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ENVIRONMENTAL SURVEY PRELIMINARY SUMMARY REPORT OF THE DEFENCE PRODUCTION FACILITIES SEPTEMBER 1988

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U.S. Department of Energy
Washington, DC

Environment, Safety and Health
Office of Environmental Audit

Environmental Survey
Preliminary Summary Report
of the
Defense Production Facilities

September 1988

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PREFACE TO THE DEPARTMENT OF ENERGY ENVIRONMENTAL SURVEY PRELIMINARY SUMMARY REPORT OF THE DEFENSE PRODUCTION FACILITIES

This report contains the preliminary summary results of the Environmental Surveys conducted at the Department of Energy (DOE) facilities associated with the Department's defense production mission. The Survey is being conducted by DOE's Office of Environment, Safety and Health.

This Preliminary Summary Report encompasses the preliminary findings of a portion of the larger, comprehensive DOE Environmental Survey. The DOE Environmental Survey is one of a series of initiatives announced on September 18, 1985, by Secretary John S. Herrington, to strengthen the environmental, safety and health programs and activities within DOE. The purpose of the Environmental Survey is to identify, via a "no fault" baseline inventory of all the Department's major operating facilities, environmental problems and areas of environmental risk. The identified problem areas will be prioritized on a Department-wide basis in order of importance in 1989.

This Preliminary Summary Report incorporates the results of the risk-based ranking of the environmental problems identified by the Environmental Survey and the integration of environmental degradation concerns. In addition, regulatory compliance issues associated with the problems included in this report are also discussed.

The problems and rankings within this report are subject to modification based on the results of site technical accuracy reviews and the sampling and analysis phase of the Survey. The modified findings and the addition of the problems identified at DOE's non-defense-related facilities will be incorporated into the Environmental Survey Summary Report. The Summary Report will serve as an internal management tool for the Department's management in meeting the Department's environmental objectives.

September 1988
Washington, D.C.

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EXECUTIVE SUMMARY

Introduction

This report contains the preliminary summary results of the Environmental Survey conducted at the Department of Energy (DOE) sites associated with the Department's defense production mission. The final product of the Survey will be the Environmental Survey Summary Report that is scheduled for completion during the fall of 1989. The Survey is being conducted by DOE's Office of Environment, Safety and Health (ES&H) to identify and rank environmental problems and areas of environmental risk at DOE's major operating facilities.

This report is intended to provide preliminary information as to the relative ranking of the findings from the Environmental Survey at 16 sites involved in DOE's defense production mission based on potential impacts to public health and the environment. It also serves as a test of the ranking system that was designed as part of the Survey program and will be formally applied to all Survey findings when the final Survey report is written. While the results are not final, due to the absence of sampling and analysis input, they do provide DOE managers with useful preliminary information for use in long-range planning activities for environmental cleanup and improvements in pollution abatement capabilities.

Ranking Results

The results of this preliminary ranking of Environmental Survey findings are presented in Table ES.1. The risk-based rankings are represented by a Hazard Potential Index (HPI) based on a calculated risk to potentially affected populations. The HPI is generated by a computer model, the Multimedia Environmental Pollutant Assessment System (MEPAS). The HPI is a relative number generated for comparison purposes only and does not indicate absolute risk.

Uncertainty in the ranking is reflected in the Critical Data Category noted in Table ES.1. Categories A through C represent respectively high through low confidence in

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TABLE ES.1

INTEGRATED DOE-WIDE RANKING
EXISTING OR SUSPECTED ENVIRONMENTAL PROBLEMS

HPI/ENV Group	Ranking Unit Name	Site Name	Environmental Management Area	Critical Data Category
Ranking Units of Most Concern from Potential Public Hazard Perspective				
9	VOCs in Groundwater	Rocky Flats	Inactive Sites and Releases	C
8	Known Liquid Releases	Pantex	Inactive Sites and Releases	B
Ranking Units of Secondary Concern from Potential Public Hazard Perspective				
7	Groundwater Contamination in Southeast Corner	Lawrence Livermore	Inactive Sites and Releases	B
7	Chromium Air Releases	Portsmouth	Air Emissions	B
7	Inactive Liquid Process Discharges in the 200 Area	Hanford	Inactive Sites and Releases	B
7	Off-site Floodplain Contamination in EFPC and BC	Y-12	Inactive Sites and Releases	B
7	Active Percolation Ponds at ICPP and TRA	INEL	Liquid Discharges/Active Waste Management	A
7	Volatile Organics and Radionuclides Released to Groundwater at RWMC	INEL	Inactive Sites and Releases	B
7	Toxic Discharge to Technical Area 1 Sewers	SNL	Liquid Discharges	B
7	Active Liquid Process Discharges in the 100 Area	Hanford	Liquid Discharges/Active Waste Management	B
7	Ditches	Pantex	Liquid Discharges	B
7	M Area Settling Basin	Savannah River	Liquid Discharges/Active Waste Management	A
6	Inactive Liquid Process Discharges in the 300 Area	Hanford	Inactive Sites and Releases	B
6	Burial Grounds	Savannah River	Active Waste Management	A
6	Eastern Sites	Pinellas	Inactive Sites and Releases	C

A - Monitored or Measured Data; B - Moderate Amount of Assumptions; C - Significant Amount of Assumptions; INT - Integration Panel Assessment

TABLE ES.1

INTEGRATED DOE-WIDE RANKING
EXISTING OR SUSPECTED ENVIRONMENTAL PROBLEMS (CONTINUED)

HPI/ENV Group	Ranking Unit Name	Site Name	Environmental Management Area	Critical Data Category
6	Playas	Pantex	Liquid Discharges	B
6	Inactive Liquid Process Discharges in the 100 Area	Hanford	Inactive Sites and Releases	B
6	Coal Pile Runoff	Portsmouth	Liquid Discharges	A
6	Process Water Discharges	Y-12	Liquid Discharges	A
6	Emissions of VOCs to the Atmosphere	Kansas City	Air Emissions	C
6	Airborne Releases	Fernald	Air Emissions	A
6	Unscheduled Air Releases	Portsmouth	Air Emissions	A
6	Contamination from Liquid Discharges	Fernald	Liquid Discharges	B
6	Active Seepage Basins	Savannah River	Liquid Discharges/Active Waste Management	A
6	Contaminant Release from Waste Pits	Fernald	Inactive Sites and Releases/Active Waste Management	B
6	On-Site Mercury Contamination	Y-12	Inactive Sites and Releases	A
6	Sediments in Steel Creek Corridor	Savannah River	Liquid Discharges	B
6	Diesel Fuel Tank Area	Sandia Livermore	Inactive Sites and Releases	A
Ranking Units Representing Most Significant Environmental Degradation Issues				
ENV-1	TCE in Drinking Water Well	INEL	Inactive Sites and Releases	INT
ENV-1	Pinhole Freon Leaks	Portsmouth	Air Emissions	INT
ENV-1	East Central Area Inactive Sites	Portsmouth	Inactive Sites and Releases	INT
ENV-1	South Area Inactive Sites	Portsmouth	Inactive Sites and Releases	INT
ENV-1	Contamination of Soils with Radionuclides	NTS	Inactive Sites and Releases	INT
ENV-1	Old TNX Basin	Savannah River	Inactive Sites and Releases	INT

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TABLE ES.1

INTEGRATED DOE-WIDE RANKING
EXISTING OR SUSPECTED ENVIRONMENTAL PROBLEMS (CONTINUED)

HPI/ENV Group	Ranking Unit Name	Site Name	Environmental Management Area	Critical Data Category
Ranking Units of Tertiary Concern from Potential Public Hazard Perspective				
5	4 5 Acre Site	Pinellas	Inactive Sites and Releases	C
5	Inactive Injection Wells TRA and ICPP	INEL	Inactive Sites and Releases	A
5	Active Liquid Process Discharges in the 300 Area	Hanford	Liquid Discharges/Active Waste Management	B
5	Solar Evaporation Ponds	Rocky Flats	Inactive Sites and Releases	B
5	Inactive Leach Pit	Mound	Inactive Sites and Releases	C
5	Groundwater Contamination from East Traffic Circle Landfill	Lawrence Livermore	Inactive Sites and Releases	B
5	Underground Storage Tanks for Non-Waste Toxic and Hazardous Substances	Y-12	Inactive Sites and Releases	B
5	Groundwater Contamination at Southwest Area	Lawrence Livermore	Inactive Sites and Releases	B
5	Off-site Direct Radiation	Fernald	Direct Radiation	A
5	Animal Contamination	Savannah River	Inactive Sites and Releases	B
5	Groundwater Contamination from Taxi Strip and Old Salvage Yard	Lawrence Livermore	Inactive Sites and Releases	B
5	Soil Contamination in the Canal	Mound	Inactive Sites and Releases	B
5	Hazardous Air Emissions - Vents	Mound	Air Emissions	B
5	Active Liquid Process Discharges in the 200 Area	Hanford	Liquid Discharges/Active Waste Management	B
5	Gasoline Spill at Building 403	Lawrence Livermore	Inactive Sites and Releases	B
5	Soil Contamination in Area S-1	Mound	Inactive Sites and Releases	B
5	903 Pad/Plutonium in Soils	Rocky Flats	Inactive Sites and Releases	B

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TABLE ES.1

INTEGRATED DOE-WIDE RANKING
EXISTING OR SUSPECTED ENVIRONMENTAL PROBLEMS (CONTINUED)

HPI/ENV Group	Ranking Unit Name	Site Name	Environmental Management Area	Critical Data Category
4	Groundwater Contamination in the Main Y-12 Plant Area	Y-12	Inactive Sites and Releases	B
4	H Area Drainage Ditch	Savannah River	Liquid Discharges	A
4	Release of PCBs, Metals, and Organics to the Environment	Kansas City	Inactive Sites and Releases	B
4	Carbon Tetrachloride Emissions from the Z-Plant	Hanford	Air Emissions	A
4	Chestnut Ridge Sediment Disposal Basin	Y-12	Active Waste Management	B
4	Chestnut Ridge Security Pits	Y-12	Active Waste Management	B
4	Inactive Fly-Ash Pile	Fernald	Inactive Sites and Releases	C
4	Perchloroethylene Emissions	Fernald	Air Emissions	A
4	Active Percolation Ponds and Ditches at ANL-West	INEL	Liquid Discharges/Active Waste Management	A
4	Soil Contamination in the Valley Locations	Mound	Inactive Sites and Releases	B
4	Airborne Mercury Releases	Savannah River	Air Emissions	B
4	Past Releases from Inactive Underground Storage Tanks	Pinellas	Inactive Sites and Releases	C
4	Soil Contamination on the SM/PP Hill	Mound	Inactive Sites and Releases	B
4	Other Active Percolation Ponds	INEL	Active Waste Management	A
4	Septic Tank Discharges from Area 3 at Tonopah	SNL	Liquid Discharges	B
4	Inactive Gravel Pits at ICPP	INEL	Inactive Sites and Releases	A
4	Technetium Air Releases	Portsmouth	Air Emissions	A

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TABLE ES.1

INTEGRATED DOE-WIDE RANKING
EXISTING OR SUSPECTED ENVIRONMENTAL PROBLEMS (CONTINUED)

HPI/ENV Group	Ranking Unit Name	Site Name	Environmental Management Area	Critical Data Category
Ranking Units Representing Less Significant Environmental Degradation Issues				
ENV-2	Thermal Impact on SRP Streams	Savannah River	Surface Water	INT
Ranking Units Where Environmental Problems Are Characterized as Generally Reaching Receptors at Levels Below Those Used in Regulatory Decisions				
3	Savannah River Swamp	Savannah River	Surface Water	INT
3	Depleted Uranium Contamination Sites	Pantex	Inactive Sites and Releases	C
3	Air Impacts from ICPP Stacks	INEL	Air Emissions	A
3	A and M Areas Nonradioactive Pits and Piles	Savannah River	Inactive Sites and Releases	A
3	Firing Site 15	Pantex	Inactive Sites and Releases	C
3	Northeast Area	Kansas City	Inactive Sites and Releases	B
3	PCB Release	Pantex	Inactive Sites and Releases	B
3	Liquid Spills and Discharges	SNL	Inactive Sites and Releases	C
3	New TNX Basin	Savannah River	Liquid Discharges/Active Waste Management	A
3	Hydrogen Fluoride Emissions	Y-12	Air Emissions	B
3	Significant Petroleum Spills	INEL	Inactive Sites and Releases	A
3	Pesticide Shed	Rocky Flats	Inactive Sites and Releases	C
3	C, F, H, and CS Areas Nonradioactive Pits and Piles	Savannah River	Inactive Sites and Releases	A
3	ITRI Active Lagoons	SNL	Liquid Discharges/Active Waste Management	C

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TABLE ES.1

INTEGRATED DOE-WIDE RANKING
EXISTING OR SUSPECTED ENVIRONMENTAL PROBLEMS (CONTINUED)

HPI/ENV Group	Ranking Unit Name	Site Name	Environmental Management Area	Critical Data Category
2	Old Railroad Dock	Kansas City	Inactive Sites and Releases	B
2	Soil Contamination Areas at Tonopah	SNL	Inactive Sites and Releases	B
2	Unsaturated Zone Inactive Injection Wells at PBF	INEL	Inactive Sites and Releases	B
2	Tritium Contamination in the Main Hill Groundwater	Mound	Inactive Sites and Releases	C
2	TA-1	LANL	Inactive Sites and Releases	C
2	Soil Contamination in Area S-7	Mound	Inactive Sites and Releases	B
2	Underground Storage Tanks	Kansas City	Inactive Sites and Releases	B
2	Contaminated Surface Soils - Accessible	Pantex	Inactive Sites and Releases	C
1	Dust and Smoke Emissions	Y-12	Air Emissions	B
1	UNC Site	Y-12	Inactive Sites and Releases	A
1	Former Liquid Disposal	LANL	Inactive Sites and Releases	B
1	1,1,1-Trichloroethane Release from M Area	Savannah River	Air Emissions	B
1	K, L, P, and R Areas Nonradioactive Pits and Piles	Savannah River	Inactive Sites and Releases	A
1	100 N Area Spills	Hanford	Inactive Sites and Releases	B
1	North Area Inactive Sites	Portsmouth	Inactive Sites and Releases	B
Ranking Units Where Environmental Problems Are Not Projected to Reach Receptors				
0	SM/PP Hill Drum Storage Area	Mound	Inactive Sites and Releases	B
0	Underground Tank Farm	Kansas City	Inactive Sites and Releases	B
0	Soil Contamination in the Main Plant Area	Y-12	Inactive Sites and Releases	B
0	Contamination from TA-54 Active Waste Management Units	LANL	Active Waste Management	C

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TABLE ES.1

INTEGRATED DOE-WIDE RANKING
EXISTING OR SUSPECTED ENVIRONMENTAL PROBLEMS (CONTINUED)

HPI/ENV Group	Ranking Unit Name	Site Name	Environmental Management Area	Critical Data Category
0	Asbestos	Pantex	Asbestos	C
0	Southeast Parking Lot	Kansas City	Inactive Sites and Releases	C
0	Fluoride Emissions	Pantex	Air Emissions	B
0	Western Sites	Pinellas	Inactive Sites and Releases	C
0	D and TNX Areas Nonradioactive Pits and Piles	Savannah River	Inactive Sites and Releases	A
0	Closed Landfills and Burn Pits	LANL	Inactive Sites and Releases	B
0	Significant Spills Involving Metals	INEL	Inactive Sites and Releases	A
0	Contaminated Surface Soils - Not Accessible	Pantex	Inactive Sites and Releases	C
0	Abandoned Process Wastewater Collection System	Rocky Flats	Inactive Sites and Releases	C
0	Inactive CFA Landfills and Lead Storage Areas	INEL	Inactive Sites and Releases	B
0	Elevated Levels of Arsenic in Groundwater	Kansas City	Inactive Sites and Releases	C
0	Surface Contamination due to Intrusion into Buried Waste	Hanford	Inactive Sites and Releases	C
0	Past Liquid Releases	LANL	Inactive Sites and Releases	C
0	Integrity of Sanitary Sewer Systems	Lawrence Livermore	Liquid Discharges	B
0	Near Surface Soil Contamination from Waste and Wastewater Disposal Practices	NTS	Liquid Discharges	B
0	Potential Leaks from Abandoned or Removed Underground Storage Tanks	LANL	Inactive Sites and Releases	B
0	Sanitary Sludge Lagoon	Savannah River	Active Waste Management	C
0	Site 300-Groundwater Contamination from Landfills	Lawrence Livermore	Inactive Sites and Releases	B

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TABLE ES.1

INTEGRATED DOE-WIDE RANKING
EXISTING OR SUSPECTED ENVIRONMENTAL PROBLEMS (CONTINUED)

HPI/ENV Group	Ranking Unit Name	Site Name	Environmental Management Area	Critical Data Category
0	Past Releases from HP Tanks	Pinellas	Inactive Sites and Releases	C
0	Soil Contamination by Hazardous Chemicals	NTS	Inactive Sites and Releases	B
0	Tunnel Ponds	NTS	Liquid Discharges	B
0	Subsurface Soil Contamination	NTS	Inactive Sites and Releases	C
0	Site 300-Groundwater Contamination from 834 Complex	Lawrence Livermore	Inactive Sites and Releases	B
0	Sediment Contamination from Outfalls	LANL	Liquid Discharges	B
0	Inactive Liquid Disposal Areas	SNL	Inactive Sites and Releases	B
0	Solid Waste Disposal Sites in the Vicinity of the 100 Area	Hanford	Inactive Sites and Releases/Active Waste Management	C
0	Solid Waste Disposal Sites in the Vicinity of the 300/400 Areas	Hanford	Inactive Sites and Releases/Active Waste Management	C
0	Herbicide Disposal in Inactive Waste Site	Hanford	Inactive Sites and Releases	C
0	Solid Waste Disposal Sites in the Vicinity of the 200 Area	Hanford	Inactive Sites and Releases/Active Waste Management	C
0	F and H Areas Miscellaneous Radioactive Surface Contamination	Savannah River	Inactive Sites and Releases	C
0	Radionuclide Sediment Contamination in Water and Ancho Canyons	LANL	Inactive Sites and Releases	C
0	Area P	LANL	Inactive Sites and Releases	B
0	PCBs in Subsurface Soils	Kansas City	Inactive Sites and Releases	B
0	Former Fire Extinguisher Training Area	Sandia Livermore	Inactive Sites and Releases	C
0	Radioactive Burial Grounds	SNL	Active Waste Management	B

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TABLE ES.1

INTEGRATED DOE-WIDE RANKING
EXISTING OR SUSPECTED ENVIRONMENTAL PROBLEMS (CONTINUED)

HPI/ENV Group	Ranking Unit Name	Site Name	Environmental Management Area	Critical Data Category
0	A and M Areas Miscellaneous Radioactive Surface Contamination	Savannah River	Inactive Sites and Releases	C
0	Site 300-HE Process Wastewater Lagoons	Lawrence Livermore	Inactive Sites and Releases	C
0	ITRI Hot Ponds	SNL	Liquid Discharges/Active Waste Management	B
0	Radioactively Contaminated Soils at Tonopah	SNL	Inactive Sites and Releases	A
0	Site 300-PCB Contamination from Landfill 6	Lawrence Livermore	Inactive Sites and Releases	B
0	Inactive Solid Disposal Areas	SNL	Inactive Sites and Releases	B
0	Classified Burial Trenches	Kansas City	Inactive Sites and Releases	C
0	Past Leaks from Single Shell Tanks	Hanford	Inactive Sites and Releases	A
0	Landfills	Pantex	Inactive Sites and Releases	A
0	Fuel Spill-Desert Rock Airstrip	NTS	Inactive Sites and Releases	A
0	Inactive ITRI Sewage Lagoon	SNL	Inactive Sites and Releases	B
0	Chromium Lagoon	Portsmouth	Active Waste Management	A
0	L and P Areas Miscellaneous Radioactive Surface Contamination	Savannah River	Inactive Sites and Releases	C
0	Discharge of Sewage onto the Surface	INEL	Liquid Discharge	INT
0	Discharge of Potentially Untreated Sanitary Wastewater	Hanford	Liquid Discharge	INT
0	Discharges to the Las Vegas Sewer System	NTS	Liquid Discharge	INT
0	Discharges of Toxics to Sewers at BAO	SNL	Liquid Discharge	INT
0	Potentially Human Health Problems from Thermophilic Pathogens	Savannah River	Liquid Discharge	INT

A - Monitored or Measured Data; B - Moderate Amount of Assumptions; C - Significant Amount of Assumptions; INT - Integration Panel Assessment

the quality/reliability of information used to describe the source of the contaminant that is driving the HPI scores.

Table ES.2 presents information on the significance of the scoring and grouping of environmental units. Since the HPIs are calculated on a logrithmic scale, each higher group theoretically represents an order of magnitude increase in potential impact relative to the group immediately below it.

Three quarters of the ranking units involving existing or suspected environmental problems included in the report (121 ranking units) fall in HPI Groups 5 and below. As a general reference point, and based on the receptor populations most frequently encountered in this report, HPI Groups 4 and 5 can be roughly equated to a level of risk of 10^{-4} to 10^{-6}. That level of risk is generally accepted as a trigger for environmental regulatory decisions. This is an indication that most of the environmental problems are at a level of risk comparable to or less than that of environmental regulatory concern (see Table ES.2). In addition, the great majority of these 121 ranking units score in the lower HPI Groups (1 and 0) implying that they represent a very low potential for risk to the public.

None of the ranking units fall in the highest HPI Group. However, one percent (two ranking units) fall in the HPI Groups of most concern (Groups 8 and 9) with another 17 percent (26 ranking units) in HPI Groups 6 and 7. DOE is currently undertaking detailed characterization studies, or, in some cases, remedial actions, on most of these problems.

A large number of the existing or suspected environmental problems with the highest uncertainty (Category C) score very low (31 of 38 score in HPI Groups 3 and below). Due to the "conservative but realistic" principle in developing assumptions for the modeling, this implies that for many of DOE's problems that are least understood, their already low score is not likely to increase when they are more accurately defined.

The majority of the highest scoring ranking units have been or are being studied by DOE. Eighty-nine percent (25 of 28) of the ranking units that score in HPI Groups 6 and above were modeled using either measured or monitoring data (Category A) or

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TABLE ES.2

SIGNIFICANCE OF HPI AND ENVIRONMENTAL DEGRADATION GROUPS

HPI/ENV Group[1]	Significance[2]
10 9 8	These groups include the environmental problems of most concern from the perspective of the potential public hazard. This concern is due to the size of the potential receptor populations and the toxicity and concentration of the contaminants.
7 6	These groups include environmental problems that represent a secondary level of concern from the potential public hazard perspective. The scores for these groups are generally driven by large receptor populations with moderate concentrations and/or toxicity of the contaminants. However, a few problems in these groups include small receptor populations where the toxicity or concentration is high.
ENV-1	This group represents the most significant environmental degradation issues that are being ranked primarily for the environmental degradation aspect.
5 4	These groups include environmental problems that present a tertiary level of concern from the potential public hazard perspective. Scores for these groups are generally a result of either small receptor populations, low doses, or low toxicity contaminants.
ENV-2	This group represents the less significant environmental degradation issues that are being ranked primarily for the environmental degradation aspect.
3 2 1	These groups include environmental problems that are characterized as generally reaching receptors at levels well below those used in regulatory decisions.
0	This group includes environmental problems that are not projected to reach receptors.

1 Proceeding down in the HPI Groups results in an order of magnitude reduction of significance. Environmental degradation groups represent qualitative assessment of significance of issue.

2 Significance of HPI Groups is based on the size of the potential receptor population most frequently encountered in this report.

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a moderate amount of assumptions to supplement the existing data on the problem (Category B).

While potential risk to public health is a primary consideration in ranking environmental problems, environmental degradation is also an important consideration. Eight environmental problems involved environmental degradation that was not sufficiently reflected in the risk-based score. These were placed in the ranking at a point between the HPI Groups 5 and 6 and between Groups 3 and 4.

Follow-on Efforts

The problems and rankings within this report are subject to modification based upon the results from the sampling and analysis phase and the continuation of the Survey to include sites not involved in the Department's defense production mission.

The results of the sampling and analysis phase will have a two-fold effect on the rankings presented in this report. First, actual data concerning the contaminants will be available to replace many of the assumptions used in the modeling, thus enabling the ranking to be more precise. The Survey's extensive sampling and analysis program will yield quantitative data pertaining to the source of the contaminants of concern for many of the problems included within this report. These sampling analysis results will have the effect of moving the Critical Data Category "C's" to "B's" to "A's". Second, sampling results will allow a number of Survey findings to be ranked that were not included in this report due to insufficient environmental data.

The Environmental Survey Summary Report will be completed in the fall of 1989, reflecting sampling and analysis results for the defense production and the 19 other sites covered in the Survey. The Summary Report will provide the health-based ranking to which other programmatic and operational considerations will be applied to formulate corrective action priorities. These include compliance with formal commitments with regulatory agencies, state and local concerns, mission accomplishment, cost, scheduling, and effectiveness of technological options.

1.0 INTRODUCTION

The purpose of this report is to present the preliminary summary results of the Environmental Survey conducted at the Department of Energy (DOE) facilities associated with the Department's defense production mission. The problems identified in the Survey are presented in this report in order of their significance relative to their potential for impacting public health and environment.

This report is comprised of five sections and two appendices. This section outlines the purpose, objectives, and scope of the Environmental Survey and of this report and will describe how the ranking was developed. The second section provides the results of the risk-based portion of the prioritization process as it applies to existing or suspected environmental problems. Section 3 identifies those situations that, although not a problem today, pose a potential for future environmental concern. Section 4 presents the results of the Integration Phase of the prioritization where environmental degradation concerns were taken into account. Section 5 explains follow-up activities associated with the Survey which will lead up to the Environmental Survey Summary Report. Appendix A provides a short discussion of each problem included within this ranking. Appendix B identifies the Survey findings associated with the problems ranked in this report.

1.1 Survey Objectives

The objectives of the Survey are to identify and prioritize, DOE-wide, the areas of existing environmental problems and risk. By so doing, the Survey will provide the Department's management with an environmental baseline from which it will be able to develop uniform, comprehensive, long-range plans for correcting identified problems and reducing environmental risks.

For purposes of the Survey, an environmental problem is defined as either of the following:

1. The existence of pollutants or hazardous materials in the air, water, groundwater, or soil resulting from DOE operations that pose or may pose a hazard to human health or the environment

2. The existence of conditions at a DOE facility that pose or may pose a hazard to human health or the environment.

In general, the levels of pollutants or materials that constitute a hazard or potential for hazard are those that exceed some Federal, state, or local regulations for release of, contamination by, or exposure to such pollutants or materials. However, in some cases, the Survey may determine that some nonregulated material is present in a concentration that presents sufficient potential hazard to local populations or the environment that it should be included as an environmental problem.

Conditions that pose or may pose a hazard are generally those that are violations of regulations or requirements (e.g., improper storage of hazardous chemicals in tanks lacking secondary containment). Such conditions constitute a potential threat to human health and the environment and are identified as environmental problems. Additionally, potentially hazardous conditions are those in which the likelihood of release is high. In general, however, conditions that meet regulatory or other requirements, where such exist, do not constitute a potential hazard and will not be identified as an environmental problem.

1.2 Survey Process

Each Survey team has a DOE Team Leader and Assistant Team Leader, as well as a core membership of technical specialists from a support contractor. The specialties cover air, surface water, groundwater, radiation, waste management, inactive waste sites, toxic substances, and quality assurance. The core Survey team may also be expanded or reduced depending on the type and complexity of the site.

A pre-Survey site visit is held prior to the Survey to scope the on-site efforts of the Survey team. During this meeting, the DOE Team Leader and Assistant Team Leader meet with officials of the Operations Office and the site contractor to explain the objectives of the Survey and to help identify areas for increased focus. For this same reason, the Team Leader and Assistant Team Leader meet with representatives of the appropriate regional office of the Environmental Protection Agency (EPA) and state and local regulatory agencies.

For many of DOE's sites, there exists a significant amount of information pertaining to the site's environmental status. Therefore, prior to the on-site visit, this information is requested of the Operations Office for the Survey team's review. This review of existing information continues as the team visits the site and after the completion of the on-site effort.

The Survey team is on-site for between 1 and 3 weeks, depending on the complexity of the site. During this time, the team members review documents pertaining to the operations of the site and to the environmental programs; inspect facilities, grounds, and operations; and observe environmental sampling and monitoring activities as part of their information-gathering activities.

At the completion of the on-site effort, the preliminary findings are presented to the site management in a formal close-out and to the Assistant Secretary for Environment, Safety and Health in a Status Report. Later, these are included in a more comprehensive report referred to as the Preliminary Report.

Upon the completion of the on-site efforts for each site, the sampling and analysis phase begins. The Survey's Sampling and Analysis Program is intended to strengthen the environmental data base for each site with additional information to further determine the existence and nature of environmental problems and risk. The effort will not duplicate existing sampling and analysis programs at the sites but will provide additional information needed to identify environmental problems. Results of the sampling and analysis effort will be included in the Summary Report. The Summary Report will also incorporate technical comments received from the sites and Operations Offices pertaining to the Preliminary Reports.

At the completion of the Survey at all of the major operating facilities, a Summary Report of the Environmental Survey will be developed. The Summary Report will include a ranking of environmental problems of all of the sites included in the Survey. The Summary Report will differ from this Preliminary Summary Report in two ways. First, it will include all of DOE's major operating facilities, whereas this Preliminary Summary Report covers only those facilities associated with the Department's defense production mission. Thus, the Summary Report will include facilities associated with fossil energy research, petroleum storage, nuclear energy research, and other non-weapon-related efforts. Second, it will have available the results of the Survey sampling and analysis efforts, whereas this Preliminary Summary Report is based upon the Survey's Preliminary Reports only.

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The entire Survey effort is scheduled to be completed in 1989. The defense production sites were scheduled to be completed first. The on-site efforts for those sites were completed in September 1987. Preliminary Reports dealing with these sites have either been issued or are scheduled to be issued shortly. Sampling and analytical efforts currently are under way on most of these sites. On-site efforts for the non-defense production sites were completed in July 1988.

1.3 Purpose and Scope of the Preliminary Summary Report

The Preliminary Summary Report is a part of the overall DOE long-range planning process for reducing environmental risks associated with the Department's operations. The first product of this planning process is an assessment of the total funding requirements associated with the environment, safety, and health efforts at the Defense Program (DP) sites. This assessment, referred to as the Environment, Safety, and Health Planning Report for the Department of Energy Defense Complex, was issued in July 1988. DOE is expanding the planning process to encompass the non-DP facilities. The result of that expanded effort, referred to as the DOE-Wide Long-Range Plan, is scheduled for completion at the end of 1988. To support the DOE-Wide Long Range Plan, the prioritization effort included within this report will be expanded as well.

The results of the Environmental Survey factor into the DOE planning process in two ways. These include providing a mechanism for inventorying the situations that will result in long-range requirements, and providing a method of assessing the significance of the environmental problems.

The requirements included within the long-range plans are based, in part, on safety and environmental concerns raised in Environmental Survey reports, Technical Safety Appraisals, and other such evaluations. In response to findings of the Environmental Survey, the DOE field offices prepare Action Plans. These Action Plans outline the response, schedules, and costs planned to address each finding.

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These Action Plans are reviewed by the DOE Office of Environment, Safety, and Health prior to their final approval. The elements included within these Action Plans form the basis of the environmental portion of the elements included in the long-range plans.

The Environmental Survey Preliminary Summary Report and the final Environmental Survey Summary Report provide an independent assessment of the significance of DOE's environmental problems. This Preliminary Report will be considered in the assessment of the long-range funding requirements included within the DP Long-Range Environment, Safety, and Health Planning. Similarly, the preliminary prioritization efforts on the non-DP sites will be considered in the assessment of the DOE-Wide Long-Range Plan. Thereafter, the final Summary Report will be the basis of the assessments of future DOE-Wide Long-Range Plan updates.

This Preliminary Summary Report of the Environmental Survey is a report of the rankings of the environmental problems at the Defense Program sites based upon the Preliminary Reports of each Survey. This is a technically based ranking making use of available environmental data on these 16 sites. These 16 sites are identified in Table 1.1. This ranking has been produced using an objective, scientifically based computer ranking system to account for the relative risk to the public associated with these problems. Environmental degradation was factored into the risk-based ranking by a panel of senior DOE environmental managers using an assessment of the significance of the environmental concern relative to the results of the health-based ranking.

These rankings are based upon the relative potential risk to public health and the environment. Other environmental management concerns such as regulatory compliance, Compliance Orders or Agreements, or state and local concerns are not factored into this technical ranking. In addition, this is a ranking of problems, not of solutions to those problems. Therefore, cost and scheduling of remedial actions, fund balancing, and other such project management concerns also have not been factored into this effort.

The rankings included within this report are based upon available data supplemented by assumptions where appropriate. These rankings do not have the benefit of the Survey's sampling efforts. Therefore, this report does not include

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TABLE 1.1

DEFENSE PRODUCTION RELATED SITES INCLUDED IN THE ENVIRONMENTAL SURVEY

Feed Materials Production Center (Fernald)

Hanford Site

Idaho National Engineering Laboratory

Kansas City Plant

Lawrence Livermore National Laboratory

Los Alamos National Laboratory

Mound Facility

Nevada Test Site

Pantex Facility

Pinellas Plant

Portsmouth Uranium Enrichment Complex

Rocky Flats Plant

Sandia National Laboratories (Albuquerque) and the Inhalation Toxicology Research Institute

Sandia National Laboratories, Livermore

Savannah River Plant

Y-12 Plant

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those findings for which sampling is required to confirm the existence of a problem or for which crucial pieces of information are lacking and will be obtained through the Survey sampling program.

Due to the lack of the Survey's sampling data, some assumptions were used in modeling the potential impacts of these environmental problems. In designing these assumptions, the principle of "realistic, but conservative assumptions" was followed. In other words, these assumptions reflect the Survey team's view of what is realistic at the site, but whenever a choice or range of values was available, those values which could be expected to result in higher impacts were used. The expectation was that this principle would result in somewhat higher scores for problems with significant unknowns. In effect, such scores represent the maximum potential relative risk given the current level of understanding of the problem. Therefore, pending the results of the sampling effort, these rankings should be viewed as preliminary. With the addition of the Survey's sampling data, these scores will more accurately reflect the actual relative risk of each problem.

1.4 Overview of Survey Prioritization System

The system for prioritizing the environmental problems included in the Survey's findings follows a multistep approach. The first step is the identification of environmental problems or potential environmental problems. The second step is the placement of each finding into one of four categories, referred to as Category I through IV. This screening step is accomplished in the Preliminary Survey Reports. The third step is the ranking based upon relative risk of the identified environmental problems. This step involves the use of a risk-based model to aid the integration of the data gathered during the Survey. The final step is the integration of environmental degradation and uncertainty into the risk-based ranking.

Environmental problems and potential environmental problems are identified by the Survey and placed into findings. The Survey findings are placed into one of four categories in the Preliminary Survey reports. Placement in these four categories serves to screen the findings and identify the severity and the appropriate timing for responses. The criteria for each category consider the seriousness of the risk, the level of data available to the Survey team, and the appropriate timing for follow-up to the finding.

The major Category III findings and those in Category II that require additional action are ranked first based upon the potential risk they pose to the public. This step requires the use of a computer model referred to as the Multimedia Environmental Pollutant Assessment System (MEPAS).

The final step is to integrate environmental degradation concerns into the risk-based ranking. The uncertainty associated with the risk-based analysis also will be factored into the ranking at this step. Other environmental management concerns such as compliance agreements, environmental standards, and state and local concerns will be acknowledged but will not affect the ranking.

1.5 Explanation of Category System

During the development of the Survey Preliminary and Interim Reports, the Survey team will place each finding into one of four categories, referred to as Categories I, II, III, and IV. The risk situations in the four categories range from the most significant and immediate (Category I) to the least significant (Category IV). In addition, the appropriate responses and attention by the Operations Office and appropriate Program Office will vary in terms of the degree and timing of risk and the amount of information available for identifying the problem.

Briefly, Category I findings involve situations where there is an immediate threat to human health. Category II findings require attention of management before the overall Survey is completed. However, unlike Category I findings, Category II findings may require additional studies to fully characterize the problem. Category III problems are those environmental problems where the broadest definition of risk is applied. Environmental problems included within this category typically will result in a lengthy multiyear investigation. Finally, Category IV findings include instances of administrative noncompliance and practices that are indirectly related to environmental risk, but are not appropriate for inclusion in Categories I-III. The four categories are more fully explained below.

1.5.1 Category I

Category I findings include only those findings which, according to the information available to the Team Leader, involve an immediate threat to human health. Findings of this type will be immediately reported to the responsible Environment, Safety and Health personnel at the scene or to those personnel in control of the facility or location in question for corrective action.

Consideration will be given to whether a "clear and present danger" exists such that facility shutdown authority by the Assistant Secretary for Environment, Safety and Health should be exercised. If so, the Assistant Secretary or designee should be informed immediately.

Category I includes those environmental problems for which the potential risk is highest; confidence in the findings, according to the information available, is the strongest; and the appropriate response is the most restrictive in terms of alternatives. No Category I findings were identified by the Surveys of the 16 sites included in this report.

1.5.2 Category II

Category II findings are findings that satisfy one or more of the following criteria:

- multiple or continuing exceedances, past or present, of a health-based standard for air, water, or soil at a location where there is immediate potential for human exposure, or a one-time exceedance where residual impacts pose an immediate potential for human exposure;

- indication that such an exceedance may occur within the timeframe of the Survey;

- evidence of the likelihood of an unplanned release, the causes of which may include the condition or design of pollution abatement or monitoring equipment or other environmental management practices; or

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- noncompliance with significant regulatory procedures (i.e., those substantive technical regulatory procedures designed to directly or indirectly minimize or prevent risks) such as inadequate monitoring of failure to obtain required permits.

The definition of Category II findings incorporates those environmental problems for which the risk is high, but the definition of risk is broader than that of Category I. The information available to the Team Leader is adequate to identify the problem but may be insufficient to fully characterize it. Finally, in this category, more discretion is available to the Operations Office and Program Office in terms of an appropriate response; however, the need for that response is such that management should not wait for the completion of the entire Survey to respond. Unlike Category I findings, a sufficient near-term response by the Operations Office may include further characterization before action is taken to rectify the situation. There have been 140 Category II findings identified in the Surveys of the sites included within this report. Many of these findings are discussed and/or analyzed as part of this ranking. Those Category II findings that were not included were not amenable to long-range planning and are identified in Section 2.2 of this report on a site-by-site basis.

1.5.3 Category III

Category III findings satisfy one or both of the following criteria:

- the existence of pollutants or hazardous materials in the air, water, groundwater, or soil that result from DOE operations and are or may be a hazard to human health or the environment; or

- the existence of conditions at a DOE facility that are or may be a hazard to human health or the environment.

Category III findings are those environmental problems for which the broadest definition of risk is used. As in Category II, the information available to the Team Leader may not be sufficient to fully characterize the problem. For problems in this category, the range of alternatives available for response and the timeframes for response are the greatest. Environmental problems included within this category will typically require lengthy investigation and remedial phases, as well as multi-year budget commitments. These problems will be included in the prioritization

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effort to ensure that DOE's resources are used most effectively. There have been 352 Category III findings identified in the Surveys at the sites included within this report. The problems included in the findings in this category compose the major focus of this ranking.

1.5.4 Category IV

Category IV findings include instances of administrative noncompliance and management practices that are indirectly related to environmental risk but are not appropriate for inclusion in Category I, II, or III. Such findings can be based upon any level of information available to the Team Leader, including direct observations by the team members. Findings in this category are generally expected to lend themselves to simple, straightforward resolution without further evaluation or analysis. Therefore, these findings are not part of the DOE-wide prioritization effort. However, they will be passed along to the Operations Office and appropriate Program Office for action. The Operations Office will respond with a memorandum regarding its intentions concerning these findings. There have been 367 Category IV findings identified in the Surveys at the sites included within this report.

1.6 Ranking Based on Risk

One of the purposes of the Survey is to provide an aid to the development of long-range plans to reduce environmental risks. Therefore, it is essential that the ranking of the identified environmental problems encompass the concept of risk and provide an understanding of the relative importance of these problems considering risk.

Risk in environmental programs can encompass many, sometimes competing, concepts. Some examples of different concepts of risk include long-term risk to public health (i.e., chronic), risk of acute health effects, risks to individuals as opposed to the public (i.e., maximum exposed individual or MEI), and a suite of non-health-related environmental effects that can be viewed under a common label of environmental degradation or ecological damage. For purposes of this ranking, the long-term risk to the public is paramount. Acute risks are generally more effectively addressed by immediate action rather than by longer-term planning and actions

suggested by this prioritization. Risk to individuals such as is considered in assessments of maximum exposed individuals is considered in this ranking to the same extent as risk to small populations. Environmental degradation is factored into the long-term public health risk rankings at a later stage.

Ranking based on risk involves the evaluation of contaminant migration through the environment, a calculation of the dose to humans through the various routes of exposure, and an assessment of the health effects associated with exposure to contaminants. There are numerous methods of ranking long-term risk to public health. These systems range from subjective methods of assigning scores to important parameters involving little physical data to detailed quantitative projections of absolute risks requiring extensive studies.

The Survey's ranking is based upon very initial investigations of potential problems and is intended, in many cases, to identify areas where further investigation should be focused. As such, this ranking is at too early a stage of investigation to justify the data and analysis required for detailed quantitative projections of absolute risk. On the other hand, the environment is too complex for an individual to be able to take into account all the considerations necessary to adequately assess risks in a judgmental or subjective manner. Physical relationships between the contaminants and the environment vary from site to site. Thus their impacts vary from site to site as well. However, the basis for these relationships, in many instances, is known to the scientific community. Therefore, it is possible to evaluate these relationships in an organized manner which accomplishes the scoring objectives of more subjective systems in a manner that is scientifically acceptable, replicable, and eliminates potential bias.

1.6.1 Multimedia Environmental Pollutant Assessment System

The Multimedia Environmental Pollutant Assessment System (MEPAS) was developed by the Pacific Northwest Laboratory for the Environmental Survey as a means of prioritizing the environmental problems identified in the Survey. MEPAS is a risk-based ranking methodology that provides a means of quantifying potential relative risk from contaminants released into the environment.

MEPAS uses mathematical algorithms to project the potential for release of contaminants into the environment, for contaminant transport through and between multiple environmental media, for exposure to surrounding populations, and the potential health risk associated with the exposure. It then produces a score for the problem that represents the potential relative risks of the problem in relation to other problems ranked by the system.

MEPAS has broad applicability. It handles problems involving radionuclides and other carcinogenic and noncarcinogenic contaminants as well as problems originating from landfills, air stacks, pipes, and other sources. Its broad applicability is due to its focus on the environment into which the contaminant is released and on the effects of the contaminant on humans regardless of the release mechanism.

MEPAS uses generally accepted models to simulate the movement of contaminants through the environment to human receptors. The environmental media in which the contaminants may be transported include subsurface soils or groundwater, surface water bodies such as rivers or lakes, soil overland runoff, and the air. The pathways by which the population can be exposed include ingestion of contaminated foods either directly or through the food chain, inhalation of air pollutants, direct contact with contaminants in soil or water, and with radionuclides by direct exposure.

MEPAS then calculates the potential relative risk posed by the problem. The potential health risks are calculated based upon either the effective whole-body dose equivalent received from each contaminant for radioactive contaminants, the cancer potency factor for carcinogens, or the reference dose factor for noncarcinogens. These factors are compared with the levels of dose that the model projects for the receptor. The size of the affected population is then factored in, as well as the time of the arrival at the population and the duration of the exposure, to result in a score that is referred to as the Hazard Potential Index (HPI).

MEPAS was developed by the Pacific Northwest Laboratory (PNL) specifically for use by the Survey. On-going efforts aimed at further refinements, documentation, and a sensitivity analysis are underway. The sensitivity analysis should assist future efforts in understanding the level of uncertainty associated with the use of the model.

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1.6.2 Hazard Potential Index

The Hazard Potential Index (HPI) is a numerical score that is calculated by the MEPAS code that represents the relative risk associated with the problem and serves as a basis for ranking. The higher the numerical score, the more serious the relative risk. In this way, it is possible to use the HPI to place the problem in a relative order. MEPAS generates an HPI for each contaminant and each pathway of each problem modeled. It does not add HPIs for multiple contaminants. Therefore, sites for which information is available for only a few contaminants are not necessarily scored lower than sites which are fully characterized. However, MEPAS does add exposures to the surrounding population from multiple pathways for each contaminant, therefore assigning higher scores (i.e., higher HPI) to problems which have potential for exposing populations from a variety of pathways.

The HPI is calculated based upon toxicity of the chemicals released; the location and size of the population potentially exposed to these chemicals; the contaminant level in the environment; the projected dose to the surrounding population, which includes the duration of the potential exposure; and the projected time of the contaminant's arrival at the receptor (i.e., mobility). As stated earlier, the toxicity is based upon either the effective whole-body dose equivalent for radionuclides, the cancer potency factor for carcinogenic chemicals, or the reference dose factor for non-carcinogens. The various routes of exposure (inhalation, ingestion, direct contact) may have different factors assigned to the same chemicals. Thus, for example, the factor assigned for inhalation of 1,1-dichloroethylene would differ from that assigned for ingestion. These factors are compared to the levels calculated to reach a receptor. The receptors are determined by considering the route of exposure. Thus the receptors considered for a contaminant that has the potential for reaching groundwater wells would be the population that uses those wells for drinking or bathing, not the general population. Similarly, the receptors for an airborne contaminant would be only those within the area potentially affected by the plume.

Time is factored into the HPIs in two ways; the duration of the exposure and the time of arrival. Exposures are calculated until the contaminant has dropped below the toxicity factor discussed above to a maximum of 7,000 years. Each exposure is

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calculated on a 70-year basis, approximating a human generation. Thus persistent contaminants expose multiple generations and score higher as a result. This is tempered to an extent by considering the time of arrival of the contaminant. The principle behind this consideration is that the earlier the contaminant can arrive and expose a population, the sooner the environmental problem should be addressed. Therefore, succeeding exposures in each 70-year period are scored progressively lower than the previous 70-year period. Note that no attempt is made in calculating HPIs to project changes in population size or distribution. The current population is used as a basis for scoring.

1.6.3 Cautions in Use and Interpretation of HPIs

The HPI is a score based on the potential hazard posed by a problem. The HPI is not a quantitative risk assessment in an absolute sense and does not represent projections of human health risks in spite of the similarities in the manner in which the HPI is developed. Three elements included in MEPAS represent examples of reasons for prohibiting its use as a quantitative risk assessment. First, in combining the three types of toxicity (radioactive, carcinogenic, and noncarcinogenic), MEPAS is comparing very different effects. To do so, it must translate these effects into a common score after which each effect loses its separate identity. Thus, the score does not represent the number of cancers from the carcinogen or the number of deaths from the non-carcinogen. Second, in focusing on a common measurement, certain non-lethal effects are lost in the analysis. Third, the scores represent a weighting of exposures due to the time the contaminants are projected to arrive at the receptors.

Foremost among the reasons for not using the MEPAS results as a projection of human health risk is that it was not designed for such a purpose. MEPAS was designed to rank the findings of the Environmental Survey and other efforts of a similar nature. As stated earlier, the Survey's ranking is based upon very initial investigations of potential problems and is intended, in many cases, to identify areas where further investigation should be focused. As such, the ranking is at too early a stage of investigation to justify the data and analysis required for detailed projections of absolute risk. By first ranking the potential problems, the best allocation of human resources and funding to correct the environmental hazard can be ensured.

1.7 Survey's Use of MEPAS

The risk-based portion of the ranking is based upon the application of MEPAS to the findings of the Environmental Survey. To apply MEPAS to the findings, several new procedures and concepts had to be developed. These procedures and concepts are explained in this section.

1.7.1 Conduct of the Prioritization

There are six groups or individuals involved in the implementation of the risk-based portion of this ranking system. These are the Survey teams, the Pacific Northwest Laboratory (PNL), the Survey Prioritization Implementation Group (SPRIG), the Prioritization Support Contractor (PSC), the DOE field organization, and the Survey Prioritization Program Manager. These groups provide a necessary mix of skills to ensure a consistent application, under DOE direction, of MEPAS to the Environmental Survey findings.

The Survey teams in general, and the DOE Team Leaders in particular, are responsible for identifying and organizing the problems to be ranked. The teams are also responsible for providing data concerning the sources of the environmental problems and for recommending the best sources of data concerning other aspects of the ranking. The data were drawn from the information included in the Preliminary Reports supplemented by other information forwarded by the sites during the Survey. Finally, the Survey teams are responsible for reviewing the initial results of the rankings to ensure that they meet the test of reasonableness.

The PNL, as the developer of MEPAS, has two roles in the implementation. First, they provided technical assistance in the conduct of the ranking. Second, a separate arm provided quality control reviews of the completed data forms. These two roles allow for quick identification and correction of problem areas with the model and with its use.

The SPRIG is a deliberative body composed of representatives of the Office of Environment, Safety and Health, each of the Survey teams, and PNL. This group raises and discusses problems with implementation. It also acted as a body to

disseminate guidance to the Survey teams and other groups involved in the ranking. In addition, Survey team members on the group have liaison responsibilities for the implementation.

The PSC is responsible for conducting the rankings under the guidance and direction of the Survey Prioritization Program Manager. This group, a separate arm of the Survey support contractor, assembled the required data, performed the required computer efforts, and interpreted the results for the 16 sites included in the rankings.

The DOE field organizations, during the data validation phase, provided a review of the data and assumptions used in the modeling. The objectives of this review were 1) to identify inaccuracies in the modeling and 2) to identify information collected by the field organizations since the Survey that would be relevant to the modeling. This validation step involved field office review of the critical data and assumptions used in the modeling and technical discussions with the PSC and Survey Prioritization Program Manager.

The Survey Prioritization Program Manager, as the representative of the Office of Environment, Safety and Health on the effort, has overall responsibility for the conduct of this ranking. He advises the teams during the identification and organization of the problems to be ranked, coordinates between PNL and the implementation groups, chairs the SPRIG meetings, coordinates the field office's data evaluation efforts, and provides guidance and direction to the PSC.

1.7.2 Environmental Settings

MEPAS requires site-specific data pertaining to the environment into which contaminants may be or are released. This enables the ranking to recognize the interactions between the environment and the chemicals of concern. Ideally, this type of data would be collected for each problem. However, given the number of problems included in this ranking, to facilitate the production, each site was divided into one or more environmental settings. Each setting characterizes the physical nature of the site and the surrounding demographics necessary to perform the analysis.

Environmental setting data include physical or demographic data that pertain to the environment into which the contaminant may be or is released or transported, not data pertaining to the source of the release such as a landfill or stack. These environmental settings include data pertaining to climatology, hydrogeology, surface water, atmospheric physics, irrigation, agriculture, population, and usage data pertaining to groundwater and surface water. Climatological information includes temperature and rainfall, among others. Examples of topsoil information include density and composition. Partially saturated layer thickness and saturated hydraulic conductivity are typical of the types of hydrogeologic data required. Surface water information includes flow rates as a function of downstream distance; while atmospheric physics data include such information as wind joint frequency distribution. Examples of groundwater and surface water exposure information include location and usage rates, while population and agricultural distribution were required for calculating atmospheric exposures.

For smaller sites with less complex settings, one environmental setting was designed and all the environmental problems were assumed to affect it. For larger sites with more complex environmental settings, up to three regions were used. In these instances, problems were modeled in the most appropriate settings. In all cases, exceptions were made where specific physical features were identified as part of the environmental problem. Given the level of the analysis, the potential error in using data on a site-wide basis was not deemed significant.

1.7.3 Ranking Units

A ranking unit is an environmental problem or group of environmental problems taken from the Environmental Survey findings that represents the environmental problems being ranked in this report. A definition of an environmental problem is provided in Section 1.1 of this report. An environmental problem is the existence or the potential for pollutants in the environment that pose or may pose a hazard to human health or the environment or conditions that pose or may pose a hazard to human health or the environment.

The ranking unit represents the environmental issue raised in the Environmental Survey findings. The environmental problems in Preliminary Reports for each site are organized into findings. The findings represent the conclusions of each

technical specialty area. Generally, these findings aggregate individual spills, discharges, or disposal sites in a summary manner to discuss the larger environmental problem. Although most often these findings focus on one particular environmental problem, some may discuss a concern that has broad applicability to the site. An example of findings with a broad focus would be inadequate segregation of wastes with the potential for improper disposal into a number of landfills. Therefore, some findings may include more than one environmental problem. On the other hand, since findings are organized by technical area, environmental problems with aspects in more than one technical area will be covered in more than one finding. For example, an inactive landfill may result in a finding in the inactive waste sites and releases section; may exhibit evidence of surface soil contamination and thus be included in the soil section; and may have the potential to contaminate groundwater, thus resulting in a groundwater finding.

The individual environmental problems identified in the findings were focused on in designing the ranking units for this report. Thus, in instances where multiple environmental problems were discussed in a single finding, multiple ranking units were developed. In addition, where an environmental problem had aspects reflected in several findings, these findings were aggregated to form the basis of a single ranking unit.

The ranking units represent some aggregation of environmental problems appropriate for a national view of the Department's environmental status. In forming these ranking units, a balancing of three principles was followed.

The first principle followed in forming the ranking units was that the ranking units combine problems that would most likely be managed as a group, thus attempting to provide a link between this ranking of the problems and later efforts directed toward characterization and corrective actions. As a result of this principle, there are instances where several problems in a particular geographic area were ranked as one ranking unit since, in those instances, a single corrective action plan most likely would be employed. Another example of this principle is the separation of facilities that come under different management organizations, such as waste storage tanks and petroleum storage tanks. From an environmental perspective,

both types of tanks may represent the potential for leakage; however, in most sites, different organizations are involved in the management of the two types of tanks.

The second principle used in aggregating environmental problems into ranking units was to keep problems that are identified by the site, the regulators, or the public together as a ranking unit, and separate from other issues. This ensures that these important problems are adequately analyzed and that their resulting priority is easily recognizable. Thus, for example, where a particular concern has been raised about waste disposal practices at a site, all findings pertaining to such practices were aggregated and a ranking unit pertaining to those practices was formed.

The third principle which guided the design of the ranking units was the need to ensure a proper balancing of the technical aspects of the ranking. These technical aspects are those that if not balanced properly may result in an inadequate assessment of all aspects of the problem. These include proximity of the environmental problems, release mechanisms, and contaminant types.

MEPAS ranks the environmental problem based upon the scenario that is designed for the release. If several environmental problems are not in proximity to each other relative to the receptor of concern, several release scenarios are required to maintain the technical integrity of the rankings. At some of DOE's larger sites, these scenarios are so different with respect to the environment into which the contaminant is released and the population potentially exposed that it makes sense to identify separate ranking units for each.

The release mechanism refers to the manner in which the contaminant was or could be deposited or released into the environment. Examples of release mechanisms are landfills, spills, and stack emissions. Each release mechanism has a unique set of forces involved in transporting the contaminants. Here again, MEPAS requires separate scenarios to ascertain the potential migration and impacts. In combining these scenarios into one ranking unit, the problem associated with one of the release mechanisms is likely to be overshadowed by another, thus resulting in a lack of assessment of the lesser problem. For example, a landfill may so overshadow a spill that the ranking unit score would only reflect the landfill.

To a lesser extent, the type of contaminants released was kept separate. MEPAS can handle multiple contaminants in a single analysis. In scoring such a problem, it totals the potential impacts for each contaminant separately. However, as in the release mechanism, the impacts of one contaminant can overshadow the impacts of another. Properly designed, this capability is beneficial to the ranking in that it identifies the contaminants of highest concern to a particular problem. However, there are instances where separate identification of the potential impacts of a type of contaminant is important. This is most often the case in combining areas of soil contamination where certain areas have chemical contamination and others are contaminated with radionuclides.

Based upon this guidance, the Survey teams identified the ranking units. Each team associated with a site met at a Scenario Development Meeting with the Survey Prioritization Program Manager and the Prioritization Support Contractor. At these meetings, all aspects of each finding were discussed and initial ranking units were developed. The Survey Prioritization Program Manager was responsible for ensuring that the ranking units from the five Survey teams were comparable in the level of detail and in the handling of the various environmental problems. The Prioritization Support Contractor provided advice on the technical aspects of the ranking. The results are the 201 ranking units analyzed in Sections 2 (155 ranking units) and 3 (46 ranking units) of this report and described in Appendix A. For a better understanding of the basis of each ranking unit, the individual Survey Preliminary Reports should be reviewed.

1.7.4 HPI Groups

The sole purpose of the scores included in this report is to provide a ranking of the environmental problems of the Department relative to one another. MEPAS's Hazard Potential Indices (HPIs) provide an approximate ranking of the ranking units. Although the resulting HPI score for a particular problem is presented in a quantitative manner, due to the simplified nature of the assessment, these scores are not as precise as they appear. Therefore, to more accurately reflect the relative significance of the ranking units, all environmental problems with proximate scores were placed into HPI Groups.

The design of the HPI Groups is based on the design of the HPIs. The HPIs were originally envisioned as a logarithmic scale going from zero to 100. Scores below zero (negative numbers) indicate a situation where the contaminant material in the environment or the effects of a condition on a DOE site were not expected to reach the receptor. As a logarithmic scale, each increment of 10 reflects an order of magnitude change in the potential impact. Thus, an HPI of 30 is 10 times more significant than an HPI of 20. The HPI Groups presented in this report focus on this order-of-magnitude difference. These HPI Groups thus aggregate HPI scores of 1 to 10 in HPI Group 1, 11 to 20 in HPI Group 2, and so forth to the top of the ranking, with Group 10 representing HPIs between 91 and 100. A Group 0 was added to account for the ranking units that score HPIs zero and below.

Although best suited to ordering the ranking units, the HPIs and the HPI Groups can provide a rough indication of the relative significance of the problem with respect to the potential public hazard. This level of significance can best be characterized as a spectrum ranging from the most significant from the potential public hazard perspective to the least significant (see Table 1.2). The level of significance can be viewed by comparisons to levels of risk considered in regulatory decisions. Most environmental regulatory decisions or actions are stimulated when the risk being considered falls in the range of 10^{-6} to 10^{-4}. Risk of a magnitude below 10^{-6} is generally considered to be acceptable by society and does not precipitate regulatory action. By comparison, for the size of the potential receptor population most frequently encountered in this report, this range falls somewhere in HPI Groups 4 and 5. Thus, ranking units which score in HPI Groups 3 and below are generally scoring below levels at which regulatory decisions are based, while those in Groups 6 and above generally are above them. Situations can exist in the ranking where the comparison is not valid. For example, receptor populations of a million or more can result in HPI Groups 6 or 7 representing the risk level used in regulatory decisions while for very small populations (e.g., less than 1,000) this figure can be below HPI Group 3.

1.7.5 Uncertainty in the Rankings

There is a degree of uncertainty in the rankings. This uncertainty emanates from three areas: data gaps associated with the source of the contamination; uncertainties associated with key physical data on the site; and uncertainties

TABLE 1.2

PUBLIC HAZARD SIGNIFICANCE OF HPI GROUPS

HPI Group[1]	Potential Public Hazard Significance[2]
10 9 8	These groups include the environmental problems of most concern from the perspective of the potential public hazard. This concern is due to the size of the potential receptor populations and the toxicity and concentration of the contaminants.
7 6	These groups include environmental problems that represent a secondary level of concern from the potential public hazard perspective. The scores for these groups are generally driven by large receptor populations with moderate concentrations and/or toxicity of the contaminants. However, a few problems in these groups include small receptor populations where the toxicity or concentrations are high.
5 4	These groups include environmental problems that present a tertiary level of concern from the potential public hazard perspective. Scores for these groups are generally a result of either small receptor populations, low doses, or low-toxicity contaminants.
3 2 1	These groups include environmental problems that are characterized as generally reaching receptors at levels well below those used in regulatory decisions.
0	This group includes environmental problems that are not projected to reach receptors.

1 Proceeding down in the HPI Groups results in an order of magnitude reduction of significance.

2 Significance is based upon the size of the potential receptor population most frequently encountered in this report.

associated with the model. During the development of this ranking, all attempts were made to minimize the effects of this uncertainty on the final rankings.

This ranking is based upon the Preliminary Reports of the Environmental Survey. These Preliminary Reports have available only those data that have been currently identified at the site. The Survey's Sampling and Analysis Program is designed to fill in data gaps that exist, which would assist in the understanding of the environmental problems. The sampling and analysis results for the problems included within this ranking are not available at this time. Therefore, a number of assumptions were used in modeling the ranking units to fill the data gaps. In some of the ranking units, these assumptions had little effect on the rankings. However, for other ranking units, assumptions were applied to data parameters for which the modeling of the ranking unit was very sensitive. As a result of the use of these assumptions, the uncertainty associated with the rankings varies.

To account for the varying amount of uncertainty, the ranking units were placed into one of three categories based upon the number and type of assumptions used in those data parameters that most influenced the ranking. These critical data can vary from site to site. For example, the ranking at one site may be sensitive to the concentrations at the source of the problem while at another, the information on the source may be less significant than such environmental conditions as rainfall in determining whether the contaminants have the potential to be transported. These broad categories of data uncertainty range from categories "A" to "C". Category "A" applies where the critical data parameters were based on measured or monitoring data. Category "B" applies where some assumptions were applied to the data to fulfill the model's needs. Finally, category "C" applies where the critical data parameters are met totally with assumptions.

In interpreting the scoring for the ranking units relative to the nature of the appropriate actions to be taken, the critical data category should be considered. The uncertainty associated with rankings in category "C" is such that decisions concerning the need for additional sampling and analysis of the problems are warranted. The uncertainty associated with ranking units in category "B" is such that decisions on additional characterization efforts would be appropriate. Finally, category "A" ranking units are closer to the point where remedial action decisions can be reached.

A second area of uncertainty in the rankings involves key physical data on the site. Several findings involved concerns that key physical data at a site, such as groundwater flow, may not be fully understood. This concern most frequently referred to insufficient characterization of the groundwater flow regime. To address this concern, important sources of potential groundwater contamination were modeled twice. Current groundwater understanding was used to arrive at the basic score for the environmental problem. To estimate the potential impact of the incomplete characterization, key groundwater parameters were modified in a second modeling exercise to reflect the worst possible characteristics relative to the receptor. The score of this second modeling exercise provided a range of HPI scores for the problem containing the sources of potential groundwater contamination.

A third area of uncertainty exists due to the model itself. In this area, three observations were noted during the development of this ranking. The first is that problems that involve the potential for contaminated soil runoff consistently score extremely low. Most such ranking units result in the contaminants never reaching the receptors. The problem is in the scientific state-of-the-art model in modeling sediment transport, and a correction cannot be made to the model at this time. Therefore, it is possible that certain aspects of a ranking unit that focus on contaminated soil runoff are under-scored. A notation to this effect has been included in the narratives in Appendix A of those ranking units that may have been affected.

The second aspect of the modeling uncertainty involves the transport of fuels and oils through groundwater. The model assumes all contaminants are mixed with the ground-water. This assumption does not hold for certain contaminants which, due to their density relative to water, may rise to the top or descend to the bottom of the groundwater. Thus, for these contaminants, supply wells withdrawing from the aquifer may be pulling water from layers that have much higher concentrations or much lower concentrations of the contaminant depending on where they are screened. Again, a notation has been included in the narratives for the affected ranking units.

The third aspect of the uncertainty associated with the modeling is the handling of organics in groundwater and surface water. The modeling of these contaminants

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assumed no decay or attenuation of organics. In other words, the quantities released were not assumed to be reduced due to decay or volatilization, and transport to the groundwater was not assumed to be impacted by intervening zones. Including these factors in the analysis would have the effect of reducing the impacts and thus the scores of these ranking units. These assumptions were used since this information is very site-specific and generally not available at the early stages of investigation associated with many of DOE's problems. To have applied these factors at the few sites where they exist would have resulted in inconsistent application of the ranking.

In the final accounting, this report represents the first test of the ranking system on a wide scale. As such, it was expected that anomalous rankings would surface that could not be explained by the Survey or by any of the measures discussed above. In that context, seven of the ranking units addressed in this report obtained scores and related rankings that are not consistent with the Survey perspective of the problems. These seven rankings units represent only three percent of the 203 ranking units included within this report, thereby implying that the system performed well in the overall test. However, the inconsistent nature of the resulting rankings, given the Survey's perspective of the issues, suggests that additional analysis of the seven ranking units is warranted before their relative ranking can be determined. Therefore, further analysis is being conducted on these ranking units and their relative ranking will be included in the final Environmental Survey Summary Report.

The seven ranking units are discussed in Section 2.1 of this report. In addition to identifying the applicable ranking units, the discussion also provides the results of the MEPAS ranking and the Survey's professional judgment as to their significance. In general, these ranking units all scored high in the relative ranking. The Survey felt that these ranking units constituted environmental problems deserving attention in the long-range planning. However, it saw the scores these problems received in the ranking as higher than warranted and was unable to explain the distortion.

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1.7.6 Existing Versus Potential for Future Problems

The Environmental Survey recognizes two types of environmental problems at DOE sites; existing or suspected problems and situations which represent the potential for future problems. These two types of problems derive from the Survey's two-fold definition of an environmental problem. An environmental problem is defined as either 1) the existence of pollutants or hazardous materials in the air, water, groundwater, or soil resulting from DOE operations that pose or may pose a hazard to human health or the environment; or 2) the existence of conditions at a DOE facility that pose or may pose a hazard to human health or the environment.

An existing or suspected environmental problem refers to past or current releases to the environment for which physical evidence and/or monitoring data exist or for which Survey sampling and analysis efforts have been programmed to confirm. Existing or suspected problems relate to the first part of the definition of an environmental problem. These types of problems are the topic of Section 2 of this report.

A situation which represents the potential for future environmental problems includes conditions at a site that if left unattended may result in releases to the environment at some future time. A typical example of this type of problem is the lack of containment of aboveground storage tanks. There may be no current evidence of leakage, but should a leak occur, substantial damage to the environment may result. These potential future problems relate to the second portion of the Survey's definition of an environmental problem and are frequently the focus of the Survey's Category II findings. These situations are discussed in Section 3 of this report.

No attempt was made during either the Surveys or the development of the rankings within this report to assign probabilities of occurrence to these potential future problems. Because of this, it would be inappropriate to compare the risks associated with these potential future problems with those associated with problems that already exist or are suspected of already existing. Therefore, throughout this report, these two types of problems are analyzed separately.

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Frequently, an environmental problem has aspects of both existing and potential for future problems. Two examples would be small, pinhole leaks in a polychlorinated biphenyl (PCB) transformer and an unlined hazardous waste landfill. In the first example, it is likely that the Survey team's concern would focus on the potential for more major releases of PCBs. The current leaks may not in themselves be sufficient to constitute an environmental problem; however, they would provide a basis for this larger future concern. In the second example, data may indicate that contaminants are being released or the team may suspect that such a release is possibly occurring. Given the amount of contaminants that may be being released, the focus of this problem would be on the existing situation. In all instances, in designing the ranking units, the placement of a problem into one category or the other was decided by the Survey team based upon scientific or engineering judgment in developing the finding and ranking unit.

1.7.7 Release Scenarios Used to Model Ranking Units

To use MEPAS to prioritize the ranking units, scenarios to describe the release of contaminants have to be developed. These scenarios describe the source of the contaminants (e.g., landfill, stack, drums), the transport pathways (i.e., air, surface water, groundwater, overland, direct exposure, and/or some combination of these), and the exposure pathways (e.g., eating contaminated foods, drinking contaminated water, breathing contaminated air). The data required to run the model are based on the scenario chosen. The process for designing the scenarios for the ranking units included in this report is discussed below.

1.7.7.1 Scenarios Used to Model Existing Problems

For existing or suspected environmental problems, the scenarios were developed on a case-by-case basis by the Survey teams. A meeting, referred to as the Scenario Development Meeting, was held with each team for each site included within this report. At that meeting, the ranking units to be included were identified. In addition, the scenarios appropriate to each ranking unit were also identified. The scenarios used for each ranking unit are briefly described in Appendix A of this report.

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To identify the appropriate scenarios for each ranking unit, the Survey teams, assisted by the Prioritization Support Contractor and the Survey Prioritization Program Manager, reviewed all aspects of the environmental problems associated with the ranking unit. Based upon their understanding of the environmental problems, they identified transport routes of concern and those which would not need to be analyzed. For example, the team may have suggested that the scenario for a landfill include as a transport pathway leaching through a partially saturated zone to a saturated zone, but not an overland runoff pathway since no surface water bodies were present at the site. The Prioritization Support Contractor had earlier assembled the site setting data which included exposure information such as drinking water well locations, irrigation usage, and population distribution. These exposure pathways were then added to the applicable transport pathway to comprise the scenario to be run.

The scenarios used in the analysis drive the data needs for the ranking unit. For this report, these data needs were met by a combination of monitoring data, published data bases, and assumptions. As would be expected in an analysis of problems from a preliminary stage of investigations, few data existed for some of the environmental problems included in this ranking, thus requiring more reliance upon assumptions. These assumptions were drawn from the Survey team members based upon their best understanding of the problem. In developing these assumptions, the principle of "conservative, but realistic assumptions" was used. In other words, these assumptions reflect the Survey team's perspective of the problem but where faced with a range of values, those values which would be expected to result in higher impacts being used. The Survey's Sampling and Analysis Program is designed to provide additional information which will be used in place of many of these assumptions in the Environmental Survey Summary Report.

1.7.7.2 Scenarios Used to Model Potential for Future Problems

Within this ranking, there are four potential future problems that occur at many of the DOE sites. To model potential future releases, additional unknowns concerning the extent and, in some cases timing, of the potential release are involved. This ranking does not purport to assign probabilities to any of these potential occurrences. Therefore, it was necessary to factor out of the ranking the major unknown that was beyond the Survey's ability to predict and focus the ranking of

these problems on information that was available -- the materials that could be released and the environment into which they may be released. To do this, assumptions concerning the potential future releases were developed and applied to entire classes of problems across the 16 sites. The resulting ranking, therefore, represents the potential for risk resulting from the problem at one site relative to the same problem at other DOE sites. The standard scenarios for the four potential future problems found most frequently at DOE sites are discussed below.

Most DOE sites have underground storage tanks, many of which have not been leak-tested and have no leak detection systems. The standard assumptions for underground storage tanks focus on long-term undetected releases from the underground tanks at a site. The analysis for these problems, therefore, considers the number of tanks, their ages, and their contents. All tanks were placed into one of five age groups (0-5, 6-10, 11-15, 16-20, and greater than 20 years old). Based upon a study by the New York State Department of Environmental Conservation (Technology for the Storage of Hazardous Liquids-A State of the Art Review, January, 1983), a fixed percentage of each tank age group was assumed to leak. The percentages of each tank in the age group discussed above that are assumed to leak at a site are 1.6, 10.8, 22.5, 25.9, and 40, respectively. The leak rate for all tanks that leak was held at 1 percent of tank contents per week. Inactive tanks were assumed to leak until the total tank inventory was depleted. Active tanks were assumed to leak until 1998 when regulations for underground tanks will require leak testing, corrosion protection, leak detection or tank removal. No tanks were assumed to be removed, replaced, or repaired until 1998.

A second potential future problem that is common on DOE sites is inadequate secondary containment on aboveground storage tanks. The standard assumptions applied to these problems at all sites where such findings were presented focused on a catastrophic release from the tank that represents the highest potential for environmental damage. This mirrors the major focus of the spill containment requirements, which is to protect against catastrophic releases. Only one tank was modeled for each unit since the potential for multiple, unrelated catastrophic tank failures occurring simultaneously was considered very low. At each site, the tank was chosen by the Survey team based upon volume, contents, and location. Each tank failure represented the release of the entire contents of the tank.

The potential for future PCB leaks represents the third potential future problem. Transformers and capacitors were modeled focusing on the potential for a serious, uncontained release of PCBs. For these ranking units, compliance with EPA cleanup regulation 40 CFR 761 was assumed. As in the aboveground tanks standard scenario, the PCB equipment that represents the potential for the most significant impacts was selected to represent the score of this problem at a site. The piece of equipment was selected by the Survey team based upon PCB content, volume, and location.

The final group of problems for which standard release assumptions were developed applied to the potential for the failure of product or waste drums which have been stored under conditions where deterioration and subsequent release could occur. The issue of drum failure most often reflected in the findings was oriented more toward steady leaks over a period of time than of a catastrophic release as in the tanks and PCB findings. Therefore, the standard release scenario for drums took into account the number and contents of drums stored in an environmentally unsound manner and their storage location. Since the drum failure rate was unknown, a rate had to be assumed. For drums stored in the open on bare ground, a standard drum failure rate of 15 percent per year was used. This equates to a failure of all drums stored in such a manner over approximately a 7-year period. Since drum failure is sensitive to such environmental conditions as moisture, special site conditions justified alternative assumptions. For example, a 10-percent failure rate was used for Pantex due to the arid climate, which presumably would result in a lower drum corrosion rate. In addition, in some findings the Survey team identified conditions of the tanks that warranted a variance from the standard failure rate.

In addition to the four potential problems discussed above, there are a small number of miscellaneous problems for which unique scenarios were developed. The scenarios used to model these problems are included in Appendix A.

1.7.8 Environmental Management Areas

The Environmental Survey included within its scope the full range of environmental regulatory and management concerns. Thus, the ranking units included within this report span a wide variety of environmental concerns. Therefore, in this report, the

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ranking units are described by reference to the technical area associated with the problem. These environmental management areas include inactive sites and releases; active waste management; underground storage tanks; PCBs; asbestos; spill containment; liquid discharges; air discharges; drum handling; and direct radiation. Some ranking units may have more than one area listed since the more complex environmental problems can encompass more than one technical area.

These environmental management areas encompass a wide range of environmental regulations. The Environmental Survey is not a regulatory compliance audit. Thus, these issues were not addressed in the Preliminary Reports specifically under regulatory headings. Therefore, a discussion of what is included in each area is provided below.

Ranking units described as "Inactive Sites and Releases" include existing environmental problems associated with inactive waste disposal and past spills and releases. These problems are typically managed under either the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendment and Reauthorization Act (SARA), or the corrective action provisions of the Resource Conservation and Recovery Act (RCRA). Generally, these problems are listed in the Preliminary Reports in either the Inactive Sites and Releases or the Soils section.

Ranking units described as "Active Waste Management" include existing environmental problems or situations that pose the potential for future environmental problems associated with the generation, storage, transportation, and disposal of hazardous, radioactive, mixed, and nonhazardous waste. These problems are typically managed under RCRA and/or provisions of the Atomic Energy Act. Findings dealing with these problems are found in the Waste Management section of the Preliminary Reports.

The "Underground Storage Tanks" area includes ranking units representing situations that pose the potential for future environmental problems associated with the current use of underground tanks for the storage of process materials or products. This area does not include tanks used for waste management purposes, which are included under Active Waste Management concerns. It also does not include past spills from currently active tanks or potential problems associated with

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abandoned tanks. These types of problems are included in the definition of Inactive Sites and Releases.

Ranking units are included as in the Polychlorinated Biphenyls area if they represent situations that pose the potential for future environmental problems associated with use, storage, or disposal of PCBs. The use, storage, or disposal of PCBs is managed by the Toxic Substance Control Act (TSCA). Most PCB-related findings are included in the Preliminary Reports in the Toxic and Chemical Handling section. However, spills involving inactive PCB equipment are not included in this definition but are included in the definition of Inactive Sites and Releases.

Ranking units described as "Asbestos" include existing environmental problems associated with the current use or disposal of asbestos. Problems associated with past disposal of asbestos are included in the Inactive Sites and Releases definition. This ranking of asbestos problems focuses only on the impacts on public health and the environment. Asbestos concerns are frequently associated with worker safety issues. Such issues are the responsibility of other offices within DOE and thus fall outside the scope of the Environmental Survey. The public health and environmental aspects of friable asbestos are managed by the Clean Air Act; however, findings involving the use or disposal of asbestos are included in the Toxic and Chemical Handling sections of the Preliminary Reports.

Ranking units described as "Spill Containment" represent situations that pose the potential for future environmental problems associated with the current use of aboveground tanks that lack sufficient secondary containment. Past spills from aboveground tanks are included in the Inactive Sites and Releases section. These tanks are generally used for storage of fuels, and chemicals used in the facility's processes or for storage of waste. Secondary containment of most aboveground tanks is managed by the spill prevention provisions of the National Contingency Plan (NCP) issued under the authority of the Clean Water Act. Tanks involving radioactive materials are managed under the Atomic Energy Act. Findings involving such problems are located in the Preliminary Reports under Toxic Chemical Handling or, for waste tanks, under Waste Management.

The "Liquid Discharges" area includes existing environmental problems or situations that pose the potential for future environmental problems associated

with process wastewater, sanitary wastewater, or stormwater discharges. These problems are typically managed under the National Pollutant Discharge Elimination System (NPDES) of the Clean Water Act or under the authority of the Atomic Energy Act. Findings including this type of problem are included in the Preliminary Reports in the Surface Water section.

Ranking units in the "Air Emission" area include existing environmental problems or situations that pose the potential for future environmental problems associated with emissions of contaminants to the air from stacks, vents, and fugitive sources (including resuspension of contaminated soil). These types of problems are typically managed under the Clean Air Act and such findings are included in the Air section of the Preliminary Report.

"Drum Handling" includes situations that pose the potential for future environmental problems associated with the storage or handling of chemicals. These problems focus on drum storage areas. Chemical storage in tanks and waste storage are not included in this description. Findings pertaining to the problems included in this area are found in the Preliminary Report section dealing with Toxic and Chemical Handling.

The "Direct Radiation" area includes ranking units that represent existing environmental problems which involve direct radiation. Environmental problems which include other radioactivity issues, such as emissions, discharges, or spills of radionuclides, are included in the areas which include the sources of such problems. Direct radiation is managed under the Atomic Energy Act. Such findings are discussed in the Radiation section of the Preliminary Reports.

1.7.9 Quality Assurance/Quality Control

To ensure a high-quality, consistent application of MEPAS, strong quality assurance/quality control (QA/QC) elements were included in the implementation process. The QA elements focused on clear division of responsibility, training consistent with this division, guidance, methods for disseminating this guidance, focused reviews, and overall project management.

As discussed in Section 1.7.1, six groups or individuals were involved in the implementation. Their responsibilities were outlined in written procedural guidance provided by the Office of Environmental Audit to each of the groups at the onset of the prioritization. These responsibilities were also reiterated in training held at the beginning of the effort. The division of responsibilities was designed to emphasize the expertise of each group. For example, the Survey teams, as the group which performed the Survey and originated the findings, were responsible for identifying the ranking units and the appropriate scenarios to model. Similarly, the Prioritization Support Contractor with their modeling focus, was responsible for assembling the data required by MEPAS and for running the model.

Training programs were designed and conducted at the beginning of each phase of the implementation. This allowed the guidance to be disseminated in a consistent manner timed to ensure that the information was fresh in the minds of the staff as the phase began. Separate training sessions for each group allowed the sessions to focus on the responsibilities of the audience. For the Survey teams and the SPRIG members, the training sessions included 1) understanding and designing scenarios; 2) general information requirements for the environmental settings and typical sources for obtaining such information; 3) guidance on identifying ranking units, general information for modeling the source term, and typical means of estimating such information where specific data are not available. The SPRIG members were also provided training in understanding data to which the model's results are most sensitive and interpreting and validating the results. The training sessions for the PSC included 1) specific information requirements and appropriate sources of information for the environmental settings; 2) specific information requirements for the source term modeling and means of estimating such information where not available; 3) how to set up the model and execute the computer run; and 4) means of interpreting and validating the results of the modeling.

Guidance, both procedural and technical, for each group was developed and distributed during training sessions. Procedural guidance was developed by the Survey Prioritization Program Manager based upon the results of a test run of the system. This procedural guidance focused on the steps in completing the ranking and the division of responsibilities. Additional procedural guidance dealing with specific issues discussed at the SPRIG meetings was disseminated by the SPRIG

members to each of the teams. These issues generally reflected specific problems encountered by a team in conducting its ranking. Technical guidance on using MEPAS was developed by PNL under direction of the Survey Prioritization Program Manager and disseminated at the training sessions. This type of guidance focused on how the system works, completion of the forms, and acceptable sources of information. It also included guidance on how the QC checks would be performed.

Focused reviews of the Prioritization Support Contractor's efforts and intermediate products took place at various steps in the process. Upon the completion of the data compilation, the data forms, referred to as templates, were reviewed by the PSC senior technical leader, the Survey teams, PNL, and the Survey Prioritization Program Manager. The PSC senior technical leader review focused on the modeling and the data used for each ranking unit. The Survey team's review focused on ensuring that the scenarios continued to accurately represent the problem as the team viewed it, that the data sources were the best available, and that the results passed the test of reasonableness. PNL performed QC reviews of all the templates to ensure 1) adequate documentation of data and assumptions, 2) consistency in the data, and 3) completeness. Finally, the Survey Prioritization Program Manager review focused on consistency with guidance and with the decisions reached in the Scenario Development Meetings, and on reasonableness of the results. These reviews also focused on identifying emerging problems and on the status of the effort. DOE field organizations reviewed the critical data and assumptions used in the modeling to identify more up-to-date data sources and inaccuracies in the use of the data.

The Survey Prioritization Program Manager is responsible for overseeing all aspects of the implementation. In addition to the responsibilities discussed above, the QA aspects of the position are to ensure consistency across the five Survey teams. In this role, the Survey Prioritization Program Manager attended each Scenario Development Meeting where ranking units were identified, chaired the SPRIG where guidance was disseminated, and advised and directed the Prioritization Support Contractor in their efforts.

1.8 Findings Not Included in the Risk-Based Ranking

Not all the findings in the Survey's Preliminary Reports are included in the risk-based ranking. As explained earlier, the prioritization focused on the Category III and, to a lesser extent, Category II findings. Category IV findings are only indirectly related to risk and are amenable to simple, straightforward resolution. Therefore, Category IV findings were not ranked. There are no Category I findings identified by the Survey for sites included in this report. In any case, Category I findings would not be amenable to the type of long-range planning that prioritization implies. Of the Category II and III findings, 76 were primarily compliance or management issues that were brought to the immediate attention of management as directed in the Category II guidance, and 26 were focused on inadequacies of the data handling procedures. None of these findings entailed an associated environmental problem to be ranked.

Of the remaining 392 Category II and III findings identified at the 16 sites, 299 or 76 percent are included in this ranking. The majority (81) of the 93 findings not ranked are awaiting the results of the Survey's Sampling and Analysis Program either to confirm the existence of a suspected problem or to gather critical information without which the risk-based ranking could not be performed. The remaining 12 findings were not ranked with the risk-based model, as the associated environmental problem was not amenable to a MEPAS analysis. MEPAS's focus on impacts of chemical contamination resulted in the inability to rank such non-chemical environmental problems as salinity or thermal pollution. In addition, public health impacts other than those associated with chronic impacts to populations could not be accounted for in a way that would accurately portray the concern. These impacts primarily include acute effects and exposures to individuals as measured in maximum exposed individual calculations. These 12 problems were addressed in the prioritization during the Integration Phase.

1.9 Consideration of Other Concerns in the Ranking

Although risk to public health is the most important concern in ranking environmental problems, it is not the only concern that needs to be addressed in environmental management. Impacts on environmental resources also must be considered. In addition, the environmental statutory and regulatory framework

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under which a Federal agency operates requires decisions to factor in a number of other concerns.

Since this ranking is intended to be a technical assessment of the potential significance of the Department's environmental problems, some but not all of these other concerns can be factored into it. Potential environmental degradation, such as contamination of migrating-waterfowl habitat, can be associated with the physical aspects of an environmental problem. On the other hand, non-compliance with a regulatory compliance schedule is more a policy issue that is inappropriate for a technical assessment. Therefore, these other considerations will be handled in this report in two manners based upon whether they involve a technical assessment.

Technical concerns are factored into the ranking based upon the individual merits of each problem. These technical concerns include issues of degradation of the environment as well as uncertainty in the modeling of the risk-based portion. The preliminary nature of the ranking would imply that a good deal of uncertainty would be present in many of the rankings. The degree to which uncertainty or environmental degradation will affect the rankings will vary in each instance. To allow these adjustments to the rankings to best represent the seriousness of the concern, no pre-set weighting system was used to guide these determinations. This allowed the seriousness of the concerns to be discussed and factored into the ranking on a case-by-case basis. The procedures followed and the results of this aspect of the ranking are discussed in Section 4 of this report.

Non-technical concerns were identified but not reflected in the rankings. These concerns include potential violations of regulatory standards, compliance schedules, expressions of state or local concerns, and other such concerns that are more appropriately considered in later efforts designed to address the issue. These concerns are included in the descriptions of the ranking units included in the appendix and elsewhere in this report.

Other concerns are not being addressed in this report. These include such project management types of concerns as the cost and scheduling of remedial actions and such fund balancing concerns as maximizing the reduction in risk relative to a given funding level. These types of issues are more appropriately addressed in a program

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planning or budgeting document focusing on remediating the environmental problems identified in this report.

Both the technical and non-technical concerns were identified by a panel composed of senior environmental managers drawn from throughout the DOE and the Survey teams. The panel also recommended to the Office of Environment, Safety and Health the extent of changes to the ranking to most accurately reflect the technical concerns. The final ranking is the responsibility of the Office of Environment, Safety and Health.

2.0 RISK-BASED RANKING OF EXISTING AND SUSPECTED PROBLEMS

This section of the report contains the preliminary summary results of the risk-based ranking of the existing and suspected problems at the 16 sites associated with DOE's defense production mission. These sites are listed on Table 1.1 and include facilities that perform a wide range of functions in support of the defense mission. These functions include basic research, engineering design, fuel fabrication and enhancement, component production, weapon assembly and testing, and waste disposal. The sites are located in 12 states. The locations of the sites are identified on Figure 2.1.

