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7. Abstract

This document establishes the technical basis in support of Emergency Planning Activities for the 222-S Laboratory Complex 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.

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222-S LABORATORY COMPLEX

HAZARDS ASSESSMENT

R. E. Broz

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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 222-S Laboratories (222-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

222-S 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 2.1-1 shows the location of Hanford Site in relationship to the State of Washington. Figure 2.1-2 shows the location of 222-S on the Hanford Site. Figure 2.1-3 shows the 222-S building complex.

2.2 Mission

The primary mission of 222-S is to provide analytic chemistry support to the Waste Management, Chemical Processing, and Environmental programs. Additional operations include: the preparation and characterization of radiochemical standards, environmental monitoring, and process development to support plant process and upset conditions. The laboratory can also be used to support other program initiatives to further WHC and DOE missions and operations as warranted. More detailed facility and process descriptions can be found in Chapters 5.0 and 6.0 in the 222-S Safety Analysis Report (SAR) (SD-HS-SAR-006) and Chapters 3.0 and 4.0 in the 222-S Laboratories Facilities Hazard Identification and Evaluation (HIE) (SD-CP-HIE-001).

Figure 2.1-1 Location of the Hanford Site

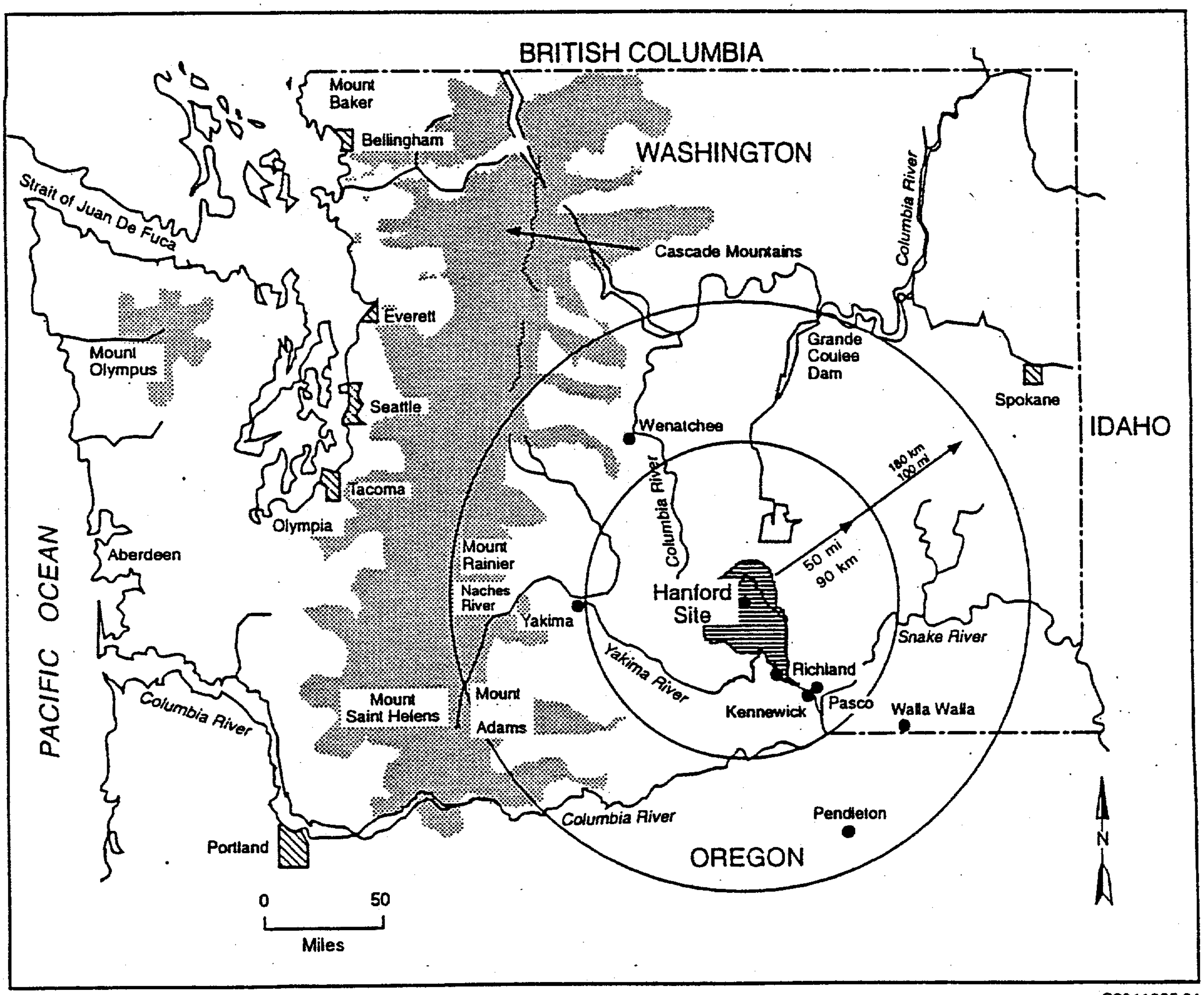


Figure 2.1-2 Location of 222-S in the 200 West Area

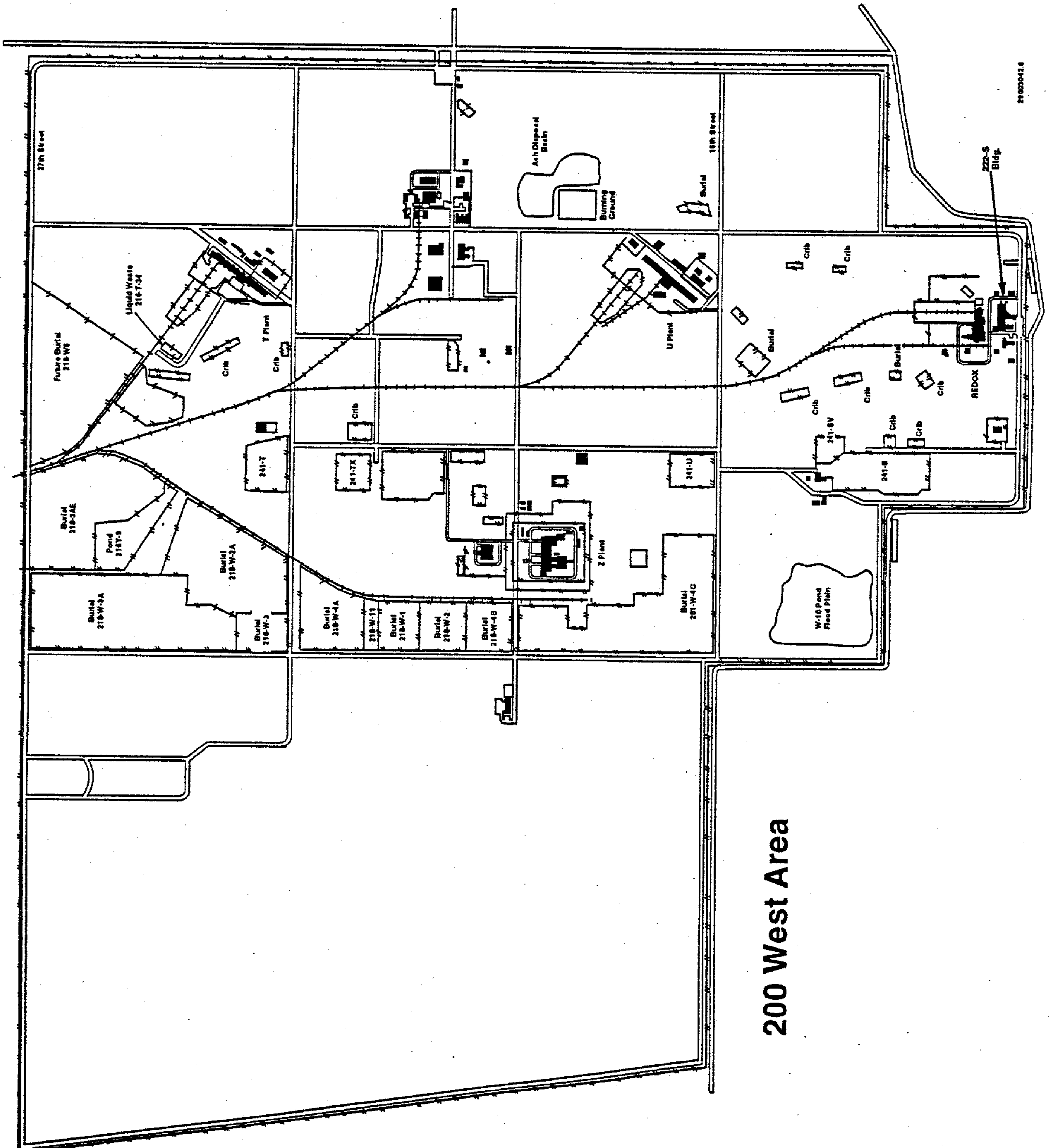
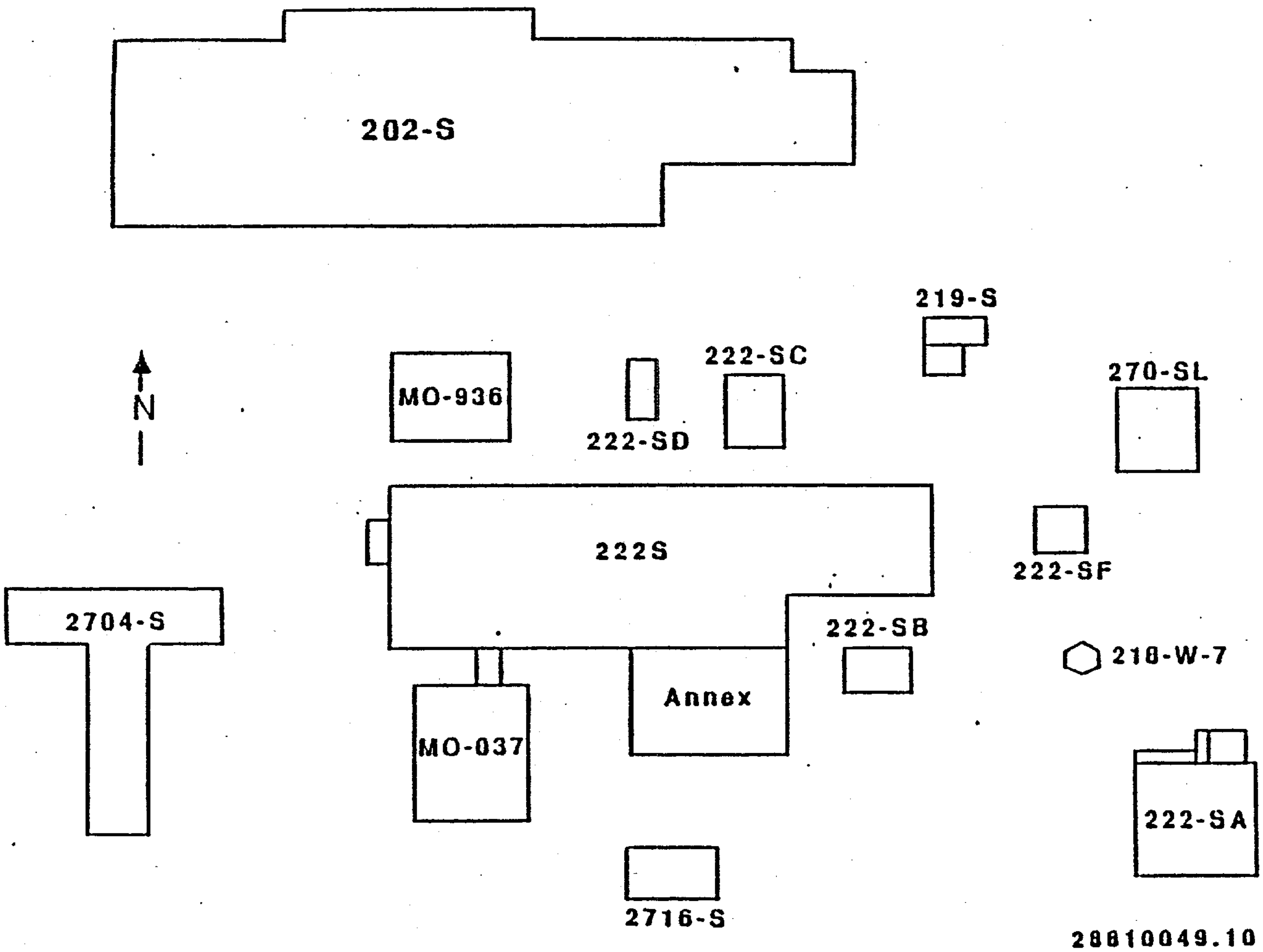


Figure 2.1-3 222-S Buildings



2.3 222-S Laboratory Complex

The 222-S process, support, and administrative buildings include: 222-S Laboratory, 2704-S Building, 2716-S Storage Building, Annex (222-S), 222-SA Laboratory, MO-037, 207-SL Retention Basin, 219-S Waste Handling Facility, MO-936, 222-SD Solid Waste Handling and Storage System, 222-SC Filter Building, 222-SB Filter Building, 222-SF, 218-W-7 Dry Waste Burial Ground, 216-S-26 Crib. The laboratory complex contains both operational and inactive facilities and support buildings. The sections below briefly describe the facilities and buildings that have hazardous material inventories that warrant consideration as detailed in the DOE guidance. Detailed descriptions of the entire 222-S complex including all facilities, buildings and barriers, and its geography and geology within the Hanford Site can be found in chapters 3.0 and 5.0 of the SAR and chapter 3.0 of the Hazard Identification and Evaluation.

