGC-913, and several pieces of existing equipment were modified to perform new functions. Specifically, the 3A and 3B columns were withdrawn from plutonium purification service, and converted for neptunium purification. The L-2 Concentrator, originally a hexone stripper for plutonium product solution, was modified to serve as the brandy product concentrator. The L-8 Brandy Concentrator Condenser and the L-21 Brandy Load-Out Tank also were modified, as were the L-4 Product Receiver Tank, the L-6 Product Sampler, the L-7 PR Head Tank (through which the PR cans were filled under vacuum), the L-9 Condensate Sampler, the L-10-F Product Feed Tank, the L-10-W Waste Receiver Tank, the L-11 and L-13 Concentrator Condensers, the L-12 Product Feed Concentrator, the L-14 Product Transfer Trap, the L-15 Jet Condenser, and the L-22 Recycle Monitoring Tank. Also, much new monitoring instrumentation was added to the 233-S Building, including neutron and alpha monitors and a gamma absorptiometer used to measure the density of the material at one point in the extraction section of the L-18 Contactor.

On November 6, 1963, after the new Plutonium Anion Exchange Contactor and Birch Recovery Program had been operating only about 18 months, a serious fire occurred in the 233-S Building. The incident began with a sudden reversal of air flow into the operating gallery. The air reversal resulted from venting of the over-pressurized Higgins contactor through a flange with a ruptured gasket. However, the cause of the pressurization of the contactor is unclear. Approximately 20 minutes later, fire was observed in the building. It burned through open floor grating to involve all four floors of the facility as well as the anion exchange contactor. Canvas clothes hampers full of coveralls, gloves, caps, hoods, and shoe covers burned on all floors, as did rubber shoes and paper floor covering. The Higgins contactor itself was severely burned although not fully consumed. The fire was extinguished in about 90 minutes, through the use of sodium bicarbonate. According to the investigation report, alpha contamination was "rather widely spread throughout the 233-S Building."