The results of the risk-based rankings are provided first on a DOE-wide basis and then by site. The DOE-wide rankings are presented first, using the critical data categories discussed in Section 1.7.5 of this report and then integrated across these categories.

The three critical data categories discussed in this section represent varying levels of uncertainty in the ranking. This uncertainty results from uncertainty in the data and assumptions used. The amount of uncertainty associated with the data could not be determined generically but varies from ranking unit to ranking unit. The data uncertainty is, for the most part, a reflection of the current stage of the problem investigation. Some problems have been extensively analyzed, while data collection efforts on others have only recently been initiated. Thus, providing separate rankings by critical data categories provides a comparison of environmental problems that are at comparable stages of investigation and, therefore, have similar, if undefined, error bands associated with them. Such a separation of ranking is useful in determining the appropriate response action, since problems associated with high confidence scores are closer to the point where remedial action decisions can be reached, while higher uncertainty would suggest additional sampling.

The final analysis in the DOE-wide ranking provides a review of all the ranking units regardless of critical data category. This provides an assessment of where the potential exists for the most significant concerns in the Department's defense production complex regardless of the stage of investigation.

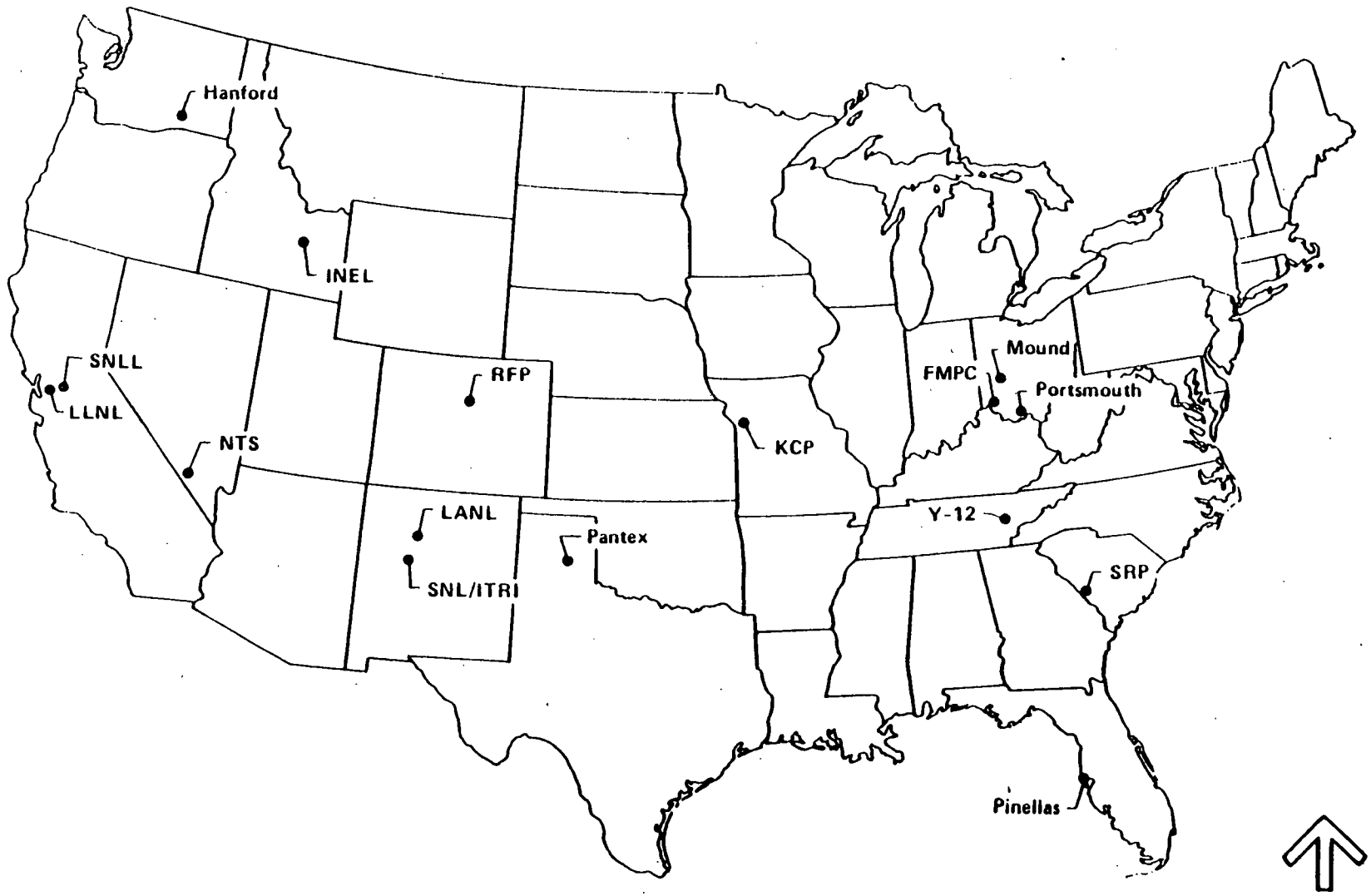

FIGURE 2.1

LOCATION MAP OF SITES
INCLUDED IN THIS REPORT

Following the DOE-wide ranking, the remainder of the section provides a discussion of the preliminary results of the Environmental Survey on a site-by-site basis, focused on the ranking of existing and suspected environmental problems. In this section, the sites are discussed in alphabetical order.

Each ranking table in this section provides the HPI Group, the environmental management area, and where appropriate, the site name and critical data category. A discussion of the meaning and significance of the HPI Groups is provided in Section 1.7.4 of this report. Section 1.7.8 provides a description of what is included in each environmental management area. More detailed discussions of each ranking unit are provided in Appendix A.

2.1 DOE-Wide Ranking of Existing and Suspected Environmental Problems

The preliminary summary results of the risk-based ranking of the existing and suspected problems are presented on a DOE-wide basis with a focus on the uncertainty associated with the rankings and on the potential hazard that these issues pose to the public. The assessment is first presented by a ranking that incorporates all of these and then is followed by critical data category (A, B, and C).

2.1.1 DOE-Wide Ranking of All Uncertainty Categories

The summary in this section provides an assessment of where the potential exists for the most significant concerns in the Department's defense production complex regardless of the stage of investigation or level of confidence in the data. It provides a perspective on the significance of all the 148 ranking units that represent existing or suspected environmental problems (see Table 2.1). These problems range in phase of investigation from full characterization to early identification; in type of environmental management area from inactive sites and releases, air releases, waste management, liquid discharges, and asbestos to direct radiation; and in significance of potential impacts (see the discussion in Section 1.7.4 on understanding the significance of the HPI Groups).

Since the completion of the Survey at individual sites, some of those sites have informed the Survey of remedial actions which have been taken or which are planned to address the issues encompassed by several of the ranking units. The

TABLE 2.1

RANKING OF EXISTING OR SUSPECTED ENVIRONMENTAL PROBLEMS ALL CRITICAL DATA CATEGORY RANKING UNITS

HPI Group	Ranking Unit Name	Site Name	Environmental Management Area	Critical Data Category
Ranking Units of Most Concern from Potential Public Hazard Perspective				
9	VOCs in Groundwater	Rocky Flats	Inactive Sites and Releases	C
8	Known Liquid Releases	Pantex	Inactive Sites and Releases	B
Ranking Units of Secondary Concern from Potential Public Hazard Perspective				
7	Groundwater Contamination in Southeast Corner	Lawrence Livermore	Inactive Sites and Releases	B
7	Chromium Air Releases	Portsmouth	Air Emissions	B
7	Inactive Liquid Process Discharges in the 200 Area	Hanford	Inactive Sites and Releases	B
7	Off-site Floodplain Contamination in East Fork Poplar Creek and Bear Creek	Y-12	Inactive Sites and Releases	B
7	Active Percolation Ponds at ICPP and TRA	INEL	Liquid Discharges/Active Waste Management	A
7	Volatile Organics and Radionuclides Released to Groundwater at RWMC	INEL	Inactive Sites and Releases	B
7	Toxic Discharge to Technical Area 1 Sewers	SNL	Liquid Discharges	B
7	Active Liquid Process Discharges in the 100 Area	Hanford	Liquid Discharges/Active Waste Management	B
7	Ditches	Pantex	Liquid Discharges	B

A - Monitored or Measured Data; B - Moderate Amount of Assumptions; C - Significant Amount of Assumptions

TABLE 2.1

RANKING OF EXISTING OR SUSPECTED ENVIRONMENTAL PROBLEMS ALL CRITICAL DATA CATEGORY RANKING UNITS (CONTINUED)

HPI Group	Ranking Unit Name	Site Name	Environmental Management Area	Critical Data Category
7	M Area Settling Basin	Savannah River	Liquid Discharges/Active Waste Management	A
6	Inactive Liquid Process Discharges in the 300 Area	Hanford	Inactive Sites and Releases	B
6	Burial Grounds	Savannah River	Active Waste Management	A
6	Eastern Sites	Pinellas	Inactive Sites and Releases	C
6	Playas	Pantex	Liquid Discharges	B
6	Inactive Liquid Process Discharges in the 100 Area	Hanford	Inactive Sites and Releases	B
6	Coal Pile Runoff	Portsmouth	Liquid Discharges	A
6	Process Water Discharges	Y-12	Liquid Discharges	A
6	Emissions of VOCs to the Atmosphere	Kansas City	Air Emissions	C
6	Airborne Releases	Fernald	Air Emissions	A
6	Unscheduled Air Releases	Portsmouth	Air Emissions	A
6	Contamination from Liquid Discharges	Fernald	Liquid Discharges	B
6	Active Seepage Basins	Savannah River	Liquid Discharges/Active Waste Management	A
6	Contaminant Release from Waste Pits	Fernald	Inactive Sites and Releases/Active Waste Management	B
6	On-Site Mercury Contamination	Y-12	Inactive Sites and Releases	A
6	Sediments in Steel Creek Corridor	Savannah River	Liquid Discharges	B
6	Diesel Fuel Tank Area	Sandia Livermore	Inactive Sites and Releases	A

A - Monitored or Measured Data; B - Moderate Amount of Assumptions; C - Significant Amount of Assumptions

TABLE 2.1

RANKING OF EXISTING OR SUSPECTED ENVIRONMENTAL PROBLEMS
ALL CRITICAL DATA CATEGORY RANKING UNITS (CONTINUED)

HPI Group	Ranking Unit Name	Site Name	Environmental Management Area	Critical Data Category
Ranking Units of Tertiary Concern from Potential Public Hazard Perspective				
5	4 5 Acre Site	Pinellas	Inactive Sites and Releases	C
5	Inactive Injection Wells at TRA and ICPP	INEL	Inactive Sites and Releases	A
5	Active Liquid Process Discharges in the 300 Area	Hanford	Liquid Discharges/Active Waste Management	B
5	Solar Evaporation Ponds	Rocky Flats	Inactive Sites and Releases	B
5	Inactive Leach Pit	Mound	Inactive Sites and Releases	C
5	Groundwater Contamination from East Traffic Circle Landfill	Lawrence Livermore	Inactive Sites and Releases	B
5	Underground Storage Tanks for Non-Waste Toxic and Hazardous Substances	Y-12	Inactive Sites and Releases	B
5	Groundwater Contamination at Southwest Area	Lawrence Livermore	Inactive Sites and Releases	B
5	Off-site Direct Radiation	Fernald	Direct Radiation	A
5	Animal Contamination	Savannah River	Inactive Sites and Releases	B
5	Groundwater Contamination from Taxi Strip and Old Salvage Yard	Lawrence Livermore	Inactive Sites and Releases	B
5	Soil Contamination in the Canal	Mound	Inactive Sites and Releases	B
5	Hazardous Air Emissions - Vents	Mound	Air Emissions	B
5	Active Liquid Process Discharges in the 200 Area	Hanford	Liquid Discharges/Active Waste Management	B
5	Gasoline Spill at Building 403	Lawrence Livermore	Inactive Sites and Releases	B
5	Soil Contamination in Area S-1	Mound	Inactive Sites and Releases	B
5	903 Pad/Plutonium in Soils	Rocky Flats	Inactive Sites and Releases	B

A - Monitored or Measured Data; B - Moderate Amount of Assumptions; C - Significant Amount of Assumptions

TABLE 2.1

RANKING OF EXISTING OR SUSPECTED ENVIRONMENTAL PROBLEMS ALL CRITICAL DATA CATEGORY RANKING UNITS (CONTINUED)

HPI Group	Ranking Unit Name	Site Name	Environmental Management Area	Critical Data Category
4	Groundwater Contamination in the Main Y-12 Plant Area	Y-12	Inactive Sites and Releases	B
4	H Area Drainage Ditch	Savannah River	Liquid Discharges	A
4	Release of PCBs, Metals, and Organics to the Environment	Kansas City	Inactive Sites and Releases	B
4	Carbon Tetrachloride Emissions from the Z-Plant	Hanford	Air Emissions	A
4	Chestnut Ridge Sediment Disposal Basin	Y-12	Active Waste Management	B
4	Chestnut Ridge Security Pits	Y-12	Active Waste Management	B
4	Inactive Fly Ash Pile	Fernald	Inactive Sites and Releases	C
4	Perchloroethylene Emissions	Fernald	Air Emissions	A
4	Active Percolation Ponds and Ditches at ANL-West	INEL	Liquid Discharges/Active Waste Management	A
4	Soil Contamination in the Valley Locations	Mound	Inactive Sites and Releases	B
4	Airborne Mercury Releases	Savannah River	Air Emissions	B
4	Past Releases from Inactive Underground Storage Tanks	Pinellas	Inactive Sites and Releases	C
4	Soil Contamination on the SM/PP Hill	Mound	Inactive Sites and Releases	B
4	Other Active Percolation Ponds	INEL	Active Waste Management	A
4	Septic Tank Discharges from Area 3 at Tonopah	SNL	Liquid Discharges	B
4	Inactive Gravel Pits at ICPP	INEL	Inactive Sites and Releases	A
4	Technetium Air Releases	Portsmouth	Air Emissions	A

A - Monitored or Measured Data; B - Moderate Amount of Assumptions; C - Significant Amount of Assumptions

TABLE 2.1

RANKING OF EXISTING OR SUSPECTED ENVIRONMENTAL PROBLEMS
ALL CRITICAL DATA CATEGORY RANKING UNITS (CONTINUED)

HPI Group	Ranking Unit Name	Site Name	Environmental Management Area	Critical Data Category
Ranking Units Where Environmental Problems Are Characterized as Generally Reaching Receptors at Levels Below Those Used in Regulatory Decisions				
3	Savannah River Swamp	Savannah River	Direct Radiation	B
3	Depleted Uranium Contamination Sites	Pantex	Inactive Sites and Releases	C
3	Air Impacts from ICPP Stacks	INEL	Air Emissions	A
3	A and M Areas Nonradioactive Pits and Piles	Savannah River	Inactive Sites and Releases	A
3	Firing Site 15	Pantex	Inactive Sites and Releases	C
3	Northeast Area	Kansas City	Inactive Sites and Releases	B
3	PCB Release	Pantex	Inactive Sites and Releases	B
3	Liquid Spills and Discharges	SNL	Inactive Sites and Releases	C
3	New TNX Basin	Savannah River	Liquid Discharges/Active Waste Management	A
3	Hydrogen Fluoride Emissions	Y-12	Air Emissions	B
3	Significant Petroleum Spills	INEL	Inactive Sites and Releases	A
3	Pesticide Shed	Rocky Flats	Inactive Sites and Releases	C
3	C, F, H, and CS Areas Nonradioactive Pits and Piles	Savannah River	Inactive Sites and Releases	A
3	ITRI Active Lagoons	SNL	Liquid Discharges/Active Waste Management	C
2	Old Railroad Dock	Kansas City	Inactive Sites and Releases	B
2	Soil Contamination Areas at Tonopah	SNL	Inactive Sites and Releases	B
2	TCE in Drinking Water Well	INEL	Inactive Sites and Releases	B
2	East Central Area Inactive Sites	Portsmouth	Inactive Sites and Releases	B

A - Monitored or Measured Data; B - Moderate Amount of Assumptions; C - Significant Amount of Assumptions

TABLE 2.1

RANKING OF EXISTING OR SUSPECTED ENVIRONMENTAL PROBLEMS ALL CRITICAL DATA CATEGORY RANKING UNITS (CONTINUED)

HPI Group	Ranking Unit Name	Site Name	Environmental Management Area	Critical Data Category
2	Unsaturated Zone Inactive Injection Wells at PBF	INEL	Inactive Sites and Releases	B
2	Tritium Contamination in the Main Hill Groundwater	Mound	Inactive Sites and Releases	C
2	TA-1	LANL	Inactive Sites and Releases	C
2	Soil Contamination in Area S-7	Mound	Inactive Sites and Releases	B
2	Underground Storage Tanks	Kansas City	Inactive Sites and Releases	B
2	South Area Inactive Sites	Portsmouth	Inactive Sites and Releases	B
2	Contaminated Surface Soils - Accessible	Pantex	Inactive Sites and Releases	C
1	Dust and Smoke Emissions	Y-12	Air Emissions	B
1	UNC Site	Y-12	Inactive Sites and Releases	A
1	Former Liquid Disposal	LANL	Inactive Sites and Releases	B
1	1,1,1-Trichloroethane Release from M Area	Savannah River	Air Emissions	B
1	K, L, P, and R Areas Nonradioactive Pits and Piles	Savannah River	Inactive Sites and Releases	A
1	100 N Area Spills	Hanford	Inactive Sites and Releases	B
1	Old TNX Basin	Savannah River	Inactive Sites and Releases	A
1	North Area Inactive Sites	Portsmouth	Inactive Sites and Releases	B
Ranking Units Where Environmental Problems Are Not Projected to Reach Receptors				
0	SM/PP Hill Drum Storage Area	Mound	Inactive Sites and Releases	B
0	Underground Tank Farm	Kansas City	Inactive Sites and Releases	B
0	Soil Contamination in the Main Plant Area	Y-12	Inactive Sites and Releases	B
0	Contamination of Soils with Radionuclides	NTS	Inactive Sites and Releases	B

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TABLE 2.1

RANKING OF EXISTING OR SUSPECTED ENVIRONMENTAL PROBLEMS
ALL CRITICAL DATA CATEGORY RANKING UNITS (CONTINUED)

HPI Group	Ranking Unit Name	Site Name	Environmental Management Area	Critical Data Category
0	Contamination from TA-54 Active Waste Management Units	LANL	Active Waste Management	C
0	Asbestos	Pantex	Asbestos	C
0	Southeast Parking Lot	Kansas City	Inactive Sites and Releases	C
0	Fluoride Emissions	Pantex	Air Emissions	B
0	Western Sites	Pinellas	Inactive Sites and Releases	C
0	D and TNX Areas Nonradioactive Pits and Piles	Savannah River	Inactive Sites and Releases	A
0	Closed Landfills and Burn Pits	LANL	Inactive Sites and Releases	B
0	Significant Spills Involving Metals	INEL	Inactive Sites and Releases	A
0	Contaminated Surface Soils - Not Accessible	Pantex	Inactive Sites and Releases	C
0	Abandoned Process Wastewater Collection System	Rocky Flats	Inactive Sites and Releases	C
0	Inactive CFA Landfills and Lead Storage Areas	INEL	Inactive Sites and Releases	B
0	Elevated Levels of Arsenic in Groundwater	Kansas City	Inactive Sites and Releases	C
0	Surface Contamination due to Intrusion into Buried Waste	Hanford	Inactive Sites and Releases	C
0	Past Liquid Releases	LANL	Inactive Sites and Releases	C
0	Integrity of Sanitary Sewer Systems	Lawrence Livermore	Liquid Discharges	B
0	Near Surface Soil Contamination from Waste and Wastewater Disposal Practices	NTS	Liquid Discharges	B
0	Potential Leaks from Abandoned or Removed Underground Storage Tanks	LANL	Inactive Sites and Releases	B
0	Sanitary Sludge Lagoon	Savannah River	Active Waste Management	C

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TABLE 2.1

RANKING OF EXISTING OR SUSPECTED ENVIRONMENTAL PROBLEMS ALL CRITICAL DATA CATEGORY RANKING UNITS (CONTINUED)

HPI Group	Ranking Unit Name	Site Name	Environmental Management Area	Critical Data Category
0	Site 300-Groundwater Contamination from Landfills	Lawrence Livermore	Inactive Sites and Releases	B
0	Past Releases from HP Tanks	Pinellas	Inactive Sites and Releases	C
0	Soil Contamination by Hazardous Chemicals	NTS	Inactive Sites and Releases	B
0	Tunnel Ponds	NTS	Liquid Discharges	B
0	Subsurface Soil Contamination	NTS	Inactive Sites and Releases	C
0	Site 300-Groundwater Contamination from 834 Complex	Lawrence Livermore	Inactive Sites and Releases	B
0	Sediment Contamination from Outfalls	LANL	Liquid Discharges	B
0	Inactive Liquid Disposal Areas	SNL	Inactive Sites and Releases	B
0	Solid Waste Disposal Sites in the Vicinity of the 100 Area	Hanford	Inactive Sites and Releases/Active Waste Management	C
0	Solid Waste Disposal Sites in the Vicinity of the 300/400 Areas	Hanford	Inactive Sites and Releases/Active Waste Management	C
0	Herbicide Disposal in Inactive Waste Site	Hanford	Inactive Sites and Releases	C
0	Solid Waste Disposal Sites in the Vicinity of the 200 Area	Hanford	Inactive Sites and Releases/Active Waste Management	C
0	F and H Areas Miscellaneous Radioactive Surface Contamination	Savannah River	Inactive Sites and Releases	C
0	Radionuclide Sediment Contamination in Water and Ancho Canyons	LANL	Inactive Sites and Releases	C
0	Area P	LANL	Inactive Sites and Releases	B
0	PCBs in Subsurface Soils	Kansas City	Inactive Sites and Releases	B
0	Former Fire Extinguisher Training Area	Sandia Livermore	Inactive Sites and Releases	C

A - Monitored or Measured Data; B - Moderate Amount of Assumptions; C - Significant Amount of Assumptions

TABLE 2.1

RANKING OF EXISTING OR SUSPECTED ENVIRONMENTAL PROBLEMS
ALL CRITICAL DATA CATEGORY RANKING UNITS (CONTINUED)

HPI Group	Ranking Unit Name	Site Name	Environmental Management Area	Critical Data Category
0	Radioactive Burial Grounds	SNL	Active Waste Management	B
0	A and M Areas Miscellaneous Radioactive Surface Contamination	Savannah River	Inactive Sites and Releases	C
0	Site 300-HE Process Wastewater Lagoons	Lawrence Livermore	Inactive Sites and Releases	C
0	ITRI Hot Ponds	SNL	Liquid Discharges/Active Waste Management	B
0	Radioactively Contaminated Soils at Tonopah	SNL	Inactive Sites and Releases	A
0	Site 300-PCB Contamination from Landfill 6	Lawrence Livermore	Inactive Sites and Releases	B
0	Inactive Solid Disposal Areas	SNL	Inactive Sites and Releases	B
0	Classified Burial Trenches	Kansas City	Inactive Sites and Releases	C
0	Past Leaks from Single Shell Tanks	Hanford	Inactive Sites and Releases	A
0	Landfills	Pantex	Inactive Sites and Releases	A
0	Fuel Spill-Desert Rock Airstrip	NTS	Inactive Sites and Releases	A
0	Inactive ITRI Sewage Lagoon	SNL	Inactive Sites and Releases	B
0	Chromium Lagoon	Portsmouth	Active Waste Management	A
0	L and P Areas Miscellaneous Radioactive Surface Contamination	Savannah River	Inactive Sites and Releases	C

A - Monitored or Measured Data; B - Moderate Amount of Assumptions; C - Significant Amount of Assumptions

impact of some of these actions has not been reflected in the rankings since the actions identified by the sites have not yet been reviewed by the Survey. However, where a review of data pertaining to these actions was conducted by the Survey, such data were included in the ranking. In all cases, the remedial actions identified by the sites are included in the discussions of the ranking units in Appendix A.

Two ranking units (one percent) represent environmental problems that rank in HPI Groups of the most concern based upon public hazard potential (see Table 1.2). These ranking units include Rocky Flats' VOCs in Groundwater and Pantex's Known Liquid Releases. The highest ranked ranking unit, Rocky Flats' VOCs in Groundwater, has a high degree of uncertainty associated with it, while the other ranking unit is associated with a moderate degree of uncertainty.

Rocky Flats' VOCs in Groundwater represents measured concentrations of VOCs identified in the groundwater. There are several possible sources of the VOCs; however, at this time there are insufficient data to point to one clear source of the contamination. Since a full characterization of this problem has not been performed, contaminant isopleths and other such information were not available. Therefore, maximum measured concentrations were used to model this ranking unit. Thus, this ranking could represent a conservative estimate of the potential effects. The score for this ranking unit is driven by tetrachloroethylene and results from potential migration to Standley Lake, which is used for crop irrigation, animal drinking water, and domestic usage.

Several releases of liquids have occurred at Pantex. The largest known liquid release is the result of the use of an unlined waste pit at Pantex for the disposal of waste solvents during the 1954 to 1980 period. In the Environmental Survey Preliminary Report, calculations were made of the potential quantities and types of solvents disposed of during this period. The quantities and types of solvents result in the potential for contaminants to reach groundwater. The toxicity of dimethylformamide and the extensive use of groundwater for irrigation and livestock result in the high score for the ranking unit. Acetone also scores high for this ranking unit.

Twenty-six ranking units (18 percent) fall in the secondary level of concern based upon public hazard potential. Fourteen of these ranking units are associated with a

moderate degree of uncertainty, while 10 are associated with a low degree of uncertainty. Only two ranking units are associated with a high degree of uncertainty.

The majority of these ranking units involve both active waste management and liquid discharges and include almost half of all the ranking units involving these environmental management areas. These ranking units rank relatively high because of the presence of significant amounts of liquids to aid contaminant transport whether the discharge is to groundwater or directly to surface water.

Thirty-four ranking units (23 percent) fall in the tertiary level of concern based upon public hazard potential. These ranking units thus are scoring around that risk range at which regulatory decisions are based. Some of the ranking units in this group result in scores below this level, others are likely to be just above this point. The size of the population that has the potential to be impacted does affect results in otherwise low risk ranking units being included in this group.

Eighty-six of the ranking units (58 percent) fall in the HPI Groups of 3 and below, indicating that the potential impacts to receptors are below levels on which regulatory decisions are generally based. Of these, 53 ranking units result in HPI Group 0, indicating no viable pathway to receptors resulted. A variety of reasons account for these scores. In some instances, the inventory of contaminants is too small to reach receptors. In others, the properties of the contaminants, particularly mobility, are such that significant migration is not predicted. Most frequently, the environmental conditions at the site minimize contaminant transport. This latter condition explains the result at those sites where the largest percentage of the site's ranking units are in these categories. At the Nevada Test Site (NTS), all six ranking units score in HPI Group 0. At SNL and LANL, six of the 11 ranking units and seven of the ten ranking units, respectively, score in that HPI Group. The low scores at these three sites generally reflect the depth to groundwater and the arid conditions.

This report represents the first test of the ranking system on a wide scale. As such, it was expected that some anomalous rankings would surface that could not be explained by the Survey or by any of the measures discussed above. After reviewing all appropriate data and the limitations of the model, seven of the ranking units addressed in this report obtained scores and related rankings that were not

consistent with the Survey perspective of the problems and the basis for the inconsistency has not been determined. These seven ranking units represent only three percent of the 208 ranking units included within this report (in addition to the seven, this includes 148 from this section, 46 from Section 3, and seven from Section 4), thereby implying that the system performed well in the overall test. However, for those seven the inconsistent nature of the resulting ranking, given the Survey's perspective of the issues, suggests additional analysis is justified prior to determining their relative ranking. Further analysis is being conducted on these problems and their relative ranking will be determined in the final Environmental Survey Summary Report.

In general, these problems all ranked high in the relative ranking. The Survey felt that these ranking units constituted environmental problems deserving attention in the long-range planning. However, the scores that these ranking units received in the ranking were inconsistent with the general assessments of the Survey.

The seven ranking units include:

- SRP Tritium Air Sources;
- SRP Unplanned Releases of Tritium;
- SRP Tritium in Surface Water;
- Y-12 Bear Creek Valley Waste Disposal Area;
- Y-12 Coal Ash Retention Pond/Rogers Quarry;
- Fernald Releases from K-65 Silos; and
- LANL Contamination at the Firing Sites.

The three SRP ranking units all rank in HPI Group 7. This group is characterized as including ranking units driven by large populations with moderate concentrations and/or toxicity of the contaminants. These SRP ranking units do have large potential receptor populations. However, they result in low, not moderate, individual doses. In fact, the doses appear to be well within the regulatory limits for radionuclides. This last fact would suggest a ranking closer to HPI Group 3, which is characterized as reaching receptors at levels well below those used in regulatory decisions. A more thorough analysis of these ranking units is warranted to determine why they are resulting in the relatively high scores that they produce.

The two Y-12 ranking units both score in HPI Group 8. The scores for both ranking units are based upon potential for arsenic contamination of surface water bodies. However, the measured concentrations of arsenic in the surface and groundwaters at the sites are low (underlying Bear Creek, measured concentrations are at 2.3 ppm in groundwater, while for the Coal Ash Retention Pond, levels of 0.1 to 0.3 ppm in surface water were used). Arsenic seems to be dominating the scoring due to the high cancer potency factor used by EPA. EPA has proposed lowering this factor. However, until that proposal is finalized, this ranking unit will rely upon EPA's existing factors. The Survey feels that both of these ranking units, particularly Bear Creek, are important, but that arsenic should not be considered the most important aspect of the ranking. For these ranking units, a more thorough analysis is warranted to determine why arsenic rather than a number of other contaminants dominated the scoring.

The Fernald ranking unit scores in HPI Group 8. The score is dominated by assumptions used in the calculation of radon development and dispersion. In addition, subsequent to the Survey's on-site visit to Fernald, actions have been taken by the site that should lower the amount released. The Survey has not evaluated the effectiveness of these actions; therefore, the scoring does not take the effect of these actions into account. The Survey feels that an evaluation of the effectiveness of the completed remedial action coupled with a more in-depth review of the assumptions used in the modeling would result in a lower, more realistic, ranking for this ranking unit. A lower ranking would be closer to the Survey's perspective of the significance of this ranking unit.

The LANL ranking unit scores in HPI Group 6. This group is characterized by large populations with moderate concentrations of contaminants. In actuality, the measured concentrations of the contaminants of concern, rather than constituting moderate concentrations, are below detection limits. The Survey feels that the ranking unit should be ranked significantly lower than the modeling results demonstrate. It is likely that the problem was modeled with an excessively high source of contamination. Due to a lack of data, this ranking unit was modeled using information on only one of the 88 active and inactive firing sites at LANL. The firing site for which the data were available is the most heavily used and is expected to represent the most significant contaminated firing site at LANL. In recognition of the paucity of data on LANL firing sites, the Survey has a significant sampling

program underway for this ranking unit. The final Summary Report will have the benefit of those sampling results.

The top rankings reflect a wide variety of conditions identified by the Survey throughout DOE's Defense Program (DP) complex. These top rankings include environmental problems in a wide range of Environmental Management Areas. Rather than being concentrated at one or two of DOE's sites, they are dispersed over a large number of sites. They also include both problems which are well-known and well-characterized (critical data category "A") and others which have only recently been identified and, therefore, are not well-characterized (critical data category "C"). For these latter problems, a significant number of assumptions were used in the ranking. Since these assumptions generally are conservative, this could have the effect of raising their rankings somewhat higher than may actually be warranted.

2.1.2 Ranking Units With the Lowest Uncertainty

Critical data category "A" encompasses those ranking units for which the lowest uncertainty is associated with the data. These ranking units were modeled using measured or monitored data pertaining to those data parameters for which the modeling of the ranking unit is most sensitive. Ranking units included within this list are typically either subjects of intensive past or present investigations, or are in geographic areas where physical environmental features of the problem are such that confidence in the model's transport and exposure results is high. Thus, ranking units included within this category generally are close to the point where remedial action decisions can be reached.

There are 34 ranking units that are considered to have sufficient data to be included within this category (see Table 2.2). The scores for these ranking units range from HPI Group 7 to HPI Group 0 (refer to Section 1.7.4). The majority of these ranking units involve environmental problems that present a secondary level of concern from the potential public hazard perspective, while the rest of the ranking units involve environmental problems that represent lesser levels of concern.

The 10 ranking units at Savannah River Plant (SRP) included in this critical data category range from seepage basins that receive radioactive process wastewaters to

TABLE 2.2

RANKING OF EXISTING OR SUSPECTED ENVIRONMENTAL PROBLEMS
CRITICAL DATA CATEGORY "A" RANKING UNITS[1]

Ranking Unit Name	Site Name	Environmental Management Area	HPI Group
Active Percolation Ponds at ICPP and TRA	INEL	Liquid Discharges/Active Waste Management	7
M Area Settling Basin	Savannah River	Liquid Discharges/Active Waste Management	7
Burial Grounds	Savannah River	Active Waste Management	6
Coal Pile Runoff	Portsmouth	Liquid Discharges	6
Process Water Discharges	Y-12	Liquid Discharges	6
Airborne Releases	Fernald	Air Emissions	6
Unscheduled Air Releases	Portsmouth	Air Emissions	6
Active Seepage Basins	Savannah River	Liquid Discharges/Active Waste Management	6
On-Site Mercury Contamination	Y-12	Inactive Sites and Releases	6
Diesel Fuel Tank Area	Sandia Livermore	Inactive Sites and Releases	6
Inactive Injection Wells at TRA and ICPP	INEL	Inactive Sites and Releases	5
Off-site Direct Radiation	Fernald	Direct Radiation	5
H Area Drainage Ditch	Savannah River	Liquid Discharges	4
Carbon Tetrachloride Emissions from the Z-Plant	Hanford	Air Emissions	4
Perchloroethylene Emissions	Fernald	Air Emissions	4
Active Percolation Ponds and Ditches at ANL-West	INEL	Liquid Discharges/Active Waste Management	4
Other Active Percolation Ponds	INEL	Active Waste Management	4

1 Category "A" ranking units are judged to have the lowest factor of uncertainty (i.e., highest confidence level) associated with the calculated HPI.

TABLE 2.2

RANKING OF EXISTING OR SUSPECTED ENVIRONMENTAL PROBLEMS CRITICAL DATA CATEGORY "A" RANKING UNITS[1] (CONTINUED)

Ranking Unit Name	Site Name	Environmental Management Area	HPI Group
Inactive Gravel Pits at ICPP	INEL	Inactive Sites and Releases	4
Technetium Air Releases	Portsmouth	Air Emissions	4
Air Impacts from ICPP Stacks	INEL	Air Emissions	3
A and M Areas Nonradioactive Pits and Piles	Savannah River	Inactive Sites and Releases	3
New TNX Basin	Savannah River	Liquid Discharges/Active Waste Management	3
Significant Petroleum Spills	INEL	Inactive Sites and Releases	3
C, F, H, and CS Areas Nonradioactive Pits and Piles	Savannah River	Inactive Sites and Releases	3
UNC Site	Y-12	Inactive Sites and Releases	1
K, L, P, and R Areas Nonradioactive Pits and Piles	Savannah River	Inactive Sites and Releases	1
Old TNX Basin	Savannah River	Inactive Sites and Releases	1
D and TNX Areas Nonradioactive Pits and Piles	Savannah River	Inactive Sites and Releases	0
Significant Spills Involving Metals	INEL	Inactive Sites and Releases	0
Radioactively Contaminated Soils at Tonopah	SNL	Inactive Sites and Releases	0
Past Leaks from Single Shell Tanks	Hanford	Inactive Sites and Releases	0
Landfills	Pantex	Inactive Sites and Releases	0
Fuel Spill-Desert Rock Airstrip	NTS	Inactive Sites and Releases	0
Chromium Lagoon	Portsmouth	Active Waste Management	0

[1] Category "A" ranking units are judged to have the lowest factor of uncertainty (i.e., highest confidence level) associated with the calculated HPI.

landfills that receive nonradioactive and radioactive solid wastes, while the majority of the ranking units at Idaho National Engineering Laboratory (INEL) are percolation ponds that receive liquid wastes containing organic, inorganic, and radioactive contaminants. Two of Portsmouth's four ranking units in this critical data category focused on air releases, while the other two ranking units, Coal Pile Runoff and Chromium Lagoon, focus on potential groundwater releases.

2.1.3 Ranking Units with Moderate Uncertainty

Critical data category "B" encompasses those ranking units for which a moderate amount of uncertainty is associated with the ranking. These ranking units were modeled using a moderate number of assumptions with regard to the critical data parameters. These assumptions generally involved manipulation of available data to make the data fulfill the model's needs. Ranking units within this list have typically had some associated sampling but would require additional characterization studies prior to reaching remedial action decisions.

There are 76 ranking units that are considered to have a moderate amount of uncertainty associated with the scores (see Table 2.3). The scores for these ranking units range from HPI Group 8 to HPI Group 0. The majority of these ranking units involve environmental problems that either represent a tertiary level of concern from the potential public hazard perspective or environmental problems that are not projected to reach receptors.

The nine Lawrence Livermore National Laboratory (LLNL) and eight Sandia National Laboratories (SNL) ranking units included in this critical data category all focus on the potential for groundwater contamination. Y-12 Plant's eight ranking units range from the potential for tank leakage in Underground Storage Tanks for Non-Waste Toxic and Hazardous Substances to the potential for PCB-contaminated soils in Soil Contamination in the Main Plant Area. Five of Mound's seven ranking units included in this critical data category represent radioactively contaminated soils, while a sixth, SM/PP Hill Drum Storage Area, represents organic and inorganic contamination of soils. A seventh Mound ranking unit, Hazardous Air Emissions-Vents, represents an air release.

TABLE 2.3

RANKING OF EXISTING OR SUSPECTED ENVIRONMENTAL PROBLEMS CRITICAL DATA CATEGORY "B" RANKING UNITS[1]

Ranking Unit Name	Site Name	Environmental Management Area	HPI Group
Known Liquid Releases	Pantex	Inactive Sites and Releases	8
Groundwater Contamination in Southeast Corner	Lawrence Livermore	Inactive Sites and Releases	7
Chromium Air Releases	Portsmouth	Air Emissions	7
Inactive Liquid Process Discharges in the 200 Area	Hanford	Inactive Sites and Releases	7
Off-site Floodplain Contamination in East Fork Poplar Creek and Bear Creek	Y-12	Inactive Sites and Releases	7
Toxic Discharge to Technical Area 1 Sewers	SNL	Liquid Discharges	7
Active Liquid Process Discharges in the 100 Area	Hanford	Liquid Discharges/Active Waste Management	7
Volatile Organics and Radionuclides Released to Groundwater at RWMC	INEL	Inactive Sites and Releases	7
Ditches	Pantex	Liquid Discharges	7
Inactive Liquid Process Discharges in the 300 Area	Hanford	Inactive Sites and Releases	6
Playas	Pantex	Liquid Discharges	6
Inactive Liquid Process Discharges in the 100 Area	Hanford	Inactive Sites and Releases	6

[1] Category "B" ranking units are judged to have a moderate amount of uncertainty associated with the calculated HPI.

TABLE 2.3

RANKING OF EXISTING OR SUSPECTED ENVIRONMENTAL PROBLEMS
CRITICAL DATA CATEGORY "B" RANKING UNITS[1] (CONTINUED)

Ranking Unit Name	Site Name	Environmental Management Area	HPI Group
Contamination from Liquid Discharges	Fernald	Liquid Discharges	6
Contaminant Release from Waste Pits	Fernald	Inactive Sites and Releases/Active Waste Management	6
Sediments in Steel Creek Corridor	Savannah River	Liquid Discharges	6
Active Liquid Process Discharges in the 300 Area	Hanford	Liquid Discharges/Active Waste Management	5
Solar Evaporation Ponds	Rocky Flats	Inactive Sites and Releases	5
Groundwater Contamination from East Traffic Circle Landfill	Lawrence Livermore	Inactive Sites and Releases	5
Underground Storage Tanks for Non-Waste Toxic and Hazardous Substances	Y-12	Inactive Sites and Releases	5
Groundwater Contamination at Southwest Area	Lawrence Livermore	Inactive Sites and Releases	5
Animal Contamination	Savannah River	Inactive Sites and Releases	5
Groundwater Contamination from Taxi Strip and Old Salvage Yard	Lawrence Livermore	Inactive Sites and Releases	5
Soil Contamination in the Canal	Mound	Inactive Sites and Releases	5
Hazardous Air Emissions - Vents	Mound	Air Emissions	5
Active Liquid Process Discharges in the 200 Area	Hanford	Liquid Discharges/Active Waste Management	5
Gasoline Spill at Building 403	Lawrence Livermore	Inactive Sites and Releases	5
Soil Contamination in Area S-1	Mound	Inactive Sites and Releases	5

1 Category "B" ranking units are judged to have a moderate amount of uncertainty associated with the calculated HPI.

TABLE 2.3

RANKING OF EXISTING OR SUSPECTED ENVIRONMENTAL PROBLEMS CRITICAL DATA CATEGORY "B" RANKING UNITS[1] (CONTINUED)

Ranking Unit Name	Site Name	Environmental Management Area	HPI Group
903 Pad/Plutonium in Soils	Rocky Flats	Inactive Sites and Releases	5
Groundwater Contamination in the Main Y-12 Plant Area	Y-12	Inactive Sites and Releases	4
Release of PCBs, Metals, and Organics to the Environment	Kansas City	Inactive Sites and Releases	4
Chestnut Ridge Sediment Disposal Basin	Y-12	Active Waste Management	4
Chestnut Ridge Security Pits	Y-12	Active Waste Management	4
Soil Contamination in the Valley Locations	Mound	Inactive Sites and Releases	4
Airborne Mercury Releases	Savannah River	Air Emissions	4
Soil Contamination on the SM/PP Hill	Mound	Inactive Sites and Releases	4
Septic Tank Discharges from Area 3 at Tonopah	SNL	Liquid Discharges	4
Savannah River Swamp	Savannah River	Direct Radiation	3
Northeast Area	Kansas City	Inactive Sites and Releases	3
PCB Release	Pantex	Inactive Sites and Releases	3
Hydrogen Fluoride Emissions	Y-12	Air Emissions	3
Old Railroad Dock	Kansas City	Inactive Sites and Releases	2
Soil Contamination Areas at Tonopah	SNL	Inactive Sites and Releases	2
TCE in Drinking Water Well	INEL	Inactive Sites and Releases	2
East Central Area Inactive Sites	Portsmouth	Inactive Sites and Releases	2
Unsaturated Zone Inactive Injection Wells at PBF	INEL	Inactive Sites and Releases	2
Soil Contamination in Area S-7	Mound	Inactive Sites and Releases	2

[1] Category "B" ranking units are judged to have a moderate amount of uncertainty associated with the calculated HPI.

TABLE 2.3

RANKING OF EXISTING OR SUSPECTED ENVIRONMENTAL PROBLEMS CRITICAL DATA CATEGORY "B" RANKING UNITS[1] (CONTINUED)

Ranking Unit Name	Site Name	Environmental Management Area	HPI Group
Underground Storage Tanks	Kansas City	Inactive Sites and Releases	2
South Area Inactive Sites	Portsmouth	Inactive Sites and Releases	2
Dust and Smoke Emissions	Y-12	Air Emissions	1
Former Liquid Disposal	LANL	Inactive Sites and Releases	1
1,1,1-Trichloroethane Release from M Area	Savannah River	Air Emissions	1
100 N Area Spills	Hanford	Inactive Sites and Releases	1
North Area Inactive Sites	Portsmouth	Inactive Sites and Releases	1
SM/PP Hill Drum Storage Area	Mound	Inactive Sites and Releases	0
Underground Tank Farm	Kansas City	Inactive Sites and Releases	0
Soil Contamination in the Main Plant Area	Y-12	Inactive Sites and Releases	0
Contamination of Soils with Radionuclides	NTS	Inactive Sites and Releases	0
Fluoride Emissions	Pantex	Air Emissions	0
Closed Landfills and Burn Pits	LANL	Inactive Sites and Releases	0
Inactive CFA Landfills and Lead Storage Areas	INEL	Inactive Sites and Releases	0
Integrity of Sanitary Sewer Systems	Lawrence Livermore	Liquid Discharges	0
Near Surface Soil Contamination from Waste and Wastewater Disposal Practices	NTS	Liquid Discharges	0

1 Category "B" ranking units are judged to have a moderate amount of uncertainty associated with the calculated HPI.

TABLE 2.3

RANKING OF EXISTING OR SUSPECTED ENVIRONMENTAL PROBLEMS CRITICAL DATA CATEGORY "B" RANKING UNITS[1] (CONTINUED)

Ranking Unit Name	Site Name	Environmental Management Area	HPI Group
Potential Leaks from Abandoned or Removed Underground Storage Tanks	LANL	Inactive Sites and Releases	0
Site 300-Groundwater Contamination from Landfills	Lawrence Livermore	Inactive Sites and Releases	0
Soil Contamination by Hazardous Chemicals	NTS	Inactive Sites and Releases	0
Tunnel Ponds	NTS	Liquid Discharges	0
Site 300-Groundwater Contamination from 834 Complex	Lawrence Livermore	Inactive Sites and Releases	0
Sediment Contamination from Outfalls	LANL	Liquid Discharges	0
Inactive Liquid Disposal Areas	SNL	Inactive Sites and Releases	0
Area P	LANL	Inactive Sites and Releases	0
PCBs in Subsurface Soils	Kansas City	Inactive Sites and Releases	0
Radioactive Burial Grounds	SNL	Active Waste Management	0
ITRI Hot Ponds	SNL	Liquid Discharges/Active Waste Management	0
Site 300-PCB Contamination from Landfill 6	Lawrence Livermore	Inactive Sites and Releases	0
Inactive Solid Disposal Areas	SNL	Inactive Sites and Releases	0
Inactive ITRI Sewage Lagoon	SNL	Inactive Sites and Releases	0

1 Category "B" ranking units are judged to have a moderate amount of uncertainty associated with the calculated HPI.

2.1.4 Ranking Units with High Uncertainty

Critical data category "C" encompasses those ranking units for which a high degree of uncertainty is associated with the ranking. The parameters that dominate the ranking for these ranking units are based on assumptions, since few or no data were available. In the views of the Survey, these assumptions were realistic but conservative. In other words, these assumptions were based upon an understanding of the site, its processes, and the particular problems included in the ranking unit. However, to account for the unknowns, these assumptions tended to the high side of possible values for the critical parameters. Therefore, these scores can be viewed as representing the highest the ranking unit can score based upon the information currently available. Thus, it is conceivable that additional sampling on these problems may result in reduced scores. Ranking units in this critical data category, therefore, are closer to the point where decisions concerning further investigations, rather than remedial actions, are warranted.

There are 38 ranking units within this category (see Table 2.4). The scores for these ranking units range from HPI Group 9 to HPI Group 0. The majority of these ranking units involve environmental problems that are not projected to reach receptors or are characterized as generally reaching receptors at levels below those used in regulatory decisions.

Three of the SRP ranking units included in this critical data category are aggregations of radioactive surface contamination sites, and three of the Hanford ranking units are aggregations of solid waste disposal sites which received hazardous and radioactive solid waste. Pantex's Depleted Uranium Contamination Sites and Firing Site 15 ranking units also focused on radioactively contaminated soils, while Los Alamos National Laboratory's (LANL's) Contamination from TA-54 Active Waste Management Units represented potential groundwater contamination from hazardous organic waste.

2.2 Site Rankings of Existing and Suspected Environmental Problems

The top scores in the ranking are dispersed over a large number of sites. Of the 16 sites included in the ranking, 13 have ranking units in those HPI Groups that constitute the primary and secondary level of concern from a potential public health

TABLE 2.4

RANKING OF EXISTING OR SUSPECTED ENVIRONMENTAL PROBLEMS CRITICAL DATA CATEGORY "C" RANKING UNITS[1]

Ranking Unit Name	Site Name	Environmental Management Area	HPI Group
VOCs in Groundwater	Rocky Flats	Inactive Sites and Releases	9
Eastern Sites	Pinellas	Inactive Sites and Releases	6
Emissions of VOCs to the Atmosphere	Kansas City	Air Emissions	6
4.5 Acre Site	Pinellas	Inactive Sites and Releases	5
Inactive Leach Pit	Mound	Inactive Sites and Releases	5
Inactive Fly-Ash Pile	Fernald	Inactive Sites and Releases	4
Past Releases from Inactive Underground Storage Tanks	Pinellas	Inactive Sites and Releases	4
Depleted Uranium Contamination Sites	Pantex	Inactive Sites and Releases	3
Firing Site 15	Pantex	Inactive Sites and Releases	3
Liquid Spills and Discharges	SNL	Inactive Sites and Releases	3
Pesticide Shed	Rocky Flats	Inactive Sites and Releases	3
ITRI Active Lagoons	SNL	Liquid Discharges/Active Waste Management	3
Tritium Contamination in the Main Hill Groundwater	Mound	Inactive Sites and Releases	2
TA-1	LANL	Inactive Sites and Releases	2
Contaminated Surface Soils - Accessible	Pantex	Inactive Sites and Releases	2
Contamination from TA-54 Active Waste Management Units	LANL	Active Waste Management	0

[1] Category "C" ranking units are judged to have the highest factor of uncertainty (i.e., the lowest confidence level) associated with the calculated HPI.

TABLE 2.4

RANKING OF EXISTING OR SUSPECTED ENVIRONMENTAL PROBLEMS CRITICAL DATA CATEGORY "C" RANKING UNITS[1] (CONTINUED)

Ranking Unit Name	Site Name	Environmental Management Area	HPI Group
Asbestos	Pantex	Asbestos	0
Southeast Parking Lot	Kansas City	Inactive Sites and Releases	0
Western Sites	Pinellas	Inactive Sites and Releases	0
Contaminated Surface Soils - Not Accessible	Pantex	Inactive Sites and Releases	0
Abandoned Process Wastewater Collection System	Rocky Flats	Inactive Sites and Releases	0
Elevated Levels of Arsenic in Groundwater	Kansas City	Inactive Sites and Releases	0
Surface Contamination due to Intrusion into Buried Waste	Hanford	Inactive Sites and Releases	0
Past Liquid Releases	LANL	Inactive Sites and Releases	0
Sanitary Sludge Lagoon	Savannah River	Active Waste Management	0
Past Releases from HP Tanks	Pinellas	Inactive Sites and Releases	0
Subsurface Soil Contamination	NTS	Inactive Sites and Releases	0
Solid Waste Disposal Sites in the Vicinity of the 100 Area	Hanford	Inactive Sites and Releases/Active Waste Management	0
Solid Waste Disposal Sites in the Vicinity of the 300/400 Areas	Hanford	Inactive Sites and Releases/Active Waste Management	0
Herbicide Disposal in Inactive Waste Site	Hanford	Inactive Sites and Releases	0
Solid Waste Disposal Sites in the Vicinity of the 200 Area	Hanford	Inactive Sites and Releases/Active Waste Management	0
F and H Areas Miscellaneous Radioactive Surface Contamination	Savannah River	Inactive Sites and Releases	0

1 Category "C" ranking units are judged to have the highest factor of uncertainty (i.e., the lowest confidence level) associated with the calculated HPI.

TABLE 2.4

RANKING OF EXISTING OR SUSPECTED ENVIRONMENTAL PROBLEMS CRITICAL DATA CATEGORY "C" RANKING UNITS[1] (CONTINUED)

Ranking Unit Name	Site Name	Environmental Management Area	HPI Group
Radionuclide Sediment Contamination in Water and Ancho Canyons	LANL	Inactive Sites and Releases	0
Former Fire Extinguisher Training Area	Sandia Livermore	Inactive Sites and Releases	0
A and M Areas Miscellaneous Radioactive Surface Contamination	Savannah River	Inactive Sites and Releases	0
Site 300-HE Process Wastewater Lagoons	Lawrence Livermore	Inactive Sites and Releases	0
Classified Burial Trenches	Kansas City	Inactive Sites and Releases	0
L and P Areas Miscellaneous Radioactive Surface Contamination	Savannah River	Inactive Sites and Releases	0

1 Category "C" ranking units are judged to have the highest factor of uncertainty (i.e., the lowest confidence level) associated with the calculated HPI.

hazard perspective. The remainder of this section discusses the results of the Environmental Survey on a site-by-site basis.

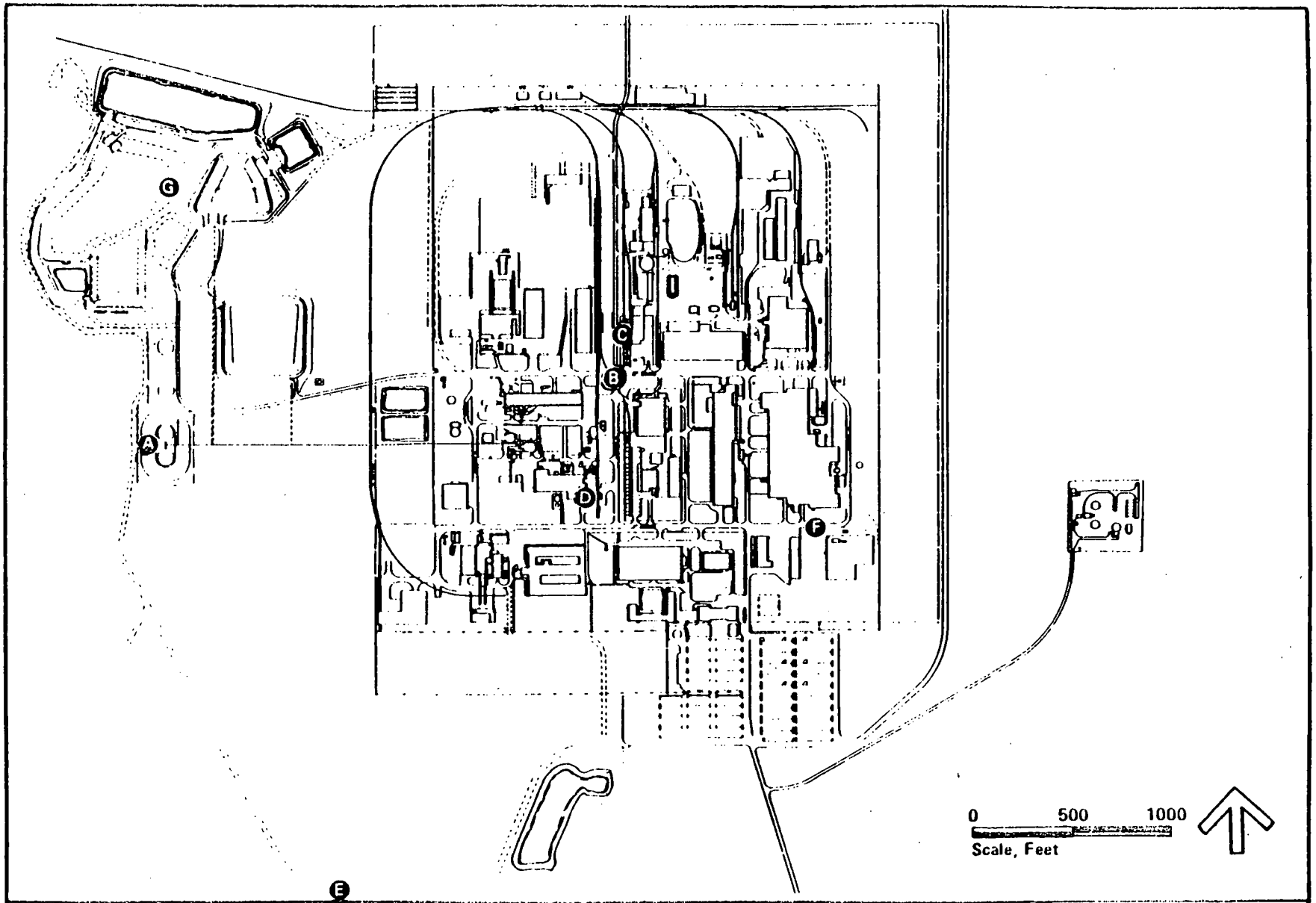
2.2.1 Feed Materials Production Center (Fernald)

The Feed Materials Production Center (FMPC) is located in the southwest corner of Ohio, approximately 20 miles northwest of the City of Cincinnati. The plant occupies approximately 136 acres of the total 1,050-acre site. Fernald produces cast and machined uranium-235 products and fabricates target fuel for DOE reactors. This facility has been in operation for 35 years.

The prevailing winds in the area of FMPC are from the south-southwest. The soil is made up chiefly of various types of silt loams. The important underlying geologic layers (from the surface down) are glacial till, glacial outwash deposits, and bedrock. Although some perched water exists within the till, the major aquifer is in the outwash deposits (Buried Valley aquifer). This aquifer, which lies from 30 to 50 feet from the surface, flows to the south and east, toward the Great Miami River. The other surface water body in the area of FMPC is Paddys Run, which intersects the Great Miami River two miles south of the site. The latter flows generally to the southwest, eventually joining the Ohio River.

Included in the Preliminary Report for FMPC are 46 Category II and III findings. Nineteen of these findings were not ranked with the risk-based model. Four which dealt with issues of data quality and five compliance or management issues were beyond the focus of the prioritization. One finding dealt with an environmental problem which MEPAS cannot rank, relatively high pulmonary doses. This problem was addressed in the Integration Phase of the ranking. Finally, nine findings were not ranked pending the results of the Survey's Sampling and Analysis Program. The remaining 27 findings are grouped into 12 ranking units and evaluated using MEPAS. These ranking units, located on Figure 2.2, are as follows:

RANKING UNIT NAME	LOCATION ON MAP
• Releases from K-65 Silos	A
• Contamination from Liquid Discharges	F
• Off-site Direct Radiation	B



APPROXIMATE LOCATIONS OF
RANKING UNITS FOR
FEED MATERIALS PRODUCTION CENTER
(FERNALD)

FIGURE 2.2

• Airborne Releases	B
• Inactive Fly Ash Pile	E
• Perchloroethylene Emissions	B
• Contaminant Release from Waste Pits	G
• Potential Future Releases of Thorium	D
• Potential for Leaks from Underground Storage Tanks	B
• Tank Farm Spill Containment	C
• Potential Releases from Anhydrous Hydrogen Fluoride Tanks	C
• Potential for Future Leaks from Waste Drums	B

Of the 12 ranking units from the FMPC Survey, five represent situations that could lead to the potential for future environmental problems and are not discussed in this section of the report (see Section 3). These five ranking units include the potential for an uncontained release from the tank farm, potential leaks from underground storage tanks, future releases of thorium, potential for releases from the anhydrous hydrogen fluoride tanks, and future leaks from waste drums. The remaining seven ranking units represent existing or suspected environmental problems and are discussed in this section of the report.

Table 2.5 presents the FMPC ranking units that are existing or suspected environmental problems. The FMPC's ranking unit scores range from HPI Group 8 to HPI Group 4. The highest score in the table (three in HPI Group 6) is due either to inhalation (similar to the result discussed above) or to ingestion, resulting from the radioactivity and the relatively large nearby population. One ranking unit, Off-site Direct Radiation, scores in HPI Group 5 due to direct external exposure to radiation.

The highest scoring ranking unit at FMPC is the ranking unit entitled Releases from K-65 Silos (not included in the ranking tables, see page 2.14). These silos contain large amounts of radium-226, which may be releasing radon gas to the surrounding area. The potential for inhalation of radon gas and its daughter products by the relatively large population in the FMPC area results in the score for this problem. One of the HPI Group 6 ranking units, Airborne Releases, represents stack emissions of several radionuclides, including plutonium-239 and 240, thorium-234,

TABLE 2.5

FEED MATERIALS PRODUCTION CENTER EXISTING OR SUSPECTED ENVIRONMENTAL PROBLEMS

HPI Group	Ranking Unit Name	Environmental Management Area	Critical Data Category
5	Airborne Releases	Air Emissions	A
6	Contamination from Liquid Discharges	Liquid Discharges	B
6	Contaminant Release from Waste Pits	Inactive Sites and Releases/Active Waste Management	B
5	Off-site Direct Radiation	Direct Radiation	A
4	Inactive Fly Ash Pile	Inactive Sites and Releases	C
4	Perchloroethylene Emissions	Air Emissions	A

A - Monitored or Measured Data; B - Moderate Amount of Assumptions; C - Significant Amount of Assumptions

232, and 230, and uranium-233, 234, 235, 236, and 238. This ranking unit scores as a result of the relatively large population.

The two other ranking units which score in HPI Group 6 do so as a result of the ingestion pathway. These ranking units are Contamination from Liquid Discharges, and Contaminant Release from Waste Pits. The Contamination from Liquid Discharges ranking unit represents infiltration and exfiltration of the storm sewer system. Monitoring well and surface water sample data were used to model this ranking unit. The Contaminant Release from Waste Pits ranking unit represents eight waste disposal pits at FMPC. These pits include the clearwell, the burn pit, and waste disposal pits one through six. Both the liquid discharges and waste pits score highest for uranium-238 as a result of the radioactivity of uranium-238 and the size of the population.

A moderate amount of assumptions were made in modeling the FMPC ranking units due to the variability of data availability (see the critical data column of Table 2.5). As an example, there were good data available for radioactive air emissions, while no sampling data were available for suspected PCBs at the inactive fly ash pile. Environmental settings for air, soil, surface water, and subsurface systems remained uniform for FMPC due to the small areal extent of the site.

2.2.2 Hanford Site

The Hanford Site occupies 560 square miles in the southeastern section of the State of Washington near the City of Richland. The primary function of this site is the production of plutonium for national defense. The site includes 10 major operating areas: six 100 Areas (100-B, 100-K, 100-N, 100-D, 100-H and 100-F), two 200 Areas (200 East and 200 West), the 300 Area, and the 400 Area. Nine plutonium production reactors are located in the 100 Areas. N-Reactor is being placed in cold standby. The other eight reactors have been retired and are awaiting decommissioning. Activities in the 200 Areas include processing irradiated fuel, waste management, plutonium and uranium processing, and laboratory research. The 300 Area is devoted primarily to research and development. The 400 Area, five miles from the 300 Area, is principally involved in reactor research. Development and testing, as well as some fabrication, are also conducted to support these and

related operations. Operations have been under way at the Hanford Site since 1944.

The Hanford Site exists in a semiarid environment due to its geographical location in the rainshadow of the Cascade Mountains. The Columbia River bisects the northern end of the site and forms the eastern border, as shown in Figure 2.3. Much of the Hanford Site, particularly along the river, has a very low topographic relief and various species of sagebrush sparsely cover the dry sandy soils. Near the center of the site, a gentle rise in elevation occurs and forms a plateau approximately 7 miles from the river. Two distinctive outcroppings, Gable Mountain and Gable Butte, also exist on the facility with an east-west orientation.

In general, Hanford's climate is characterized by relatively cool, mild winters and long, warm summers. January is the coldest month with an average minimum temperature of 22°F, and July is the warmest month with an average maximum temperature of 92°F. The average precipitation at Hanford is 6.3 inches, about 40 percent of which occurs between November and January. The prevailing regional winds are from the northwest, yet, as is typical of a desert area, strong inversions can occur during the night or at daybreak, which results in unstable conditions.

Included in the Preliminary Report for the Hanford Site are 35 Category II and III findings. Eleven of these findings were not ranked with the risk-based model. Three which dealt with issues of data quality and one compliance or management issue were beyond the focus of the prioritization. Two findings dealt with environmental problems which MEPAS cannot rank, maximum exposed individual and non-chemical pollutants. These two problems were addressed in the Integration Phase of the ranking. Finally, five findings were not ranked pending the results of the Survey's Sampling and Analysis Program. The remaining 24 findings are grouped into 16 ranking units and evaluated using MEPAS. These ranking units, located on Figure 2.3, are as follows:

RANKING UNIT NAME	LOCATION ON MAP
• Inactive Liquid Process Discharges in the 100 Area	C
• Inactive Liquid Process Discharges in the 200 Area	E
• Inactive Liquid Process Discharges in the 300 Area	F

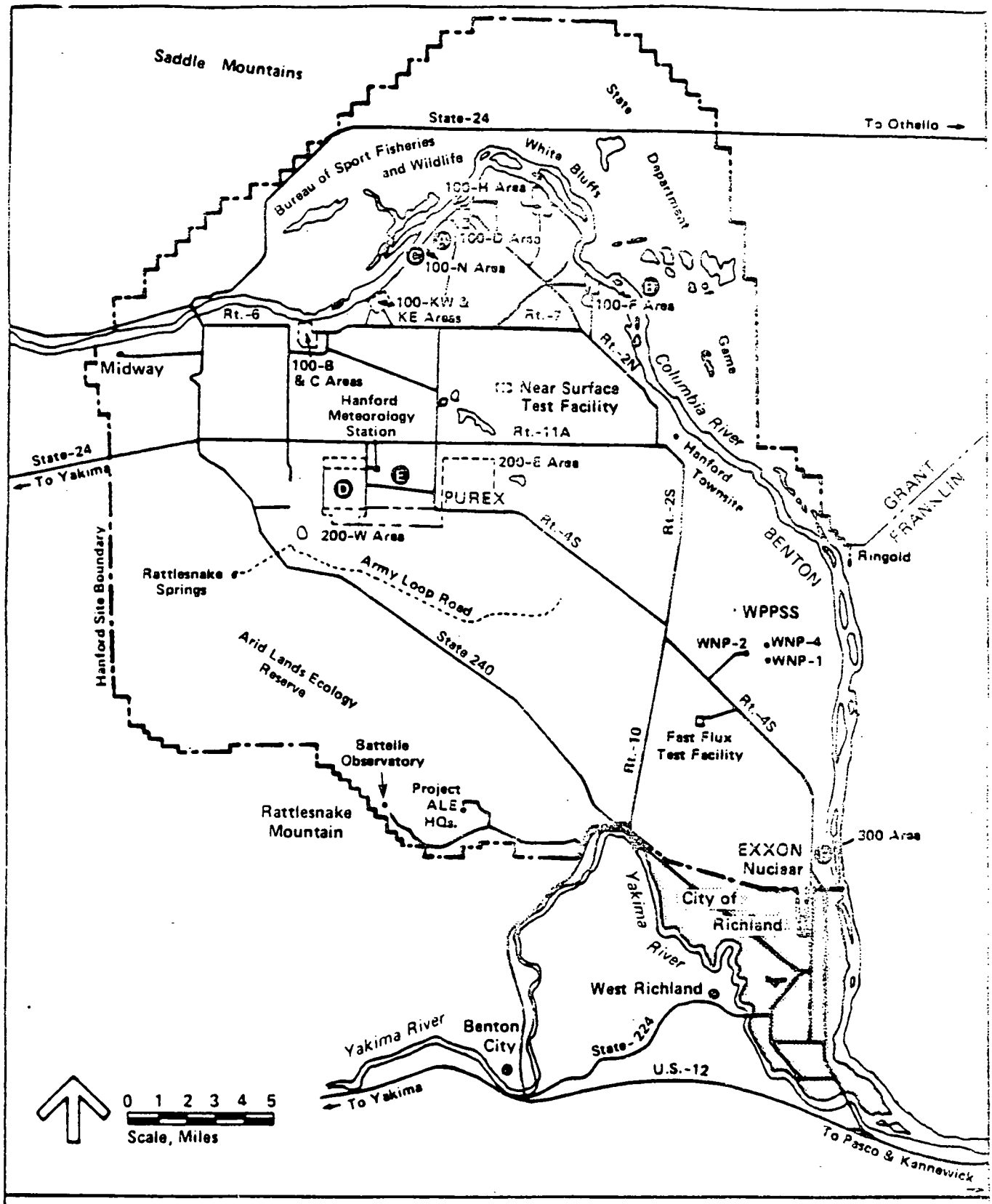


FIGURE 2.3

APPROXIMATE LOCATIONS OF RANKING UNITS FOR HANFORD SITE

• Active Liquid Process Discharges in the 100 Area	C
• Active Liquid Process Discharges in the 200 Area	E
• Active Liquid Process Discharges in the 300 Area	F
• Solid Waste Disposal Sites in the Vicinity of the 100 Area	C
• Solid Waste Disposal Sites in the Vicinity of the 200 Area	E
• Solid Waste Disposal Sites in the Vicinity of the 300/400 Areas	F
• Past Leaks from Single Shell Tanks	E
• 100 N Area Spills	A
• Herbicide Disposal in Inactive Waste Site	B
• Surface Contamination due to Intrusion into Buried Waste	E
• Carbon Tetrachloride Emissions from the Z-Plant	D
• Potential for Future Releases from Single Shell Tanks and Associated Piping	E
• Potential Releases from Aboveground Product Tanks	E

Of the 16 ranking units from the Hanford Site Survey, two represent potential for future environmental problems and are not discussed in this section of the report (see Section 3). These two ranking units involve the potential for future releases from the single shell tanks, and the potential releases from aboveground product tanks. The remaining 14 ranking units represent existing or suspected environmental problems and are discussed in this section of the report.

Table 2.6 presents the Hanford Site ranking units that are existing or suspected environmental problems. Four of the Hanford Site's ranking units score in HPI Groups that represent a secondary level of concern (HPI Groups 6 and 7). Half score in the very low groups (HPI Groups 0 and 1). Those ranking units that score relatively high with the groundwater pathway have large inventories and relatively mobile organics associated with them. In the few cases where radionuclides scored in the moderately high range of the ranking (HPI Groups 6 and 7), they are located where depth to groundwater is relatively shallow. Conversely, the low scores were associated with either small inventories or chemicals which are not very mobile.

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TABLE 2.6

HANFORD SITE
EXISTING OR SUSPECTED ENVIRONMENTAL PROBLEMS

HPI Group	Ranking Unit Name	Environmental Management Area	Critical Data Category
7	Inactive Liquid Process Discharges in the 200 Area	Inactive Sites and Releases	B
7	Active Liquid Process Discharges in the 100 Area	Liquid Discharges/Active Waste Management	B
6	Inactive Liquid Process Discharges in the 300 Area	Inactive Sites and Releases	B
6	Inactive Liquid Process Discharges in the 100 Area	Inactive Sites and Releases	B
5	Active Liquid Process Discharges in the 300 Area	Liquid Discharges/Active Waste Management	B
5	Active Liquid Process Discharges in the 200 Area	Liquid Discharges/Active Waste Management	B
4	Carbon Tetrachloride Emissions from the Z-Plant	Air Emissions	A
1	100 N Area Spills	Inactive Sites and Releases	B
0	Surface Contamination due to Intrusion into Buried Waste	Inactive Sites and Releases	C
0	Solid Waste Disposal Sites in the Vicinity of the 100 Area	Inactive Sites and Releases/Active Waste Management	C
0	Solid Waste Disposal Sites in the Vicinity of the 200 Area	Inactive Sites and Releases/Active Waste Management	C
0	Herbicide Disposal in Inactive Waste Site	Inactive Sites and Releases	C
0	Solid Waste Disposal Sites in the Vicinity of the 300/400 Areas	Inactive Sites and Releases/Active Waste Management	C
0	Past Leaks from Single Shell Tanks	Inactive Sites and Releases	A

A - Monitored or Measured Data; B - Moderate Amount of Assumptions; C - Significant Amount of Assumptions

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Three inactive liquid disposal ranking units are on the upper portion of the Hanford ranking (HPI Groups 7 and 6). Scores for inactive liquid disposal in the 200 Area and the 300 Area, including ponds, cribs and trenches, focus on the organics rather than the radionuclides. This is due to the high mobility of carbon tetrachloride in the 200 Area inactive liquid discharges and of the trichloroethylene in the 300 Area discharges. The 100 Area inactive liquid disposal area ranked for tritium owing to its high mobility and large inventory. It should be noted that some of the treatment and disposal facilities are also in the 600 Area. These are included in the appropriate 100, 200, and 300 Areas for purposes of the Survey.

Active liquid discharges are also in the upper portion of Hanford's ranking (HPI Groups 5 and 7). In the 100 Area, the shallow depth (50 feet) to the aquifer and the size of the inventory involved allows tritium to dominate the score despite the distance to the receptors. In the 200 Area, where the depth to groundwater is greater (280 feet), and the 300 Area where the depth to the aquifer is shallow (50 feet), organics, acetone and trichloroethylene respectively, again drive the ranking.

Six ranking units rank extremely low (HPI Group 0). These six include the ranking units representing the solid waste disposal sites in the 100, 200, and the 300/400 Areas, Herbicide Disposal in Inactive Waste Site, Surface Contamination due to Intrusion into Buried Waste, and Past Leaks from Single Shell Tanks. The chemical constituents were poorly defined. Therefore, the scores for these ranking units may be understated. The remainder score low due to either small inventories (the herbicide and the intrusion into buried waste ranking units) or to low mobility potential for the constituents (single shell tanks).

A large number of assumptions were made for modeling the Hanford Site ranking units due to lack of data on the majority of ranking units (see the critical data column of Table 2.6). In particular, there was a lack of characterization of active wastewater discharges and significant consolidation of data for over 330 inactive sites.

Environmental settings for air, soil, surface water, and subsurface systems at the Hanford Site were separated into three settings each. This was due to the size of the Hanford Site, the geographic separation of the 100, 200, 300/400 Areas, and the difference in distances to the receptors. Air was divided because of the geographic

separation (i.e., 5 to 30 miles between areas) and differing functions at each area. Soil settings were segregated because of geographic distance and different soil characteristics. The 100 and 300/400 Areas consist more of alluvial deposits from the Columbia River and the 200 Area soil of silty sand. Surface water was divided by the distance to receptors (i.e., drinking water supplies for the townships and the site, irrigation supplies, and recreational and fishing activities). Subsurface hydrogeology was separated because of location/geographic areas as well. Contaminant migration time to receptors and surface water recharge points is greater for the 200 Area than that for the 100 and 300/400 Areas. Aquifer flow direction is east toward the Columbia River. In addition to the distances, the depth to groundwater at the 200 Area is greater than at the 100 or 300/400 Areas because the 200 Area is located on a plateau.

2.2.3 Idaho National Engineering Laboratory

The Idaho National Engineering Laboratory (INEL) covers approximately 890 square miles on the Snake River Plain in southeastern Idaho and is located approximately 29 miles west of Idaho Falls, Idaho. The primary mission of the INEL is nuclear reactor research and development and reactor fuel processing. Activities at this installation began in 1949. Most operations are located in eight areas of INEL; the Test Area North (TAN), the Test Reactor Area (TRA), the Central Facilities Area (CFA), the Radioactive Waste Management Complex (RWMC), the Auxiliary Reactor Area (ARA), the Power Burst Facility/Special Power Excursion Reactor Test (PBF/SPERT), the Idaho Chemical Processing Plant (ICPP), and the Argonne National Laboratory-West (ANL-W).

The topography of the INEL site is flat to gently rolling with frequent lava outcrops. The average elevation of the INEL is 5,000 feet above sea level. Annual rainfall at the INEL is light, and the region has semiarid characteristics. The local northeast-southwest orientation of the plain and bordering mountain ranges tends to channel prevailing west winds, so that southwest winds predominate over the INEL; the second most frequent winds come from the northeast. The INEL lies within an area designated as a "sagebrush ecosystem," since 80 percent of the area is covered by sagebrush. The surface water bodies entering the INEL include the Big Lost River, Birch Creek, and Little Lost River, and typically drain the mountain watersheds north and northwest of INEL. These surface water bodies recharge the Snake River Plain

aquifer. This aquifer is the primary source of drinking water and is used for irrigation of crops in the Snake River Basin. The direction of local groundwater movement is toward the south and southwest. Drinking water at the INEL is provided by an extensive system of individual wells locally referred to as production wells. Some of the facilities at INEL have dedicated drinking water wells, while other locations have wells that can serve multiple purposes, including domestic use, fire protection, and storage.

Included in the Preliminary Report for the INEL are 22 Category II and III findings. Eleven of these findings were not ranked with the risk-based model. Three which dealt with issues of data quality and three compliance or management issues were beyond the focus of the prioritization. One finding dealt with an environmental problem which MEPAS cannot rank, non-chemical pollutants. This problem was addressed in the Integration Phase of the ranking. Finally, four findings were not ranked pending the results of the Survey's Sampling and Analysis Program. The remaining 11 findings are grouped into 13 ranking units and evaluated using MEPAS. These ranking units, located on Figure 2.4, are as follows:

RANKING UNIT NAME	LOCATION ON MAP
• Active Percolation Ponds at ICPP and TRA	D, E
• Active Percolation Pond and Ditches at ANL-West	J
• Other Active Percolation Ponds	A, I
• Significant Petroleum Spills	A, B, G
• Significant Spills Involving Metals	D, E
• Unsaturated Zone Inactive Injection Wells at PBF	F
• Inactive Gravel Pits at ICPP	E
• Inactive Injection Wells at TRA and ICPP	D, E
• TCE in Drinking Water Well	C
• Inactive CFA Landfills and Lead Storage Areas	G
• Volatile Organics and Radionuclides Released to Groundwater at RWMC	H
• Air Impacts from ICPP Stacks	E
• Potential for PCB Release from Transformers	A, E, D, G, F, I, J

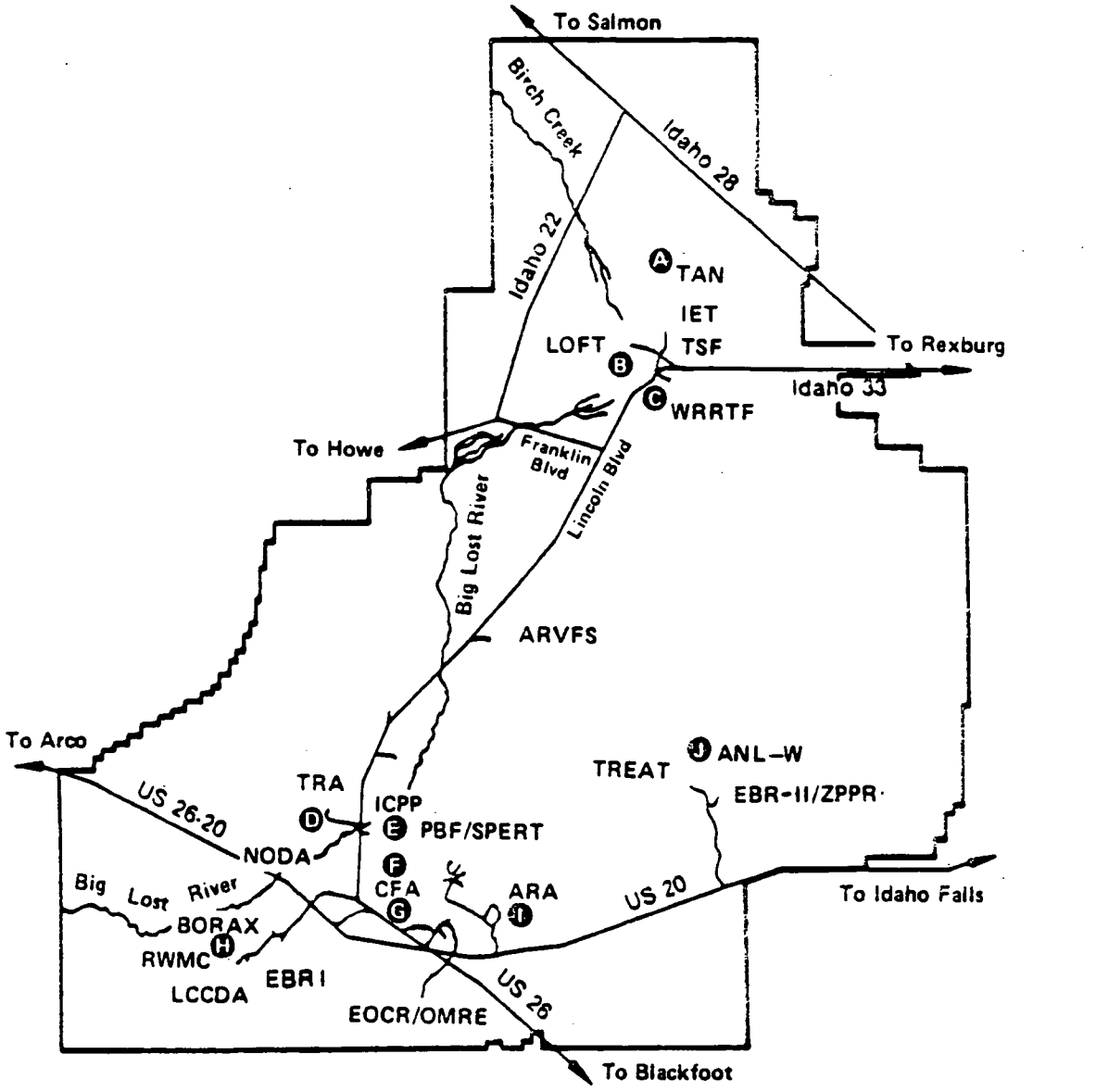

FIGURE 2.4

APPROXIMATE LOCATIONS OF
RANKING UNITS FOR
IDAHO NATIONAL ENGINEERING LABORATORY

Of the 13 ranking units from the INEL Survey, one represents a potential for a future environmental problem and is not discussed in this section of the report (see Section 3). This ranking unit involves the potential for a PCB release from transformers. The remaining 12 represent existing or suspected environmental problems and are discussed in this section of the report.

Table 2.7 presents the INEL ranking units (HPI Groups 7 to 0) that are existing or suspected environmental problems. Most of the ranking units at the INEL rank in the HPI Groups that represent the tertiary level of concern or lower (Groups 5 and 4, and 3 and below, respectively). Two ranking units, however, do score in the HPI Group in the secondary level of concern (HPI Group 7). With two exceptions, all of the ranking units focus on groundwater transport of the contaminants. In these ranking units, the receptors are frequently on-site wells. The one ranking unit that scores on the non-groundwater pathways focuses on the air pathway. Surface water pathways were not considered a significant concern on this site. Direct contact by the public also was not considered a significant concern due to the size of the site and because access to many of the areas covered by the ranking units is controlled.

The highest scoring ranking units at the INEL are Active Percolation Ponds at the ICPP and TRA, and the Volatile Organics and Radionuclides Released to Groundwater at RWMC. The former ranking unit deals with liquid wastewater discharges to on-site percolation ponds. These wastes are mainly from process and laboratory drains. The ranking unit scores due to the high concentration and mobility of tritium included in the wastewater. The latter ranking unit deals with the on-site burial of volatile organics and radionuclides. The ranking unit scores based on the potential ingestion of carbon tetrachloride, a volatile organic, from on-site drinking water wells.

One additional ranking unit ranks in HPI Group 5. This is Inactive Injection Wells at the TRA and ICPP and involves liquid waste disposal concerns. This injection well ranking unit scores based on the toxicity and mobility of iodine-129.

The ranking units that rank lowest are generally farther from production wells that serve the more heavily populated portions of the site or involve dry storage. In

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TABLE 2.7

IDAHO NATIONAL ENGINEERING LABORATORY EXISTING OR SUSPECTED ENVIRONMENTAL PROBLEMS

HPI Group	Ranking Unit Name	Environmental Management Area	Critical Data Category
7	Active Percolation Ponds at ICPP and TRA	Liquid Discharges/Active Waste Management	A
7	Volatile Organics and Radionuclides Released to Groundwater at RWMC	Inactive Sites and Releases	B
5	Inactive Injection Wells at TRA and ICPP	Inactive Sites and Releases	A
4	Active Percolation Ponds and Ditches at ANL-West	Liquid Discharges/Active Waste Management	A
4	Other Active Percolation Ponds	Active Waste Management	A
4	Inactive Gravel Pits at ICPP	Inactive Sites and Releases	A
3	Air Impacts from ICPP Stacks	Air Emissions	A
3	Significant Petroleum Spills	Inactive Sites and Releases	A
2	TCE in Drinking Water Well	Inactive Sites and Releases	B
2	Unsaturated Zone Inactive Injection Wells at PBF	Inactive Sites and Releases	B
0	Significant Spills Involving Metals	Inactive Sites and Releases	A
0	Inactive CFA Landfills and Lead Storage Areas	Inactive Sites and Releases	B

A - Monitored or Measured Data; B - Moderate Amount of Assumptions

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which the rainfall alone is insufficient to rapidly drive the contaminants to the groundwater.

Relatively few assumptions were made when modeling the INEL ranking units because of the availability of good data (see the critical data column of Table 2.7). A majority of the ranking units were modeled using measured data from site studies. As an example, the data for the active percolation ponds at ICPP reflected all radioactive, organic, and inorganic constituents based on INEL monitoring studies.

Environmental settings for air and surface water were uniform for the INEL, while subsurface and soil systems were divided into two each. The subsurface systems were segregated due to the varying depth to the Snake River Plain aquifer, which underlies the site. As an example, the depth to the aquifer at the TAN is 200 feet, while 25 miles south at the CFA, it is 450 feet. Soils were separated because of the varying soil characteristics in relation to the depth to groundwater.

2.2.4 Kansas City Plant

The Kansas City Plant (KCP) is located on a 136-acre parcel of a 300-acre Federal complex within the city limits of Kansas City, Missouri. The plant lies about 12 miles south of the downtown area. The principal mission of the plant is the production and procurement of non-nuclear electrical, electronic, electromechanical, mechanical, plastic, and nonfissionable metal components for the DOE weapons program. KCP has been in operation since 1949.