2.3.1 222-S Laboratory

The 222-S building is a two story building of fire resistant reinforced concrete, 98.1 meter (m) long and 32.6 m wide. The first floor is segregated into "zones" based on the potential radioactivity of sample storage, sample preparation, and sample analysis within each area. The western-most end is designated "Zone I," the clean area; occupancy includes the lunchroom, offices and locker rooms.

The central portion of the building (Zone II) contains the analytic laboratories and service areas working with low-to intermediate-level radioactive and toxic materials. The eastern section of the facility contains the laboratories and hot cells for storage and preparation of high activity samples.

The first floor systems include the necessary laboratory benches, hoods, electric outlets, compressed gases, vacuum lines and water lines. Ventilation control is established throughout the main floor laboratories with flow from Zone I to Zone III.

A partial basement contains the service piping and vacuum pumps, a filter counting room, and an instrument repair shop. The second floor contains the primary ventilation control, duct work, plenums, exhaust fans, ventilation control room, storage areas, and a glass shop.

The laboratory is classified "Isolated." Isolated facilities may not contain an inventory of fissile material greater than one third of a critical mass. This restricts the total inventory of plutonium to 177 grams (10 curies).

2.3.2 2716-S

2716-S is a storage facility located south of 222-S. The floor area is approximately 157.9 m^2 with a 18.6 m^2 section designed for hazardous material storage. The storage area contains no radioactive materials and is design tolerant within Occupational Safety and Health Act standards for volatile liquid combustible materials, although no such materials are stored in 2716-S.

2.3.3 222-SA

222-SA Laboratory Annex is a five-wide trailer facility located southeast of 222-S. This laboratory prepares nonradioactive standards for the PUREX Analytical Laboratory, 234-5Z Analytical Laboratory and the 222-S Analytical Laboratory. It is also used for cold process development.

2.3.4 207-SL

The 207-SL retention basin acts as a temporary holding facility for potentially radioactive or hazardous liquid effluents prior to discharge to the 216-S-26 crib. Two 94632 liter (l) compartments allow batch collection, sampling, and discharge of the waste. If the waste water meets alpha, beta, gamma, and pH specifications for surface discharge (WHC-CM-7-5), it is routed to the 216-S-26 crib, located southeast of 222-S outside the 200 West exclusion area. Waste water not meeting radioactivity specifications is routed to the 219-S Waste Handling Facility for disposal to underground storage tanks. Designated hazard waste (40 Code of Federal Regulations (CFR) 261) is handled per regulatory requirements and WHC policy and procedure.

2.3.5 219-S

The 219-S Waste Handling Facility accepts radioactive liquids from the 222-S Laboratory Complex operations. The facility is composed of a below grade vault, a concrete vault containing three stainless steel tanks (TK-101, TK-102, TK-103), the pipe trench and operating gallery, an attached concrete walled sampling gallery and transit building. The vault tanks are exhausted through a fiberglass prefilter, deentrainer and HEPA filter prior to final discharge through the 296-S-16 stack.

Laboratory generated radioactive waste is classified as low-level waste (10 CFR 61). The laboratory uses a referencing scheme classifying its radioactive wastes as low- to intermediate-level radioactive waste or high-level radioactive waste. High-level radioactive waste is sent to TK-101 and the low-to intermediate-level radioactive waste is sent to TK-103. TK-102 is the neutralization tank where NaOH is added to wastes transferred from TK-101 and TK-103. TK-101 and TK-102 have working capacities of 12491 l, and TK-103 has a working capacity of 4769 l.

Neutralized liquid effluent is transferred from the 219-S Waste Handling Facility by a 13248 l tanker truck to the 200 West Area Waste Tank Farms.

2.3.6 222-SD

The 222-SD Solid Waste Handling and Storage System is a concrete shielded drum storage area. The area is used for temporary storage of radioactive waste drums destined for underground disposal.

2.3.7 222-SC

The 222-SC Filter Building contains the second and third stage HEPA filtration for Hot Cells 1-A, 1-E-1, 1-E-2, and 1-F. 222-SC houses five parallel pairs of HEPA filters which filters the hot cell exhaust before it enters the main exhaust plenum and final filtering in the 222-SB Filter Building. In total, four stages of HEPA filtration are provided for hot cell exhaust.

2.3.8 222-SB

The 222-SB Filter Building houses 96 HEPA filters to provide final filtration for the 222-S Laboratory. Under normal operation of the ventilation system, two 1303 m^3/minute (min) fans exhaust air from the laboratory. Exhaust air leaves the 222-S Building through the 296-S-21 stack.

2.3.9 216-S-26

The 216-S-26 Crib receives all waste including both radioactive and non radioactive sewer effluents that are collected in the 207-SL retention basis. The crib is designed to receive 94632 l of effluent per eight hour period.

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 Chemicals Identified

Identification of chemicals stored and used at 222-S Laboratories was accomplished through the Hazardous Materials Inventory Database which is updated quarterly for the Hanford Site. The database supplies a list of the chemicals for each facility, provides the quantities and lists storage location and configuration. This list is used for the initial screening of chemicals at 222-S Laboratories. Chemicals with inventories in excess of 85 percent of the reporting quantity were compared against the threshold planning quantity if one existed for the chemical. If a threshold planning quantity had not been established for the chemical, it was evaluated independently when inventories appear to be substantial based on "apparent" toxicity; this analysis included evaluation of chemical carcinogens which may not pose an acute exposure hazard.