Figure 2.1 Location of the Hanford Site

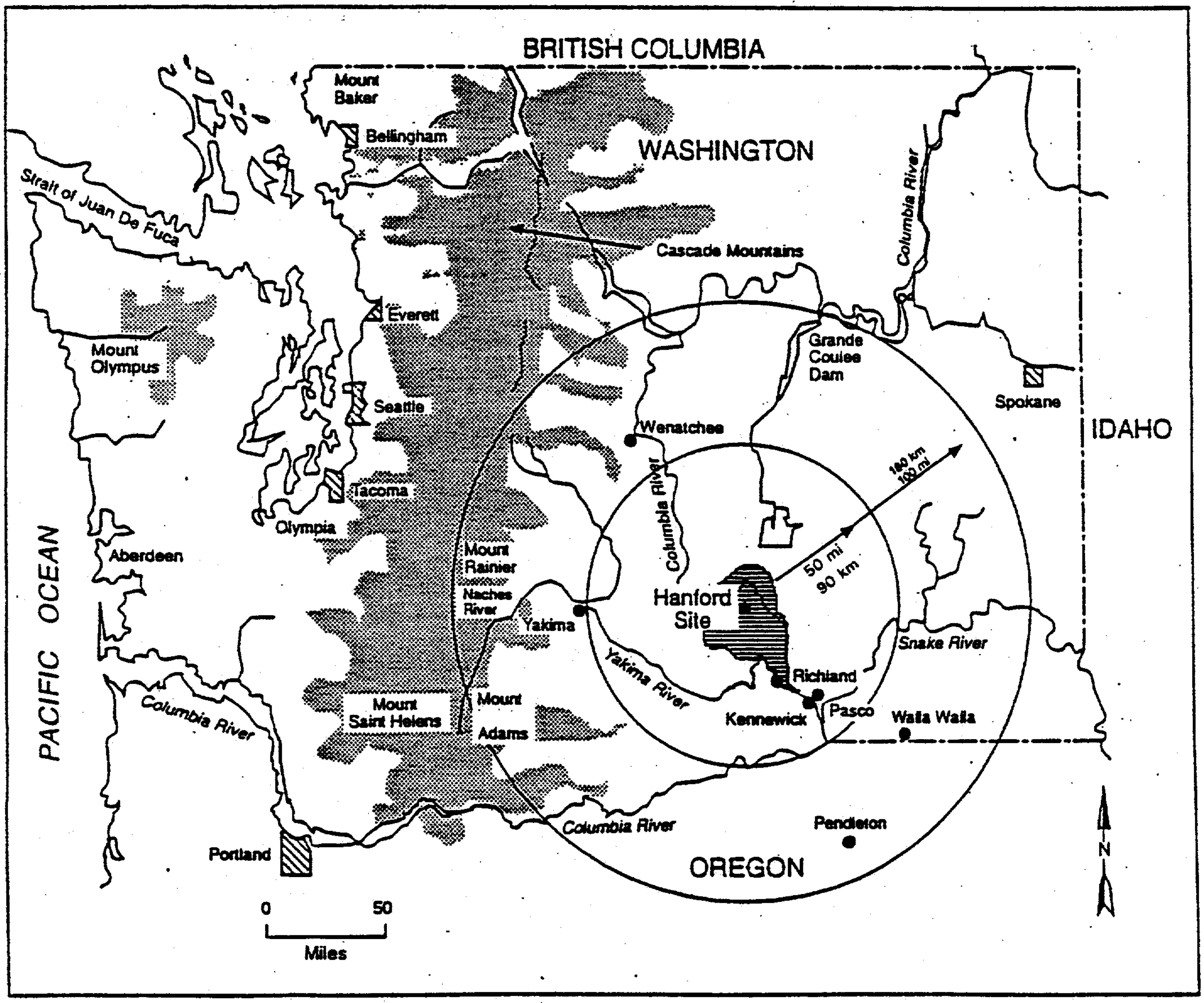


Figure 2.2 Location of 233-S in the 200 West Area

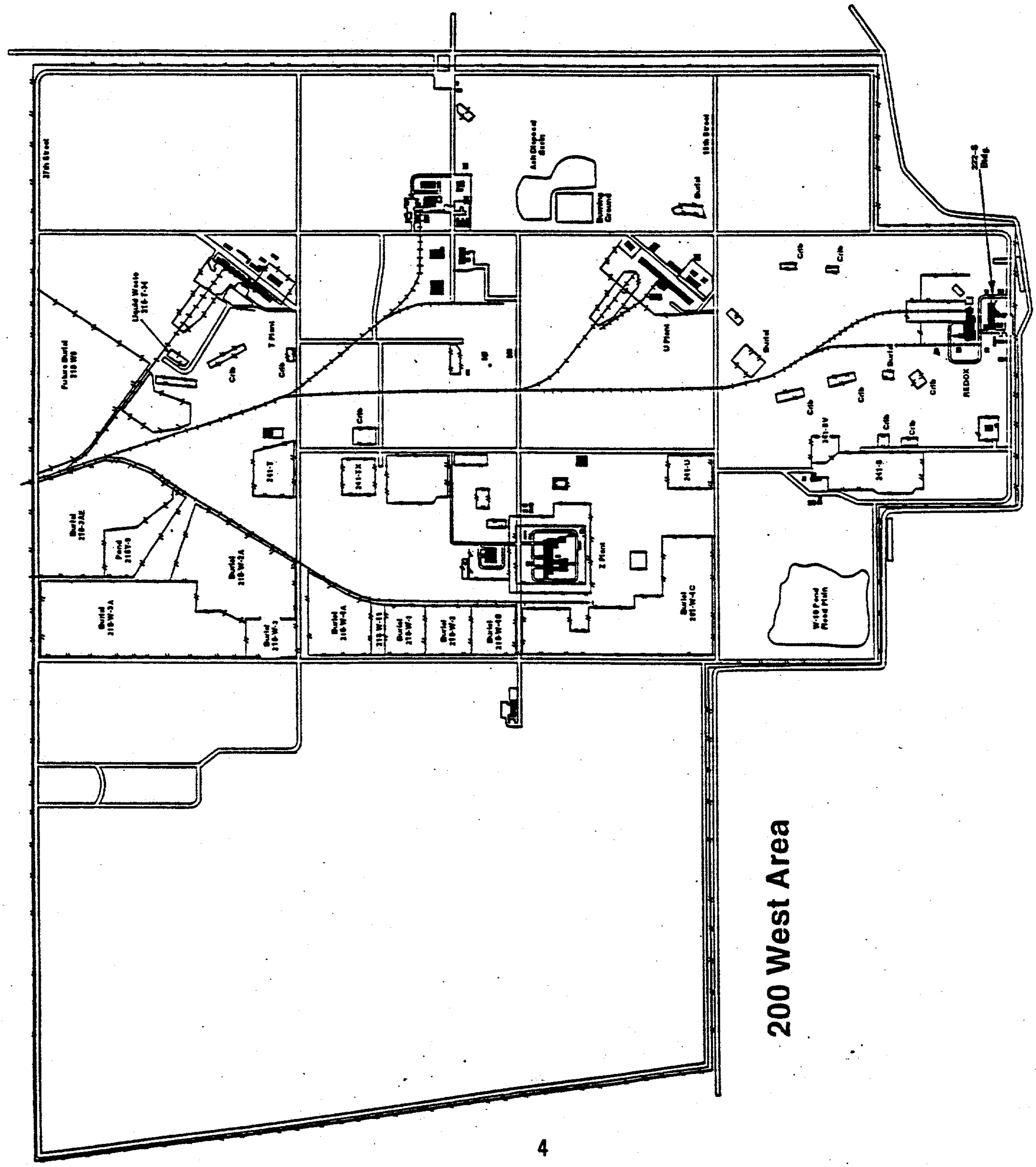
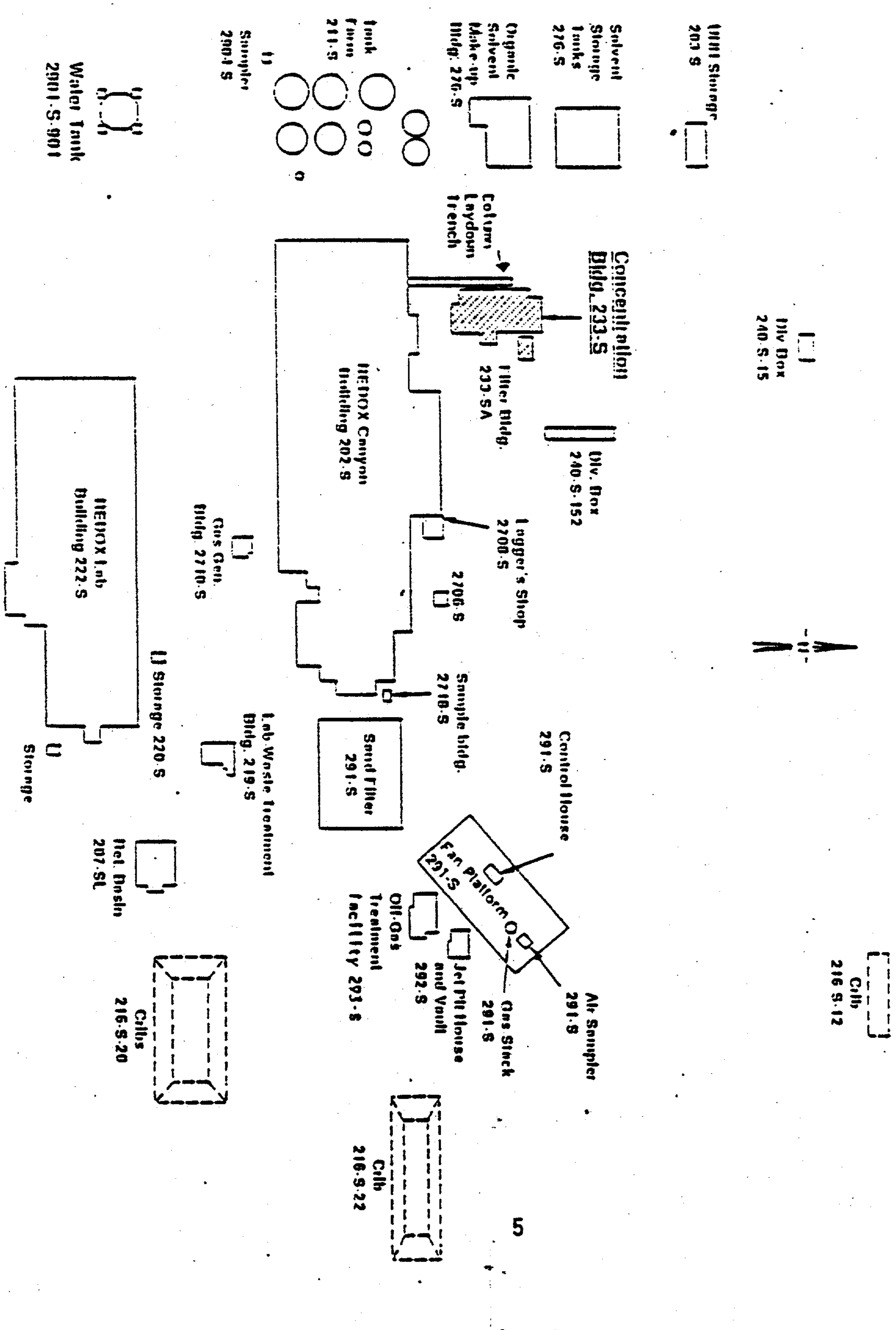


Figure 2.3 233-S Buildings



2.3 233-S Complex

The 233-S process and support buildings include: 233-S Plutonium Concentration Facility, 233-SA Filter Building, 296-S-7 Exhaust Stacks, the pipe trench connecting the 233-S Plutonium Concentration Facility to the 202-S REDOX Building, and the abandoned underground filter housing located between 233-S and 202-S facilities. The sections below briefly describe the facilities and buildings that have hazardous material inventories that warrant consideration as detailed in the DOE guidance.