The Federal complex is zoned for heavy industry with the surrounding area characterized by single and multiple family dwellings, commercial establishments, industrial districts, and public use lands. The property adjoining the Federal complex is zoned for residential use with isolated commercial tracts, except for areas along the east and north sides that have been designated for public recreational and agricultural uses. Some croplands remain near the site, but they are diminishing because of rapid urbanization of the area. Low hills nearly encircle the plant, which is situated in a small river valley about 800 feet above sea level. The complex is bordered on the west side by Troost Avenue, a major north-south traffic artery for metropolitan Kansas City. A heavily wooded bluff and the Legacy

Park wildlife refuge border the north side of the complex. The Blue River flows northward along the east border, and the south side is bordered by Bannister Road and Indian Creek. The major water bodies in the area are the Missouri and Kansas Rivers, which flow west to east through Kansas City, Missouri, and Kansas City, Kansas, respectively. Indian Creek flows into the Blue River, which flows north to the Missouri River. The counties downstream of Kansas City generally obtain their drinking and irrigation water from sources other than these rivers or the groundwater.

Kansas City is very near the geographical center of the United States in an area of gently rolling terrain. Because of a lack of obstructions to air flow, the climate of the region is defined as modified continental. Summers are characterized by warm to hot days and mild nights, with moderate humidity. Daytime temperatures occasionally exceed 100°F. Winters are not severely cold, with about 10 days per year of below 0°F. The record low is -13°F. The fall season is normally mild, with mild sunny days and cold nights. Spring is a period of frequent and rapid fluctuations in conditions. Temperatures range from an average daily minimum of 18°F in January to an average daily maximum of 88°F in July.

The average annual precipitation (water equivalent) is 37 inches, including about 20 inches per year of snow. Measurable precipitation (0.01 inch or more) occurs on an average of 101 days per year. Nearly 60 percent of the precipitation occurs during the 6-month period of April through September. Snow is generally light; rarely do snowfalls accumulate to 10 inches. The depth to groundwater averages only 18 feet at KCP. Severe weather in the Kansas City area usually means thunderstorm activity (about 52 days per year) with lightning, hail, heavy rain, and strong winds. This area is also considered a high tornado risk area. During a 17-year period, 68 tornadoes have struck within a 25-mile radius of Kansas City, but none have hit the Federal complex.

The surface wind flow at Kansas City (Downtown Airport) is predominantly from the south during the April through October period and from the south-southeast for the balance of the year, except for March, when the wind is from the east-northeast. Annual average wind speed is 10 miles per hour; however, wind speeds as high as 72 miles per hour have been recorded.

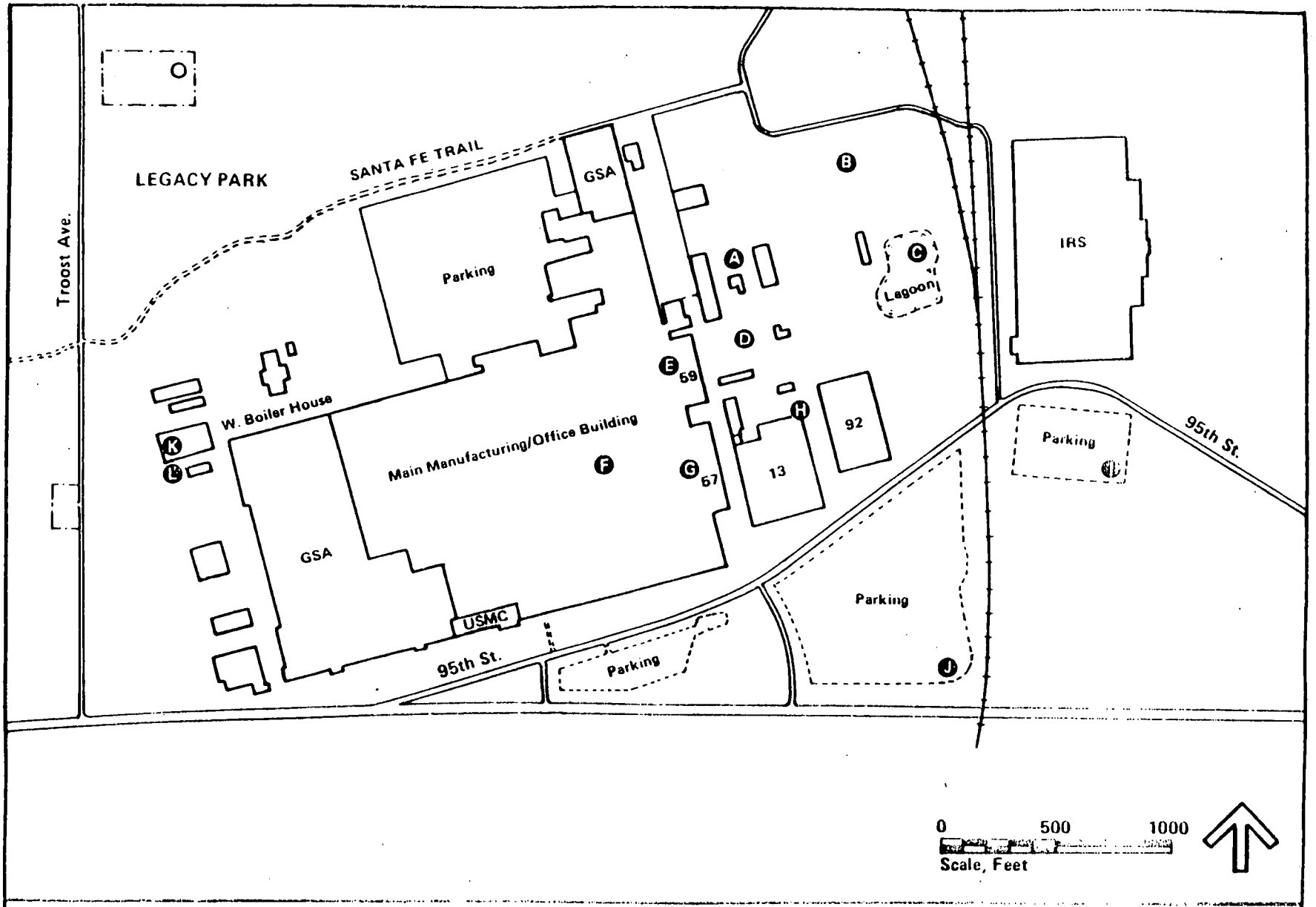
Included in the Preliminary Report for KCP are 27 Category II and III findings. Nine of these findings were not ranked with the risk-based model. One which dealt with issues of data quality and four compliance or management issues were beyond the focus of the prioritization. Four findings were not ranked pending the results of the Survey's Sampling and Analysis Program. The remaining 18 findings are grouped into 11 ranking units and evaluated using MEPAS. These ranking units, located on Figure 2.5, are as follows:

RANKING UNIT NAME	LOCATION ON MAP
• Release of PCBs, Metals, and Organics to the Environment	C
• Emissions of VOCs to the Atmosphere	F
• Southeast Parking Lot	J
• Northeast Area	B
• Old Railroad Dock	E
• Underground Tank Farm	A
• Underground Storage Tanks	A, G, L
• Elevated Levels of Arsenic in Groundwater	A, B, C, E, I, J
• PCBs in Subsurface Soils	G, L
• Classified Burial Trenches	D
• Inadequate Protection of Waste Management Facilities Against Floods	A, D, H, K

Of the 11 ranking units from the KCP Survey, one represents a potential for a future environmental problem. This ranking unit involves inadequate protection of waste management facilities against floods and is not discussed in this section of the report (see Section 3). The remaining 10 ranking units represent existing or suspected environmental problems and are included in this section.

Table 2.8 presents the KCP ranking units that are existing or suspected environmental problems.

Two of the ranking units at KCP rank in the HPI Groups that represent the secondary and tertiary levels of concern (HPI Groups 6 and 7, and 4 and 5, respectively). With one exception, the environmental concern is for the contaminant to enter the Blue



APPROXIMATE LOCATIONS OF
RANKING UNITS FOR
KANSAS CITY PLANT

FIGURE 2.5

TABLE 2.8

KANSAS CITY PLANT
EXISTING OR SUSPECTED ENVIRONMENTAL PROBLEMS

HPI Group	Ranking Unit Name	Environmental Management Area	Critical Data Category
6	Emissions of VOCs to the Atmosphere	Air Emissions	C
4	Release of PCBs, Metals, and Organics to the Environment	Inactive Sites and Releases	B
3	Northeast Area	Inactive Sites and Releases	B
2	Old Railroad Dock	Inactive Sites and Releases	B
2	Underground Storage Tanks	Inactive Sites and Releases	B
0	Underground Tank Farm	Inactive Sites and Releases	B
0	Southeast Parking Lot	Inactive Sites and Releases	C
0	Elevated Levels of Arsenic in Groundwater	Inactive Sites and Releases	C
0	PCBs in Subsurface Soils	Inactive Sites and Releases	B
0	Classified Burial Trenches	Inactive Sites and Releases	C

B - Moderate Amount of Assumptions; C - Significant Amount of Assumptions

and later the Missouri River via groundwater recharge or, in one case, direct discharge. The highest scoring ranking unit at KCP is this exception. This ranking unit, the only non-groundwater issue analyzed, involves the emissions of VOCs from a wide variety of KCP operations. The scoring for this ranking unit is driven by the toxicity and quantity of some of the chemicals used on-site as well as the size and proximity of the potential receptor population.

Three of the lowest scores (HPI Group 0) for ranking units are associated with the high degree of attenuation (i.e., the low mobility) of the chemicals potentially being released (Elevated Levels of Arsenic in Groundwater, PCBs in Subsurface Soils, and Classified Burial Trenches). The other two score low due to the less toxic properties of their constituents as well as the smaller release rates of these constituents.

A moderate to large number of assumptions were made in modeling the KCP ranking units due to the lack of data for certain ranking units and the difficulty in identifying specific sources (see the critical data columns of Table 2.8). As an example, good groundwater characterization data were available for the Northeast Area, but the source term itself could not be identified.

Environmental settings for air and soil at KCP remained uniform; however, there were two settings for surface water and three for subsurface systems. Surface water was divided into two systems, one for flood potential with maximum flow rates, and one for normal flow rates. Three subsurface settings were utilized because of known varying thicknesses of the unsaturated zone and saturated zones at the plant.

2.2.5 Lawrence Livermore National Laboratory

Lawrence Livermore National Laboratory (LLNL), is located approximately 40 miles east of San Francisco, California, and about three miles east of Livermore, California. The Livermore site, or the Main Site, occupies an area of approximately 1.3 square miles. LLNL was established in 1952 to conduct nuclear weapons and controlled thermonuclear research. The laboratory performs research, development, and testing associated with the nuclear design aspects of all phases of the weapons cycle. A majority of materials testing and high explosives diagnostics work for LLNL

is conducted at Site 300, 19 miles southeast of the Main Site. Located in the Diablo Hill Range, Site 300 covers an area of 11 square miles.

Land to the north of the Main Site is zoned industrial and, to the west, land is a high-density urban setting. Sandia National Laboratories Livermore (SNLL), is located to the south. Land to the east is mainly agricultural and pasture. The surface waters generally drain from the Main Site area to the west by means of arroyos and intermittent streams. Also nearby are the South Bay Aqueduct and the Del Valle Reservoir. The major water-bearing formations in this area are multilayered systems of (55 to 100 feet) an upper, unconfined aquifer overlying a series of semiconfined aquifers. The two most important formations containing aquifers are the surface valley-fill materials and the Livermore Formation. Groundwater flow tends to be to the west or west-northwest. The climate is generally characterized as Mediterranean type. Summers are typically warm and dry and winters are mild and moderately wet. Rainfall occurs mostly from October to April and averages about 14 inches. Predominant winds in the summers are from the west and southwest, while in the winter, they are mixed, with a high percentage coming from the northeast and north. Wind speeds are most frequently in the range of 11 to 16 miles per hour.

Areas around Site 300 are sparsely populated, and the majority of the land is used for sheep and cattle ranching. Surface-water drainage at Site 300 is mostly from intermittent streams that flow during the wet winter months. Groundwater at Site 300 is found in the two major water-bearing zones: an upper aquifer in the sandstones (375 feet deep) and conglomerates and a deeper, confined aquifer in a lower sandstone. In addition, several localized, perched aquifers have been identified. The climate at Site 300 is also classified as Mediterranean type. Summers are typically warm and dry, and the winters are mild and slightly wet. The average precipitation is 10 inches, which usually falls from October to April.

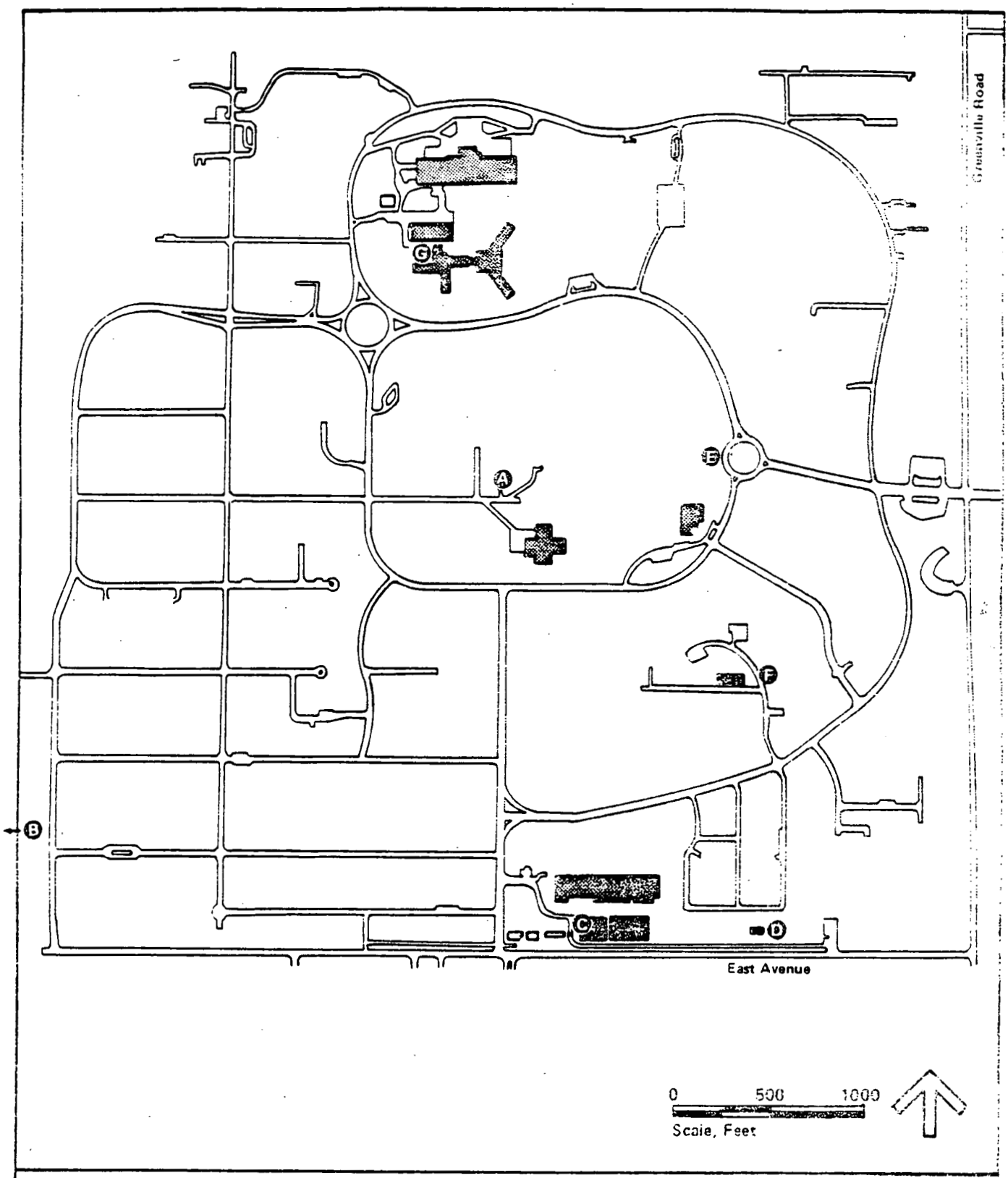
Included in the Preliminary Report for LLNL are 30 Category II and III findings. Fourteen of these findings were not ranked with the risked-based model. One, which dealt with issues of data quality and four compliance or management issues were beyond the focus of the prioritization. Nine findings were not ranked pending the results of the Survey's Sampling and Analysis Program. The remaining

16 findings are grouped into 12 ranking units and evaluated using MEPAS. These ranking units, located on Figures 2.6 and 2.7, are as follows:

RANKING UNIT NAME	LOCATION ON MAP
• Gasoline Spill at Building 403	Main Site C
• Groundwater Contamination in Southeast Corner	Main Site D
• Groundwater Contamination from Taxi Strip and Old Salvage Yard	Main Site F
• Groundwater Contamination at Southwest Area	Main Site B
• Groundwater Contamination from East Traffic Circle Landfill	Main Site E
• Integrity of Sanitary Sewer System	Main Site A
• Potential Release of PCB from Transformers and Capacitors	Main Site G
• Site 300-HE Process Wastewater Lagoons	Site 300 E
• Site 300-Groundwater Contamination from Landfills	Site 300 C
• Site 300-Groundwater Contamination from 834 Complex	Site 300 B
• Site 300-PCB Contamination from Landfill 6	Site 300 D
• Site 300-Oily Waste at the Building 865 Complex	Site 300 A

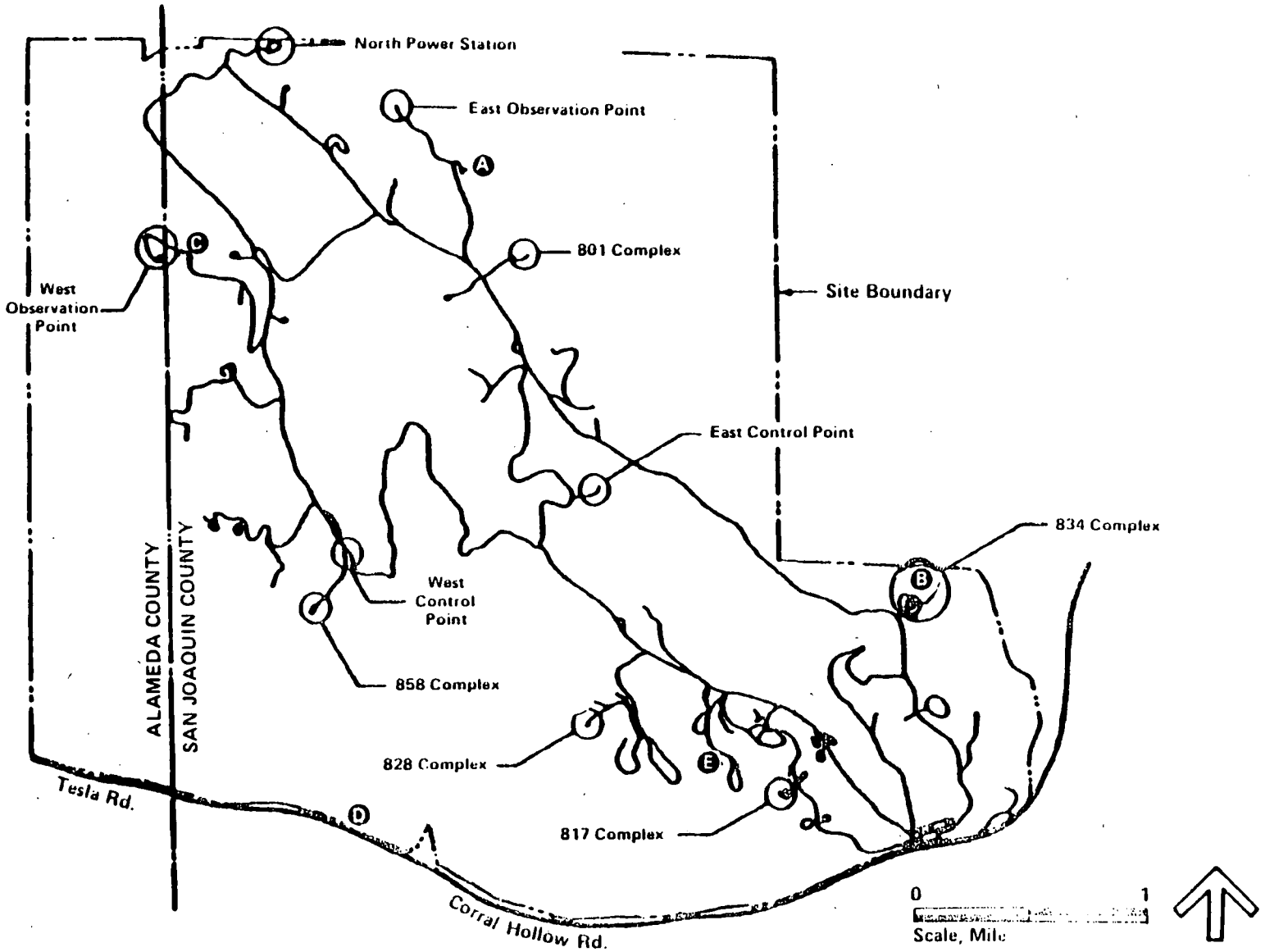
Of the 12 rankings units from the LLNL Survey, two represent the potential for future environmental problems and are not discussed in this section of the report (see Section 3). These ranking units involve the potential release of PCBs from transformers and capacitors and oily waste from the Building 865 complex. The remaining 10 ranking units represent existing or suspected environmental problems and are included in this section.

Table 2.9 presents the LLNL ranking units that are existing or suspected environmental problems. Half of the ranking units for LLNL rank in the HPI Groups that represent the secondary and tertiary levels of concern (Groups 6 and 7, and 4



APPROXIMATE LOCATIONS OF
RANKING UNITS FOR
LAWRENCE LIVERMORE NATIONAL LABORATORY – MAIN SITE

FIGURE 2.3



APPROXIMATE LOCATIONS OF
RANKING UNITS FOR
LAWRENCE LIVERMORE NATIONAL LABORATORY - SITE 300

FIGURE 2.7

TABLE 2.9

LAWRENCE LIVERMORE NATIONAL LABORATORY
EXISTING OR SUSPECTED ENVIRONMENTAL PROBLEMS

HPI Group	Ranking Unit Name	Environmental Management Area	Critical Data Category
7	Groundwater Contamination in Southeast Corner	Inactive Sites and Releases	B
5	Groundwater Contamination from East Traffic Circle Landfill	Inactive Sites and Releases	B
5	Groundwater Contamination at Southwest Area	Inactive Sites and Releases	B
5	Groundwater Contamination from Taxi Strip and Old Salvage Yard	Inactive Sites and Releases	B
5	Gasoline Spill at Building 403	Inactive Sites and Releases	B
0	Integrity of Sanitary Sewer Systems	Liquid Discharges	B
0	Site 300-Groundwater Contamination from Landfills	Inactive Sites and Releases	B
0	Site 300-Groundwater Contamination from 834 Complex	Inactive Sites and Releases	B
0	Site 300-HE Process Wastewater Lagoons	Inactive Sites and Releases	C
0	Site 300-PCB Contamination from Landfill 6	Inactive Sites and Releases	B

B - Moderate Amount of Assumptions; C - Significant Amount of Assumptions

and 5, respectively). Most of these ranking units focus on groundwater impacts from past spills and score as a result of large inventories released and proximity to receptors.

The five highest scoring ranking units at LLNL represent spills on the Main Site. These ranking units, Groundwater Contamination from East Traffic Circle Landfill, Groundwater Contamination in Southwest Area, Groundwater Contamination from Taxi Strip and Old Salvage Yard, Groundwater Contamination in Southeast Corner, and Gasoline Spill at Building 403, rank as a result of the toxicity of the dominant contaminant and the proximity of the receptors. The first two of these ranking units represent a VOC plume of unknown origin and contamination from a former landfill. The third of these ranking units represents measured groundwater concentrations resulting from spills, discharges, and surface impoundments in the general area of the taxi strip and old salvage yard. Soil removal has taken place in this area. The fourth of these ranking units represents another VOC plume of unknown origin. Measured groundwater concentrations were used to rank this problem. The last of these five ranking units represents a 1979 leak of approximately 17,000 gallons of gasoline. Measured groundwater concentrations were also used to rank this problem.

The lowest scoring ranking units include ranking units at Site 300 and leaks in the sewer system of the Main Site. These ranking units rank relatively low due to time required for the contaminants to reach the receptors. In Site 300's landfill number 6, the primary concern was potential PCB releases as well as the small potential receptor population. PCB's low mobility results in an extremely low score for that problem. For the other Site 300 landfills and for the Main Site's sewer system leaks, the highest scoring constituent is tritium. Due to the slow movement of groundwater underlying the Main Site and the distance to the wells at Site 300, the short half-life of tritium as well as the low inventory results in low scores for these problems. The groundwater contamination at Site 300 from the 834 Complex scores low due to the small inventory.

A moderate number of assumptions were made in modeling the LLNL ranking units (see the critical data column of Table 2.9). A majority of the ranking units used assumptions based on available groundwater monitoring data to estimate the source term for modeling. There were two environmental settings each for air and

surface systems corresponding to the Main Site and Site 300 at LLNL, while soil and surface water systems remained uniform throughout LLNL. Air settings were divided by geographic locations of the Main Site and Site 300, as there is a distance between the facilities of approximately 12 miles. Two subsurface settings were needed based on this separation as well. The groundwater flows in two geographically separated aquifers.

2.2.6 Los Alamos National Laboratory

Los Alamos National Laboratory (LANL) is located on a 28,186-acre site in north-central New Mexico. The laboratory is approximately 25 miles northwest of Santa Fe, New Mexico. The primary mission of LANL is nuclear weapons research and development. Other current programs include magnetic and inertial fusion, nuclear fusion, nuclear safeguards and security, and laser separation. LANL has been in operation since 1943.

Los Alamos County is a small incorporated county located in north-central New Mexico on the Pajarito Plateau between the Jemez Mountains to the west and the Rio Grande Valley to the east. Los Alamos County is 60 miles north-northeast of Albuquerque and 25 miles northwest of Santa Fe. Within the county are the LANL and two adjacent communities, Los Alamos and White Rock. The LANL also occupies a small portion of Santa Fe County. Sixteen drainage areas, with a total of 52,500 acres, pass through or start with the LANL site. Streamflow in these canyons is intermittent. Springs on the flanks of the Jemez Mountains supply base flow into the upper reaches of some canyons. The amount of water is insufficient to maintain surface flows across the LANL site before depletion. Runoff from heavy thunderstorms or heavy snowmelt reaches the Rio Grande several times a year. The main aquifer in the LANL area is located within the Tesuque Formation beneath the entire plateau and Rio Grande Valley. The lowest part of the Puye Conglomerate and the Tesuque Formation are within the main aquifer beneath the central and western portions of the plateau. The depths to water below the mesa tops range from 1,200 feet along the western margin of the plateau to about 600 feet along the eastern part.

Los Alamos has a semiarid, temperate mountain climate. Average annual precipitation is nearly 18 inches. Forty percent of the annual precipitation occurs during July and August in the form of thunderstorms. The rest of the [illegible]

is from winter storms. Surface winds in Los Alamos often vary dramatically with time of day and with location because of the complex terrain. With light, large-scale winds and clear skies, a distinct daily wind cycle often exists. A light southeasterly to southerly upslope wind occurs during the day. During the night, a light westerly to northwesterly drainage wind occurs. On the whole, the predominant winds are southerly to westerly over Los Alamos County.

Included in the Preliminary Report for LANL are 36 Category II and III findings. Ten of these findings were not ranked with the risk-based model. Four which dealt with compliance or management issues and one which dealt with worker safety were beyond the focus of the prioritization. Five findings were not ranked pending the results of the Survey's Sampling and Analysis Program. The remaining 26 findings are grouped into 15 ranking units and evaluated using MEPAS. These ranking units, located on Figure 2.8, are as follows:

RANKING UNIT NAME	LOCATION ON MAP
• Contamination at the Firing Sites	B
• TA-1	O
• Closed Landfills and Burn Pits	N
• Former Liquid Disposal	L
• Contamination from TA-54 Active Waste Management Units	D
• Past Liquid Releases	J
• Sediment Contamination from Outfalls	C
• Radionuclide Sediment Contamination in Water and Ancho Canyons	A
• Area P	P
• Potential for PCB Releases from Transformers	H
• Potential for Future Releases from Radioactive Waste Tanks	F
• Potential for Future Releases from Product Drums	I
• Potential Leaks from Abandoned or Removed Underground Storage Tanks	M
• Potential for Future Releases from Underground Tanks	K

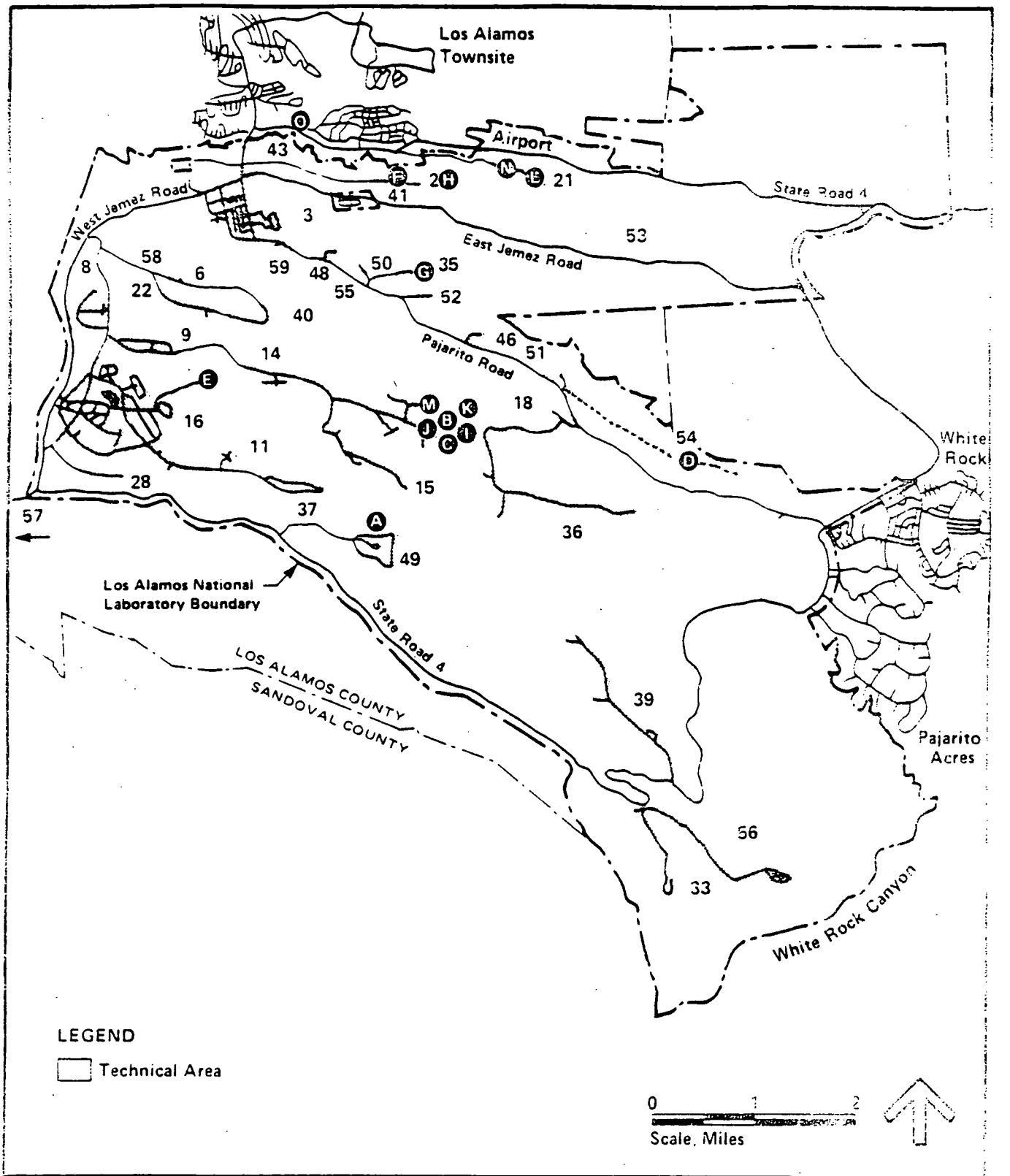


FIGURE 2.8

APPROXIMATE LOCATIONS OF RANKING UNITS FOR LOS ALAMOS NATIONAL LABORATORY

- Potential Future Releases from Nonradioactive Aboveground Tanks G

Of the 15 ranking units from the LANL Survey, five represent potential for future environmental problems and are not discussed in this section of the report (see Section 3). These five ranking units involve the potential releases from radioactive waste tanks, nonradioactive aboveground tanks, product drums, underground tanks, and PCB releases from transformers. The remaining ten ranking units represent existing or suspected environmental problems and are included in this section.

Table 2.10 presents the LANL ranking units that are existing or suspected environmental problems. Most problems at LANL rank very low due to the arid climate, the soil type, the distance to surface water, and the depth to groundwater. One ranking unit, Contamination at the Firing Sites, results in an HPI Group which represents a secondary level of concern (HPI Group 6 not included in the ranking tables, see page 2.14). Data on the majority of the firing sites are scarce. As a result, the modeling relied upon data from the one firing site where sufficient data are available and applied this information to all of the firing sites. This firing site is one of the most heavily used and contamination is expected to be greater at this site. This suggests that the score for this ranking unit is likely to be high.

A significant amount of assumptions were made in modeling the LANL ranking units (see the critical data column in Table 2.10). In particular, there was a lack of characterization of waste drums and many assumptions were made in conjunction with organic contamination.

Environmental settings for air, soil, and surface water remained uniform for LANL; however, the subsurface system was divided into two settings representing the desert geologic formations of mesa tops and canyon bottoms.

2.2.7 Mound Facility

The Mound Facility is located on a 306-acre site in southwestern Ohio. The major technical work areas of the Mound Facility are within the city limits of Miamisburg, Ohio, and about 10 miles south-southwest of Dayton, Ohio. The main mission of this facility is the manufacturing of both non-nuclear and tritium-containing

TABLE 2.10

LOS ALAMOS NATIONAL LABORATORY
EXISTING OR SUSPECTED ENVIRONMENTAL PROBLEMS

HPI Group	Ranking Unit Name	Environmental Management Area	Critical Data Category
2	TA-1	Inactive Sites and Releases	C
1	Former Liquid Disposal	Inactive Sites and Releases	B
0	Contamination from TA-54 Active Waste Management Units	Active Waste Management	C
0	Closed Landfills and Burn Pits	Inactive Sites and Releases	B
0	Past Liquid Releases	Inactive Sites and Releases	C
0	Potential Leaks from Abandoned or Removed Underground Storage Tanks	Inactive Sites and Releases	B
0	Sediment Contamination from Outfalls	Liquid Discharges	B
0	Radionuclide Sediment Contamination in Water and Ancho Canyons	Inactive Sites and Releases	C
0	Area P	Inactive Sites and Releases	B

B - Moderate Amount of Assumptions; C - Significant Amount of Assumptions

components for nuclear weapons which are assembled at another site. The Mound Facility has been in continuous use since 1948.

The northern boundary of the site is approximately 0.13 mile south of Mound Avenue in Miamisburg. Mound Avenue runs south along the eastern boundary of the site. The southern boundary of the site is Benner Road. Tracks of the Penn Central Railroad roughly parallel the western boundary at distances ranging from approximately 50 to 200 feet. The Great Miami River flows 1,500 to 2,000 feet west of the site. The present land use within a 5-mile radius is mostly residential, with limited industrial development. Most residential, commercial, and industrial development is concentrated on the Great Miami River floodplain. The adjacent upland areas are used for residences and agriculture or are unused open spaces. The major water body in the vicinity of the plant site is the Great Miami River. Agricultural land within a 5-mile area around the site is used primarily for corn and soybean production and for livestock grazing.

The climate of the area is continental, with moderate extremes in temperature. Temperatures in the Dayton area range from an average daily minimum of 23.1°F in January to an average daily maximum of 86.9°F in July. The relative humidity in southwestern Ohio is moderately high, in correlation with precipitation patterns. Estimated average values for different times of the day at the Mound site range from 50 to 85 percent. Precipitation is common in all seasons. The average annual rainfall equivalent is about 40 inches, including about 27 inches per year of snow. The maximum 24-hour rainfall recorded in Dayton is 4.56 inches. The surface wind flow at Dayton is predominantly from the southwest quadrant. Average annual wind speeds range from 7 to 10 miles an hour.

Included in the Preliminary Report for the Mound Facility are 33 Category II and III findings. Twenty of these findings were not ranked with the risk-based model. Eleven which dealt with issues of compliance or management and three laboratory quality assurance issues were beyond the focus of the prioritization. Six findings were not ranked pending the results of the Survey's Sampling and Analysis Program. The remaining 13 findings are grouped into 10 ranking units and evaluated using MEPAS. These ranking units, located on Figure 2.9, are as follows:

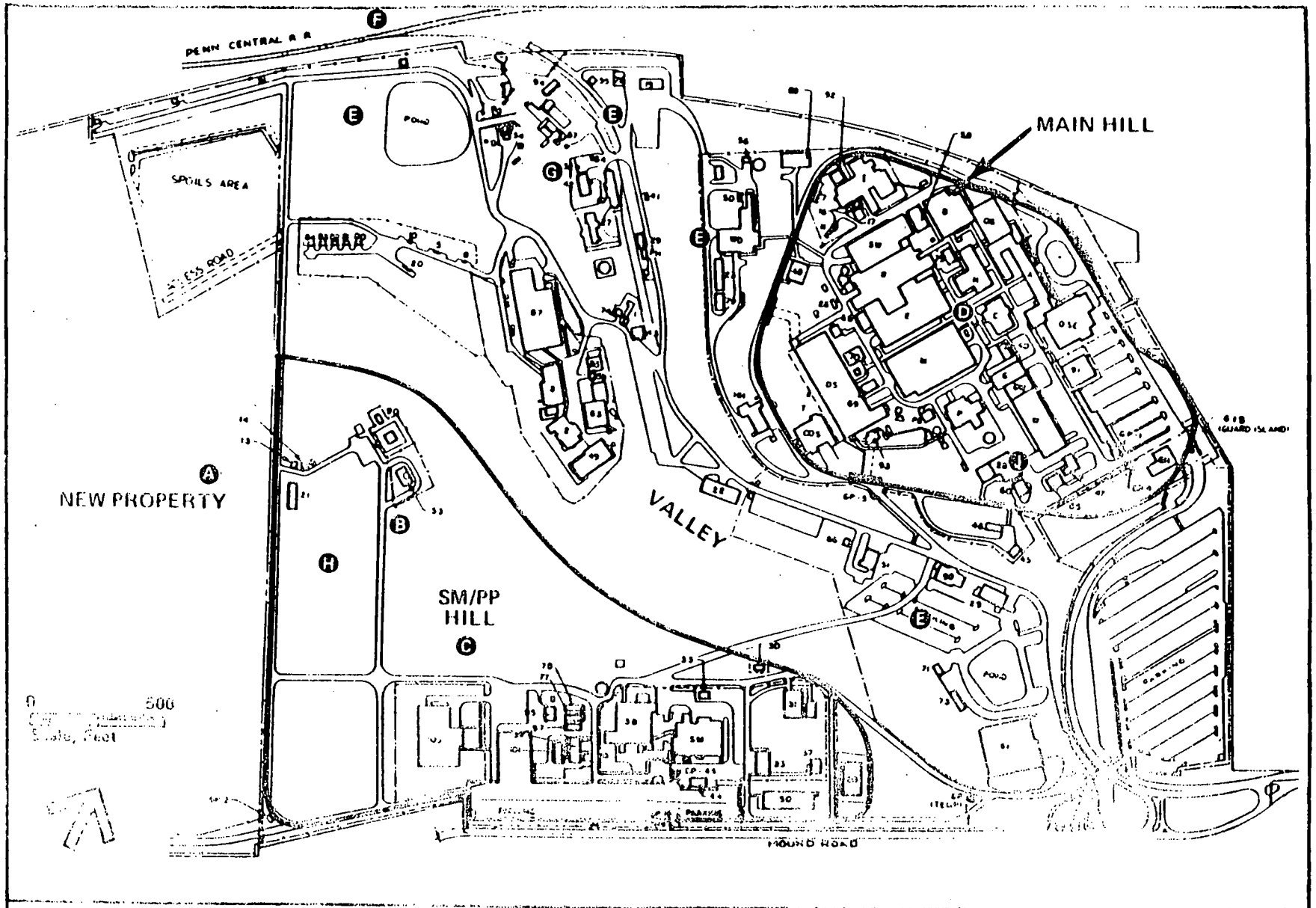


FIGURE 2.9

APPROXIMATE LOCATIONS OF
RANKING UNITS FOR MOUND FACILITY

RANKING UNIT NAME	LOCATION ON MAP
• Hazardous Air Emissions - Vents	J
• Inactive Leach Pit	G
• Soil Contamination in the Canal	F
• Soil Contamination in Area S-1	A
• Soil Contamination in the Valley Locations	E
• Soil Contamination on the SM/PP Hill	C
• Soil Contamination in Area S-7	B
• Tritium Contamination in the Main Hill Groundwater	D
• SM/PP Hill Drum Storage Area	H
• Potential Leakage from Underground Tanks	D

Of the 10 ranking units from the Mound Facility Survey, one represents a potential for a future environmental problem and is not discussed in this section of the report (see Section 3). This ranking unit involves the potential for leakage from underground tanks. The remaining nine ranking units represent existing or suspected environmental problems and are included in this section.

Table 2.11 presents the Mound Facility ranking units that are existing or suspected environmental problems. The Mound Facility ranking units score in HPI Groups associated with tertiary levels of concern and below (HPI Groups 4 and 5, and 3 and below, respectively). In most of the highest scoring ranking units, the scoring is driven by atmospheric transport of the contaminants. One of these ranking units involves organic emissions from the laboratory hoods while others, including the S-1, Valley, and SM/PP Hill areas, include contaminated soils in which the potential for resuspension drives the ranking.

Several reasons exist for the atmospheric-related ranking units at the Mound Facility. The primary reason is that the Mound Facility has a significant population at its boundaries. In addition, many of these ranking units concern long-lived radionuclides which would result in raising the score to account for the persistence of the chemical in the environment. For the vents ranking unit, conservative assumptions were used concerning the degradation of the organics emitted.

TABLE 2.11

MOUND FACILITY
EXISTING OR SUSPECTED ENVIRONMENTAL PROBLEMS

HPI Group	Ranking Unit Name	Environmental Management Area	Critical Data Category
5	Inactive Leach Pit	Inactive Sites and Releases	C
5	Soil Contamination in the Canal	Inactive Sites and Releases	B
5	Soil Contamination in Area S-1	Inactive Sites and Releases	B
5	Hazardous Air Emissions - Vents	Air Emissions	B
4	Soil Contamination in the Valley Locations	Inactive Sites and Releases	B
4	Soil Contamination on the SM/PP Hill	Inactive Sites and Releases	B
2	Tritium Contamination in the Main Hill Groundwater	Inactive Sites and Releases	C
2	Soil Contamination in Area S-7	Inactive Sites and Releases	B
0	SM/PP Hill Drum Storage Area	Inactive Sites and Releases	B

B - Moderate Amount of Assumptions; C - Significant Amount of Assumptions

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Two non-air-related concerns result in HPI Group 5: an inactive leach pit, and off-site contamination in the abandoned Miami-Erie Canal. These issues score highest for the groundwater pathway due to the proximity of the problems to supply wells. In addition, the potentially large inventory at the leach pit and the persistence of the inventory at the canal were factors in the scores. In the leach pit ranking unit, no volatilization of the acetone was assumed; thus the score for this ranking unit is conservative (i.e., may err on the high side). Depth to groundwater is approximately 25 feet.

The lowest scores at Mound are due to either the small inventory available (drums), the small area available for resuspension (Area S-7), or the distance to the receptor (Main Hill tritium).

A moderate amount of assumptions were made in modeling the Mound Facility ranking units due to the variability of the data availability (see the critical data column of Table 2.11). As an example, the potentially contaminated radioactive soil areas had good data on the contaminants present; however, the areal extent of contamination was not well-defined.

Environmental settings for air, soil, surface water, and subsurface systems remained uniform for the Mound Facility due to the relatively small areal extent of the site.

2.2.8 Nevada Test Site

The Nevada Test Site (NTS) is a proving grounds for nuclear devices and diagnostic instrumentation. Nuclear devices are detonated underground for containment purposes. NTS is located in Nye County, Nevada, with its southwest corner approximately 56 miles northwest of Las Vegas. It has an area of 1,345 square miles and is bordered on the north, east, and west by Nellis Air Force Base Range Complex. NTS has been a testing ground for approximately 35 years.

The topography of the NTS consists of north-south-trending rugged mountains separated by broad, flat-floored and gentle-sloped valleys. The highest elevations at the NTS are on Pahute Mesa, about 7,235 feet, and Rainier Mesa, 7,694 feet above sea level. The lowest elevations are in Frenchman Flat and Jackass Flat, both at about 3,000 feet above sea level. There are three principal valleys within the

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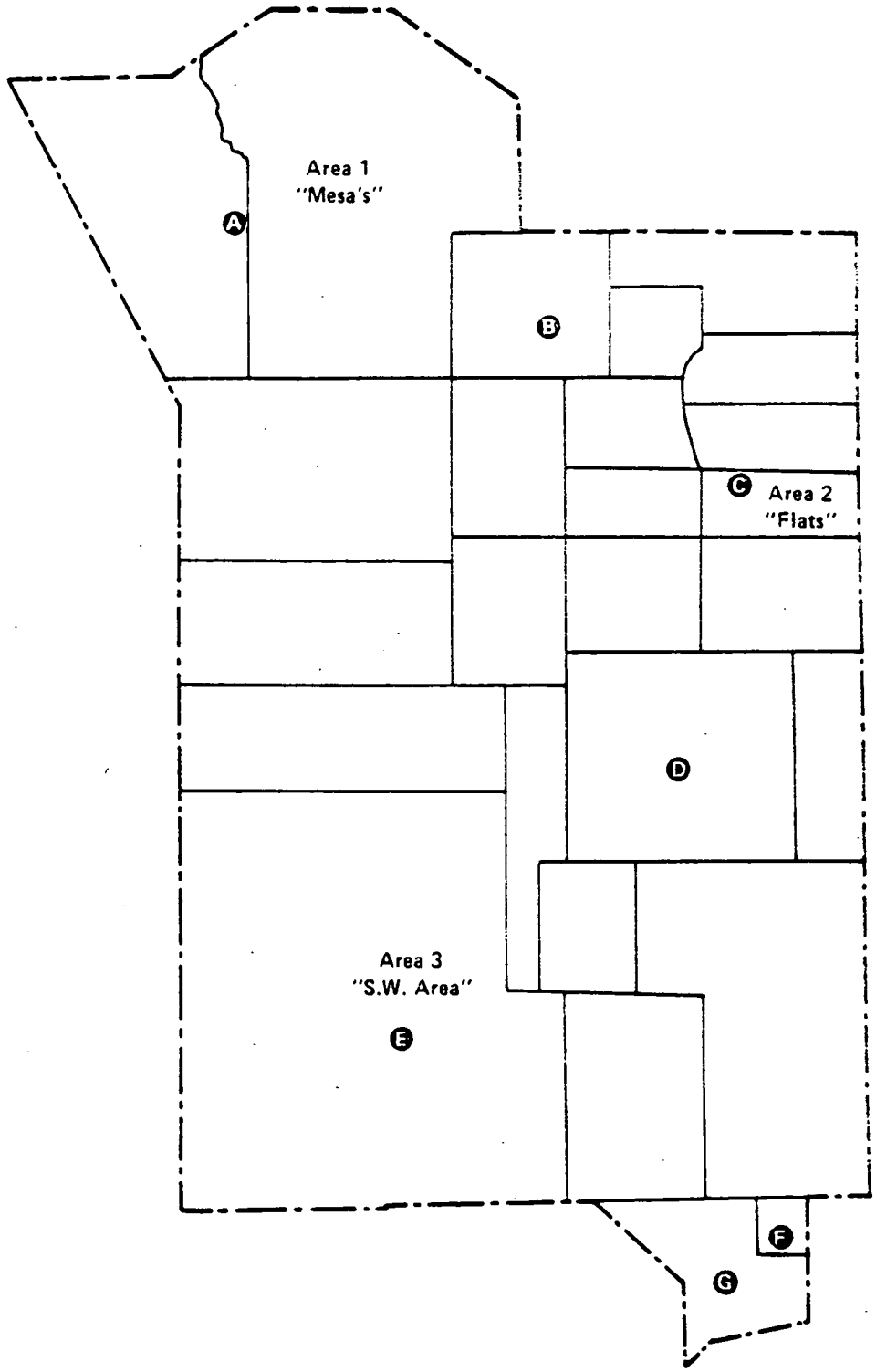
NTS: (1) Yucca Flat, a north-south elongated closed basin with a dry lake (playa) at the southern end, (2) Frenchman Flat, an oval-shaped closed basin with a playa at the center, and (3) Jackass Flat, a valley that drains off the NTS at its southwest corner. The depth to groundwater ranges from 650 to 1,650 feet.

The climate of the NTS and surrounding area is variable, due to variations in elevation and its rugged terrain. Generally, the climate is referred to as continental arid. Throughout the year, there is insufficient water to support the growth of common food crops without irrigation. The NTS average annual precipitation ranges from about 4 inches at the lower elevations to around 12 inches on the higher elevations. Temperatures vary considerably with elevation, slope, and local air currents. The average daily temperatures at the lower elevations range between 26°F and 53°F in January and between 62°F and 97°F in July, with extremes of 115°F and -30°F. Corresponding average daily temperature ranges on the plateaus are 27°F to 37°F in January and 61°F to 77°F in July. The wind direction, as measured on a 100-foot tower at an observation station about 5.5 miles north-northwest of Yucca Lake, is predominantly northerly except during May through August when winds from the south-southwest predominate. However, because of the prevalent mountain/valley winds in the basins, south to southwest winds predominate during daylight hours of most months. These wind patterns may be quite different at other locations on the NTS because of local terrain effects and differences in elevation.

Included in the Status Report (the Preliminary Report was under development during this Prioritization effort) for NTS are 50 Category II and III findings. Twenty of these findings were not ranked with the risk-based model. Ten which dealt with compliance or management issues were beyond the focus of the prioritization. One finding dealt with an environmental problem which MEPAS cannot rank, discharges to a municipal sewage treatment plant. This problem was addressed in the Integration Phase of the ranking. Finally, nine findings were not ranked pending the results of the Survey's Sampling and Analysis Program. The remaining 30 findings are grouped into 10 ranking units and evaluated using MEPAS. These ranking units, located on Figure 2.10, are as follows:



APPROXIMATE LOCATIONS OF
RANKING UNITS FOR
NEVADA TEST SITE

FIGURE 2.10

RANKING UNIT NAME	LOCATION ON MAP
• Tunnel Ponds	B
• Fuel Spill - Desert Rock Airstrip	G
• Soil Contamination by Hazardous Chemicals	D
• Wastewater Lagoons in Drainage Swales	B
• Subsurface Soil Contamination	A, C
• Contamination of Soils with Radionuclides	C
• Near Surface Soil Contamination from Waste and Wastewater Disposal Practices	D, E, F
• Potential for Leaks from Underground Storage Tanks	E
• Potential for Release from Hazardous Materials and Waste Storage Areas in NTS	F
• Potential for Leaks from PCB Transformers	F

Of the 10 ranking units from the NTS Survey, four represent potential for future environmental problems and are not discussed in this section of the report (see Section 3). These four ranking units involve the potential for leaks from PCB transformers, releases from wastewater lagoons located in drainage swales, leaks from underground storage tanks, and releases from hazardous materials and waste storage areas. The remaining six ranking units represent existing or suspected environmental problems and are included in this section.

Table 2.12 presents the NTS ranking units that are existing or suspected environmental problems. All of the ranking units for NTS rank low (HPI Group 0) in the DOE-wide ranking, suggesting that the model does not project contaminants to reach receptors. Those involving groundwater transport rank low due to the thickness of the unsaturated zone and the distance to receptors. Distance to receptors results in low scores for airborne pathways as well.

One unit, Contamination of Soil with Radionuclides, represents the radioactive surface soil contamination resulting from past atmospheric nuclear detonations, safety experiments, and nuclear rocket experiments. Atmospheric testing was halted in 1963 following the Limited Test Ban Treaty. Resuspension of plutonium-239 scores the highest for this ranking unit. This is due to the toxicity and long half-

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TABLE 2.12

NEVADA TEST SITE
EXISTING OR SUSPECTED ENVIRONMENTAL PROBLEMS

HPI Group	Ranking Unit Name	Environmental Management Area	Critical Data Category
0	Contamination of Soils with Radionuclides	Inactive Sites and Releases	B
0	Near Surface Soil Contamination from Waste and Wastewater Disposal Practices	Liquid Discharges	B
0	Soil Contamination by Hazardous Chemicals	Inactive Sites and Releases	B
0	Tunnel Ponds	Liquid Discharges	B
0	Subsurface Soil Contamination	Inactive Sites and Releases	C
0	Fuel Spill - Desert Rock Airstrip	Inactive Sites and Releases	A

A - Monitored or Measured Data; B - Moderate Amount of Assumptions; C - Significant Amount of Assumptions

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life of the contaminant. It should be kept in mind, however, that even this ranking unit ranks very low.

A second major issue at NTS involves the subsurface soil contamination resulting from underground nuclear tests. This ranking unit scores extremely low HPI as a result of the encapsulation of the radionuclides in the soil by the heat of the tests, the depth to groundwater, low groundwater velocity, and distance to the receptor. To identify the effects of potential changes created in groundwater flow direction and velocity resulting from these tests, this ranking unit was modeled a second time. This second modeling assumed the worst case scenario for those important groundwater characteristics; however it also scores very low (Group 0).

A moderate amount of assumptions were made in modeling the NTS ranking units due to the moderate quantity of data available (see the critical data column in Table 2.12). Good data were available for characterization of radionuclide contamination in soils and their areal extent, but characteristics such as the depth of contamination were estimated.

There were two environmental settings for air, and three settings each for soil and subsurface systems for NTS. As surface water does not pose a viable pathway for contaminant migration, a setting for this transport pathway was not completed. Two air settings were utilized, as two wind/air monitoring stations with different data exist at this site. The three soil settings were based on three different topographic areas with differing activities. These areas are the flats, where a majority of the underground testing occurs; the mesa areas, which are used for tunnel shots and additional underground testing; and the southwest area, which is mainly an administrative/support area. The subsurface system was divided into three settings by the distance to the receptors with respect to the location of the site activities. As an example, contaminant migration time to receptors is greater for the mesas than for the flats or the southwest areas.

2.2.9 Pantex Facility

The Pantex Facility is approximately 17 miles northeast of downtown Amarillo, Texas. The facility is on a 10,300-acre portion of a former Department of Defense facility used from the early 1940s to 1947 for the production of conventional

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ordnances. The current mission is the assembly and maintenance of nuclear weapons. This is accomplished through weapons stockpile maintenance, weapons safety inspections, weapons components disposal, and high explosives machining and development. The Pantex Facility has been used since 1951 by DOE and its predecessor agencies.

The winds at the facility are predominantly from the south through southwest, with more northerly and westerly winds from November to March. The facility lies on the Southern High Plains, which consist of uniform, deep, moderately fine-textured, fertile soils. The soils are gently sloping, forming a localized closed basin at the Pantex Facility. Waters from infrequent rains (average precipitation is 20 inches per year) and process discharge waters drain to depressions in the soil (playas). The playas are an intermittent source of recharge to the underlying water table aquifer (Ogallala). However, evapotranspiration greatly exceeds precipitation and the aquifer is decreasing by approximately two feet per year. The depth to the water table at the Pantex Facility is presently 400 feet, with a saturated thickness of 300 feet. Groundwater also occurs perched above the water table on localized beds of impermeable clay.

Included in the Preliminary Report for Pantex Facility are 31 Category II and III findings. Seven of these findings were not ranked with the risk-based model. Five which dealt with compliance or management issues were beyond the focus of the prioritization. Two findings were not ranked pending the results of the Survey's Sampling and Analysis Program. The remaining 24 findings are grouped into 14 ranking units and evaluated using MEPAS. These ranking units, located on Figure 2.11, are as follows:

RANKING UNIT NAME	LOCATION ON MAP
• Known Liquid Releases	E
• Playas	F
• Ditches	G
• Contaminated Surface Soils - Not Accessible	C
• Contaminated Surface Soils - Accessible	B
• PCB Release	C
• Depleted Uranium Contamination Sites	E

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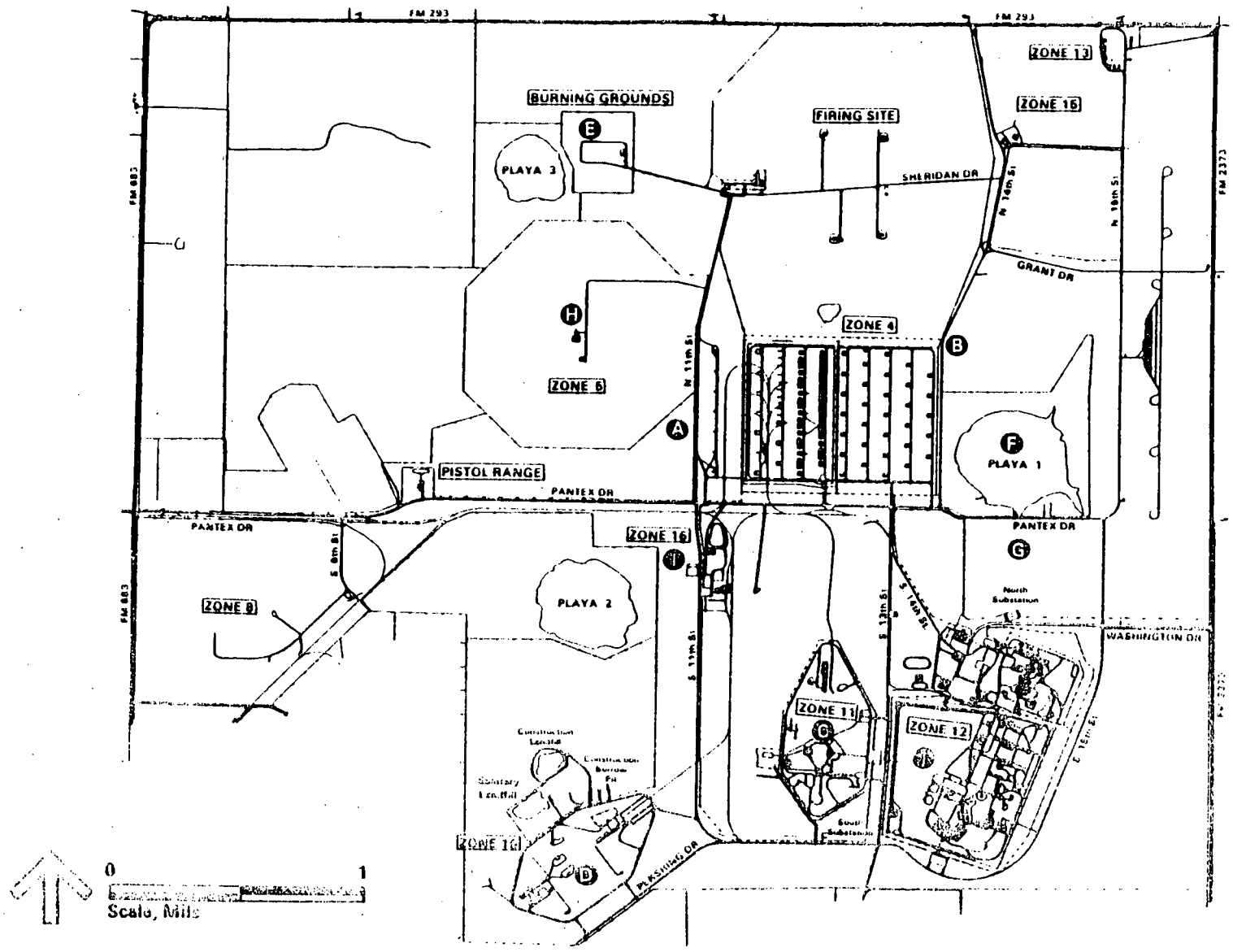

APPROXIMATE LOCATIONS OF
RANKING UNITS FOR
PANTEX FACILITY

FIGURE 2.11

• Firing Site 15	H
• Asbestos	D
• Fluoride Emissions	E
• Landfills	A
• Potential Future Releases from Non-Tank Sources	A
• Potential Future Releases from Aboveground Tanks	C
• Potential Future Releases from Underground Tanks	I

Of the 14 ranking units from the Pantex Facility Survey, three represent potential for future environmental problems and are not discussed in this section of the report (see Section 3). These three ranking units involve the potential for future releases from non-tank sources and aboveground and underground tank sources. The remaining 11 ranking units represent existing or suspected environmental problems, which are included in this section.

Table 2.13 presents the Pantex Facility ranking units that are existing or suspected environmental problems. One ranking unit scores in an HPI Group of most concern (HPI Group 8), while two others score in HPI Groups of secondary concern (HPI Groups 6 and 7). Four ranking units scored in the lowest group (HPI Group 0). In all cases, the exposure concern that drives the scores for the highest ranking units involves crops and livestock. Generally, these ranking units include large releases of liquid, a necessary ingredient for migration to the groundwater in the Pantex area. Where migration was dependent upon rainfall, the ranking unit scores low or is not scored for that pathway. In those ranking units, resuspension becomes the focus of concern. Resuspension generally drives the ranking units that score in the middle of the Pantex ranking.

The highest scoring ranking unit at the Pantex Facility (HPI Group 8) is Known Liquid Releases, which represents several major past releases identified at the site. However, the modeling for the ranking unit focuses on historic waste solvent disposal due to the potential quantities and contaminants involved. Between 1954 and 1980, waste solvents were disposed of in an unlined waste pit. The large quantities that may have been disposed of over that period, coupled with the toxicity of dimethylformamide, are the reasons for the score for this ranking unit.

TABLE 2.13

PANTEX FACILITY
EXISTING OR SUSPECTED ENVIRONMENTAL PROBLEMS

HPI Group	Ranking Unit Name	Environmental Management Area	Critical Data Category
8	Known Liquid Releases	Inactive Sites and Releases	B
7	Ditches	Liquid Discharges	B
6	Playas	Liquid Discharges	B
3	Firing Site 15	Inactive Sites and Releases	C
3	Depleted Uranium Contamination Sites	Inactive Sites and Releases	C
3	PCB Release	Inactive Sites and Releases	B
2	Contaminated Surface Soils - Accessible	Inactive Sites and Releases	C
0	Contaminated Surface Soils - Not Accessible	Inactive Sites and Releases	C
0	Asbestos	Asbestos	C
0	Fluoride Emissions	Air Emissions	B
0	Landfills	Inactive Sites and Releases	A

A - Monitored or Measured Data; B - Moderate Amount of Assumptions; C - Significant Amount of Assumptions

Two other ranking units are in the upper portion of the Pantex ranking. These ranking units, referred to as Playas and Ditches, have related environmental problems. All site process effluents and runoff drain to natural lakes referred to as playas. As a result, these playas may contain inorganic, organic, radioactive, and high-explosive contaminants. The largest playa supplies irrigation water to nearby cropland. Although this ranking unit scores for the groundwater pathway, it would also score high for irrigation from the surface water. The ditches ranking unit represents four drainage ditches which ultimately lead to the playas. These ditches receive effluents containing treatment plant wastes, processing wastes, high explosives, and potential solvent and lead-based residues. Like the Playas ranking unit, the toxicity of high explosives results in a moderately high score for this ranking unit. Again, the focus of the exposure concern is on the potential to impact crops and livestock.

The lowest scoring ranking units rank low for a variety of reasons. The Asbestos ranking unit focuses on the potential for exposure to the few workers who come into the area of an abandoned building. The Fluoride Emissions ranking unit focuses on an environmental, not human, health concern: the potential for fluoride uptake concentrating in cattle bones. Finally, the Contaminated Surface Soils - Not Accessible and the Landfills ranking units rank low due to insufficient liquids to aid the migration of contaminants.

Due to the small quantity of data available, a significant number of assumptions were made in modeling the Pantex Facility ranking units (see the critical data column of Table 2.13). Particularly, analytical data for inactive/abandoned waste sites were lacking for modeling.

Environmental settings for air, soil, and surface water systems remained uniform for the Pantex Facility; however, the subsurface settings were divided into two differing sets of soil characteristics in relation to vadose zone flow to the aquifer. One setting was for playas and the other for the loess which covers the remainder of the site.

2.2.10 Pinellas Plant

The Pinellas Plant is 3.2 miles northwest of Pinellas Park, Florida, and 3.5 miles southeast of Largo, Florida. The plant covers approximately 100 acres of land and was designed for the manufacture of neutron generators, a principal component of nuclear weapons. It has been in operation since 1957.

The Pinellas Plant is bordered on the east by Belcher Road (County Road 27), the south by Bryan Dairy Road (County Road 135), the west by the Seaboard Coast Line railroad tracks, and the north by light industry. The closest residential areas are approximately 1/4 mile from the plant. Pinellas County contains 24 municipalities in which 73 percent of the population resides. Largo, 6.3 miles northwest of the plant, and Pinellas Park, 3.5 miles southeast, are the closest municipalities to the plant site.

Pinellas County has a subtropical marine climate, with extended humid summers and short, mild winters. Average summer temperatures range from the low 70s to low 90s Fahrenheit, and winter temperatures from the low 50s to low 70s. Snow is very rare, as freezing temperatures occur only once or twice a year or not at all. The outstanding feature of the local climate is summer thunderstorms. On the average, thunderstorms occur 90 days a year, mostly in the late afternoons during June, July, August, and September. Prevailing winds are from the north and northeast during the winter months; east and south winds predominate during the remainder of the year. Given the fact that westerly sea breezes occur commonly in the summer, there is a roughly uniform distribution of wind directions. The average wind speed is 8.3 miles per hour. Tornadoes and hurricanes are possible in the Pinellas County area. The frequency of a hurricane's passing within a 50-mile radius of the plant is one every 8.5 years.

Sinkholes occur in the vicinity of the Pinellas Plant and may provide a possible conduit between the surficial aquifer and the Upper Floridan aquifer. The scoring of the Pinellas ranking units depends heavily upon whether such an interconnection exists. There is a difference of opinion concerning this possible interconnection; therefore, for modeling purposes the conservative assumption was made that these sinkholes do provide an interconnection between the aquifers. The depth to groundwater was then assumed to be about 100 feet. There is also a difference of

opinion whether the Upper Floridan aquifer is used for drinking water in the vicinity of the site. Again a conservative assumption was made that there is limited use of the Upper Floridan aquifer as drinking water.

Included in the Preliminary Report for Pinellas Plant are nine Category II and III findings. Four of these findings were not ranked with the risk-based model. One which dealt with issues of data quality and two compliance or management issues were beyond the focus of the prioritization. One finding was not ranked pending the result of the Survey's Sampling and Analysis Program. The remaining five findings are grouped into six ranking units and evaluated using MEPAS. These ranking units, located on Figure 2.12, are as follows:

RANKING UNIT NAME	LOCATION ON MAP
• 4.5 Acre Site	A
• Eastern Sites	C
• Western Sites	B
• Potential Releases from Active Underground Storage Tanks	D, E, F, H
• Past Releases from Inactive Underground Storage Tanks	G, H, I, J, K
• Past Releases from HP Tanks	L

Of the six ranking units from the Pinellas Plant Survey, one represents a potential for future environmental problem and is not discussed in this section of the report (see Section 3). This ranking unit involves the potential for releases from active underground storage tanks. The remaining five ranking units represent existing or suspected environmental problems, which are included in this section.

Table 2.14 presents the Pinellas Plant ranking units that are existing or suspected environmental problems. One Pinellas Plant ranking unit ranks in an HPI Group which represents a secondary level of concern. In all cases, the higher rankings are due to the proximity of the environmental problems to local wells, the relatively large amounts available for potential migration, and the toxicity of the dominant chemicals. In addition, these scores are based upon assumptions of potential

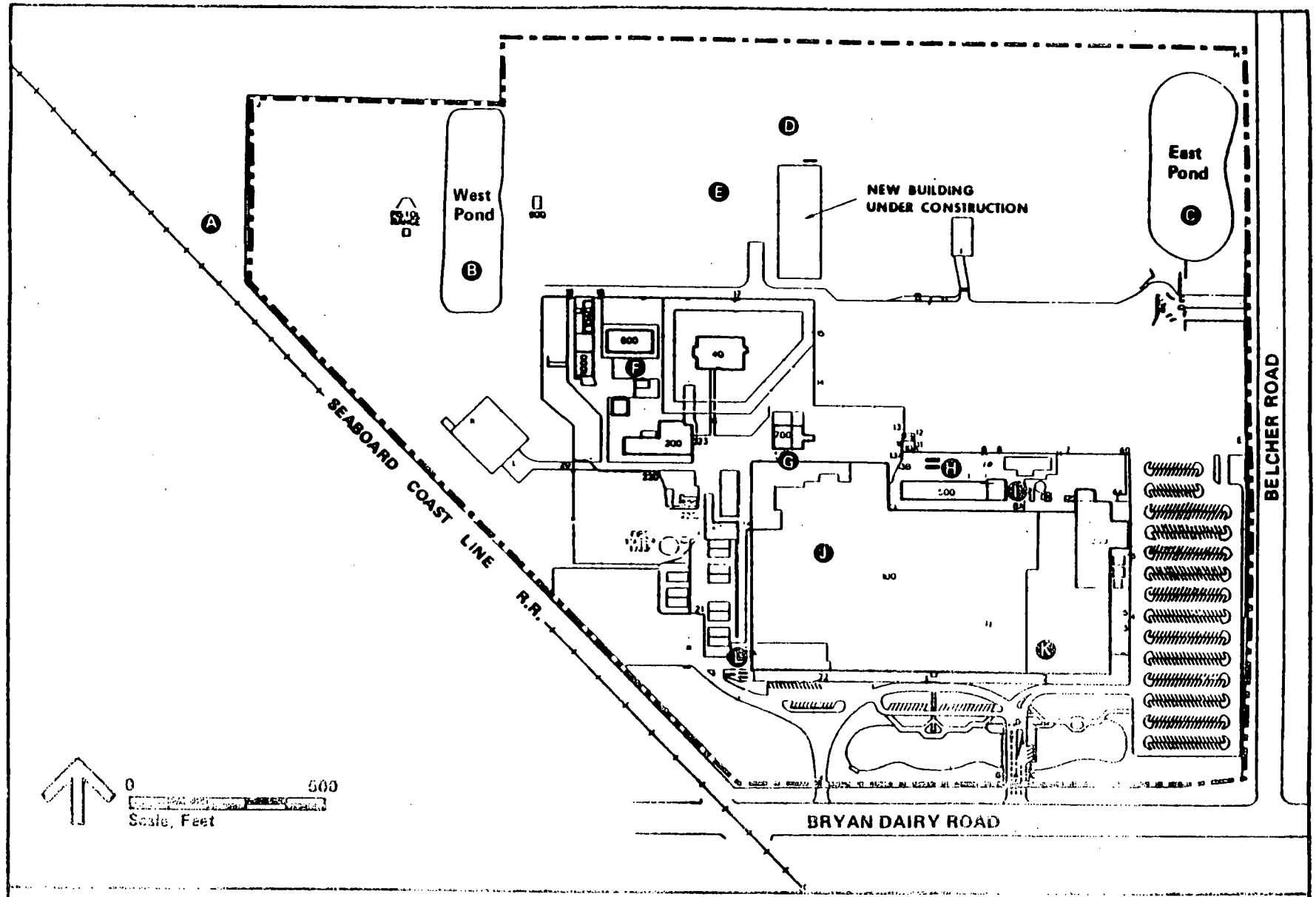

FIGURE 2.12

APPROXIMATE LOCATIONS OF RANKING UNITS FOR PINELLAS PLANT

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TABLE 2.14

PINELLAS PLANT
EXISTING OR SUSPECTED ENVIRONMENTAL PROBLEMS

HPI Group	Ranking Unit Name	Environmental Management Area	Critical Data Category
6	Eastern Sites	Inactive Sites and Releases	C
5	4.5 Acre Site	Inactive Sites and Releases	C
4	Past Releases from Inactive Underground Storage Tanks	Inactive Sites and Releases	C
0	Western Sites	Inactive Sites and Releases	C
0	Past Releases from HP Tanks	Inactive Sites and Releases	C

C - Significant Amount of Assumptions

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communication between the surficial aquifer and the Upper Floridan aquifer as well as assumed usage of nearby wells.

The Eastern Sites ranking unit includes the East Pond and the Northeast Site. Among the wastes discharged in the East Pond were industrial wastewater, spray irrigation field underdrain, cooling tower blowdown, tritium-contaminated wastewater, solids incinerator scrubber water, photographic laboratory effluent, and stormwater runoff. The Northeast Site is a swampy area adjacent to the East Pond that received soil removed during the deepening of the pond in 1972 and had previously been used for the storage of drums of waste and construction debris.

A significant amount of assumptions were made in modeling the Pinellas Plant ranking units (see the critical data column of Table 2.14). In addition to the assumptions concerning the interconnection via sinkholes and the usage of nearby wells, mentioned above, there was a lack of quantitative waste site inventories, and therefore, groundwater monitoring data were used to derive contaminant inventories in a majority of the ranking units. Environmental settings for air, soil, surface water, and subsurface systems remained uniform for the Pinellas Plant due to the small areal extent of the site.

2.2.11 Portsmouth Uranium Enrichment Complex

The Portsmouth Uranium Enrichment Complex (PUEC), of which the Portsmouth Gaseous Diffusion Plant is a part, is located in the south-central part of Ohio. PUEC occupies about a 6.3-square-mile area. The principal mission of PUEC is the separation of uranium isotopes via gaseous diffusion. This separated enriched uranium is part of the fuel cycle for national defense and commercial reactors. This plant has been in operation since 1954.

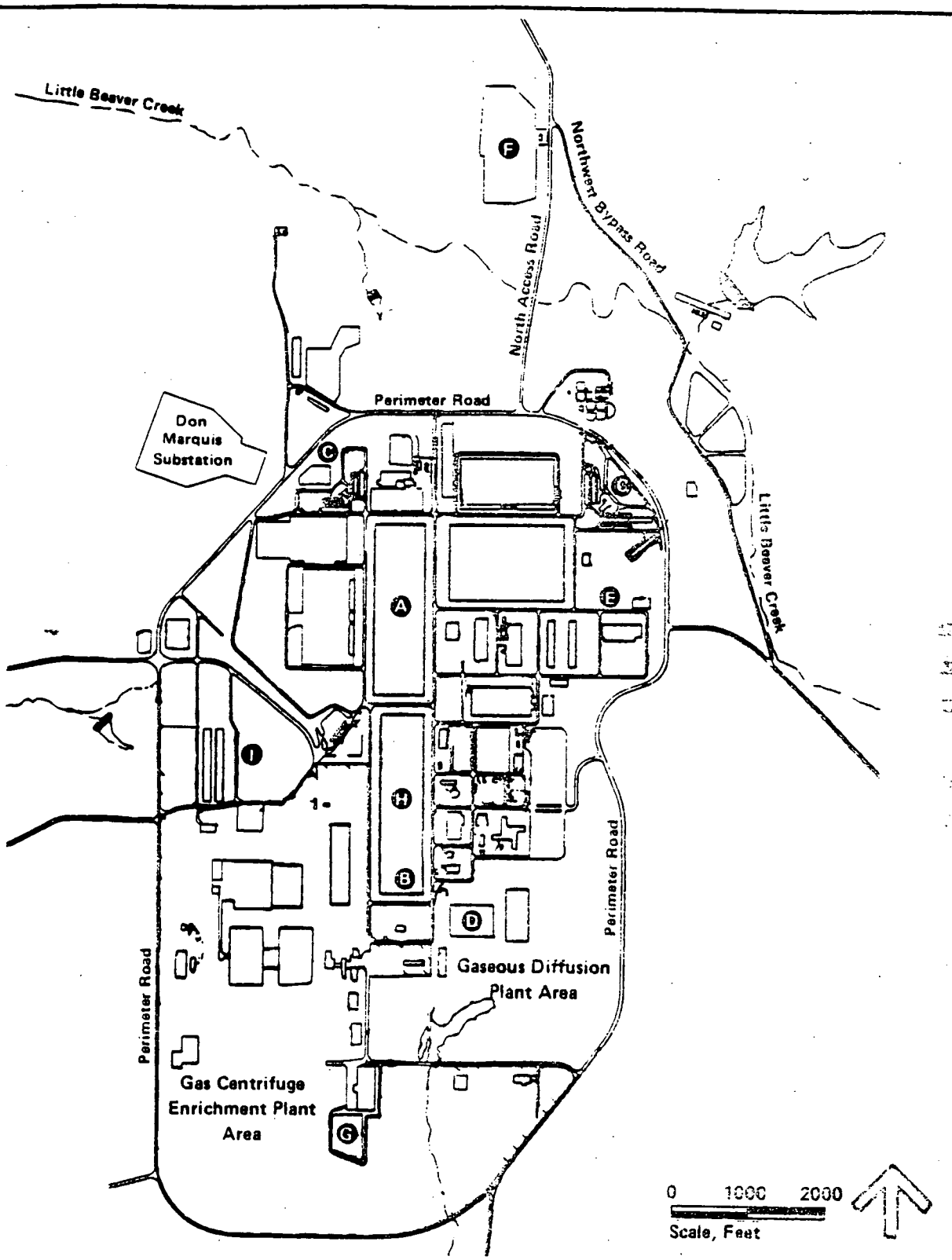
Several small communities, such as Piketon, Wakefield, and Jasper, lie within a few miles of the plant. Piketon, the only nearby urban center (population 1,726), is located approximately five miles north of the plant on U.S. Route 23. Piketon is in a rural, agricultural area with very few other industrial air pollution sources. There are no major nuclear facilities in the vicinity other than PUEC. The area surrounding the plant, except for the Scioto River floodplain, consists of marginal farmland and

densely forested hills. The Scioto River Valley is farmed extensively, particularly for grain crops.

Pike County is located in a humid-continental climatic zone. This zone, unique to the Northern Hemisphere, lies between the dominating polar front and the tropical climates. Temperature and precipitation extremes, such as heat waves, cold waves, blizzards, and cloudbursts, are relatively common. Winters are moderately cold, with an average of 112 days of 32°F or lower temperature but only 3 days of sub-zero temperatures per year. Summers are moderately warm and humid, with an average of 27 days of 90°F or above per year. During the period 1936 to 1974, the average temperature was 53.3°F, which was approximately 1.5°F below the average for south-central Ohio. The average daily maximum and minimum temperatures for the period were 65.3°F and 4.14°F, respectively. Precipitation varies widely, with a yearly average of about 39.8 inches. The precipitation is usually well-distributed throughout the year, although fall is often the driest.

Included in the Preliminary Report for PUEC are 32 Category II and III findings. Eighteen of these findings were not ranked with the risk-based model. Eleven which dealt with compliance or management issues and three which dealt with data quality issues were beyond the focus of the prioritization. Two findings dealt with environmental problems which MEPAS cannot address, photochemical oxidation and PCBs found in off-site minnows. These two findings were addressed in the Integration Phase of the ranking. Two findings were not ranked pending the results of the Survey's Sampling and Analysis Program. The remaining 14 findings are grouped into 11 ranking units and evaluated using MEPAS. These ranking units, located on Figure 2.13, are as follows:

RANKING UNIT NAME	LOCATION ON MAP
• Chromium Air Releases	C
• Technetium Air Releases	B
• Unscheduled Air Releases	A
• Coal Pile Runoff	D
• East Central Area Inactive Sites	E
• South Area Inactive Sites	G
• North Area Inactive Sites	F



APPROXIMATE LOCATIONS OF RANKING UNITS FOR PORTSMOUTH URANIUM ENRICHMENT COMPLEX

FIGURE 2.12

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- Chromium Lagoon I
- Potential Future Releases from Underground Tanks H
- Potential Future Releases from Aboveground Tanks H
- Recirculating Cooling Water System H

Of the 11 ranking units from the PUEC Survey, three represent potential for future environmental problems and are not discussed in this section of the report (see Section 3). These three ranking units involve the potential for releases from underground and aboveground tanks and from the recycled cooling water system. The remaining eight ranking units represent existing or suspected environmental problems, which are included in this section.

Table 2.15 presents the PUEC ranking units that are existing or suspected environmental problems. Three ranking units at PUEC rank in HPI Groups representing a secondary level of concern (HPI Groups 7 to 6). Four rank in HPI Groups 2 and below.

Three of the four highest scoring ranking units involve air releases from the site. These ranking units include Chromium Air Releases, Unscheduled Air Releases, and Technetium Air Releases. The chromium releases are due to drift from the cooling towers. The score for this ranking unit is heavily influenced by the drift rate used. There is a difference of technical opinion as to the appropriate figure. This analysis is based on that which provides the highest score. The unscheduled air releases are due to fugitive emissions of uranium-235 and 238 from process leaks. The technetium releases are due to contaminant trap inefficiencies. These ranking units rank relatively high as a result of the radioactivity or toxicity of the releases.

The only non-air ranking unit that ranks high in the Portsmouth ranking is Coal Pile Runoff. This ranking unit represents the leachate from the coal pile. This leachate may be released to the surface water due to inadequate containment. The ranking is due to the toxicity of arsenic and the quantity of the runoff. PUEC has indicated that it has taken measures to minimize this concern since the Survey was conducted. Such measures have not been factored into this ranking.

The scores for the ranking units that rank low are due to contaminants that are not very mobile in soils (Chromium Lagoon) or the groundwater flow velocity is so low

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TABLE 2.15

PORTSMOUTH URANIUM ENRICHMENT COMPLEX EXISTING OR SUSPECTED ENVIRONMENTAL PROBLEMS

HPI Group	Ranking Unit Name	Environmental Management Area	Critical Data Category
7	Chromium Air Releases	Air Emissions	B
6	Coal Pile Runoff	Liquid Discharges	A
6	Unscheduled Air Releases	Air Emissions	A
4	Technetium Air Releases	Air Emissions	A
2	East Central Area Inactive Sites	Inactive Sites and Releases	B
2	South Area Inactive Sites	Inactive Sites and Releases	B
1	North Area Inactive Sites	Inactive Sites and Releases	B
0	Chromium Lagoon	Active Waste Management	A

A - Monitored or Measured Data; B - Moderate Amount of Assumptions

that migration to receptors is projected to be minimal (North, South, and East Central Areas Inactive Sites).

A small number of assumptions were made in modeling the PUEC ranking units (see the critical data column of Table 2.15). Good data were available for air emissions, while a moderate number of assumptions were used for the inactive sites as well as the aboveground and underground tanks.

Environmental settings for air, soil, and surface water systems remained uniform for PUEC; however, there are two subsurface settings, as the installation is located on an aquifer divide. Groundwater flow is segregated because of the divide and is directed into two geologically separated aquifers. The depth to groundwater varies from 25 to 400 feet.

2.2.12 Rocky Flats Plant

The Rocky Flats Plant (RFP) is located on a 6,550-acre site in northern Jefferson County, Colorado. The plant occupies approximately 384 acres. Its primary mission is the production of the component parts for nuclear weapons, which are shipped to another DOE site for final assembly. Key production activities involve the fabrication of plutonium, uranium, and nonradioactive metals, principally beryllium, stainless steel, and aluminum. Components from obsolete nuclear weapons are disassembled and processed to recover plutonium and americium. Recovery and recycling of components and scrap of some special nuclear materials also occurs at RFP. This facility has been in continuous use since 1952.

Downtown Denver is about 16 miles southeast of RFP, and the cities of Boulder and Golden are each about 8 miles north and south, respectively, from the plant. The plant is on a flat, poorly vegetated area sheltered by the Rocky Mountains to the west. Although RFP is located in a basically rural area, there is no prime agriculture as determined by the USDA Soil Conservation Service. Several ranches are located within 10 miles of the plant.

Six ditches convey water through the area. A series of on-site collection ponds intercept water before it reaches the five streams that are near the RFP site. Of these streams, North Walnut Creek, South Walnut Creek, and Woman Creek drain

the RFP site; all of these are ephemeral. The climate at RFP is characterized by dry, cool winters with some snow cover, and warm, somewhat moist summers. There is considerable clear-sky sunshine, and the average precipitation and relative humidity are low. The depth to groundwater averages only about 25 feet at the plant. The annual average precipitation is slightly over 15 inches. Typically, more than 80 percent of the precipitation falls as rain between April and September. Most of the remaining precipitation is in the form of snow. Winds, although variable, originate predominantly in the northwesterly quadrant, with stronger winds occurring during the winter months.

Included in the Preliminary Report for the RFP are 23 Category II and III findings. Eight of these findings were not ranked with the risk-based model. Three which dealt with compliance or management issues and one which involved data quality issues were beyond the focus of the prioritization. Four findings were not ranked pending the results of the Survey's Sampling and Analysis Program. The remaining 15 findings are grouped into seven ranking units and evaluated using MEPAS. These ranking units, located on Figure 2.14, are as follows:

RANKING UNIT NAME	LOCATION ON MAP
• VOCs in Groundwater	B, C, D, E, F, G
• Solar Evaporation Ponds	F
• 903 Pad/Plutonium in Soils	B
• Underground Product Storage Tanks	J
• PCB Transformer	A
• Abandoned Process Wastewater Collection System	I
• Pesticide Shed	H

Of the seven ranking units from the RFP Survey, two represent potential for future environmental problems and are not included in this section of the report (see Section 3). These two ranking units include the potential for a release from PCB transformers and from underground product storage tanks. The remaining five ranking units represent existing or suspected environmental problems and are included in this section.