3.1.1 Non-Radiological Hazardous Materials

222-S provides analytic chemistry support to many Hanford missions. Many reagents must be stored for use in a variety of analytic chemistry forms. These reagents are often toxic chemicals. However the quantities used in individual facilities, and individual laboratories are limited to bench scale applications in analysis and standard preparations. The chemicals are segregated and stored to minimize chemical incompatibilities under applicable OSHA laboratory safety regulations. Although many chemicals in the 222-S inventory are classed as "Extremely Hazardous Substances" by 40 CFR 355, Appendix A, the quantities are very small fractions of the specified TPQ. Table 3.1 is a listing of the chemicals in 222-S as well as the individual TPQ. Nitric acid will be analyzed since it is in excess of the TPQ.

Table 3.1 Comparison of Extremely Hazardous Chemical Inventory with TPQ Values

Substance	Amount	TPQ
Aniline	2.8 kgs	453.6 kgs
Cadmium Oxide	0.5 kg	4536 kgs
Carbon Disulfide	0.63 kg	4536 kgs
Chloroform	18.73 kgs	4536 kgs
Hydrazine	2 kgs	4536 kgs
Hydrofluoric Acid	0.45 kg	45.4 kgs
Nitric Acid*	23.8 kgs	4536 kgs
Nitrobenzene	1.8 kgs	4536 kgs
Mercuric Chloride	0.63 kg	4536 kgs
Phenol	1 kgs	4536 kgs
Phenylmercury Acetate	0.1 kg	4536 kgs
Potassium Cyanide	2.1 kgs	45.4 kgs
Pyrene	0.05 kg	4536 kgs
Sodium Arsenate	0.1 kg	4536 kgs
Sodium Azide	0.2 kg	227 kgs

Substance	Amount	TPQ
Sodium Cyanide	0.1 kg	45.4 kgs
Sodium Selenate	0.3 kg	4536 kgs
Sulfuric Acid	11.0 kgs	453.6 kgs
Tellurium	0.16 kg	4536 kgs

* This represents a typical laboratory facility inventory only.

Nitric acid in excess of the TPQ of 453.6 kgs is stored in stainless steel tanks located in two places [further information on the physical properties and toxicities of these substances may be found in the Material Safety Data Sheets (MSDS)].

3.1.2 Nitric Acid

Nitric acid is stored primarily as a 60 percent aqueous solution. One bulk storage location is immediately north of the 222-S Building. The storage vessel is constructed of stainless steel and has a 2271 l capacity. The tank is supported on stainless steel "legs" and rests inside a concrete reinforced stainless steel lined berm with an area of approximately 5.4 m^2. The stainless steel walls are approximately 1.2 m tall. Present inventory is estimated at 1136 l. The impoundment can contain a spill exceeding the 2271 l tank capacity. An estimated 681 l have been used in laboratory operations in the last two years. The second bulk storage location is a 200 gallon tank in a separate room in the northeast corner of the second floor of the 222-S Building. The room has concrete walls and floor.

3.2 Radiological Hazards

222-S Laboratories receive a variety of samples from different missions at Hanford. Sample receipt is from source materials, environmental media, air filters and other low-level effluent stream samples from other facilities. Higher activity samples are received from B Plant, WESF, and the waste tanks.

High activity samples are received and diluted in hot cells and the byproduct waste sent to the 219-S Waste Handling Facility. Typical sample activity from B-Plant and WESF are shown in Table 3.2 below:

Table 3.2 **Typical B-Plant and WESF Samples**

Sample Size	Primary Isotope	Average Bq/ml	High Bq/ml	Sample Container and Carrier
1 ml	$^{89,90}Sr$	2.2E+10	4.8E+10	1 ml pipette tip in a doorstop
2 ml	^{137}Cs	7.1E+10	7.1E+10	2 ml pipette tip in a pig
1 ml	$^{89,90}Sr$	3.7E+10	8.6E+10	1 ml pipette tip in a doorstop
2 ml	^{137}Cs ^{134}Cs	8.1E+7 8.1E+7	1.2+11 6.3E+6	2 ml pipette tip in a pig
5 ml	$^{89,90}Sr$	7.8+10	2.9+11	5 ml bottle in a pig
5 ml	^{137}Cs ^{134}Cs	3.9E+11	1.7E+12 4.1E+11	5 ml bottle in a pig

Samples are transported to the laboratory in sealed units described in Table 3.3.

Table 3.3 **Samples Transported to the 222-S Laboratory**

Sample Carrier	Sample Container	User Group
Pig	0.5, 1.0, an d 2 .0 ml pipette tip	B Plant
Pig	5 ml bottle	WESF
Pig	100 ml glass or 125 ml plastic bottle	WESF and Tank Farm Operations
Doorstop	0.5, 1.0, and 2.0 ml pipette tip	B Plant
Polybottle	100 ml - 2.0 L	WESF, Tank Farm Operations and Environmental
Double Plastic Bags	Various Sizes	Environmental

Waste tank samples include many fission products and actinides. The maximum fissile material inventories based on the facility designation as an "Isolated Facility" is 3.7E+11 bequerel (Bq) ^{239}Pu. The maximum fission product inventories based upon sample acceptance and storage criteria is 1.1E+13 Bq ^{90}Sr and 1.7E+12 Bq ^{137}Cs for the entire 222-S Building.

The 219-S Waste Handling Facility may contain the following maximum inventories:

Table 3.4 Maximum Waste Tank Inventory

Tank number	Working capacity (l)	^{239}Pu/l[1]	Total Pu[1]	^{90}Sr/l[2]	Total Sr[3]	^{137}Cs/l[2]	Total Cs[3]
TK 101	12491	8.0E-04	9.9	1.1E+08	1.43E+12	6.8E+07	8.5E+11
TK 102	12491	8.0E-04	9.9	1.1E+08	1.43E+12	6.8E+07	8.5E+11
TK 103	4769	8.0E-04	3.78	1.1E+08	5.5E+11	3.0E+08	3.2E+11
Total	29752	8.0E-04	23.58	1.1E+08	3.4E+12[4]	6.8E+07	2.0E+12

1 ^{239}Pu values are in grams
2 ^{90}Sr and ^{137}Cs values are Bq/l
3 ^{90}Sr and ^{137}Cs values are Bq
4 ^{90}Sr total inventory exceeds the TPQ

The conclusion from this review is that the radionuclide inventory at individual work stations does not exceed the threshold planning quantity specified in 10 CFR 30.72 but the total building inventory may. Plutonium exceeds the TPQ only through the facility designation as an "Isolated Facility." The potential plutonium inventory of 3.7E+11 Bq is in the form of a wetted nitrate that would require evaporation and resuspension for dispersion.