2.3.1 233-S Plutonium Concentration Facility

The Plutonium Concentration Facility is a reinforced-concrete structure 11.3 m by 25.7 m. The facility consists of a process area and support rooms. The process area is a four-story high bay with concrete walls and is divided into two zones: the Process Hood and the Viewing Room, which are separated from each other by a partition of transparent plastic panels and reinforced structural steel. The Viewing Room has open grate flooring on each of the upper three levels with the original access ladder in the southwest corner. The Process Hood consists of criticality-safe process vessels up to 7 m tall and 17 cm in diameter. An ion-exchange enclosure contains the failed column and is located on the west wall of the Process Hood area.

2.3.2 233-SA Filter Building

The 233-SA Filter Building was constructed following the 1963 fire to handle the ventilation for the 233-S Plutonium Concentration Facility. The 233-SA Filter Building is a one-story, 4.9 m by 7.3 m reinforced concrete and block structure. The filter building is located on a reinforced concrete pad at the northeast corner of the 233-S Plutonium Concentration Facility. The filter building houses parallel banks of dual in-line (two stages) HEPA filters, each with its own exhaust fan, 7.6 m high metal stack, and record sampling equipment. The fan and stack are located to the north of the building and are designated 296-S-7 East and West. A flow diverter allows one alpha continous air monitor to handle the operating exhaust fan.

2.3.3 Pipe Trench

The pipe trench is a concrete underground, metal plate covered structure running between the REDOX Building and the southeast corner of the 233-S Building. The pipe trench is divided into two parallel sections to separate radiological solution transfer lines and nonradiological piping whch have been plugged to prevent inadvertent transfers. The trench is covered with concrete cover blocks and has been covered with protective foam to prevent contamination spread.

2.3.4 Abondoned Filter Box

The abandoned filter box is a reinforced concrete structure located below grade, between the REDOX Building and the 233-S Building. The filter box is approximately 12.23 m^3 and was used as a backup system during the time of the fire. The primary system was located above ground and was concluded to be damaged during the 1963 fire. With the tie-in of the 233-SA Filter Building, the filter box was abandoned.

3.0 IDENTIFICATION AND SCREENING OF HAZARDS

The Emergency Management Guide on Hazards Assessment indicates that 40 CFR 355 Appendix A and 10 CFR 30.72 Schedule C provide screening quantities or thresholds that should be used to eliminate the need to analyze insignificant hazards. The screening quantity is called a Threshold Planning Quantity (TPQ). These lists are not entirely inclusive. Other hazardous materials may exist in sufficient quantity which when released to the environment may pose public health hazards to Hanford workers and the general public.

3.1 Radiological Hazards

Based on the types of material processed in this facility and the results of the non destructive assay (NDA), the nuclear material is assumed to be plutonium and associated special nuclear material in oxide form. The nuclear material remaining within the 233-S Building is located in the pipe trench connecting 233-S with 202-S, process piping, and the process hood room. The amount of plutonium held up in the pipe trench and process hood room was determined by NDA to be 950 grams as documented in DOE/RL-94-107. The Threshold Planning Quantity is 2 curies for plutonium isotopes and there are approximately 444 curies in the facility. The table below includes neptunium-237 but recent analyses did not find the isotope and hence will not be included in the accidents analyzed in section 5.

Table 3.1 Activity Available in 233-S[1]

Nuclide	Specific Activity Ci/gram	Weight Percent	Source Term (Ci)	Source Term (Bq)
^{237}Np	2.7E-5	NA	2.6E-2	9.6E+8
^{238}Pu	7.6E-3	4.6E-2	7.3E+0	2.7E+11
^{239}Pu	5.3E-2	9.2E+1	5.1E+1	1.9E+12
^{240}Pu	1.8E-2	8.0E+0	1.7E+1	6.4E+11

Nuclide	Specific Activity Ci/gram	Weight Percent	Source Term (Ci)	Source Term (Bq)
^{241}Pu	3.6E-1	3.3E-1	3.5E+2	1.3E+13
^{242}Pu	1.3E-5	7.5E-1	1.2E-2	4.6E+8
^{241}Am	2.4E-2	1.0E+0	2.3E+1	8.6E+11

DOE/RL-94-107

4.0 HAZARD CHARACTERIZATION

4.1 Plutonium

The Hazards Assessment of the 233-S Laboratory is based on potential release of the maximum plutonium activity in the entire facility. Specific accident scenarios (section 5) have been identified as the cause of the potential releases.

4.1.1 Inventory and Properties

Of the 950 grams of plutonium shown in the NDA, 0.312 grams are in the pipe trench. This is not in the ventilation flow path and is considered to be non dispersible. Total inventory of the activity is shown in Table 3.1. Plutonium's critical organ is the bone surface with the resultant dose factored into the Effective Dose Equivalent (EDE).