Table 2.16 presents the RFP ranking units that are existing or suspected

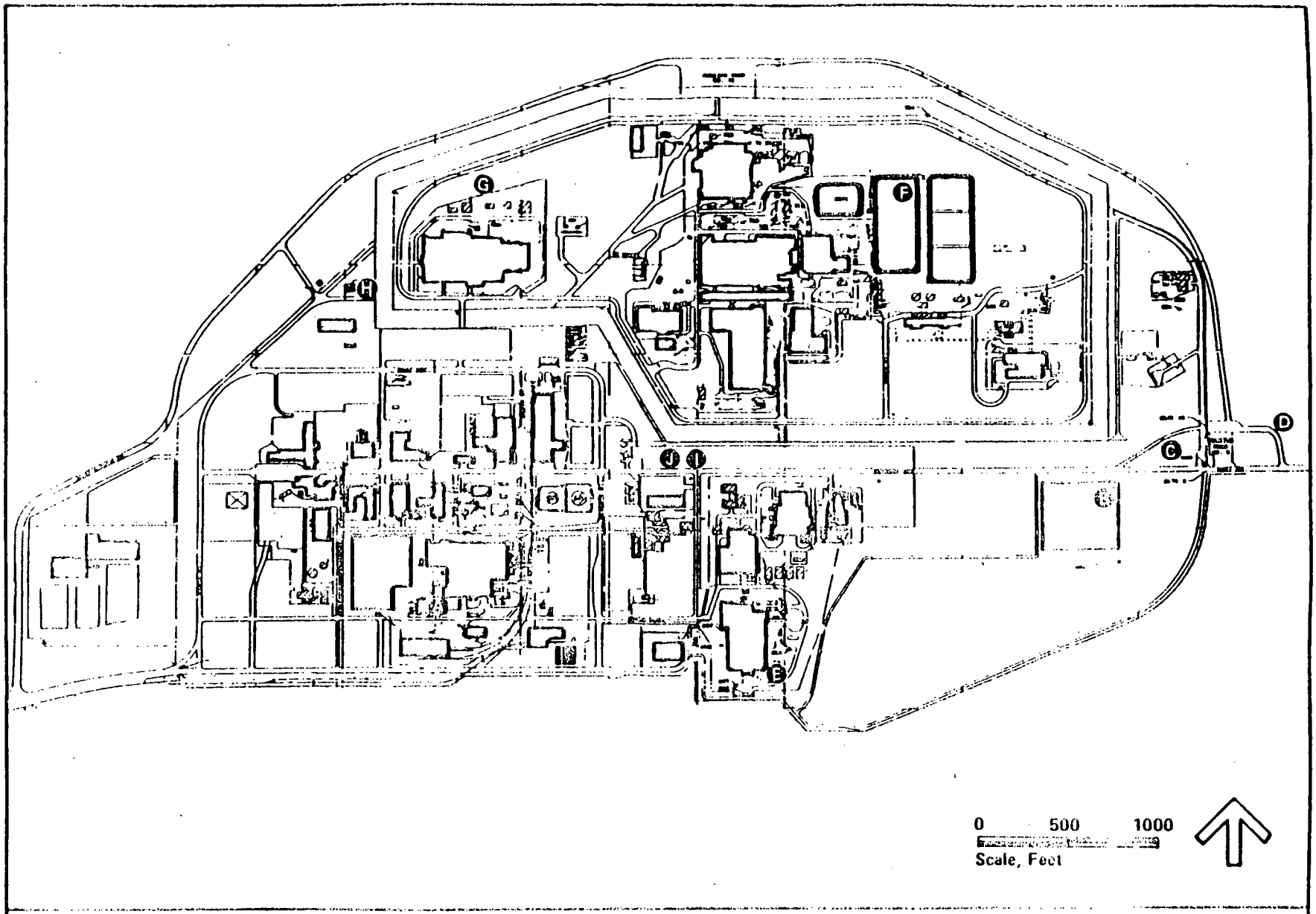


FIGURE 2.14

APPROXIMATE LOCATIONS OF
RANKING UNITS FOR
ROCKY FLATS PLANT

TABLE 2.16

ROCKY FLATS PLANT
EXISTING OR SUSPECTED ENVIRONMENTAL PROBLEMS

HPI Group	Ranking Unit Name	Environmental Management Area	Critical Data Category
9	VOCs in Groundwater	Inactive Sites and Releases	C
5	Solar Evaporation Ponds	Inactive Sites and Releases	B
5	903 Pad/Plutonium in Soils	Inactive Sites and Releases	B
3	Pesticide Shed	Inactive Sites and Releases	C
0	Abandoned Process Wastewater Collection System	Inactive Sites and Releases	C

B - Moderate Amount of Assumptions; C - Significant Amount of Assumptions

environmental problems. One ranking unit at the RFP ranks highest in the DOE-wide ranking. All but two of the ranking units focus on the potential for impacts to Standley Lake and/or the Great Western Reservoir by either overland runoff to or groundwater recharging one of those surface water bodies.

The highest scoring ranking unit at RFP is VOCs in Groundwater with a score in HPI Group 9. This ranking unit represents identified concentrations of VOCs in the on-site groundwater. The average measured concentrations were used to model this problem. Since the plume was assumed to be very large, the ranking represents a conservative estimate of this problem. Additional characterization of the plume will yield a more accurate ranking in future analyses. The proximity and large size of the population using Standley Lake, the shallow depth to groundwater, and the mobility of the contaminant result in the ranking for the ranking unit.

Three ranking units involve materials that have a high affinity to the soils. In the ranking unit that involves surface water runoff (903 Pad/Plutonium in Soil), this characteristic results in a score in HPI Group 5. On the other hand, this characteristic results in a very low score (HPI Group 0) for the ranking unit that involves movement through the groundwater (Abandoned Process Wastewater Collection System).

A moderate to large number of assumptions were made in modeling the RFP ranking units due to the degree in variability of available data for modeling (see the critical data column in Table 2.16). For example, sampling data were available for the solar evaporation ponds but no sampling data were available for the pesticide shed.

Environmental settings for RFP consisted of one setting each for air and soil, and two settings each for surface water and subsurface systems. Surface water was divided into two settings representing the two drainage basins on the site. The subsurface system was also divided due to geologically separated aquifers.

2.2.13 Sandia National Laboratories (Albuquerque) and the Inhalation Toxicology Research Institute

The Sandia National Laboratories - Albuquerque (SNLA) and the Inhalation Toxicology Research Institute (ITRI) occupy an approximate 15,600-acre area which is located in various technical areas and test sites on and next to Kirtland Air Force Base (KAFB) on the southeastern border of Albuquerque, New Mexico. The primary

function of SNLA is the development of explosives mechanization for nuclear weapons including arming, fusing, and firing systems design. Other projects include nuclear reactor safety, special nuclear material transport, and storage systems. This site has been in operation since 1946. ITRI conducts inhalation exposure studies on animals. This small facility has been in existence since 1962. In addition to the Albuquerque site, SNL has a major nuclear ordnance test range in Tonopah, Nevada. This facility has been in operation since 1957.

KAFB , where SNLA and ITRI are located, is situated on two mesas which are divided by Tijeras Arroyo, a canyon which runs from east to west. The two mesas are bounded on the east by the Manzano Mountains in Cibola National Forest, and on the west by the Rio Grande, which is about 5 miles from KAFB and which flows from north to south. The total area of KAFB is approximately 74 square miles, approximately half of which is controlled by the DOE. The DOE-controlled areas are bounded on the west by the western boundary of KAFB and Albuquerque International Airport, on the north by the City of Albuquerque, on the north and east by Cibola National Forest, and on the south by the Isleta Pueblo, a Native American Reservation. Irrigation from groundwater and the Rio Grande supports farming and fruit trees in the Rio Grande Valley. The City of Albuquerque has trees, shrubs, and other vegetation typically found in urban areas. Domestic and municipal water in the area is supplied by groundwater wells with an average depth of 1,000 feet.

The climate in the Albuquerque area is arid continental, characteristic of high altitudes. Sunshine is abundant throughout the year, and more than 75 percent of daylight hours have sunshine. The area is dry, and the average annual relative humidity is 43 percent, falling to less than 20 percent in the spring. The average precipitation is about 8 inches per year, half of which occurs in the form of brief thundershowers from July through September. Winter months are generally dry, with less than 2 inches of precipitation. Much of the winter precipitation is in the form of snow. The thundershower activity in the summer months is sufficient to cause intermittent flow and erosive conditions in the Tijeras Arroyo and other smaller arroyos on the site. There are no continuously running streams on KAFB Average monthly temperatures range from 35°F in the month of January to 79°F in the month of July. Daily temperature fluctuations are wide, with nighttime temperatures considerably lower than daytime temperatures because of the high

elevation and sparse cloud cover. Rapid nighttime ground cooling provides strong temperature inversions. Prevailing winds on KAFB are from the east. Sustained winds of greater than 12 miles per hour occur approximately 20 percent of the time at Albuquerque International Airport. Sustained winds greater than 25 miles per hour occur less than 3 percent of the time. Strong winds which can be accompanied by blowing dust occur in the late winter and early spring months. Nighttime temperature inversions can cause strong drainage winds down Tijeras Arroyo.

The Tonopah Test Range (TTR) occupies an approximate 624-square-mile area, which is located in various technical areas and test sites inside Nellis Air Force Base Range Complex. It is about 140 miles northwest of Las Vegas, Nevada, by air, and 39 miles southeast of Tonopah by road.

The test range has an irregular, but near-square shape about 24 miles wide and 26 miles long. The main target areas for testing are a north-south string of dry lakebeds or playas at an elevation of approximately 5,400 feet. Along the west side of TTR is the Cactus Range, a series of low rocky mountains with the highest peak 7,500 feet above mean sea level. Along the east boundary is the Kawich Range, whose peaks range from 6,500 to 9,400 feet. The main area of the Range is a broad, high desert valley known as Cactus Flat, which lies between the Cactus and Kawich Ranges.

The climate is hot in the summer and cold in the winter. The valley floor is sparsely covered with range grasses and low bushes such as budsage and shadscale. The fauna of the valley consists of such animals as kangaroo rats, coyotes, lizards, wild horses, occasional wayward cattle, and a variety of birds. The vegetation grades into larger bushes, Joshua trees, and juniper as one ascends the slopes at the sides of the valley and into the low mountains. There are no perennial streams and only a few permanent springs from which the water evaporates or percolates back underground within a few hundred feet. Average temperatures range from 29°F in the winter to 71°F in the summer, with an average minimum of 14°F in January and a maximum of 89°F in July. Winds are frequent and generally come from the south, southeast, or northwest. Relative humidity ranges from 26 to 59 percent. Precipitation averages about five inches per year. Minimum cloud coverage and generally good visibility (about 60 miles) in this dry, moderate climate provide TTR with over 300 days per year of good testing conditions. The Sierra Nevada to the

west blocks most Pacific-originated storms, and the intervening desert exhausts moisture from storms arising in that area. When storms reach TTR from the west, they generally deposit little moisture but cause a high cloud cover that is usually of short duration. The few storms that deposit much moisture and remain in the area for some time usually come from the southwest.

Included in the Preliminary Report for SNLA and ITRI are 32 Category II and III findings. Ten of these findings were not ranked using the risk-based model. Two which dealt with issues of data quality and four compliance or management issues were beyond the focus of the prioritization. One finding dealt with an environmental problem which MEPAS cannot rank, discharges to a municipal sewage treatment plant. This problem was addressed in the Integration Phase of the ranking. Finally, three findings were not ranked pending the results of the Survey's Sampling and Analysis Program. The remaining 22 findings are grouped into 18 ranking units and evaluated using MEPAS. These ranking units, located on Figures 2.15 and 2.16, are as follows:

RANKING UNIT NAME	LOCATION ON MAP
• Toxic Discharge to Technical Area 1 Sewers	G
• Liquid Spills and Discharges	C,D
• Inactive Liquid Disposal Areas	E
• Radioactive Burial Grounds	A
• Inactive Solid Disposal Areas	E
• Orphaned Chemicals	E
• Potential Releases of PCBs from Transformers at SNL	F
• SNL Underground Storage Tanks	C,D
• ITRI Active Lagoons	B
• ITRI Hot Ponds	H
• Potential Releases of PCBs from Transformers at ITRI	B
• ITRI Underground Storage Tanks	B
• Inactive ITRI Sewage Lagoon	B
• ITRI Leaking Drums	H
• Radioactively Contaminated Soils at Tonopah	Tonopah C

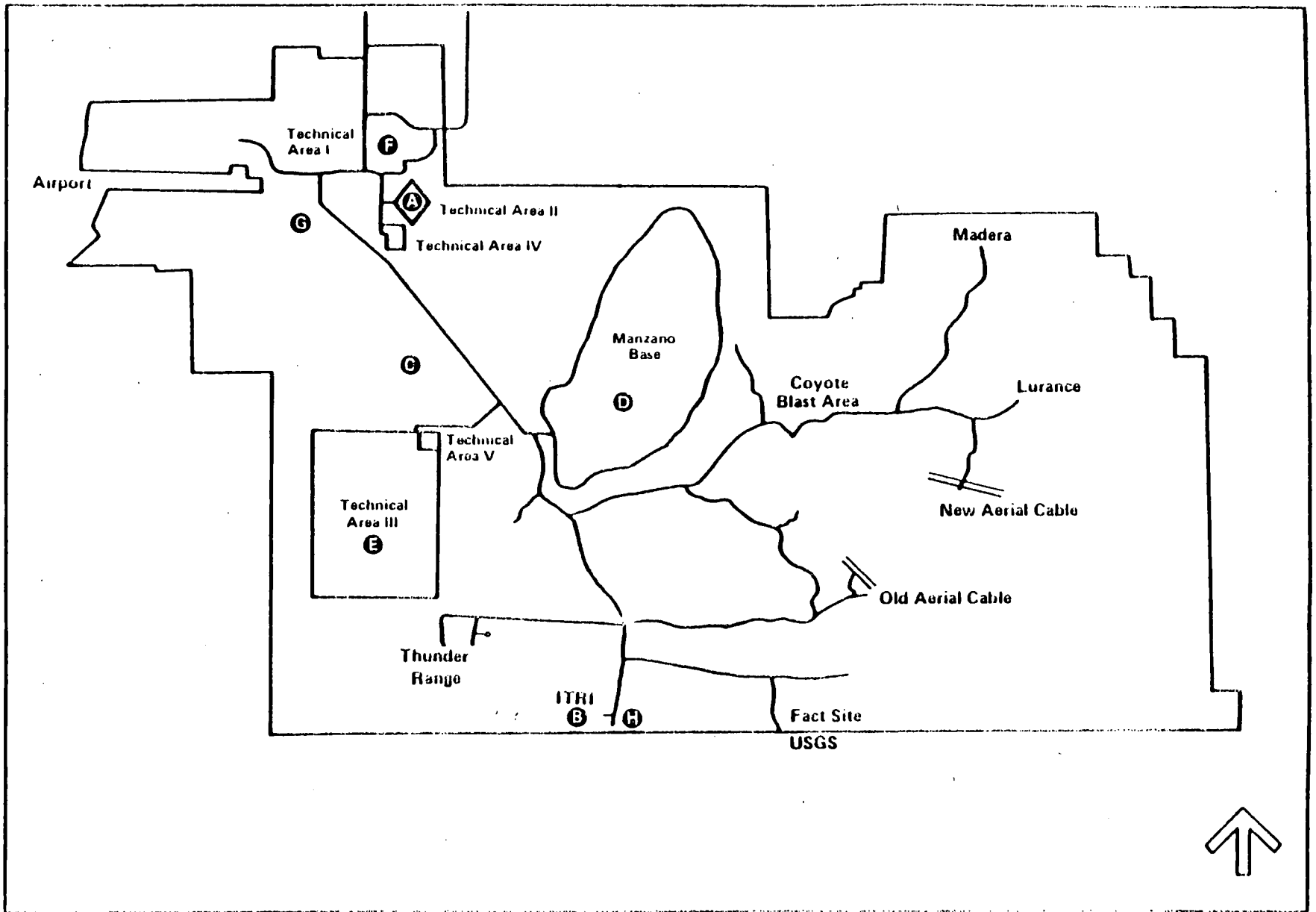
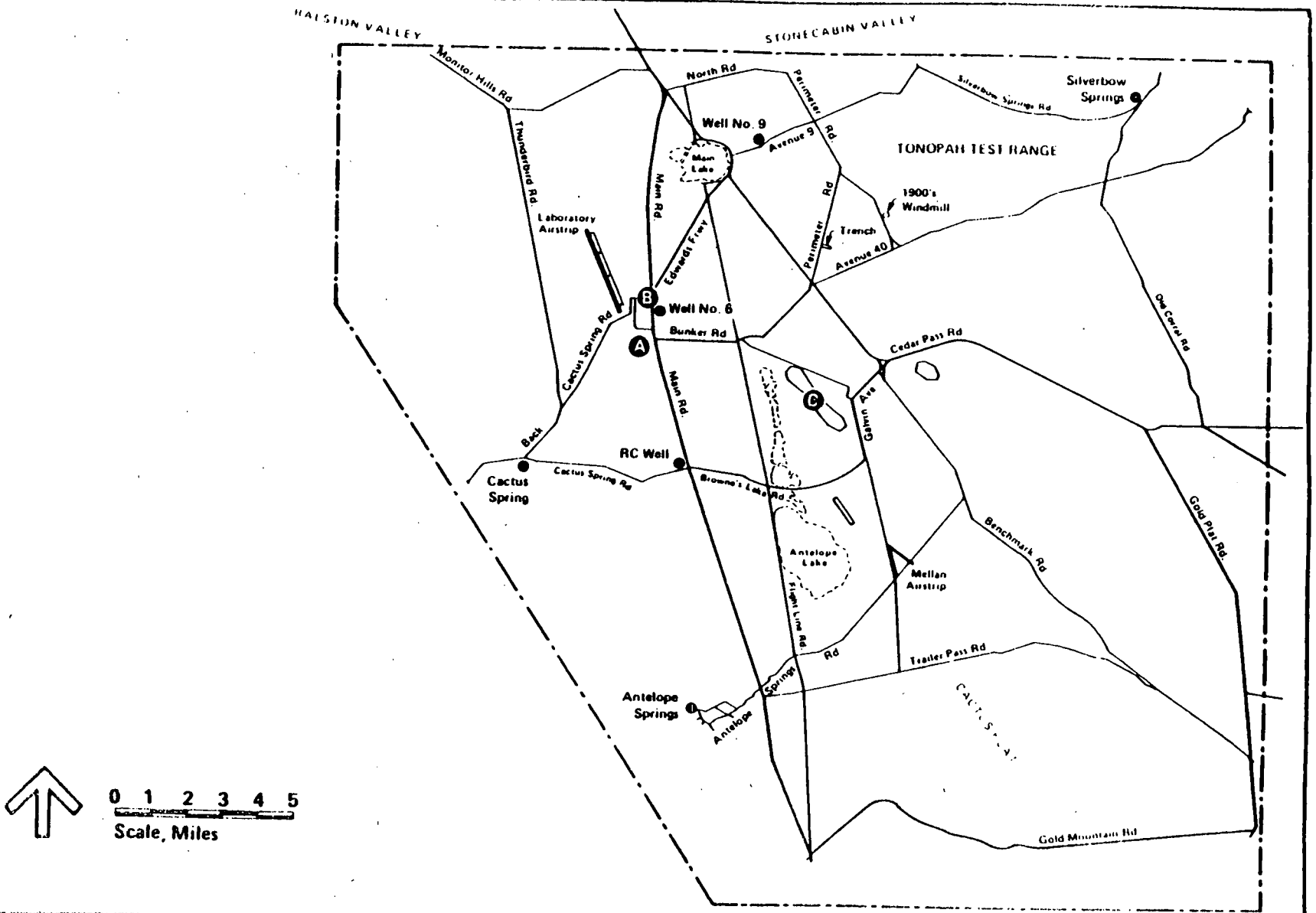


FIGURE 2.15

APPROXIMATE LOCATIONS OF RANKING UNITS FOR SANDIA NATIONAL LABORATORIES (ALBUQUERQUE) AND LOS ALAMOS INHALATION TOXICOLOGY RESEARCH INSTITUTE



APPROXIMATE LOCATIONS OF
RANKING UNITS FOR
SANDIA NATIONAL LABORATORIES AT TONOPAH

FIGURE 2.16

- Soil Contamination Areas at Tonopah — Tonopah A
- Septic Tank Discharges from Area 3 at Tonopah — Tonopah B
- Drum Storage at Tonopah — Tonopah A

Of the 18 ranking units from the SNL/ITRI Survey, eight were from SNLA, six from ITRI, and four from SNL at Tonopah. Seven of the 18 ranking units represent potential for future environmental problems and are not discussed in this section of the report (see Section 3). These ranking units involve the potential for releases of PCBs from transformers at both SNL and ITRI, potential for releases from underground storage tanks at both SNL and ITRI, and potential releases from drums at SNLA, ITRI, and SNL-Tonopah. The remaining 11 ranking units represent existing or potential suspected environmental problems.

Table 2.17 presents the SNLA ranking units that are existing or suspected environmental problems, while Table 2.18 presents the ITRI ranking units that are existing or suspected environmental problems. Most ranking units for SNL rank extremely low due to the low mobility or, in a few instances, small quantities of the contaminants. One ranking unit scores in an HPI Group that constitutes a secondary level of concern (HPI Group 7). This ranking unit involves contaminants that are very mobile and is located close to potential receptors. One Tonopah ranking unit scores in an HPI Group that represents a tertiary level of concern (HPI Groups 4 and 2). These two both involve nonradionuclides.

Seventy-five percent of the sewer system effluent from Technical Area 1 is discharged to two KAFB ponds. This ranking unit, Toxic Discharge to Technical Area 1 Sewers, ranks the highest at SNLA. These ponds are unlined, and recent samples of influent and effluent identified chlorinated hydrocarbons and solvents. These ponds are close to the KAFB wells. This proximity, coupled with the mobility and large inventory of 1,1,1-trichloroethane, results in the score.

The Tonopah ranking unit that ranks the highest is entitled Septic Tank Discharges from Area 3 at Tonopah (HPI Group 4). This ranking unit represents an open-bottomed leach pit into which the effluent from the Photoprocessing Laboratory is piped. This pit is close to well six, which is the major source of drinking water for Tonopah personnel. The proximity of this well is somewhat offset in the scoring by the depth to groundwater.

TABLE 2.17

SANDIA NATIONAL LABORATORIES (ALBUQUERQUE) EXISTING OR SUSPECTED ENVIRONMENTAL PROBLEMS

HPI Group	Ranking Unit Name	Environmental Management Area	Critical Data Category
7	Toxic Discharge to Technical Area 1 Sewers	Liquid Discharges	B
4	Septic Tank Discharges from Area 3 at Tonopah	Liquid Discharges	B
3	Liquid Spills and Discharges	Inactive Sites and Releases	C
2	Soil Contamination Areas at Tonopah	Inactive Sites and Releases	B
0	Inactive Liquid Disposal Areas	Inactive Sites and Releases	B
0	Radioactively Contaminated Soils at Tonopah	Inactive Sites and Releases	A
0	Inactive Solid Disposal Areas	Inactive Sites and Releases	B
0	Radioactive Burial Grounds	Active Waste Management	B

A - Monitored or Measured Data; B - Moderate Amount of Assumptions; C - Significant Amount of Assumptions

TABLE 2.18

INHALATION TOXICOLOGY RESEARCH INSTITUTE EXISTING OR SUSPECTED ENVIRONMENTAL PROBLEMS

HPI Group	Ranking Unit Name	Environmental Management Area	Critical Data Category
3	ITRI Active Lagoons	Liquid Discharges/Active Waste Management	C
0	ITRI Hot Ponds	Liquid Discharges/Active Waste Management	B
0	Inactive ITRI Sewage Lagoons	Inactive Sites and Releases	B

B - Moderate Amount of Assumptions; C - Significant Amount of Assumptions

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The highest scoring ranking unit at ITRI is entitled ITRI Active Lagoons. This ranking unit represents five active lagoons which receive 30,000 gallons per day of water contaminated with organics, inorganics, and radionuclides. These lagoons are unlined or have liners in poor condition. The ranking for this ranking unit was driven by methylene chloride, which is relatively mobile.

Six of the SNLA ranking units and all three of the ITRI ranking units rank low (HRI Group 3 and below). These include two additional ranking units pertaining to Tonopah and four additional SNLA ranking units. Five of these nine ranking units were only focused on radionuclides. The low mobility of these radionuclides is the reason for the extremely low scores for these units. The arid climate, coupled with the small quantities involved in the remaining units, is the reason they rank so low.

A moderate number of assumptions were made to model the SNL/ITRI ranking units because of the variability of available data (see the critical data column of Tables 2.17 and 2.18). For example, the Radioactively Contaminated Soils at Tonopah ranking unit used measured data, while the ITRI Active Lagoons ranking unit had little data available for the contaminants of concern.

Environmental settings for SNL and ITRI consisted of one setting each for air and surface water, and two each for soil and subsurface systems. The two soil settings were based on differing soil types in relation to desert geologic formations (mesas and canyons). Mesa soils consist of thin erosional layers, while canyon soils are made up of deeper erosional and alluvial deposits. Depth to groundwater was either 75 feet or 490 feet, depending upon which side of the fault the ranking unit is on. Because of the relative uniformity throughout the Tonopah site, only one environmental setting for each system was utilized. Depth to groundwater was approximately 350 feet.

2.2.14 Sandia National Laboratories, Livermore

Sandia National Laboratories, Livermore (SNLL) is located about 40 miles east of San Francisco, California, and approximately three miles east of Livermore, California. The facility is bounded on the north by Lawrence Livermore National Laboratory (LLNL). SNLL occupies approximately 220 acres of land. Current programs at SNLL

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include nuclear development and combustion, solar, and fusion research. This installation was established in 1956.

Land to the north of the laboratories is zoned industrial. To the west, land is rapidly becoming a high-density urban setting. To the south, land is zoned industrial, although its present use is mostly agricultural. To the east, land is zoned agricultural and is currently used as pasture. Surface waters in the area generally drain toward the west by means of arroyos (creeks in arid regions) and intermittent streams. Also nearby are the South Bay Aqueduct and the Del Valle Reservoir.

The major water-bearing formations in this area are multilayered systems of an upper, unconfined aquifer overlying a series of semiconfined aquifers. The two most important units containing aquifers are the surface valley-fill materials and the Livermore Formation. Groundwater occurs chiefly in an upper aquifer in sandstones and conglomerates, and in a lower aquifer among deeper sandstones. There are also several localized perched aquifers underlying the site. Flow tends to be to the west or west-northwest. The local climate is generally characterized as Mediterranean type. Summers are typically warm and dry and winters are mild and moderately wet. Rainfall occurs mostly from October to April and averages about 14.6 inches per year. Predominant winds in the summer are from the west and southwest, while in the winter, they are mixed, with a high percentage coming from the northeast and north. Wind speeds are in the range of 11 to 16 miles per hour.

Included in the Preliminary Report for SNLL are 12 Category II and III findings. Nine of these findings were not ranked in the risk-based model. Two which dealt with issues of data quality were beyond the focus of the prioritization. Seven findings were not ranked pending the results of the Survey's Sampling and Analysis Program. The remaining three findings are grouped into two ranking units and evaluated using MEPAS. These ranking units, located on Figure 2.17, are as follows:

RANKING UNIT NAME	LOCATION ON MAP
• Diesel Fuel Tank Area	A
• Former Fire Extinguisher Training Area	B

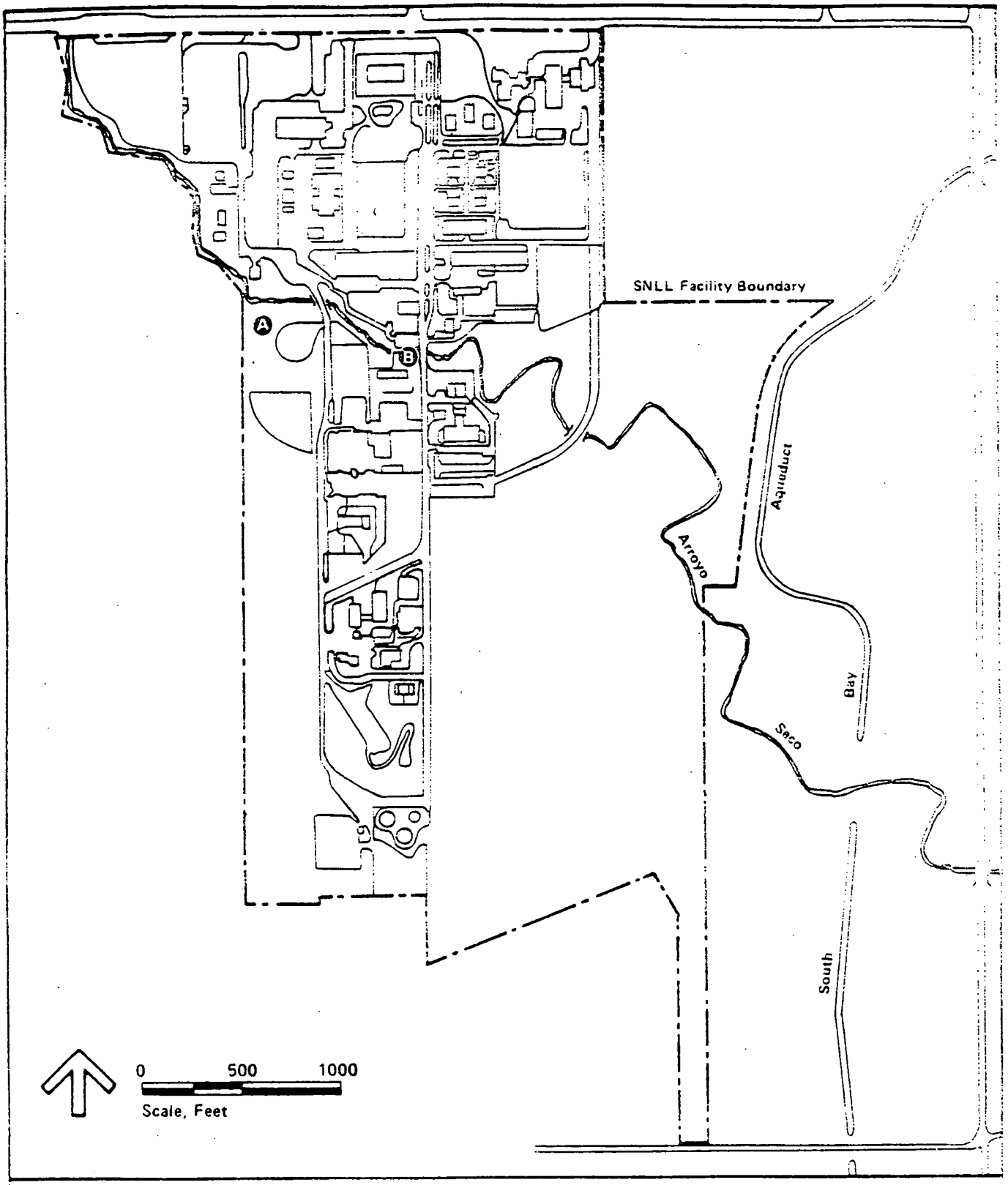

FIGURE 2.17

APPROXIMATE LOCATIONS OF
RANKING UNITS FOR
SANDIA NATIONAL LABORATORIES, LIVERMORE

Both of the ranking units from the SNLL Survey represent existing or suspected environmental problems.

Table 2.19 presents the SNLL ranking units that are existing or suspected environmental problems. Only two ranking units are scored for SNLL due to the lack of data on the other environmental problems identified by the Survey team. One of these two ranking units scores in an HPI Group that represents a secondary level of concern (HPI Group 6). This ranking unit represents a leak of 59,500 gallons of diesel fuel in 1975. The score for this ranking unit results from the large inventory released and the proximity of the receptors. The small inventory released in the second ranking unit, Former Fire Extinguisher Training Area, results in an extremely low ranking for that ranking unit.

There were a moderate amount of assumptions made to model the SNLL ranking units (see the critical data column of Table 2.19). The Diesel Fuel Tank Area ranking unit had extensive site monitoring data, while the Fire Extinguisher Training Area ranking unit had limited data pertaining to contaminant inventories. Environmental settings for air, soil, surface water, and subsurface systems remained uniform for SNLL due to the small areal extent of the site.

2.2.15 Savannah River Plant

The Savannah River Plant (SRP) occupies an area of approximately 300 square miles along the Savannah River in the state of South Carolina. Aiken, South Carolina, and Augusta, Georgia, lie approximately 20 miles to the north and 25 miles northwest, respectively, of SRP. The primary purpose of the plant is to produce plutonium, tritium, and other special nuclear materials for use in the U.S. defense programs. This is accomplished through fuel and target manufacturing for site reactors, chemical separation for recovery of special nuclear materials, tritium production and recovery. The major facilities at SRP have been in operation since 1954.

The SRP is bounded on the southwest by the Savannah River and on the west, north, and east by privately and publicly owned, mostly forested land. The average population density in the counties that surround the SRP ranges from 23 to 560 people per square mile.

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TABLE 2.19

SANDIA NATIONAL LABORATORIES, LIVERMORE
EXISTING OR SUSPECTED ENVIRONMENTAL PROBLEMS

HPI Group	Ranking Unit Name	Environmental Management Area	Critical Data Category
6	Diesel Fuel Tank Area	Inactive Sites and Releases	A
0	Former Fire Extinguisher Training Area	Inactive Sites and Releases	C

A - Monitored or Measured Data; C - Significant Amount of Assumptions

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The land surrounding the SRP is predominantly forested. Farming is prevalent with major crops being cotton, soybeans, corn, and small grains. Beef cattle are also raised. Two distinct physiographic subregions exist at the SRP. These are the Pleistocene coastal terraces (below elevation 270 feet) and the Aiken Plateau (above elevation 270 feet). The terraces include those listed below.

- The Wicomico (which is the floodplain of the Savannah River) is covered by a dense swamp forest typically comprised of bald cypress and tupelo gum trees.

- The Brandywine and Sunderland Terraces have gently rolling topography. They are characterized by both bottomland hardwood forest and loblolly pine, oak, birch, poplar, and gum.

The Aiken Plateau is characterized by hilly upland areas dissected by streams. Longleaf pine forest and scrub oak are the typical vegetation in the upland areas.

The climate at the SRP is temperate with mild winters and long summers. The average frost-free season is approximately 246 days. Average monthly temperatures range from 45°F in the month of January to 81°F in the month of July. Summers typically have six days of temperatures greater than or equal to 97°F. Less than one-third of the days during the winter months have minimum temperatures below freezing. The average annual rainfall at the SRP from 1952 through 1978 was about 47 inches. The annual precipitation at Augusta from 1941 to 1970 ranged from a maximum of about 42.5 inches to a minimum of 28.05 inches. The maximum monthly precipitation at the SRP was 12.4 inches, recorded in August 1964. Precipitation is usually greatest in March and least in November. Snowfall and freezing rain are infrequent in the winter in the area. A day with more than 1 inch of snowfall occurs in only one out of five winters. Average daily humidity in the vicinity of the plant ranges from 43 to 90 percent. The SRP lies in a region that averages 8.5 tornadoes per year. Three tornadoes have been confirmed on the plant site or vicinity between 1951 and 1983. Hurricanes also affect South Carolina, with damaging ones occurring approximately once every seven years. The SRP, however, has experienced hurricane force winds only once, during Hurricane Gracie in 1959. The average wind speed measured in Augusta, Georgia, for the years [illegible]-1981 was 7.2 miles per hour. Calms and winds below 3.4 miles per hour were

reported to occur about 33 percent of the time. On an annual basis, winds are predominantly from the west-northwest. Depth to groundwater averages approximately 350 feet.

Included in the Preliminary Report for SRP are 33 Category II and III findings. Eleven of these findings were not ranked with the risk-based model. Two which dealt with issues of laboratory quality assurance and four compliance or management issues were beyond the focus of the prioritization. Three findings dealt with environmental problems which MEPAS cannot rank, one with non-chemical pollutants, and two with environmental impacts with no associated human health effect. These three problems were addressed in the Integration Phase of the ranking. Finally, two findings were not ranked pending the results of the Survey's Sampling and Analysis Program. The remaining 22 findings are grouped into 28 ranking units and evaluated using MEPAS. These ranking units, located on Figure 2.18, are as follows:

RANKING UNIT NAME	LOCATION ON MAP
• M Area Settling Basin	C
• Unplanned Releases of Tritium	D
• Tritium Air Sources	D,I
• Sediments in Steel Creek Corridor	B
• Tritium in Surface Water	B
• Burial Grounds	G
• Active Seepage Basins	P
• H Area Drainage Ditch	E
• Animal Contamination	B
• Airborne Mercury Releases	D
• New TNX Basin	F
• Savannah River Swamp	O
• Old TNX Basin	F
• 1,1,1-Trichloroethane Release from M Area	C
• Sanitary Sludge Lagoon	A
• K, L, P, and R Areas Nonradioactive Pits and Piles	K
• C, F, H, and CS Areas Nonradioactive	

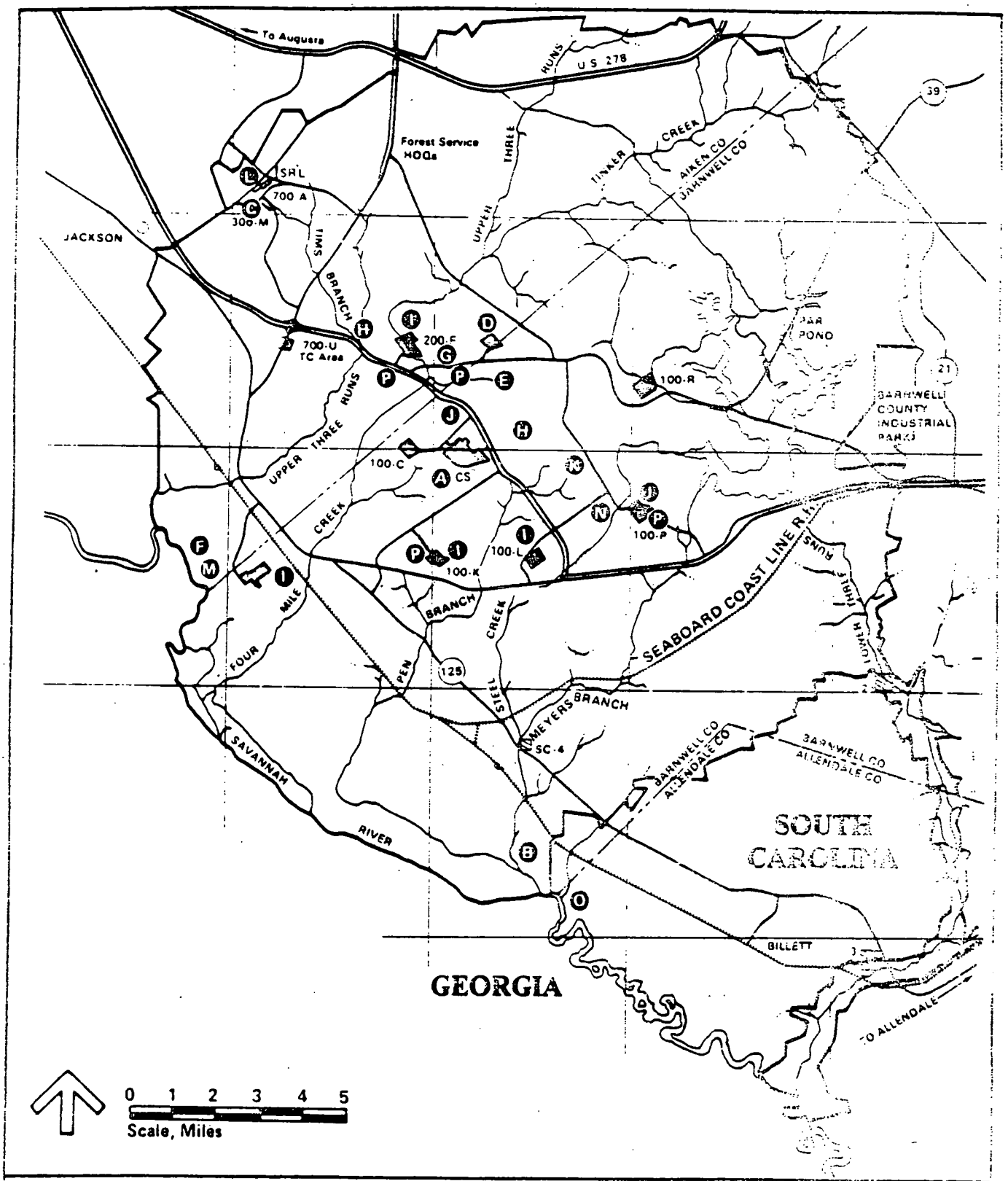


FIGURE 2.18

APPROXIMATE LOCATIONS OF
RANKING UNITS FOR
SAVANNAH RIVER PLANT

Pits and Piles	J
• A and M Areas Nonradioactive Pits and Piles	L
• D and TNX Areas Nonradioactive Pits and Piles	M
• F and H Areas Miscellaneous Radioactive Surface Contamination	G
• A and M Areas Miscellaneous Radioactive Surface Contamination	L
• L and P Areas Miscellaneous Radioactive Surface Contamination	N
• 211 F and H Treatment Tanks and Associated Piping	D
• C, F, H, and CS Areas Underground Storage Tanks	J
• D and TNX Areas Underground Storage Tanks	M
• K, L, P, and R Areas Underground Storage Tanks	K
• A and M Areas Underground Storage Tanks	L
• Depleted Uranium Storage	H

Of the 28 ranking units from the SRP Survey, six represent potential for future environmental problems and are not discussed in this section of the report (see Section 3). These six ranking units involve the potential for releases from the depleted uranium storage areas; and releases from underground storage tanks at A and M Areas; C, F, H, and CS Areas; D and TNX Areas; and K, L, P, and R Areas, and the potential for uncontained releases from the 211 F and H treatment tanks and associated piping. The remaining 22 ranking units represent existing or suspected environmental problems and are included in this section.

Table 2.20 presents the SRP ranking units that are existing or suspected environmental problems. The rankings for these 22 ranking units at SRP range from HPI Groups in the secondary level of concern (HPI Groups 6 and 7) to the extremely low end (HPI Group 0). Four rank in HPI Groups 6 and 7, with an additional three in HPI Groups 4 and 5. At the other end of the scale, five ranking units rank extremely

TABLE 2.20

SAVANNAH RIVER PLANT
EXISTING OR SUSPECTED ENVIRONMENTAL PROBLEMS

HPI Group	Ranking Unit Name	Environmental Management Area	Critical Data Category
7	M Area Settling Basin	Liquid Discharges/Active Waste Management	A
6	Burial Grounds	Active Waste Management	A
6	Active Seepage Basins	Liquid Discharges/Active Waste Management	A
6	Sediments in Steel Creek Corridor	Liquid Discharges	B
5	Animal Contamination	Inactive Sites and Releases	B
4	H Area Drainage Ditch	Liquid Discharges	A
4	Airborne Mercury Releases	Air Emissions	B
3	Savannah River Swamp	Direct Radiation	B
3	A and M Areas Nonradioactive Pits and Piles	Inactive Sites and Releases	A
3	New TNX Basin	Liquid Discharges/Active Waste Management	A
3	C, F, H, and CS Areas Nonradioactive Pits and Piles	Inactive Sites and Releases	A
1	1,1,1-Trichloroethane Release from M Area	Air Emissions	B
1	K, L, P, and R Areas Nonradioactive Pits and Piles	Inactive Sites and Releases	A
1	Old TNX Basin	Inactive Sites and Releases	A
0	D and TNX Areas Nonradioactive Pits and Piles	Inactive Sites and Releases	A
0	Sanitary Sludge Lagoon	Active Waste Management	C
0	F and H Areas Miscellaneous Radioactive Surface Contamination	Inactive Sites and Releases	C
0	A and M Areas Miscellaneous Radioactive Surface Contamination	Inactive Sites and Releases	C
0	L and P Areas Miscellaneous Radioactive Surface Contamination	Inactive Sites and Releases	C

A - Monitored or Measured Data; B - Moderate Amount of Assumptions; C - Significant Amount of Assumptions

low (HPI Group 0), with an additional seven ranking fairly low (HPI Groups 3 through 1).

With the exception of four ranking units that focus on the air pathway, one that focuses on the potential for ingestion of contaminated wildlife, and one that focuses on the potential migration of contaminants to the Tuscaloosa aquifer, all of the ranking units focus on potential migration of contaminants to the Savannah River. As a result, the exposure pathway for these ranking units is focused on the potential for impacts to local water supplies which draw from the river. There are a wide variety of pathways to the river in the ranking units. These pathways include migration through the groundwater with recharge to the river, overland runoff to the river, direct discharge to the river or swamps, and contaminated sediment movement to the river. As a result of the similarity of the receptors, the size of the inventory has the most significant effect on the ranking of these units.

The highest ranking units at SRP include Tritium in Surface Water, Unplanned Releases of Tritium, Tritium Air Sources (all three are not included in the ranking tables, see page 2.14) and the M Area Settling Basin. Tritium in Surface Water involves routine releases of wastewaters containing tritium to on-site streams. Evaluation of this ranking unit is dominated by the quantity of tritium being released to the on-site streams which drain to the Savannah River.

Tritium Air Sources focuses on site-wide emissions including such sources as the Tritium Production Facility, the Heavy-Water Rework Facility, the reactor disassembly and seepage basins, the reactor stacks, the Separations Facility, the F and H Areas seepage basins, and the Receiving Basin for Off-Site Fuels Facility. The potential for consumption of tritium in regionally produced agricultural products for releases from the F and H Area stacks drives the ranking. The Unplanned Releases of Tritium ranking unit focuses on the additional releases of tritium that have historically occurred. To rank this problem, the historical releases were added to the amount modeled in the Tritium Air Sources ranking unit. Thus the impact of the unplanned releases is the difference between the scores of the two ranking units. In this case, the difference is minimal. It should be noted that the score is focused on long-term, rather than acute, impacts based upon long-term average conditions. Therefore, the significance of episodic events such as this ranking unit represents may not be best reflected in the score.

The M Area Settling Basin is part of the M Area Hazardous Waste Management Facility. This ranking unit ranks high due to the mobility of tetrachloroethylene. Other chemicals also rank high for this ranking unit.

Three ranking units that represent aggregations of radioactive surface contamination areas rank extremely low. These contamination areas are placed into one of three ranking units based upon their location. In all three cases, the small inventory results in the low ranking.

A majority of the ranking units for SRP used either measured data or conservative assumptions (see the critical data column of Table 2.20). A moderate amount of these assumptions were made; however, the data for the radioactive surface contamination ranking units were incomplete and a significant amount of assumptions were used.

There were three environmental settings for air, two settings for soil, and one each for surface water and subsurface systems for SRP. The air settings were divided into three by geographic centers in relation to activities at the installation. The two soil settings were used to reflect the difference between the swamp and the marsh soils, the swamp soils being closer to the Savannah River. While both soils are saturated with water, marsh soils are generally more stagnant by nature than are swamp soils. Surface water and subsurface systems are uniform for this site.

2.2.16 Y-12 Plant

The Y-12 Plant occupies 811 acres in the eastern end of the Oak Ridge Reservation (ORR), in eastern Tennessee. The ORR is about 20 miles west of Knoxville, Tennessee, and about three miles southwest of the center of the City of Oak Ridge, Tennessee. Also within the 137,000-acre reservation are the Oak Ridge National Laboratory (ORNL) and the Oak Ridge Gaseous Diffusion Plant. The primary mission of the Y-12 Plant is the processing of source and special nuclear materials and the production of weapons component parts. These are shipped to another DOE site for final assembly. The plant also provides support to the weapons design laboratories, other Oak Ridge Reservation activities, and other government agencies. Key production activities at the Y-12 Plant involve the fabrication of parts from uranium, nonradioactive metals (principally iron, steel, aluminum, and

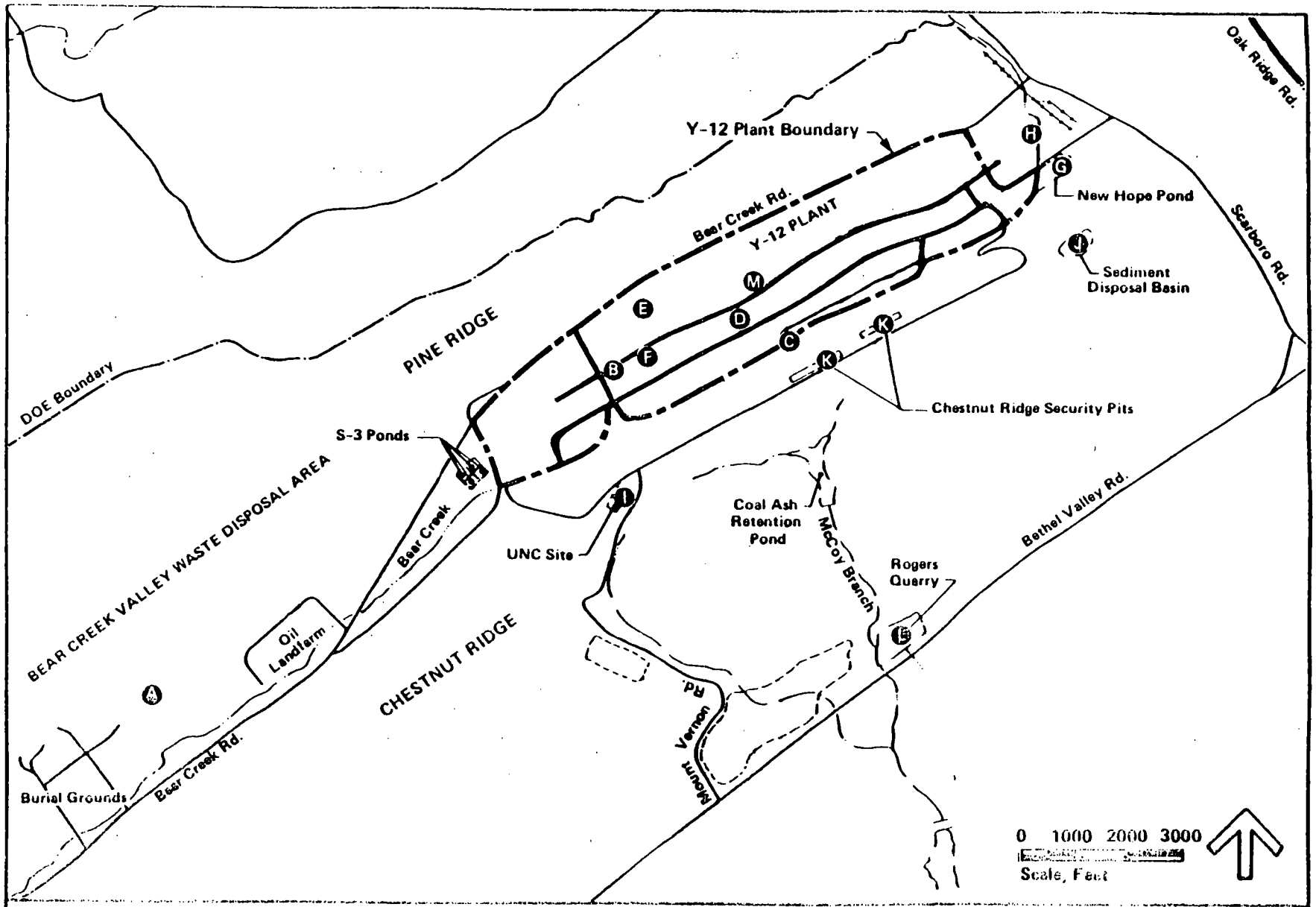
copper); and also plastics, ceramics, and carbon. Lithium and beryllium metals are also processed at this installation. The Y-12 Plant has been in continuous use since 1943.

The Y-12 Plant is situated in the eastern end of the Reservation in the Bear Creek Valley with the Cumberland Mountains rising to an elevation of 3,000 feet or more about 10 miles to the northwest, and the Great Smoky Mountains reaching over 6,600 feet about 70 miles to the southeast. The plant occupies an area about 2/3 mile wide by 3.2 miles long. Except for Knoxville and the City of Oak Ridge, the land within 50 miles of the ORR is predominantly rural, used largely for residences, small farms, and pasturage of cattle. The Tennessee and Clinch Rivers are the major streams flowing through the area; the Clinch River forms the southeastern border of the ORR.

Oak Ridge has a mild climate with warm, humid summers and cool winters. No extreme conditions prevail in temperature, precipitation, or winds. The year-round mean temperature is 59°F, with a January mean of about 38°F and a July mean of about 77°F. Recorded maximum and minimum temperatures are 100.4°F and -0.4°F. Total annual precipitation (water equivalent) is 53 inches including approximately 10 inches of snowfall, with monthly precipitation peaking in January and February. Oak Ridge is one of the country's calmest wind areas. The atmosphere can be considered to be in an inversion status about 36 percent of the time. The daily up- and down-valley winds, however, provide some diurnal exchange. The prevailing wind directions are from the northeast (down-valley) and southwest (up-valley).

Included in the Preliminary Report for the Y-12 Plant are 42 Category II and III findings. Fourteen of these findings were not ranked with the risk-based model. One which dealt with issues of data quality and five compliance or management issues were beyond the focus of the prioritization. Eight findings were not ranked pending the results of the Survey's Sampling and Analysis Program. The remaining 28 findings are grouped into 16 ranking units and evaluated using MEPAS. These ranking units, located on Figure 2.19, are as follows:

RANKING UNIT NAME	LOCATION ON MAP
• Coal Ash Retention Pond/Rogers Quarry	L



APPROXIMATE LOCATIONS OF RANKING UNITS FOR Y-12 PLANT

FIGURE 2.19

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• Off-site Floodplain Contamination in the East Fork Poplar Creek and Bear Creek	H
• Bear Creek Valley Waste Disposal Area	A
• Process Water Discharges	G
• On-site Mercury Contamination	B
• Groundwater Contamination in the Main Y-12 Plant Area	D
• Chestnut Ridge Sediment Disposal Basin	J
• Chestnut Ridge Security Pits	K
• Hydrogen Fluoride Emissions	E
• Dust and Smoke Emissions	F
• UNC Site	I
• Soil Contamination in the Main Plant Area	C
• Inadequate Containment of Spills and Leaks	D
• Leaking Drums at the Salvage Yard	M
• Underground Storage Tanks for Non-Waste Toxic and Hazardous Substances	D
• Underground Storage Tanks for Waste Materials	D

Of the 16 ranking units from the Y-12 Plant Survey, three represent potential for future environmental problems and are not included in this section of the report (see Section 3). These three ranking units include the potential for releases due to inadequate containment of spills and leaks; the potential for PCB releases from drum storage; and the potential for releases from underground waste and non-waste storage tanks. The remaining 13 ranking units represent existing or suspected environmental problems, which are included in this section.

Table 2.21 presents the Y-12 Plant ranking units that are existing environmental problems. The Y-12 Plant ranking units rankings range from HPI Groups representing a secondary level of concern to HPI Groups in the lowest end of the ranking. Most ranking units focus on the potential for migration through the groundwater, which is approximately 20 feet deep, to nearby surface streams and ultimately to the Clinch River. Two ranking units involve direct discharge to the stream from either process discharges or contaminated soil movement. Finally,

TABLE 2.21

Y-12 PLANT
EXISTING OR SUSPECTED ENVIRONMENTAL PROBLEMS

HPI Group	Ranking Unit Name	Environmental Management Area	Critical Data Category
7	Off-site Floodplain Contamination in EFPC and BC	Inactive Sites and Releases	B
6	Process Water Discharges	Liquid Discharges	A
6	On-site Mercury Contamination	Inactive Sites and Releases	A
5	Underground Storage Tanks for Non-Waste Toxic and Hazardous Substances	Inactive Sites and Releases	B
4	Groundwater Contamination in the Main Y-12 Plant Area	Inactive Sites and Releases	B
4	Chestnut Ridge Sediment Disposal Basin	Active Waste Management	B
4	Chestnut Ridge Security Pits	Active Waste Management	B
3	Hydrogen Fluoride Emissions	Air Emissions	B
1	Dust and Smoke Emissions	Air Emissions	B
1	UNC Site	Inactive Sites and Releases	A
0	Soil Contamination in the Main Plant Area	Inactive Sites and Releases	B

A - Monitored or Measured Data; B - Moderate Amount of Assumptions

three ranking units focus on airborne transport resulting either from emissions (two ranking units) or through volatilization (one ranking unit).

All of the highest rankings at the Y-12 Plant are a result of large inventories and/or high toxicity of the contaminants released. Arsenic drives the scoring in the three highest units. Oil is the contaminant that drives the ranking for the Process Water Discharges ranking unit, while mercury is the contaminant that drives the ranking for On-site Mercury Contamination. Conversely, the lowest scoring ranking units contain contaminants that have low toxicity values and, in some cases, low concentrations or inventories presumed to be released.

The two highest ranked ranking units at Y-12 (not included in the ranking tables, see page 2.14) include Bear Creek Valley Waste Disposal Area and Coal Ash Retention Pond/Rogers Quarry (HPI Group 8). The Bear Creek Valley Waste Disposal Area has numerous disposal pits and landfills which contain a variety of contaminants. The Coal Ash Retention Pond, located in Rogers Quarry, serves as a settling pond for fly ash and bottom ash from the Y-12 Steam Plant. The quarry is unlined.

The next two highest ranked ranking units at Y-12 include Off-site Floodplain Contamination in the East Fork Poplar Creek and Bear Creek and Process Water Discharges. The first of these represents off-site contamination in the floodplain of the East Fork Poplar Creek and Bear Creek. The second ranking unit represents waste streams that discharge into New Hope Pond.

A moderate amount of assumptions were used in modeling the Y-12 Plant ranking units (see the critical data column of Table 2.21). A moderate number of assumptions were necessary to extend the measured site information to develop source terms for modeling purposes. Four ranking units used site monitoring data directly for modeling purposes.

Environmental settings for air, surface water, and subsurface systems remained uniform for the Y-12 Plant; however, two soil settings were modeled based on different soil erosion factors in conjunction with geologic formation slopes. Soil erosion and runoff loads are higher in the mountain ridge area where the formation slopes range from 25 to 50 percent than near the main plant toward the

valley where the formation slopes range from 12 to 20 percent with a lower erosional force.

3.0 SITUATIONS THAT HAVE THE POTENTIAL FOR FUTURE ENVIRONMENTAL PROBLEMS

This section of the report contains the preliminary summary results of the risk-based ranking of the situations that have the potential for future environmental problems. This type of situation includes conditions that if left unattended may result in releases to the environment at some future time. Since the release has not occurred in these problems, a scenario describing the extent and the timing of the potential future release had to be developed. The release scenarios used in this section were developed for the sole purpose of comparing one type of potential environmental condition where it occurs with others across DOE. The resulting rankings, therefore, represent the potential for risk resulting from the problem at one site relative to the same problem at other DOE sites.

No attempt was made during either the Surveys or the development of the rankings within this report to assign probabilities of occurrence to these potential future problems Therefore, it is inappropriate to compare scores in this section with those generated for the problems described in Section 2 of this report. Since these scenarios also differ for each class of problem, it is inappropriate to compare the scores of one class of problems with those of another.

The situations discussed in the remainder of this section include five classes of issues: underground storage tanks (USTs), spill containment, polychlorinated biphenyls (PCBs), drum handling, and miscellaneous situations.

3.1 Underground Storage Tanks

Ranking units in this section include the potential for future environmental problems associated with the current use of underground tanks for the storage of process materials or products. This management area does not include tanks used for waste management purposes, which are included in Section 3.5. It also does not include past spills from currently active tanks nor potential problems associated with abandoned tanks. These types of problems are included in the Inactive Sites and Releases environmental management area.

As explained in Section 1, to assess the potential environmental problems associated with USTs, a hypothetical leakage scenario was developed and applied to all tanks at all sites. The effect of this was to hold constant the potential for leaks and to focus the ranking on the effects of the material leaked on the environment in which these tanks are located. This should allow the ranking to focus on the sites that have tanks that pose the most significant risk should a leak occur.

The standard assumptions for USTs focus on long-term undetected releases from the underground tanks at a site. The analysis for these problems, therefore, considers the number of tanks, their ages, and their contents. All tanks were placed into one of five age groups (0-5, 6-10, 11-15, 16-20, and greater than 20 years old). Based upon a study by the New York State Department of Environmental Conservation (Technology for the Storage of Hazardous Liquids-A State of the Art Review, January, 1983), a fixed percentage of each tank age group was assumed to leak. The data used in the study were developed by the American Petroleum Institute (API). The percentages of each tank in the age groups discussed above that are assumed to leak at a site are 1.6, 10.8, 22.5, 25.9, and 40, respectively. The leak rate for all tanks that leak was held at one percent of the tank contents per week. Inactive tanks were assumed to leak until the total tank inventory was depleted. Active tanks were assumed to leak until 1998 when regulations for USTs will require leak testing, corrosion protection, leak detection, or tank removal. No tanks were assumed to be removed, replaced, or repaired until 1998.

Table 3.1 provides the ranking of these USTs. There are 15 ranking units representing 11 of the 16 sites. Most of these ranking units score in the middle range of the ranking (HPI Groups 4-6) and also score relatively close together. The USTs at Pantex rank based on the contaminant of concern, its bioaccumulation properties, and extensive use of irrigation for agricultural production in the area. The ranking for the Sandia National Laboratories' (SNL) USTs results from their proximity to receptors. Fernald UST rankings result from their proximity to receptors and a larger populace utilizing surface water that is recharged by groundwater. The USTs at Rocky Flats rank due to their large inventory and their potential to impact a water body that is extensively used. The USTs at Savannah River Plant (SRP) also have a large inventory for release, but the receptors are significantly farther away than those mentioned above. Although the Pinellas UTTs are close to their receptors, the portion of the aquifer that they have the potential

TABLE 3.1

UNDERGROUND STORAGE TANKS
POTENTIAL FOR FUTURE ENVIRONMENTAL PROBLEMS

HPI Group	Ranking Unit Name	Site Name	Critical Data Category
7	Potential Future Releases from Underground Storage Tanks	Pantex	B
6	SNL Underground Storage Tanks	SNL/ITRI	B
6	Potential for Leaks from Underground Storage Tanks	Fernald	B
6	ITRI Underground Storage Tanks	SNL/ITRI	B
6	Underground Product Storage Tanks	Rocky Flats	B
4	Potential Leakage from Underground Tanks	Mound	B
4	D and TNX Areas Underground Storage Tanks	Savannah River	B
4	C, F, H, and CS Areas Underground Storage Tanks	Savannah River	B
4	Potential Releases from Active Underground Storage Tanks	Pinellas	B
4	A and M Areas Underground Storage Tanks	Savannah River	B
4	Underground Storage Tanks for Waste Materials	Y-12	B
3	K, L, P, and R Areas Underground Storage Tanks	Savannah River	B
0	Potential Future Releases from Underground Storage Tanks	Portsmouth	B
0	Potential for Future Releases from Underground Tanks	LANL	B
0	Potential for Leaks from Underground Storage Tanks	NTS	B

B - Moderate Amount of Assumptions

to impact is not extensively used. Three of these ranking units rank very low. The USTs at Los Alamos National Laboratory (LANL) and Nevada Test Site (NTS) rank low due to the depth to groundwater. Portsmouth's low ranking results from the small inventory available.

3.2 Spill Containment

Ranking units in this section include the potential for environmental problems associated with the current use of aboveground tanks that lack sufficient secondary containment. This section does not include past spills from aboveground tanks, which are included in the Inactive Sites and Releases environmental management area. These tanks are generally used for storage of fuels, chemicals used in the facility's processes, or waste. Secondary containment of most aboveground tanks is managed by the spill prevention provisions of the National Contingency Plan (NCP) issued under the authority of the Clean Water Act. Tanks involving radioactive materials are managed under the Atomic Energy Act. Findings involving such problems are located in the Environmental Survey Preliminary Reports under Toxic and Chemical Handling or, for waste tanks, under Waste Management.

The potential for uncontained releases was modeled for this report using hypothetical release assumptions explained in Section 1. The standard release focused on a major release from the single tank that, in most cases, represented the potential for the most environmental damage. This scenario was chosen since the NCP requirements are focused on catastrophic releases, rather than small undetected leaks.

Table 3.2 presents the ranking of the potential for releases from such tanks. There are nine ranking units in this management area representing the spill containment issues at eight sites. Those tanks of most significance include those at SRP and Y-12. Spill containment concerns rank in the higher groups in these locations as a result of the potential for direct discharge of contaminants to surface water bodies. For example, the SRP tank is near a storm drain which could collect tank contents and release them to nearby creeks. Portsmouth's, LANL's, and Hanford's tanks rank very low. Portsmouth ranks low due to the low groundwater velocity coupled with the distance to the receptors. LANL ranks low due to minimal resuspension or migration

TABLE 3.2

SPILL CONTAINMENT
POTENTIAL FOR FUTURE ENVIRONMENTAL PROBLEMS

HPI Group	Ranking Unit Name	Site Name	Critical Data Category
8	211 F and H Treatment Tanks and Associated Piping	Savannah River	B
7	Inadequate Containment of Spills and Leaks	Y-12	C
4	Potential for Future Releases from Radioactive Waste Tanks	LANL	C
3	Tank Farm Spill Containment	Fernald	C
3	Potential Future Releases from Aboveground Tanks	Pantex	B
1	Site 300-Oily Waste at the Building 865 Complex	Lawrence Livermore	B
0	Potential Future Releases from Aboveground Tanks	Portsmouth	B
0	Potential Future Releases from Nonradioactive Aboveground Tanks	LANL	B
0	Potential Releases from Aboveground Product Tanks	Hanford	B

B - Moderate Amount of Assumptions; C - Significant Amount of Assumptions

potential, while Hanford ranks low due to the small inventory and distance to receptors.

3.3 Polychlorinated Biphenyls

Ranking units in this section include the potential for future environmental problems associated with use, storage, or disposal of PCBs. The use, storage, or disposal of PCBs is managed by the Toxic Substance Control Act (TSCA) 40 CFR 761. Most PCB-related findings are included in the Preliminary Reports in the Toxic and Chemical Handling section. This management area does not include spills involving inactive PCB equipment, which are included in the Inactive Sites and Releases environmental management area. These types of problems can be found in the Inactive Sites and Releases section of the Environmental Survey Preliminary Reports.

The potential for future releases of PCBs also was modeled for this report using hypothetical release assumptions. The standard PCB release scenario focused on an undetected leak from the location (transformer, storage pad, etc.) that represented the potential for the most environmental damage. In most cases, this involved a single transformer per site, or per major area of the site. Compliance with Environmental Protection Agency (EPA) cleanup regulations (40 CFR 76) was assumed. This regulation requires cleanup within 48 hours to a level of 50 parts per million. Since this equipment is active and a catastrophic failure would impact power production, it is safe to assume that such an event would be quickly detected.

Table 3.3 presents the ranking of the potential for releases of PCBs from PCB or PCB-contaminated equipment. There are seven ranking units in this management area, representing the PCB issues at six sites. LANL's Potential for PCB Release from Transformers ranks the highest in this management area due to its proximity to a nearby stream. The next highest ranking units include Idaho National Engineering Laboratory's (INEL's) Potential for PCB Release from Transformers and Rocky Flats' PCB Transformer. These two ranking units have a large inventory of PCBs that could be released to the environment. Four ranking units rank very low. These include PCB releases at NTS, SNL, Inhalation Toxicology Research Institute (ITRI), and Lawrence Livermore National Laboratory (LLNL). These ranking units rank low due to the minimal potential for migration at these sites.

TABLE 3.3

POLYCHLORINATED BIPHENYLS
POTENTIAL FOR FUTURE ENVIRONMENTAL PROBLEMS

HPI Group	Ranking Unit Name	Site Name	Critical Data Category
6	Potential for PCB Releases from Transformers	LANL	B
3	Potential for PCB Release from Transformers	INEL	B
3	PCB Transformer	Rocky Flats	C
0	Potential for Leaks from PCB Transformers	NTS	B
0	Potential Release of PCB from Transformers and Capacitors	Lawrence Livermore	C
0	Potential Releases of PCBs from Transformers at SNL	SNL/ITRI	B
0	Potential Releases of PCBs from Transformers at ITRI	SNL/ITRI	B

B - Moderate Amount of Assumptions; C - Significant Amount of Assumptions

3.4 Drum Handling

Ranking units in this section include the potential for future environmental problems associated with the storage or handling of chemicals. These problems focus on drum storage areas. Chemical storage in tanks and waste storage are not included in this section. Findings pertaining to the problems included in this section are found in the Environmental Survey Preliminary Report section dealing with Toxic and Chemical Handling. As explained in Section 1, the potential leakage from drums was modeled using standard release assumptions.

The issue of drum failure most often reflected in the findings was oriented more toward steady leaks over a period of time rather than a catastrophic release as in the tanks and PCB findings. Therefore, the standard release scenario for drums took into account the number and contents of drums stored in an environmentally unsound manner and their storage location. Since the drum failure rate was unknown, a rate had to be assumed. For drums stored in the open on bare ground, a standard drum failure rate of 15 percent per year was used. This equates to a failure of all drums stored in such a manner over approximately a seven-year period. Since drum failure is sensitive to environmental conditions such as moisture, special site conditions justified alternative assumptions. For example, a 10 percent failure rate was used for Pantex due to the arid climate, which presumably would result in a lower drum corrosion rate. In addition, in some findings the Survey team identified conditions of the drums that warranted a variance from the standard failure rate.

Table 3.4 provides the ranking of these problems. There are seven ranking units in this category. The highest scoring ranking units include Potential Future Releases from Non-Tank Sources at Pantex, and Leaking Drums at the Salvage Yard at Y-12 (both HPI Group 6). These two ranking units rank higher than the others due to their large inventories and the proximity of the receptors.

Five ranking units rank very low due to the minimal liquid influx to the saturated zone. Three of these are from the SNL Survey, one from LANL, and one from SRP.

TABLE 3.4

DRUM HANDLING
POTENTIAL FOR FUTURE ENVIRONMENTAL PROBLEMS

HPI Group	Ranking Unit Name	Site Name	Critical Data Category
6	Potential Future Releases from Non Tank Sources	Pantex	C
6	Leaking Drums at the Salvage Yard	Y-12	B
1	Depleted Uranium Storage	Savannah River	B
0	Potential for Future Releases from Product Drums	LANL	C
0	Orphaned Chemicals	SNL	B
0	Drum Storage at Tonopah	SNL	C
0	ITRI Leaking Drums	SNL	C

B - Moderate Amount of Assumptions; C - Significant Amount of Assumptions

3.5 Other Situations that Represent the Potential for Future Environmental Problems

Eight ranking units that represented miscellaneous problems at the 16 sites were modeled (see Table 3.5). Two involve potential air emissions, four represented waste handling situations, and two others were potential problems associated with liquid discharges.

Two ranking units in this section include the potential for environmental problems associated with emissions of contaminants to the air from stacks, vents, and fugitive sources (including resuspension of contaminated soil). These types of problems are typically managed under the Clean Air Act and such findings are included in the Air section of the Environmental Survey Preliminary Report. Air ranking units, even with small releases, rank relatively high, generally due to the size of the population potentially exposed to the contaminants. These ranking units include Potential Future Releases of Thorium and Potential Releases from Anhydrous Hydrogen Fluoride Tanks. The thorium ranking unit represents the potential for a release due to structural deficiencies noted at the time of the Survey. Since that time, the Feed Materials Production Center (FMPC) has informed the Survey of actions that have been taken to address the structural integrity of the tanks.

Four ranking units in this section include the potential for future environmental problems associated with the generation, storage, transportation, and disposal of hazardous, radioactive, by-product, and non-hazardous waste. These problems are typically managed under RCRA or provisions of the Atomic Energy Act. Findings dealing with these problems are found in the Waste Management section of the Preliminary Reports. These ranking units include Inadequate Protection of Waste Management Facilities Against Floods, Potential for Future Releases from Single Shell Tanks and Associated Piping, Potential for Releases from Hazardous Material and Waste Storage Areas at NTS, and Potential for Future Leaks from Waste Drums.The most significant of these issues is the potential for future releases from Kansas City Plant's waste storage areas resulting from a catastrophic flood. This problem scores highest as a potential source of 1,1,1-trichoroethane in drinking water.

TABLE 3.5

OTHER SITUATIONS THAT REPRESENT POTENTIAL FOR FUTURE ENVIRONMENTAL PROBLEMS

HPI Group	Ranking Unit Name	Site Name	Critical Data Category
6	Potential Future Releases of Thorium	Fernald	B
4	Inadequate Protection of Waste Management Facilities Against Floods	Kansas City	C
2	Potential Releases from Anhydrous Hydrogen Fluoride Tank	Fernald	B
0	Potential for Future Releases from Single Shell Tanks and Associated Piping	Hanford	A
0	Potential for Release from Hazardous Materials and Waste Storage Areas in NTS	NTS	C
0	Potential for Future Leaks from Waste Drums	Fernald	C
0	Wastewater Lagoons in Drainage Swales	NTS	B
0	Recirculating Cooling Water System	Portsmouth	B

A - Monitored or Measured Data; B - Moderate Amount of Assumptions; C - Significant Amount of Assumptions

Two ranking units in this section include the potential for environmental problems associated with process wastewater, sanitary wastewater, or stormwater discharges. These problems are typically managed under the National Pollutant Discharge Elimination System (NPDES) of the Clean Water Act or under the authority of the Atomic Energy Act. Findings including this type of problem are included in the Environmental Survey Preliminary Reports in the Surface Water section. These ranking units include Wastewater Lagoons in Drainage Swales and Recirculating Cooling Water System.

4.0 INTEGRATION OF OTHER ENVIRONMENTAL CONCERNS TO THE RANKING

4.1 Purpose of Integration Phase

As expressed in many environmental statutes, the focus of environmental management efforts is the protection of public health and the environment. The risk-based ranking is focused only on public health. Therefore, other concerns have to be factored into the ranking. The Multimedia Environmental Pollutant Assessment System (MEPAS) is focused on the potential long-term health impacts of chemical or radionuclide releases to the general public. The resulting MEPAS scores include some amount of uncertainty that should be recognized. In addition, acute health effects or health effects resulting from other types of releases are beyond the ability of the model to assess and, therefore, must be addressed as well. In addition, environmental degradation effects that are non-health-related are also not considered and need to be factored into the ranking. Thus, the final ranking of the environmental problems identified in the Environmental Survey needs to include appropriate consideration of the uncertainty associated with the risk-based ranking of the chemical and radionuclide concerns, the potential risk posed by releases beyond the model's capability to address (primarily non-chemical, non-radionuclide releases), and degradation of the environment.

In addition to the issues discussed above, there are other concerns that an environmental management program considers. Primary among these are statutory and regulatory compliance requirements. Schedules included within statutes, regulations, and enforcement actions represent commitments that have to be taken into account in developing plans for corrective action. How these commitments affect the ranking of health and environmental issues in developing appropriate response plans is an issue that is more appropriately addressed in program planning documents than in this technical assessment. To assist the decisionmakers in that effort, this document provides such regulatory information in the discussion of the ranking units in Appendix A.

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4.2 Process by Which Other Environmental Concerns Are Factored into the Ranking

Comparing across environmental concerns as diverse as public health risk and environmental degradation requires a solid understanding of the relative significance of the issues. In developing the system by which the Survey's findings would be prioritized, it was decided that such comparisons would best be handled based upon the technical merits of each environmental problem. To ensure that this case-by-case assessment is performed in a fair and consistent manner, a structured decisionmaking process which relies upon a group knowledgeable in the environmental problems being discussed was designed. Considering the needs discussed above, the basic elements of the procedures through which these concerns were compared started with the Survey teams and culminated in recommendations to the Office of Environment, Safety and Health (ES&H) by a panel of senior DOE environmental managers, referred to as the Integration Panel. The final decision on these integrations was the responsibility of the ES&H. The details on how uncertainty, environmental degradation, and releases beyond the model's capability to address were identified and prioritized are discussed below.

4.2.1 Identifying and Factoring in Uncertainty to the Ranking

There are two types of uncertainty associated with the ranking; uncertainty associated with the data and uncertainty associated with the model. Unfortunately, sensitivity analyses that would aid in understanding the amount of uncertainty associated with the rankings have not yet been conducted. Therefore, a good quantitative assessment of the uncertainty in the rankings could not be performed. Without a quantitative understanding of the uncertainty, adjustments to the rankings themselves would have been baseless. Therefore, to account for uncertainty in the rankings, two pieces of information were included in this report. These include a qualitative evaluation of the data uncertainty and a qualitative evaluation of modeling uncertainty.

The Prioritization Support Contractor (PSC) developed a preliminary scaling of the data quality for each ranking unit to develop a qualitative evaluation of the data uncertainty. Each ranking unit was reviewed and the data parameters which dominated the scoring were identified. The model developer assisted in this by

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preparing an evaluation of the parameters of the model which included indications of when these parameters would be significant. Based upon the data that were determined to be critical to the ranking for each ranking unit, the PSC then placed each ranking unit into one of three critical data categories. Critical data category "A" includes those ranking units where the critical data parameters were based upon measured or monitoring data. Critical data category "B" includes those ranking units where some assumptions were used to manipulate the data to a form that would be useful to the modeling. Critical data category "C" includes those ranking units where a significant number of assumptions were necessary for the critical data parameters.

The initial scaling was reviewed and revised during the data accuracy review phase by DOE field organizations. These changes resulted from the receipt of additional data and explanations of limitations of the data that were used.

This scaling of the critical data parameters forms the basis for the DOE-wide analysis of the existing and suspected problems in Section 2 of this report. Separate rankings and associated discussions are included in that section for each of the three critical data categories. Potential future problems that are discussed in Section 3 of the report are presented by type of problem since the design of the standard release scenarios used for each type of those problems represented the major uncertainty in those rankings.

To provide a qualitative assessment of the modeling uncertainty, the PSC, with the assistance of the model developer, identified types of problems where the necessary simplifications in the model may have a significant impact on the rankings. The three types of problems listed in Section 1.7.5 of this report (contaminated soil runoff, transport of fuels and oils through groundwater, and transport of organics through groundwater and surface water) were identified after review of the results of the modeling. No attempt was made to provide an indication of the extent of the significance of this type of uncertainty since the impact would vary from ranking unit to ranking unit. Instead, these qualifiers were inserted in the discussions of the appropriate ranking units in Appendix A.

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4.2.2 Identifying and Factoring in Environmental Degradation to the Ranking

"Environmental degradation," as it is used in this report, implies a measurable adverse impact on one of the five basic resources (i.e., air, soil, groundwater, surface water, and biological resources). The Natural Resource Damage Assessment (NRDA) regulations (43 CFR Part 11) provide principles and processes for defining environmental damage. The operational definition of environmental degradation used in this report draws from those principles and processes. However, the analyses that are called for in making injury and damage determinations under the NRDA regulations have not been performed since such assessments, should they be required, would not be performed until later stages in the problem investigations. Therefore, "environmental degradation" as used in this report is not the same as natural resource damage.

The process of identifying the environmental degradation issues associated with the environmental problems starts with the Survey teams. The process begins during the initial development of the Survey findings. In developing Survey findings, each team focuses on the potential impact on the environment. To support the efforts of the Integration Panel, the Survey teams reviewed the findings associated with the ranking units and identified a list of potential environmental degradation issues. The Integration Panel members also reviewed the ranking units and provided additional potential environmental degradation issues. All of these potential environmental degradation issues were analyzed and a preliminary categorization based on significance was developed to assist the panel (see Table 4.1).

The groundwater issues were grouped based upon the existence of contamination. The first group included instances where contamination had been detected in a groundwater formation. No attempt was made to distinguish between classes of groundwater nor of significance of the formation. The second group included instances where sampling had not been completed but where contamination was suspected. The third group included instances where the ranking unit presented the potential to impact the groundwater.

The surface water issue groups also were based upon the existence of contamination; however, the significance of the water body also was considered. The first group included issues where contamination was detected in a water body

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TABLE 4.1

CATEGORIZATION OF ENVIRONMENTAL DEGRADATION ISSUES

Groundwater

1 - Detected in aquifer
2 - Suspected in aquifer
3 - Potential to impact aquifer

Surface Water

1 - Detected in "special" water body
2 - Detected in water body other than "special"
3 - Not detected but potential to impact surface water body

Soil

1 - Detected off-site
2 - Detected on-site at levels that restrict use
3 - Detected on-site at levels that restrict future use

Air

1 - Emissions at levels to require response action
2 - Emissions at levels to impact biological systems or ambient standards
3 - Emissions of hazardous pollutants to air

Biological

1 - Potential to impact threatened, endangered, or State sensitive species
2 - Impact to other species
3 - Potential to impact other species

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that was special in some manner, such as a recreational river. The second group included detection in any other water body. The last group included ranking units which presented the potential to impact a surface water body.

The soil groups focused on the significance of the resource and of the contamination. The first of the three soil groups included soil contamination that was detected beyond the site boundary. The second group included on-site soil contamination that resulted in restrictions to the use of the soil, primarily in terms of access. The third group included on-site soil contamination that would restrict future use of the property. This last group focused on whether a change in institutional control over the property in the future would be prohibited as a result of the contamination.

The air groups focused on the type and extent of emissions. The first group was envisioned to include any ranking units where emissions were at levels to require response actions such as evacuations. No such issues surfaced in the preliminary lists. The second group included emissions that might be at levels to impact biological systems or ambient standards. The third group included emissions of hazardous air pollutants.

The biological groups focused on the type of species potentially impacted. The first group included any ranking units that have the potential to impact threatened, endangered, State-sensitive, or other such designated species. The second group included any ranking units that have impacted any other species. The third group includes any ranking unit that was identified as having the potential to impact any other species.

From this list of potential environmental degradation issues, the Integration Panel identified actual environmental degradation issues. The review of the potential degradation issues focused on the operational definition of environmental degradation provided earlier, that is, a measurable adverse impact on one of the five basic resources.

Having identified the list of degradation issues, the next step is to review the list of actual environmental degradation issues for significance in order to identify issues that may affect the rankings. To review the actual degradation issues for

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significance, a test of significance was applied. This test included reviewing the risk-based ranking to determine whether it adequately reflected the environmental degradation. The criterion for making this determination was whether the adverse impact foreclosed the ability of the resource to provide the types of services generally expected of the resource in the future. For example, the risk-based score for an aquifer that is used for domestic purposes by a large population likely has reflected the major environmental degradation concern. However, one which is not currently in use by a sizable population would likely not be reflecting the extent of the environmental degradation that exists. This criterion is much like the options valuation test in the NRDA.

Having identified those ranking units where the environmental degradation issues were not adequately reflected in the risk-based score, the Integration Panel next identified where in the ranking such issues should be situated. As a rule, it was felt that no significant public health risk should be below the environmental degradation issues. Thus a ceiling was placed on the movement of ranking units for environmental degradation purposes.

To identify that ceiling, the discussion in Section 1.7.4 of this report was used. That discussion provides a discussion of the public hazard significance associated with the HPI Groups. The 11 groups can be described as a spectrum of significance ranging from those issues of most concern from the potential public hazard perspective to issues where the contaminants are not projected to reach receptor populations. In Section 1.7.4, problems identified in HPI Groups 4 and 5 are considered to be roughly comparable with the minimum risk levels considered in regulatory decisions. Therefore, above these groups, the potential public health impacts could be considered sufficiently significant to violate the ceiling.

4.2.3 Identifying and Factoring in Releases that Are Beyond the Model's Capability To Address to the Ranking

The Survey findings identified a number of issues that involved the [illegible] or potential releases that were beyond the capability of the MEPAS model to [illegible]. These releases generally involve biological or physical releases such as fecal coliform and thermal discharges. Issues such as these were identified by the survey teams early in the prioritization effort. At the Scenario Development Meetings where the

ranking units were developed (see Section 1.7.3), a listing of such issues was also developed.

The Integration Panel reviewed these issues based upon their technical merit and provided a qualitative assessment of their potential for hazard to the public and to the environment. The Survey teams also provided to the Integration Panel their perspective on the potential hazards. The qualitative assessment of potential public hazard was compared to the public hazard significance associated with the NRI Groups, as discussed in Section 1.7.4 of this report. These unranked issues would be placed where the Section 1.7.4 descriptions best fit the qualitative assessment of the finding. The qualitative assessment of environmental degradation was compared to the assessment of environmental degradation issues which were ranked in the environmental degradation step. This aspect of the findings would then be placed in the ranking by comparison to these other degradation issues.

4.3 Results of the Integration Phase

The processes and procedures discussed above were developed in a series of meetings conducted on March 22-23 and April 12-13, 1988. In the first set of those meetings, the Integration Panel focused on developing the procedures by which the integration would be performed. In the second set of meetings, the panel was presented with the specific environmental degradation issues and non-rankable findings. The general procedures were first refined and tested and then applied.

4.3.1 Results of the Integration Phase Pertaining to Uncertainty

The Integration Panel made no changes to the rankings to account for uncertainty in the scores. Rather, the presentation of the scores was modified to better highlight categories of uncertainties by the use of critical data categories and by the addition of an additional qualifier to the narratives in Appendix A (see Section 4.2.1).

4.3.2 Results of the Integration Phase Pertaining to Environmental Degradation

The initial list of potential environmental degradation issues included 92 issues out of the 201 ranking units. By far, the largest number of these potential issues (56) involved groundwater. Sixteen soil issues were included; eight involved air issues; seven involved biological resources; and five involved surface water.

4.3.2.1 Identification of Environmental Degradation Issues

Of the 92 potential environmental degradation issues, the Integration Panel agreed that 50 included environmental degradation issues as defined (see Table 4.2). The majority of these issues (30) involve groundwater concerns. The remainder include 12 soil issues, four biological resource issues, three surface water issues, and one air issue. Most of the potential issues that were deleted did not qualify as having measurable adverse impacts since the concerns were listed only as representing a potential for such impacts. Thus, all of the groundwater issues identified in the second and third groundwater groups and the third surface water group (see Section 4.2.2 of this report) were deleted. Similarly, those issues in the third air group were deleted since the emission levels did not represent a measurable adverse impact. The 50 environmental degradation issues are discussed below by site.