4.0 HAZARD CHARACTERIZATION

4.1 Nitric Acid

4.1.1 Inventory and Properties

Nitric acid solution is a clear liquid. It is a strong oxidizer and is very corrosive. As such, contact can cause severe eye and skin burns. Exposure to vapors is very irritating. Inhalation of the vapors, or ingestion may be fatal at high concentrations.

Table 4.1 Nitric Acid Physical Properties

Physical Properties (pure)	
Molecular weight	63.01
Specific gravity	1.50
Melting point	-42°C
Boiling point	83°C
Vapor pressure (60 percent solution)	0.84 mm Hg @ 20°C

Table 4.2 Nitric Acid Exposure Limits

Exposure Limits*	
OSHA TWA-PEL	5 mg/m^3 (2 ppm)
OSHA STEL	10 mg/m^3 (4 ppm)
NIOSH REL-10hr	5 mg/m^3 (2 ppm)
ERPG-1	5 mg/m^3 (2 ppm)
ERPG-2	37.5 mg/m^3 (15 ppm)
ERPG-3	75 mg/m^3 (30 ppm)
NIOSH IDLH	250 mg/m^3 (250 ppm)

* ERPG values are draft values in use by various DOE contractors and are not approved AIHA values (4/93).

4.2 Plutonium

The Hazards Assessment of the 222-S Laboratory is based on potential release of the maximum plutonium allowed in the entire facility. Specific accident scenarios (section 5) have been identified as the cause of the potential releases.

4.2.1 Inventory and Properties

Inventory of the plutonium that is involved in the postulated accidents is shown in Table 3.4. Resuspension factors are included in the calculation and section 5 to determine the effective dose equivalent (EDE). The resuspension factors are different for the various scenarios and are provided in SD-CP-HIE-001, 222-S Laboratory Facilities Hazards Identification and Evaluation. Plutonium's critical organ is the bone surface with the resultant dose factored into the EDE.

4.3 Cesium

4.3.1 Inventory and Properties

Inventory of the cesium that is involved in the postulated accidents is shown in Tables 3.2 through 3.4. Resuspension factors are different for the various scenarios and are included in the calculation and discussion in section 5 to determine the effective dose equivalent (EDE). The resuspension factors are provided in SD-CP-HIE-001, 222-S Laboratory Facilities Hazards Identification and Evaluation. Cesium's critical organ is the whole body with the resultant dose factored into the EDE.

4.4 Strontium

4.4.1 Inventory and Properties

Inventory of the strontium and yttrium that is involved in the postulated accidents is shown in Tables 3.2 through 3.4. Resuspension factors are different for the various scenarios and are included in the calculation in section 5 to determine the effective dose equivalent (EDE). The resuspension factors are provided in SD-CP-HIE-001, 222-S Laboratory Facilities Hazards Identification and Evaluation. Strontium's critical organ is the bone surface and the resultant dose factored into the EDE.

5.0 EVENT SCENARIOS

This section briefly describes several scenarios from Environmental Impact Statements, Environmental Assessments, 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 Hazardous Material Releases

5.1.1 Nitric Acid Spill

5.1.1.1 Failure of Primary Barrier and Range of Possible Releases

Nitric acid aqueous solutions have a lower vapor pressures than the pure substance and therefore evaporate more slowly. Since the amount of nitric acid exceeds the threshold planning quantity, two spill scenarios are included below to assess the hazard.

The first spill is a large leak in the 2271 liter (l) storage tank (primary barrier) located immediately north of the 222-S building. The spill is confined by a 5.4 m^2 catch basin (another primary barrier) below the tank.

5.1.2 Nitric Acid Transportation Spill

5.1.2.1 Failure of Primary Barrier and Range of Possible Releases

The second spill simulates a transportation incident with the nitric acid leak from a tank truck (primary barrier) or the connecting piping to asphalt pavement. The spill area is 46.4 m^2.

5.1.2.2 Effects of Other Barriers

One other engineered barrier exits to reduce or mitigate the release of nitric acid or byproducts. The facility sprinkler system, if not destroyed by the seismic event or snow or ash loading, will reduce the potential for a release. No other barriers to the release of nitric acid are known. The laboratory has HEPA filtration but nitric acid fumes or its by products are not contained by the filter and a transportation accident occurs out in the environment without additional barriers.

5.2 Radiological Releases

The traditional approach for radiological releases is to postulate accident scenarios and analyze the results. Only major events such as an earthquake that put the entire building at risk result in significant potential dose values outside the facility. The earthquake followed by a fire scenario from the Hazards Identification and Evaluation document is summarized below to demonstrate the maximum consequences from a 222-S radiological release.

5.2.1 Stack Release

5.2.1.1 Failure of Primary Barrier and Range of Possible Releases

The primary barriers are the hot cell, sample types, and the high efficiency particulate (HEPA) filters. Two scenarios are discussed in this section. The first is a small explosion occurs in the 222-S hot cell from the improper use of solvents or other flammable volatile substances. The radiological material which escapes is shown in Table 5.1-1. The source material is driven past three stages of HEPA filtration but is filtered by one final stage. This release fraction is a reduction factor of 1000.

The second scenario is from the 222-S SAR. A fire occurs in a hot cell which totally consumes accumulated paper, plastic and fabric releasing 1.85E+11 Bq each of ^{90}Sr and ^{137}Cs. The fire severely damages the hot cell HEPAs in 222-SC and the exhaust, containing 3.33E+7 Bq each of ^{90}Sr and ^{137}Cs all escaping to the environment through the last two damaged HEPA stages.

Table 5.1-1 Hot Cell Fire Source Term[1]

Isotopes	Total Bq Released
	Soluble
^{90}Sr	1.85E+11
^{90}Y	1.85E+11
^{137}Cs	1.85E+11

1 SD-MS-SAR-006, Rev.1, 222-S Laboratory Safety Analysis Report

5.2.2.2 Effects of Other Barriers

Administrative procedures limit the amount and types of flammable volatile substances as well as the materials which increase the cell's fire load.

5.2.3 Loss of Service Systems

No scenarios are discussed and calculated in the 222-S SAR or HIE. Service Systems are not required for operation of any safety systems, and loss of these systems will not result in any dose to the onsite or offsite individuals. This event cannot require the facility to declare an emergency.