4.2 Americium

The radioisotope ^{241}americium (Am) is a potentially major contributor to an inhalation or ingestion dose from 233-S. It is the beta decay product of ^{241}Pu. Although it takes approximately 70 years to reach transient equilibrium, due to competing effects with the decay of ^{241}Pu, 95 percent of the peak health hazard occurs approximately 20 years after discharge from the reactor. Americium-241 is also important because of its probability of emitting a number of low energy gamma and x-rays. For this reason, the dose rate at the surface of a canister of fresh plutonium oxide can actually increase over several years.

Experiments on animals indicate that compounds of americium are more rapidly cleared from the lung and absorbed from the gastrointestinal tract than are compounds of plutonium. Like plutonium, americium settles primarily in the bone and liver. The ICRP model assumes americium to be uniformly distributed over the bone surfaces at all times following its deposition in the skeleton.

4.2.1 Inventory and Properties

Inventory of the americium that is involved in the postulated accidents is shown in Table 3.1. Americium's critical organ is the bone surface with the resultant dose factored into the EDE.

5.0 EVENT SCENARIOS AND CONSEQUENCES

This section briefly describes several scenarios from Environmental Impact Statements, Environmental Assessments, Safety Analysis Reports (SAR), Hazards Identification and Evaluations, Technical Safety Assessments and Operational Safety Requirements applicable to the status of the facilities. The projected consequences from these events are used to establish the size of the emergency planning zone and to provide guidance for establishing EALs.

DOE Order 5500.3A also specifies that accidents whose consequences and probabilities fall outside the scope of traditional safety analysis reports must be considered. These events include accidents of higher probability and less consequence and those that may be classified as incredible in the SAR.

5.1 Stack Release With HEPA Filtration

The inventory of smearable contamination (0.312 g) is assumed to be released with the ventilation working through two stages of HEPA filters, the 7.6 m (25 ft) stack, stack radius of 0.3 m (1 ft), and a flow rate of 252 m^3/min (8900 ft^3/min). The release is assumed to be 1.0E-4 grams, using the reduction factor specified in WHC-SD-EN-SAD-029 of 3000. The plutonium oxide released is conservatively assumed to consist of respirable sized particles (10 microns or less diameter). The plutonium that is released is assumed to have the worst case dose conversion value as shown in Table 3.1. Table 5.1 shows the isotopic acitivity released.

Table 5.1 Activity Released with HEPA Filtration

Nuclide	Specific Activity Ci/gram	Weight Percent	Source Term (Ci)	Source Term (Bq)
^{238}Pu	7.6E-3	4.6E-2	2.5E-10	1.3E+1
^{239}Pu	5.3E-2	9.2E+1	4.9E-6	1.8E+5
^{240}Pu	1.8E-2	8.0E+0	1.4E-7	5.3E+3
^{241}Pu	3.6E-1	3.3E-1	1.2E-7	4.4E+3
^{242}Pu	1.3E-5	7.5E-1	9.8E-12	3.6E-1

Nuclide	Specific Activity Ci/gram	Weight Percent	Source Term (Ci)	Source Term (Bq)
^{241}Am	2.4E-2	1.0E+0	2.4E-8	8.9E+2

5.1.1 Consequence of Stack Release With HEPA Filtration

The stack release scenario has the highest 100 meter EDE of 1 mrem (1.0E-5 Sv) when using F stability meteorological conditions and the highest EDE for the nearest site boundary receptor at 8.14 miles (13 km) is <0.1 mrem (1.0E-6 Sv) when using F stability meteorological conditions. This dose would not require declaration of an emergency since the facility boundary dose is less than 100 mrem.

5.2 Stack Release Without HEPA Filtration

The inventory of smearable contamination (0.312 g) is assumed to be released but not through HEPA filters which lost their integrity from moisture loading. The release is out the 7.6 m stack, stack radius of 0.3 m, and a flow rate of 252 m^3/min. The release is assumed to be a portion (0.001), (DOE-HDBK-0013-93) of the inventory, or 3.0E-4 g. The oxide released is conservatively assumed to consist of respirable sized particles (10 microns or less diameter). The activity that is released is shown in Table 5.2.

Table 5.2 Activity Released without HEPA Filtration

Nuclide	Specific Activity Ci/gram	Weight Percent	Source Term (Ci)	Source Term (Bq)
^{238}Pu	7.6E-3	4.6E-2	1.1E-9	4.0E+1
^{239}Pu	5.3E-2	9.2E+1	1.5E-5	5.4E+5
^{240}Pu	1.8E-2	8.0E+0	4.3E-7	1.5E+4
^{241}Pu	3.6E-1	3.3E-1	3.6E-7	1.3E+4
^{242}Pu	1.3E-5	7.5E-1	2.9E-11	1.1E+0
^{241}Am	2.4E-2	1.0E+0	7.2E-8	2.7E+3

5.2.1 Consequence of Stack Release Without HEPA Filtration

The stack release scenario with no HEPA filtration has the highest 100 meter EDE of 2 mrem (2.0E-5 Sv) when using D stability meteorological conditions and the highest EDE for the nearest site boundary receptor at 8.14

miles (13 km) is 0.1 mrem (1.0E-5 Sv) when using D stability meteorological conditions. This dose would not require declaration of an emergency since the facility boundary dose is less than 100 mrem.