The Feed Materials Production Center (FMPC) has two environmental degradation issues associated with the ranking units. Both of these involve ranking units that have contributed to concentrations of contaminants in the groundwater. The ranking units are entitled (1) Contamination from Liquid Discharges and (2) Contaminant Release from Waste Pits.

There are six environmental degradation issues in the Hanford ranking units. All of these involve groundwater contamination resulting from the active and inactive liquid discharges in the 100 Area, 200 Area, and 300 Area ranking units.

The Idaho National Engineering Laboratory (INEL) has four environmental degradation issues associated with their ranking units. Three degradation issues involve contamination of the groundwater (Inactive Injection Wells at TRA and CPP,

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TABLE 4.2

ENVIRONMENTAL DEGRADATION ISSUES

Site Name	Ranking Unit Name	Degradation
Fernald	Contamination from Liquid Discharges	GW-1
Fernald	Contaminant Release from Waste Pits	GW-1
Hanford	Inactive Liquid Process Discharges in the 100 Area	GW-1
Hanford	Inactive Liquid Process Discharges in the 200 Area	GW-1
Hanford	Inactive Liquid Process Discharges in the 300 Area	GW-1
Hanford	Active Liquid Process Discharges in the 100 Area	GW-1
Hanford	Active Liquid Process Discharges in the 200 Area	GW-1
Hanford	Active Liquid Process Discharges in the 300 Area	GW-1
INEL	Inactive Injection Wells at TRA and ICPP	GW-1
INEL	TCE in Drinking Water Well	GW-1
INEL	Volatile Organics and Radionuclides Released to Groundwater at RWMC	GW-1
INEL	Air Impacts from ICPP Stacks	AIR-2
Kansas City	Release of PCBs, Metals, and Organics to the Environment	SW-2
Lawrence Livermore	Site 300-Groundwater Contamination from 834 Complex	GW-1
Lawrence Livermore	Gasoline Spill at Building 403	GW-1
Lawrence Livermore	Groundwater Contamination from Taxi Strip and Old Salvage Yard	GW-1
Lawrence Livermore	Groundwater Contamination at Southwest Area	GW-1
Lawrence Livermore	Groundwater Contamination from East Traffic Circle Landfill	GW-1
Lawrence Livermore	Groundwater Contamination in Southeast Corner	GW-1
LANL	TA-1	SOIL-1
LANL	Sediment Contamination from Outfalls	SOIL-3
Mound	Soil Contamination in the Canal	SOIL-1
Mound	Tritium Contamination in the Main Hill Groundwater	GW-1
NTS	Tunnel Ponds	BIO-3
NTS	Contamination of Soils with Radionuclides	SOIL-3

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TABLE 4.2

ENVIRONMENTAL DEGRADATION ISSUES (CONTINUED)

Site Name	Ranking Unit Name	Degradation
NTS	Contamination of Soils with Radionuclides	BIO-1
Pantex	Depleted Uranium Contamination Sites	SOIL-3
Pantex	Firing Site 15	SOIL-3
Pantex	Fluoride Emissions	BIO-2
Pinellas	4.5 Acre Site	GW-1
Pinellas	Eastern Sites	GW-1
Pinellas	Western Sites	GW-1
Portsmouth	East Central Area Inactive Sites	GW-1
Portsmouth	South Area Inactive Sites	GW-1
Rocky Flats	VOCs in Groundwater	GW-1
Rocky Flats	903 Pad/Plutonium in Soils	SOIL-1
Sandia Livermore	Diesel Fuel Tank Area	GW-1
Savannah River	M Area Settling Basin	GW-1
Savannah River	Burial Grounds	GW-1
Savannah River	Active Seepage Basins	GW-1
Savannah River	Sediments in Steel Creek Corridor	SOIL-2
Savannah River	Savannah River Swamp	SOIL-1
Savannah River	Old TNX Basin	SOIL-3
Y-12	Off-site Floodplain Contamination in EFPC and BC	SOIL-1
Y-12	Process Water Discharges	SW-2
Y-12	On-site Mercury Contamination	SW-2
Y-12	On-site Mercury Contamination	SOIL-3
Y-12	Chestnut Ridge Security Pits	GW-1
Y-12	Hydrogen Fluoride Emissions	BIO-2
Y-12	Groundwater Contamination in the Main Y-12 Plant Area	GW-1

LEGEND:
- GW- Groundwater
- SW - Surface Water
- BIO - Biological Resource

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TCE in Drinking Water Wells, and RWMC). The fourth involves potential visibility issues at a nearby Class I airshed (Air Impacts from ICPP Stacks).

There is one environmental degradation issue at the Kansas City Plant (KCP). It involves releases of contaminants to an adjacent stream. The ranking unit is entitled Release of PCBs, Metals and Organics to the Environment.

All six environmental degradation issues at the Lawrence Livermore National Laboratory (LLNL) involve groundwater contamination. Five of the six issues are at the Main Site. These ranking units include Gasoline Spill at Building 403, Groundwater Contamination from Taxi Strip and Old Salvage Yard, Groundwater Contamination at Southwest Area, Groundwater Contamination from East Traffic Circle Landfill, and Groundwater Contamination in Southeast Corner. The sixth environmental degradation issue involves contamination of a perched zone at Site 300 (Site 300 - Groundwater Contamination from 834 Complex).

Two environmental degradation issues are included in the ranking units for the Los Alamos National Laboratory (LANL). Both of these issues involve soil contamination. The ranking units are Sediment Contamination from Outfalls and TA-1. The latter issue involves off-site soils.

Two environmental degradation issues are included in the Mound ranking units. One issue involves off-site soil contamination (Soil Contamination in the Canal) and the other involves groundwater contamination in a perched zone (Tritium Contamination in the Main Hill Groundwater).

The Nevada Test Site (NTS) has three environmental degradation issues associated with two of their ranking units (Tunnel Ponds and Contamination of Soils with Radionuclides). Both ranking units include concerns over potential impacts on wildlife, while one (Contamination of Soils with Radionuclides) also involves on-site soil contamination.

There are three environmental degradation issues at Pantex. Two issues deal with on-site soil contamination (Depleted Uranium Contamination Sites and Firing Site 15). One issue involves potential impacts on nearby cattle (Fluoride Emissions).

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In the Pinellas Plant ranking units, there are three environmental degradation issues. Each of these involve contamination of a shallow aquifer. The ranking units are (1) 4.5 Acre Site, (2) Eastern Sites, and (3) Western Sites.

Both of the environmental degradation issues at Portsmouth involve groundwater contamination. The ranking units are (1) East Central Area Inactive Sites and (2) South Area Inactive Sites.

One of the two environmental degradation issues identified at the Rocky Flats Plant (RFP) involves groundwater contamination (VOCs in Groundwater). The other issue involves on- and off-site contaminated soils (903 Pad/Plutonium in Soils).

The one environmental degradation issue at the Sandia National Laboratory - Livermore (SNLL) involves groundwater contamination (Diesel Fuel Tank Area).

Three of the six environmental degradation issues identified at the Savannah River Plant (SRP) involve groundwater contamination of the shallow aquifer (M-Area Settling Basin, Burial Grounds, and Active Seepage Basins). The other three issues involve on-site soil contamination (Sediments in the Steel Creek Corridor and Old TNX Basin) and off-site soil contamination (Savannah River Swamp).

There are seven environmental degradation issues associated with seven of the ranking units at the Y-12 Plant. Two ranking units involve contaminated soil, with one issue including on-site soil contamination (On-Site Mercury Contamination) and the other involving off-site soil (Off-Site Floodplain Contamination at East Fork Poplar Creek and Bear Creek). The On-Site Mercury Contamination ranking unit, along with Process Water Discharges, also involves contaminants to surface water bodies. Two ranking units, Groundwater Contamination in the Main Plant Area and Chestnut Ridge Security Pits, involve groundwater contamination. One ranking unit, Hydrogen Fluoride Emissions, has the potential to impact plant life in the area.

4.3.2.2 Test of Significance

After a review of the scoring for the ranking units encompassing the 50 environmental degradation issues, the significance of the environmental degradation issues associated with five ranking units was identified as being

inadequately represented by the risk-based ranking. These ranking units (see Table 4.3) are discussed below.

The ranking unit, TCE in Drinking Water Wells, at INEL involves concentrations of trichloroethylene (TCE) that have been identified in drinking water wells at TAN. The ranking unit scores low in the risk-based ranking (HPI Group 2). The concentrations identified are greater than the potential public hazard significance for the HPI Group would suggest. The low score is a result of the small receptor population that can be impacted.

Both the East Central Area Inactive Sites and the South Area Inactive Sites ranking units at Portsmouth include high concentrations of TCE in the groundwater. However, groundwater flow velocity in the contaminated area is very low. Therefore, the risk-based ranking does not project significant movement to receptors and scores this ranking unit low (HPI Group 2).

The Contamination of Soils with Radionuclides ranking unit at NTS includes surface soil contamination resulting from past aboveground tests and experiments. The area of contamination is extensive and the concentrations are sufficient to restrict access. This meets the test of significance since future use of the soils would have to be restricted as well. The risk-based ranking scores this ranking unit low (HPI Group 0) due to a lack of receptors.

The Savannah River ranking unit entitled Old TNX Basin involves a seepage basin used between 1958 and 1980 which received discharged wastewater from the TNX development facility. The outfall from the basin discharged to a marshy area. The outfall delta has measured concentration levels of metals, and damage to the forest canopy in the vicinity has been observed. The risk-based ranking scores the ranking unit low (HPI Group 1) due to the minimal numbers of potential human receptors.

4.3.3 Results of the Integration Phase Pertaining to Releases that are Beyond the Model's Capability to Address

The Integration Panel addressed nine findings which were not ranked due to the inability of the MEPAS model to address the type of associated concerns (see Table 4.4). One issue was deferred to the Final Summary Report since it could have been

TABLE 4.3

FINAL ENVIRONMENTAL DEGRADATION ISSUES THAT REQUIRED ADJUSTMENTS TO THE RISK-BASED RANKING

Site	Ranking Unit	Degradation	Placement in Ranking
INEL	TCE in Wells	GW	Placed in a separate env. degrad. group between HPI Groups 5 and 6
Portsmouth	East Central Area	GW	Same as above
Portsmouth	South Area	GW	Same as above
NTS	Contamination of Soils with Radionuclides	Soil BIO	Same as above
Savannah River	Old TNX Basin	Soil	Same as above

Legend
GW - Groundwater
BIO - Biological resource

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TABLE 4.4

DECISIONS ON HANDLING RANKING UNITS THAT DID NOT GET RANKED WITH MEPAS

Site	Ranking Unit	Quantitative Rank	Decision
INEL	Discharge of Sewage to Surface Soil	Low	Rank based on potential public hazard
Hanford	Potential Undertreated Sanitary Wastewater	Low	Rank based on potential public hazard
Hanford	Maximum Exposed Individual Dose Estimate	N/A	Delete; calculation issue not amenable to long-range planning
NTS	Discharge to the Las Vegas Sewer System	Low	Rank based on potential public hazard
Sandia Livermore/ ITRI	Discharges to Albuquerque POTW of Toxics to Sewers at BAO	Low	Rank based on potential public hazard
Savannah River	Thermal Impacts to SRP Streams	Low Environmental Degradation	Treat as environmental degradation issue
Portsmouth	Pinhole Freon Leaks	Environmental degradation	Treat as environmental degradation issue
Savannah River	Potential problem from Thermophilic pathogens	Low	Rank based on potential public hazard
Savannah River	400 D Area Basin Dike	N/A	Deferred to Ranking in Final Summary Report

Legend
GW - Groundwater
BIO - Biological resource

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ranked using MEPAS. A second issue was deleted since it involved a calculational concern that is not amenable to the long-range planning appropriate to this ranking. Two of the remaining seven were viewed as environmental degradation issues; five were discussed for their public hazard potential.

The finding, Pinhole Freon Leaks at Portsmouth, involves releases of approximately 200,000 pounds per year of Freon to the atmosphere. The primary concern focuses on the effects of Freons on the ozone layer. The MEPAS model cannot simulate the complexity of photochemical oxidation, a phenomenon which is still a topic of major research. The amount of the releases coupled with recent results of stratospheric ozone depletion studies resulted in a high interest in the environmental aspects of the finding.

The finding, Thermal Impact on SRP Streams, involves thermal discharges from reactor operations and 400 D-Area power operations. The discharges have resulted in loss of forest canopy and stream erosion at four streams and associated wetlands. The impacts do not appear to be irreversible; however, recovery may result in changes to the ecosystem. The recoverability aspect of this finding resulted in an assessment that the environmental degradation aspect of the finding should rank relatively low.

Two findings involved discharges of untreated or undertreated sanitary waste which could not be modeled since MEPAS is focused on chemical releases. Discharge of Sewage onto the Surface from EOCR, WERF, and CFA at INEL involves areas where sanitary sewage treatment systems may be malfunctioning with resulting soil areas potentially contaminated with sanitary waste. The impacted areas are small and given the low scores received at INEL for much larger releases, the assessment of this finding was that the public risk aspect was equivalent to the HPI Group 0 (i.e., not projected to reach receptors). Discharge of Potentially Undertreated Sanitary Wastewater at Hanford focuses on the large amounts of sanitary wastewaters that are being discharged to septic systems at the site. A new treatment system was being constructed at the 100 Area at the time of the Survey and has since been completed. A project to reconstruct the system in the 300 Area was proposed at the time of the Survey and has been approved. Given the new treatment systems in the most critical areas and the large volumes of liquids necessary to score in the risk-

based ranking at Hanford, the assessment for this ranking unit was that the risk posed was also equivalent to HPI Group 0.

Two findings involved discharges to publicly owned treatment works (POTWs) where the effectiveness of the POTW to treat the discharges could not be ascertained and, therefore, the findings could not be modeled. Discharges to the Las Vegas Sewer System at NTS involved small quantities of metals that occasionally would be discharged by the North Las Vegas site. NTS has stated that they have taken action to prevent this from recurring. Discharges of Toxics to Sewers at SAO at the Sandia National Laboratories (Albuquerque) is most concerned with past releases to the Albuquerque POTW. The primary concern in both of these findings is the potential to disrupt the POTW and the potential to contaminate the POTW's sludge. The assessment of each of these resulted in a determination that the risk posed would be equivalent to HPI Group 0. The Sandia finding focused on historic practices. The NTS finding focused on occasional occurrences. Neither suggested that the contaminants would pass through the POTW and thus neither would impact receptors. Therefore, the assessment was that the risk posed would be equivalent to HPI Group 0.

The ranking unit Potential Human Health Problem from Thermophilic Pathogens at SRP involves populations of thermophilic microoganisms in L-Lake due to the elevated water temperatures. This finding could not be modeled since MEPAS is focused on chemical releases. The problem is primarily one of worker exposure since it is likely that populations of pathogens would decrease as water temperatures decrease downstream from the thermal discharges. Therefore, from the perspective of potential public hazard, as opposed to worker exposure, the assessment was that the risk posed would be equivalent to HPI Group 0.

4.4 Integrated DOE-Wide Ranking

This section presents the Integrated DOE-Wide ranking first for existing and suspected environmental problems and then for situations that represent the potential for future environmental problems. The rankings in this section include the integration of other environmental concerns to the risk-based rankings provided in Sections 2 and 3 of this report. Thus, the results of the Integration Phase of the ranking discussed in the previous section are included.

4.4.1 Integrated DOE-Wide Ranking of Existing and Suspected Environmental Problems

During the Integration Phase of the prioritization, the risk-based ranking was modified to account for environmental degradation issues and findings that were beyond the ability of the MEPAS model to assess. The integrated rankings provided on Table 4.5 incorporate these modifications.

The environmental degradation issues where adjustments to the rankings were required were placed relative to the potential public health significance associated with the HPI Groups (see Section 1.7.4 of this report). Five environmental degradation issues were associated with the ranking units where adjustments to the rankings were deemed necessary (see Section 4.3.2.2). Two additional issues were identified in the findings that were beyond MEPAS' capabilities to address (see Section 4.3.3). Of the seven ranking units where adjustments to the rankings are required, six were viewed as significant concerns from an environmental degradation perspective. The six deemed significant were viewed as representing a level of degradation that would justify a response action. Thus, conceptually they can be viewed as being equivalent at least to risk levels where regulatory actions are generally initiated, generally HPI Groups 4 and 5. On the other hand, a ceiling had been put on the level at which a ranking unit would score for environmental degradation concerns. This ceiling was placed below HPI Group 6 since this level is generally above that risk level used in regulatory actions. Therefore, these six were placed together as a block between HPI Groups 5 and 6.

The seventh environmental degradation issue, Thermal Impact on SRP Streams, was not viewed as being as significant as the other environmental degradation issues. The releases were viewed as having an impact on the environmental receptor of a significance below that of the ranking units in the tertiary level of concern (i.e., below HPI Group 4).

Five findings that were not ranked with the risk-based model were placed in the rankings based upon their potential public hazard significance. All of these five were assessed as unlikely to reach receptors. Therefore, they have been placed as a block within HPI Group 0.

TABLE 4.5

INTEGRATED DOE-WIDE RANKING
EXISTING OR SUSPECTED ENVIRONMENTAL PROBLEMS

HPI/ENV Group	Ranking Unit Name	Site Name	Environmental Management Area	Critical Data Category
Ranking Units of Most Concern from Potential Public Hazard Perspective				
9	VOCs in Groundwater	Rocky Flats	Inactive Sites and Releases	C
8	Known Liquid Releases	Pantex	Inactive Sites and Releases	B
Ranking Units of Secondary Concern from Potential Public Hazard Perspective				
7	Groundwater Contamination in Southeast Corner	Lawrence Livermore	Inactive Sites and Releases	B
7	Chromium Air Releases	Portsmouth	Air Emissions	B
7	Inactive Liquid Process Discharges in the 200 Area	Hanford	Inactive Sites and Releases	B
7	Off-site Floodplain Contamination in EFPC and BC	Y-12	Inactive Sites and Releases	B
7	Active Percolation Ponds at ICPP and TRA	INEL	Liquid Discharges/Active Waste Management	A
7	Volatile Organics and Radionuclides Released to Groundwater at RWMC	INEL	Inactive Sites and Releases	B
7	Toxic Discharge to Technical Area 1 Sewers	SNL	Liquid Discharges	B
7	Active Liquid Process Discharges in the 100 Area	Hanford	Liquid Discharges/Active Waste Management	B
7	Ditches	Pantex	Liquid Discharges	B
7	M Area Settling Basin	Savannah River	Liquid Discharges/Active Waste Management	A

A - Monitored or Measured Data; B - Moderate Amount of Assumptions; C - Significant Amount of Assumptions; INT - Integration Panel Assessment

TABLE 4.5

INTEGRATED DOE-WIDE RANKING
EXISTING OR SUSPECTED ENVIRONMENTAL PROBLEMS (CONTINUED)

HPI/ENV Group	Ranking Unit Name	Site Name	Environmental Management Area	Critical Data Category
6	Inactive Liquid Process Discharges in the 300 Area	Hanford	Inactive Sites and Releases	B
6	Burial Grounds	Savannah River	Active Waste Management	A
6	Eastern Sites	Pinellas	Inactive Sites and Releases	C
6	Playas	Pantex	Liquid Discharges	B
6	Inactive Liquid Process Discharges in the 100 Area	Hanford	Inactive Sites and Releases	B
6	Coal Pile Runoff	Portsmouth	Liquid Discharges	A
6	Process Water Discharges	Y-12	Liquid Discharges	A
6	Emissions of VOCs to the Atmosphere	Kansas City	Air Emissions	C
6	Airborne Releases	Fernald	Air Emissions	A
6	Unscheduled Air Releases	Portsmouth	Air Emissions	A
6	Contamination from Liquid Discharges	Fernald	Liquid Discharges	B
6	Active Seepage Basins	Savannah River	Liquid Discharges/Active Waste Management	A
6	Contaminant Release from Waste Pits	Fernald	Inactive Sites and Releases/Active Waste Management	B
6	On-Site Mercury Contamination	Y-12	Inactive Sites and Releases	A
6	Sediments in Steel Creek Corridor	Savannah River	Liquid Discharges	B
6	Diesel Fuel Tank Area	Sandia Livermore	Inactive Sites and Releases	A

A - Monitored or Measured Data; B - Moderate Amount of Assumptions; C - Significant Amount of Assumptions; INT - Integration Panel Assessment

TABLE 4.5

INTEGRATED DOE-WIDE RANKING
EXISTING OR SUSPECTED ENVIRONMENTAL PROBLEMS (CONTINUED)

HPI/ENV Group	Ranking Unit Name	Site Name	Environmental Management Area	Critical Data Category
Ranking Units Representing Most Significant Environmental Degradation Issues				
ENV-1	TCE in Drinking Water Well	INEL	Inactive Sites and Releases	INT
ENV-1	Pinhole Freon Leaks	Portsmouth	Air Emissions	INT
ENV-1	East Central Area Inactive Sites	Portsmouth	Inactive Sites and Releases	INT
ENV-1	South Area Inactive Sites	Portsmouth	Inactive Sites and Releases	INT
ENV-1	Contamination of Soils with Radionuclides	NTS	Inactive Sites and Releases	INT
ENV-1	Old TNX Basin	Savannah River	Inactive Sites and Releases	INT
Ranking Units of Tertiary Concern from Potential Public Hazard Perspective				
5	4 5 Acre Site	Pinellas	Inactive Sites and Releases	C
5	Inactive Injection Wells TRA and ICPP	INEL	Inactive Sites and Releases	A
5	Active Liquid Process Discharges in the 300 Area	Hanford	Liquid Discharges/Active Waste Management	B
5	Solar Evaporation Ponds	Rocky Flats	Inactive Sites and Releases	B
5	Inactive Leach Pit	Mound	Inactive Sites and Releases	C
5	Groundwater Contamination from East Traffic Circle Landfill	Lawrence Livermore	Inactive Sites and Releases	B
5	Underground Storage Tanks for Non-Waste Toxic and Hazardous Substances	Y-12	Inactive Sites and Releases	B
5	Groundwater Contamination at Southwest Area	Lawrence Livermore	Inactive Sites and Releases	B
5	Off-site Direct Radiation	Fernald	Direct Radiation	A
5	Animal Contamination	Savannah River	Inactive Sites and Releases	B

A - Monitored or Measured Data; B - Moderate Amount of Assumptions; C - Significant Amount of Assumptions; INT - Integration Panel Assessment

TABLE 4.5

INTEGRATED DOE-WIDE RANKING
EXISTING OR SUSPECTED ENVIRONMENTAL PROBLEMS (CONTINUED)

HPI/ENV Group	Ranking Unit Name	Site Name	Environmental Management Area	Critical Data Category
5	Groundwater Contamination from Taxi Strip and Old Salvage Yard	Lawrence Livermore	Inactive Sites and Releases	B
5	Soil Contamination in the Canal	Mound	Inactive Sites and Releases	B
5	Hazardous Air Emissions - Vents	Mound	Air Emissions	B
5	Active Liquid Process Discharges in the 200 Area	Hanford	Liquid Discharges/Active Waste Management	B
5	Gasoline Spill at Building 403	Lawrence Livermore	Inactive Sites and Releases	B
5	Soil Contamination in Area S-1	Mound	Inactive Sites and Releases	B
5	903 Pad/Plutonium in Soils	Rocky Flats	Inactive Sites and Releases	B
4	Groundwater Contamination in the Main Y-12 Plant Area	Y-12	Inactive Sites and Releases	B
4	H Area Drainage Ditch	Savannah River	Liquid Discharges	A
4	Release of PCBs, Metals, and Organics to the Environment	Kansas City	Inactive Sites and Releases	B
4	Carbon Tetrachloride Emissions from the Z-Plant	Hanford	Air Emissions	A
4	Chestnut Ridge Sediment Disposal Basin	Y-12	Active Waste Management	B
4	Chestnut Ridge Security Pits	Y-12	Active Waste Management	B
4	Inactive Fly-Ash Pile	Fernald	Inactive Sites and Releases	C
4	Perchloroethylene Emissions	Fernald	Air Emissions	A
4	Active Percolation Ponds and Ditches at ANL-West	INEL	Liquid Discharges/Active Waste Management	A
4	Soil Contamination in the Valley Locations	Mound	Inactive Sites and Releases	B

A - Monitored or Measured Data; B - Moderate Amount of Assumptions; C - Significant Amount of Assumptions; INT - Integration Panel Assessment

TABLE 4.5

INTEGRATED DOE-WIDE RANKING
EXISTING OR SUSPECTED ENVIRONMENTAL PROBLEMS (CONTINUED)

HPI/ENV Group	Ranking Unit Name	Site Name	Environmental Management Area	Critical Data Category
4	Airborne Mercury Releases	Savannah River	Air Emissions	B
4	Past Releases from Inactive Underground Storage Tanks	Pinellas	Inactive Sites and Releases	C
4	Soil Contamination on the SM/PP Hill	Mound	Inactive Sites and Releases	B
4	Other Active Percolation Ponds	INEL	Active Waste Management	A
4	Septic Tank Discharges from Area 3 at Tonopah	SNL	Liquid Discharges	B
4	Inactive Gravel Pits at ICPP	INEL	Inactive Sites and Releases	A
4	Technetium Air Releases	Portsmouth	Air Emissions	A
Ranking Units Representing Less Significant Environmental Degradation Issues				
ENV-2	Thermal Impact on SRP Streams	Savannah River	Surface Water	INT
Ranking Units Where Environmental Problems Are Characterized as Generally Reaching Receptors at Levels Below Those Used in Regulatory Decisions				
3	Savannah River Swamp	Savannah River	Surface Water	INT
3	Depleted Uranium Contamination Sites	Pantex	Inactive Sites and Releases	C
3	Air Impacts from ICPP Stacks	INEL	Air Emissions	A
3	A and M Areas Nonradioactive Pits and Piles	Savannah River	Inactive Sites and Releases	A
3	Firing Site 15	Pantex	Inactive Sites and Releases	C
3	Northeast Area	Kansas City	Inactive Sites and Releases	B
3	PCB Release	Pantex	Inactive Sites and Releases	B
3	Liquid Spills and Discharges	SNL	Inactive Sites and Releases	C
3	New TNX Basin	Savannah River	Liquid Discharges/Active Waste Management	A
3	Hydrogen Fluoride Emissions	Y-12	Air Emissions	B
3	Significant Petroleum Spills	INEL	Inactive Sites and Releases	A

A - Preferred Data; B - Moderate Amount of Assumptions; C - Significant Amount of Assumptions; INT - Integration Panel Assessment

TABLE 4.5

INTEGRATED DOE-WIDE RANKING
EXISTING OR SUSPECTED ENVIRONMENTAL PROBLEMS (CONTINUED)

HPI/ENV Group	Ranking Unit Name	Site Name	Environmental Management Area	Critical Data Category
3	Pesticide Shed	Rocky Flats	Inactive Sites and Releases	C
3	C, F, H, and CS Areas Nonradioactive Pits and Piles	Savannah River	Inactive Sites and Releases	A
3	ITRI Active Lagoons	SNL	Liquid Discharges/Active Waste Management	C
2	Old Railroad Dock	Kansas City	Inactive Sites and Releases	B
2	Soil Contamination Areas at Tonopah	SNL	Inactive Sites and Releases	B
2	Unsaturated Zone Inactive Injection Wells at PBF	INEL	Inactive Sites and Releases	B
2	Tritium Contamination in the Main Hill Groundwater	Mound	Inactive Sites and Releases	C
2	TA-1	LANL	Inactive Sites and Releases	C
2	Soil Contamination in Area S-7	Mound	Inactive Sites and Releases	B
2	Underground Storage Tanks	Kansas City	Inactive Sites and Releases	B
2	Contaminated Surface Soils - Accessible	Pantex	Inactive Sites and Releases	C
1	Dust and Smoke Emissions	Y-12	Air Emissions	B
1	UNC Site	Y-12	Inactive Sites and Releases	A
1	Former Liquid Disposal	LANL	Inactive Sites and Releases	B
1	1,1,1-Trichloroethane Release from M Area	Savannah River	Air Emissions	B
1	K, L, P, and R Areas Nonradioactive Pits and Piles	Savannah River	Inactive Sites and Releases	A

A - Monitored or Measured Data; B - Moderate Amount of Assumptions; C - Significant Amount of Assumptions; INT - Integration Panel Assessment

TABLE 4.5

INTEGRATED DOE-WIDE RANKING
EXISTING OR SUSPECTED ENVIRONMENTAL PROBLEMS (CONTINUED)

HPI/ENV Group	Ranking Unit Name	Site Name	Environmental Management Area	Critical Data Category
1	100 N Area Spills	Hanford	Inactive Sites and Releases	B
1	North Area Inactive Sites	Portsmouth	Inactive Sites and Releases	B
Ranking Units Where Environmental Problems Are Not Projected to Reach Receptors				
0	SM/PP Hill Drum Storage Area	Mound	Inactive Sites and Releases	B
0	Underground Tank Farm	Kansas City	Inactive Sites and Releases	B
0	Soil Contamination in the Main Plant Area	Y-12	Inactive Sites and Releases	B
0	Contamination from TA-54 Active Waste Management Units	LANL	Active Waste Management	C
0	Asbestos	Pantex	Asbestos	C
0	Southeast Parking Lot	Kansas City	Inactive Sites and Releases	C
0	Fluoride Emissions	Pantex	Air Emissions	B
0	Western Sites	Pinellas	Inactive Sites and Releases	C
0	D and TNX Areas Nonradioactive Pits and Piles	Savannah River	Inactive Sites and Releases	A
0	Closed Landfills and Burn Pits	LANL	Inactive Sites and Releases	B
0	Significant Spills Involving Metals	INEL	Inactive Sites and Releases	A
0	Contaminated Surface Soils - Not Accessible	Pantex	Inactive Sites and Releases	C
0	Abandoned Process Wastewater Collection System	Rocky Flats	Inactive Sites and Releases	C
0	Inactive CFA Landfills and Lead Storage Areas	INEL	Inactive Sites and Releases	B
0	Elevated Levels of Arsenic in Groundwater	Kansas City	Inactive Sites and Releases	C
0	Surface Contamination due to Intrusion into Buried Waste	Hanford	Inactive Sites and Releases	C

A - Monitored or Measured Data; B - Moderate Amount of Assumptions; C - Significant Amount of Assumptions; IIT - Integration Panel Assessment

TABLE 4.5

INTEGRATED DOE-WIDE RANKING
EXISTING OR SUSPECTED ENVIRONMENTAL PROBLEMS (CONTINUED)

HPI/ENV Group	Ranking Unit Name	Site Name	Environmental Management Area	Critical Data Category
0	Past Liquid Releases	LANL	Inactive Sites and Releases	C
0	Integrity of Sanitary Sewer Systems	Lawrence Livermore	Liquid Discharges	B
0	Near Surface Soil Contamination from Waste and Wastewater Disposal Practices	NTS	Liquid Discharges	B
0	Potential Leaks from Abandoned or Removed Underground Storage Tanks	LANL	Inactive Sites and Releases	B
0	Sanitary Sludge Lagoon	Savannah River	Active Waste Management	C
0	Site 300-Groundwater Contamination from Landfills	Lawrence Livermore	Inactive Sites and Releases	B
0	Past Releases from HP Tanks	Pinellas	Inactive Sites and Releases	C
0	Soil Contamination by Hazardous Chemicals	NTS	Inactive Sites and Releases	B
0	Tunnel Ponds	NTS	Liquid Discharges	B
0	Subsurface Soil Contamination	NTS	Inactive Sites and Releases	C
0	Site 300-Groundwater Contamination from 834 Complex	Lawrence Livermore	Inactive Sites and Releases	B
0	Sediment Contamination from Outfalls	LANL	Liquid Discharges	B
0	Inactive Liquid Disposal Areas	SNL	Inactive Sites and Releases	B
0	Solid Waste Disposal Sites in the Vicinity of the 100 Area	Hanford	Inactive Sites and Releases/Active Waste Management	C
0	Solid Waste Disposal Sites in the Vicinity of the 300/400 Areas	Hanford	Inactive Sites and Releases/Active Waste Management	C
0	Herbicide Disposal in Inactive Waste Site	Hanford	Inactive Sites and Releases	C
0	Solid Waste Disposal Sites in the Vicinity of the 200 Area	Hanford	Inactive Sites and Releases/Active Waste Management	C

A - Monitored or Measured Data; B - Moderate Amount of Assumptions; C - Significant Amount of Assumptions; INT - Integration Panel Assessment

TABLE 4.5

INTEGRATED DOE-WIDE RANKING
EXISTING OR SUSPECTED ENVIRONMENTAL PROBLEMS (CONTINUED)

HPI/ENV Group	Ranking Unit Name	Site Name	Environmental Management Area	Critical Data Category
0	F and H Areas Miscellaneous Radioactive Surface Contamination	Savannah River	Inactive Sites and Releases	C
0	Radionuclide Sediment Contamination in Water and Ancho Canyons	LANL	Inactive Sites and Releases	C
0	Area P	LANL	Inactive Sites and Releases	B
0	PCBs in Subsurface Soils	Kansas City	Inactive Sites and Releases	B
0	Former Fire Extinguisher Training Area	Sandia Livermore	Inactive Sites and Releases	C
0	Radioactive Burial Grounds	SNL	Active Waste Management	B
0	A and M Areas Miscellaneous Radioactive Surface Contamination	Savannah River	Inactive Sites and Releases	C
0	Site 300-HE Process Wastewater Lagoons	Lawrence Livermore	Inactive Sites and Releases	C
0	ITRI Hot Ponds	SNL	Liquid Discharges/Active Waste Management	B
0	Radioactively Contaminated Soils at Tonopah	SNL	Inactive Sites and Releases	A
0	Site 300-PCB Contamination from Landfill 6	Lawrence Livermore	Inactive Sites and Releases	B
0	Inactive Solid Disposal Areas	SNL	Inactive Sites and Releases	B
0	Classified Burial Trenches	Kansas City	Inactive Sites and Releases	C
0	Past Leaks from Single Shell Tanks	Hanford	Inactive Sites and Releases	A
0	Landfills	Pantex	Inactive Sites and Releases	A
0	Fuel Spill-Desert Rock Airstrip	NTS	Inactive Sites and Releases	A
0	Inactive ITRI Sewage Lagoon	SNL	Inactive Sites and Releases	B

A - Monitored or Measured Data; B - Moderate Amount of Assumptions; C - Significant Amount of Assumptions; IPI - Integration Panel Assessment

TABLE 4.5

INTEGRATED DOE-WIDE RANKING
EXISTING OR SUSPECTED ENVIRONMENTAL PROBLEMS (CONTINUED)

HPI/ENV Group	Ranking Unit Name	Site Name	Environmental Management Area	Critical Data Category
0	Chromium Lagoon	Portsmouth	Active Waste Management	A
0	L and P Areas Miscellaneous Radioactive Surface Contamination	Savannah River	Inactive Sites and Releases	C
0	Discharge of Sewage onto the Surface	INEL	Liquid Discharge	INT
0	Discharge of Potentially Untreated Sanitary Wastewater	Hanford	Liquid Discharge	INT
0	Discharges to the Las Vegas Sewer System	NTS	Liquid Discharge	INT
0	Discharges of Toxics to Sewers at BAO	SNL	Liquid Discharge	INT
0	Potentially Human Health Problems from Thermophilic Pathogens	Savannah River	Liquid Discharge	INT

A - Monitored or Measured Data; B - Moderate Amount of Assumptions; C - Significant Amount of Assumptions; INT - Integration Panel Assessment

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4.4.2 Integrated DOE-Wide Ranking of Situations that Represent the Potential for Future Environmental Problems

No changes were made to the rankings of situations that represent the potential for future environmental problems during the Integration Phase of the prioritization. Thus, the rankings provided in Section 3 of this report constitute the integrated rankings of these problems.

4.4.3 Summary of the Integrated DOE-Wide Ranking

In the Integration Phase of the prioritization, two groups of environmental degradation issues were placed within the 11 HPI Groups. In addition, one group of previously unranked findings were ranked based upon the potential public hazard they pose. These additions were possible by comparing the HPIs with risk levels used in environmental regulatory decisions and using this benchmark to identify clusters of HPI Groups which demonstrated a level of significance. The result of this integration effort was to modify Table 1.2 in Section 1.7.4 by the addition of two clusters to represent the significance of the environmental degradation concerns relative to potential public hazards (see Table 4.6). The descriptions in Table 4.6 should provide a systematic means to replicate these results in future Survey ranking efforts.

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TABLE 4.6

SIGNIFICANCE OF HPI AND ENVIRONMENTAL DEGRADATION GROUPS

HPI/ENV Group[1]	Significance[2]
10 9 8	These groups include the environmental problems of most concern from the perspective of the potential public hazard. This concern is due to the size of the potential receptor populations and the toxicity and concentration of the contaminants.
7 6	These groups include environmental problems that represent a secondary level of concern from the potential public hazard perspective. The scores for these groups are generally driven by large receptor populations with moderate concentrations and/or toxicity of the contaminants. However, a few problems in these groups include small receptor populations where the toxicity or concentration is high.
ENV-1	This group represents the most significant environmental degradation issues that are being ranked primarily for the environmental degradation aspect.
5 4	These groups include environmental problems that present a tertiary level of concern from the potential public hazard perspective. Scores for these groups are generally a result of either small receptor populations, low doses, or low toxicity contaminants.
ENV-2	This group represents the less significant environmental degradation issues that are being ranked primarily for the environmental degradation aspect.
3 2 1	These groups include environmental problems that are characterized as generally reaching receptors at levels well below those used in regulatory decisions.
0	This group includes environmental problems that are not projected to reach receptors.

1 Proceeding down in the HPI Groups results in an order of magnitude reduction of significance. Environmental degradation groups represent qualitative assessment of significance of issue.

2 Significance of HPI Groups is based on the size of the potential receptor population most frequently encountered in this report.

5.0 FOLLOW-ON EFFORTS

The problems and rankings within this report are subject to modification based upon the results from the Sampling and Analysis Program and other continuing efforts of the Environmental Survey. The impact of these efforts will be included in the Environmental Survey Summary Report.

5.1 Survey Sampling and Analysis Program

Upon the completion of the on-site efforts for each site in the Environmental Survey, the sampling and analysis phase begins. The goal of the Sampling and Analysis Program is to strengthen the environmental data base for each site with additional information to further determine the existence and nature of environmental problems and risk. Selective sampling and analysis is being performed to fill data gaps by identifying the presence of contaminants and, in some cases, by defining the general nature of contamination for those environmental problems requiring further investigative information. The results of the sampling and analysis efforts will be included in the Environmental Survey Summary Report.

The Survey's Sampling and Analysis Program is not intended to characterize a site's environmental problems by determining specific contaminant boundaries, rate of contaminant movement, or contaminant concentration gradients. It will, however, help complete information gaps by identifying the presence and, in some limited cases, the approximate location and direction of movement of contaminants. As such, the results of the Sampling and Analysis Program will have a two-fold effect on the rankings presented in this report. First, actual data concerning the contaminants will be available to replace many of the assumptions used in the modeling, thus improving the precision of the rankings. Second, it will allow a number of problems to be ranked that were not ranked in this report since data were not available to confirm the actual existence of these problems.

5.2 Additional DOE Sites

The Environmental Survey encompasses all the major operating facilities of DOE. With the completion of the preliminary efforts on the Defense Program sites, the

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Survey has progressed to sites containing facilities associated with the Department's other program areas. The on-site efforts for these other sites were completed in July 1988, with completion of all efforts scheduled in the following year. To support DOE's long-range planning efforts, these sites will be incorporated into the Preliminary Summary Report by the end of 1988.

The remaining programs which have sites that are included in the Survey include Nuclear Energy, Fossil Energy, Conservation and Renewable Energy, and Energy Research.

The Nuclear Energy program operates three sites which are included in the Survey. Two of these sites are involved in nuclear fuel enrichment. The third site performs research and development efforts associated with components in the reactor program.

The Fossil Energy program operates six groups of sites that are included in the Survey. These sites include five sites responsible for research, development, and demonstration programs involving fossil fuels, such as coal, petroleum, and natural gas. This program is also responsible for managing the Naval Petroleum and Oil Shale Reserves and the Strategic Petroleum Reserves.

The Conservation and Renewable program operates one site that is included in the Survey. This site is responsible for research, development, and demonstration of solar energy technologies.

The Energy Research program operates nine sites that are included in the Survey. These laboratories are all associated with the program's mission of basic energy sciences and high energy and nuclear physics.

The list of sites that are included in the non-defense production portion of the Environmental Survey is included on Table 5.1. Some of the sites are multipurpose (i.e., they span program lines). In addition, some of the programs have facilities located on one or more of the 16 sites included in the Defense Production program. These facilities have been included in this Preliminary Summary Report.

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TABLE 5.1
LIST OF NON-DEFENSE PRODUCTION RELATED SITES TO BE INCLUDED IN THE ENVIRONMENTAL SURVEY

Nuclear Energy

Energy Technology Engineering Center
K-25 Gaseous Diffusion Plant
Paducah Gaseous Diffusion Plant

Fossil Energy

Component Development Integration Facility
Bartlesville Project Office
Morgantown Energy Technology Center
Pittsburgh Energy Technology Center
Naval Petroleum Reserves
Strategic Petroleum Reserves

Conservation and Renewable

Solar Energy Research Institute

Energy Research

Ames Laboratory
Argonne National Laboratory
Brookhaven National Laboratory
Fermi National Accelerator Facility
Laboratory for Energy-Related Health Research
Lawrence Berkeley Laboratory
Oak Ridge National Laboratory
Princeton Plasma Physics Laboratory
Stanford Linear Accelerator Center

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5.3 Summary Report

At the completion of the Survey at all of the major operating facilities, an Environmental Survey Summary Report will be developed. Like this Preliminary Summary Report, the Summary Report will include a ranking of all the major environmental problems identified by the Survey. The results of the Survey at the non-defense production facilities, as well as the results of the Survey's Sampling and Analysis Program at both the defense production and non-defense production facilities, will be incorporated into the Environmental Survey Summary Report. This Summary Report is scheduled to be issued in 1989.

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APPENDIX A
RANKING UNIT NARRATIVES

This appendix includes a short narrative on each of the 201 ranking units included in this report. Each narrative is formatted to provide a concise discussion of specific information pertaining to the ranking unit. The specific information in these narratives includes a short discussion of the following:

- description of the ranking unit;
- how the ranking unit was modeled;
- results of the risk-based modeling;
- qualifiers to the risk-based ranking;
- regulatory aspects of the ranking unit; and
- current status of the ranking unit. (This section has been developed from information received from the site subsequent to the on-site Survey. The information has not been independently corroborated by the Survey.)

These narratives are presented by site in the order these sites are presented in Section 2. Within sites, the narratives are presented in the order they are introduced in Section 2.

The Survey Prioritization Program Manager, within the DOE Office of Environmental Audit, has additional information on the ranking units and the data used to produce the risk-based portion of the ranking. The Survey Preliminary Report for each site should be reviewed for a detailed discussion of each finding.

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APPENDIX A

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Feed Materials Production Center
Fernald, Ohio

FMPC
Releases from K-65 Silos

Description of Ranking Unit

The Feed Materials Production Center (FMPC) K-65 silos are two 80-foot-diameter, 30-foot-tall concrete tanks which hold 195,000 cubic feet of pitchblende waste. The pitchblende waste contains large amounts of radium-226, a source of radon gas which may be released and dispersed to the surrounding area.

How the Ranking Unit was Modeled

The transport pathway that was modeled was the atmospheric pathway.

The exposure pathway analyzed in the modeling was inhalation of radon gas in the atmosphere

The transport and exposure scenarios that were not analyzed include groundwater and surface water. These pathways were not analyzed as the pitchblende waste is assumed to be confined to the concrete silos which contain an underdrain collection system. In addition, deposition of radon on soil and crops and contamination of livestock were not considered because the radioactive gas would not directly affect humans through exposure routes other than direct inhalation.

Although an earthen embankment was built in 1964 to reduce gamma radiation levels (modeled in the "Direct Radiation" FMPC ranking unit), cracks in the silos enable radon gas to escape. Data concerning source terms were derived from site information. Radon gas was modeled based on a conservative calculation of release rate derived from monitoring data. Therefore, the critical data category for the ranking unit was "B".

Results of the Risk-Based Modeling

The relatively high population density within 50 miles of Fernald and the adverse effects of radon inhalation drove the ranking. The ranking unit resulted in an HPI in Group 8 for the inhalation of radon gas. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems of most concern from the perspective of the potential public hazard.

Since a significant aspect of the modeling of this ranking unit involved assumptions concerning radon production and dispersion, a sensitivity analysis was performed. The base case of approximately 11,000 curies/year resulted in an HPI Group 8 whereas the sensitivity analysis case used approximately 1,000 curies/year and resulted in an HPI Group 7. This ranking unit was one of the seven that the Survey is reviewing in more depth. The Survey feels that an evaluation of the effectiveness of the completed remedial action coupled with a more in-depth review of the assumptions used in the modeling would result in a lower, more realistic ranking for this ranking unit.

Regulatory Aspects of the Ranking Unit

Upgrading the silos' stability, radon reduction, and the ultimate disposition of their contents are commitments of the site Federal Facility Compliance Agreement (FFCA) dated April 17, 1985.

Current Status of the Ranking Unit

In March 1988, FMPC informed the Survey that the exposed exterior of the silos has been covered by foam to improve its weather resistance and to decrease radon emissions. Foam will be placed in the silos in 1988 to further decrease radon emissions and to improve their structural integrity.

FMPC
Contamination from Liquid Discharges

Description of Ranking Unit

Various sewer lines and drainage ditches at FMPC may enable contaminated liquids to migrate to groundwater as well as surface water. Storm sewer discharges and groundwater may infiltrate and exfiltrate the storm sewer system in response to fluctuating water table levels in the local perched aquifer, resulting in the potential for contamination.

How the Ranking Unit was Modeled

The transport pathways that were modeled included groundwater, contaminated groundwater recharge of surface water, and direct storm sewer discharges to surface water.

The exposure pathways analyzed in the modeling were drinking water consumption and ingestion of crops irrigated with potentially contaminated water. Both groundwater and surface water supply drinking water to the neighboring communities. Populations at the receptor locations may be exposed to the contaminants through ingestion of groundwater and surface water, bathing, consumption of crops and livestock irrigated with contaminated water, and recreational activities.

The transport and exposure scenarios that were not analyzed included surface soil contamination-related scenarios because most of these liquid collection systems are buried.

An assumed exfiltration rate of 10 percent per year of total liquid was imposed for the storm sewer system for modeling purposes. It has been estimated that approximately 218 million gallons per year of groundwater and liquid discharges enter the storm sewer system and are transported off the FMPC site. The data concerning the source terms were derived from site monitoring well and surface water data. The critical data category for the ranking unit is "B" due to this derivation.

Results of the Risk-Based Modeling

The ranking unit resulted in a score in HPI Group 6, driven by the relatively large population potentially impacted via drinking water and the adverse health effects of uranium-238. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that represent a secondary level of concern from the potential public hazard perspective.

Integration Phase Concerns

This ranking unit was identified as having environmental degradation issues associated with it. The degradation issue was concentrations of contaminants in the groundwater.

Regulatory Aspects of the Ranking Unit

Actions are required under the site FFCA to evaluate and, if practicable, to reduce the infiltration of contaminated groundwater into the stormwater system.

Current Status of the Ranking Unit

In March 1988, FMPC informed the Survey that a stormwater retention basin was placed into service to reduce releases of waterborne solids to off-site streams. The basin is to be expanded to handle even very large storm events

FMPC
Off-site Direct Radiation

Description of Ranking Unit

The potential for direct external exposure to radiation exists as a result of the storage of various radioactive materials at FMPC. Sources of the radiation are: the K-65 silos, thorium-bearing materials stored on-site, previously released and dispersed radioactive materials, and other stored radioactively contaminated materials (scrap, rubble, abandoned drums, and burial sites).

How the Ranking Unit was Modeled

The only transport pathway that was modeled was direct radiation.

The single exposure pathway analyzed was exposure to direct radiation.

The source term data were derived from site radiation monitoring data. The critical data category for this ranking unit is "A".

Results of the Risk-Based Modeling

The ranking unit resulted in a score in HPI Group 5 for direct external exposure to radiation, excluding on-site doses, within a two-mile radius of FMPC. This ranking is driven by the specific activity of the contaminant as well as the proximity of the receptors. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that present a tertiary level of concern from the potential public hazard perspective.

FMPC
Airborne Releases

Description of Ranking Unit

Airborne releases from stacks at FMPC may have resulted in the deposition of contaminants on soils in the vicinity of the site.

How the Ranking Unit was Modeled

The transport pathways that were modeled included air, surface soil, surface water, and groundwater. These airborne releases may be the source of contamination which is available for migration from the surface soil to the underlying groundwater. Contaminants may enter surface water from overland runoff, or from groundwater which recharges surface water.

The exposure pathways analyzed included drinking water consumption, ingestion of crops irrigated with potentially contaminated water, and inhalation. Groundwater and surface water both provide drinking water for the population in the FMPC vicinity. The airborne contaminants may be available for deposition on crop fields used for livestock grazing, as well as uptake through inhalation. Virtually all exposure pathways have the potential to be affected, and consequently were addressed in this ranking unit.

The source term data were derived from historical monitoring and emission data records for FMPC. Total curies of contaminants released, soil concentrations, and average emission rates were obtained from FMPC environmental documentation. The critical data category for the ranking unit was "A".

Results of the Risk-Based Modeling

The ranking unit resulted in a score in HPI Group 6 for exposure to uranium-234 through inhalation of suspended soil. The relatively high density of population within a 50-mile radius of FMPC, and the radioactive effects of uranium drove the ranking for airborne releases from the FMPC stacks. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that represent a secondary level of concern from the potential public hazard perspective.

Qualifiers to the Risk-Based Ranking

This ranking unit includes overland runoff of contaminated soil. The qualifiers discussed in Section 1.7.5 of this report apply.

Current Status of the Ranking Unit

In March 1988, FMPC informed the Survey that the administrative controls on the operation of existing filtration systems, as well as new systems, have decreased uranium discharges. In addition, the site indicated that Environmental Protection Agency (EPA) standards for radiation dose to the public are being met.

FMPC
Inactive Fly Ash Pile

Description of Ranking Unit

An inactive fly ash pile at FMPC contains 50,000 tons of fly ash and may be a potential source of surface soil contamination. The fly ash pile contains approximately 1,000 kilograms of natural uranium. Uranium and PCB-contaminated waste oils may have been applied to the pile for dust control purposes.

How the Ranking Unit was Modeled

The transport pathways that were modeled were volatilization of PCB in the waste oil, wind suspension of the fly ash pile contents, overland transport to surface water, groundwater, and groundwater recharge of surface water.

The exposure pathways analyzed included potential for ingestion of groundwater, potential for ingestion of crops and livestock irrigated with groundwater and surface water, potential for ingestion of fish caught in surface waters, and potential for accidental ingestion of and external exposure to surface waters during recreational activities.

It was assumed that the entire fly ash pile is uncovered for modeling purposes. The source term data were derived based on the information provided in the site inventory records, along with assumptions. The critical data category for the ranking unit is "C".

Results of the Risk-Based Modeling

This ranking unit's HPI fell into Group 4 for potential ingestion of uranium-234 contaminated groundwater. This value is due to the persistence and toxicity of uranium-234 as well as the distance to the receptors. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that present a tertiary level of concern from the potential public hazard perspective.

Qualifiers to the Risk-Based Ranking

This ranking unit includes overland runoff of contaminated soil. The qualifiers discussed in Section 1.7.5 of this report apply.

Regulatory Aspects of the Ranking Unit

The FFCA- required RI/FS includes the fly-ash pile.

Current Status of the Ranking Unit

In March 1988, FMPC informed the Survey that characterization of the fly ash pile has begun under DOE's CERCLA program.

FMPC
Perchloroethylene Emissions

Description of Ranking Unit

A dry-cleaning facility at FMPC has been releasing perchloroethylene to the air.

How the Ranking Unit was Modeled

The transport pathway that was modeled was the atmospheric pathway for emission of the contaminant to the atmosphere.

The exposure pathway analyzed in the modeling was the potential for inhalation of the perchloroethylene vapor, which is vented from the roof of the dry cleaning facility, by receptors within 50 miles of FMPC. The perchloroethylene vapor disperses and is not assumed to condense.

The transport and exposure scenarios that were not analyzed include surface water, surface soil, and groundwater because there are no liquid discharges of the perchloroethylene, and the gaseous air emissions do not deposit on surface soil. Because it is an air release and the perchloroethylene remains in a gaseous state, air exposure scenarios dealing with contamination of crops and animals were not addressed.

The data concerning the source term were derived based on site-provided initial quantities and estimates. An emission rate of 21,000 pounds per year was estimated by the FMPC Survey team based on known initial quantities, and EPA approximations of the volatilization associated with this type of perchloroethylene use. The critical data category for this ranking unit is "A".

Results of the Risk-Based Modeling

This ranking resulted in a score in HPI Group 4 for potential exposure to perchloroethylene through inhalation. The ranking was driven by the relatively high population density in the area potentially impacted by Fernald's air emissions, and the adverse health effects of perchloroethylene. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that present a tertiary level of concern from the potential public hazard perspective.

Current Status of the Ranking Unit

In March 1988, FMPC informed the Survey that the use of perchloroethylene has been terminated. It had been used as a dry cleaning solvent in the laundry.

FMPC
Contaminant Release from Waste Pits

Description of Ranking Unit

There are eight waste disposal pits at FMPC. They received wet and dry wastes from FMPC process operations over more than 30 years. The pits included are the clearwell, the burn pit, and waste disposal pits one through six.

How the Ranking Unit was Modeled

The transport pathways that were modeled were groundwater, groundwater recharge to surface water, and the air pathway for soil resuspension.

The exposure pathways analyzed included potential for ingestion of groundwater, potential for ingestion of crops and livestock irrigated with groundwater and surface water, potential for ingestion of fish caught in surface waters, potential for accidental ingestion of surface water during recreational activities, and potential for external exposure to surface waters. Included also was the exposure pathway for inhalation of suspended soils.

The source term data were derived from site inventories and soil monitoring data. The critical data category for this ranking unit is "B".

Results of the Risk-Based Modeling

The ranking unit resulted in a score in HPI Group 6 for potential ingestion of uranium-238 in groundwater. The radioactivity of uranium-238 and the local drinking water populace within a 10-mile radius were the driving factors for this ranking unit. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that represent a secondary level of concern from the potential public hazard perspective.

Integration Phase Concerns

This ranking unit was identified as having environmental degradation issues associated with it. The degradation issue was concentrations of contaminants in the groundwater.

Regulatory Aspects of the Ranking Unit

The FFCA-required RI/FS includes the waste pits.

Current Status of the Ranking Unit

In March 1988, FMPC informed the Survey that the contents of the waste pits have been sampled and a surface radiological survey completed under DOE's Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) program.

FMPC
Potential Future Releases of Thorium

Description of Ranking Unit

Thorium may be released to the environment at FMPC due to the condition of various thorium storage containers. Thorium is stored in silos, bins, tanks, 55-gallon drums, and cans. In particular, the Plant Eight thorium storage silo is in poor physical condition, and presents a potential environmental hazard. The silo is elevated about 50 feet above the ground, is 17 feet in diameter, and contains 175 metric tons of various thorium oxides.

How the Ranking Unit was Modeled

The transport and exposure pathway that was modeled was the atmospheric pathway.

The exposure pathway analyzed included potential for inhalation and ingestion of crops and livestock contaminated due to air emissions.

The transport and exposure scenarios that were not analyzed included surface soil resuspension, overland runoff, and percolation to the groundwater. These pathways were not modeled because it is assumed action would be taken to contain the spill within four hours to prevent the spread of contamination.

The source term data were derived from site inventories and with the assumption that if a spill were to occur, up to one percent of the thorium powder would become suspended in air as a result of the impact with the ground. The surface area that would be affected by a potential spill is assumed to be approximately 2,100 square feet which could be exposed for up to four hours. The release of thorium-232 (and its decay daughters) to the environment was modeled based on the event of a catastrophic spill of the entire thorium inventory in the Plant eight storage silo. The critical data category for the ranking unit is "B".

Results of the Risk-Based Modeling

This ranking unit yielded an HPI in Group 6 for the potential for inhalation of thorium-232 in the neighboring area. The relatively high population density of the area potentially impacted by airborne releases from FMPC, and the level of radioactivity of thorium drove the ranking. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that represent a secondary level of concern from the potential public hazard perspective.

Current Status of the Ranking Unit

In March 1988, FMPC informed the Survey that the thorium silo has been structurally reinforced to prevent failures and a resultant release of the contents. Repackaging of the thorium begins in 1988.

FMPC
Potential for Leaks from Underground Storage Tanks

Description of Ranking Unit

There is a potential for undetected releases of hazardous substances from nine underground storage tanks (USTs) at FMPC. The contents of the tanks include gasoline, kerosene, and used motor oil.

How the Ranking Unit was Modeled

The transport pathways that were modeled included groundwater and groundwater recharging surface water.

The exposure pathways analyzed included potential for ingestion of groundwater, potential for ingestion of crops and livestock irrigated with groundwater and surface water, potential for ingestion of fish caught in surface waters, potential for accidental ingestion of surface water during recreational activities, and potential for external exposure to surface waters.

The transport and exposure scenarios that were not analyzed included surface soil and air transport because the tanks are underground.

The source term data were derived based on inventory data along with the standard assumption for potential releases from USTs described in Section 1.7.7 of the report. The critical data category for the ranking unit is "B".

Results of the Risk-Based Modeling

The ranking unit resulted in an HPI in Group 6. This value was driven by the potential for ingestion of surface water and crops and livestock irrigated with surface water contaminated with kerosene. The inventory and the relatively small distance to the potential receptors are two major factors for the value. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that represent a secondary level of concern from the potential public hazard perspective.

Qualifiers to the Risk-Based Ranking

This ranking unit scores for fuel in groundwater. The qualifiers discussed in Section 1.7.5 of this report apply.

FMPC
Tank Farm Spill Containment

Description of Ranking Unit

The tank farm spill containment system has inadequate capacity to handle the volume of a major chemical spill. If the contents of one of the twenty-one tanks were to be released, contaminants would drain from the underlying tile field toward a collection basin. The tank contents would then be pumped from the collection basin to a 89,500-gallon sump tank. However, due to the configuration of the spill containment system, liquids may be discharged to surrounding soils prior to reaching the collection basin. This condition may enable contaminants to enter the surface water pathway. Some of the contents of the tank may enter the storm sewers, which may provide a conduit for these liquids to drain directly to surface water, or run overland to streams. Contaminants may percolate downward to the aquifer which recharges surface water.

How the Ranking Unit was Modeled

The transport pathways that were modeled included groundwater, groundwater recharge to surface water, surface water, and overland runoff.

The exposure pathways analyzed included potential for ingestion of groundwater, potential for ingestion of crops and livestock irrigated with groundwater and surface water, and potential for exposure due to recreational activities.

The transport and exposure scenarios that were not analyzed included surface soils because the groundwater and surface water pathways were the Survey team's primary concern. The air exposure pathway was modeled as anhydrous hydrogen fluoride (AHF) in a gaseous phase in another FMPC ranking unit.

The source term data were derived from site inventories and using the standard assumption for catastrophic releases from aboveground tanks described in Section 1.7.7 of this report. The FMPC Survey team identified a 30,000-gallon hydrogen fluoride tank as the worst-case tank for modeling purposes. The critical data category for the ranking unit is "C".

Results of the Risk-Based Modeling

This ranking unit resulted in an HPI in Group 3 resulting from the potential for ingestion of hydrogen fluoride-contaminated groundwater. The toxicity of hydrogen fluoride drove the ranking. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are characterized as generally reaching receptors at levels below those used in regulatory decisions.

Qualifiers to the Risk-Based Ranking

This ranking unit includes overland runoff of contaminated soil. The qualifiers discussed in Section 1.7.5 of this report apply.

FMPC
Potential Releases from Anyhdrous Hydrogen Fluoride Tank

Description of Ranking Unit

Due to the age of the aboveground tanks at the FMPC tank farm, there exists the potential for the release of gaseous contaminants to the atmosphere.

How the Ranking Unit was Modeled

The transport pathway that was modeled was the atmospheric pathway where emission of these contaminants to the air may deposit on the soil.

The exposure pathways analyzed included the potential for inhalation and the potential for ingestion of contaminated crops and livestock.

Surface water, surface soil, and groundwater transport scenarios for the tank farm are addressed in another ranking unit.

The source term data were derived based on the assumption of a catastrophic release of AHF from the tank as a worst-case scenario. The worst-case scenario tank was a 26,000-gallon AHF tank. The largest impact would be on the air quality due to the ability of the AHF to vaporize rapidly upon release. Factors which affect the quantities of AHF deposited are prevailing wind direction and precipitation rates. The critical data category for the ranking unit is "B".

Results of the Risk-Based Modeling

The ranking unit resulted in an HPI in Group 2 due to potential for ingestion of AHF-contaminated crops and livestock. The ranking was driven by the toxicity of AHF and the agricultural production in the Fernald area. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are characterized as generally reaching receptors at levels below those used in regulatory decisions.

Current Status of the Ranking Unit

In March 1988, FMPC informed the Survey that these tanks are to be replaced by September 1989.

FMPC
Potential for Future Leaks from Waste Drums

Description of Ranking Unit

Approximately 35,000 drums at FMPC contain radioactive waste. The deteriorating condition of these drums presents the potential for spills and leaks. The drums contain uranium-235 and uranium-238 as a solid material and are seated on a concrete pad. Should such a leak or spill occur, stormwater runoff may carry the contaminants to Paddys Run and other nearby streams.

How the Ranking Unit was Modeled

The transport pathway that was modeled included surface water runoff to nearby streams.

The exposure pathways analyzed included the potential for ingestion of contaminated surface water through bathing, consumption of crops and livestock irrigated with surface water, and recreational activities.

The transport and exposure scenarios that were not modeled were air, resuspension, and groundwater. Since the drums are stored on a concrete pad, groundwater transport scenarios were not addressed. The drums themselves are stored so compactly that there is little chance that vehicular traffic could result in resuspension of the contaminants. For this reason, air transport scenarios were not considered.

The source term data were derived from inventory data with the standard drum failure assumptions discussed in Section 1.7.7 of this report for the release of the contamination to overland transport pathways. The critical data category for the ranking unit is "C".

Results of the Risk-Based Modeling

The ranking unit resulted in a score in HPI Group 0 due to the low concentration of contaminants that may eventually reach surface waters used for drinking water. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are not projected to reach receptors.

Qualifiers to the Risk-Based Ranking

This ranking unit includes overland runoff of contaminated soil. The qualifiers discussed in Section 1.7.5 of this report apply.

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Hanford Site
Richland, Washington

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Hanford Site
Inactive Liquid Process Discharges in the 100 Area

Description of Ranking Unit

Untreated wastewaters historically have been discharged to cribs and trenches in the 100 Area that were designed to allow for percolation of effluent into the subsurface soil. These disposal practices have been used from 1944, when the first Hanford reactor became operational, to the 1980s. The prevalent contaminants in the liquid process discharges include radionuclides and various cooling water additives associated with the past operation of the reactors in the 100 Area. The 57 liquid waste sites in this ranking unit are no longer active.

How the Ranking Unit was Modeled

The transport pathway modeled was groundwater to surface water. In this pathway, contaminants in the waste unit may migrate through the partially saturated zone into the unconfined aquifer and then laterally to a nearby river.

The exposure pathways analyzed included potential for ingestion of surface water for drinking purposes, potential for ingestion of crops irrigated and livestock watered with surface water, potential for ingestion of fish caught in surface waters, and potential for accidental ingestion of surface water during recreational activities.

Surface soil transport pathways were not considered, due to the contaminants being discharged to ponds, cribs, and trenches, where little or no resuspension may occur.

Inventories for this ranking unit were an aggregate of the individual discharge sites and were obtained from the Hanford Site Preliminary Report. The aggregate site was assumed to be 100 feet from the river. The critical data category is "B" because of the assumed aggregation. The contaminants in the waste unit are assumed to migrate as a result of infiltration of the liquid discharges.

Results of the Risk-Based Modeling

The ranking unit resulted in an HPI Group 6 for the potential for ingestion of crops and livestock which may be potentially contaminated with tritium due to irrigation from the river. Tritium scored higher than did other contaminants because of the large inventory in this ranking unit. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that represent a secondary level of concern from the potential public hazard perspective.

Integration Phase Concerns

This ranking unit was identified as having environmental degradation issues associated with it. The degradation issue was groundwater contamination.

Regulatory Aspects of the Ranking Unit

According to the Hanford Site, some of the inactive sites in this ranking unit were included in a Consent Order/Compliance Agreement issued on October 1, 1986 by the State of Washington, Department of Ecology and by the U.S. Environmental

Protection Agency (EPA), Region X, through the Resource Conservation and Recovery Act (RCRA) program. The Hanford Site has submitted information to Region X EPA for the 100 Area to be considered as a candidate site for the National Priorities List (NPL) under the Comprehensive Environmental Response, Compensation, and Liability Act/Superfund Amendment and Reauthorization Act (CERCLA/SARA). The Hanford Site is currently working with the State of Washington and Region X EPA on a new Consent Agreement/Compliance Order which is expected to include these inactive waste sites in the 100 Area.

Current Status of the Ranking Unit

In March 1988, the Hanford Site informed the Survey that the findings supporting this ranking unit have been included in the Hanford Environmental Management Program Implementation Plan. The inactive discharge sites have been identified and ranked in the CERCLA Phase I Report and will be addressed in priority order with the other Hanford inactive waste sites. A Remedial Investigation Scoping Study for the 100 Area is scheduled for completion in September 1989.

Hanford Site
Inactive Liquid Process Discharges in the 200 Area

Description of Ranking Unit

Process wastewater was discharged, with little or no prior treatment, to ponds, cribs, and trenches in the 200 Area since the start-up of the chemical separation and processing plants in 1944. These disposal sites were designed to allow effluent to percolate into the soil column. In the past, process wastewater contained both radioactive and organic chemical contaminants. Approximately 200 inactive liquid waste disposal sites in the 200 Area are included in this ranking unit.

How the Ranking Unit was Modeled

The transport pathways modeled include groundwater and groundwater to surface water. In this pathway, contaminants in the waste unit may migrate through the partially saturated zone into the unconfined aquifer to potential groundwater receptors or may pass through the unconfined aquifer and migrate laterally to a nearby river.

The exposure pathways analyzed include potential for ingestion of groundwater, potential for ingestion of crops irrigated and livestock watered with surface water, potential for ingestion of fish caught in surface waters, and potential for accidental ingestion of surface water during recreational activities.

Surface soil transport pathways were not considered, due to the contaminants being discharged to ponds, cribs, and trenches, where little or no resuspension may occur.

Inventories for this ranking unit were an aggregate of the individual discharge sites and were obtained from the Hanford Site Preliminary Report. The aggregate site was located between the 200 East and West Areas. The critical data category is "B" because of the assumed aggregation. The contaminants in the waste unit are assumed to migrate as a result of the liquid discharged to these areas.

Results of the Risk-Based Modeling

This ranking unit resulted in an HPI Group 7 for the potential for carbon tetrachloride in surface water used for irrigation. The highest HPI for groundwater use fell into Group 7 for carbon tetrachloride, driven by the potential for consumption at a downgradient receptor These scores are due to the high mobility of carbon tetrachloride in the soil and groundwater and its relatively high inventory in the 200-W Area. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that represent a secondary level of concern from the potential public hazard perspective.

Qualifiers to the Risk-Based Ranking

This ranking unit models organics in groundwater and surface water. The qualifiers discussed in Section 1.7.5 of this report apply.

Integration Phase Concerns

This ranking unit was identified as having environmental degradation issues associated with it. The degradation issue was groundwater contamination.

Regulatory Aspects of the Ranking Unit

The Hanford Site has submitted information to Region X EPA for the 200 Area to be considered as a candidate site for the NPL under CERCLA/SARA. The Hanford Site has informed the Survey that it is working with the State of Washington and Region X EPA on a new Tri Party Agreement which is expected to include these inactive waste sites in the 200 Area.

Current Status of the Ranking Unit

In March 1988, the Hanford Site informed the Survey that the findings supporting this ranking unit have been included in the Hanford Environmental Management Program Implementation Plan. A Remedial Investigation/Feasibility Study (RI/FS) has been initiated on the 200 Area inactive liquid waste sites. An aquifer restoration technology demonstration is planned for initiation in fiscal year 1988.

Hanford Site
Inactive Liquid Process Discharges in the 300 Area

Description of Ranking Unit

This ranking unit includes two process ponds and a trench in the 300 Area that were used for disposal of process wastewater. First use of one of the ponds began in 1944 when the Hanford Site went into operation and they continued to be used until 1975. The ponds and trench were not lined, which allowed the wastewater to percolate into the soil column. The wastewater disposed of in these sites contained various inorganic constituents, trichloroethylene (TCE), and uranium.

How the Ranking Unit was Modeled

The transport pathways modeled included waste unit to groundwater and waste unit to groundwater to surface water. In this pathway, contaminants in the waste

unit potentially may migrate through the partially saturated zone into the unconfined aquifer and then laterally to the river, as well as to groundwater receptors in the surrounding area.

The exposure pathways analyzed include potential for ingestion of groundwater, potential for ingestion of crops irrigated and livestock watered with surface water, potential for ingestion of fish caught in surface water, and potential for accidental ingestion of surface water during recreational activities.

Surface soil transport pathways were not considered, due to the contaminants being discharged to ponds and trenches where little or no resuspension may occur.

Inventories for the ranking unit were an aggregate of the individual discharge sites and were obtained from the Hanford Site Preliminary Report. The aggregate site was assumed to be 100 feet from the river. The critical data category is "B" because of the assumed aggregation. The contaminants in the waste unit are assumed to migrate with the liquid being discharged to the waste unit.

Results of the Risk-Based Modeling

This ranking unit resulted in HPI Group 6 for the potential for TCE-contaminated surface water which may be used to irrigate crops and water livestock. This score is due to the high mobility of TCE in groundwater and the relatively short distance from the 300 Area to the river. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that represent a secondary level of concern from the potential public hazard perspective.

Qualifiers to the Risk-Based Ranking

This ranking unit models an organic in groundwater and surface water. The qualifiers discussed in Section 1.7.5 of this report apply.

Integration Phase Concerns

This ranking unit was identified as having environmental degradation issues associated with it. The degradation issue was groundwater contamination.

Regulatory Aspects of the Ranking Unit

The 300 Area process ponds were included in the Consent Order/Compliance Agreement issued on October 1, 1986 by the State of Washington, Department of Ecology, and Region X EPA, through the RCRA program. The Hanford Site has submitted information to Region X EPA for the 300 Area to be considered as a candidate site for the NPL under CERCLA/SARA. The Hanford Site is currently working with the State of Washington and Region X EPA on a new Tri Party Agreement which is expected to include the inactive liquid waste sites in the 300 Area.

Current Status of the Ranking Unit

In March 1988, the Hanford Site informed the Survey that the groundwater monitoring requirements for the two process ponds in the 300 Area, which were established in the 1986 Consent Order/Compliance Agreement, have been completed. The pond sediments were sampled in 1987 as part of the Remedial

Investigation Work Plan which will be available in January 1989. Priority has been given to the 300 Area process ponds due to their high Hazard Ranking System (HRS) scores. The findings supporting this ranking unit have been included in the Hanford Environmental Management Program Implementation Plan.

Hanford Site
Active Liquid Process Discharges in the 100 Area

Description of Ranking Unit

Contaminated wastewaters, primarily radioactive, have been and continue to be discharged to the soils in the 100 Area. This ranking unit includes all active cribs, trenches, and seepage ponds within the 100 Area. These disposal units were designed to allow the effluent to percolate into the soil column.

How the Ranking Unit was Modeled

The transport pathway modeled was waste unit to groundwater to surface water.

The exposure pathways analyzed included potential for ingestion of surface water, potential for ingestion of crops irrigated and livestock watered with surface water, potential for ingestion of fish caught in surface water, and potential for accidental ingestion of surface water during recreational activities.

The waste unit to groundwater transport pathway was not considered because of the proximity of the waste units to a nearby river.

An estimated contaminant release was calculated for tritium, cobalt-60, strontium-90, iodine-131, and cesium-137 based on information obtained from an Environmental Impact Statement on the PUREX and Uranium Oxide Plant. All of the individual sites were aggregated into a single site, located 100 feet from the river. The critical data category is "B" because of the assumed aggregation.

Results of the Risk-Based Modeling

The ranking unit resulted in an HPI Group 7 for the potential for tritium in surface water potentially used for irrigation of crops and livestock. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that represent a secondary level of concern from the potential public hazard perspective. Tritium scored higher than the other contaminants due to its relatively high mobility in groundwater and the short horizontal distance (100 feet) to the river.

Integration Phase Concerns

This ranking unit was identified as having environmental degradation issues associated with it. The degradation issue was groundwater contamination.

Regulatory Aspects of the Ranking Unit

The 1325-N crib, one of the sites included in this ranking unit, is part of the National Pollutant Discharge Elimination System (NPDES) permit WA0003743, which includes

the 100-N Area springs. A Part B application has been submitted for 1324-N and closure plans have been submitted for 1324-NA, 1301-N, and 1325-N.

Current Status of the Ranking Unit

According to the Hanford Site, the findings supporting this ranking unit have been included in the Hanford Environmental Management Program Implementation Plan. A document entitled "Plan and Schedule to Discontinue Disposal of Contaminated Liquids into the Soil Column at the Hanford Site, March 1987" has been provided to Congress. At the 100-N Area, the location of most remaining 100 Area active liquid discharges, efforts were underway to minimize effluent flow rates and to reduce the radioactive and chemical contaminants. From 1963 to 1985 the 1301-N Liquid Waste Disposal Facility received radioactive liquid effluents from 100-N operations. In September 1985, 1301-N was replaced by the 1325-N Liquid Waste Disposal Facility. During the 1987 N Reactor standdown, the 1301-N facility was permanently isolated from the radioactive drain system. With the February 1988 decision to place N Reactor in cold standby, a project for the treatment of all radioactive liquid effluents from 100-N Area was placed on hold pending any future restart decision. During cold standby, 1325-N will receive diminished discharges, projected as less than 10 percent of the long-lived radioisotopes discharged during reactor operations. Closure plans have been submitted to EPA and the State of Washington for 1301-N and 1325-N. The groundwater contamination from past 1301-N operations still contributes the majority of the off-site dose due to Hanford operations. An elementary neutralization facility is being installed to replace the 1324-N Surface Impoundment which holds and neutralizes regeneration waste prior to release to the 1324-NA Percolation Pond. A Part B application has been submitted for 1324-N, and a closure plan has been submitted for 1324-NA.

Hanford Site
Active Liquid Process Discharges in the 200 Area

Description of Ranking Unit

Contaminated wastewaters, radioactive and hazardous, have been and continue to be discharged to the soils in the 200 Area. This ranking unit includes all active cribs, trenches, and seepage ponds within the 200 Area. These waste units are designed to allow liquids to percolate into the soil column.

How the Ranking Unit was Modeled

The transport pathways modeled included waste unit to groundwater and waste unit to groundwater to surface water. Groundwater flow direction may be altered due to groundwater mounding resulting from many years of liquid discharge in the 200 Area.

The exposure pathways analyzed included potential for ingestion of groundwater, potential for ingestion of surface water, potential for ingestion of crops irrigated and livestock watered with surface water, potential for ingestion of fish caught in surface waters, and potential for accidental ingestion of surface water during recreational activities.

Surface soil transport pathways were not considered due to the contaminants being discharged to ponds, cribs, and trenches, where little or no resuspension may occur.

A contaminant release rate was estimated for tritium, plutonium-239, acetone, and chromium based upon the Environmental Impact Statement for the PUREX and Uranium Oxide Plants. All of the individual sites were aggregated into a single site, located between the 200 East and West Areas. The critical data category is "B" because of the assumed aggregation. The contaminants in the waste unit are assumed to migrate as a result of infiltration due to liquid discharges in the 200 Area.

Results of the Risk-Based Modeling

The ranking unit resulted in an HPI Group 5 for the potential for acetone in surface water that may be used for irrigation downstream of the facility. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that present a tertiary level of concern from the potential public hazard perspective. Acetone scored because of its high mobility in soil and groundwater.

Qualifiers to the Risk-Based Ranking

This ranking unit models an organic in groundwater and surface water. The qualifiers discussed in Section 1.7.5 of this report apply.

Integration Phase Concerns

This ranking unit was identified as having environmental degradation issues associated with it. The degradation issue was groundwater contamination.

Regulatory Aspects of the Ranking Unit

According to the Hanford Site, RCRA Part A applications have been submitted to the State of Washington and Region X EPA for many of the sites which were included in this ranking unit. In March 1988, the Hanford Site informed the Survey that closure plans either have been submitted or are in preparation for many of the sites included in this ranking unit.

Current Status of the Ranking Unit

In March 1988, according to the Hanford Site, the findings supporting this ranking unit have been included in the Hanford Environmental Management Program Implementation Plan. A document entitled "Plan and Schedule to Discontinue Disposal of Contaminated Liquids into the Soil Column at the Hanford Site, March 1987" has been provided to Congress. This plan establishes a strategy and schedule to discontinue the use of soil columns for disposal of liquid waste. According to the Hanford Site, a number of projects are underway at the 200 Area facilities to reduce process discharges to the ground. A characterization study is in progress for the 200 Area (as well as all other operating areas) to determine the concentration of hazardous constituents in the liquid effluents.

Hanford Site
Active Liquid Process Discharges in the 300 Area

Description of Ranking Unit

Contaminated wastewaters, radioactive and hazardous, have been and continue to be discharged to waste units in the 300 Area that are designed to allow effluent to percolate into the soil column. This ranking unit includes all active cribs, trenches, and seepage ponds within the 300 Area. A potential exists for contaminants to migrate downward into the saturated zone and then laterally toward groundwater receptors and a nearby river.

How the Ranking Unit was Modeled

The transport pathways modeled included waste unit to groundwater and waste unit to groundwater to surface water.

The exposure pathways analyzed include the potential for ingestion of groundwater, the potential for ingestion of surface water, the potential for ingestion of crops irrigated and livestock watered with surface water, the potential for ingestion of fish caught in surface waters, and the potential for accidental ingestion of surface water during recreational activities.

Surface soil transport pathways were not considered, due to the contaminants being discharged to ponds, cribs, and trenches, where little or no resuspension may occur.

An estimated contaminant release was calculated for uranium-238, chloroform, tetrachloroethylene, and TCE based upon the Environmental Survey Preliminary Report. All of the individual sites were aggregated into a single site, located 100 feet from the river. The critical data category is "B" because of the assumed aggregation. The contaminants in the waste unit are assumed to migrate as a result of infiltration due to the volume of liquids discharged.

Results of the Risk-Based Modeling

The ranking unit resulted in HPI Group 5 for the potential for TCE in surface water that is used for irrigation. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that present a tertiary level of concern from the potential public hazard perspective. Trichloroethylene scored because of its relatively high mobility in the groundwater and the 300 Area's proximity to the river.

Qualifiers to the Risk-Based Ranking

This ranking unit models organics in groundwater and surface water. The qualifiers discussed in Section 1.7.5 of this report apply.

Integration Phase Concerns

This ranking unit was identified as having environmental degradation issues associated with it. The degradation issue was groundwater contamination.

Regulatory Aspects of the Ranking Unit

According to the Hanford Site, a Closure/Post-Closure Plan has been developed for the 300 Area process trenches, which were included in this ranking unit. This plan has been submitted to the State of Washington and Region X EPA.

Current Status of the Ranking Unit

In March 1988, according to the Hanford Site, the findings supporting this ranking unit have been included in the Hanford Environmental Management Program Implementation Plan. A document entitled "Plan and Schedule to Discontinue Disposal of Contaminated Liquids into the Soil Column at Hanford Site, March 1987" has been provided to Congress. This plan establishes a strategy and schedule to discontinue the use of soil columns for disposal of liquid waste. Radioactive liquid wastes in the 300 Area are collected for transport to the 200 Areas for treatment. Fuel fabrication for the 100 N Reactor has been placed in standby, thereby minimizing future uranium effluents. Current liquid releases to the 300 Area Process Trenches are maintained at levels below 4 percent of the Derived Concentration Guide (DCG) and applicable primary and secondary EPA drinking water standards (based on an annual average).

Hanford Site
Solid Waste Disposal Sites in the Vicinity of the 100 Area

Description of Ranking Unit

Burial grounds, burn pits, and inactive ash basins in the 100 Area have primarily received solid wastes over the past 45 years of Hanford Site's operations. Some of these waste units received radioactive solid wastes, and it is suspected that chemical wastes were disposed of in some of these units. These waste units were constructed without liners or groundwater protection measures.

How the Ranking Unit was Modeled

The transport pathways modeled included waste unit to groundwater to surface water.

The exposure pathways analyzed included the potential for ingestion of surface water, the potential for ingestion of crops irrigated and livestock watered with surface water, the potential for ingestion of fish caught in surface waters, and the potential for accidental ingestion of surface water during recreational activities.

The waste unit to groundwater transport pathway was not modeled due to the proximity of the waste unit to a nearby river.

Inventories were obtained from the Hanford Site Preliminary Report. The available information for the source term included estimates of the radioactive inventory and some data on the metallic wastes. No organic chemical source term data were available. Accordingly, the critical data category was "C".

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Results of the Risk-Based Modeling

The ranking unit resulted in an HPI Group 0 for uranium-238 in surface water which may be used for irrigation. This low ranking is due to the high distribution coefficient (i.e., affinity for soils) associated with uranium-238. This HPI score is based only on the known types and quantities of contaminants disposed of in the 100 Area solid waste disposal units. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are not projected to reach receptors.

Regulatory Aspects of the Ranking Unit

The Hanford Site has submitted information to Region X EPA for the 100 Area to be considered as a candidate site for the NPL under CERCLA/SARA. The Site is currently working with the State of Washington and Region X EPA on a new Tri Party Agreement which is expected to include the solid waste sites in the 100 Area.

Hanford Site
Solid Waste Disposal Sites in the Vicinity of the 200 Area

Description of Ranking Unit

Landfills, burial grounds, burn pits, and inactive ash basins in the 200 Area have been used for solid waste disposal over the past 45 years of Hanford Site's operation. Many of the burial grounds were used to dispose of radioactively contaminated waste, and it is suspected that they may have also received chemical waste. The types of waste placed in the other sites in this ranking unit are either unknown or poorly defined. Various wastes from the other operational areas at Hanford have been transported to the 200 Area for disposal. The solid waste disposal sites were constructed without liners or groundwater protection measures.

How the Ranking Unit was Modeled

The transport pathways modeled include waste unit to groundwater and waste unit to groundwater to surface water.

The exposure pathways analyzed include the potential for ingestion of groundwater, the potential for ingestion of surface water, the potential for ingestion of crops irrigated and livestock watered with surface water, the potential for ingestion of fish caught from surface waters, and the potential for ingestion of surface water during recreational activities.

Inventories were estimated from the Hanford Site Preliminary Report. The individual sites were aggregated into a single site. The critical data category was "C" because of incomplete knowledge of the inventories described above.

Results of the Risk-Based Modeling

The ranking unit resulted in a HPI Group 0 for plutonium-239 for all surface water and groundwater receptors. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are not projected to reach receptors. The HPI scores are low because of the high affinity the radionuclides analyzed have for soils, which limits its potential to reach the

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receptors. These scores are based only on the known types and quantities of wastes disposed of in the 200 Area.

Regulatory Aspects of the Ranking Unit

The groundwater monitoring requirements and closure plan that were established in the 1986 Consent Order/Compliance Agreement for one of the sites included in this ranking unit have been completed. In addition, some of the sites in this ranking unit were included in the RCRA Part A applications. The Hanford Site has submitted information to Region X EPA for the 200 Area to be considered as a candidate site for the NPL under CERCLA/SARA. The site has informed the Survey that it is currently working with the State of Washington and Region X EPA on a new Tri Party Agreement which is expected to include the solid waste sites in the 200 Area.

Hanford Site
Solid Waste Disposal Sites in the Vicinity of the 300/400 Areas

Description of Ranking Unit

Solid wastes have been disposed of in landfills, burial grounds, and inactive ash basins in the vicinity of the 300/400 Areas over the past 45 years of the Hanford Site's operation. These sites are known to contain radioactively contaminated solid waste. Records of the other types of waste disposed of in these sites have not been maintained. These waste units were constructed without liners or groundwater protection measures, and are relatively close to a nearby river.

How the Ranking Unit was Modeled

The transport pathways modeled include waste unit to groundwater and waste unit to groundwater to surface water.

The exposure pathways analyzed included the potential for ingestion of groundwater, the potential for ingestion of surface water, the potential for ingestion of crops irrigated and livestock watered with surface water, the potential for ingestion of fish caught from surface waters, and the potential for accidental ingestion of surface water during recreational activities.

Contaminant inventories were obtained from the Hanford Site Preliminary Report. Individual sites were aggregated into a single site. The critical data category is "C" because of the uncertainty of inventory information.

Results of the Risk-Based Modeling

This ranking unit resulted in an HPI Group 0 for plutonium-239 for potential irrigation with surface water. An HPI Group 0 also resulted for strontium-90 in groundwater which may be ingested. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are not projected to reach receptors. These HPI scores are low because of the affinity of subsurface soils for strontium-90 and plutonium-239, which limits the potential for them to reach the receptors mentioned. These scores are based only on the known types and quantities of contaminants disposed of in the sites in the vicinity of the 300/400 Areas.