5.2.4 Loss of Confinement

The worst case loss of confinement accident is a release of radioactive material from the vent HEPA filter system for tanks TK-101, TK-102, and TK-103. The steam pre-heater does not raise the temperature of the airstream to above the dew point of water thus allowing condensation of water on the filter media. The filters fail with an increase of delta pressure. The release rate of the three tanks is 4.58 E-9 liters per hour. The source term for the postulated six hour release would be 2.7 E-8 l. Total activity released is approximately 3 E+4 Bq. Resulting onsite and offsite doses are below the level which requires further analysis.

5.3 Natural Emergencies

5.3.1 Seismic Event (Earthquake)

5.3.1.1 Failure of Primary Barrier and Range of Possible Releases

Primary barriers for the radioactive material includes sample containers, the 222-S hot cells and the building that encloses these areas. The postulated accidents which release the radioactive material include: fire in a hot cell which causes the facility to collapse either from a fire in a neighboring facility, range fire, a seismically induced fire, a hot cell explosion. A portion of all material is assumed to be released.

5.3.2.2 Effects of Other Barriers

The fire suppression system, sprinklers, is considered another barrier that would limit or eliminate the potential for a radioactive material release in the case of a facility fire. A seismic event large enough to destroy the complex buildings would destroy the sprinkler system.

The source term for this accident is based on the maximum expected amounts of ^{239}Pu (3.7E+11 Bq) = (3.7E+11 Bq), ^{90}Sr (1.1E+13 Bq), and ^{137}Cs (1.74E+12 Bq) in the building. All of this activity would not become airborne even in the worst disaster. The building would be able to provide a removal factor (20) even if it were extensively damaged. Furthermore, experiments indicate that fires involving radioactive material only release a fraction of the material. Resuspension factors are for ^{239}Pu 1.9E-4, for ^{90}Sr 2E-2, and for ^{137}Cs 1E-2. Total activity released is shown in Table 5.1-2.

Table 5.1-2 Seismic/Fire Release Source Term[1]

Isotopes	Total Bq Released
	Soluble
^{90}Sr	1.1E+9
^{90}Y	1.1E+9
^{137}Cs	8.9E+8
^{137m}Ba	8.4E+8
^{239}Pu	3.7E+7

1 SD-CP-HIE-001, Rev.0, 222-S Laboratory Facilities Hazards Identification and Evaluation

5.3.2 High Winds/Tornado

The Hanford Site is subject to frequent strong westerly winds. The all-time peak gust of 3.6E+5 m/second was recorded January 11, 1972. The 3.6E+5 m/second gust is expected to occur once every 30 years. A peak of 4.3E+5 m/second would be expected to occur once every 500 years.

The Site is well outside of established tornado alleys. The probability of a tornado in any year at any point within the 1.6E+2 km radius of the Hanford Meteorology Station is 6.8 E-6/yr. The Hanford design base tornado is defined as having a 6.7E+5 m/second rotational velocity and a 1.1E+5 m/second translational speed. The 222-S Laboratory facilities were designed and constructed to withstand these events. No further analysis for this event is warranted.

5.3.3 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 E9 l/hr and is estimated to be well below the level of the 222-S Laboratory. No emergency level declaration should be made.

5.3.4 Range Fire

5.3.4.1 Failure of Primary Barrier and Range of Possible Releases

The primary barrier is the fire suppression system in the laboratory. The land immediately around the laboratory is cleared of range grasses and plants. Flying embers could ignite the roof of the laboratory or a neighboring facility which in turn could ignite the laboratory. The fire is not extinguished and the roof collapses releasing the same quantity as the seismic event. The same release factors are applied with the quantity released shown in Table 5.1-2.

5.3.4.2 Effects of Other Barriers

Other barriers are the administrative procedure to maintain the cleanliness around and in the facility as well as minimize the quantity of flammable liquids.

5.3.5 Snow and Ashfall

The Hanford Site is in a region subject to snowfall as well as ashfall from volcanic eruptions. The SAR does not hypothesize this event. The three major volcanic peaks closest to the project are: Mt. Adams about 1.6E+2 km away, Mt. Rainier, and Mt. St. Helens approximately 1.9E+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. The table 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 is 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 accumulate could cause actual roof structural damage. There would probably be ample warning of an approaching large ash fall and the facility could be placed in a stable condition.

Table 5.7-1 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

As a result of the 1980 Mt. St. Helens eruption, the site design criteria was modified to include ashfall.

5.4 Security Contingencies

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

5.4.1 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 any of the 222-S facilities, declaration of an event is required.

5.4.2 Sabotage

A confirmed physical damage as a result of sabotage, resulting in potential loss of confinement/containment of hazardous materials to any of the 222-S facilities requires declaration of an event.

5.4.3 Hostage Situation

A confirmed hostage situation occurring within the 222-S Complex requires declaration of an event.

5.4.4 Armed Intruder

A confirmed armed intruder(s) located within any of the 222-S facilities requires declaration of an event.

5.4.5 Aircraft Crash

This event is not discussed in the facility SAR or HIE but is assumed to be initiated by a plane crash into the 222-S laboratory, along with a fire. The same inventory and meteorological conditions as the seismic/fire event would be expected with the same consequences.

6.0 EVENT CONSEQUENCES

6.1 Calculational Models

Environmental radiological releases shown in the facility safety document was confirmed by modeling with the Hanford Unified Dose Utility computer code (HUDU). 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-STD-0013-93).

Release of radionuclides into the environment occurs either through a facility stack, or by loss of facility containment integrity. By convention, release heights less than 10 meters default to ground level releases. In these analysis plume rise is not considered, producing conservative dose estimates. All effluent flow rates are 0.0 m^3/second for all but the stack release scenario, this is not to be confused with an absence of effluent in the dispersion modelling input parameters.

Chemical environmental releases were modelled using the Emergency Prediction Information computer code (EPI). EPI is the primary emergency prediction computer code utilized in the Unified Dose Assessment Center for the Hanford Site. EPI employs a straight-line Guassian plume model, Pasquill-Gifford stability classes, and uses a plume depletion algorithm based on deposition velocity. EPI allows the user to model term and continuous releases from point sources and area sources, as well as an option for modelling spills. Meteorological parameters used in the analysis were one meter per second wind speed, class "F" stability and an air temperature 20 degrees Centigrade (C). These parameters produce the most restrictive concentration estimates for nitric acid. Code input consists of the spill area and depth and the partial vapor pressure of the substance at 20 degrees C.