5.3 Uncontrolled Chemical Reactions

It has been documented in WHC-SD-EN-SAD-029 that there is not enough special nuclear material available for a criticality during the cesium source location, shielding or removal. Because of this analysis, liquids are to be used in the decontamination and decommissioning and as such no further hazards assessment analysis is necessary.

5.4 Natural Emergencies

5.4.1 Seismic Event (Earthquake)

A seimic event occurs which destroys the 233-S and 233-SA buildings. The contamination and other solids are released. The total activity released is assumed to be 950 grams at ground level, with a release fraction assumed to be 3E-4/0.5 from free-fall (< 3m) spill of powders from a shock impact (DOE-HDBK-0013-93). Total activity released is assumed to be 0.57 g. The oxide released is conservatively assumed to consist of respirable sized particles (10 microns or less diameter). The activity that is released is shown in Table 5.3.

Table 5.3 Activity Released from a Seismic Event

Nuclide	Specific Activity Ci/gram	Weight Percent	Source Term (Ci)	Source Term (Bq)
^{238}Pu	7.6E-3	4.6E-2	2.0E-6	7.4E+4
^{239}Pu	5.3E-2	9.2E+1	2.8E-2	1.0E+9
^{240}Pu	1.8E-2	8.0E+0	8.0E-4	3.0E+7
^{241}Pu	3.6E-1	3.3E-1	7.0E-4	2.5E+7
^{242}Pu	1.3E-5	7.5E-1	5.6E-8	2.1E+3
^{241}Am	2.4E-2	1.0E+0	1.0E-4	5.1E+6

5.4.1.1 Consequences of Seismic Event

The earthquake caused EDE for the 100 meter facility boundary is 88 rem (8.8E-1 Sv) and the nearest offsite boundary EDE is 49 mrem (5.0E-4 Sv). This dose would require declaration of a SITE AREA Emergency since the facility boundary dose is greater than 1 rem but the site boundary is less than 1 rem.

5.4.2 Tornado/High Winds/Thunderstorm

Some damage is expected if high winds or a tornado strike the 233-S complex, but the offsite impact is not expected to be significant. The survivability varies with the building affected. The buildings have experienced two wind storms in recent years with gust to 3.6E+1 m/second (1972) and 3.4E+1 m/second (1990) with no damage. A graded precautionary approach is recommended for high winds at the 233-S complex.

5.4.3 Volcanic Ashfall/Snowfall

The Hanford Site is in a region subject to snowfall as well as ashfall from volcanic eruptions. The three major volcanic peaks closest to the project are: Mt. Adams about 1.6 E+2 km away, Mt. Rainier, and Mt. St. Helens approximately 1.9 E+2 km away.

Important historical ash falls affecting this location were from eruptions of Glacier Peak about 12,000 years ago, Mt. Mazama about 6,000 years ago, and Mt. St. Helens about 3,600 years ago. The most recent ashfall resulted from the May 18, 1980 eruption of Mt. St. Helens. Table 5.1 below indicates the estimated ash depth deposited at the Hanford site from past volcanic eruptions in the region. The ash weight from the Mt Mazama event would probably have exceeded the design roof loading of most older Hanford buildings and roof failure would have been probable. However, the ash loading from the other eruptions would have been well below the roof loading limit. An emergency declaration is suggested if ash or snow accumulations could cause actual roof structural damage. There would be ample warning of an approaching large ash fall and the facility could be placed in a stable condition.

Table 5.4 Estimated Ash Depth at 200 Area from Major Eruptions

Volcano	Time	Depth of Ash	Equivalent Roof Loading Dry (psf)*	Equivalent Roof Loading Wet (psf)*
Glacier Peak	12,000 B.P.	0.025 m	6	8.4
Mt Mazama	6,000 B.P.	0.15 m	36	50
Mt. St. Helens	3,600 B.P.	0.025 m	6	8.4
Mt. St. Helens	1980	0.013 m	3	4.2

* pounds per square foot
B.P. = Before present

5.4.4 Range Fire

The Hanford Site is in a semiarid region with sagebrush and grasses growing between areas. Range fires periodically occur and can sweep over large regions before they are controlled. The summer months are historically the most likely time for a large fire to occur because of the combustible condition of the natural grasses.

The 233-S complex would probably not be affected by a range fire since the ground near the buildings is devoid of vegetation. Furthermore, many of the buildings are concrete and, therefore, not particularly susceptible to a fire initiated from outside the building.