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Regulatory Aspects of the Ranking Unit

According to the Hanford Site, some of the sites in this ranking unit were included in the RCRA Part A applications. In addition, the Hanford Site has submitted information to Region X EPA for the 300 Area to be considered as a candidate site for the NPL under CERCLA/SARA. The Hanford Site has informed the Survey that negotiations are ongoing with the State of Washington and Region X EPA on a new Consent Order/Compliance Agreement which is expected to include the solid waste sites in the 300 and 400 Areas.

Hanford Site
Past Leaks from Single Shell Tanks

Description of Ranking Unit

There are 149 single shell underground tanks containing high-level radioactive waste at the Hanford Site. A monitoring program has confirmed leakage of cesium-137 from some of these tanks.

How the Ranking Unit was Modeled

The only transport pathway modeled was waste unit to groundwater.

The exposure pathways analyzed included the potential for ingestion of groundwater and the potential for ingestion of crops irrigated and livestock watered with groundwater.

Because these releases occurred underground, overland runoff and surface soil resuspension scenarios were not considered.

The contaminant inventory was based on a Draft Environmental Impact Statement on the Disposal of High-Level Tank Wastes (SD-WM-SAR-006), which documents the actual release of cesium-137 from these tanks. The relative certainty of this inventory resulted in a critical data category of "A".

Results of the Risk-Based Modeling

The ranking unit resulted in an HPI Group 0 for cesium-137 for all groundwater receptors. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are not projected to reach receptors. The reasons for this low score include a relatively high affinity of cesium-137 for soils and the depth to groundwater (approximately 280 feet), which limits the potential for cesium-137 to reach the receptor locations.

Regulatory Aspects of the Ranking Unit

According to the Hanford Site, some of the issues in this ranking unit are included in the RCRA Part A applications that have been submitted. In addition, the Hanford Site has submitted information to Region X EPA for the 200 Area to be considered as a candidate site for the NPL under CERCLA/SARA. Single shell tanks will be regulated under RCRA. The Hanford Site has informed the Survey that negotiations are ongoing with the State of Washington and Region X EPA on a new Consent

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Order/Compliance Agreement which is expected to include the single shell tanks in the 200 Area.

Current Status of the Ranking Unit

In March 1988, according to the Hanford Site, the current program to stabilize the single shell tanks by transferring liquids to the double shell tanks is continuing.

Hanford Site
100 N Area Spill

Description of Ranking Unit

An accidental spill involving 80,000 gallons of diesel fuel occurred in 1966 at the 100 N Area. The leak, from a supply line break, caused diesel fuel to seep downward into the subsurface soils. A portion of this spill was cleaned up by the site contractor using a shallow interceptor recovery trench; however, documentation of this cleanup is limited.

How the Ranking Unit was Modeled

The only transport pathway modeled was surface soil to groundwater to surface water.

The exposure pathways analyzed included the potential for ingestion of surface water, the potential for ingestion of crops irrigated and livestock watered with surface water, the potential for ingestion of fish caught in surface waters, and the potential for accidental ingestion of surface water during recreational activities.

Because the majority of the fuel is assumed to have percolated downward into subsurface soils, and because the surface area is small, overland runoff and surface soil resuspension transport scenarios were not considered.

The contaminant inventory was taken from the Environmental Survey Preliminary Report. The critical data category is "B" because of the uncertainty in the efficiency of the cleanup. Diesel fuel was assumed to migrate into the subsurface as a result of the discharged liquids.

Results of the Risk-Based Modeling

The ranking unit resulted in an HPI Group 1 for diesel fuel from ingestion of crops irrigated and livestock watered with surface water. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are characterized as generally reaching receptors at levels below those used in regulatory decisions. Although the spill site is near the river, the low inventory results in the relatively low score.

Qualifiers to the Risk-Based Ranking

This ranking unit scores for fuel. It also models an organic in groundwater and surface water. The qualifiers in Section 1.7.5 of this report apply.

Hanford Site
Herbicide Disposal in Inactive Waste Site

Description of Ranking Unit

A site on the eastern side of the Columbia River was used for disposal of soil contaminated by the herbicide 2,4-D, which may be contaminated with dioxin. The 2, 4-D-contaminated soil was overlain by four feet of backfill which would preclude overland transport of contaminated soil. The horizontal distance from this waste unit to the river is approximately 1,500 feet.

How the Ranking Unit was Modeled

The only transport pathway modeled was waste unit to groundwater to surface water.

The exposure pathways analyzed included potential ingestion of surface water, potential ingestion of crops irrigated and livestock watered with surface water, potential ingestion of fish caught in surface waters, and potential accidental ingestion of surface water during recreational activities.

No sampling data were available, so a dioxin content of 2 ppm of 2,4-D was assumed for this modeling effort. Accordingly, the critical data category is "C". The dioxin is assumed to migrate from the waste unit as a result of precipitation-generated leachate.

Results of the Risk-Based Modeling

The ranking unit resulted in an HPI Group 0 for dioxin for all surface water receptors. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are not projected to reach receptors. This low HPI is due to the small inventory of dioxin assumed to be present and the high equilibrium coefficient (10,000 mL/g) indicating that dioxin adsorbs tightly to soil particles and would be difficult to dissolve into groundwater.

Qualifiers to the Risk-Based Ranking

This ranking unit models an organic in groundwater and surface water. The qualifiers discussed in Section 1.7.5 of this report apply.

Hanford Site
Surface Contamination due to Intrusion into Buried Waste

Description of Ranking Unit

Contamination due to the intrusion into buried liquid and solid wastes by animals and plants has been measured in surface soils and in vegetation in the 200 Area. These wastes are radioactive and include strontium-90, cesium-137, and plutonium-239. They may be transported from the source of contamination by animals and deep-rooted vegetation, which die, desiccate, and decompose, potentially resulting in surface soil contamination.

How the Ranking Unit was Modeled

The transport pathways modeled include surface soil overland to surface water and surface soil to atmosphere by resuspension.

The exposure pathways analyzed include potential ingestion and/or inhalation of contaminated soil, and potential ingestion of crops and animals contaminated with deposited contaminants.

Because burrowing of animals and decomposition of vegetation create surface soil contamination, groundwater transport scenarios were not considered.

Contaminant inventories were taken from measured contaminant concentrations in the surface soil which were reported in the Environmental Survey Preliminary Report. The entire 200 Area was considered the source. The critical data category is "C" because of the extrapolation of isolated measurements to the entire area. Contaminant migration is assumed to occur from the waste unit as a result of resuspension and atmospheric dispersion of contaminated soil particles.

Results of the Risk-Based Modeling

The ranking unit resulted in an HPI Group 0 for strontium-90 for the potential for ingestion of contaminated crops and livestock irrigated in areas surrounding the facility. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with the environmental problems that are not projected to reach receptors. This low ranking is due to low contaminant levels in the surface soils (4.7 pCi/g strontium-90) and the large horizontal distances between the waste unit and the receptors.

Qualifiers to the Risk-Based Ranking

This ranking unit includes overland runoff of contaminated soil. The qualifiers discussed in Section 1.7.5 of this report apply.

Hanford Site
Carbon Tetrachloride Emissions from the Z-Plant

Description of Ranking Unit

The main stack at the Z-Plant located in the 200-West Area emits approximately seven tons/year of carbon tetrachloride. These emissions are neither monitored nor controlled. Carbon tetrachloride is highly volatile and readily disperses through the atmosphere. Because carbon tetrachloride is a gas, it will not be deposited unless washed out by precipitation, which is expected to occur rarely due to the low rainfall in the area.

How the Ranking Unit was Modeled

The only transport pathway modeled was potential direct emission from waste unit to the atmosphere.

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The exposure pathways analyzed included potential inhalation of contaminated air by the surrounding population and potential ingestion of contaminated crops and livestock produced in surrounding agricultural areas.

Because this is a stack emission of a highly volatile contaminant, surface soil and groundwater transport scenarios were not considered.

Source term and release rate information were provided in the Environmental Survey Preliminary Report. The certainty of the release rate resulted in a critical data category of "A". The stack release rate is assumed to be continuous for the next 40 years.

Results of the Risk-Based Modeling

This ranking unit resulted in an HPI Group 4 for potential inhalation of carbon tetrachloride by the population within 50 miles of the center of 200 Area. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are characterized as generally reaching receptors at levels below those used in regulatory decisions. This ranking was driven by the large inventory of carbon tetrachloride released and relatively low reference dose.

Current Status of the Ranking Unit

In March 1988, the site informed the Survey that the release is not continuous. Furthermore, based upon the N Reactor cold standby decision, the PUREX and Z-Plant operating schedules, while not finalized, are likely to extend no more than 10 years.

Hanford Site
Potential for Future Releases from Single Shell Tanks and Associated Piping

Description of Ranking Unit

There is an ongoing program to transfer high-level radioactive waste from the 149 single shell tanks into double shell tanks by 1995. These tanks are located approximately 10 feet below the ground surface but a portion of the distribution system including pipes, valves, vents and diversion boxes are located above-ground. The average age of the single shell tanks is 34 years.

How the Ranking Unit was Modeled

There are three potential transport pathways by which contaminants may enter the environment. First, there is a potential for leakage to the subsurface due to corrosion. This scenario used the standard release scenarios for underground storage tanks (USTs) described in Section 1.7.7 of this report. Second, surface soil could become contaminated due to operator or equipment failure. The contaminated surface soil could then be transported overland into a nearby river by storm-generated runoff. Last, the contaminated surface soil could be resuspended by wind or mechanical disturbance.

The exposure pathways analyzed included potential inhalation of airborne contaminated soil particles, potential ingestion of contaminated crops and livestock

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produced in surrounding areas, potential ingestion of groundwater, potential ingestion of surface water, potential ingestion of fish caught in surface waters, and potential accidental ingestion of surface water during recreational activities.

The contaminant inventory within the tanks was taken from the Environmental Survey Preliminary Report. The contaminant release from the tanks to the surface soil was based upon an actual release documented in "Investigation Report of January 1985 241-C-151 Diversion Box Contamination Incident" and input provided by the Survey team. The latter, which was the important pathway, was categorized as critical data category "A", being based on actual experience.

Results of the Risk-Based Modeling

The ranking unit resulted in an HPI Group 0 for strontium-90 for potential ingestion of contaminated crops and livestock produced in irrigated areas surrounding the facility. This involves the atmospheric transport scenario following resuspension of soil. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are not projected to reach receptors. This low ranking is due to the relatively low quantity of contaminants released to the environment and a significant amount of atmospheric dispersion between the waste unit and the potential receptors.

Qualifiers to the Risk-Based Ranking

This ranking unit includes overland runoff and the UST standard release scenario. The qualifiers discussed in Sections 1.7.5 and 1.7.7 of this report apply.

Current Status of the Ranking Unit

Ninety-five of the 149 single shell tanks have been interim stabilized and contain no free liquids. The remainder contain liquids in amounts well below their capacities.

Hanford Site
Potential Releases from Aboveground Product Tanks

Description of Ranking Unit

Storage facilities for chemicals, most of which are located in the 200 Area, were observed to have deficiencies in either design or operation of spill-control measures. Such deficiencies consist of missing or faulty secondary containment structures or lack of impervious bottom liners surrounding the tanks.

How the Ranking Unit was Modeled

The transport pathways modeled included surface soil to groundwater and surface soil to groundwater to surface water.

The exposure pathways analyzed included the potential for ingestion of groundwater, the potential for ingestion of surface water, the potential for ingestion of crops irrigated and livestock watered with surface water, the potential for ingestion of fish caught in surface waters, and the potential for ingestion of surface water during recreational activities.

Overland transport and soil resuspension scenarios were not considered due to the type of waste unit.

The three tanks containing the largest inventory of toxic materials, which were carbon tetrachloride, nitric acid, and sulfuric acid, were modeled. Three tanks, rather than the usual standard scenario of one tank, were catastrophically failed due to the large area of the Hanford Site and the unknown condition of the tanks involved. The critical data category was "B" because, although the contents of the tanks were known, the conditions of the tanks were not.

Results of the Risk-Based Modeling

This ranking unit resulted in an HPI Group 0 for all constituents for all projected surface water usage locations. The groundwater usage pathway also produced HPIs in Group 0 for all constituents. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are not projected to reach receptors. The low HPI scores resulted from the relatively low contaminant inventory and the great horizontal distance to potential receptors.

Qualifiers to the Risk-Based Ranking

This ranking unit models an organic in groundwater and surface water. The qualifiers discussed in Section 1.7.5 of this report apply.

Idaho National Engineering Laboratory
Idaho Falls, Idaho

INEL
Active Percolation Ponds at ICPP and TRA

Description of Ranking Unit

The Idaho Chemical Processing Plant (ICPP) and Test Reactor Area (TRA) facilities at the Idaho National Engineering Laboratory (INEL) dispose of liquid waste through effluent discharge to on-site percolation ponds. Discharges to the two ICPP ponds and the six TRA ponds consist mainly of wastes from process and laboratory drains and may result in organic (including biocides from cooling towers), inorganic, metal, and radioactive contamination of the ponds.

How the Ranking Unit was Modeled

The transport pathway that was modeled was groundwater.

The exposure pathways analyzed in the modeling were potential drinking water consumption and potential ingestion of crops irrigated with water from the aquifer.

The transport and exposure scenarios that were not analyzed include surface water, direct contact, and resuspension because (a) the percolation ponds and on-site surface water bodies (three small disappearing streams) are not interconnected nor are the streams used as a drinking water source or for recreation; (b) contact with the ponds by the public does not occur as access to the ponds is controlled; and (c) pond sediments/soils are covered with water or are moist and would not be resuspendible.

The data concerning the source term were derived from lift station monitoring reports, sampling results, waste management information system reports, and on-site Survey interviews. The critical data pertaining to contaminant inventory were available in site inventory records and reports. Thus, the critical data category for the ranking unit is "A".

Results of the Risk-Based Modeling

The ranking unit resulted in a score in HPI Group 7. The potential for consumption of tritium due to drinking water from the aquifer drove the ranking. This contaminant scored because of its mobility in water and its relatively high concentration at this site. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that represent a secondary level of concern from the potential public hazard perspective.

Qualifiers to the Risk-Based Ranking

This ranking unit includes potential contamination of organics in groundwater. The qualifiers discussed in Section 1.7.5 of this report apply.

Regulatory Aspects of the Ranking Unit

All eight ponds are covered under the Consent Order/Compliance Agreement (COCA). The TRA Chemical Pond is considered to be a Land Disposal Unit (LDU) and, as such, is subject to Closure and Groundwater Monitoring requirements specified in 40 CFR Part 265. The TRA Warm Waste Pond is considered to be an active release

unit because chrome concentrations have been measured in the perched water under the pond. As such, it is subject to Corrective Action requirements. The remaining six ponds are all considered to be Solid Waste Management Units (SWMUs) under the COCA and are subject to Monitoring, Analysis and Testing requirements.

Current Status of the Ranking Unit

In March of 1988, the INEL informed the Survey that the percolation ponds were being worked in accordance with an Action Plan generated under the Department of Energy/Environmental Protection Agency (DOE-EPA) Region X Consent Order Compliance Agreement for Resource Conservation and Recovery Act (RCRA) compliance. Initial Assessments were performed. Closure Plan, Monitoring, Analysis and Testing Plans were under development. Sampling schedules and evaluation of data to determine if further action is required were also scheduled in the Action Plan.

INEL
Active Percolation Pond and Ditches at ANL-West

Description of Ranking Unit

Liquid waste in the form of demineralizer regeneration effluent, cooling tower blowdown, laboratory drain waste, and photoprocessing wastes is or has been discharged to a percolation pond via a series of ditches at the Argonne National Laboratory-West. Contaminants within the effluent may consist of organics (including pesticides), inorganics, metals, and radionuclides.

How the Ranking Unit was Modeled

The potential transport pathway that was modeled was groundwater.

The potential exposure pathways analyzed in the modeling were the potential for drinking water consumption and ingestion of crops irrigated with water from the aquifer.

The potential transport and exposure scenarios that were not analyzed include surface water, direct contact, and resuspension, because percolation pond, ditches and on-site surface water bodies (three small, intermittent, disappearing streams) are not interconnected nor are the intermittent streams used as a drinking water source or for recreation. Contact with the pond and ditches by the public does not occur, as access is controlled. Pond and ditch sediments/soils are covered with water or are moist and would not be resuspendible.

The data concerning the source terms were derived from sediment sample, initial environmental assessment data, and waste management information system reports. The critical data category for the ranking unit is "A".

Results of the Risk-Based Modeling

The ranking unit resulted in a score in HPI Group 4. The potential for consumption of sulfate from the aquifer drove the ranking. This contaminant scored in the ponds and the ditches because of its large amount, persistence, and its high solubility in

water. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that present a tertiary level of concern from the potential public hazard perspective.

Qualifiers to the Risk-Based Ranking

This ranking unit includes potential contamination of organics in groundwater. The qualifiers discussed in Section 1.7.5 of this report apply.

Regulatory Aspects of the Ranking Unit

These units are covered by the COCA. The classification of the percolation pond is currently under negotiation with EPA Region X to determine whether the percolation pond constitutes an LDU or SWMU. The ditch from the regeneration process is considered an LDU and is subject to Closure and Groundwater Monitoring requirements under 40 CFR Part 265. The remaining ditches and, depending on negotiations, the pond itself are considered to be SWMUs and are subject to Monitoring, Analysis and Testing requirements.

Current Status of the Ranking Unit

In March of 1988, the INEL informed the Survey that the percolation pond was being worked in accordance with an Action Plan generated under the DOE-EPA Region X Consent Order Compliance Agreement for RCRA compliance. Initial Assessments were performed. Closure Plan, Monitoring, Analysis and Testing Plans were under development. Sampling schedules and evaluation of data to determine if further action is required were also scheduled in the Action Plan.

INEL
Other Active Percolation Ponds

Description of Ranking Unit

Active percolation ponds at the Test Area North (TAN) and Auxiliary Reactor Area (ARA-I) are utilized for on-site disposal of liquid waste from cooling towers and from equipment and laboratory drains. Contaminants within the discharge to two ponds at the TAN and one pond at ARA-I may include organics, inorganics, metals, and radionuclides.

How the Ranking Unit was Modeled

The transport pathway that was modeled was groundwater.

The exposure pathways analyzed in the modeling were potential drinking water consumption and potential ingestion of crops irrigated with water from the aquifer.

The transport and exposure scenarios that were not analyzed include surface water, direct contact and resuspension because percolation ponds and on-site surface water bodies (three small, intermittent, disappearing streams) are not interconnected nor are the streams used as a drinking water source or for recreation. Contact with the ponds by the public does not occur, as access to the

ponds is controlled. Pond sediments/soils are covered with water or are moist and would not be resuspendible.

The data concerning the source terms were derived from the TAN lift station monitoring report, an estimated disposal/discharge inventory from ARA-I, waste management information systems reports and on-site Survey interviews. The critical data category for the ranking unit is "A".

Results of the Risk-Based Modeling

The ranking unit resulted in a score in HPI Group 4. The potential for consumption of carbon tetrachloride from the aquifer drove the ranking. This contaminant scored because of its toxicity and its high solubility in water. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that present a tertiary level of concern from the potential public hazard perspective.

Qualifiers to the Risk-Based Ranking

This ranking unit includes potential contamination of organics in groundwater. The qualifiers discussed in Section 1.7.5 of this report apply.

Regulatory Aspects of the Ranking Unit

These units are covered under the COCA. Both the TSF Pond and ARA Pond are LDUs and are subject to Closure and Groundwater Monitoring requirements of 40 CFR Part 265. The other pond at TAN is considered to be an SWMU and is subject to Monitoring, Analysis and Testing requirements.

INEL
Significant Petroleum Spills

Description of Ranking Unit

Numerous petroleum product spills have occurred at INEL from line and tank failures and product transfer mishaps. Four significant spills of this nature were used for this ranking unit: one at ICPP involving kerosene; one at the Test Area North/Loss of Fluid Test (TAN/LOFT) involving diesel fuel; and two at the Central Facilities Area (CFA) also involving diesel fuel.

How the Ranking Unit was Modeled

The transport pathway that was modeled was groundwater.

The exposure pathways analyzed in the modeling were potential drinking water consumption and potential ingestion of crops irrigated with water from the aquifer.

The transport and exposure scenarios that were not analyzed include surface water, direct contact, and resuspension. Overland flow to surface water does not normally occur at this installation due to the porosity of the soil. Contact with the spills by the public does not occur as access to the sites is controlled or the releases were

underground leaks. Resuspension is considered insignificant because of the rapid seepage of liquids into the porous surface soil.

Data concerning the source terms were derived from initial environmental assessments provided by the INEL. The critical data pertaining to the contaminant inventory were available, and therefore the critical data category for the ranking unit is "A".

Results of the Risk-Based Modeling

The ranking unit resulted in a score in HPI Group 3. The potential for consumption of diesel fuel from the aquifer drove the ranking. This contaminant scored because of its persistence and its concentration in water at this site. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are characterized as generally reaching receptors at levels below those used in regulatory decisions.

Qualifiers to the Risk-Based Ranking

This ranking unit scores for potential fuels in groundwater and involves organics in groundwater. The second and third qualifiers discussed in Section 1.7.5 of this report apply.

Regulatory Aspects of the Ranking Unit

These items are all covered under the COCA. The spill at the TAN/LOFT is considered to be an LDU and as such is subject to Closure and Groundwater Monitoring requirements of 40 CFR Part 265. The remaining spills are considered to be SWMUs and are subject to Monitoring, Analysis and Testing requirements.

INEL
Significant Spills Involving Metals

Description of Ranking Unit

Numerous releases and spills of substances containing metals have occurred at INEL through tank failures, cooling tower blowdown, and solvent disposal. Four significant releases or spills involving metal contamination occurred at ICPP (two spills) and the TRA (one spill, one release).

How the Ranking Unit was Modeled

The transport pathway that was modeled was groundwater.

The exposure pathways analyzed in the modeling were potential drinking water consumption and potential ingestion of crops irrigated with water from the aquifer.

The transport and exposure scenarios that were not analyzed include surface water, direct contact, and resuspension because (a) overland flow to surface water does not normally occur; (b) contact with the spills by the public would not occur as access to the facilities is controlled; and (c) resuspension was considered to be a minor component.

The data concerning the source terms were derived from recent soil sampling results provided by the INEL. The critical data pertaining to the contaminant inventory were available, and therefore the critical data category for the ranking unit is "A".

Results of the Risk-Based Modeling

The ranking unit resulted in a score in HPI Group 0. The potential for consumption of hexavalent chromium from the aquifer drove the ranking. However, this low score was due to the high distribution coefficient (Kd values) for chromium which retards its movement to aquifer and receptors. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are not projected to reach receptors.

Regulatory Aspects of the Ranking Unit

These sites are all SWMUs under the COCA and are subject to Monitoring, Analysis and Testing requirements.

INEL
Unsaturated Zone Inactive Injection Wells at PBF

Description of Ranking Unit

The INEL and its predecessor, the National Reactor Test Station (NRTS), commonly made use of injection wells for liquid waste disposal. Of specific concern are two inactive injection wells at the PBF, which were designed to percolate wastes through the unsaturated zone. These wells were used to dispose of corrosive wastes and wastes containing moderate levels of radioactivity. Contaminants within the discharged liquid may include organics, inorganics, metals, and radionuclides.

How the Ranking Unit was Modeled

The transport pathway that was modeled was groundwater.

The exposure pathways analyzed in the modeling were potential drinking water consumption and potential ingestion of crops irrigated with water from the aquifer.

The transport and exposure scenarios that were not analyzed include surface water, direct contact, and resuspension because the injection wells and on-site surface water bodies are not interconnected. Direct contact by the public and resuspension do not occur as the contamination is underground and not accessible.

The data concerning the source term were derived from estimates from the INEL. Critical data pertaining to contaminant inventory were partly available and partly estimated based on assumptions. Thus, the critical data category for the ranking unit is "B".

Results of the Risk-Based Modeling

The ranking unit resulted in a score in HPI Group 2. Potential consumption of sulfuric acid from the aquifer drove the ranking. This contaminant scored because

of its toxicity and its solubility in water. However, this low score was due to low concentration of sulfuric acid, owing to low source term. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are characterized as generally reaching receptors at levels below those used in regulatory decisions.

Qualifiers to the Risk-Based Ranking

This ranking unit includes potential contamination of organics in groundwater. The qualifiers discussed in Section 1.7.5 of this report apply.

Regulatory Aspects of the Ranking Unit

These sites are all SWMUs under the COCA and are subject to Monitoring, Analysis and Testing requirements.

Current Status of the Ranking Unit

In March of 1988, the INEL informed the Survey that the injection wells have been shut down since 1979. No groundwater in the vicinity had shown contamination. An Action Plan was under development with EPA Region X, and the wells were to be analyzed for possible hazardous constituents. Also, appropriate actions were to be taken to correct a release, if one was detected.

INEL
Inactive Gravel Pits at ICPP

Description of Ranking Unit

Percolation ponds and ditches were used at the INEL to receive liquid effluents contaminated with organics, inorganics, metals, and radionuclides. Three inactive ponds of particular concern are gravel pit 1 at the ICPP and one leach pond each at the ARA-III and OMRE.

How the Ranking Unit was Modeled

The transport pathway that was modeled was groundwater.

The exposure pathways analyzed in the modeling were potential drinking water consumption and potential ingestion of crops irrigated with water from the aquifer.

The transport and exposure scenarios that were not analyzed include surface water, direct contact, and resuspension because the pits, ponds, and on-site surface water bodies (three small, intermittent, disappearing streams) are not interconnected, nor are these streams used as a drinking water source or for recreation. Contact with the pit and ponds by the public does not occur as access is controlled. Overland flow to surface water does not typically occur at this installation due to the porous soil. Resuspension would not occur because of the rapid seepage of liquids into the porous surface soil.

The data concerning the source terms were derived from radiation surveys, soil sampling results and annual discharge inventories. Critical data pertaining to the

contaminant inventory were available from site records. Thus, the critical data category for the ranking unit is "A".

Results of the Risk-Based Modeling

The ranking unit resulted in a score in HPI Group 4. The potential for consumption of tritium from the aquifer drove the ranking. This contaminant scored because of its mobility in water and its relatively high concentration at this site. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that present a tertiary level of concern from the potential public hazard perspective.

Qualifiers to the Risk-Based Ranking

This ranking unit includes potential contamination of organics in groundwater. The qualifiers discussed in Section 1.7.5 of this report apply.

Regulatory Aspects of the Ranking Unit

The ICPP gravel pit and pond at ARA-III are LDUs under the COCA and as such are subject to Closure and Groundwater Monitoring requirements of 40 CFR Part 265. The OMRE pond is an SWMU subject to Monitoring, Analysis and Testing requirements.

INEL
Inactive Injection Wells at TRA and ICPP

Description of Ranking Unit

The INEL commonly made use of gravity-fed injection wells for liquid waste disposal in the past. Contaminants may have been discharged to the unsaturated zone through perforations in the inactive well casings, which includes the perched aquifers underlying the TRA and the ICPP.

How the Ranking Unit was Modeled

The transport pathway that was modeled was groundwater.

The exposure pathways analyzed in the modeling were potential drinking water consumption and potential ingestion of crops irrigated with water from the aquifer.

The transport and exposure scenarios that were not analyzed include surface water, direct contact, and resuspension because the injection wells and on-site surface water bodies are not interconnected. Contact by the public and resuspension does not occur as the injection wells are underground.

The data concerning the source terms were derived from annual release inventories and estimates from the INEL. The critical data category for the ranking unit is "A".

Results of the Risk-Based Modeling

The ranking unit resulted in a score in HPI Group 5. The potential for consumption of iodine-129 from the aquifer drove the ranking. This contaminant scored because of its toxicity and its mobility in water. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that present a tertiary level of concern from the potential public hazard perspective.

Regulatory Aspects of the Ranking Unit

The ICPP injection well is considered to be an LDU under the COCA and as such is subject to Closure and Groundwater Monitoring requirements of 40 CFR Part 265. The TRA injection well is considered to be an SWMU under the COCA and as such is subject to Monitoring, Analysis and Testing requirements.

INEL
TCE in Drinking Water Wells

Description of Ranking Unit

Trichloroethylene (TCE) has been found in two drinking water wells at TAN.

How the Ranking Unit was Modeled

The transport pathway that was modeled was groundwater.

The exposure pathway analyzed in the modeling was potential drinking water consumption from the aquifer.

The transport and exposure scenarios that were not analyzed include surface water, direct contact, and resuspension. The surface water scenario was not used because the surface water (snowmelt, precipitation) affects the ranking unit only as the driving force for contaminant migration and not a surface flow. Direct contact and resuspension would not occur, as the contamination is underground and not directly accessible.

The data concerning the source terms were derived from analytical results provided by the INEL. Since known well concentrations were applied to an assumed plume, the critical data category for the ranking unit is "B".

Results of the Risk-Based Modeling

The ranking unit's HPI fell within Group 2. The potential for consumption of TCE from the aquifer drove the ranking. This contaminant scored because of its toxicity and its solubility in water. However, this low score is due to the low concentration of TCE in the aquifer. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are characterized as generally reaching receptors at levels below those used in regulatory decisions. However, as explained in Section 1.7.4 of this report, the size of the population potentially impacted can affect the score.

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Qualifiers to the Risk-Based Ranking

This ranking unit includes potential contamination of organics in groundwater. The qualifiers discussed in Section 1.7.5 of this report apply.

Integration Phase Concerns

This ranking unit was identified as having environmental degradation issues associated with it. The degradation issue was the contamination of groundwater. The significance of the degradation issue was viewed as being inadequately represented by the risk-based ranking. Therefore, the ranking for this unit was adjusted.

Regulatory Aspects of the Ranking Unit

This unit is covered under the COCA as a Corrective Action Unit. A Corrective Action Workplan has been submitted to EPA detailing the actions planned to alleviate the problem.

Current Status of the Ranking Unit

In March of 1988, the INEL informed the Survey that additional sampling data have indicated well water contamination by 6 to 8 ppb trichloroethylene (TCE) and 2 to 3 ppb perchloroethylene (PCE). Samples taken at the other well serving the TAN/TSF area indicated 4 to 5 ppb TCE and 1 to 2 ppb PCE. Water samples had been taken at the point of entry to the drinking water system, as opposed to the wellhead. The results indicated that the MCLG is not exceeded in the water consumed by workers at TAN/TSF. The highest contaminant levels were 4 ppb TCE and less than 1 ppb PCE.

Monthly sampling at the point of entry to the drinking water system was expected to continue so that any trends in contaminant concentration would be identified. In addition, extensive investigations were in progress to determine the source of these contaminants. EPA Region X and the State of Idaho were officially informed of a release of organic material to the groundwater in the TAN area. Finally, systems to remove the volatile organic contaminants were being investigated for possible construction and use in the TAN/TSF area.

INEL
Inactive CFA Landfills and Lead Storage Areas

Description of Ranking Unit

Landfills and surface storage areas were used at the INEL to dispose of wastes and trash or to store materials. Three such areas, inactive Landfills I and II and the lead storage area, all located at the CFA, were utilized for this ranking unit. Contaminants of concern include organics, hazardous materials, and metals.

How the Ranking Unit was Modeled

The transport pathway that was modeled was groundwater.

The exposure pathways analyzed in the modeling were potential drinking water consumption and potential ingestion of crops irrigated with water from the aquifer.

The transport and exposure scenarios that were not analyzed include surface water, direct contact, and resuspension. This is because the overland flow to surface water does not occur at this installation due to porous soil. Since the landfills are covered and inactive and access to the site is controlled, contact by the public does not occur.

The data concerning the source terms were derived from INEL waste disposal records. Critical data pertaining to the contaminant inventory were available in site records; therefore, the critical data category for the ranking unit is "B".

Results of the Risk-Based Modeling

The ranking unit resulted in a score in HPI Group 0. The potential for consumption of xylene from the aquifer drove the ranking. This low score was due to low concentration of xylene, owing to a low source term. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are not projected to reach receptors.

Qualifiers to the Risk-Based Ranking

This ranking unit includes potential contamination of organics in groundwater. The qualifiers discussed in Section 1.7.5 of this report apply.

Regulatory Aspects of the Ranking Unit

These units are both covered under the COCA. The landfills are LDUs and SWMUs, depending on the age of the landfill in question, and the Lead Storage Areas are SWMUs. The LDUs are subject to Closure and Groundwater Monitoring requirements of 40 CFR Part 265, and the SWMUs are subject to Monitoring, Analysis and Testing requirements.

INEL
Volatile Organics and Radionuclides Released to the Groundwater at RWMC

Description of Ranking Unit

Volatile organics and radionuclides, which may have resulted from waste disposal at the Radioactive Waste Management Complex (RWMC), have been found in the aquifer beneath the INEL.

How the Ranking Unit was Modeled

The transport pathway that was modeled was groundwater.

The exposure pathways analyzed in the modeling were potential drinking water consumption and potential ingestion of crops irrigated with water from the aquifer.

The transport and exposure scenarios that were not analyzed include surface water, direct contact, and resuspension. The surface water scenario was not used because

the surface water (snowmelt, precipitation) affects this ranking unit only as the driving force for the subsurface migration of the contaminants and not a surface flow. Contact and resuspension would not occur as the contamination is underground and not directly accessible or resuspendible.

The data concerning the source terms were derived from monitoring well and soil borings analysis. Critical data pertaining to the contaminant inventory and concentrations were determined from monitoring data at the RWMC, and therefore the critical data category for the ranking unit is "B".

Results of the Risk-Based Modeling

The ranking unit's HPI fell within HPI Group 7. The potential for consumption of carbon tetrachloride in on-site wells drove the ranking. This contaminant scored because of its toxicity and its solubility in water. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that represent a secondary level of concern from the potential public hazard perspective.

Qualifiers to the Risk-Based Ranking

This ranking unit includes potential contamination of organics in groundwater. The qualifiers discussed in Section 1.7.5 of this report apply.

Integration Phase Concerns

This ranking unit was identified as having environmental degradation issues associated with it. The degradation issue was the contamination of groundwater.

Regulatory Aspects of the Ranking Unit

The RWMC is listed under the COCA as a Corrective Action Unit due to the release of hazardous constituents. A Corrective Action Work Plan has been submitted to EPA outlining the plans for alleviating and studying the problems.

Current Status of the Ranking Unit

In March of 1988, the INEL informed the Survey that a 4-year action plan (1988-1991) for buried transuranic and organic wastes at the RWMC has been proposed. The plan included a long-term management action recommendation in 1990, with preparation of National Environmental Policy Act (NEPA) or Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) documentation being completed by 1993. This action plan represented a 5-year acceleration over the original program. The INEL Action Plan consisted of three major objectives:

1. Minimize further water infiltration, thereby reducing migration of radioactive and hazardous constituents from the RWMC.

2. Enhance environmental characterization activities to determine sources, extent, and consequences of migration.

3. Develop and demonstrate cost-effective long-term solutions to reduce or eliminate further migration.

INEL
Air Impacts from ICPP Stacks

Description of Ranking Unit

The Main and FAST (Fluorinel Dissolution Process and Fuel Storage Facility) stacks at ICPP are two of the major point sources of air contaminants at the INEL.

The ranking unit addresses both nonradioactive and radioactive emissions.

How the Ranking Unit was Modeled

The transport pathway that was modeled was the atmospheric pathway. The potential exposure pathways analyzed in the modeling were the potential for inhalation of and direct contact with contaminants within the plume and atmosphere and the potential for ingestion with respect to contaminants deposited on surface soils. Both on and off the site, exposures of concern were considered.

The data concerning the source terms were derived from modeling performed by the INEL. The source term data were taken from the emission inventory and the INEL modeling data sets provided; therefore, the critical data category for the ranking unit is "A".

Results of the Risk-Based Modeling

The ranking unit resulted in an HPI in Group 3. The potential for inhalation and ingestion of nitrogen oxides (NO_x) from the Main stack based on 50-mile population, crop, meat, and milk production drove the ranking. This contaminant scored because of its concentration from the stacks and its minimal potential for health effects. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are characterized as generally reaching receptors at levels below those used in regulatory decisions.

Integration Phase Concerns

This ranking unit was identified as having environmental degradation issues associated with it. The degradation issue was the potential visibility impacts at a nearby Class I airshed.

Regulatory Aspects of the Ranking Unit

There are no commitments at this time for this unit. It is not listed under the COCA since it is an active unit and the releases are within limits for attainment areas.

Current Status of the Ranking Unit

In March of 1988, INEL informed the Survey that the ICPP has an on-going study of the stack releases of toxic air pollutants and the various processes associated with pollutants. Pollutants being studied include the four elements listed. As part of this study, the following two documents, "A Survey of Atmospheric Release Points" and "Projections of Future Monitoring Needs (WIN-137)" and "Determination of Baseline Levels of Toxic Non-Radioactive Substances at the ICPP (ENICO-1136)," were relevant. The qualitative and quantitative assessment of nonradioactive

contaminants was assessed in the Safety Analysis Report and NEPA Documentation for each project.

There are no EPA or State of Idaho standards for cadmium, mercury, fluoride, and boron. The emission rates of those elements were studied, as reported in the publications "A Survey of Atmospheric Release Points and Projection of Future Monitoring Needs (WIN-137)" and "Determination of Baseline Levels of Toxic Non-Radioactive Substances at the ICPP (ENICO-1136)."

The ICPP is continuing with projections of future monitoring needs and the survey of atmospheric release points from all stacks at the ICPP including the main stack. All characterization work is scheduled for completion in FY 90. The FAST and NWCF VOG stacks were scheduled for completion in FY 88.

INEL
Potential for PCB Release from Transformers

Description of Ranking Unit

Leaking and weeping polychlorinated biphenyl (PCB) transformers at INEL pose a threat of contamination to soils and surface water due to the lack of spill and leak containment and of monitoring provisions. This presents a potential for an uncontained PCB release.

How the Ranking Unit was Modeled

The potential transport pathways that were modeled were deposition from air transport to surface soils, and direct contact.

The potential exposure pathways analyzed in the modeling were the potential for on- and off-site inhalation and ingestion. A group of large transformers located near a series of drainage ditches at Argonne National Laboratory West (ANL-W) was utilized as the worst-case scenario. These ditches service a percolation pond at the facility.

The source term data were derived from the total PCB content in the transformers, based on some assumptions. Critical data pertaining to the contaminant inventory given were used to estimate source terms. Therefore, the critical data category for the ranking unit is "B".

Results of the Risk-Based Modeling

The ranking unit resulted in an HPI in Group 3. The potential for inhalation and ingestion of PCBs off-site drove the ranking. This unit scored because of PCB toxicity and persistence and the potential concentration within the transformers. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are characterized as generally reaching receptors at levels below those used in regulatory decisions.

Qualifiers to the Risk-Based Ranking

This ranking unit includes overland runoff of contaminated soil. The qualifiers discussed in Section 1.7.5 of this report apply.

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Regulatory Aspects of the Ranking Unit

There are no outstanding commitments on this problem, but there are plans for removing all PCB transformers from INEL by the end of FY 89. The transformer of concern in the write-up was at ANL-W and will be removed by the end of May 1988.

Current Status of the Ranking Unit

In March of 1988, INEL informed the Survey that the potential leakage from PCB-containing transformers constituted a low-probability future problem. The problem was being addressed since all PCB transformers on the INEL were scheduled for replacement by the end of FY 89.

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Kansas City Plant
Kansas City, Missouri

Kansas City Plant
Release of PCBs, Metals, and Organics
to the Environment

Description of Ranking Unit

Contamination of soils and sewer lines at Kansas City Plant (KCP) with polychlorinated biphenyls (PCBs) has resulted in the release of PCBs to the off-site environment. In the 1960s and 1970s, spills from two heat transfer systems, which contained high concentrations of PCBs, directly contaminated the storm sewers, soils, and work locations in these areas. Any current releases of PCBs to off-site surface water can be attributed primarily to past operations and practices. However, other organics and toxic metals are still being discharged on-site and thus released to the off-site surface water.

How the Ranking Unit was Modeled

The transport pathway that was modeled was direct discharge to surface water.

The exposure pathways analyzed included potential consumption of fish caught in surface water, potential inhalation and ingestion of bath water, and potential ingestion of surface water as drinking water.

The surface water is not used for any purpose other than those stated above; therefore other exposure scenarios were not considered.

Measured concentrations of chromium VI, nickel, zinc compounds, benzene, and total toxic organics in KCP effluents, and the average discharge rate to the publicly owned treatment works (POTW) were used to calculate the quantities of these constituents potentially being released to the river. It was concluded that trichloroethylene (TCE) is a solvent representative of the organics used at KCP. Therefore, total toxic organics were modeled as TCE. PCB has been measured in KCP's effluent to the POTW. However, current data do not allow assessment of the effects the POTW may have on PCBs in KCP's effluent to the POTW. Therefore, the potential risk that PCBs in KCP's discharges may pose was not analyzed. All other contaminants modeled were assumed to pass unmitigated through the POTW. The moderate number of assumptions made in modeling this ranking unit give it a critical data category of "B".

Results of the Risk-Based Modeling

The resulting score falls into HPI Group 4, driven by the toxicity of TCE (representing total toxic organics) potentially contaminating receptors within 50 miles of KCP. TCE ranked in this group because of the large quantity of total toxic organics which could be affecting receptors using the river water nearly 50 miles from KCP. HPI Group 4 reflects the distance of the receptor population from the ranking unit; this HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that present a tertiary level of concern from the potential public hazard perspective. However, PCB releases were not scored due to the inability to assess the effect on the POTW.

Qualifiers to the Risk-Based Ranking

This ranking unit involves organics in groundwater and surface water. The qualifier in Section 1.7.5 of this report applies.

Integration Phase Concerns

This ranking unit was identified as having environmental degradation issues associated with it. The degradation issue was releases of contaminants to an adjacent stream.

Regulatory Aspects of the Ranking Unit

Discharges to the POTW occasionally exceed pretreatment guidelines for certain metals and organics.

Current Status of the Ranking Unit

In March 1988, the KCP informed the Survey that, to prevent PCBs from being discharged to the environment via the stormwater and sanitary sewers, sewer lines are being cleaned, repaired, rerouted, and relined. PCB-contaminated soil is also being removed. A detailed sewer mapping program will be undertaken in 1988 to identify problem areas. A pretreatment facility, currently being constructed and scheduled for completion in January 1989, will precipitate metals, reduce chromium, and destroy cyanides, thereby achieving compliance with the Metal Finishing Standards. In addition, administrative controls are being implemented to reduce the amount of organics in wastewater discharges to acceptable levels. Total toxic organics discharges have shown substantial reductions in 1986 and 1987.

Kansas City Plant
Emissions of VOCs to the Atmosphere

Description of Ranking Unit

It is estimated that approximately 240 tons/year of volatile organic compounds (VOCs) are being emitted to the atmosphere from a wide variety of operations at KCP. VOCs emitted to room air and to vents are exhausted to the atmosphere by over 500 exhaust systems. These emissions may be affecting populations in the vicinity of KCP, in addition to contributing to the ozone concentrations around Kansas City.

How the Ranking Unit was Modeled

The transport pathway modeled was air.

The exposure pathways modeled were potential inhalation and potential ingestion of crops and animals.

Since the contaminants are volatile, exposure through ingestion of residential soil is not a pathway of concern.

Acetone, methylene chloride, tetrachloroethylene, 1,1,1-trichloroethane, TCE, isopropyl alcohol, and trichlorotrifluoroethane (Freon 113) were used to model

potential contamination from VOC emissions. Since no monitoring data are available to determine the actual quantity released, the quantity of each solvent released was estimated from the known quantity purchased in one year, each solvent's relative tendency to evaporate, and the total quantity of solvents hauled away that year for disposal. Almost all other parameters describing the location and rate of release were assumed. Therefore, the critical data category is "C".

Results of the Risk-Based Modeling

The resulting score in HPI Group 6 is driven by the combination of methylene chloride's high estimated quantity of emissions, its toxicity by inhalation, and the fairly large, relatively close-in potential receptor population. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that represent a secondary level of concern from the potential public hazard perspective.

Current Status of the Ranking Unit

In March 1988, the KCP informed the Survey that it is involved in a continuing program to minimize sources of VOCs including more efficient usage of degreasers and reductions in the amount and toxicity of degreasing fluids. Decreased usage of chlorinated hydrocarbon solvents, and alternate cleaning methods have substantially reduced emissions. Alternate cleaning and collection methods have, however, increased solvent wastes.

Kansas City Plant
Underground Tank Farm

Description of Ranking Unit

During 1943 and 1944, an underground tank farm of 28 steel and concrete tanks was constructed to store liquid products at the KCP, including gasoline, kerosene, diesel fuel, No. 6 fuel oil, lubricants, coolants, and solvents. Although at the time of the Environmental Survey the tanks had been abandoned and scheduled for Resource Conservation and Recovery Act (RCRA) Closure in 1987, inspections revealed that they may have leaked while they were in service. Furthermore, RCRA monitoring in 1982 revealed parts-per-million levels of TCE, methylene chloride, and 1,1,1-trichloroethane in the groundwater.

How the Ranking Unit was Modeled

The transport pathway that was modeled was groundwater to surface water.

The exposure pathways analyzed included potential consumption of fish caught in surface water, potential inhalation and ingestion of bath water, and potential ingestion of surface water as drinking water.

Evidence indicates that no other use of groundwater-fed surface water within 50 miles of KCP occurs, so other exposure scenarios were not modeled. Direct use of contaminated groundwater is not a concern since groundwater is not used for drinking in the vicinity of KCP.

Known plume dimensions and groundwater concentrations of TCE, methylene chloride, 1,1,1-trichloroethane, perchloroethylene (PCE), 1,1- and 1,2-dichloroethylene, benzene, and toluene were used to represent the source of contamination. Thus the critical data category for this ranking unit is "B".

Results of the Risk-Based Modeling

This ranking unit scored in HPI Group 0 for 1,1-dichloroethylene, driven by the large distance to the potential drinking water receptors. This HPI Group, as explained in Section 1.7.4 of this report, would place the tank farm with those environmental problems that are not projected to reach receptors.

Qualifiers to the Risk-Based Ranking

This ranking unit involves organics in groundwater and surface water. The third qualifier in Section 1.7.5 of this report applies.

Regulatory Aspects of the Ranking Unit

The tank farm requires remediation under a RCRA Closure Plan.

Current Status of the Ranking Unit

In March 1988, the KCP informed the Survey that the tanks, piping, and contaminated soil have been removed and the area has been backfilled with clean soil. The site reported that groundwater treatment by ultraviolet light and ozone gas is in the start-up phase and the system should become fully operational in the spring of 1988.

Kansas City Plant
Southeast Parking Lot

Description of Ranking Unit

Unknown quantities of construction debris and plating wastes may have been disposed of between 1962 and 1966 in an area now covered by the Southeast Parking Lot. It is possible that waste chemicals, such as potassium permanganate and solvents, also were disposed of in this area. Although manganese levels are unexpectedly high throughout the KCP, elevated manganese levels in shallow wells at the Southwest Parking Lot suggest that an unconfirmed burial site may be present and that chemical disposals may have occurred there. Both arsenic and VOCs have been found in groundwater in this area.

How the Ranking Unit was Modeled

The transport pathway that was modeled was groundwater to surface water.

The exposure pathways anlayzed included potential consumption of fish caught in surface water, potential inhalation and ingestion of bath water, and potential ingestion of surface water as drinking water.

Evidence indicates that no other use of groundwater-fed surface water occurs within 50 miles downstream of KCP. Exposure through direct use of contaminated

groundwater is not a concern as groundwater is not used for drinking in the vicinity of KCP.

Assumed plume dimensions and known groundwater concentrations of manganese, 1,2-dichloroethylene, methylene chloride, and trichloroethylene were used to model this ranking unit. The critical data category thus is "C".

Results of the Risk-Based Modeling

An HPI in Group 0 for ingestion of drinking water potentially contaminated with methylene chloride resulted. This low score is driven by the large distance to the potential drinking water receptors. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are not projected to reach receptors.

Qualifiers to the Risk-Based Ranking

This ranking unit involves organics in groundwater and surface water. The qualifier in Section 1.7.5 of this report applies.

Current Status of the Ranking Unit

In March 1988, theKCP informed the Survey that following the on-site visit of the Survey team, a monitoring well was installed in this area and soil gas sampling was performed, as part of the AL Environmental Restoration Program. The site reported that sampling results have detected no contamination. In addition, the KCP has retained a consultant to investigate potential manganese contamination and its source.

Kansas City Plant
Northeast Area

Description of Ranking Unit

This site, which includes lagoons and at least one trench, formerly served as an occasional disposal area for unknown but probably small quantities of dilute waste acids and caustics, drainwater collected from sumps (some of which contained PCB-contaminated soil), and possibly some waste oil sludge. Aerial photographs indicate that at least three ponds existed in this area during the late 1950s and possibly the early 1960s. The practice of dumping wastes was discontinued in the 1970s. Monitoring indicates that the groundwater under the Northeast Area is contaminated with organics, but the data do not definitively point to the possible source(s) of this contamination.

How the Ranking Unit was Modeled

The transport pathway that was modeled was groundwater to surface water.

The exposure pathways analyzed included potential consumption of fish caught in surface water, potential inhalation and ingestion of bath water, and potential ingestion of surface water as drinking water.

Evidence indicates that no other use of groundwater-fed surface water occurs within 50 miles downgradient of KCP. Exposure through direct use of contaminated groundwater is not a concern, since the groundwater in this area is not used for drinking.

Partially-known plume dimensions and measured average well concentrations for TCE, 1,2-dichloroethylene, 1,2-dichloroethane, vinyl chloride, and chloroform were used to model groundwater contamination. The critical data category for the Northeast Area ranking unit is a "B".

Results of the Risk-Based Modeling

Vinyl chloride scored in HPI Group 3, based on its toxicity and the small number of people using surface water within 50 miles of KCP. This HPI Group, as explained in Section 1.7.4 of this report, indicates that the level of vinyl chloride that potentially may reach the drinking water is projected to be below levels used in regulatory decisions.

Qualifiers to the Risk-Based Ranking

This ranking unit models organics in groundwater and surface water. The qualifiers discussed in Section 1.7.5 of this report apply.

Regulatory Aspects of the Ranking Unit

Remediation of the Northeast Area is required as part of a RCRA closure.

Current Status of the Ranking Unit

In March 1988, the KCP informed the Survey that characterization of the contaminant plume is being performed and remedial actions are planned for fiscal year (FY) 1989.

Kansas City Plant
Old Railroad Dock

Description of Ranking Unit

A solvent-recovery still once operated on the old railroad dock at the KCP, located inside the main building near the northern end of Building 57. The dock now serves as a storage area, but numerous spills are believed to have occurred at this location, as the underlying soils contain relatively high concentrations of organic solvents. Although the area has been covered with concrete, a plume of groundwater contaminated with organic solvents is migrating in a southerly direction.

How the Ranking Unit was Modeled

The transport pathway that was modeled was groundwater to surface water.

The exposure pathways analyzed included potential consumption of fish caught in surface water, potential inhalation and ingestion of bath water, and potential ingestion of surface water as drinking water.

Evidence indicates that no other uses of groundwater-fed surface water occur within 50 miles downgradient of KCP. Exposure by direct use of potentially contaminated groundwater is not a concern, as groundwater in this area is not used for drinking.

The amounts of solvents which potentially may reach the surface water body were calculated using known plume dimensions and groundwater concentrations for TCE, 1,2-dichloroethylene, vinyl chloride, toluene, benzene, ethylbenzene, methylene chloride, 1,1-dichloroethylene, 1,1,1-trichloroethane, and PCE. The critical data are in category "B" for this ranking unit.

Results of the Risk-Based Modeling

The resulting HPI ranked in Group 2 for vinyl chloride. The population consuming surface water within 50 miles of KCP and the toxicity of vinyl chloride were the driving forces. A score in HPI Group 2, as explained in Section 1.7.4 of this report, indicates that the levels of vinyl chloride that potentially may reach the drinking water are projected to be below levels used in regulatory decisions.

Qualifiers to the Risk-Based Ranking

This ranking unit involves organics in groundwater and surface water. The qualifier in Section 1.7.5 of this report applies.

Current Status of the Ranking Unit

In March 1988, KCP informed the Survey that characterization of the contaminant plume is being performed and remedial actions are scheduled to begin in FY 1988.

Kansas City Plant
Underground Storage Tanks

Description of Ranking Unit

Fourteen inactive underground storage tanks (USTs) containing waste and fuel oils, kerosene, diesel fuel, and gasoline, are scattered throughout KCP. These tanks could have leaked during their active lives between 1943 and 1985. In addition, relatively high concentrations of PCBs in one soil boring indicate that the tank nearby may have leaked PCB-containing oil into the soil. Five active USTs also are potential sources of fuel and waste oil contamination to the underlying aquifer. This ranking unit does not include the tanks discussed in the Underground Tank Farm ranking unit. Current evidence does not suggest that groundwater contamination from any of these tanks has occurred.

How the Ranking Unit was Modeled

The transport scenarios included migration to the underlying aquifer and then to a surface water body.

The exposure scenario modeled includes the potential for ingestion of fish and of water drawn from the river.

No other uses of the surface water within 50 miles downstream of KCP are known. Exposure through direct use of the groundwater in the vicinity of KCP is not a concern, as the groundwater is not used for drinking.

The standard release scenario for underground tanks described in Section 1.7.7 of this report was used. These standardized assumptions put the critical data for this ranking unit in category "B".

Results of the Risk-Based Modeling

Potential contamination of the municipal water supply within 50 miles of KCP is the driving force behind the resulting HPI. Of the possible contaminants considered, only two, gasoline and kerosene, would be expected to readily migrate to the groundwater. This mobility led to a score in HPI Group 2 for gasoline. As explained in Section 1.7.4 of this report, this HPI Group indicates that the level of gasoline potentially reaching the drinking water is projected to be below levels used in regulatory decisions.

Qualifiers to the Risk-Based Ranking

This ranking unit scores for fuel in groundwater, and involves organics in groundwater and surface water. Therefore the second and third qualifiers in Section 1.7.5 of this report apply. As mentioned earlier, this ranking unit was modeled using the standard leaking UST assumptions discussed in Section 1.7.7 of this report.

Current Status of the Ranking Unit

In March 1988, the KCP informed the Survey that tank integrity testing has been conducted and soil borings have been taken to determine which tanks need to be replaced. KCP is currently developing a program to replace tanks, with removal scheduled to begin in November 1988. In addition, the KCP plans to develop a comprehensive management program for USTs in the future.

Kansas City Plant
Elevated Levels of Arsenic in Groundwater

Description of Ranking Unit

Elevated levels of arsenic, which are not associated with plating wastes or machining operations, have been found sporadically in the groundwater at KCP. Levels of arsenic in some wells exceed the drinking water standards of 0.05 mg/L. The source(s) of the elevated levels remain(s) unknown and cannot be traced to any KCP operations. The elevated levels may be natural or due to nearby use of agricultural chemicals.

How the Ranking Unit was Modeled

The transport scenario modeled was groundwater to surface water.

The exposure scenarios analyzed include the potential for ingestion of surface water, and the potential for ingestion of fish caught in surface water.

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There is no reported use of surface water for recreational activities; therefore, this exposure scenario was not analyzed. There is no use of groundwater in the vicinity of KCP for domestic purposes.

For purposes of modeling only, an arsenic plume near KCP's South Lagoon was assumed to be the source of arsenic. The many assumptions thus required put the critical data for this ranking unit in category "C".

Results of the Risk-Based Modeling

The score resulting from this assumed source falls into HPI Group 0. The score was driven by arsenic's tendency to adhere to the soil, thus reducing its mobility in groundwater, coupled with the small population drinking the surface water. The HPI value for arsenic is based on current Environmental Protection Agency (EPA) cancer potency factors. These factors are currently under review and EPA has proposed that they are overly conservative. However, for modeling purposes, these values have been and will be used until EPA provides new values. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are not projected to reach receptors.

Current Status of the Ranking Unit

In March 1988, KCP informed the Survey that monitoring of the groundwater for arsenic is continuing and that recent data indicate that the arsenic is not migrating. In addition, the site reported that a consultant has been hired to investigate arsenic species present, and to determine if the presence of arsenic is natural or man-made.

Kansas City Plant
PCBs in Subsurface Soils

Description of Ranking Unit

Both former heat exchange systems at KCP, located outside Departments 26 and 27, contained Therminol FR-1, a PCB-containing heat transfer fluid. Spills from expansion tanks and leaks from failures of expansion joints, pumps, and piping have released PCBs to the soils around both systems. Another source of PCB contamination of soils at KCP was an underground steel tank installed in 1943, which contained PCB-contaminated waste oil. This 1,000-gallon tank was removed in 1985, but evidence suggests that it may have leaked during its active life. The surface soils surrounding these sources have either been removed or paved over.

How the Ranking Unit was Modeled

The transport scenario modeled is migration to the groundwater and then to surface water.

The exposure scenario is the potential for ingestion of fish and drinking water.

Exposure through direct ingestion of the PCB-contaminated groundwater is not a concern, since groundwater in the area is not used for drinking. Other uses of the surface water body within 50 miles of KCP are not known to occur, so other exposure scenarios were not considered.

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The highest measured groundwater concentration of PCBs was assumed to represent the concentration throughout the ranking unit. The critical data category is "B".

Results of the Risk-Based Modeling

This assumption yielded a score in HPI Group 0. The low HPI is due to the affinity PCBs have for the soil, which inhibits their migration to and through groundwater. The consumption of both fish and water from the surface water body contributed to this HPI. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are not projected to reach receptors.

Qualifiers to the Risk-Based Ranking

This ranking unit scores based on oil in groundwater. It also models an organic in groundwater and surface water. The qualifiers discussed in Section 1.7.5 of this report apply.

Current Status of the Ranking Unit

In March 1988, KCP informed the Survey that the heat exchanger systems have been replaced with non-PCB systems. A project to remove and treat or dispose of contaminated soil around D26 and D27 is scheduled for late FY 1988.

Kansas City Plant
Classified Burial Trenches

Description of Ranking Unit

In the late 1950s and early 1960s, material used in the machining and inspection of depleted uranium was buried in three unlined earthen trenches. The trenches have been capped since 1957. The wastes were exhumed, and the trench area re-capped in 1984. The wastes were subsequently determined to be hazardous. However, the virgin soil beneath the exhumed trenches was not found to be hazardous, although total lead concentrations ranged as high as 400 ppm.

How the Ranking Unit was Modeled

The transport pathway that was modeled was groundwater to surface water.

The exposure pathways analyzed included potential consumption of fish caught in surface water, potential inhalation and ingestion of bath water, and potential ingestion of surface water as drinking water.

Evidence indicates that no other use of groundwater-fed surface water occurs within 50 miles downstream of KCP, and that groundwater in the vicinity of KCP is not used for drinking.

As no information regarding the actual contents of the exhumed trenches was available at the time of analysis, the combined volume of the three trenches was assumed to have been contaminated with 400 ppm lead, based on the maximum lead concentration detected in the virgin soil remaining below. No information was

available pertaining to the composition of the trench cap; therefore, the trenches were assumed for modeling purposes not to be or have been capped. The many assumptions necessary to develop an inventory of potential contaminants place the critical data for this ranking unit in category "C".

Results of the Risk-Based Modeling

The resulting score for lead from ingestion of potentially contaminated drinking water and fish is in HPI Group 0. The low HPI reflects lead's tendency to adsorb to the soils and thus to not migrate to groundwater. Thus this analysis indicates that, despite the high soil concentrations, the lead under these trenches is not projected to impact the receptors. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are not projected to reach receptors.

Current Status of the Ranking Unit

In March of 1988, the KCP informed the Survey that annual monitoring for lead in wells near the trench area will be performed to ensure that lead is not leaching from the area. Solvent-contaminated soils are being characterized and are scheduled for removal in FY 1991.

Kansas City Plant
Inadequate Protection of Waste Management Facilities Against Floods

Description of Ranking Unit

Hazardous wastes (including PCB wastes) generated at the KCP are stored on-site for later off-site disposal in a manner which is not in compliance with either RCRA or the Toxic Substances Control Act (TSCA). The storage methods include below-grade, open-topped concrete tanks; large concrete tanks aged 15 to 44 years; uncovered concrete lots and curbed pads; and unanchored steel USTs. The wastes stored include such hazardous constituents as PCBs, 1,1,1-trichloroethane, acetone, TCE, PCE, waste oil (modeled as motor oil), diesel fuel, dimethylformamide, lead, and sodium hydroxide. In the event of a 70-year or more flood at KCP, waste management facilities (and subsequently, waste storage containers) could be damaged, possibly causing the widespread release of hazardous substances to the environment.

How the Ranking Unit was Modeled

The transport pathway that was modeled is direct discharge of surface water.

The exposure pathways analyzed include the potential for ingestion of surface water, the potential for bathing with surface water, and the potential for ingestion of fish caught in surface waters.

There is no reported recreational use of surface water; therefore, this exposure scenario was not analyzed.

A catastrophic release of the wastes was modeled. Since nothing can be known about the actual releases that would occur in a flood, the types and quantities of

wastes released were assumed based on known waste types and quantities usually stored within the 70-year floodplain at KCP. These major assumptions place the critical data for this ranking unit in category "C".

Results of the Risk-Based Modeling

For the potential for ingestion of surface water, 1,1,1-trichloroethane resulted in a score in HPI Group 4. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that present a tertiary level of concern from the potential public hazard perspective. The score for this ranking unit reflects the large inventory of 1,1,1-trichloroethane that was modeled.

Qualifiers to the Risk-Based Ranking

This ranking unit involves organics in surface water. The third qualifier in Section 1.7.5 of this report applies.

Current Status of the Ranking Unit

In March 1988, the KCP informed the Survey that funds have been requested for a project to protect against a 100-year flood. Funding for this project, however, will have to be a cooperative effort since the Internal Revenue Service (IRS) and other Government Services Administration (GSA) facilities are located with KCP in a Federal Complex. If the project does not get funded, KCP has a contingency plan to construct floodwells and gates around six hazardous waste storage areas.

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Lawrence Livermore National Laboratory
Livermore, California

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Lawrence Livermore
Gasoline Spill at Building 403

Description of Ranking Unit

In 1979, the Lawrence Livermore National Laboratory (LLNL) discovered through inventory reconciliation that approximately 17,000 gallons of gasoline leaked from underground storage tanks (USTs) near Building 403 at the LLNL Main Site. Gasoline has subsequently been identified in the groundwater. The dimensions of the plume are well-documented. Migration is minimal due to the low hydraulic gradient in the area. Contaminated groundwater may eventually reach populations at receptor locations.

How the Ranking Unit was Modeled

The transport pathway that was modeled was groundwater.

The exposure pathways analyzed included potential inhalation and ingestion of bath water, and potential ingestion of groundwater.

Because this is an underground spill, surface soil transport scenarios were not addressed. There is no reported agricultural production in the area, so exposure through consumption of contaminated crops and meat was not addressed.

Groundwater concentrations were used to back-calculate the inventories of benzene, toluene, and xylene. Because of this back-calculation, the critical data category for this ranking unit is "B".

Results of the Risk-Based Modeling

This ranking unit yielded an HPI in Group 5. This value was driven by the potential for ingestion of gasoline in the area. The score for this ranking unit is due in part to the toxicity of gasoline as well as the proximity to the receptor location. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that present a tertiary level of concern from the potential public hazard perspective.

Qualifiers to the Risk-Based Ranking

This ranking unit scores for gasoline in groundwater. It also models an organic in groundwater. The qualifiers discussed in Section 1.7.5 of this report apply.

Integration Phase Concerns

This ranking unit was identified as having environmental degradation issues associated with it. The degradation issue was groundwater contamination.

Regulatory Aspects of the Ranking Unit

In March 1988, the DOE San Francisco Office (SAN) informed the Survey that LLNL is complying with regulatory requirements from both State and Federal regulatory agencies. A California Regional Water Quality Control Board (RWQCB) Order requires groundwater remediation of the site. The last issue is the listing of the site to the National Priorities List (NPL). The Environmental Protection Agency (EPA) is

now the regulatory lead for the remedial project and a transition from the State to EPA is underway. The formal agreement is being negotiated in a Section 120 Interagency Agreement. The current RWQCB clean-up schedule is being revised to reflect the new Comprehensive Environmental Response, Compensation, and Liability Act/Superfund Amendment and Reauthorization Act (CERCLA/SARA) requirements.

LLNL has been meeting a strict schedule of interim RWQCB deadlines for over two years.

Current Status of the Ranking Unit

In March 1988, SAN informed the Survey that the 'Gasoline Spill at Building 403' is scheduled for a pilot test to dewater the soil and perform venting in late 1988. The final Remedial Investigation/Feasibility Study (RI/FS) is scheduled to be completed by March 1990.

Lawrence Livermore
Groundwater Contamination in Southeast Corner

Description of Ranking Unit

LLNL has identified several volatile organic compounds (VOCs) in the groundwater in the southeastern corner of LLNL. VOCs were found in the vicinity of Buildings 518, 612, and 514. These buildings are potential sources for the contamination. The groundwater in the area initially moves in a southerly direction, and then in a westerly direction. Because of this flow, receptor locations west of LLNL have the potential to be exposed through contaminated groundwater.

How the Ranking Unit was Modeled

The transport pathway that was modeled was groundwater.

The exposure pathways analyzed included potential inhalation and ingestion of bath water, and potential ingestion of groundwater.

Since there is no clear source term for this ranking unit, only the groundwater pathway was modeled. There is no reported agricultural production in the area, so exposure through consumption of contaminated crops and meat was not addressed.

Inventories were back-calculated from known groundwater contamination. Because of this back-calculation, the critical data category for this ranking unit is "B".

Results of the Risk-Based Modeling

This ranking unit's HPI fell into Group 7. This value was driven by the potential for consumption of carbon tetrachloride-contaminated drinking water. The large inventory was a major factor in obtaining this value. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that represent a secondary level of concern from the potential public hazard perspective.

Qualifiers to the Risk-Based Ranking

This ranking unit models organics in groundwater. The qualifiers discussed in Section 1.7.5 of this report apply.

Integration Phase Concerns

This ranking unit was identified as having environmental degradation issues associated with it. The degradation issue was groundwater contamination.

Regulatory Aspects of the Ranking Unit

In March 1988, SAN informed the Survey that LLNL is complying with regulatory requirements from both State and Federal regulatory agencies. A California RWQCB Order requires groundwater remediation of the site. The last issue is the listing of the site to the NPL. The EPA is now the regulatory lead for the remedial project and a transition from the State to EPA is underway. The formal agreement is being negotiated in a Section 120 Interagency Agreement. The current RWQCB clean-up schedule is being revised to reflect the new CERCLA/SARA requirements.

LLNL has been meeting a strict schedule of interim RWQCB deadlines for over two years. A Record of Decision (ROD) is expected in August 1990.

Lawrence Livermore
Groundwater Contamination from Taxi Strip and Old Salvage Yard

Description of Ranking Unit

Leaching from spills, discharges, and surface impoundments has caused groundwater contamination in the taxi strip and old salvage yard area. Soils from these areas have been removed, but there is still some residual contamination. Several organics and tritium were found in the groundwater in this area. This plume has the potential to migrate westward and expose receptors to these contaminants.

How the Ranking Unit was Modeled

The transport pathway that was modeled was groundwater.

The exposure pathways that were analyzed were potential inhalation and ingestion of bath water, and potential ingestion of groundwater.

Because soils from the area were removed, surface soil transport scenarios were not considered. There is no reported agricultural production in the area, so exposure through ingestion of contaminated crops and meat was not addressed.

The inventories were back-calculated from groundwater concentrations. The source-term area was developed from the volume of soil removed and the depth of removal. Because of the back-calculation, the critical data category for this ranking unit is "B".

Results of the Risk-Based Modeling

This ranking unit resulted in an HPI which fell into Group 5. This value was driven by the potential for ingestion of 1,1-dichloroethylene-contaminated drinking water in the area. This ranking is due in part to the inventory present and the proximity to the potential receptor locations. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that present a tertiary level of concern from the potential public hazard perspective.

Qualifiers to the Risk-Based Ranking

This ranking unit models organics in groundwater. The qualifiers discussed in Section 1.7.5 of this report apply.

Integration Phase Concerns

This ranking unit was identified as having environmental degradation issues associated with it. The degradation issue was groundwater contamination.

Regulatory Aspects of the Ranking Unit

In March 1988, SAN informed the Survey that LLNL is complying with regulatory requirements from both State and Federal regulatory agencies. A California RWQCB Order requires groundwater remediation of the site. The last issue is the listing of the site to the NPL. The EPA is now the regulatory lead for the remedial project and a transition from the State to EPA is underway. The formal agreement is being negotiated in a Section 120 Interagency Agreement. The current RWQCB clean-up schedule is being revised to reflect the new CERCLA/SARA requirements.

LLNL has been meeting a strict schedule of interim RWQCB deadlines for over two years. A ROD is expected in August 1990.

Lawrence Livermore
Groundwater Contamination at Southwest Area

Description of Ranking Unit

A plume of VOCs is moving off the site from the southwestern corner of the LLNL property toward a residential development. Nine VOCs, from an undetermined source, were found in groundwater samples of the area. The migration of these chemicals have the potential to affect populations in the nearby area.

How the Ranking Unit was Modeled

The transport pathway that was modeled was groundwater.

The exposure pathways that were analyzed were potential inhalation and ingestion of bath water, and potential ingestion of groundwater.

Since there is no clear source term for this ranking unit, but there is measured groundwater contamination, only the groundwater pathway was considered. There is no reported agricultural production in the area; therefore, exposure through contaminated crops and meat was not addressed.

Contaminant inventories and fluxes were developed from isopleths and measured concentrations for this ranking unit. The volume of the plume was determined from depth-of-well data and well maps. Because the inventories and release rates were developed from isopleths, the critical data category for this ranking unit is "B".

Results of the Risk-Based Modeling

This ranking unit resulted in an HPI in Group 5. This value was driven by the potential for ingestion of tetrachloroethylene-contaminated drinking water in the area. This moderate value is due in part to the large inventory estimated at the ranking unit and the proximity to the potential receptors. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that present a tertiary level of concern from the public hazard perspective.

Qualifiers to the Risk-Based Ranking

This ranking unit models organics in groundwater. The qualifiers in Section 1.7.5 of this report apply.

Integration Phase Concerns

This ranking unit was identified as having environmental degradation issues associated with it. The degradation issue was groundwater contamination.

Regulatory Aspects of the Ranking Unit

In March 1988, SAN informed the Survey that LLNL is complying with regulatory requirements from both State and Federal regulatory agencies. A California RWQCB Order requires groundwater remediation of the site. The last issue is the listing of the site to the NPL. The EPA is now the regulatory lead for the remedial project and a transition from the State to EPA is underway. The formal agreement is being negotiated in a Section 120 Interagency Agreement. The current RWQCB clean-up schedule is being revised to reflect the new CERCLA/SARA requirements.

LLNL has been meeting a strict schedule of interim RWQCB deadlines for over two years. A ROD is expected in August 1990.

Lawrence Livermore
Groundwater Contamination from East Traffic Circle Landfill

Description of Ranking Unit

Groundwater in the area of the former east traffic circle landfill is contaminated with a number of VOCs. The landfill was excavated in 1984 and 1985. No post-cleanup soil analyses were performed to assess the effectiveness of the exhumation.

How the Ranking Unit was Modeled

The transport pathway that was modeled was groundwater.

The exposure pathways analyzed included potential inhalation and ingestion of bath water, and potential ingestion of groundwater.

Because the landfill was excavated, surface soil transport scenarios were not considered. The exposure scenario of the potential for ingestion of contaminated crops and meat was not modeled, because there is no reported agricultural production in the area.

The inventories for the contaminants were back-calculated from measured groundwater concentrations and plume dimensions estimated from monitoring well locations. Because of this back-calculation, the critical data category for this ranking unit is "B".

Results of the Risk-Based Modeling

This ranking unit produced an HPI in Group 5. This value was driven by the potential for the ingestion of tetrachloroethylene-contaminated drinking water in the area. This ranking is due in part to the inventory present and the proximity to the potential receptor location. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that present a tertiary level of concern from the potential public hazard perspective.

Qualifiers to the Risk-Based Ranking

This ranking unit models organics in groundwater. The qualifiers discussed in Section 1.7.5 of this report apply.

Integration Phase Concerns

This ranking unit was identified as having environmental degradation issues associated with it. The degradation issue was groundwater contamination.

Regulatory Aspects of the Ranking Unit

In March 1988, SAN informed the Survey that LLNL is complying with regulatory requirements from both State and Federal regulatory agencies. A California RWQCB Order requires groundwater remediation of the site. The last issue is the listing of the site to the NPL. The EPA is now the regulatory lead for the remedial project and a transition from the State to EPA is underway. The formal agreement is being negotiated in a Section 120 Interagency Agreement. The current RWQCB clean-up schedule is being revised to reflect the new CERCLA/SARA requirements.

LLNL has been meeting a strict schedule of interim RWQCB deadlines for over two years. A ROD is expected in August 1990.

Lawrence Livermore
Integrity of Sanitary Sewer System

Description of Ranking Unit

The integrity of the sanitary sewer system shared by Sandia National Laboratory at Livermore/Lawrence Livermore National Laboratory (SNLL/LLNL) is suspect. Cracks in the sewer lines from seismic activity, acid releases, or construction may be releasing

radionuclides, heavy metals, toxic organics, and fecal coliforms to the groundwater. Groundwater receptors downgradient of SNLL/LLNL potentially may be exposed to these contaminants.

How the Ranking Unit was Modeled

The transport pathway that was modeled was groundwater.

The exposure pathways analyzed included potential inhalation and ingestion of bath water, and potential ingestion of groundwater.

Since the contaminants are released underground, surface soil transport scenarios were not addressed. The groundwater at SNLL/LLNL reportedly does not reach any surface water; therefore the groundwater to surface water transport scenario was not considered. There is no reported agricultural production in the area; therefore exposure through consumption of contaminated crops and meat was not addressed.

The area of this ranking unit is assumed to be the area of SNLL/LLNL since the leaks in the system are assumed to be uniformly distributed throughout the system. This ranking unit is an analysis of a sanitary sewer system shared by LLNL and SNLL. Therefore a separate ranking unit dealing with this system is not included in the SNLL narratives. Because the area of the contamination is unknown, the critical data category for this ranking unit is "B".

Results of the Risk-Based Modeling

This ranking unit's HPI fell into Group 0 for tritium. This value was driven by the potential for ingestion of tritium-contaminated drinking water in the area. This ranking is due to the relatively short half-life of tritium (12.4 years) and the distance to the potential receptor locations. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are not projected to reach receptors.

Regulatory Aspects of the Ranking Unit

In March 1988, SAN informed the Survey that the 'Integrity of Sanitary Sewer System' is covered under the National Pollutant Discharge Elimination System (NPDES) permit.

Lawrence Livermore
Potential Releases of PCB from Transformers and Capacitors

Description of Ranking Unit

Several polychlorinated biphenyl (PCB) transformers at LLNL have leaks or are in poor condition and have the potential to leak. These factors contribute to the risk of a release of PCBs to surface soils. A worst-case scenario for this ranking unit would involve transformer 342 at Building 381 in a catastrophic release, which would release PCBs to surface soils.

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How the Ranking Unit was Modeled

The transport pathway that was modeled was groundwater.

The exposure scenarios included potential inhalation and ingestion of bath water, and potential ingestion of groundwater.

Other transport scenarios were not considered because the concern was for a liquid release to the groundwater from surface soils. Because there is no reported agricultural production in the area, exposure through consumption of contaminated crops and meat was not addressed.

The inventory was calculated based on the concentration of PCBs in the transformer. Because a significant number of assumptions were made, including an assumed catastrophic release, the critical data category for this ranking unit is "C".

Results of the Risk-Based Modeling

This ranking unit's HPI fell into Group 0. This value was driven by the potential for ingestion of PCB-contaminated drinking water in the neighboring area. This low ranking is due to the high affinity PCBs have for the soil. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are not projected to reach receptors.

Qualifiers to the Risk-Based Ranking

This ranking unit scores for PCBs in groundwater. The qualifiers discussed in Section 1.7.5 of this report apply.

Regulatory Aspects of the Ranking Unit

In March 1988, SAN informed the Survey that a Toxic Substances Control Act (TSCA) settlement agreement requires the removal of PCB transformers from the site. This agreement will be completed by November 1988.

Lawrence Livermore
Site 300 - HE Process Wastewater Lagoons

Description of Ranking Unit

The lack of completed closures of eight high explosive (HE) process wastewater lagoons at Site 300 has the potential to result in groundwater contamination. The lagoons were constructed between the late 1950s and mid 1960s, with an average life of 25 years. Receptors may potentially receive contaminated groundwater in the future.

How the Ranking Unit was Modeled

The transport pathway that was modeled was groundwater.

The exposure pathways analyzed included potential inhalation and ingestion of bath water, potential ingestion of groundwater, and potential consumption of crops and livestock watered with groundwater.

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Air and surface soil transport scenarios were not modeled because there is no vehicular traffic in the area and there is no potential for overland runoff to reach a surface water body.

The inventories were determined from the life of the lagoons, the flow rate, and the concentrations of the constituents in the lagoons. The source term for this ranking unit was calculated from known lagoon water concentrations for three lagoons. These concentrations were assumed to apply to the other five lagoons. This ranking unit is believed to be conservative, in that the lagoons were used with clarifiers in their later years to remove particulates from the influent streams. However, the source term was developed assuming that the clarifiers removed no contaminants from the lagoons. Because a significant number of assumptions were made in developing the source term, the critical data category for this ranking unit is "C".

Results of the Risk-Based Modeling

This ranking unit resulted in an HPI in Group 0. This value was a result of the high affinity the contaminants have for the soil. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are not projected to reach receptors.

Qualifiers to the Risk-Based Ranking

This ranking unit models organics in groundwater. The qualifiers discussed in Section 1.7.5 of this report apply.

Regulatory Aspects of the Ranking Unit

In March 1988, SAN informed the Survey that there are no enforcement actions at Site 300 and that several of the lagoons have been determined by the RWQCB and EPA to be non-hazardous.

Lawrence Livermore
Site 300 - Groundwater Contamination from Landfills

Description of Ranking Unit

Tritium has been identified in the groundwater under all landfill areas at Site 300, except pit 6. Pits 3 and 5 appear to be the major sources of the contamination at Site 300. This groundwater contamination has the potential to impact downgradient receptor locations in the future.

How the Ranking Unit was Modeled

The transport pathway that was modeled was groundwater.

The exposure pathways analyzed included potential inhalation and ingestion of bath water, potential ingestion of groundwater, and potential consumption of crops and livestock which were watered with groundwater. Air and surface soil transport scenarios were not modeled because there is no vehicular traffic in the area and no surface water bodies within 50 miles of the site.

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The tritium inventory was back-calculated from groundwater concentrations and plume dimensions. The area of this ranking unit is the total area of pits 3 and 5, since they are the major contributors to the contamination. Because of this back-calculation, the critical data category for this ranking unit is "B".

Results of the Risk-Based Modeling

This ranking unit yielded an HPI in Group 0. This low value was driven by the potential for consumption of tritium-contaminated crops and meat from nearby farmland. This ranking is due to the relatively short half-life (12.4 years) of tritium and the distance to the potential receptor locations. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are not projected to reach receptors.

Regulatory Aspects of the Ranking Unit

In March 1988, SAN informed the Survey that there are no enforcement actions at Site 300.

Lawrence Livermore
Site 300 - Groundwater Contamination from 834 Complex

Description of Ranking Unit

Up to 12,000 mg of trichloroethylene (TCE)/kg of soil were found in soil samples and up to 460 mg of TCE/L of groundwater were found in groundwater samples in the 834 Complex Area at Site 300. The complex was built in 1959, and TCE was used as a heat transfer fluid. Several hundred cubic yards of soil were removed, but residual contamination remains. Receptor locations may potentially be exposed to contaminated groundwater in the future.

How the Ranking Unit was Modeled

The transport pathway that was modeled was groundwater.

The exposure pathways analyzed included potential inhalation and ingestion of bath water, potential ingestion of groundwater, and potential consumption of crops and livestock which were watered with groundwater.

Since soils were removed, surface soil transport scenarios were not considered.

The inventory was back-calculated from measured groundwater contamination. The extent of the plume was estimated from the locations of the monitoring wells. Because a moderate amount of assumptions were made in developing the source term, the critical data category for this ranking unit is "B".

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Results of the Risk-Based Modeling

This ranking unit yielded an HPI which fell into Group 0. This low value was driven by the potential for consumption of TCE-contaminated produce and meat. This ranking is the result of the small inventory of TCE and the distance to the receptor wells. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are not projected to reach receptors.

Qualifiers to the Risk-Based Ranking

This ranking unit models an organic in groundwater. The qualifiers discussed in Section 1.7.5 of this report apply.

Integration Phase Concerns

This ranking unit was identified as having environmental degradation issues associated with it. The degradation issue was contamination of a perched zone at Site 300.

Regulatory Aspects of the Ranking Unit

In March 1988, SAN informed the Survey that there are no enforcement actions at Site 300 and that the 'Site 300 Groundwater Contamination from the 834 Complex' is being investigated under the RWQCB. The current schedule projects a pilot extraction system in the summer of 1988 and final remediation ending in January 1989.

Lawrence Livermore
Site 300 - PCB Contamination from Landfill 6

Description of Ranking Unit

Pit 6 at Site 300 is a potential source of future groundwater contamination because approximately 2,000 PCB capacitors were disposed of in this location. According to the Survey team, each capacitor contains five gallons of 100 percent PCBs. Should these capacitors leak, receptor locations may potentially receive PCB-contaminated groundwater.

How the Ranking Unit was Modeled

The transport pathway that was modeled was groundwater.

The exposure pathways analyzed included potential inhalation and ingestion of bath water, potential ingestion of groundwater, and potential consumption of crops and livestock which were watered with groundwater.

Air and surface soil transport scenarios were not modeled because the contaminants are buried.

To provide a release scenario, the capacitors were treated in a manner similar to leaking drums. Because of this assumption, the critical data category for this ranking unit is "B".

Results of the Risk-Based Modeling

This ranking unit resulted in an HPI in Group 0. This value is due to the low mobility of PCBs in the soil and the low solubility of PCBs in water. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are not projected to reach receptors.

Qualifiers to the Risk-Based Ranking

This ranking unit scores for oil in groundwater. It was also modeled assuming a constant leak rate which has been applied to storage drums. The qualifiers discussed in Sections 1.7.5 and 1.7.7 of this report apply.

Regulatory Aspects of the Ranking Unit

In March 1988, SAN informed the Survey that there are no enforcement actions at Site 300.

Current Status of the Ranking Unit

In March 1988, LLNL informed the Survey that ten groundwater monitoring wells have been installed surrounding landfill pit 6 and they are monitored quarterly. Based on the density of monitoring wells and the frequency of sampling, it is unlikely that leakage from the pit could go undetected.

Lawrence Livermore
Site 300 Oily Waste at the Building 865 Complex

Description of Ranking Unit

Oil and possibly other pollutants have been released to the ground in the area of Building 865 at Site 300. Three retention tanks show evidence of poor handling of oils and oily waste. Further contamination is possible due to a lack of sufficient secondary containment. There is a possibility for surface contamination of oils and oily waste to migrate through the vadose zone to the aquifer.

How the Ranking Unit was Modeled

The transport pathway that was modeled was groundwater.

The exposure pathways analyzed included potential inhalation and ingestion of bath water, potential ingestion of groundwater, and potential consumption of crops and livestock that were watered with groundwater.

Surface soil resuspension and runoff scenarios were not addressed due to the soil being saturated in the release scenario, with the majority of the contaminants leaching underground.

This ranking unit is modeled as a catastrophic release of a 5,000-gallon waste oil tank. The tank chosen for the release was selected due to its large volume. Because of the catastrophic release assumption, the critical data category for this ranking unit is "B".

Results of the Risk-Based Modeling

This ranking unit produced an HPI in Group 1. This moderately low value was driven by the potential for consumption of waste-oil-contaminated produce and meat from nearby farmland. It is also due to the relatively large amount of produce and meat cultivated in the area. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those problems that are characterized as generally reaching receptors at levels below those used in regulatory decisions.

Qualifiers to the Risk-Based Ranking

This ranking unit scores for oil in groundwater. It also models an organic in groundwater. The qualifiers discussed in Section 1.7.5 of this report apply.

Regulatory Aspects of the Ranking Unit

In March 1988, LLNL informed the Survey that there are no enforcement actions at Site 300.

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Los Alamos National Laboratory
Los Alamos, New Mexico

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LANL
Contamination at the Firing Sites

Description of Ranking Unit

Test firings of high explosives (HE) occur at specific locations within the Los Alamos National Laboratory (LANL). Some of these firing sites use depleted uranium to simulate fissionable materials. During firings, the depleted uranium is scattered over the firing site. The larger pieces are collected and disposed. This residual surface soil contamination has the potential to impact receptors from resuspension and overland runoff.

How the Ranking Unit was Modeled

The transport pathways that were modeled included resuspension and overland runoff.

The exposure pathways analyzed included potential inhalation, potential external exposure, potential ingestion of crops and livestock irrigated with surface water, and consumption of fish caught in surface waters.

Groundwater pathways were not considered due to the low mobility of uranium in soil. There is no reported use of the river for drinking water in the potentially affected area; therefore, exposure through ingestion of drinking water was not considered.

This ranking unit was modeled by placing it at the center of LANL, due to the firing sites being widely distributed over LANL. Data were available for only one site. This site is not representative of all the firing sites at LANL; however, the data from this site used for modeling purposes will yield a conservative HPI, due to this particular firing site being one of the most heavily used and contaminated at LANL. Because data were available for only one firing site, the critical data category for this ranking unit is "C".