6.2 Hazardous Material Release

6.2.1 Nitric Acid Spill

Nitric acid aqueous solutions have a lower vapor pressures than the pure substance and therefore evaporate more slowly. Since the amount of nitric acid exceeds the threshold planning quantity, two spill scenarios are included below to assess the hazard.

Calculations were performed for two postulated nitric acid spills. The first spill is a large leak in the 2271 l storage tank located immediately north of the 222-S building. The spill is confined by a 5.4 m^2 catch basin below the tank. The results summarized in Table 6.1 show that the air concentration is below the criteria for an Alert Level Emergency.

Table 6.1 Loss of Nitric Acid Bulk Storage Inventory

Receptor Height	Ground Level
Wind velocity	1 m/s
stability class	"F"
temperature	20°C
spill depth	42.06 centimeters
spill area	5.40 m^2
estimated spill volume	2271 l
vapor pressure	1.0 mm Hg @ 20°C 60% solution (0.84 mm Hg in Perry's Chemical Engineers' Handbook)
estimated removal rate	0.037 grams/second
receptor concentration (nominally 100 meters)	0.41 ppm (draft ERPG-1 is 2 ppm)

6.2.2 Nitric Acid Transportation Accident

The second spill simulates a transportation incident with the nitric acid leak from a tank truck or the connecting piping to asphalt pavement. The results summarized in Table 6.2 show that a 46.5 m^2 spill is an ALERT LEVEL Emergency.

Table 6.2 Transportation Spill Equalling an Alert Level Emergency

receptor height	ground level
wind velocity	1 m/s
stability class	"F"
temperature	20°C
spill depth	0.38 centimeters
spill area	46 m^2
estimated spill volume	189 l
vapor pressure	1.0 mm Hg @ 20°C 60% solution (0.84 mm Hg in Perry's Chemical Engineers' Handbook)
estimated removal rate	0.4 grams/second

receptor concentration (nominally 100 meters)	approx. 2.0 ppm (draft ERPG-1 is 2 ppm)

6.3 Radiological Releases

6.3.1 Stack Release/Explosion

The hot cell explosion and stack release source term shown in Table 5.1-1 was used in the HUDU program to calculate the downwind dose values. This event would not require an emergency declaration.

6.3.2 Stack Release/Hot Cell Fire

The hot cell fire releases approximately 1.85E+11 Bq each ^{90}Sr and ^{137}Cs through the last two damaged HEPA filters. The 100 meter effective dose equivalent (EDE) is 0.002 Sv and the offsite EDE is 0.00001 Sv when calculated and discussed in the SAR. This same accident, when using the HUDU program, A stability, and building wake, gives an effective dose equivalent of 0.003 Sv to the 100 m, nearest on-site receptor. This event requires declaration of an ALERT LEVEL Emergency.

6.3.3 Seismic/Fire Consequences

The HUDU program was used to calculate the downwind dose values from the source term shown in Table 5.1-2. The dose values were projected for a ground level release, class "F" atmospheric stability, 1 m/s wind speed and mixing layer depth of 60 meters. The result has an effective dose equivalent of 0.031 Sv at the facility boundary (100 m) and 0.00002 Sv at the site boundary. These values place this event in the SITE AREA Emergency category. This is the worst release identified in the Hazards Identification and Evaluation and SAR documents.

6.3.4 Range Fire

The HUDU program was used to calculate the downwind dose values from the source term shown in Table 5.1-2. The dose values were projected for a ground level release, class "F" atmospheric stability, 1 m/s wind speed and mixing layer depth of 60 meters. The result has an effective dose equivalent of 0.031 Sv at the facility boundary (100 m) and 0.00002 Sv at the site boundary. These values place this event in the SITE AREA Emergency category.

6.4 Security Contingencies

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

6.4.1 Explosive Device

An ALERT LEVEL Emergency shall be declared if confirmed physical damage as a result of a detonation of an explosive device, in which potential loss of confinement/containment of hazardous materials, occurs in any of the 222-S facilities.

6.4.2 Sabotage

An ALERT LEVEL Emergency shall be declared if confirmed physical damage as a result of sabotage, results in potential loss of confinement/containment of hazardous materials to any of the 222-S facilities.

6.4.3 Hostage Situation

An ALERT LEVEL Emergency shall be declared if a confirmed hostage situation is occurring within the 222-S Complex.

6.4.4 Armed Intruder

An ALERT LEVEL Emergency shall be declared if confirmed armed intruder(s) are located within any of the 222-S facilities.

6.4.5 Aircraft Crash

Assuming that this scenario is similar to the seismic event with fire, using Table 5.1-2 source term, and meteorological conditions, this event would be a SITE AREA Emergency.

6.5 Receptor Locations

The facility boundary receptor location is chosen to be 100 meters from 222-S release points even though the facility SAR uses 1.1 kilometers. The 100 meters is less than the default value of 200 m suggested in the guidance document for hazards assessments but consistent with the distance used at some other 200 Area facilities. The nearest Hanford Site boundary to 222-S is 12.9 kilometers.

7.0 THE 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 (ESHE). DOE order 5500.3A 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. The Emergency Management Guide on Hazards Assessment provides several pages of 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 a default size for each emergency class or the maximum distance that an Early Severe Health Effect 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 222-S Laboratory based on this review is described below.

7.1 The Minimum EPZ Radius

The Hazards Identification and Evaluation document identifies one scenario with calculated dose values in the Site Area emergency category. This scenario is an earthquake followed by a fire. The EPZ size is the larger of 2 km (the default size for a Site Area emergency) or the maximum radius for ESHE. The Emergency Management Guide on Hazards Assessments provides the following criteria for ESHEs.

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

All of the analyzed releases give consequences less than the ESHE criteria at the default distance of 2 kilometers. Therefore, the EPZ for the 222S Laboratory complex is a circle with a 2 km radius around the facility. This EPZ falls completely within the larger 16.1 km EPZ established for the 200 Area tank farms. All the reasonableness tests will be applied to the larger area and will be discussed in section 7.2.

7.2 Test of Reasonableness

1. Are the maximum distances to PAG/ERPG-level impacts (Hanford PAG is 1 rem) for most of the analyzed accident scenarios equal to or less than the EPZ radius selected?

   Most of the analyzed accident scenarios give consequences less than the ESHE criteria at the default EPZ radius of 2 km.

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

   The 222-S Laboratory EPZ is within the 10 mile EPZ for the 200 Area facilities. Therefore, emergency plans are already in place to extend the Hanford emergency response well beyond the 222-S Laboratory EPZ.