5.4.5 Flood

The Probable Maximum Flood (PMF), calculated by the Corps of Engineers, is based on the concurrence of the worst of several natural phenomena, including a record snowfall in the Columbia River watershed, no melting of this snow until late spring, then warm, heavy rain. This hypothetical flood would have a flow of 2.4 E+9 l/hr and is estimated to be well below the level of the tank farm facilities. No emergency level declaration should be made.

5.5 Security Events

The following events have not been analyzed but are discussed and given a consequence.

5.5.1 Explosive Device

If confirmed physical damage as a result of a detonation of an explosive device occurs, in which there is a potential loss of confinement/containment of hazardous or radioactive materials in the 233-S facilities, declaration of an ALERT LEVEL Emergency is required.

5.5.2 Sabotage

A confirmed physical damage as a result of sabotage, resulting in potential loss of confinement/containment of hazardous materials to any of the 233-S facilities requires declaration of an ALERT LEVEL Emergency.

5.5.3 Hostage Situation

A confirmed hostage situation occurring within any of the 233-S facility requires declaration of an ALERT LEVEL Emergency.

5.5.4 Armed Intruder

A confirmed armed intruder(s) located within any of the 233-S facilities requires declaration of an ALERT LEVEL Emergency.

5.5.5 Aircraft Crash

This event is assumed to be initiated by a plane crash into a 233-S facility housing hazardous material, destroying the 233-S and 233-SA buildings. The same inventory and meteorological conditions as the seismic event would be expected with the same consequences.

5.5.5.1 Consequences of Aircraft Crash

The aircraft caused EDE for the 100 meter facility boundary is 110 rem (1.1 Sv) and the nearest offsite boundary EDE is 59 mrem (0.0006 Sv). This dose would require declaration of a SITE AREA Emergency since the facility boundary dose is greater than 1 rem but the site boundary is less than 1 rem.

6.0 EVENT CONSEQUENCES

6.1 Calculation Models

Consequences of the events and conditions identified in Section 5.0 were estimated using two primary computational models. The GENII program was used in the SARs for radiological dose calculations and the dispersion calculation for uranium toxicity evaluation. The Hanford Unified Dose Utility (HUDU) computer code. This code is the primary emergency response tool for radiological releases on the Hanford Site and in the Unified Dose Assessment Center (UDAC). It employs a straight line Gaussian plume model, Pasquill-Gifford stability classes, and ICRP 26 and 30 Aerodynamic Mean Activity Diameter (AMAD). Release source terms considered only the respirable fraction, nominally 0.1 percent (DOE-HDBK-0013-93) unless otherwise specified.

Release of radionuclides into the environment occurs either through a facility stack, or by loss of facility integrity. By convention, release heights less than 10 meters default to ground level releases. In these analyses plume rise is not considered, producing conservative dose estimates.

6.2 Receptor Locations

Two receptor locations are evaluated for purposes of comparing with the emergency classification criteria: a maximum onsite individual at the facility boundary and a maximum offsite individual at the offsite boundary.

7.0 EMERGENCY PLANNING ZONE

The Emergency Planning Zone (EPZ) is an area within which special planning and preparedness efforts are warranted since the consequences of a severe accident could result in Early Severe Health Effects. DOE order 5500.3A endorses the EPZ concept and requires that the choice of an EPZ for each facility be based on an objective analysis of the hazards associated with the facility. The Emergency Management Guide on Hazards Assessments provides several pages on guidance on establishing the size of the EPZ. The suggested approach is to determine the emergency classification of the events analyzed in the Hazards Assessment and then base the EPZ size on the larger of the default size for each emergency class for the maximum distance that an Early Severe Threshold is exceeded. A final step is to make adjustments to the area, if necessary, based on reasonableness tests in the guidance document. For example, the selected EPZ should conform to natural and jurisdictional boundaries where reasonable. The selection of the EPZ for the Waste Tank facilities is described below.

7.1 The Minimum EPZ Radius

Radiological

External or uniformly distributed internal emitters	1 Sv
Thyroid	30 Sv
Skin	12 Sv
Ovary	1.7 Sv
Bone Marrow	1.65 Sv
Testes	4.4 Sv
Other Organs	55 Sv

Non-Radiological

A peak concentration of the substance in air that equals or exceeds the ERPG-3 value, or equivalent.

Conclusion

The highest emergency classification for the 233-S facility is a site area emergency for a seismic event. The default EPZ size is the larger of two (2) km or the distance to the calculated levels associated with the Early Severe Health Effects determined in the hazards assessment. All the reasonableness tests will be applied to the larger area and will be discussed in section 7.2.

This hazards assessment contains a review of the worst postulated event for each of the above categories and the associated radiological consequences for the postulated event.