Results of the Risk-Based Modeling

The ranking unit yielded an HPI in Group 6, driven by the potential for inhalation and external exposure to uranium-238 in the receptors surrounding the ranking unit. The HPI Group for resuspension was aided by the presence of mechanical resuspension (i.e., vehicular traffic on or near the firing sites) of the surface soil at the ranking unit. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that represent a secondary level of concern from the potential public hazard perspective. This ranking unit was one of the seven that the Survey is reviewing in more depth. The Survey feels that the ranking unit should be ranked significantly lower than the modeling results demonstrate since measurements are below detection limits. It is likely that the problem was modeled with an excessively high source of contamination.

Qualifiers to the Risk-Based Ranking

This ranking unit includes overland runoff of contaminated soil. The qualifiers discussed in Section 1.7.5 of this report apply.

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Integration Phase Concerns

This ranking unit was identified as having environmental degradation issues associated with it. The degradation issue was on-site soil contamination.

Current Status of the Ranking Unit

In March 1988, the LANL informed the Survey team that routine surveillance activities at the Firing Sites include monitoring for uranium in groundwater and surface water, soils, sediments, and air. In most cases, airborne uranium concentrations are indistinguishable from background and in other cases, represent only a small fraction of a percent of exposure standards. Further evaluation of possible contamination will be made as part of the AL Environmental Res oration Program.

LANL
TA-1

Description of Ranking Unit

Chemicals and radionuclides may have been released to the soils in the vicinity of the former TA-1 Sigma Building. In 1966, the land was transferred to Los Alamos County and private landowners. Portions of the former technical area were developed as condominiums, thus possibly further distributing the contaminants.

How the Ranking Unit was Modeled

The transport pathway that was modeled was the residential soil pathway.

The exposure pathways analyzed included external exposure and soil ingestion.

No other transport scenarios were considered since the concern is for the immediate population living in the condominiums. For the same reason, other exposure scenarios were not modeled.

The ranking unit was modeled based on soil concentrations back-calculated from Toxicity Concentration Leaching Procedure leachate concentrations, as this was the only available information. Because a significant number of assumptions were made in developing the soil concentrations, the critical data category for this ranking unit is "C".

Results of the Risk-Based Modeling

This ranking unit's HPI fell into Group 2. This was driven by the potential for ingestion of 1,1,1-trichloroethane-contaminated soil. This HPI is directly related to the soil concentration and toxicity of the constituent. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are characterized as generally reaching receptors at levels below those used in regulatory decisions.

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Integration Phase Concerns

This ranking unit was identified as having environmental degradation issues associated with it. The degradation issue was off-site soil contamination.

Current Status of the Ranking Unit

In March 1988, LANL informed the Survey team that a project to identify and remove residual contamination from the area was undertaken in 1974. The results of a limited soil sampling effort in 1987 indicated that chemical contamination at Resource Conservation and Recovery Act (RCRA) levels was not present in the samples. TA-1 will be evaluated in 1988 as part of the AL Environmental Restoration Program.

LANL
Closed Landfills and Burn Pits

Description of Ranking Unit

There are 49 inactive landfills, burial areas, and former burn pits at LANL that are either known to contain radioactive and/or chemical waste or may potentially contain residual waste.

How the Ranking Unit was Modeled

The transport pathways that were modeled included groundwater and groundwater to surface water.

The exposure pathways analyzed included potential for ingestion of groundwater, potential for ingestion of crops and livestock irrigated with groundwater and surface water, potential for consumption of fish caught in surface waters, potential for accidental ingestion during recreational activities on the surface waters, and potential for external exposure to surface water.

The main concern for contaminant transport for this ranking unit is the groundwater; therefore, soil resuspension and overland runoff scenarios were not considered. There is no reported domestic usage of the river in the potentially contaminated area; therefore, exposure through drinking water ingestion and bathing with surface water was not addressed.

Twelve of the landfills were of particular concern and two of these, MDA-B and MDA-C, were selected for modeling since data were available only for these two. Since these two landfills were assumed to have received the most liquid waste of all of the landfills, focusing the modeling on these landfills represents a worst-case scenario for this ranking unit. For this reason, the critical data category for this ranking unit is "B".

Results of the Risk-Based Modeling

An HPI in Group 0 was obtained for this ranking unit. This HPI was driven by the potential for consumption of 1,1,1-trichloroethane in drinking water. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are not projected to reach receptors.

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Qualifiers to the Risk-Based Ranking

This ranking unit scores for organics in groundwater and surface water. The qualifiers discussed in Section 1.7.5 of this report apply.

Current Status of the Ranking Unit

In March 1988, the LANL informed the Survey that these sites will be evaluated as part of the AL Environmental Restoration Program. A plan for addressing these findings, as well as other potential release sites (the Installation Generic Monitoring Plan) will be completed in 1988.

LANL
Former Liquid Disposal

Description of Ranking Unit

Former radioactive and liquid waste disposal sites at LANL have potentially contaminated surface and subsurface soils. Nine sites were determined to be of particular concern. Of these nine, MDA-T in TA-21 received the largest volume of radioactive liquid waste.

How the Ranking Unit was Modeled

The transport pathways that were modeled included soil resuspension, overland runoff, groundwater, and groundwater to surface water.

The exposure pathways analyzed included potential inhalation of resuspended soils, potential ingestion of crops and livestock irrigated with groundwater and surface water, potential ingestion of groundwater, potential consumption of fish caught in the surface waters, and potential accidental ingestion of surface water during recreational activities.

There is no reported domestic use of the river in the potentially contaminated area; therefore, exposure to contaminants through ingestion of surface water as drinking water or for bathing was not considered.

Although only one of the nine sites is modeled, MDA-T received the largest volume of radioactive liquid waste. Data were available for radionuclides only; therefore, this ranking unit may not be truly representative of other liquid waste disposal sites that may have received organic constituents. Because data were only available for radionuclides, the critical data category for this ranking unit is "B".

Results of the Risk-Based Modeling

This ranking unit's HPI fell into Group 1. The ranking was driven by the potential for inhalation of americium-241 in the surrounding counties. The concentration of americium-241 in the soil is the driving factor for the HPI value. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are characterized as generally reaching receptors at levels below those used in regulatory decisions.

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Qualifiers to the Risk-Based Ranking

This ranking unit includes overland runoff of contaminated soil. The qualifiers discussed in Section 1.7.5 of this report apply

Current Status of the Ranking Unit

In March 1988, the LANL informed the Survey that disposal areas will be evaluated as part of the AL Environmental Restoration Program. A plan for addressing these sites (the Installation Generic Monitoring Plan) is being developed.

LANL
Contamination from TA-54 Active Waste Management Units

Description of Ranking Unit

Area L of TA-54 at LANL was previously used as a disposal area for hazardous organic waste. Thirty-four shafts, ranging from 3 to 8 feet in diameter and 60 feet deep, are located in Area L. Organic vapors have been detected in Area L at a depth of 100 feet in the parts-per-million range.

How the Ranking Unit was Modeled

The transport pathways that were modeled included groundwater and groundwater to surface water.

The exposure scenarios analyzed included potential ingestion of groundwater, potential ingestion of crops and livestock which were irrigated with groundwater and surface water, potential consumption of fish caught in surface waters, and potential accidental ingestion of surface water during recreational activities.

Since the shafts are capped, resuspension of surface soils and overland runoff transport scenarios were not considered. There is no reported domestic use of the river in the potentially contaminated area; therefore, exposure to contaminants through ingestion of surface water as drinking water or for bathing was not considered.

Contaminant inventories were developed based on the size of the shaft and the proportion of volatile organics used at LANL in 1984. All the waste disposed of in the shafts was assumed to be uncontained, when in reality the wastes in all but one shaft were contained. Because of this, a sensitivity analysis was performed at one-half and one-tenth the maximum worst-case inventory. Because the actual type of organics deposited is unknown, the critical data category for this ranking unit is "C".

Results of the Risk-Based Modeling

This ranking unit resulted in HPIs in Group 0 for the full inventory, one-half the inventory, and one-tenth the inventory. The HPI was driven by potential for ingestion of 1,1,1-trichloroethane in groundwater used as drinking water. This ranks low even though there is a large inventory of organics in this ranking unit and they have a high mobility in soil. This HPI Group, as explained in Section 1.7.4 of this

report, would place this ranking unit with those environmental problems that are not projected to reach receptors.

Qualifiers to the Risk-Based Ranking

This ranking unit scores for organics in groundwater and surface water. The qualifiers discussed in Section 1.7.5 of this report apply.

Regulatory Aspects of the Ranking Unit

Pursuant to the New Mexico Hazardous Waste Act a Compliance Order/Schedule dated May 7, 1985, was issued by the State of New Mexico Environmental Improvement Division (EID) to obtain information on hydrogeological characterization of the TA-54 waste disposal area. A report entitled "Hydrogeologic Assessment of Technical Area 54, Areas G and L" was submitted to EID in March 1987.

Current Status of the Ranking Unit

In March 1988, the LANL informed the Survey that the conclusion reached in the hydrogeologic assessment of TA-54, Areas L and G, was that no potential for groundwater contamination exists. However, additional test holes will be installed to better delineate the extent of organic vapor migration in the vadose zone.

LANL
Past Liquid Releases

Description of Ranking Unit

Past and ongoing releases of liquids from drains and tanks at LANL have resulted in the contamination of surface soils. Leakage of fluids during storage and transfer operations and areas of stained soil were noted during the Environmental Survey.

How the Ranking Unit was Modeled

The transport pathways that were modeled included resuspension of surface soils and overland runoff.

The exposure pathways analyzed included potential inhalation of resuspended soils, potential ingestion of crops and livestock which were irrigated with surface water, potential consumption of fish caught in surface waters, and potential accidental ingestion of surface water during recreational activities.

Groundwater transport scenarios were not considered due to the low permeability of the vadose zone at LANL. There is no reported domestic usage of the water from the river at the potentially affected area; therefore, exposures through drinking water and bathing using surface water were not considered.

The inventories for this ranking unit and the aggregate area of the contaminated soil locations were placed in the center of LANL for modeling purposes. Because a significant number of assumptions were made in determining the inventory and area of contamination, the critical data category for this ranking unit is "C".

Results of the Risk-Based Modeling

This ranking unit resulted in an HPI in Group 0. This value was driven by the potential for consumption of tetrachloroethylene-contaminated crops and meat in the counties surrounding LANL. The transport of the contaminant was a result of surface soil resuspension and volatilization of the organic constituents. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are not projected to reach receptors.

Qualifiers to the Risk-Based Ranking

This ranking unit includes overland runoff of contaminated soil and models organics in surface water. The qualifiers discussed in Section 1.7.5 of this report apply.

Current Status of the Ranking Unit

In March 1988, the LANL informed the Survey that past liquid releases are being evaluated as part of the AL Environmental Restoration Program. A plan to address these sites is being developed (the Installation Generic Monitoring Plan).

LANL
Sediment Contamination from Outfalls

Description of Ranking Unit

Of the outfalls at LANL that have discharged or are discharging wastes to the canyons on-site, three are of most concern. Radionuclides, HE, organics, and other contaminants were reported to be in these wastewaters.

How the Ranking Unit was Modeled

The transport pathways that were modeled included surface soil resuspension and overland runoff.

The exposure pathways analyzed included potential inhalation of resuspended soils, potential external exposure, potential ingestion of crops and livestock irrigated with surface water, and potential consumption of fish caught in surface waters.

Groundwater transport scenarios were not considered due to the low permeability of the vadose zone at LANL. There is no reported domestic usage of the river in the potentially affected area; therefore, exposure through ingestion of drinking water and through bathing was not considered.

Since the ranking unit consists of three separate sites at LANL, the ranking unit was situated at the center of LANL for modeling purposes. Because a moderate number of assumptions were made in developing the inventory and area of contamination, the critical data category for this ranking unit is "B".

Results of the Risk-Based Modeling

This ranking unit yielded an HPI in Group 0. This was due to the potential inhalation of tritium in the surrounding counties. This HPI is a result of the lack of surface soil being mechanically resuspended by vehicular traffic at the outfalls. This HPI Group,

as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are not projected to reach receptors.

Qualifiers to the Risk-Based Ranking

This ranking unit includes overland runoff of contaminated soil and models organics in groundwater. The qualifiers discussed in Section 1.7.5 of this report apply.

Integration Phase Concerns

This ranking unit was identified as having environmental degradation issues associated with it. The degradation issue was on-site soil contamination.

Current Status of the Ranking Unit

In March 1988, the LANL informed the Survey that a TA-16 area-wide study of National Pollutant Discharge Elimination System (NPDES) outfalls and treatment needs is in progress. An organic treatment unit was installed at the TA-16 burning grounds in September 1987. Barium and solvent-laden wastewater is now collected and transported to a treatment unit where barium is filtered and solvents are removed by activated carbon. The seepage area at TA-33-86 will be evaluated as part of the AL Environmental Restoration Program.

LANL
Radionuclide Sediment Contamination in Water and Ancho Canyons

Description of Ranking Unit

Between 1959 and 1961, TA-49 at LANL was used to conduct underground hydronuclear experiments. Cuttings from a shaft drilled during October and November of 1960 caused measurable surface contamination by plutonium. A sediment-monitoring program was established near TA-49 in 1975. These stations registered plutonium contamination ranging from 0.01 to 17 pCi/g, with a mean of 3.5 pCi/g.

How the Ranking Unit was Modeled

The transport pathway that was modeled was overland runoff to surface water.

The exposure pathways analyzed included potential ingestion of crops and livestock irrigated with surface water, potential direct exposure to surface water, and potential accidental ingestion during recreational activities on surface waters.

Resuspension of the contaminants was not considered since they are in the sediment at the bottom of a canyon, with little chance of mechanical resuspension or exposure to receptors. Groundwater pathways were not considered due to the low mobility of the contaminants in the soil. There are no reported drinking water usages of the river in the potentially affected area; therefore, exposure through ingestion of drinking water was not considered. The only reported fishing use of the river is upstream of where the contaminants from this particular ranking unit would discharge into the river; therefore, exposure through consumption of fish caught in surface waters was not addressed.

The inventories of the contaminants were back-calculated from the sediment concentration of plutonium and the ratio of plutonium to the other contaminants used in the experiments. Because a significant amount of assumptions were used in determining the source term, the critical data category for this ranking unit is "C".

Results of the Risk-Based Modeling

This ranking unit's HPI fell into Group 0 for uranium-235, the highest scoring constituent, as well as the other three contaminants, plutonium-239, uranium-238, and beryllium. This HPI Group is due to the minimal amount of runoff that occurs at the ranking unit due to the soil type and the arid climate at LANL. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are not projected to reach receptors.

Qualifiers to the Risk-Based Ranking

This ranking unit includes overland runoff of contaminated soil. The qualifiers discussed in Section 1.7.5 of this report apply.

Current Status of the Ranking Unit

In March 1988, LANL informed the Survey team that the area in TA-49 used for underground testing has been closely monitored as part of the LANL Environmental Surveillance Program. In addition this site is being evaluated as part of the AL Environmental Restoration Program.

LANL
Area P

Description of Ranking Unit

Area P of TA-16 at LANL is the former disposal site for hazardous waste from HE research and development and from waste HE burning operations at TA-16.

How the Ranking Unit was Modeled

The transport pathway that was modeled was overland runoff to surface water.

The exposure pathways analyzed included potential ingestion of crops and livestock which were irrigated with surface water and potential accidental ingestion of surface water during recreational activities.

Resuspension was not considered due to the limited chance of receptors coming into contact with windblown particulates from the side of the landfill and the lack of mechanical resuspension at the ranking unit. Groundwater transport scenarios were not considered due to the high affinity of the contaminants for the soil. There are no reported domestic uses of the river in the affected area, and the site of reported fishing is upstream of the location where the contaminants from this particular ranking unit may enter the river. For these reasons, exposure through water use and fish ingestion was not considered.

The only constituent modeled was barium, since no information was available for the HEs and heavy metals. Because data were not available for these other potential contaminants, the critical data category for this ranking unit is "B".

Results of the Risk-Based Modeling

This ranking unit resulted in an HPI in Group 0 for barium. This ranking is due to the soil type at LANL and the arid climate. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are not projected to reach receptors.

Qualifiers to the Risk-Based Ranking

This ranking unit includes overland runoff of contaminated soil. The qualifiers discussed in Section 1.7.5 of this report apply.

Current Status of the Ranking Unit

In March 1988, the LANL informed the Survey that Area P is being evaluated as part of the AL Environmental Restoration Program.

LANL
Potential for PCB Releases from Transformers

Description of Ranking Unit

There is a potential for the release of polychlorinated biphenyl (PCB)-containing fluids to the environment at LANL. Numerous PCB transformers and capacitors are situated near drains, lack adequate spill containment facilities, and/or are of poor condition due to their age.

How the Ranking Unit was Modeled

The transport pathways that were modeled included surface soil resuspension and overland runoff to surface water.

The exposure pathways that were analyzed included potential inhalation of resuspended soils, potential ingestion of crops and livestock which were irrigated with surface water, potential consumption of fish caught in surface waters, and potential accidental ingestion of surface water during recreational activities.

Groundwater transport scenarios were not considered due to the small contaminant inventory, the great depth to groundwater at LANL, and the high affinity PCBs have for the soil. There is no reported domestic usage of the river in the potentially affected area; therefore, exposure through drinking water ingestion and bathing was not considered.

In accordance with the standard release scenario for PCBs (see Section 1.7.7 of this report), this ranking unit was modeled as a catastrophic release of the entire contents (390-gallon capacity) of a PCB transformer at TA-2 with subsequent clean-up to comply with EPA's PCB clean-up regulations. This transformer is near the stream flowing in Los Alamos Canyon, with boulders above it restrained with chains.

Because this ranking unit assumes a catastrophic release, the critical data category for this ranking unit is "B".

Results of the Risk-Based Modeling

This ranking unit's HPI fell into Group 6. This was due to the potential for consumption of PCB-contaminated crops, meat, and fish for the overland runoff scenario. This value results from the proximity of the transformer to the stream flowing in Los Alamos Canyon. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that represent a secondary level of concern from the potential public hazard perspective.

Qualifiers to the Risk-Based Ranking

This ranking unit includes overland runoff of contaminated soil and models PCBs in surface water. The qualifiers discussed in Section 1.7.5 of this report apply.

Current Status of the Ranking Unit

In March 1988, the LANL informed the Survey that over the past 18 months, 750,000 lb of PCB oil and equipment and 1,000,000 lb of PCB-contaminated soils, asphalt, and equipment have been disposed of. LANL has prioritized remaining PCB items, and will address them as funding becomes available. In the interim, all PCB equipment is inspected daily.

LANL
Potential for Future Releases from Radioactive Waste Tanks

Description of Ranking Unit

Several aboveground tanks without adequate spill containment are used for the storage of radioactive liquids at LANL. One tank at TA-2 is totally uncontained and within 50 feet of the stream in Los Alamos Canyon.

How the Ranking Unit was Modeled

The transport pathways that were modeled included surface soil resuspension and overland runoff to surface water.

The exposure pathways analyzed included potential inhalation of resuspended soils, potential ingestion of crops and livestock irrigated with surface water, potential consumption of fish caught in surface waters, and potential accidental ingestion of surface water during recreational activities.

Groundwater transport scenarios were not considered due to the low mobility of the contaminants in the soil. There were no reported domestic uses of the river in the potentially affected area; therefore, exposure through drinking water and bathing was not addressed.

In accordance with the standard release scenario for aboveground tanks (see Section 1.7.7 of this report), this ranking unit was modeled as a catastrophic release of the entire contents of the tank at TA-2, which could lead to the majority of the contaminants entering the stream in Los Alamos Canyon. The inventory of the tank

was developed from the pretreatment concentrations of the primary coolant system since actual tank concentrations were unavailable. Although the tank is used for secondary containment, liquids are known to have been contained within this tank on occasion. Because the actual concentrations of radionuclides in the tank are unknown, the critical data category for this ranking unit is "C".

Results of the Risk-Based Modeling

This ranking resulted in an HPI which fell into Group 4. This was due to the potential for consumption of strontium-90 in crops and livestock that utilized irrigation water from the river. Unlike the majority of overland scenarios at LANL, this particular case ranked due to the proximity of the source to the surface water. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that present a tertiary level of concern from the potential public hazard perspective.

Qualifiers to the Risk-Based Ranking

This ranking unit includes overland runoff of contaminated soil. The qualifiers discussed in Section 1.7.5 of this report apply.

Current Status of the Ranking Unit

In March 1988, the LANL informed the Survey that a Spill Prevention, Control and Countermeasures plan has recently been developed to address the management of tanks. The tank at TA-2 is used as secondary containment for another tank, and would only contain liquid in an emergency.

LANL
Potential for Future Releases from Product Drums

Description of Ranking Unit

There is a potential for leakage and spills from the storage of oil and hazardous materials in drums stored outdoors at LANL. These drums contain dielectric oil, motor oil, hydraulic fluid, alcohols, chlorinated solvents, various laboratory and process wastes, and discarded product materials. Inadequate practices associated with these drums include storage directly on the soil, storage without secondary containment, unlabeled drums, storage in uncovered locations, and storage of drums in or adjacent to drainage ditches.

How the Ranking Unit was Modeled

The transport pathways that were modeled included resuspension of surface soils and overland runoff to surface water.

The exposure pathways analyzed included potential inhalation of resuspended soils, potential ingestion of crops and livestock which were irrigated with surface water, potential consumption of fish caught in surface waters, and potential accidental ingestion of surface water during recreational activities.

Groundwater transport pathways were not addressed due to the great depth to groundwater at LANL and the low permeability of the vadose zone. There is no

reported domestic usage of water from the river at the potentially affected area; therefore, drinking water and bathing exposures were not considered.

In accordance with the standard release scenarios for drum handling (see Section 1.7.7 of this report), a uniform leak rate was used to model this ranking unit, with the drums assumed to be situated at the center of LANL. Because a significant number of assumptions were made in developing the release rates of the contaminants, the critical data category for this ranking unit is "C".

Results of the Risk-Based Modeling

This ranking unit resulted in an HPI in Group 0. This ranking was driven by the potential for inhalation of methylene chloride in the surrounding counties. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are not projected to reach receptors.

Qualifiers to the Risk-Based Ranking

This ranking unit includes overland runoff of contaminated soil and models organics in surface water. The qualifiers discussed in Section 1.7.5 of this report apply.

Current Status of the Ranking Unit

In March 1988, the LANL informed the Survey that a memo was issued October 5, 1987, outlining general housekeeping requirements. In addition, a videotape was distributed to upper-level management and Environmental Coordinators that describes safe drum handling procedures. Additional chemical waste handling staff have been hired to increase the drum collection rate and to analyze contents. Over 2,200 drums were shipped for disposal in fiscal year (FY) 1987. A 16,000-gallon bulk-oil blending station will be installed in the third quarter of FY 1988 to help handle the increased volume.

LANL
Potential Leaks from Abandoned or Removed Underground Storage Tanks

Description of Ranking Unit

Undetected releases may occur at LANL from abandoned and removed underground storage tanks (USTs). Some of the USTs at LANL that were used for storage of fuels, oils, and radionuclides have been abandoned in place or removed.

How the Ranking Unit was Modeled

The transport pathway that was modeled is groundwater to surface water.

The exposure pathways analyzed included potential ingestion of crops and livestock irrigated with surface water, potential consumption of fish caught in surface waters, potential direct exposure to surface water, and potential accidental ingestion of surface water during recreational activities.

Since the tanks are buried, soil resuspension and overland runoff scenarios were not considered. There is no reported domestic usage of the river within the potentially contaminated area; therefore, exposure through drinking water and bathing was

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not addressed. The standard release scenario for potential releases from USTs (see Section 1.7.7 of this report) was used to determine the inventory of contaminants that leaked and their leak rates. The ranking unit was situated at the center of LANL for modeling purposes. Because the standard UST release assumption was used, the critical data category for this ranking unit is "B".

Results of the Risk-Based Modeling

An HPI which fell into Group 0 was obtained for this ranking unit. This HPI was driven by the potential for consumption of fuel-oil-contaminated fish. This ranking is the result of the great depth to groundwater at LANL, the low permeability of the vadose zone, and the distance to the receptor locations. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are not projected to reach receptors.

Qualifiers to the Risk-Based Ranking

This ranking unit scores for fuel oil in groundwater and surface water. It also models organics in groundwater. The qualifiers discussed in Section 1.7.5 of this report apply.

Current Status of the Ranking Unit

In March 1988, the LANL informed the Survey that all abandoned USTs have been emptied. In addition, 15 USTs have been removed from the ground and 26 more are scheduled for removal.

LANL
Potential for Future Releases from Underground Tanks

Description of Ranking Unit

The storage of hazardous liquids in active underground tanks at LANL presents the potential for undetected releases to subsurface soils. A number of tanks that have the potential for leakage are operated at LANL, and have not been tested to determine if they have leaked or are leaking.

How the Ranking Unit was Modeled

The transport pathway that was modeled was groundwater to surface water.

The exposure pathways analyzed were potential ingestion of crops and livestock irrigated with surface water, potential consumption of fish caught in surface waters, and potential accidental ingestion of surface water during recreational activities.

Since the ranking unit is situated beneath the topsoil, surface and airborne transport scenarios are not pertinent. There is no reported domestic usage of the surface water from the river in the potentially affected area; therefore, drinking water and bathing exposures were not considered.

The standard release scenarios for USTs (see Section 1.7.7 of this report) were used. Since this ranking unit applies to tanks scattered over LANL, the ranking unit was

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centered at LANL for modeling purposes. Because the standard UST release assumption was used, the critical data category for this ranking unit is "B".

Results of the Risk-Based Modeling

This ranking unit's HPI fell into Group 0. The ranking was driven by the potential for consumption of fish contaminated with fuel oil. The HPI for this unit is a result of the distance to the receptors, the relatively low inventories, and the low permeability of the vadose zone at LANL. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are not projected to reach receptors.

Qualifiers to the Risk-Based Ranking

This ranking unit scores for fuel oil in groundwater and surface water. It also models organics in groundwater. The qualifiers discussed in Section 1.7.5 of this report apply.

Current Status of the Ranking Unit

In March 1988, LANL informed the Survey that all USTs with high-volume flow-through have been tested for tightness. Corrective actions have been taken as necessary.

LANL
Potential Future Releases from Nonradioactive Aboveground Tanks

Description of Ranking Unit

There are a number of aboveground storage tanks at LANL that lack adequate spill containment. Fourteen tanks were identified without secondary containment and 12 with minor secondary containment. The constituents of the tanks varied from diesel fuel, gasoline, and dielectric oil contaminated with PCB, to acidic and basic fluids.

How the Ranking Unit was Modeled

The transport pathways that were modeled included resuspension of surface soils and overland runoff to surface water.

The exposure pathways analyzed included potential inhalation of resuspended soils, potential ingestion of crops and livestock which were irrigated with surface water, and potential accidental ingestion of surface water during recreational activities.

Groundwater transport pathways were not considered due to the low permeability of the vadose zone and the high affinity PCBs have for soils. There is no reported domestic usage of the river in the potentially affected area; therefore, exposure through drinking water ingestion and bathing was not considered. The only reported fishing location on the river in the potentially contaminated area is upstream of the point where the contaminants would enter the river. Ingestion of contaminated fish was not addressed for this reason.

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In accordance with the standard release scenario for aboveground tanks (see Section 1.7.7 of this report), this ranking unit was modeled as a catastrophic release of one 35,000-gallon dielectric oil tank. This tank was selected due to its large volume and the PCBs potentially present in the oil. Because a catastrophic release was assumed, the critical data category for this ranking unit is "B".

Results of the Risk-Based Modeling

An HPI in Group 0 was obtained for this ranking unit. The ranking was driven by the potential for inhalation and ingestion of PCB-contaminated crops and meat in the counties surrounding LANL. This value is the result of the lack of mechanical disturbances (e.g., vehicular traffic) on the surface soil of the ranking unit. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are not projected to reach receptors.

Qualifiers to the Risk-Based Ranking

This ranking unit includes overland runoff of contaminated soil and models oil in surface water. The qualifiers discussed in Section 1.7.5 of this report apply.

Current Status of the Ranking Unit

In March 1988, LANL informed the Survey that a Spill Prevention, Control and Countermeasures Plan was developed to address the management of tanks.

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Mound Facility
Miamisburg, Ohio

Mound
Hazardous Air Emissions - Vents

Description of Ranking Unit

There is a potential for atmospheric releases of organic contaminants from 570 ventilation hoods in 34 buildings at the facility. These organic compounds include acetone, methylene chloride, trichloroethylene, and toluene.

How the Ranking Unit was Modeled

The transport pathway that was modeled for this ranking unit was an atmospheric vent/stack release.

The exposure pathways analyzed for this ranking unit included potential inhalation of ambient air, potential direct radiation exposure through particle suspension and deposition on crops and soil, potential direct ingestion of soil and crops with contaminant deposits, and potential ingestion of contaminated crop-fed animal products.

Resuspension of soil contaminated by emissions from the stacks was not considered.

The source term inventories were derived from reported annual chemical purchases at the facility. It was assumed that the total amount of chemicals purchased in a year would go out the vents. The contaminants from the 570 vents were modeled as if they were emitted from a single aggregated vent in the center of the facility. The data used for the source terms were good but some assumptions were made; therefore a critical data category "B" resulted.

Twenty-eight usage/exposure locations were simulated within a 50-mile radius of the facility. The population for potential inhalation exposure was almost three million for this ranking unit. The population, amount of crops grown, and the number of animals were estimated from county reports.

Results of the Risk-Based Modeling

The ranking unit resulted in an HPI in Group 5 because of the potential for ingestion and inhalation of methylene chloride through the atmospheric pathway. The ranking is because of methylene chloride's toxicity. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that present a tertiary level of concern from the potential public hazard perspective.

Current Status of the Ranking Unit

In March 1988, Mound informed the Survey that air emissions control devices will be installed if sampling results demonstrate that such devices are necessary.

Mound
Inactive Leach Pit

Description of Ranking Unit

There is a potential for groundwater releases of organic contaminants from the subsurface soil in a 25-ft by 25-ft pit located on the western portion of the facility. This pit received acetone for 18 years until 1985. This potential release of acetone to the groundwater from leachate migration could result in groundwater contamination.

How the Ranking Unit was Modeled

The transport pathway that was modeled for this ranking unit was groundwater.

The exposure pathways analyzed for this ranking unit included potential inhalation or ingestion of water vapor from bathing and through consumption of drinking water pumped from on-site facility wells and off-site private wells. Groundwater at the usage locations is not used for irrigation of agricultural crops or as feedwater for animals that may be consumed; therefore this exposure pathway was not modeled. All of the acetone disposed of in the leach pit was assumed to have infiltrated into the ground (no volatilization). The groundwater does not enter the river bordering the site because it is a losing river in this area (i.e., there is a net exfiltration from the river); therefore the surface water pathway was not modeled.

Contaminant inventories were calculated based on Survey team estimates that 2,000 gallons per year of liquid waste were disposed of into the leach pit and that 10 percent of the waste was acetone. The contaminants were assumed to move from the ranking unit by precipitation-generated leachate and snowmelt percolation. For modeling purposes, transport was assumed to be from the leach pit through the aquifer to on-site and off-site wells. Four receptor wells were modeled, one on-site and three off-site. The data used for the source terms were adequate, but many assumptions were made; therefore these data were considered to be in category "C".

Results of the Risk-Based Modeling

The ranking unit resulted in an HPI in Group 5 because of the potential for consumption of acetone in the bathing and drinking water through the groundwater pathway. The ranking is due to the toxicity of acetone because of its physical characteristic of being miscible in water and because of the unit's proximity to the exposure locations. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that present a tertiary level of concern from the potential public hazard perspective.

Qualifiers to the Risk-Based Ranking

This ranking unit involves the modeling of organic contaminants in groundwater and surface water. The qualifiers discussed in Section 1.7.5 apply.

Current Status of the Ranking Unit

In March 1988, the site informed the Survey that only trace amounts of organics were detected when this site was sampled as part of the AL Environmental

Restoration Program. Mound reports that action will be taken based on the AL Environmental Restoration Program investigation if necessary.

Mound
Soil Contamination in the Canal

Description of Ranking Unit

There is a potential for groundwater releases of plutonium-238 from the subsurface soil in a 4,000-ft by 20-ft portion of the abandoned Miami-Erie Canal that is about 500-ft west of Areas V-1 and V-5. This site received accidental discharge of plutonium-238 during 1969.

How the Ranking Unit was Modeled

The transport pathway that was modeled for this ranking unit was groundwater. The model-predicted plutonium-238 concentrations were calibrated to measured concentrations at the monitoring wells near the exposure locations.

The exposure pathways analyzed for this ranking unit included potential ingestion of water from bathing and through consumption of drinking water pumped from on-site facility wells and off-site private wells.

Groundwater at the usage locations is not used for irrigation of agricultural crops or as feedwater for animals that may be consumed; therefore this exposure pathway was not modeled. The groundwater does not enter the river bordering the site because it is a losing river in this area (the river recharges groundwater); therefore the surface water pathway was not modeled. It was assumed that plutonium-238 does not volatilize.

Contaminant concentration in the soil was calculated based on the estimated total inventory and the assumed contaminated area which was 4,000-ft by 20-ft and 4-ft in depth. The contaminant was assumed to move from the ranking unit as the result of precipitation-generated leachate and snowmelt percolation. Because monitoring well data near the exposure locations were available, these measured concentrations were used to calibrate the model-predicted plutonium-238 concentrations at the source. These monitoring data were recorded as below detection limits and, therefore, have a high degree of uncertainty associated with them. The adsorption coefficient (Kd) of plutonium-238 was the only model parameter adjusted in the calibration process.

For modeling purposes, transport was assumed to be from the ranking unit, through the aquifer, to on-site and off-site wells. Four receptor wells were modeled, one on-site and three off-site. The data used for the source terms were adequate but some assumptions were made; therefore the data were considered in category "B".

Results of the Risk-Based Modeling

The ranking unit resulted in an HPI in Group 5 because of the potential for consumption of plutonium-238 in the bathing and drinking water with subsequent radiation effects and because of the unit's proximity to the exposure locations. This ranking was based on monitoring well data near the exposure locations which were

used to calibrate the model. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that present a tertaiary level of concern from the potential public hazard perspective.

Integration Phase Concerns

This ranking unit was identified as having environmental degradation issues associated with it. The degradation issue was off-site soil contamination.

Current Status of the Ranking Unit

In March 1988, Mound informed the Survey that extensive data gathering and analysis, performed around 1973, indicate that, in the site's technical opinion, plutonium deposits do not and will not present a hazard to human health. However, the issue will be revisited by the site when the Environmental Survey sampling results become available.

Mound
Soil Contamination in Area S-1

Description of Ranking Unit

There is a potential for groundwater, surface water, and atmospheric releases of radioactive contamination from the soil in a 500-ft by 1300-ft portion of the facility. This site received discharges of plutonium-238 and thorium-232 during 1964.

How the Ranking Unit was Modeled

The transport pathways that were modeled for this ranking unit include groundwater, surface water, and atmospheric transport.

The exposure pathways analyzed for this ranking unit included: 1) the potential for inhalation or ingestion of water vapor from bathing and consumption of drinking water pumped from on-site facility wells and off-site private wells; 2) the potential for consumption of fish, for ingestion during recreational activities, and for direct radiation exposure during recreation; and 3) the potential for inhalation of ambient air, for direct radiation exposure to particles in the air or deposited on crops and soil, for ingestion of soil or crops with contaminant deposits, and through ingestion of contaminated crop-fed animal products.

Groundwater at the usage locations is not used for irrigation of agricultural crops or as feedwater for animals that may be consumed; therefore this exposure pathway was not modeled. Surface water is not used for drinking water or irrigation of crops and livestock that may be ingested at usage locations.

Measured soil concentrations and calculated inventories were used for this ranking unit. The adequacy of the data base for this ranking unit was marginal because of the limited number of soil concentrations available over this large area; therefore the critical data category designation was "B". Also, the hydrology of the area is complex and the data are limited. Therefore, it was difficult to define the groundwater flow path with confidence.

It was assumed that the entire area of the ranking unit is contaminated with the average soil concentration and the contaminated soil was assumed to be 5- ft deep. The contaminants move from the ranking unit as the result of precipitation-generated leachate and snowmelt, overland runoff into the site-wide drainage system and then out to an off-site surface water body, and from suspension of contaminated surface soils.

Four groundwater usage locations were modeled including one on-site and three off-site wells. Default values were used for the fish and recreational exposure pathways for the surface water because of lack of data. Twenty-eight usage locations were used for the soil suspension based on county data within the 50-mile radius of the facility.

Results of the Risk-Based Modeling

The ranking unit resulted in an HPI in Group 5 because of the potential for ingestion and inhalation of thorium-232 atmospherically transported to agriculture products and breathing the air. The radiation effects of thorium-232 and the large number of people for inhalation around the facility drove the HPI. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that present a tertiary level of concern from the potential public hazard perspective.

Qualifiers to the Risk-Based Ranking

This ranking unit includes overland runoff. The qualifiers discussed in Section 1.7.5 of this report apply.

Current Status of the Ranking Unit

In March 1988, Mound informed the Survey that current data do not indicate movement of plutonium or thorium from this area in the site's technical opinion.

Mound
Soil Contamination in Valley Locations

Description of Ranking Unit

There is a potential for groundwater, surface water, and atmospheric releases of radioactive contamination from the soil in a 405-ft by 405-ft area of the facility. This site received discharges of plutonium-238, cobalt-60, and cesium-137 during the past 18 years.

How the Ranking Unit was Modeled

The transport pathways that were modeled for this ranking unit include groundwater, surface water, and atmospheric transport.

The exposure pathways analyzed for this ranking unit included: 1) the potential for inhalation or ingestion of water vapor from bathing and through consumption of drinking water pumped from on-site facility wells and off-site private wells; 2) the potential for the consumption of fish, for ingestion during recreational activities, and for direct radiation exposure during recreation; and 3) the potential for

inhalation of ambient air, for direct radiation exposure to particles in the air or deposited on crops and soil, for ingestion of soil or crops with contaminant deposits, and for ingestion of contaminated crop-fed animal products.

Groundwater at the usage locations is not used for irrigation of agricultural crops or as feedwater for animals that may be consumed; therefore this exposure pathway was not modeled. Surface water at the usage locations is not used for drinking water or irrigation of crops and livestock that may be ingested.

The data for this ranking unit were adequate with a few assumptions made; therefore the critical data category is "B". The hydrology of this area is better understood than other areas at the facility. Six areas were aggregated into one large area. Sensitivity runs were made to determine if this aggregation had an effect on the scoring of the ranking unit. The sensitivity runs indicated no significant changes from this assumption.

It was assumed that the entire area of the ranking unit is contaminated with the average soil concentration and the contaminated soil was assumed to be 5- ft deep. The contaminants move from the ranking unit as the result of precipitation-generated leachate and snowmelt, overland runoff into the site-wide drainage system and then to a river off-site, and from suspension of contaminated surface soils.

Four groundwater usage locations were modeled including one on-site and three off-site wells. Twenty-eight usage locations were used for the soil suspension based on county data within the 50-mile radius of the facility.

Results of the Risk-Based Modeling

The ranking unit resulted in an HPI in Group 4 because of the potential for ingestion and inhalation of plutonium-238 atmospherically transported to agriculture products and breathing the air. The radiation effects of plutonium-238 and the relatively large number of people for inhalation around the facility drove the HPI. This HPI Group, as explaned in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that present a tertiary level of concern from the potential public hazard perspective.

Qualifiers to the Risk-Based Ranking

This ranking unit includes overland runoff. The qualifiers discussed in Section 1.7.5 of this report apply.

Current Status of the Ranking Unit

In March of 1988, Mound informed the Survey that the valley areas are being evaluated as part of the AL Environmental Restoration Program. Decontamination and Decommissioning projects have begun in some areas, and are being planned in others.

Mound
Soil Contamination on the SM/PP Hill

Description of Ranking Unit

There is a potential for groundwater, surface water, and atmospheric releases of radioactive contamination from the soil in a 205-ft by 800-ft area of the facility. This site received discharges of plutonium-238, thorium-232, and actinium-227 during the past 25 years.

How the Ranking Unit was Modeled

The transport pathways that were modeled for this ranking unit include groundwater and surface water for all three contaminants and atmospheric for thorium-232 only.

The exposure pathways analyzed for this ranking unit included: 1)the potential for inhalation or ingestion of water from bathing and through consumption of drinking water pumped from on-site facility wells and off-site private wells; 2) the potential for consumption of fish, for ingestion during recreational activities, and for direct radiation exposure during recreation; and 3) the potential for inhalation of ambient air, for direct radiation exposure to particles in the air or deposited on crops and soil, for ingestion of soil or crops with contaminant deposits, and for ingestion of contaminated crop-fed animal products.

Groundwater at the usage locations is not used for irrigation of agricultural crops or as feedwater for animals that may be consumed; therefore this exposure pathway was not modeled. Surface water at the usage locations is not used for drinking water or irrigation of crops and livestock that may be ingested.

Measured soil concentrations and calculated inventories were used for this ranking unit. The adequacy of the data base for this ranking unit was marginal and assumptions were made for the source term; therefore the critical data category is "B". Also, the hydrology of the area is complex and the data are limited. Therefore, it was difficult to define the groundwater flow path with confidence.

Because of the sensitivity of the model to soil cover characteristics (especially the vegetation cover parameter), only one source area out of seven was modeled for the atmospheric pathway. This area contained thorium-232 and a vegetated surface cover of 15 percent, based on information from Mound personnel. It was assumed that the entire area of the ranking unit is contaminated with the average soil concentration and the contaminated soil was assumed to be 5-ft deep.

The contaminants from the seven aggregated areas move from the ranking unit as the result of precipitation-generated leachate and snowmelt, overland runoff into the site-wide drainage system and then to an off-site water body, and from suspension of contaminated surface soils. Sensitivity runs were made to determine if this aggregation had an effect on the scoring of the ranking unit. The sensitivity runs indicated no significant changes from this assumption.

Four groundwater usage locations were modeled including one on-site and three off-site wells. Twenty-eight usage locations were used for the soil suspension of thorium-232 based on county data within the 50-mile radius of the facility.

Results of the Risk-Based Modeling

The ranking unit resulted in an HPI in Group 4 because of the potential for ingestion and inhalation of thorium-232 atmospherically transported to agriculture products and breathing the air. The radiation effects of thorium-232 and the relatively large number of people for inhalation around the facility drove the HPI. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that present a tertiary level of concern from the potential public hazard perspective.

Qualifiers to the Risk-Based Ranking

This ranking unit includes overland runoff. The qualifiers discussed in Section 1.7.5 of this report apply.

Current Status of the Ranking Unit

In March 1988, Mound informed the Survey that remedial actions for this site are dependent on the results of sampling.

Mound
Soil Contamination in Area S-7

Description of Ranking Unit

There is a potential for groundwater, surface water, and atmospheric releases of radioactive contamination from the soil in a 100-ft by 100-ft area of the facility. This site received discharges of cobalt-60 during 1985.

How the Ranking Unit was Modeled

The transport pathways that were modeled for this ranking unit include groundwater, surface water, and atmosphere for cobalt-60.

The exposure pathways analyzed for this ranking unit included: 1) the potential for inhalation or ingestion of water from bathing and for consumption of drinking water pumped from on-site facility wells and off-site private wells; 2) the potential for the consumption of fish, for ingestion during recreational activities, and for direct radiation exposure during recreation; and 3) the potential for inhalation of ambient air, for direct radiation exposure to particles in the air or deposited on crops and soil, for ingestion of soil or crops with contaminant deposits, and for ingestion of contaminated crop-fed animal products.

Groundwater at the usage locations is not used for irrigation of agricultural crops or as feedwater for animals that may be consumed; therefore this exposure pathway was not modeled. Surface water at the usage locations is not used for drinking water or irrigation of crops and livestock that may be ingested.

Measured soil concentrations and calculated inventories were used for this ranking unit. The adequacy of the data base for this ranking unit was marginal because of limited number of measurements and assumptions were made for the source term; therefore the critical data category is "B". Also, the hydrology of the area is

complex and the data are limited. Therefore, it was difficult to define the groundwater flow path with confidence.

Because of the sensitivity of the model to soil cover characteristics (especially the vegetation cover parameter), special attention was given to this parameter and information from Mound personnel was used. It was assumed that the entire area of the ranking unit is contaminated with the average soil concentration and the contaminated soil was assumed to be 5-ft deep.

The contaminants from the area move from the ranking unit as the result of precipitation-generated leachate and snowmelt, overland runoff into the site-wide drainage system and then to an off-site river, and from suspension of contaminated surface soils.

Four groundwater usage locations were modeled including one on-site and three off-site wells. Twenty-eight usage locations were used for the soil suspension of cobalt-60 based on county data within the 50-mile radius of the facility.

Results of the Risk-Based Modeling

The ranking unit resulted in an HPI in Group 2 because of the potential for ingestion and inhalation of cobalt-60 atmospherically transported to agriculture products and breathing the air. The radiation effects of cobalt-60 and the large number of people for inhalation around the facility drove the HPI. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are characterized as generally reaching receptors at levels well below those used in regulatory decisions.

Qualifiers to the Risk-Based Ranking

This ranking unit includes overland runoff. The qualifiers discussed in Section 1.7.5 of this report apply.

Current Status of the Ranking Unit

In March 1988, Mound informed the Survey that this area will be evaluated as part of the AL Environmental Restoration Program.

Mound
Tritium Contamination in the Main Hill Groundwater

Description of Ranking Unit

Past on-site releases have resulted in tritium contamination of groundwater on the Main Hill. Site sampling has confirmed tritium contamination and has found elevated tritium concentrations in shallow groundwater.

How the Ranking Unit was Modeled

The transport pathway that was modeled for this ranking unit was groundwater.

The exposure pathways analyzed for this ranking unit included the potential inhalation or ingestion of water vapor from bathing and through consumption of

drinking water pumped from on-site facility wells and off-site private wells. Groundwater at the usage locations is not used for irrigation of agricultural crops or as feedwater for animals that may be consumed; therefore this exposure pathway was not modeled. This ranking unit was the only unit simulated that introduces tritium into the groundwater flow system. The groundwater does not enter the river bordering the site because it is a losing river in this area; therefore the surface water pathway was not modeled.

The source of the tritium in the groundwater near the Main Hill is of question because well monitoring data have indicated it is present in the groundwater but the source is unknown. It could be from Main Hill but the hydrology of the area is complex and not well-defined.

Tritium inventories were estimated from groundwater concentrations. These estimates were crude as a result of the limited data. Because of the poor source terms data and the many assumptions made in the groundwater flow, the data were considered to be in category "C".

The contaminants were assumed to move from the ranking unit by precipitation-generated leachate and snowmelt percolation. For modeling purposes, transport was assumed to be from the Main Hill through the aquifer to on-site and off-site wells. Four receptor wells were modeled, one on-site and three off-site.

Results of the Risk-Based Modeling

The ranking unit resulted in an HPI in Group 2 because of the potential for consumption of tritium in the bathing and drinking water through the groundwater pathway and subsequent radiation effects. The low ranking is because of the relatively few people exposed and because the groundwater pathway off the Main Hill is poorly understood. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are characterized as generally reaching receptors at levels below those used in regulatory decisions.

Integration Phase Concerns

This ranking unit was identified as having environmental degradation issues associated with it. The degradation issue was groundwater contamination in a perched zone.

Current Status of the Ranking Unit

In March 1988, Mound informed the Survey that investigations are being undertaken as a cooperative effort of the AL Environmental Restoration Program and the contractor. Collection, monitoring and pumping equipment and wells have been installed, and groundwater samples taken daily. The site reports that remedial actions will be based on the results of this sampling effort.

Mound
SM/PP Hill Drum Storage Area

Description of Ranking Unit

There is a potential for groundwater releases of organic and inorganic contaminants from the subsurface soil in a 50-ft by 50-ft area of the facility that was used for storage of drums in 1985. Contents of the drums include silver, lead, chromium, and acetone.

How the Ranking Unit was Modeled

The transport pathway that was modeled for this ranking unit was groundwater.

The exposure pathways analyzed for this ranking unit included potential inhalation or ingestion of water vapor from bathing and through consumption of drinking water pumped from on-site facility wells and off-site private wells. Groundwater at the usage locations is not used for irrigation of agricultural crops or as feedwater for animals that may be consumed; therefore this exposure pathway was not modeled. The groundwater does not enter the river bordering the site because it is a losing river in this area; therefore the surface water pathway was not modeled.

The failure scenario assumed that all the drums over a 50-ft by 50-ft area leaked 15 percent of their contents in one year over a 6.7-year period starting in 1985. Exact contents and concentrations in the drums were not measured. Because of this, the critical data category is "B".

The contaminants were assumed to move from the ranking unit by precipitation-generated leachate and snowmelt percolation. For modeling purposes, transport was assumed to be from the ranking unit, through the unsaturated till layer, through the aquifer, and out to the on-site and off-site wells. Four receptor wells were modeled, one on-site and three off-site.

Qualifiers to the Risk-Based Ranking

This ranking unit involves the modeling of organic contaminants in groundwater and surface water. The qualifiers discussed in Section 1.7.5 of this report apply.

Results of the Risk-Based Modeling

The ranking unit resulted in a very low HPI in Group 0 because of the small inventories of contaminants, the long groundwater flow path, the large adsorption coefficients (Kd), and the relatively few people that potentially could be exposed. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are not projected to reach receptors.

Current Status of the Ranking Unit

In March 1988, Mound informed the Survey that all drums containing hazardous waste have been shipped off-site for disposal at an EPA-approved site. The remaining drums, containing non-regulated oil, have been moved to the waste storage facility. Sampling and analyses of the drum contents, to determine whether or not regulated materials are present, are scheduled by the site to be completed by June 1988.

Mound
Potential Leakage from Underground Tanks

Description of Ranking Unit

There is a potential for groundwater releases of organic contaminants from the subsurface soil behind Building 51 from an underground solvent storage tank. The tanks have not been leak tested.

How the Ranking Unit was Modeled

The transport pathway that was modeled for this ranking unit was groundwater.

The exposure pathways analyzed for this ranking unit included potential inhalation or ingestion of water vapor from bathing and through consumption of drinking water pumped from on-site facility wells and off-site private wells. Groundwater at the usage locations is not used for irrigation of agricultural crops or as feedwater for animals that may be consumed; therefore this exposure pathway was not modeled. The groundwater does not enter the river bordering the facility because it is a losing river in this area; therefore the surface water pathway was not modeled.

The standard release scenario for drums (see Section 1.7.7 of this report) assumed that the entire tank leaked over a 7.4-year period (135 gal/year). The contents of the tank are unknown so two runs were made with pure trichloroethylene (TCE) in the tank first and then pure acetone. It was assumed that TCE and acetone would not volatilize. Because of the lack of data, the critical data category is "C".

The contaminants were assumed to move from the ranking unit by precipitation-generated leachate and snowmelt percolation. For modeling purposes, transport was assumed to be from the ranking unit, through the unsaturated till layer, through the aquifer, and out to the on-site and off-site wells. The hydrology of this area is very poorly understood. Four receptor wells were modeled, one on-site and three off-site.

Results of the Risk-Based Modeling

The ranking unit resulted in an HPI in Group 4 because of the potential for consumption of TCE in the bathing and drinking water with subsequent toxic effects. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that present a tertiary level of concern from the potential public hazard perspective.

Qualifiers to the Risk-Based Ranking

This ranking unit involves the modeling of organic contaminants in groundwater. The qualifiers discussed in Section 1.7.5 of this report apply.

Current Status of the Ranking Unit

In March of 1988, Mound informed the Survey that corrective action will be taken based on the results of the sampling and determination of need.

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Nevada Test Site
Nye County, Nevada

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NTS
Tunnel Ponds

Description of Ranking Unit

Nuclear testing tunnels are mined into Rainier Mesa. These tunnels occasionally intercept perched groundwater lenses which are channeled into a series of ponds called tunnel ponds. These ponds store the water until exfiltration or evaporation occurs. The water is contaminated with tritium and other radionuclides; methylene chloride has also been detected. Because these ponds are unlined and the discharged volumes are relatively large, there is a potential for the contaminants to migrate through the unsaturated layer and into the groundwater zone.

How the Ranking Unit was Modeled

The only transport pathway modeled were the ponds leaching to groundwater.

The exposure pathways analyzed included potential ingestion of groundwater, and potential ingestion of crops irrigated and livestock that have been drinking the groundwater.

Volatilization of contaminants was not considered because of the great horizontal distance between this waste unit and potential receptors.

Migration of contaminants is assumed to occur due to infiltration of liquids from a continuous head of water in the ponds. Contaminant inventory data were taken from measured surface water sampling data. The critical data category was "B" based on the groundwater transport parameters.

Results of the Risk-Based Modeling

This ranking unit resulted in an HPI in Group 0 for potential consumption of methylene chloride and tritium-contaminated groundwater. Even though methylene chloride is a highly mobile and toxic chemical, the great vertical distance to groundwater and low groundwater velocity have resulted in a very low risk to receptors. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are not projected to reach receptors.

Qualifiers to the Risk-Based Ranking

This ranking unit models organics in groundwater. The qualifiers discussed in Section 1.7.5 of this report apply.

Integration Phase Concerns

This ranking unit was identified as having environmental degradation issues associated with it. The degradation issue was potential impacts on wildlife.

Regulatory Aspects of the Ranking Unit

If the presence of toxic chemical contaminants is confirmed, actions specified under the Resource Conservation and Recovery Act (RCRA) will have to be executed. A Part A Application will have to be submitted to the state of Nevada and

Environmental Protection Agency (EPA), followed by a Closure plan for the existing ponds. A Part B Application will have to be submitted with plans for new wastewater holding areas that meet RCRA criteria, and subsequent remedial action will be required.

NTS
Fuel Spill-Desert Rock Airstrip

Description of Ranking Unit

Sometime between December 20 and 26, 1985, the airstrip refueling system released approximately 18,000 gallons of Jet A-50 fuel to the subsurface soil. There are many different types of jet fuels; for simplicity, jet fuel was simulated by kerosene. The tank system has been repaired but the contaminated subsurface soil remains. The concern is that the fuel may leach through the partially saturated zone into the groundwater.

How the Ranking Unit was Modeled

The only transport pathway modeled was the leaching of contaminated soil to groundwater.

The exposure pathways analyzed included potential ingestion of groundwater, and potential ingestion of irrigated crops and livestock that have been drinking the groundwater.

The contaminant inventory was supplied by the Survey team and obtained from the facility personnel. The source data were adequate, resulting in critical data category "A."

Results of the Risk-Based Modeling

This ranking unit resulted in an HPI Group 0 for jet fuel for all groundwater receptors. This low score is due to the relatively low volume of fuel spilled, the large vertical distance to groundwater, and the low rainfall available to drive the contaminants downward. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are not projected to reach receptors.

Qualifiers to the Risk-Based Ranking

The score for this ranking unit is based on jet fuel in groundwater. This ranking unit also models an organic in groundwater. The qualifiers discussed in Section 1.7.5 of this report apply.

NTS
Soil Contamination by Hazardous Chemicals

Description of Ranking Unit

Hazardous chemicals have been and continue to be released to the surface soils at the Nevada Test Site (NTS). These releases are mainly due to leaks from chemical

storage areas such as leaking drain valves and spillage resulting from drum transfers. The volume of leakage is generally low and occurs intermittently. The chemicals of concern include motor oil, diesel fuel, asphalt binder, and Stoddard solvent. All releases are assumed to occur in Area 6 (Flats Area) because the majority of waste units are located in this area. The major concern is that contaminated surface soil particles may be resuspended by disturbances or the wind and then be inhaled by the surrounding population or deposited on crops.

How the Ranking Unit was Modeled

The only transport pathway modeled was surface soil to atmosphere.

The exposure pathways analyzed included potential inhalation of airborne contaminated soil particles, potential ingestion of contaminated crops and livestock produced in surrounding areas, and the potential of direct contact with contaminated soil particles.

The inventory of hazardous materials in this waste unit was provided by the Survey team. The critical data category was "B" due to the uncertainty pertaining to the quantities of materials leaked. The contaminants are assumed to migrate from the waste unit as a result of resuspension into the atmosphere by wind or mechanical disturbances.

Results of the Risk-Based Modeling

This ranking unit scored in HPI Group 0 for diesel fuel for ingestion of potentially contaminated crops and livestock. Diesel fuel and the other contaminants scored low because of their relatively low inventories in the soil. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are not projected to reach receptors.

Regulatory Aspects of the Ranking Unit

The presence of hazardous materials, if confirmed, would trigger a Remedial Investigation/Feasibility Study (RI/FS) specified under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

NTS
Wastewater Lagoons in Drainage Swales

Description of Ranking Unit

Several sewage lagoons and tunnel ponds are located in drainage swales which may be washed away by large storm events. The tunnel ponds receive subsurface drainage from tunnels N, T, and E which are used to conduct tests which generate radioactivity. The ponds are used to collect the contaminated drainage and sediments. Release of contaminants from the ponds themselves is not a concern in this ranking unit. It is only if the pond contents have been washed out over the desert by a flood event that they may result in the potential for direct contact or for transport to off-site receptors by volatilization or resuspension.

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How the Ranking Unit was Modeled

The contaminants modeled include ruthenium-103, plutonium-239, strontium-90, methylene chloride, tritium, chlorobenzene, and acetone because these were the only contaminants identified in the water samples.

The transport pathway modeled was surface soil to atmosphere. The radioactive contaminants may be transported by resuspended soil particles. The organic contaminants may potentially be volatilized and inhaled by the surrounding population.

The exposure pathways analyzed included potential inhalation of airborne contaminants by the surrounding population, potential ingestion of potentially contaminated crops and livestock produced in the surrounding area, and potential direct contact with contaminated soil.

The inventory of contaminants was determined from measured contaminant concentrations in the ponds. The critical data category for this ranking unit is "B" due to the volume of material lost during a flood. The contaminants are assumed to migrate from the surface soil either by resuspension by mechanical disturbance or volatilization, depending on the contaminant in question.

Results of the Risk-Based Modeling

The ranking unit resulted in HPI Group 0 for the potential for inhalation and ingestion of ruthenium-103 by the surrounding population. Ruthenium-103 and the other contaminants all scored low because of the great distances to the receptors. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are not projected to reach receptors.

Regulatory Aspects of the Ranking Unit

If the presence of radioactive and toxic chemical contaminants is confirmed, actions specified under RCRA will have to be executed. A Part A Application will have to be submitted to the State of Nevada and EPA, followed by a closure plan for the existing ponds. A Part B Application will have to be submitted with plans for new wastewater holding areas that meet RCRA criteria, and remedial action will be required.

NTS
Subsurface Soil Contamination

Description of Ranking Unit

As of April 1987, there have been 108 announced underground nuclear tests below the water table. These tests were carried out in both the Mesas and Flats areas. All material in the immediate vicinity of the blast is vaporized and the material further away is fractured by the shock wave from the explosion. Groundwater surrounding the blast is forced outward at the explosion site.

How the Ranking Unit was Modeled

The only transport pathway modeled was subsurface soil leaching to groundwater.

The exposure pathways analyzed included potential ingestion of groundwater, and potential for ingestion of livestock that have been drinking the groundwater.

Because the tests were conducted underground, surface soil and air transport pathways were not addressed.

The Survey team could not obtain actual fission product inventories for the test locations. Generalized assumptions were made regarding yield, decay, and fission products. Because the majority of the fission products solidify in the subsurface soils after a blast, it was assumed only .0001 percent (10^{-6}) of the fission products was available for groundwater migration. Because of the lack of inventory data, a critical data category "C" was assigned to this ranking unit.

Because of the tremendous pressures created by these nuclear detonations, fractures result which may affect flow rate and direction. Therefore, it was decided to perform a sensitivity analysis based on these hydrogeologic properties. A base case scenario was performed where groundwater flows southward at the average velocity determined for the NTS. A scenario was analyzed where groundwater flows southward at a higher velocity resulting from potential fracturing. There are four computer analyses associated with this ranking unit: 1) base case in the Flats Area (groundwater flows south and the velocity normally assumed for the Flats Area is utilized), 2) sensitivity case in the Flats Area where the groundwater flows south and velocity is increased due to fracturing, 3) base case in Mesas Area, and 4) sensitivity case in the Mesas Area.

Results of the Risk-Based Modeling

All four of the analyses discussed above resulted in an HPI Group 0. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are not projected to reach receptors.

Regulatory Aspects of the Ranking Unit

Recently, the state of Nevada submitted a proposal to the EPA for primacy in controlling injection wells. Emplacement holes for nuclear test devices can be considered injection wells by current definition. The position the state will take with regard to construction of the emplacement hole and the execution of a test in the future is unknown at the present time. The position the EPA or state will take under CERCLA is uncertain at this time.

NTS
Contamination of Soils with Radionuclides

Description of Ranking Unit

Surface soils at NTS have been contaminated with radioactive materials from previous activities including nuclear detonations, safety experiments, and nuclear-rocket accidents. At the time of the Survey, 77 square miles were identified as being contaminated with various radionuclides. Contaminants of concern include

plutonium-239, cesium-137, strontium-90, and europium-152. Because much of the measured contamination has been in the Flats Area, the source term is assumed to be located in the center of the Flats Area for modeling purposes.

How the Ranking Unit was Modeled

The only transport pathway modeled was surface soil to atmosphere.

The exposure pathways analyzed included potential inhalation of airborne contaminants, potential ingestion of contaminated crops and livestock, and the potential for dermal contact with contaminated soils.

The contaminant inventory was determined from measured surface soil concentrations taken from numerous areas of the site. A critical data category "B" was assigned to this ranking unit due to the assumptions pertaining to the location of the contamination. Contaminated soil may be transported by atmospheric resuspension, particularly if the desert surface is disturbed.

Results of the Risk-Based Modeling

This ranking unit resulted in an HPI Group 0 for the potential for inhalation and ingestion of plutonium-239 contaminated soil particles. This low score is due to the great horizontal distances between the waste unit and the receptors. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are not projected to reach receptors.

Integration Phase Concerns

This ranking unit was identified as having environmental degradation issues associated with it. The degradation issues were on-site soil contamination and potential impacts on wildlife. The significance of the soil degradation issue was viewed as being inadequately represented by the risk-based ranking. Therefore, the ranking for this unit was adjusted.

Regulatory Aspects of the Ranking Unit

In March 1988, NTS informed the Survey that the preliminary assessments/site investigation requirements established under CERCLA are being completed. Preliminary reviews indicate that the scores will be high enough to place portions of the NTS on the National Priorities List (NPL). This status will require that a list of requirements be satisfied including the RI/FS.

NTS
Near Surface Soil Contamination from Waste and Wastewater Disposal Practices

Description of Ranking Unit

This ranking unit is subdivided into three waste units due to differences in the release mechanisms, type of contaminants, and timing of release. The first waste unit is the Area 6 decontamination pond, which can potentially release contaminants to both the atmosphere and the groundwater. This pond is currently active and sampling and analysis has revealed the presence of tritium and various volatile organics. The second waste unit includes a disposal area in Areas 25 and 26.

This waste unit consists of leachfields used to dispose of liquid radioactive waste including cesium-137 and cobalt-60. The third waste unit includes the Area 23 Hazardous Waste Trenches, where hazardous chemicals have been disposed of. This waste unit is no longer active.

How the Ranking Unit was Modeled

The transport pathways modeled included waste unit to groundwater and waste unit to atmosphere.

The exposure pathways analyzed included potential ingestion of groundwater, potential ingestion of irrigated crops and livestock that have been drinking groundwater, potential inhalation of airborne contaminants, and the potential for dermal contact with volatile organics.

Contaminant inventories have been calculated from measured contaminant concentrations and historical records of disposal. A critical data category "B" was assigned to this ranking unit due to the assumptions made pertaining to groundwater transport of contaminants. Contaminants are assumed to migrate from the pond along with liquid seepage from the pond. Contaminants are assumed to migrate from the leachfields and trenches by precipitation-generated leachate. The Area 6 decon pond is an active waste unit and is assumed, for modeling purposes, to release contaminants for a period of 76 years past plus 40 years. Areas 25 and 26 and the Area 23 hazardous waste trenches were assumed to have been operating for 12 and 13 years, respectively.

Results of the Risk-Based Modeling

The Area 6 decon pond resulted in an HPI Group 0 for ingestion of methylene chloride-contaminated groundwater. The Area 23 Hazardous Waste Trenches resulted in an HPI Group 0 for ingestion of tetrachloroethylene. The Area 25 and 26 waste units resulted in an HPI Group 0. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are not projected to reach receptors.

Qualifiers to the Risk-Based Ranking

This ranking unit models organics in groundwater. The qualifiers discussed in Section 1.7.5 of this report apply.

Regulatory Aspects of the Ranking Unit

In March 1988, NTS informed the Survey that a RCRA Part A Application for the Area 6 decontamination pond has been submitted to the EPA and the State of Nevada. It is recognized that a Part B Application will have to be submitted which outlines the plans to close the existing pond and construct a new pond for decontamination runoff that satisfies RCRA requirements. A closure plan has been submitted for the hazardous waste trenches in Area 23. Subsequent remedial action may be required.

NTS
Potential for Leaks from Underground Storage Tanks

Description of Ranking Unit

Underground storage tanks (USTs) are located throughout the facility but are concentrated in the southwest portion; therefore, this ranking unit deals only with the tanks in that area. Mean tank age and capacity are 25 years and 8,000 gallons, respectively. The contaminants of concern include gasoline, diesel fuel, kerosene, and fuel oil. These tanks are not cathodically protected nor are they monitored for leakage.

How the Ranking Unit was Modeled

The only transport pathway modeled was waste unit to groundwater.

The exposure pathways analyzed include potential ingestion of groundwater and potential ingestion of irrigated crops and livestock drinking the groundwater.

Because the tanks are underground, surface soil and air transport pathways were not considered.

Subsurface releases from these tanks were modeled using the standard assumptions described in Section 1.7.7 of this report. A critical data category "B" was assigned to this ranking unit due to the lack of information concerning the condition of the tanks.

Results of the Risk-Based Modeling

This ranking unit resulted in an HPI Group 0 for ingestion of groundwater containing the above-mentioned contaminants. This low score is due to the low hydraulic conductivity and the thickness of the unsaturated soil layer. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are not projected to reach receptors.

Qualifiers to the Risk-Based Ranking

This ranking unit scores for oil and fuels in groundwater and models organics in groundwater. It also uses a standard release assumption for USTs. The qualifiers discussed in Sections 1.7.5 and 1.7.7 of this report apply.

NTS
Potential for Release from Hazardous Materials and Waste Storage Areas in NTS

Description of Ranking Unit

Several aboveground tanks lacking spill containment barriers or having unsatisfactory containment berms were noted. The worst of these is a 420,000-gallon gasoline bulk storage tank in Area 23. The major concern is that gasoline vapors may be inhaled by the surrounding population or absorbed by crops in the areas surrounding the site following a spill.

How the Ranking Unit was Modeled

The only transport pathway modeled was waste unit to atmosphere.

The exposure pathway analyzed was potential inhalation of gasoline vapors.

In accordance with the standard release scenario for aboveground tanks (see Section 1.7.7), it is assumed that a catastrophic event results in the release of the tank's contents which will likely be one-half full. The contaminant release rate was estimated by the Survey team. It is assumed that 25 percent of the product (52,500 gallons) is lost to the atmosphere by evaporation. The critical data category for this ranking unit is "C" due to the lack of information concerning the condition and contents of the tanks.

Results of the Risk-Based Modeling

The ranking unit resulted in an HPI Group 0 for the potential for inhalation of gasoline vapors by the population within a 50-mile radius of the site. This low score is due to the large distances to the receptors from the waste unit. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are not projected to reach receptors.

NTS
Potential for Leaks from PCB Transformers

Description of Ranking Unit

During the Survey, it was found that several transformers containing polychlorinated biphenyls (PCBs) either were leaking or had leaked in the past.

How the Ranking Unit was Modeled

The only transport pathway modeled was surface soil to atmosphere.

The exposure pathways analyzed included potential inhalation of contaminated soil particles and the potential for dermal contact with contaminated soil particles.

All PCB storage areas are secured and the total number of potentially exposed workers is approximately 50. In accordance with the standard release scenarios for PCB (see Section 1.7.7), in order to model the worst-case scenario, a large transformer near Mercury was assumed to fail catastrophically. It was also assumed that emergency cleanup measures would remove all soils containing greater than 50 µg/g PCB concentration. The critical data category for this ranking unit is "B" due to the assumptions made for the catastrophic release of the transformer.

Results of the Risk-Based Modeling

This ranking unit resulted in an HPI Group 0 for potential exposure by on-site workers through inhalation and dermal contact. This low score is due to the small population (50) that can potentially be exposed to the PCBs. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are not projected to reach receptors.

Qualifiers to the Risk-Based Ranking

This ranking unit assumes a catastrophic failure of a transformer. The qualifiers discussed in Section 1.7.5 of this report apply.

Pantex Facility
Amarillo, Texas

Pantex
Known Liquid Releases

Description of Ranking Unit

An unlined waste pit at Pantex received waste solvents when it operated from 1954 to 1980. There is a potential for these solvents to migrate to the groundwater. In addition, there have been several leaks from underground storage tanks (USTs) on the Pantex facility.

How the Ranking Unit was Modeled

Solvent contaminants have the potential to seep into both a potentially perched aquifer, which may serve some local residents close to the northern border of Pantex, and the main aquifer, which serves the site and nearby communities.

The transport pathway that was modeled was groundwater.

The exposure pathways that were modeled included potential inhalation and ingestion of bath water, potential ingestion of groundwater, and potential consumption of crops and livestock which were irrigated with groundwater.

There are no known surface water pathways which link any discharges of the pit contents to any of the playas at Pantex; therefore surface water pathways were not modeled.

Based on reports of the annual quantity of waste solvents generated during the years 1981 to 1984, an estimate of the maximum disposal rate of solvent was developed for use in the model. Information on the types of solvents used in the past at Pantex indicates that toluene, acetone, tetrahydrofuran, methanol, dimethylformamide, methyl ethyl ketone, and ethanol may have been disposed of in the waste pit. This quantity of solvent estimated to be disposed of in the waste pit greatly exceeds the volume of other known liquid releases from underground gasoline tanks and is modeled in place of these low-volume releases. The critical data category for this ranking unit is "B" due to the estimation of the discharge.

Results of the Risk-Based Modeling

Due to the toxicity of dimethylformamide, the ranking unit resulted in an overall HPI in Group 8, caused by the potential for ingestion of dimethylformamide-contaminated crops and livestock from groundwater used for irrigation. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems of most concern from the perspective of the potential public hazard.

Qualifiers to the Risk-Based Ranking

This ranking unit models organics in groundwater. The qualifiers discussed in Section 1.7.5 of this report apply.

Regulatory Aspects of the Ranking Unit

The site included in this ranking unit, an inactive solvent disposal pit, is being addressed as a Comprehensive Environmental Response, Compensation, and Liability Act/Superfund Amendment and Reauthorization Act (CERCLA/SARA) site.

Current Status of the Ranking Unit

In March 1988, Pantex informed the Survey that a Remedial Investigation Plan, which is expected to address the site in this ranking unit, is currently in preparation as part of the Albuquerque Operations Office (AL) Environmental Restoration Program. Field work is scheduled to begin in July 1988.

Pantex
Playas

Description of Ranking Unit

Four natural lakes (called playas) at Pantex receive all site process effluents and rainwater runoff draining potentially contaminated soils. As a result, the playas may contain inorganic, organic, radioactive, and high explosive (HE) contaminants from these sources. In addition to these surface water bodies acting as a potential source of contamination, the standing water in the playas serves as a driving force to assist migration of the contaminants to the groundwater.

How the Ranking Unit was Modeled

The transport pathways that were modeled were groundwater and surface water.

The exposure pathways that were analyzed included potential inhalation and ingestion of bath water, potential ingestion of groundwater, and potential ingestion of crops and livestock irrigated with groundwater and surface water.

The exposure scenarios that were not analyzed included ingestion of surface water and recreational exposure to surface water since the playas are not used for these purposes.

Analytical data from surface water samples collected from Playa 1 were used to model the transport of uranium-238, barium, hexavalent chromium, cyanide, di-N-butyl phthalate, HMX, and TATB from the playas to the aquifer(s) and subsequent exposure. Because a moderate number of assumptions were made in developing the source term from this data, the critical data category for this ranking unit is "B".

Results of the Risk-Based Modeling

Due to the toxicity of HEs, the ranking unit yielded an HPI in Group 6, resulting from the potential for ingestion of HMX-contaminated crops and livestock from groundwater used for irrigation. The potential for ingestion of, and irrigation with, groundwater contaminated with the high explosives HMX and TATB from the playas resulted in the highest overall HPIs. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that represent a secondary level of concern from the potential public hazard perspective.

Qualifiers to the Risk-Based Ranking

This ranking unit models organics in groundwater. The qualifiers discussed in Section 1.7.5 of this report apply.

Current Status of the Ranking Unit

In March 1988, the Pantex site informed the Survey that efforts are ongoing to characterize the waste streams entering the playas.

Pantex
Ditches

Description of Ranking Unit

Four drainage ditches at Pantex receive effluents which contain treatment plant wastes, processing wastes, high explosives, and potential solvent and lead-based paint residues. The ditches drain to the playas.

How the Ranking Unit was Modeled

Possible groundwater contamination was modeled for both the potential shallow perched aquifer, which may serve some residences close to the northern border of Pantex, and the deeper aquifer, which serves the site and nearby communities.

The transport pathways that were modeled included groundwater and surface water.

The exposure pathways that were analyzed included potential inhalation and ingestion of bath water, potential ingestion of groundwater, and potential consumption of crops and livestock irrigated with groundwater and surface water.

The exposure pathways that were not modeled included ingestion of surface water and recreational exposure to surface water because the playas are not used for these purposes.

Analytical data for samples of the liquid and sediment in the ditches were used to model the migration of hexavalent chromium, phenol, di-N-butyl phthalate, toluene, trichloroethylene, TATB, RDX, HMX, PETN, and cyanide to the groundwater. Wells located at and outside the Pantex Facility were used to model the exposure to potentially contaminated drinking water. Because a moderate number of assumptions were made in developing the source term from the liquid and sediment data, the critical data category for this ranking unit is "B".

Results of the Risk-Based Modeling

The ranking unit scored in HPI Group 7. The potential for irrigation with groundwater from the deeper aquifer containing PETN drove the ranking, due to the toxicity of HEs. In general, irrigation with and ingestion of groundwater containing high explosives, HMX, PETN, and RDX gave the highest overall HPIs. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit

with those environmental problems that represent a secondary level of concern from the potential public hazard perspective.

Qualifiers to the Risk-Based Ranking

This ranking unit models organics in groundwater. The qualifiers discussed in Section 1.7.5 of this report apply.

Current Status of the Ranking Unit

In March 1988, the Pantex site informed the Survey that activated charcoal filters are being added to all HE wastewater treatment systems to prevent the discharge of high explosives and some solvents. In addition, efforts are ongoing to characterize the waste streams entering the playas.

Pantex
Contaminated Surface Soils-Not Accessible

Description of Ranking Unit

The area around two former drum storage pads located in Zone 11 at pads 11-12 and 11-13, and two former drum salvaging pads located at Buildings 10-7 and 10-9, may be contaminated from spills and releases of various solvents (i.e., toluene, acetone, tetrahydrofuran, methanol, dimethylformamide, methyl ethyl ketone, and ethanol) that occurred when the facilities were operating.

How the Ranking Unit was Modeled

There is a potential for the liquids from the releases to migrate through the soil to the underlying groundwater. The groundwater pathway includes both the potential perched aquifer, which may serve some local residents close to the northern border of Pantex, and the main aquifer, which serves the site and nearby communities.

The transport scenario that was modeled was groundwater.

The exposure pathways that were analyzed included potential inhalation and ingestion of bath water, potential ingestion of groundwater, and potential consumption of crops and livestock irrigated with groundwater.

Neither the potentially contaminated soil areas nor nearby surface water bodies were accessible to the public; therefore, these exposure pathways were not modeled.

In accordance with the standard release scenario for drums (see Section 1.7.7), an assumed 10 percent per year drum failure rate was imposed to model the potential leakage of the contents of the drums during the 10-year operational life of the facilities. Because a significant number of assumptions were made in developing the source term and a standard failure rate was used, the critical data category for this ranking unit is "C".

Results of the Risk-Based Modeling

The ranking unit scored in HPI Group 0, driven by the toxicity of dimethylformamide and the potential for ingestion of contaminated drinking water from wells using perched groundwater. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are not projected to reach receptors.

Qualifiers to the Risk-Based Ranking

This ranking unit models organics in groundwater. The qualifiers discussed in Section 1.7.5 of this report apply.

Pantex
Contaminated Surface Soils-Accessible

Description of Ranking Unit

Two areas at Pantex are accessible to farmers and may contain contaminated surface soils. The areas in question are a transmission line pole area and a former burning ground. Soils in these areas have potentially been contaminated with herbicide and with barium-contaminated ash, respectively. TNT and other HEs may also be present in the ash. Soils may be susceptible to wind suspension and to mechanical resuspension from cultivation activities.

How the Ranking Unit was Modeled

The transport pathways that were modeled included direct exposure to the soils and surface soil resuspension.

The exposure pathways that were modeled included potential direct exposure, potential inhalation of resuspended soils, and potential ingestion of crops and livestock which were contaminated by resuspended soils.

Groundwater and surface water transport were not modeled, because surface soil contaminant concentrations were not considered high enough to reach groundwater or affect surface water quality.

Assumptions made by the Pantex Survey team to determine concentrations of barium, dioxin, and 2,4-D to model this ranking unit were an application rate of herbicide at the transmission line pole area, and a frequency of burning trash at the burning grounds. Because these assumptions were made in developing the source term, the critical data category for this ranking unit is "C".

Results of the Risk-Based Modeling

The potential for direct exposure and exposure through consumption of livestock and crops contaminated with dioxin from the transmission line pole area gave an HPI in Group 2. The score results from the extreme toxicity of dioxin. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are characterized as generally reaching receptors at levels below those used in regulatory decisions.

Current Status of the Ranking Unit

In March 1988, Pantex informed the Survey that these areas were sampled as part of the Environmental Survey. They will be further evaluated as part of the AL Environmental Restoration Program.

Pantex
PCB Release

Description of Ranking Unit

Surface soils surrounding a concrete transformer pad may be contaminated with polychlorinated biphenyls (PCBs). PCB is volatile, and potentially contaminated soils may be washed via stormwater runoff to the playas, which are used for irrigation.

How the Ranking Unit was Modeled

The transport pathways that were modeled included soil resuspension and overland runoff.

The exposure pathways analyzed included potential inhalation of resuspended soils, potential ingestion of crops and livestock contaminated with redeposited soils, and potential ingestion of crops and livestock irrigated with playa water.

The groundwater transport pathway for PCB-contaminated surface soils is expected to be limited due in part to the low annual precipitation rate for this area. Rainfall serves as a driving force for the migration of contaminants from the surface soil to the groundwater. In addition, PCB concentrations in the surface soil are not expected to be high enough to affect groundwater quality. The playas are not used for recreation, so direct exposure to surface water was not modeled.

Measured surface soil concentrations of PCBs were used to model exposure. Because a moderate number of assumptions were made in developing the source term and the areal extent of contamination, the critical data category for this ranking unit is "B".

Results of the Risk-Based Modeling

Transport by the wind, and the potential effects from inhalation and exposure from ingestion of contaminated crops and livestock, resulted in an HPI in Group 3 from air transport and redeposition of PCB-contaminated soils. The score was driven by the toxicity of PCB. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are characterized as generally reaching receptors at levels below those used in regulatory decisions.

Qualifiers to the Risk-Based Ranking

This ranking unit includes overland runoff of contaminated soil and an organic in surface water. The qualifiers discussed in Section 1.7.5 of this report apply.

Current Status of the Ranking Unit

In March 1988, the Pantex site informed the Survey that the cleanup actions ongoing at the time of the Survey have been completed. According to the site, additional soil samples are expected to be collected to verify the cleanup.

Pantex
Depleted Uranium Contamination Sites

Description of Ranking Unit

Activities at three test firing sites and the burning grounds at Pantex have deposited uranium on surface soils that are subject to transport by the wind and by stormwater runoff to surface water bodies (the playas). Pantex documentation indicates that an area of approximately 8,500,000 square meters around firing sites could be contaminated with depleted uranium.

How the Ranking Unit was Modeled

The transport pathways that were modeled included resuspension of surface soils and overland runoff.

The exposure pathways analyzed included potential inhalation of resuspended soils, potential ingestion of crops and livestock contaminated with deposited soils, and potential consumption of crops and livestock which were irrigated with playa water.

The groundwater transport pathway for uranium-contaminated surface soils is expected to be limited due in part to the low annual precipitation rate typical of this area. Rainfall serves as a driving force for the migration of contaminants from the surface soil to the groundwater.

Soil concentration data were used to model potential exposure to uranium-238-contaminated surface soils. Because a significant number of assumptions were made in developing the source term from the soil concentrations, the critical data category for this ranking unit is "C".

Results of the Risk-Based Modeling

The ranking unit scored in Group 3 from air suspension and redeposition of uranium-238-contaminated surface soils and the potential for subsequent inhalation. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are characterized as generally reaching receptors at levels below those used in regulatory decisions.

Qualifiers to the Risk-Based Ranking

This ranking unit includes overland runoff of contaminated soil. The qualifiers discussed in Section 1.7.5 of this report apply.

Integration Phase Concerns

This ranking unit was identified as having environmental degradation issues associated with it. The degradation issue was on-site soil contamination.

Current Status of the Ranking Unit

In March 1988, the Pantex site informed the Survey that current disposal practices at the burning grounds for explosives associated with depleted uranium are conducted in such a way as to minimize the spread of contamination.

Pantex
Firing Site 15

Description of Ranking Unit

Tests performed at Pantex firing site 15 may have contaminated surface soils with strontium-90. The strontium-90 was an inadvertent contaminant of lanthanum, which was included in a test firing. The potentially contaminated surface soil is susceptible to wind suspension and redeposition.

How the Ranking Unit was Modeled

The transport pathway modeled was resuspension of surface soils.

The exposure pathways analyzed included potential inhalation of resuspended soils and potential ingestion of crops and livestock contaminated by the resuspended soils.

Limited rainfall, a deep aquifer (i.e., approximately 400 feet to the saturated zone in the Ogallala), and a high equilibrium coefficient (i.e., high affinity for soil) for strontium-90 restricts the potential for contaminant migration to the groundwater. Surface water runoff from the firing site is collected by a diversion ditch and is channeled to the effluent of the wastewater treatment plant; therefore, surface water pathways were not modeled.

Soil concentration estimates were based on an assumed proportion of strontium-90 (i.e., 0.1 percent) associated with lanthanum fired at the site. The estimates were used to determine the effect of exposure to strontium-90-contaminated surface soils. Because these estimates were made in developing the source term, the critical data category for this ranking unit is "C".

Results of the Risk-Based Modeling

The estimates revealed a ranking unit HPI in Group 3 based on the high radioactivity of strontium-90 and inhalation of resuspended soils by the surrounding population. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are characterized as generally reaching receptors at levels below those used in regulatory decisions.

Integration Phase Concerns

This ranking unit was identified as having environmental degradation issues associated with it. The degradation issue was on-site soil contamination.

Regulatory Aspects of the Ranking Unit

This ranking unit is being addressed as a CERCLA/SARA site.

Current Status of the Ranking Unit

In March 1988, the Pantex site informed the Survey that a Remedial Investigation/Feasibility Study (RI/FS) and the Remedial Design/Remedial Actions are scheduled to be completed by the end of fiscal year 1989.

Pantex
Asbestos

Description of Ranking Unit

An abandoned building at Pantex contains loose pipe insulation that contains friable asbestos. The doors and windows are missing from the building, thus exposing the insulation which contains asbestos, creating a possible air-transport pathway. There is a potential for Pantex personnel who work near this building in Zone 11 to inhale air that is contaminated with the asbestos.

How the Ranking Unit was Modeled

The transport pathway modeled was resuspension of asbestos dust.

The exposure pathways analyzed included potential inhalation of asbestos and potential consumption of crops and livestock contaminated by airborne asbestos.

Groundwater and surface water transport pathways were not modeled because asbestos is not a substance considered to be readily transported to groundwater, and surface water is not used for drinking water in the area.

The asbestos was assumed to be covering one inch of the building's floor for the air-transport modeling effort associated with this ranking unit. Because a significant number of assumptions were made in developing the source term from the limited data, the critical data category for this ranking unit is "C".

Results of the Risk-Based Modeling

The exposure resulting from resuspension of the asbestos resulted in an HPI in Group 0 for the ranking unit. The score results from the small number of people potentially affected by the asbestos emission and the small inventory of asbestos. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are not projected to reach receptors.

Current Status of the Ranking Unit

In March 1988, the Pantex site informed the Survey that the building which constituted this ranking unit has been decontaminated.

Pantex
Fluoride Emissions

Description of Ranking Unit

The burning grounds at Pantex are a source of hydrogen fluoride emissions to the air. The fluoride emissions may be deposited on grasses directly off-site, which are consumed by cattle. Texas has a standard for the amount of fluoride allowable in cattle feed, which may be exceeded as a result of the emissions. The potential for the exceedance of the fluoride standard on forage is an environmental degradation concern. The associated human health risk concerns consumption of the cattle by humans.

How the Ranking Unit was Modeled

The transport pathway modeled was an air release of fluoride.

The exposure pathway analyzed was potential ingestion of fluoride-contaminated cattle.

No other exposure or transport scenarios were modeled due to the specificity of the potential environmental problem and the minimal adverse effects of small quantities of fluoride on humans via a direct-contact route.

It was assumed that two percent of the HEs burned was fluoride. Because of this assumption, the critical data category for this ranking unit is "B".

Results of the Risk-Based Modeling

The HPI for human consumption of fluoride-contaminated cattle fell into Group 0. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are not projected to reach receptors.