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

   The 2 km radius encompasses the entire 222-S Laboratory, the nearest other occupied Hanford facilities, and the Hanford Site roads leading past the facility. Access control can readily be established on these roads.

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?

   There are no natural boundaries with which it makes sense to align any of the EPZ boundary lines. The 222-S Laboratory EPZ falls within the 200 Area 16.1 km EPZ. Therefore, all the jurisdictional boundary questions and offsite agency needs are included in the emergency planning for this larger zone.

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

   The proposed EPZ radius is within the 200 Area 16.1 km EPZ. This larger EPZ ensures the involvement of all local agencies and governments in the planning process for Hanford emergencies.

The radiological hazards at the 222-S Laboratory require that low probability accidents occur to reach Alert and Site Area emergencies based on projected dose criteria. The facility and the emergency preparedness organizations are in the process of establishing event recognition and classification procedures.

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 Emergency Action Levels. 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 emergency action levels are provided in Appendix A.

9.0 MAINTENANCE 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

Department of Energy, June 26, 1992, Emergency Management Guide, Guidance for Hazards Assessment, U.S. Department of Energy, Washington, D.C.

Department of Energy, April 30, 1991, Planning and Preparedness for Operational Emergencies, DOE Order 5500.3A, U.S. Department of Energy, Washington, D.C.

Emergency Prediction Information Code, Homann Associates, Inc., Fremont, Ca.

Green, Don W. et al (editors), Perry's Chemical Engineers' Handbook, 6th Ed., McGraw-Hill Book Company, New York, NY.

Lide, David R (Editor), 1992, Handbook of Physics and Chemistry, 78th Ed., CRC Press, Boca Raton, Fl.

National Institute for Occupational Safety and Health, February 1987, Pocket Guide to Chemical Hazards, U.S. Department of Health and Human Resources, Washington, D.C.

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

WHC-SD-HS-SAR-006, Safety Analysis Report, Revision 1, February 1984; Revision 2, June 1984; Revision 3, December 1984.

WHC-SD-CP-HIE-001, 222-S Laboratory Facilities Hazards Identification and Evaluation, Revision 0-A.

APPENDIX A FACILITY AND/OR AREA INDEX OF EMERGENCY CONDITIONS

No. 1A
FACILITIES EMERGENCY EVENTS
(sheet 1 of 1)

FIRE

Initiating Condition	Emergency Action Level	Event Classification
A fire in the 222-S building.	A fire lasting >15 minutes	**ALERT LEVEL EMERGENCY**
A fire in the 222-S building.	A fire lasting >15 minutes AND Stack CAMs alarm.	**SITE AREA EMERGENCY**

Note: No General Emergency class identified.

No. 1B
FACILITIES EMERGENCY EVENTS
(sheet 1 of 1)

HAZARDOUS MATERIAL RELEASE

Initiating Condition	Emergency Action Level	Event Classification
Catastrophic release of HNO_3 to environment from transportation event.	Any significant release of HNO_3 to the environment which results in a strong detectable odor.	**ALERT LEVEL EMERGENCY**

Note: No Site Area or General Emergency class identified.

No. 2A
NATURAL EMERGENCIES
(sheet 1 of 1)

SEISMIC EVENT

Initiating Condition	Emergency Action Level	Event Classification
A seismic event occurs in the 200 Area.	An event felt by personnel in the WSCF Complex, with some breakage of windows and disturbance of tall objects.	**ALERT LEVEL EMERGENCY**
A seismic event occurs in the 200 Area.	An event felt by personnel in the 222-S Complex, with some breakage of windows and disturbance of tall objects AND Fire engulfs the facility.	**SITE AREA EMERGENCY**

Note: No General Emergency classes identified.

No. 2B
NATURAL EMERGENCIES
(sheet 1 of 1)

RANGE FIRE

Initiating Condition	Emergency Action Level	Event Classification
Range Fire enters 200 West Area and is threatening to involve the 222-S Complex facilities.	A range fire observed to have entered the 222-S Complex.	**ALERT LEVEL EMERGENCY**
Range Fire enters 200 West Area and the 222-S Complex facilities are involved.	A range fire observed to have entered the 222-S Complex AND The laboratory roof or walls are involved.	**SITE AREA EMERGENCY**

Note: No General Emergency classes identified.

No. 3A
SECURITY CONTINGENCIES
(sheet 1 of 1)

EXPLOSIVE DEVICE

Initiating Condition	Emergency Action Level	Event Classification
Explosive device in the 222-S Complex.	A confirmed explosive device is located within or a confirmed explosion is noted in the 222-S.	**ALERT LEVEL EMERGENCY**

Note: No Site Area or General Emergency classes identified.

No. 3B
SECURITY CONTINGENCIES
(sheet 1 of 1)

SABOTAGE

Initiating Condition	Emergency Action Level	Event Classification
Confirmed sabotage to 222-S Complex facilities.	Confirmed damage to confinement/containment of radioactive or hazardous materials.	**ALERT LEVEL EMERGENCY**

Note: No Site Area or General Emergency class identified.

No. 3C
SECURITY CONTINGENCIES
(sheet 1 of 1)

HOSTAGE SITUATION

Initiating Condition	Emergency Action Level	Event Classification
Hostage situation.	A confirmed hostage situation is occurring within 222-S Complex.	**ALERT LEVEL EMERGENCY**

Note: No Site Area or General Emergency classes identified.

No. 3D
SECURITY CONTINGENCIES
(sheet 1 of 1)

ARMED INTRUDER

Initiating Condition	Emergency Action Level	Event Classification
Armed intruder(s) within the 222-S Complex facilities.	A confirmed armed intruder(s) are located within the 222-S Complex.	**ALERT LEVEL EMERGENCY**

Note: No Site Area or General Emergency classes identified.

No. 3E
SECURITY CONTINGENCIES
(sheet 1 of 1)

AIRCRAFT CRASH

Initiating Condition	Emergency Action Level	Event Classification
An aircraft crash has occurred at or near one of the 222-S facilities.	An aircraft crash has occurred AND has or is likely to have an adverse affect on the facility's safety or has or is likely to release radioactive/hazardous material to the environment.	**ALERT LEVEL EMERGENCY**
An aircraft crash has occurred at or near the one of the 222-S facilities.	An aircraft crash has occurred AND a fire is burning.	**SITE AREA EMERGENCY**

Note: No General Emergency classes identified.