7.2 Tests of Reasonableness

The radial distance selected above defines the minimum EPZ size that should be considered. Other factors should also be considered and the size and shape adjusted accordingly so that:

(1) Are the maximum distances to PAG/ERPG-level impacts for most of the analyzed accident scenarios (i.e., all but the most severe consequence scenario for each hazardous material) equal to or less than the EPZ radius selected?

The EPZ bounds all analyzed accident scenarios, and includes the most severe events postulated.

(2) Is the selected EPZ radius large enough to provide for extending response activities outside the EPZ if conditions warrant?

The EPZ radius is large enough to include response activities beyond the EPZ if conditions warrant.

(3) Is the EPZ radius large enough to support an effective response at and near the scene of the emergency.

Yes, the EPZ radius extends enough to support this effort.

(4) Does the proposed EPZ conform to natural and jurisdictional boundaries where reasonable, and are other expectations and needs of the offsite agencies likely to be met by the selected EPZ?

The EPZ does not conform to natural and jurisdictional boundaries at this point in time. The geopolitical boundaries associated with all Hanford EPZs were defined during FY 94 in conjunction with the State of Washington and the local county emergency management organizations, and will be approved during FY95.

(5) What enhancement of the facility and site preparedness stature would be achieved by increasing the selected EPZ radius?

None.

8.0 EMERGENCY CLASSES, PROTECTIVE ACTIONS, AND EMERGENCY ACTION LEVELS

8.1 Emergency Classes

A goal of the DOE emergency preparedness system is to quickly classify the severity of an accident. Preplanned actions are then implemented for each emergency class. The emergency classification is based, in part, on projected dose and concentration values at the facility and Hanford site boundaries for pre analyzed accident scenarios. The emergency classification criteria are shown in Tables 8.1 and 8.2 below.

Table 8.1 Radiological Release Criteria

Emerg. Category	Criteria*
Alert	> 0.001 Sv committed dose equivalent at facility boundary > 0.005 Sv thyroid (worker) dose at facility boundary > 0.05 Sv skin dose at facility boundary
Site Area	≥0.01 Sv committed dose equivalent at facility boundary > 0.05 Sv thyroid (worker) dose at facility boundary > 0.5 Sv skin dose at facility boundary
General	≥0.01 Sv committed dose equivalent at site boundary > 0.05 Sv thyroid (infant) dose at site boundary > 0.5 Sv skin dose at site boundary

Table 8.2 Non-Radiological Release Criteria

Emerg. Category	Criteria*
Alert	> ERPG 1 at facility boundary
Site Area	≥ERPG 2 at facility boundary
General	≥ERPG 2 at site boundary

*The criteria apply to a peak concentration of the substance in air. If ERPG values have not been established for a substance, alternative criteria specified in the Emergency Management Guide for Hazards Assessments shall be used.

There are also general criteria for emergency classification in addition to the numerical values in the tables above. 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 the tables above.

ALERT

An ALERT LEVEL Emergency 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

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

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

There is additional emergency classification guidance in the Emergency Management Guide on Event Classification and EALs. The Hazards Assessment in the following sections is based primarily on a comparison of calculated consequences with the numerical criteria in the tables above. However, some recommendations are provided based on the more general emergency classification criteria.

8.2 Emergency Action Levels

The facility accidents, trigger events, and recommended EALs are provided in facility procedures.

9.0 MAINTAINANCE AND REVIEW OF THIS HAZARDS ASSESSMENT

The Operating Contractor, Manager of Emergency Preparedness, is responsible for ensuring that this Hazards Assessment is regularly reviewed and maintained current.

10.0 REFERENCES

DOE, 1991b, Planning and Preparedness for Operational Emergencies, DOE Order 5500.3A, U.S. Department of Energy, Washington, D.C.

DOE, July 1993, Recommended Values and Technical Bases for Airborne Released Fractions (ARFs), Airborne Release Rates (ARRs), and Respirable Fractions (RFs) at DOE Non-Reactor Nuclear Facilities, DOE-HDBK-0013-93, U.S. Department of Energy, Washington, D.C.

DOE-0223, Emergency Plan Implementing Procedures, U.S. Department of Energy, Richland Operations Office, Richland, WA.

DOE/RL-94-107, Radioactive Air Emissions Program Notice of Construction for the Decommissioning of the 233-S Plutonium Concentration Facility Complex, October 1994, United States, Department of Energy, Richland, WA.

Napier, B. A., et al., 1988, GENII - The Hanford Environmental Radiation Dosimetry Software System, PNL-6584, Pacific Northwest Laboratory, Richland, WA.

Scherpelz, R. I., February 1991, HUDU - The Hanford Unified Dose Utility Computer Code, PNL-7636, Pacific Northwest Laboratory, Richland, WA.

WHC-SD-EN-SAD-029, Rev. 0, March 1994, Safety Assessment for 233-S Plutoniumn Concentration Facility Characterization/Verification Activities, Westinghouse Hanford Company, Richland, WA.