Integration Phase Concerns

This ranking unit was identified as having environmental degradation issues associated with it. The degradation issue was potential impacts on nearby cattle.

Current Status of the Ranking Unit

In March 1988, the Pantex site informed the Survey that administrative controls have been implemented to reduce the quantity of fluoride available for release to the environment.

Pantex
Landfills

Description of Ranking Unit

There is a potential for contaminant migration from the landfills at Pantex. Various wastes that were possibly disposed of in the landfills (i.e., assumed to include the following solvents: toluene, acetone, tetrahydrofuran, methanol, dimethylformamide, methyl ethyl ketone, and ethanol) potentially may migrate in the form of a leachate to the underlying groundwater. The groundwater transport pathway for the leachate includes both a potentially perched aquifer, which may serve some local residents close to the northern border of Pantex, and the main aquifer, which serves the site and nearby communities.

How the Ranking Unit was Modeled

The transport pathway modeled was groundwater.

The exposure pathways modeled were potential ingestion of groundwater, and potential consumption of crops and livestock irrigated with groundwater.

Air and surface water transport pathways were eliminated from the modeling effort because the landfills are inactive and maintain a cover which inhibits transport from runoff and wind suspension.

Because the site's environmental conditions minimize the contaminant transport of the large estimated inventory, the critical data category for this ranking unit is "A".

Results of the Risk-Based Modeling

Due to the low annual precipitation rate, the driving force for the migration of the rainfall-generated leachate derived from the landfill was insufficient to enable the contaminants to reach the groundwater, as evidenced by the HPI Group. The ranking unit resulted in an HPI in Group 0 for all groundwater-related exposure pathways. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are not projected to reach receptors.

Qualifiers to the Risk-Based Ranking

This ranking unit models organics in groundwater. The qualifiers discussed in Section 1.7.5 of this report apply.

Regulatory Aspects of the Ranking Unit

This ranking unit is being addressed as a CERCLA/SARA site.

Current Status of the Ranking Unit

In March 1988, the Pantex site informed the Survey that no additional work has been performed to date; however, there are plans to conduct an RI of the sites in this ranking unit under the AL Environmental Restoration Program.

Pantex
Potential Future Releases from Non-Tank Sources

Description of Ranking Unit

Hazardous waste and product storage drums at Pantex are stored in a manner that presents the potential for uncontrolled releases to the surface soil. The contents of the drums (i.e., toluene, acetone, tetrahydrofuran, methanol, dimethylformamide, methyl ethyl ketone, Freon, MOCA, and benzene) may leak and migrate through the soil to the underlying groundwater.

How the Ranking Unit was Modeled

The groundwater pathway includes both a potentially perched aquifer, which may serve some local residents close to the northern border of Pantex, and the main aquifer, which serves the site and nearby communities. The total quantity available for leakage was unknown.

The transport pathway that was modeled was groundwater.

The exposure pathways analyzed included potential ingestion of groundwater and potential consumption of crops and livestock which were irrigated with groundwater.

Air and surface soil transport scenarios were not modeled because there is no traffic in the area and liquid releases tend to percolate through the soil rather than run off.

In accordance with the standard release scenario for drums (see Section 1.7.7), an inventory assumption based on annual chemical inventory was developed. An assumed 10 percent per year drum failure rate was imposed (rather than the 15 percent standard assumption failure rate), due to the arid climate and the observed condition of the drums. Because a significant number of assumptions were made in developing the source term, the critical data category for this ranking unit is "C".

Results of the Risk-Based Modeling

The ranking unit resulted in an HPI in Group 6, driven by the toxicity of benzene and the potential for ingestion of crops and livestock contaminated from irrigation using groundwater from the main aquifer. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that represent a secondary level of concern from the potential public hazard perspective.

Qualifiers to the Risk-Based Ranking

This ranking unit models organics in groundwater. The qualifiers discussed in Section 1.7.5 of this report apply.

Current Status of the Ranking Unit

In March 1988, the Pantex site informed the Survey that two portable hazardous waste storage sheds have been purchased and are in use. A funding request for a new drum storage facility has been submitted.

Pantex
Potential Releases from Aboveground Tanks

Description of Ranking Unit

There is potential for undetected releases of hazardous substances from 45 aboveground storage tanks at Pantex. A potential release of the hazardous materials stored in the tanks may allow the hazardous materials to migrate to the groundwater.

How the Ranking Unit was Modeled

The transport pathway that was modeled was groundwater.

The exposure pathways analyzed included potential ingestion of groundwater and potential consumption of crops and livestock which were irrigated with groundwater.

The groundwater does not recharge surface water in this area; therefore, there is no potential for surface water to be impacted by this ranking unit.

For modeling the effect of a potential release of an aboveground tank at Pantex, the standard assumptions described in Section 1.7.7 of this report were used. A catastrophic release from a 3,000-gallon tank which has inadequate spill containment was used to model the transport of sulfuric acid from the tank to the wells screened in the underlying aquifers. No attempt was made to factor in the neutralization effects of the alkaline soil on the potential acid release. Because a catastrophic release assumption was used, the critical data category for this ranking unit is "B".

Results of the Risk-Based Modeling

This ranking unit fell in HPI Group 3. Ingestion of potentially contaminated crops and meat drove the ranking. Sulfuric acid scored because of its low reference dose for ingestion. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are characterized as generally reaching receptors at levels below those used in regulatory decisions.

Current Status of the Ranking Unit

In March 1988, the Pantex site informed the Survey that a program is in place for routine inspections of the aboveground storage tanks to detect signs of leakage or deterioration. In addition, the site is preparing a Spill Prevention, Control and Countermeasures Plan which is expected to address these tanks.

Pantex
Potential Future Releases from Underground Tanks

Description of Ranking Unit

There is potential for undetected releases of hazardous substances from 47 USTs at Pantex. A potential release of the hazardous materials stored in the tanks may allow the hazardous materials to migrate to the groundwater.

How the Ranking Unit was Modeled

The transport pathway that was modeled was groundwater.

The exposure pathways analyzed included potential ingestion of groundwater and potential consumption of crops and livestock irrigated with groundwater.

The groundwater does not recharge surface water in this area; therefore, there is no potential for surface water to be impacted by this ranking unit.

For modeling the effect of a potential release of an underground tank at Pantex, the standard assumptions described in Section 1.7.7 of this report were used. Reported underground tank inventory data were used to model the transport of gasoline, motor oil, ethylene glycol, toluene, dimethylformamide, and diesel fuel from the tanks to the wells screened in the underlying aquifers. Because a moderate number of assumptions were made in developing the release rates, the critical data category for this ranking unit is "B".

Results of the Risk-Based Modeling

This ranking fell in HPI Group 7. The potential for ingestion of potentially contaminated crops and meat drove the ranking for dimethylformamide, diesel fuel, and gasoline. These contaminants scored high because of their high bioaccumulation factors for vegetables. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that represent a secondary level of concern from the potential public hazard perspective.

Qualifiers to the Risk-Based Ranking

This ranking unit models organics in groundwater. The qualifiers discussed in Section 1.7.5 of this report apply.

Current Status of the Ranking Unit

In March 1988, the Pantex site informed the Survey that the tanks containing toluene and dimethylformamide were removed in January and February 1988.

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Pinellas Plant
Largo, Florida

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Pinellas
4.5 Acre Site

Description of Ranking Unit

The 4.5 Acre Site is a triangular area northwest of the present plant property that was sold to a private citizen in 1972. Disposal of drums containing hazardous wastes is known to have occurred at the 4.5 Acre Site while it was part of the plant's property, but complete records are not available. During a cleanup operation performed in 1985, 83 drums and 303 tons of waste and contaminated soil were removed. On-site groundwater contamination with volatile organic compounds (VOCs) has been documented.

How the Ranking Unit was Modeled

The transport pathway modeled was the groundwater pathway.

The exposure pathways modeled were the potential for ingestion of groundwater, and the potential for bathing with groundwater.

A release to groundwater may involve a release to surface water, but this transport scenario was not modeled because the surrounding surface water bodies are tidal, and the model cannot simulate this situation. The irrigation of cropland exposure scenario was not modeled because the wells downgradient from the site are not used for this purpose.

The source term was derived by the Survey team from groundwater sampling data from the 4.5 Acre Site. Since a significant amount of assumptions were made in determining the release rate of the contaminants and the potentially impacted drinking water population, the critical data category for this ranking unit is "C".

Results of the Risk-Based Modeling

The ranking unit resulted in HPI Group 5. The potential for consumption of vinyl chloride (present as a decomposition product of methylene chloride) in local well drinking water drove the ranking. Vinyl chloride scored due to the large quantity present in the groundwater, its toxicity, and the proximity of the plant to the local drinking water wells. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that present a tertiary level of concern from the potential public hazard perspective.

Qualifiers to the Risk-Based Ranking

This ranking unit involves the modeling of organic contaminants in groundwater. The qualifiers discussed in Section 1.7.5 of this report apply.

Integration Phase Concerns

This ranking unit was identified as having environmental degradation issues associated with it. The degradation issue was contamination of a shallow aquifer.

Current Status of the Ranking Unit

In March 1988, Pinellas informed the Survey that contaminated material has been removed from the site. The Remedial Investigation/Feasibility Study (RI/FS) under the Comprehensive Environmental Response, Compensation, and Liability Act/Superfund Amendments and Reauthorization Act (CERCLA/SARA) was reported by the site to have been completed and approved in October 1987.

Pinellas
Eastern Sites

Description of Ranking Unit

This ranking unit consists of the East Pond and the Northeast Site. East Pond has received several waste types, including industrial wastewater, collected underdrain wastewater from an on-site spray irrigation field, cooling tower blowdown, tritium-contaminated wastewater, solids incinerator scrubber water, photographic laboratory effluent, and stormwater runoff. The Northeast Site is a swampy area adjacent to the East Pond that received soil removed during the deepening of the pond in 1972 and had previously been used for the storage of drums of waste and construction debris. Groundwater contamination with VOCs in these areas has been documented.

How the Ranking Unit was Modeled

The transport pathway modeled was the groundwater pathway.

The exposure pathways modeled were the potential for ingestion of groundwater and the potential for bathing with groundwater.

A release to groundwater may involve a release to surface water, but this transport scenario was not modeled because the surrounding surface water bodies are tidal, and the model cannot simulate this situation. The irrigation of cropland exposure scenario was not modeled because the wells downgradient from the site are not used for this purpose.

The source term was derived by the Survey team from groundwater sampling data from the Northeast Site. Since a significant amount of assumptions were made in determining the release rate of the contaminants and the potentially impacted drinking water population, the critical data category for this ranking unit is "C".

Results of the Risk-Based Modeling

The ranking unit resulted in HPI Group 6. The potential for consumption of vinyl chloride (present as a decomposition product of methylene chloride) in local well drinking water drove the ranking. Vinyl chloride scored due to the large quantity present in the groundwater, its toxicity, and the proximity of the plant to the local drinking water wells. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that represent a secondary level of concern from the potential public hazard perspective.

Qualifiers to the Risk-Based Ranking

This ranking unit involves the modeling of organic contaminants in groundwater. The qualifiers discussed in Section 1.7.5 of this report apply.

Integration Phase Concerns

This ranking unit was identified as having environmental degradation issues associated with it. The degradation issue was contamination of a shallow aquifer.

Current Status of the Ranking Unit

In March 1988, Pinellas informed the Survey that an RI for the Northeast Area under CERCLA/SARA was completed, and the FS plan was being prepared. Remedial action was anticipated by the site to be scheduled for the summer of 1988. Actions on the East Pond were expected to depend on results from groundwater assessments for the Northeast Area.

Pinellas
Western Sites

Description of Ranking Unit

This ranking unit consists of five inactive waste disposal/spill sites in the western portion of the Pinellas Plant: West Pond, Spray Irrigation Site, Former Thermal-Treatment Site/Current Firing-Training Site, and a diesel fuel spill. The West Pond received all the plant's wastewaters for a 10-year period between 1972 and 1982, which were then pumped out and sprayed onto the 10-acre Spray Irrigation Site. The pond is also known to have received rejected plant parts and lumber contaminated with tritium and sulfuric acid. Fuel oil and other flammable liquids and solids have been used at the Former Thermal-Treatment Site/Current Firing-Training Site.

How the Ranking Unit was Modeled

The transport pathway modeled was the groundwater pathway.

The exposure pathways modeled were the potential for ingestion of groundwater and the potential for bathing with groundwater.

A release to groundwater may involve a release to surface water, but this transport scenario was not modeled because the surrounding surface water bodies are tidal, and the model cannot simulate this situation. The irrigation of cropland exposure scenario was not modeled because the wells downgradient from the site are not used for this purpose.

The source term data were derived from groundwater sampling data from the Spray Irrigation Site. Since a significant amount of assumptions were made in determining the release rate of the contaminants and the potentially impacted drinking water population, the critical data category for this ranking unit is "C".

Results of the Risk-Based Modeling

The ranking unit resulted in HPI Group 0 for all of the contaminants. This ranking unit resulted in this HPI Group because of the high equilibrium coefficients (i.e., high affinity for soils) for some of the contaminants modeled and the low inventories of the other contaminants modeled. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are not projected to reach receptors.

Integration Phase Concerns

This ranking unit was identified as having environmental degradation issues associated with it. The degradation issue was contamination of a shallow aquifer.

Current Status of the Ranking Unit

In March 1988, Pinellas informed the Survey that remedial action for the West Pond and the spray irrigation fields was dependent on the results of sampling taken as part of the AL Environmental Restoration Program. Results were expected to be available by September 1988. Also, the diesel fuel spill remedial action involving excavation of soil and land spreading on-site was completed in FY83, and the AL Environmental Restoration Program will verify adequacy of cleanup.

Pinellas
Potential Releases from Active Underground Storage Tanks

Description of Ranking Unit

This ranking unit includes three active underground storage tanks (USTs). Two of these tanks contain diesel fuel, while the third contains lead washwater. These tanks have the potential to leak to the subsurface soil and subsequently to the groundwater. In addition, these tanks have not been leak-tested. Therefore, the standard release scenario for USTs discussed in Section 1.7.7 of this report was used to assess the potential release.

How the Ranking Unit was Modeled

The transport pathway modeled was the groundwater pathway.

The exposure pathways modeled were the potential for ingestion of groundwater and the potential for bathing with groundwater.

A release to groundwater may involve a release to surface water, but this transport scenario was not modeled because the surrounding surface water bodies are tidal, and the model cannot simulate this situation. The irrigation of cropland exposure scenario was not modeled because the wells downgradient from the site are not used for this purpose.

The source term data were derived from an inventory listing of the site's tanks. Since a significant amount of assumptions were made in determining the release rate of the contaminants and the potentially impacted drinking water population, the critical data category for this ranking unit is "C".

Results of the Risk-Based Modeling

The ranking unit resulted in HPI Group 4. The potential for consumption of diesel fuel in local well drinking water drove the ranking. Diesel fuel scored due to its large inventory, its toxicity, and the proximity of the plant to the local drinking water wells. The HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that present a tertiary level of concern from the potential public hazard perspective.

Qualifiers to the Risk-Based Ranking

This ranking unit scores for fuel in groundwater and involves the modeling of organic contaminants in groundwater and surface water. The qualifiers discussed in Section 1.7.5 of this report apply.

Current Status of the Ranking Unit

In March 1988, Pinellas informed the Survey that all USTs will be removed from service or upgraded to Environmental Protection Agency (EPA) standards for corrosion protection, spill prevention, and leak detection when EPA promulgates such standards.

Pinellas
Past Releases from Inactive USTs

Description of Ranking Unit

This ranking unit includes five inactive USTs, four of which have been removed and one abandoned in place. These tanks may have had the potential to leak diesel fuel and fuel oil to the subsurface soil and subsequently to the groundwater. In addition, these tanks have not been leak-tested. Therefore, the standard release scenario for USTs discussed in Section 1.7.7 of this report was used to assess the potential release.

How the Ranking Unit was Modeled

The transport pathway modeled was the groundwater pathway.

The exposure pathways modeled were the potential for ingestion of groundwater and the potential for bathing with groundwater.

A release to groundwater may involve a release to surface water, but this transport scenario was not modeled because the surrounding surface water bodies are tidal, and the model cannot simulate this situation. The irrigation of cropland exposure scenario was not modeled because the wells downgradient from the site are not used for this purpose.

The source term data were derived from an inventory listing of the site's tanks. Since a significant amount of assumptions were made in determining the release rate of the contaminants and the potentially impacted drinking water population, the critical data category for this ranking unit is "C".

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Results of the Risk-Based Modeling

The ranking unit resulted in HPI Group 4. The potential for consumption of diesel fuel in local well drinking water drove the ranking. Diesel fuel scored due to its large inventory, its toxicity, and the proximity of the plant to the local drinking water wells. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that present a tertiary level of concern from the potential public health hazard perspective.

Qualifiers to the Risk-Based Ranking

This ranking unit scores for fuel in groundwater and involves the modeling of organic contaminants in groundwater and surface water. The qualifiers discussed in Section 1.7.5 of this report apply.

Current Status of the Ranking Unit

In March 1988, Pinellas informed the Survey that in 1964, four of these tanks were removed, and one was abandoned in place. Soil in and around the tanks was tested for contamination, and contaminated soil was removed and disposed of off-site. Continuing groundwater monitoring has detected no evidence of fuel leakage.

Pinellas
Past Releases from HP Tanks

Description of Ranking Unit

Two 10,000-gallon underground wastewater holding tanks were installed at the Pinellas Plant in 1957 and a third in 1969. Control of wastewater containing traces of tritium was provided by this system. All three tanks were taken out of service in 1986. While in service, these tanks may have had the potential to leak tritiated wastewater to the subsurface soil and subsequently to the groundwater. Therefore, the standard release scenario for USTs discussed in Section 1.7.7 of this report was used to assess the potential release.

How the Ranking Unit was Modeled

The transport pathway modeled was the groundwater pathway.

The exposure pathways modeled were the potential for ingestion of groundwater and the potential for bathing with groundwater.

A release to groundwater may involve a release to surface water, but this transport scenario was not modeled because the surrounding surface water bodies are tidal, and the model cannot simulate this situation. The irrigation of cropland exposure scenario was not modeled because the wells downgradient from the site are not used for this purpose.

The source term data were derived from the current tritium concentrations in the wastewaters discharged to the publicly owned treatment works (POTW). Since a significant amount of assumptions were made in determining the release rate of the contaminants and the potentially impacted drinking water population, the critical data category for this ranking unit is "C".

Results of the Risk-Based Modeling

This ranking unit resulted in HPI Group 0. Tritium scored this low because of its trace concentration in the wastewater. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are not projected to reach receptors.

Regulatory Aspects of the Ranking Unit

A Resource Conservation and Recovery Act (RCRA) Closure Permit Application has been submitted and tank removal and closure (dependent on approval from Florida Department of Environmental Regulation) are scheduled by the site to be completed by 4/30/88.

Current Status of the Ranking Unit

In March 1988, Pinellas informed the Survey that sludge was removed from the tanks.

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Portsmouth Uranium Enrichment Complex
Piketon, Ohio

370

Portsmouth
Chromium Air Releases

Description of Ranking Unit

Water droplet "drift" from the cooling towers containing chromium is being released to the atmosphere. Since most of the droplets are very small, there is a potential for emissions of the chromium solution mist to travel a great distance and deposit on plants and soils of the surrounding areas.

How the Ranking Unit was Modeled

The transport pathway that was modeled was an air release of the contaminant.

The exposure pathways analyzed included potential inhalation of the chromium and potential ingestion of crops grown and livestock raised on land on which the chromium may have deposited.

The transport pathways that were not analyzed included direct discharge to surface soil, groundwater, and surface water pathways because this is an air release. Exposure through ingestion of groundwater and surface water was not considered for the same reason.

The mass of hexavalent chromium released by the cooling towers per day was used to run the model. This was calculated from the known concentration of chromium in the cooling water and the amount of of drift released from the towers. For modeling purposes a 0.1 percent draft rate was used. There is a difference of opinion about the rate used to model this ranking unit. The concentration of chromium was known, the drift rate was assumed using a generally acceptable rate, but it is not known whether the chromium was in a trivalent or hexavalent form. The critical data category for this ranking unit is "B".

Results of the Risk-Based Ranking

The ranking unit fell into HPI Group 7 due to the potential for inhalation of hexavalent chromium transported through the atmosphere to agricultural products and breathing air. Chromium discharges to the atmosphere scored high because of the toxicity of hexavalent chromium, as well as the size of the population potentially affected, and the inventory released. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that represent a secondary level of concern from the potential public hazard perspective.

Current Status of the Ranking Unit

In March 1988, the DOE Oak Ridge Operations Office (ORO) informed the Survey that newer phosphate-based inhibitors are under test with an expected test completion date of June 1988.

Portsmouth
Unscheduled Air Releases

Description of Ranking Unit

Process leaks of suspended particles have resulted in uranium releases from the site to the atmosphere over the past eight years. Releases are continuing. As a consequence, fugitive emissions of uranium may deposit on plants and soils of the surrounding areas.

How the Ranking Unit was Modeled

The transport pathway that was modeled was a release of uranium to the atmosphere.

The exposure pathways analyzed included potential inhalation of the uranium as well as potential ingestion of crops and livestock raised on land on which the uranium has deposited. Direct exposure to potentially contaminated surface soils was also analyzed

The transport pathways that were not modeled were surface soil, groundwater, and surface water pathways because it was an air release. Exposure to groundwater and surface water was also not considered for this ranking unit.

Air monitoring data were used to model the transport of uranium-235 and uranium-238 to the surrounding area within a 50-mile radius. Because the data were available, the critical data category for this ranking unit is "A".

Results of the Risk-Based Modeling

The ranking unit fell into HPI Group 6. The potential for ingestion and inhalation of uranium-235 associated with agricultural products and breathing air drove the ranking. Uranium-235 scored due to its radiation effects, the size of the population potentially affected, and the size of the release. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that represent a secondary level of concern from the potential public hazard perspective.

Current Status of the Ranking Unit

In March 1988, ORO informed the Survey that improved real-time radiation monitors are being developed to detect radiological releases and allow rapid action to minimize losses to the air. A prototype model is expected to be installed by August 1988 for a one-year test.

Portsmouth
Technetium Air Releases

Description of Ranking Unit

Contaminant trap inefficiencies have resulted in suspended particulate technetium releases from the site to the atmosphere. As a consequence, fugitive emissions of technetium may deposit on plants and soils of the surrounding areas.

How the Ranking Unit was Modeled

The transport pathway that was modeled was a release of technetium to the atmosphere.

The exposure pathways analyzed included potential inhalation of technetium, direct exposure to potentially contaminated surface soils, and the potential ingestion of crops grown and livestock raised on land on which technetium may have deposited.

The transport pathways that were not modeled were the surface soil, groundwater, and surface water pathways because this was an air release. For the same reason, exposure to groundwater and surface water was not considered.

Air monitoring data were used to model the transport of technetium-99 to the surrounding area within a 50-mile radius. Because these data were available, the critical data category for this ranking unit is "A".

Results of the Risk-Based Modeling

The ranking unit fell into HPI Group 4 due to the potential for ingestion and inhalation of technetium-99 transported through the atmosphere to consumed agricultural products and breathing air. This score was due to the radioactivity level of technetium, as well as the size of the population potentially affected, and the inventory released. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that present a tertiary level of concern from the potential public hazard perspective.

Regulatory Aspects of the Ranking Unit

In March 1988, ORO informed the Survey that, public radiation doses from the release from technetium are well within EPA standards; nevertheless, studies are being conducted to determine if reductions in releases are feasible and practicable.

Current Status of the Ranking Unit

In March 1988, ORO informed the Survey that a 6-month field test is scheduled to begin in June 1988, which will evaluate alternative emission reduction methods.

Portsmouth
Coal Pile Runoff

Description of Ranking Unit

Leachate from the coal pile may be released to groundwater from under and around the pile due to lack of liners and to surface water because of inadequate containment. As a result, groundwater and surface water may receive inorganic contaminants from this source. The X-621 Coal Pile Treatment Plant is used to treat leachate prior to disposal in and subsequent release to surface water from the X-230k South Holding Pond. Because of operations problems, however, much of the leachate from the coal pile bypasses the treatment plant, drains into the holding pond untreated, and is discharged directly to surface water.

How the Ranking Unit was Modeled

The transport pathways that were modeled included groundwater and surface water.

The exposure pathways analyzed included inhalation of bath water vapor which originated as groundwater, potential ingestion of groundwater, and potential ingestion of crops irrigated and livestock watered with groundwater and surface water.

The air transport pathway was not modeled because it is a liquid release. Resuspension of particulates and their potential inhalation was not addressed for the same reason. Potentially affected surface water in the area is not used for drinking water, fish/shellfish production, bathing, or recreation, so these surface water-related exposure scenarios were not modeled.

Calculated average daily flow of water from the coal pile with measured concentrations of iron, manganese, arsenic, copper, nickel, and zinc were used to run the model. The model assumes that one-half the average daily flow goes to surface water and that the other half goes to either the treatment plant or groundwater. Because a flow rate and measured concentrations were available for this ranking unit, the critical data category is "A" for this ranking unit.

Results of the Risk-Based Modeling

The ranking unit fell into HPI Group 6 due to the potential for ingestion of arsenic transported through the surface water to consumed agricultural products. This score is because of the quantity of coal pile runoff being transported to surface water and the extreme toxicity of arsenic. Arsenic scores are based on current Environmental Protection Agency (EPA) cancer potency factors. These cancer potency factors are currently under review and EPA has proposed that they are overly conservative. For modeling purposes these values have been used until EPA provides new values. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that present a tertiary level of concern from the potential public hazard perspective.

Current Status of the Ranking Unit

In March 1988, ORO informed the Survey that improved coal pile runoff control has been accomplished by upgrading the Coal Pile Treatment Plant.

Portsmouth
East Central Area Inactive Sites

Description of Ranking Unit

Radioactive, organic, and inorganic contaminants may be released to groundwater and surface water by a group of disposal components comprising this ranking unit. Releases to groundwater may occur because of the lack of pond or ditch liners and surface water releases that may occur when pond or ditch storage capacities are exceeded (from too much waste or rainfall).

How the Ranking Unit was Modeled

The transport pathways that were modeled included groundwater and surface water.

The exposure pathways analyzed were the potential inhalation or ingestion of bath water vapor which originated from groundwater, potential ingestion of groundwater, potential ingestion of crops and livestock watered with groundwater or surface water, potential ingestion of fish caught in the surface waters, and potential direct exposure to the surface water.

The transport pathways that were not analyzed were the air scenarios because this is a liquid release. Exposure to resuspended particulates was not considered for this same reason. Surface water at the usage locations is not directly ingested or used for bathing.

Measured sediment and groundwater concentrations, estimated inventory, and concentrations based on results of Survey team on-site investigations, calculated average daily overland flow rate, and leach rate were used to run the model. All disposal components were aggregated and modeled as a single site at the X-701B pond. Because a moderate number of assumptions were used in developing the source term, the critical data category for the ranking unit is "B".

Results of the Risk-Based Modeling

The ranking unit fell into HPI Group 2. The potential for consumption of TCE transported through the groundwater to drinking water and agricultural products drove the ranking. The low score is due in part to the low groundwater flow velocity. This HPI Group, as explained Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are characterized as generally reaching receptors at levels below those used in regulatory decisions.

Qualifiers to the Risk-Based Ranking

This ranking unit includes runoff of contaminated soil and models organics in groundwater and surface water. The qualifiers discussed in Section 1.7.5 of this report apply.

Integration Phase Concerns

This ranking unit was identified as having environmental degradation issues associated with it. The degradation issue was groundwater contamination. The significance of the degradation issue was viewed as being inadequately represented by the risk-based ranking. Therefore, the ranking for this unit was adjusted.

Current Status of the Ranking Unit

In March 1988, ORO informed the Survey that a comprehensive Remedial Investigation/Feasibility Study (RI/FS) was planned for this ranking unit and the North Area Inactive Sites and South Area Inactive Sites ranking units areas.

Portsmouth
South Area Inactive Sites

Description of Ranking Unit

Radioactive, organic, and inorganic contaminants may be released to groundwater, surface water, and air by a group of disposal components comprising this ranking unit. Releases to groundwater may occur because of the lack of liners, surface water releases may occur due to erosion of solid material by rainfall runoff, and air releases may occur due to wind erosion of dry and unstabilized contaminated soil.

How the Ranking Unit was Modeled

The transport pathways that were modeled included air resuspension, groundwater, and surface water.

The exposure pathways analyzed included potential inhalation of the contaminants in the air and bath water vapor, potential ingestion of groundwater, potential ingestion of crops irrigated and livestock watered with groundwater and surface water, potential consumption of fish caught in surface waters, and potential direct exposure to surface water.

The exposure pathways which were not analyzed included ingestion of surface water and bath water from surface water. Surface water at the usage locations is not directly ingested or used for bathing.

Measured soil and groundwater concentrations, estimated inventory and concentrations based on results of Survey team on-site investigations, and calculated average daily overland flow, leach, and emission rates were used to run the model. All disposal components were aggregated and modeled as a single site at the X-749 landfill. Transport for air is assumed to be from the X-749 landfill to cropland, pasture, and the human population in the surrounding area within a 50-mile radius. Because a moderate number of assumptions were made in developing the source term, the critical data category for the ranking unit is "B".

Results of the Risk-Based Modeling

The ranking unit fell into HPI Group 2. The potential for consumption of a relatively low inventory of trichloroethylene (TCE) transported through the groundwater to drinking water and agricultural products drove the ranking because of TCE's toxicity and mobility. This low score is due, in part, to the low groundwater flow velocity. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are characterized as generally reaching receptors at levels below those used in regulatory decisions.

Qualifiers to the Risk-Based Ranking

This ranking unit includes runoff of contaminated soil and models organics in groundwater and surface water. The qualifiers discussed in Section 1.7.5 of this report apply.

Integration Phase Concerns

This ranking unit was identified as having environmental degradation issues associated with it. The degradation issue was groundwater contamination. The significance of the degradation issue was viewed as being inadequately represented by the risk-based ranking. Therefore, the ranking for this unit was adjusted.

Current Status of the Ranking Unit

In March 1988, ORO informed the Survey that a comprehensive RI/FS was planned for this ranking unit, for the East-central Area Inactive Sites, and for the North Areas Inactive Sites ranking units.

Portsmouth
North Area Inactive Sites

Description of Ranking Unit

Radioactive, organic, and inorganic contaminants may be released to groundwater and surface water by a landfill and construction spoils disposal area comprising this ranking unit. Releases to groundwater may occur because of the lack of liners, and surface water releases may occur when rainfall erodes solid material (due to inadequate cover) and transports it in suspension.

How the Ranking Unit was Modeled

The transport pathways that were modeled included groundwater and surface water.

The exposure pathways analyzed included potential inhalation and ingestion of groundwater during bathing, potential ingestion of groundwater, potential consumption of crops irrigated and livestock watered with groundwater and surface water, potential ingestion of fish caught in surface waters, and potential direct exposure to surface water.

The transport pathway which was not modeled was the air transport scenario because it is a liquid release of contaminants. Exposure through ingestion of surface water was not considered because surface water at the usage locations is not directly ingested or used for bathing.

Measured soil and groundwater concentrations, estimated inventory and concentrations based on results of Survey team on-site investigations, and calculated average daily overland flow rate and leach rate were used to run the model. Because a moderate number of assumptions were used in the modeling of this ranking unit, the critical data category is "B".

Results of the Risk-Based Modeling

The ranking unit fell into HPI Group 1. The potential for consumption of a low inventory of TCE transported through the groundwater to drinking water and agricultural products drove the ranking because of TCE's toxicity and mobility. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit

with those environmental problems that are characterized as generally reaching receptors at levels below those used in regulatory decisions.

Qualifiers to the Risk-Based Ranking

This ranking unit includes runoff of contaminated soil and models organics in groundwater and surface water. The qualifiers discussed in Section 1.7.5 of this report apply.

Current Status of the Ranking Unit

In March 1988, ORO informed the Survey that a comprehensive RI/FS was planned for this ranking unit, for the East-central Area Inactive Sites, and for the South Areas Inactive Sites ranking units.

Portsmouth
Chromium Lagoon

Description of Ranking Unit

Trivalent and hexavalent chromium may be released to groundwater from sludge (generated by the X-616 chromium reduction plant) that is stored in the X-616 sludge lagoons.

How the Ranking Unit was Modeled

The transport pathway that was modeled was groundwater.

The exposure pathways analyzed included potential ingestion or inhalation of bath water, potential ingestion of groundwater, and potential ingestion of crops irrigated and livestock watered with groundwater.

Measured sediment concentrations, estimated inventory and concentrations based on results of Survey team on-site investigations, and a calculated average daily leach rate were used to run the model. For modeling purposes, transport is assumed to be from the center of the two X-616 chromium sludge lagoons to cropland, pasture, and the human population in the surrounding area off-site. Because the source term was developed from measured concentrations, the critical data category for this ranking unit is "A".

Results of the Risk-Based Modeling

The ranking unit fell into HPI Group 0 due to the potential for consumption of chromium in drinking water and agricultural products. This ranking results because the model predicts that all contaminants will be attenuated by the soil. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are not projected to reach receptors.

Current Status of the Ranking Unit

In March 1988, ORO informed the Survey that newer phosphate-based inhibitors are under test with an expected test completion date of June 1988.

Portsmouth
Potential for Future Releases from Underground Storage Tanks

Description of Ranking Unit

Organic contaminants have a potential for being released to groundwater by underground storage tanks (USTs) comprising this ranking unit. Releases to groundwater may occur because some USTs are more than 30 years old and have not been leak-tested. As a result, groundwater may become contaminated by diesel fuel, gasoline, and oil from these sources.

How the Ranking Unit was Modeled

The transport pathway that was modeled was groundwater.

The exposure pathways analyzed included inhalation and potential ingestion of bath water, potential ingestion of groundwater, and potential ingestion of crops irrigated and livestock watered with groundwater.

The transport scenarios which were not modeled were air, surface soil, and surface water because it was an underground release. For the same reason, air, surface soil, and surface water exposure pathways were not considered.

The standard release scenario for USTs in Section 1.7.7 of this report was used. For modeling purposes, transport is assumed to be from the geographic center of the facility to cropland, pasture, and the human population in the surrounding area off-site. Because a moderate number of assumptions were made in determining the source term, the critical data category for this ranking unit is "B".

Results of the Risk-Based Modeling

The ranking unit fell into HPI Group 0 due to the potential for consumption of diesel fuel in drinking water and agricultural products. This HPI Group results from a projected small inventory of potential contaminants. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are not projected to reach receptors.

Qualifiers to the Risk-Based Ranking

This ranking unit scores for fuel in groundwater. It also models organics in groundwater. The qualifiers discussed in Section 1.7.5 of this report apply.

Portsmouth
Potential for Future Releases from Aboveground Tanks

Description of Ranking Unit

Organic contaminants have a potential for being released to groundwater and surface water from aboveground tanks (AGTs) comprising this ranking unit. Spills from AGTs have occurred in the past and many AGTs do not have lined spill-containment areas. Releases to surface water may occur because spill-containment areas may not exist or may not have adequate capacities to avoid overflows. As a

result, groundwater and surface water may become contaminated by diesel fuel, oil, gasoline, and sodium hydroxide from these sources.

How the Ranking Unit was Modeled

The transport pathways that were modeled included groundwater and surface water.

The exposure pathways analyzed included potential inhalation and ingestion of bath water, potential ingestion of groundwater, potential consumption of crops irrigated and livestock watered with groundwater and surface water, and consumption of fish caught in surface waters.

The transport scenarios that were not analyzed were the air pathways because this is a liquid release. For this same reason, potential exposure through inhalation was not considered. Surface water at the usage locations is not being used for drinking water, bathing, or recreation.

A hypothetical, one-time release; leach rate; and overland flow rate were used to run the model. Because a moderate number of assumptions were made in developing the source term, the critical data category for this ranking unit is "B".

Results of the Risk-Based Modeling

The ranking unit fell into HPI Group 0 due to the potential for consumption of gasoline in groundwater used for drinking water and in agricultural products. This HPI Group results from a projected small inventory of potential contaminants. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are not projected to reach receptors.

Qualifiers to the Risk-Based Ranking

This ranking unit scores for fuel in groundwater. In addition, this ranking unit includes overland runoff of contaminated soil and models organics in groundwater and surface water. The qualifiers discussed in Section 1.7.5 of this report apply.

Portsmouth
Recirculating Cooling Water System

Description of Ranking Unit

Hexavalent chromium in cooling water may be released to groundwater from leaks in the recirculating cooling water basins (X-626, X-630, X-633) and associated piping.

How the Ranking Unit was Modeled

The transport pathway that was modeled was groundwater.

The exposure pathways analyzed include potential inhalation and ingestion of bath water, potential ingestion of groundwater, and potential consumption of crops irrigated and livestock watered with groundwater.

The transport scenarios which were not modeled were the surface soil, air, and surface water pathways because this is an underground release. Exposure scenarios associated with these three pathways were not modeled for the same reason.

This ranking unit was modeled using the standard release scenario for USTs in Section 1.7.7 of this report. Because a moderate number of assumptions were made in determining the source term, the critical data category for this ranking unit is "B".

Results of the Risk-Based Modeling

The ranking unit fell into HPI Group 0 due to the consumption of hexavalent chromium in drinking water and agricultural products. This low ranking is because the model predicts that all contaminants will be attenuated by the soil. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are not projected to reach-receptors.

Current Status of the Ranking Unit

In March 1988, ORO informed the Survey that newer phosphate-based inhibitors are under test with an expected test completion date of June 1988.

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Rocky Flats Plant
Golden, Colorado

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Rocky Flats Plant
VOCs in Groundwater

Description of Ranking Unit

Volatile organic compounds (VOCs) are present in the groundwater at the Rocky Flats Plant (RFP). The organics consist of trichloroethylene, tetrachloroethylene, 1,1-dichloroethylene, 1,1,1-trichloroethane, 1,2-dichloroethane, carbon tetrachloride, and chloroform. In some cases, potential sources have been identified although the link between the potential sources and certain VOCs has not been established. In other cases, VOCs are present in groundwater in locations for which no known potential source exists.

How the Ranking Unit was Modeled

The transport pathway modeled was groundwater to surface water.

The exposure scenarios analyzed included the potential for ingestion of surface water, the potential for bathing with surface water, and the potential for ingestion of crops irrigated and livestock watered with surface water.

There is no reported recreational use of surface water; therefore, recreational exposure scenarios were not addressed. There are no groundwater wells in use in the area; therefore, exposure to groundwater was not considered.

A rectangular area encompassing wells having the highest VOC concentrations was assumed to represent the area of the "source," since the VOC concentrations actually vary widely and do not follow a pattern that delineates a specific source of contamination. The average VOC concentrations measured in the wells lying within this assumed source were assumed to exist throughout the source. Many of these concentrations were expressed as "less than" a value; in these cases, the maximum possible value for concentration was used, thereby yielding a conservative estimate of the VOC inventory. Furthermore, some of the contaminated groundwater may re-emerge and flow into on-site settling ponds, thus reducing the potential contamination of the off-site surface water bodies. For a conservative estimate of the potential effects of the groundwater contamination, however, this possibility was not included in the modeling. Because many significant assumptions regarding the source term were necessary, the critical data category is "C".

Results of the Risk-Based Modeling

This ranking unit resulted in an HPI in Group 9, driven by the potential for ingestion of tetrachloroethylene in surface water as well as in potentially contaminated crops and livestock products. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems of most concern from the perspective of the potential public hazard.

The high ranking for this unit is due to the large exposed population and the additional irrigation/livestock usage at this potential receptor. The magnitude of the HPI was also due to the shallow depth to groundwater, the relatively high mobility of the VOCs, and their large quantities.

Qualifiers to the Risk-Based Ranking

This ranking unit involves organics in groundwater and surface water. The third qualifier in Section 1.7.5 of this report applies.

Integration Phase Concerns

This ranking unit was identified as having environmental degradation issues associated with it. The degradation issue was groundwater contamination.

Regulatory Aspects of the Ranking Unit

In July 1986, a compliance agreement between RFP, the Environmental Protection Agency (EPA), and the Colorado Department of Health stipulated that a comprehensive Remedial Investigation/Feasibility Study (RI/FS) be conducted as the first part of a groundwater contamination mitigation program.

Current Status of the Ranking Unit

In March 1988, RFP informed the Survey that RIs for major suspected sources of VOCs were completed in December of 1987 and RIs are being initiated at lower priority sites suspected of contributing to VOCs in the groundwater. The FS for the 881 Hillside (high-priority sites) was submited on March 1, 1988.

Rocky Flats Plant
Solar Evaporation Ponds

Description of Ranking Unit

The solar evaporation ponds at Rocky Flats were used to store and reduce the water content, by natural evaporation, of low-level radioactive process wastes. There has been measurable groundwater contamination at the site due to nitrate, uranium, and tritium from these ponds.

How the Ranking Unit was Modeled

The transport pathway modeled was groundwater to surface water.

The exposure scenario analyzed was the potential for ingestion of surface water.

No wells are known to be in use in the contaminated area; therefore the groundwater transport pathway was not modeled. The contaminants in the evaporation ponds are not volatile; therefore, no air transport scenarios were considered. Overland runoff is not of concern, since there is no surface release from the ponds.

The evaporation ponds were assumed to have all been in use from 1955 to 1977. The concentrations of tritium and nitrate in the ponds during their active lives were assumed to be equal to the maximum concentrations detected in groundwater monitoring wells downgradient of the ranking unit. Some of the contaminated groundwater may re-emerge and flow to on-site collection ponds, which could reduce the quantity of contaminants that might reach the reservoir. In order to be conservative, however, this possibility has not been accounted for in the modeling

process. The concentration of uranium-238 in the ponds was assumed to be equal to the maximum radioactivity that was allowed to be deposited in the ponds. Since the source term is derived from assumptions that are based on real data, the critical data category is "B".

Results of the Risk-Based Modeling

This ranking unit yielded an HPI in Group 5, driven by the potential for ingestion of nitrate in surface water. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that present a tertiary level of concern from the potential public hazard perspective. The HPI for nitrate in this ranking unit is mainly due to the large amount of nitrate in the ponds and its high mobility through the soil.

Regulatory Aspects of the Ranking Unit

At the time of the Survey, the site was removing materials from the ponds and preparing closure and post-closure plans in accordance with the terms of the compliance agreement.

Current Status of the Ranking Unit

In March 1988, RFP informed the Survey that Resource Conservation and Recovery Act (RCRA) closure activities were in progress and that field studies had been initiated in 1987. Remedial actions are to be conducted on the basis of the results of the field studies and a risk assessment.

Rocky Flats Plant
903 Pad/Plutonium in Soils

Description of Ranking Unit

Between 1958 and 1967, approximately 5,240 drums of machining oils contaminated with plutonium-239 were stored on an asphalt pad at the 903 Area at Rocky Flats. Leakage of the drums was detected in 1959 and 1964. The drums were removed in 1967 and 1968. An asphalt pad was constructed in 1969 to cover the contaminated area and to prevent runoff. Approximately 11.4 Ci of plutonium-239 were released to the soils around the pad, with 1.7 Ci now buried beneath the asphalt. The remaining 9.7 Ci are estimated to be present in on-site soil, and in off-site soil at much lower concentrations.

How the Ranking Unit was Modeled

The transport scenarios modeled are resuspension of particulates and overland runoff to surface water.

The exposure scenarios analyzed include the potential for direct ingestion of off-site residential soils; the potential for inhalation of, external exposure to, or ingestion of resuspended particulates; the potential for the ingestion of surface water; and the potential for the ingestion of crops irrigated and livestock watered with surface water.

Groundwater transport pathways were not considered due to the minimal depth of soil contamination and the relative immobility of plutonium-239 in the soil. There is no reported recreational use of surface water; therefore, exposure to plutonium-239 through recreational activities was not considered.

The areal extent of the potential contamination was assumed in order to obtain a soil concentration of plutonium-239 when measured concentrations were not available. Fifty percent of the 903 Pad area was assumed to lie within the area served by RFP's on-site drainage and collection system. Ninety percent of the contaminants in this area were assumed to be retained by this collection system. Thus, only a total of 55 percent of the 9.7 Ci inventory was assumed to have the capability of reaching the receptors via overland flow. These many assumptions place the critical data in category "C" for the resuspension and overland flow transport scenarios. Category "B" is more appropriate to describe the critical data for the residential soil ingestion pathway where some actual plutonium-in-soil concentrations were available.

Results of the Risk-Based Modeling

The residential soil ingestion scenario ranked this unit in HPI Group 5, due to the low soil concentrations involved. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that present a tertiary level of concern from the potential public hazard perspective.

Qualifiers to the Risk-Based Ranking

This ranking unit includes overland runoff of contaminated soil. The qualifier discussed in Section 1.7.5 of the report applies.

Integration Phase Concerns

This ranking unit was identified as having environmental degradation issues associated with it. The degradation issue was on-site and off-site contaminated soils.

Current Status of the Ranking Unit

In March 1988, RFP informed the Survey that Remedial Investigation (RI) field activities, including soil gas and geophysical sampling, groundwater monitoring well installation and groundwater sampling, and surface water sampling, have been completed and the report submitted in December 1987. The site also reported that Feasibility Studies (FS) are currently being conducted.

Rocky Flats Plant
Underground Product Storage Tanks

Description of Ranking Unit

The RFP has 33 underground storage tanks (USTs) that have been or are being used to store petroleum products. Virtually all the tanks are at least 20 years old. Due to the age of the tanks, some of their contents may have leaked or are likely to leak in the future. The diesel fuel and gasoline in the tanks thus present a source of possible groundwater contamination.

How the Ranking Unit was Modeled

The transport scenario is groundwater to surface water.

The exposure scenario modeled is the potential for ingestion of surface water and the potential for ingestion of crops irrigated and livestock watered with surface water.

There is no reported recreational use of surface water. No groundwater supply wells are in use in the area; therefore, exposure to groundwater was not considered.

Although leak information specific to these tanks is not known, their contents and capacities are known, and the standard release scenario for USTs described in Section 1.7.7 of this report was used to assess the potential releases. Some of the potentially contaminated groundwater may re-emerge and flow to on-site collection ponds. No adjustments have been made for the effect this may have on reducing the quantity of contaminants potentially reaching the receptor The critical data category for this ranking unit is "B".

Results of the Risk-Based Modeling

This ranking unit resulted in an HPI in Group 6. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that represent a secondary level of concern from the potential public hazard perspective. The potential for ingestion of gasoline in surface water as well as in potentially contaminated crops and livestock products drove the HPI. Gasoline scored this high based on the relatively large amount assumed to have the potential to be released to the groundwater.

Qualifiers to the Risk-Based Ranking

This ranking unit scores for fuel in groundwater. It also involves organics in groundwater and surface water. The qualifiers in Section 1.7.5 of this report apply.

Current Status of the Ranking Unit

In March 1988, RFP informed the Survey that all USTs at RFP are scheduled to be removed within the next two years. The current plans are to remove all USTs and replace them with aboveground, diked, inspectable tanks. If removal of tanks is not possible, tanks will be upgraded to EPA standards to be promulgated in the spring of 1988.

Rocky Flats Plant
PCB Transformer

Description of Ranking Unit

A polychlorinated biphenyl (PCB) transformer on the roof of Building 447 at the RFP has shown evidence of leaks. The transformer is located near a roof drain that leads to a drainage ditch near Building 447. Up to now, the leakage from this transformer

has been less than a gallon. The potential does exist, however, for the transformer to leak its entire contents, 333 gallons of Aroclor-1260.

How the Ranking Unit was Modeled

The transport scenarios modeled included overland runoff to surface water and resuspension of surface soil.

The exposure scenarios analyzed were the potential for ingestion of surface water, the potential for ingestion of crops irrigated and livestock watered with surface water, and the potential for inhalation of resuspended soil particulates.

Since the potential depth of contamination is small, no groundwater transport scenarios were modeled. There is no reported recreational use of surface water; therefore, this exposure scenario was not addressed.

For modeling purposes, an estimated 90 percent of the potentially released volume is assumed to remain in the ditch and in the on-site holding ponds to which the ditch drains. Thus, 10 percent of the release is estimated to have the potential to reach the lake via overland flow. A catastrophic leak from an operating transformer such as this one would be noticed quickly. Therefore, in accordance with the standard PCB release scenario (see Section 1.7.7 of this report), it was assumed that the hypothetical leak would be cleaned up within two days to a remaining soil concentration of 50 ppm. A uniform soil concentration was determined from an assumed depth and the dimensions of the ditch. Since little is known about what would actually occur if the transformer leaked, the many assumptions place the critical data in category "C".

Results of the Risk-Based Modeling

The resultant HPI is in Group 3, due to the potential for ingestion of PCBs in surface water as well as in potentially contaminated crops in livestock products. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are characterized as generally reaching receptors at levels below those used in regulatory decisions.

The HPI for overland runoff is due to the high affinity PCBs have for soils. As the soil is eroded and carried off by stormwater, some PCBs may be present on the soil particulates and thus may reach surface water.

Qualifiers to the Risk-Based Ranking

This ranking unit scores for overland runoff of contaminated soil. The qualifier discussed in Section 1.7.5 of this report applies.

Current Status of the Ranking Unit

In March 1988, RFP informed the Survey that all PCBs in transformers at RFP are scheduled to be removed before the end of the fiscal year, probably within the next few months.

Rocky Flats Plant
Abandoned Process Wastewater Collection System

Description of Ranking Unit

An underground wastewater collection system at RFP was used for aqueous radioactive and chemical wastes until the late 1970s. Seventeen holding tanks remain in place at the facility. The system is known to have leaked during operation, but only one leak was analyzed by RFP. The system was flushed prior to abandonment.

How the Ranking Unit was Modeled

The transport scenario modeled was groundwater to surface water.

The exposure scenarios analyzed were the potential for ingestion of surface water, the potential for ingestion of crops irrigated and livestock watered with surface water.

There is no reported recreational use of surface water; therefore, recreational exposure scenarios were not considered. There are no groundwater wells in use in the area, so the groundwater exposure scenario was not modeled.

Since no other data are available, the ranking unit was modeled based on the analysis of the leak mentioned above. This 1,000-gallon leak contained radioactive contaminants and nitrates. The concentrations of the system after it was flushed were estimated to have been diluted by a factor of 10^3 to 10^6 times the concentrations found in the leak. A sensitivity analysis was therefore performed in which the ranking unit was modeled once with a 10^3 dilution factor and once with a 10^6 dilution factor. Some of the contaminated groundwater may re-emerge and flow to on-site collection ponds, which could reduce the quantity of contaminants that might reach the surface water receptors. In order to be conservative, however, this possibility has not been accounted for in the modeling process. Since no critical data pertaining specifically to this ranking unit were available, the critical data category is "C".

Results of the Risk-Based Modeling

Both dilution factors resulted in an HPI in Group 0 and were driven by nitrate. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are not projected to reach receptors. This ranking unit's low score is due to the low inventory of nitrate present in the ranking unit as well as the high affinity these radioactive contaminants have for the soil.

Current Status of the Ranking Unit

In March 1988, RFP informed the Survey that these lines are being investigated as part of a RCRA closure. In 1988, RFP will survey the abandoned process waste lines and tanks for location, verification, and presence of waste. In addition, an alpha survey will be conducted at the ground surface, soil samples will be taken along waste lines, and the interior of pipes and tanks will be sampled.

Rocky Flats Plant
Pesticide Shed

Description of Ranking Unit

Large quantities of pesticides and herbicides are stored in Building 367, which lacks adequate containment measures. The building is used for pesticide and herbicide mixing, and rinsate waters from pesticide containers have been disposed of on the ground outside the building.

How the Ranking Unit was Modeled

The transport scenarios analyzed included overland runoff to surface water, groundwater to surface water, and resuspension.

The exposure scenarios modeled included the potential for ingestion of surface water, the potential for ingestion of crops irrigated and livestock watered with surface water, and the potential for inhalation of particulates.

There is no reported recreational use of surface water; therefore, recreational exposure scenarios were not considered. Groundwater is not directly used as a water supply at or near RFP.

For modeling purposes, soil concentrations were estimated by assuming that one percent of the 1984 pesticide inventory of the shed was spilled to soils adjacent to the building. The spillage was assumed to have occurred from 1952, when pesticides and herbicides were first stored in the building, to 1984, when operations there were greatly improved. The area and depth of this contamination were also based on realistic assumptions. However, the 1984 inventory does not necessarily represent the quantities or types of pesticides and herbicides presently stored in Building 367. Furthermore, some of the potentially contaminated groundwater may re-emerge and flow to on-site collection ponds, which could reduce the quantity of contaminants that might reach the reservoir. In order to be conservative, however, this possibility has not been accounted for in the modeling process. However, 90 percent of the inventory potentially reaching the receptor via overland flow was assumed to be retained by the on-site collection system. The many assumptions regarding critical data for this ranking unit put the critical data in category "C".

Results of the Risk-Based Modeling

This ranking unit resulted in an HPI in Group 3 based on the potential for ingestion of Rozol in surface water as well as potentially contaminated crops in livestock products. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are characterized as generally reaching receptors at levels below those used in regulatory decisions.

Qualifiers to the Risk-Based Ranking

This ranking unit scores for overland runoff of contaminated soil and for transport of organics in surface water. The qualifiers discussed in Section 1.7.5 of this report apply.

Current Status of the Ranking Unit

In March 1988, RFP informed the Survey that the unused chemicals have been disposed of, the area around the building has been cleaned up, and soil sampling in the area is scheduled for the fall of 1988.

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Sandia National Laboratories (Albuquerque)
Inhalation Toxicology Research Institute
Albuquerque, New Mexico
and
Sandia National Laboratories, Tonopah Test Range
Tonopah, Nevada

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Sandia
Toxic Discharge to Tech Area 1 Sewers

Description of Ranking Unit

There are two ponds at Kirtland Air Force Base (KAFB) that receive 75 percent of the sewer system effluent from Sandia's Technical Area 1. Over the past 25 years, large volumes of hazardous materials discharged to the sewer system have entered the ponds. Recent samples of the lagoon influent and effluent were found to contain chlorinated hydrocarbons and solvents. Since these ponds are unlined, there is the possibility that pollutants seeping through the pond bottoms could reach groundwater (depth to groundwater is 400 feet) and be transported into an area that provides drinking water or water used for recreational or agricultural purposes by the local population.

How the Ranking Unit was Modeled

The transport pathway modeled was groundwater.

The exposure pathway analyzed was potential ingestion of groundwater

The local population's dependence on groundwater makes this the most critical pathway, therefore, other transport and exposure scenarios were not addressed.

The ranking unit was modeled on the basis of the known flow rates and the measured concentrations of contaminants. The constituents modeled were tetrachloroethylene, trichloroethylene, toluene, 1,1,1-trichloroethane, methylene chloride, and o-xylene. The model was run using the concentration of the contaminants in the ponds and the influent flow rate. Because a moderate number of assumptions were made in developing the source term from the pond concentrations, the critical data category for this ranking unit is "B".

Results of the Risk-Based Modeling

The HPI Group for this ranking unit is 7 for 1,1,1-trichloroethane. The HPI is driven by the potential for consumption of potentially contaminated groundwater. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that represent a secondary level of concern from the potential public hazard perspective.

Qualifiers to the Risk-Based Ranking

This ranking unit models organics in groundwater. The qualifiers discussed in Section 1.7.5 of this report apply.

Regulatory Aspects of the Ranking Unit

The State of New Mexico Environmental Improvement Division (EID) has indicated verbally that SNLA will be receiving a Compliance Order pertaining to this issue.

Current Status of the Ranking Unit

In March 1988, SNLA informed the Survey that wastewater that had been discharged to the lagoons was being rerouted to the publicly owned treatment

works (POTW) because it met the standards established by the POTW. Also, the lagoons had not received discharges from any source since January 1988. The State of New Mexico was requiring the lagoons to be evaluated under the Resource Conservation and Recovery Act (RCRA), and KAFB through United States Geological Survey (USGS), was investigating contaminants actually present, and levels of contamination. In addition, SNLA was investigating possible sources of contamination.

Sandia
Liquid Spills and Discharges

Description of Ranking Unit

The Sandia site is divided by the Sandia Fault, which marks the division between a deep water table (with depths up to approximately 400 feet) on the west side of the fault and a shallow water table (with depths as shallow as approximately 50 feet) on the east side on the fault. There have been numerous spills and discharges of a variety of chemical substances on both sides of the fault, and the potential exists for the groundwater to be contaminated.

How the Ranking Unit was Modeled

The transport pathway that was modeled was groundwater.

The exposure pathways analyzed included potential ingestion of groundwater and potential consumption of crops and livestock watered with groundwater.

Compared to groundwater, other transport scenarios are not important because of the transitory nature of the spill events, the low volatility of the compounds, and the relatively small volume of material involved in each event.

The ranking unit was modeled by combining all the spills of similar materials to obtain separate totals for the areas east and west of the Sandia Fault, and treating the totals as if they were separate single events. The materials modeled were oil and ethylene glycol. Because a significant number of assumptions were made in developing this source term, the critical data category for this ranking unit is "C".

Results of the Risk-Based Modeling

The HPI Group was 3 for oil on the west side of the fault. The HPI Group on the west side of the fault is driven by the ranking unit's proximity to receptor wells. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are characterized as generally reaching receptors at levels below those used in regulatory decisions.

Qualifiers to the Risk-Based Ranking

This ranking unit scores for oil in groundwater and models organics in groundwater. The qualifiers discussed in Section 1.7.5 of this report apply.

Current Status of the Ranking Unit

In March 1988, SNLA informed the Survey that a Remedial Investigation (RI) plan was being prepared for the most significant spills and releases as part of the AL Environmental Restoration Program. Field work was scheduled to begin in the summer of 1988

Sandia
Inactive Liquid Disposal Area

Description of Ranking Unit

Since the early 1940s, approximately 10 sites at Sandia have been used for the disposal of hazardous liquid wastes. These disposal areas are located near the Technical Areas. There are apparently no records of the exact types or quantities of wastes discarded. Since these disposal sites are unlined, there is the possibility that pollutants leaching out of the disposed materials could reach groundwater and be transported into an area that provides drinking water or water used by the local population for recreational or agricultural purposes. The local population's dependence on groundwater makes this a critical transport pathway.

How the Ranking Unit was Modeled

The transport pathway that was modeled was groundwater.

The exposure pathway analyzed was potential ingestion of groundwater.

Because the groundwater pathway is critical and no cropland is affected, other transport and exposure pathways were not modeled.

The types and quantities of wastes that were disposed of were estimated from recent waste disposal records, the assumption being that the pattern of waste generation has not changed significantly over the years. The constituents modeled were acetone, benzene, chloroform, methyl ethyl ketone, toluene diisocyanate, 1,1,1-trichloroethane, trichloroethylene (TCE), trichlorofluoromethane, xylene, and cobalt-60. Estimates of the disposal sites' depths and areal extents were combined for modeling as a single disposal area. Because the types and quantities of waste were estimated, the critical data category for this ranking unit is "B".

Results of the Risk-Based Modeling

The HPI Group for this ranking unit is 0 for all the constituents, due to the depth to groundwater (approximately 400 feet). This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are not projected to reach receptors.

Qualifiers to the Risk-Based Ranking

This ranking unit models organics in groundwater. The qualifiers discussed in Section 1.7.5 of this report apply.

Current Status of the Ranking Unit

In March 1988, SNLA informed the Survey that these areas were being evaluated as part of the AL Environmental Restoration Program.

Sandia
Radioactive Burial Grounds

Description of Ranking Unit

A series of pits and trenches in Technical Areas 1 and 2 have been used for the disposal of radioactive wastes. The facilities were not lined and the Survey team observed signs of cap subsidence, indicating the potential for precipitation to enter the waste units and cause some of the radionuclides to leach. The contaminants may be released out through the bottoms of the trenches and eventually enter the groundwater.

How the Ranking Unit was Modeled

The groundwater transport scenario was modeled.

The exposure pathway analyzed was potential ingestion of groundwater.

Because the wastes are buried and there is no cropland potentially affected, other transport pathways and exposure pathways were not considered.

The unit was modeled by combining the volume of all the individual trenches and pits, then treating them as a single unit. The radionuclides modeled were strontium-90, cesium-137, cobalt-60, tritium, uranium-238, and thorium-232. Receptor populations on the site and in nearby centers of population were considered. Because a moderate number of assumptions were made in developing the source term from the available trench data, the critical data category for this ranking unit is "B".

Results of the Risk-Based Modeling

This ranking unit fell into HPI Group 0 for all constituents due to the depth to groundwater (approximately 400 feet), and the ability of the soil to retard the migration of radionuclides. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are not projected to reach receptors.

Current Status of the Ranking Unit

In March 1988, SNLA informed the Survey that the inactive burial site in TA II would be evaluated via the AL Environmental Restoration Program. A surface water runoff control system was scheduled to be constructed at the Technical Area III burial grounds in fiscal year (FY) 1988.

Sandia
Inactive Solid Disposal Area

Description of Ranking Unit

More than 30 disposal areas at SNL have received hazardous materials since the early 1940s. The disposal facilities include pits, trenches, mounds, mineshafts, arroyos, scrapyards, and open dumps. The Survey team has estimated that approximately 8 square miles of land have been involved in these disposal activities. There are no records of the exact types or quantities of wastes discarded, however it is known that these wastes contained the modeled constituents. For modeling purposes it was assumed that the types and amounts of wastes produced currently are the same as those produced in the past. These facilities are unlined, and there is the possibility that contaminants leaching out of the disposed materials could reach groundwater and be transported into an area that provides drinking water. The local population's dependence on groundwater makes this a critical transport pathway.

How the Ranking Unit was Modeled

The transport pathway that was modeled was groundwater.

The exposure pathway analyzed was potential ingestion of groundwater.

Because this pathway is the most critical and there is no potentially affected cropland, no other transport pathways or exposure pathways were considered.

The types and quantities of wastes that were disposed of were estimated from recent waste disposal records. The materials modeled were lead oxide, sodium hydroxide, plutonium-239, uranium-238, and tritium. Estimates of the disposal sites' depths and areal extents were combined for modeling as a single disposal area. Because these estimates were made in developing the source term, the critical data category for this ranking unit is "B".

Results of the Risk-Based Modeling

This ranking unit fell into Group 0 for all constituents due to the depth to groundwater and the constituents' high equilibrium coefficient (i.e., high affinity for soils). This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are not projected to reach receptors.

Current Status of the Ranking Unit

In March 1988, SNLA informed the Survey that these areas were being evaluated as part of the AL Environmental Restoration Program.

Sandia
Orphaned Chemicals

Description of Ranking Unit

There are approximately 50 abandoned (orphaned) drums of chemicals near buildings 6730 and 6732 that have been unattended for several years. Because they have been abandoned, there is the possibility that the drums are leaking and that the waste materials could infiltrate through the surface soils and reach groundwater (depth to groundwater is as deep as approximately 400 feet in this area of the Sandia facility) and be transported into an area that provides drinking water. The local population's dependence on groundwater makes this a critical transport pathway.

How the Ranking Unit was Modeled

The transport pathway modeled was groundwater.

The exposure pathway analyzed was potential ingestion of groundwater.

Because this is a critical pathway and there is no potentially affected cropland in the area, other transport and exposure pathways were not modeled.

The ranking unit was modeled using the standard leaking drum scenario described in Section 1.7.7 of this report. The constituents modeled were oil and sodium hydroxide. Because this standard scenario was used, the critical data category for this ranking unit is "B".

Results of the Risk-Based Modeling

The HPI Group for this ranking unit was 1 for oil, due to the depth to groundwater and the low contaminant inventory. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are characterized as generally reaching receptors at levels below those used in regulatory decisions.

Qualifiers to the Risk-Based Ranking

This ranking unit scores for oil in groundwater. It also models organics in groundwater. This ranking unit also uses a standard assumption for leaking drums. The qualifiers discussed in Sections 1.7.5 and 1.7.7 of this report apply.

Current Status of the Ranking Unit

In March 1988, SNLA informed the Survey that orphaned chemicals located adjacent to Building 8730 were removed from the area and disposed of as hazardous waste. Also, SNLA's Safety, Health and Environmental Appraisal Committee will address this finding in its safety reviews.

Sandia
Potential Release of PCBs from Transformers at SNL

Description of Ranking Unit

Transformers used in research applications are not routinely inspected at Sandia. These units are indoors, and failure of one could release polychlorinated biphenyls (PCBs), which would flow into the building's sewer system, enter the storm drain system, and then be discharged to an arroyo.

How the Ranking Unit was Modeled

The transport pathway modeled was groundwater.

The exposure pathway modeled was potential ingestion of groundwater.

In this area, drinking water is obtained from wells, so the surface water exposure pathway was not modeled.

The ranking unit was modeled by using the standard assumptions described in Section 1.7.7 of this report. One transformer containing 500 gallons of PCB (Arochlor-1260) was assumed to have released its contents onto the floor of the transformer facility. Because these standard assumptions were made in developing the source term, the critical data category for this ranking unit is "B".

Results of the Risk-Based Modeling

The HPI Group for this ranking unit is 0. The score results from the high affinity of PCB for soil, which limits its migration potential. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are not projected to reach receptors.

Qualifiers to the Risk-Based Ranking

This ranking unit uses a standard release assumption for PCB transformers and models PCBs in groundwater. The qualifiers discussed in Sections 1.7.5 and 1.7.7 of this report apply.

Current Status of the Ranking Unit

In March 1988, SNLA informed the Survey that flammable material was removed from around transformers; proper signs and markings were currently being provided; retrofill of 30 PCB transformers was scheduled to be completed by 8/89; replacement of 55 PCB transformers was scheduled for completion by 10/89 along with proper containment structures.

Sandia
SNL Underground Storage Tanks

Description of Ranking Unit

There are numerous underground storage tanks (USTs) at the Sandia National Laboratories. A large number of the tanks are old; approximately 75 percent are

more than 20 years old and approximately 50 percent are more than 35 years old. The installation of many of the tanks may have been poor, the tanks were not coated, and there is a potential for the tanks to leak. If this were to occur, the contents of the tanks would infiltrate the soil and could reach groundwater (depth to groundwater is as deep as approximately 400 feet in this area of the Sandia facility) and be transported into an area that provides drinking water. The local population's dependence on groundwater makes this a critical transport pathway.

How the Ranking Unit was Modeled

The transport pathway modeled was groundwater.

The exposure pathway analyzed was potential ingestion of groundwater.

Because the groundwater is a critical pathway and there is no potentially affected cropland, other transport and exposure scenarios were not modeled.

The ranking unit was modeled by using the UST scenario as described in Section 1.7.7 of this report. The tanks were all assumed to be more than 20 years old, and the constituents were assumed to be oil, gasoline, diesel fuel, fuel oil, and tritiated water. Because a moderate number of assumptions were made in developing the source term, the critical data category for this ranking unit is "B".

Results of the Risk-Based Modeling

The HPI Group for this ranking unit was 6 for gasoline. The HPI was driven by gasoline's ability to move through the soil and by the potential for consumption of groundwater. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that represent a secondary level of concern from the potential public hazard perspective.

Qualifiers to the Risk-Based Ranking

This ranking unit scores for fuel in groundwater and models organics in groundwater. It also uses a standard release rate for USTs. The qualifiers discussed in Sections 1.7.5 and 1.7.7 of this report apply.

Current Status of the Ranking Unit

In March 1988, SNLA informed the Survey that all abandoned tanks in Area III and Coyote Canyon were removed from the ground except one. Also, SNLA planned to remove the remaining abandoned and inactive UST in Area I and those in Area II after promulgation of final UST regulations by the Environmental Protection Agency (EPA).

ITRI
ITRI Active Lagoons

Description of Ranking Unit

Six lagoons at ITRI receive 30,000 gallons per day of water contaminated with organics, inorganics, and radionuclides. The lagoons designated 4, 5, and 6 have unlined compacted soil bottoms, while those lagoons designated 1, 2, and 3 contain

liners that are in poor condition. Since these ponds are all therefore essentially unlined, there is the possibility that pollutants seeping through the pond bottoms could reach groundwater and be transported into an area that provides water used for agricultural purposes by the local population. The local population's dependence on groundwater makes this a critical transport pathway.

How the Ranking Unit was Modeled

The transport pathway modeled was groundwater.

The exposure pathway analyzed was potential consumption of crops and livestock watered with groundwater.

Because the groundwater is a critical pathway because of irrigation and there are no potential groundwater drinking water receptors in the area, other transport and exposure pathways were not considered.

The unit was modeled on the basis of the estimated constituent fluxes for the period from 1963 to 1973. The contaminants modeled were methylene chloride, chromic acid, ethanol, cyanide, and arsenic. Because a significant number of assumptions were made in developing the source term, the critical data category for this ranking unit is "C".

Results of the Risk-Based Modeling

The HPI Group was 3 for methylene chloride. The score was driven by the constituent's low equilibrium coefficient (i.e., low affinity for soils) and the proximity to receptors used to water livestock. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are characterized as generally reaching receptors at levels below those used in regulatory decisions.

Qualifiers to the Risk-Based Ranking

This ranking unit models organics in groundwater. The qualifiers discussed in Section 1.7.5 of this report apply.

Regulatory Aspects of the Ranking Unit

Negotiations by the site to obtain a Discharge Permit under state Water Quality Regulations are on-going with the New Mexico EID.

Current Status of the Ranking Unit

In March 1988, ITRI informed the Survey that water and sediments in and around the lagoon will be sampled as part of the Environmental Survey. Three soil borings will also be taken and one to three monitoring wells installed. Further action will be dependent on the results of the sampling and analysis.

ITRI
ITRI Hot Ponds

Description of Ranking Unit

Two "hot" ponds at ITRI have received intermediate-level radioactive liquid wastes. The liners of these ponds show signs of deterioration, and there is the possibility that pollutants seeping through the pond bottoms could reach groundwater. If seepage occurs, radioactive wastes could be transported into an area that provides water used for agricultural purposes by the local population. The local population's dependence on groundwater makes this a critical transport pathway.

How the Ranking Unit was Modeled

The transport pathway modeled was groundwater.

The exposure pathway analyzed was potential consumption of crops and livestock watered with groundwater.

Because groundwater is a critical pathway because of irrigation and there are no potential groundwater drinking water receptors, other transport and exposure scenarios were not addressed.

Results of analyses performed on the water and sludge of the ponds were used to calculate the radionuclide content and total inventory. The constituents modeled were plutonium-238, plutonium-239, americium-241, curium-243, curium-244, strontium-90, cesium-137, and cesium-134. Although a moderate number of assumptions were made in developing the source term, and a significant amount of analytical data were available, the critical data category for this ranking unit is "B".

Results of the Risk-Based Modeling

The HPI Group for this ranking unit is 0 for all constituents, due to the constituents' high equilibrium coefficients (i.e., high affinity for soils). This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are not projected to reach receptors.

Current Status of the Ranking Unit

In March 1988, ITRI informed the Survey that water and sediments will be sampled as part of the Environmental Survey. Some sediments were removed. A soil boring will be taken and a monitoring well will be installed if the water table is shallow. Further actions will be dependent on the results of the sampling.

ITRI
Potential Releases of PCBs from Transformers at ITRI

Description of Ranking Unit

Transformers at ITRI are not equipped with spill containment devices. These units are indoors, and the potential failure of one would release PCBs, which would flow into the building's sewer system, enter the storm drain system, and then be discharged to the lagoon system. Since some of the lagoons are unlined, and others

have liners in very poor condition, there is a potential that the PCBs could migrate downward through the bottom of the lagoons and eventually reach the groundwater. The contaminants could be transported into an area that provides water used for agricultural purposes by the local population. The local population's dependence on groundwater makes this the most critical transport pathway.

How the Ranking Unit was Modeled

The transport pathway modeled was groundwater.

The exposure pathway analyzed was potential consumption of crops and livestock watered with groundwater.

Because groundwater is a critical pathway because of irrigation and there are no groundwater drinking water receptors in the area, other transport and exposure pathways were not modeled.

The scenario was modeled assuming that one transformer would fail and release 300 gallons of PCB (Arochlor-1260), which would then discharge into the lagoon system. An active life of 40 years was assumed for the lagoons. Because a moderate number of assumptions were made in developing the source term, the critical data category for this ranking unit is "B".

Results of the Risk-Based Modeling

The HPI Group for this ranking unit is 0, due to the constituent's high equilibrium coefficient (i.e., high affinity for soils) and the low precipitation in the region. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are not projected to reach receptors.

Qualifiers to the Risk-Based Ranking

This ranking unit scores for oil in groundwater and models PCBs in groundwater. The qualifiers discussed in Section 1.7.5 of this report apply.

Current Status of the Ranking Unit

In March 1988, ITRI informed the Survey that replacement of the transformer oil of the outdoor transformer, and complete removal of the indoor transformers were scheduled for FY 1989. In the interim, ITRI will maintain an active inspection program for the transformers.

ITRI
ITRI Underground Storage Tanks

Description of Ranking Unit

There are seven USTs at ITRI with a total storage capacity of 82,000 gallons. While the tanks are known to be in good condition, the possibility exists that they could leak in the future. If this were to occur, the contents of the tanks could infiltrate the soil, reach groundwater (depth to groundwater is 400 feet in this area of the ITRI facility), and be transported into an area that provides water used for agricultural

purposes by the local population. The local population's dependence on groundwater makes this the most critical transport pathway for this ranking unit.

How the Ranking Unit was Modeled

The transport pathway modeled was groundwater.

The exposure pathway analyzed was potential consumption of crops and livestock watered with groundwater.

Because the tanks are underground and there are no groundwater drinking water receptors in the area, other transport and exposure scenarios were not addressed.

This ranking unit was modeled by assuming that the tanks contained diesel fuel and are more than six years old. The standard scenario for modeling USTs as described in Section 1.7.7 of this report was used. Because this standard assumption was used in developing the source term, the critical data category for this ranking unit is "B".

Results of the Risk-Based Modeling

This ranking unit fell into HPI Group 6, due to diesel fuel's ability to move through the soil and the ranking unit's proximity to receptors. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that represent a secondary level of concern from the potential public hazard perspective.

Qualifiers to the Risk-Based Ranking

This ranking unit scores for fuel in groundwater and models organics in groundwater. It also uses a standard release assumption for USTs. The qualifiers discussed in Sections 1.7.5 and 1.7.7 of this report apply.

Current Status of the Ranking Unit

In March 1988, ITRI informed the Survey that all USTs will be removed or upgraded to meet EPA standards for spill prevention, corrosion protection, and leak detection when EPA promulgates final UST regulations.

ITRI
Inactive ITRI Sewage Lagoon

Description of Ranking Unit

Lagoon 1 was in service from 1962 to 1970. During its active life, it received an unknown quantity of cesium-137 and presumably also received quantities of chemical wastes that reached the lagoon via sinks and drains in the ITRI labs. Since this lagoon has a liner of questionable integrity, there is the possibility that contaminants could leach through the pond bottom and reach groundwater. The contaminants could be transported into an area that provides water used for agricultural purposes by the local population. The local population's dependence on groundwater makes this a critical transport pathway.

How the Ranking Unit was Modeled

The transport pathway modeled was groundwater.

The exposure pathway analyzed was potential consumption of crops and livestock watered with groundwater.

Because the groundwater is a critical pathway because of irrigation and there are no groundwater drinking water receptors in the area, other transport and exposure pathways were not considered.

For modeling purposes, the activity level of cesium-137 measured in the lagoon sediment after it was closed was used as an indication of contaminant inventory. The cesium inventory was computed on the basis of the estimated volume of the lagoon. Because a moderate number of assumptions were made in developing the source term from this data, the critical data category for this ranking unit is "B".

Results of the Risk-Based Modeling

The HPI Group for this ranking unit was 0 due to cesium's high equilibrium coefficient (i.e., high affinity for soils). This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are not projected to reach receptors.

Current Status of the Ranking Unit

In March 1988, ITRI informed the Survey that this lagoon will be evaluated further as part of the AL Environmental Restoration Program.

ITRI
ITRI Leaking Drums

Description of Ranking Unit

There are more than 200 drums of scintillation wastes stored outdoors on the concrete apron of the ITRI hot ponds. While these wastes are known to consist of xylene contaminated with radionuclides, no information is available on the types and quantities of radionuclides present. Many of the drums are rusty and leaking and there is visual evidence that waste has spread from the concrete pad onto the surrounding soil. The possibility exists that the radionuclides could leach through the soil to the groundwater, which is potentially less than 100 feet below the surface at this location. If this were to happen, the contaminants could be transported into an area that provides water used for agricultural purposes by the local population. The local population's dependence on groundwater makes this a critical transport pathway for this ranking unit.

How the Ranking Unit was Modeled

The transport pathway modeled was groundwater.

The exposure pathway analyzed was potential consumption of crops and livestock watered with groundwater.

Because the groundwater is a critical pathway because of irrigation and there are no groundwater drinking water receptors in the area, other transport and exposure pathways were not considered.

The constituents modeled were the radionuclides. Because of the lack of data for the drums, the radionuclide data for the adjacent hot ponds were assumed to apply to the drummed wastes and the standard release scenario for leaking drums as described in Section 1.7.7 of this report was used to assess the potential release. The radionuclides modeled were plutonium-238, plutonium-239, americium-241, curium-243, strontium-90, and cesium-137. Because a significant amount of assumptions were made in developing the source term, the critical data category for this ranking unit is "C".

Results of the Risk-Based Modeling

The ranking unit fell into HPI Group 0 for all constituents. This is due to the capacity of the soil to retard the migration of radionuclides and the relatively low inventory of contaminants. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are not projected to reach receptors.

Qualifiers to the Risk-Based Ranking

This ranking unit uses a standard release assumption for leaking drums. The qualifiers discussed in Section 1.7.7 of this report apply.

Current Status of the Ranking Unit

In March 1988, ITRI informed the Survey that all scintillation wastes were repackaged and transferred indoors where they will remain until a mixed waste treatment and/or land disposal facility becomes available.

Sandia
Radioactively Contaminated Soils at Tonopah

Description of Ranking Unit

In 1963, a series of three tests designed to provide data on the dispersal of plutonium-238, was performed at the Tonopah Test Range (TTR). Following the tests, the resulting debris and heavily contaminated soils were collected and buried in trenches at the center of each of the test sites. Several feet of soil were placed over each trench and the areas were fenced to limit access. The total activity of the buried material was approximately 64 curies and the total area involved was roughly 2.4 square kilometers. The areas have not been sampled recently and the possibility exists that the plutonium could leach from the burial pits and reach the groundwater.

How the Ranking Unit was Modeled

The transport pathway modeled was groundwater.

The exposure pathways analyzed were potential ingestion of groundwater and potential consumption of crops and livestock watered with groundwater.

The air pathway was not modeled because the soil was buried in trenches and fenced, therefore limiting both external exposure and mechanical resuspension. The unit was modeled by assuming that a single 2.4-acre site contained all 64 curies of plutonium. Receptor populations on the site and in nearby areas were considered. Because monitored and measured data was used in modeling this ranking unit, the critical data category is "A".

Results of the Risk-Based Modeling

The HPI Group for this ranking unit was 0 due to the depth to groundwater, low rainfall in the area, and the radionuclides' high affinity for soils. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are not projected to reach receptors.

Current Status of the Ranking Unit

In March 1988, TTR informed the Survey that a Preliminary Assessment under the Comprehensive Environmental Response, Compensation, and Liability Act/Superfund Amendment and Reauthorization Act (CERCLA/SARA) was being prepared and was scheduled by the site to be submitted to EPA in April 1988. Remedial Investigation activities for high-priority sites at TTR were scheduled to begin in 1989.

Sandia
Soil Contamination Areas at Tonopah

Description of Ranking Unit

Between 1953 and 1985, all the wastes from TTR operations were disposed of in the "old landfill" near Technical Area 3. The landfill is unlined and there is the possibility that the wastes will leach through the landfill bottom and enter the groundwater approximately 350 feet below the surface. In this area, groundwater is the only source of water for domestic and agricultural use.

How the Ranking Unit was Modeled

The transport pathway modeled was groundwater.

The exposure pathways analyzed were potential ingestion of groundwater and potential consumption of crops and livestock watered with groundwater.

Because the groundwater pathway is so critical, other transport and exposure pathways were not considered.

The unit was modeled using an assumed yearly waste inventory consisting of 25 drums of oils and 10 drums containing 25 percent Stoddard solvent, 25 percent methylene chloride, 25 percent trichloroethylene, and 25 percent 1,1,1-trichloroethane. The standard release scenario for leaking drums as described in Section 1.7.7 of this report was used to assess the potential release. Because a moderate number of assumptions were made in developing the source term, as well as a standard release scenario, the critical data category for this ranking unit is "B".

Results of the Risk-Based Modeling

This ranking unit fell into HPI Group 2 for 1,1,1-trichloroethane, trichloroethylene, and methylene chloride. This value was driven by the constituents' toxicity factors and the landfill's proximity to a well, which is a major source of water. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are characterized as generally reaching receptors at levels below those used in regulatory decisions.

Qualifiers to the Risk-Based Ranking

This ranking unit uses a standard release assumption for leaking drums, and models organics in groundwater. The qualifiers discussed in Sections 1.7.5 and 1.7.7 of this report apply.

Current Status of the Ranking Unit

In March 1988, TTR informed the Survey that a Preliminary Assessment under the CERCLA/SARA was being prepared and was scheduled by the site to be submitted to EPA in April 1988. RI activities for high-priority sites at TTR were scheduled to begin in 1989.

Sandia
Septic Tank Discharges from Tech Area 3 at Tonopah

Description of Ranking Unit

The effluent from the Photoprocessing Laboratory in Tech Area 3 is piped into a nearby open-bottomed leaching pit. Photoprocessing effluents contain potential contaminants, including silver. The pit is designed to allow liquid wastes to percolate into the underlying soils. The discharge poses a potential threat to the local groundwater, which is located 350 feet below the surface. In this area, the groundwater obtained from Well Six, which is near the leaching pit, is a major source of drinking water for TTR personnel.

How the Ranking Unit was Modeled

The transport pathway modeled was groundwater.

The exposure pathway modeled was potential ingestion of groundwater.

This ranking unit was modeled by assuming that the wastewater contains 25 mg/L of silver based on analytical data and that the waste volume was 945,000 L/yr. Because a moderate number of assumptions were made in developing the source term from this data, the critical data category for this ranking unit is "B".

Results of the Risk-Based Modeling

The HPI Group for this ranking unit was determined to be 4 as a result of the proximity of the ranking unit to a well. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that present a tertiary level of concern from the potential public hazard perspective.

Current Status of the Ranking Unit

In March 1988, TTR informed the Survey that a Preliminary Assessment under CERCLA/SARA was being prepared and was scheduled by the site to be submitted to EPA in April 1988. RI activities at high-priority sites at TTR were scheduled to begin in 1989.

Sandia
Drum Storage at Tonopah

Description of Ranking Unit

Drums containing waste oil are improperly stored at a location south of Technical Area 3. Many of the drums are either rusty and leaking or open, and soil in the area shows signs of leaks and spills. None of the drums are properly marked. The possibility exists that the leaked wastes could infiltrate through the soil and eventually contaminate the groundwater approximately 350 feet below ground level. In this area, the groundwater obtained from Well Six in Technical Area 3 is a major source of drinking water for TTR personnel.

How the Ranking Unit was Modeled

The transport pathway modeled was groundwater.

The exposure pathway analyzed was potential consumption of groundwater.

This ranking unit was modeled by assuming that the constituent was waste oil, and the standard release scenario for leaking drums as described in Section 1.7.7 of this report was used to assess the potential release. The active life of the ranking unit was set at 42 years. Because a significant number of assumptions were made in developing the source term, the critical data category for this ranking unit is "C".

Results of the Risk-Based Modeling

The HPI Group for this ranking unit was 0. The score resulted from the low inventory of contaminants. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are not projected to reach receptors.

Qualifiers to the Risk-Based Ranking

This ranking unit scores for oil in groundwater. It also uses a standard release assumption for leaking drums and models organics in groundwater. The qualifiers discussed in Sections 1.7.5 and 1.7.7 of this report apply.

Current Status of the Ranking Unit

In March of 1988, TTR informed the Survey that they are in the process of selecting a lab to analyze the contents of the drums. The drums will then be sent off-site for recycling. Contaminated soil in the yard will be removed.

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Sandia National Laboratories, Livermore
Livermore, California

410

Sandia National Laboratories, Livermore
Diesel Fuel Tank Area

Description of Ranking Unit

A leak of approximately 59,500 gallons of No. 2 diesel fuel oil has contaminated about 7,650 to 15,300 cubic meters of soil, and has created a plume of contaminated groundwater that extends about 45 feet northwest of the leak. A grounding rod was accidentally driven through a fiberglass transfer pipe in January 1975, causing the leak.

How the Ranking Unit was Modeled

The transport pathway that was modeled was groundwater.

The exposure pathways analyzed included potential ingestion of groundwater, potential inhalation and ingestion during bathing, and potential consumption of crops irrigated with groundwater.

Other transport scenarios were not considered because it was an underground release. Other exposure scenarios were not modeled for the same reason. There is little reported livestock production in the area, so exposure through groundwater-contaminated meat was not addressed.

This ranking unit was modeled as a point-source release. Because the volume of the release was known, the critical data category for this ranking unit is "A".

Results of the Risk-Based Modeling

This ranking unit fell into HPI Group 6. This value was driven by the potential for ingestion of diesel fuel-contaminated groundwater in the area. This ranking is due to the large inventory and the proximity to the potential receptor location. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that represent a secondary level of concern from the potential public hazard perspective.

Qualifiers to the Risk-Based Ranking

This ranking unit scores for fuel in groundwater. It also models organics in groundwater. The qualifiers discussed in Section 1.7.5 of this report apply.

Integration Phase Concerns

This ranking unit was identified as having environmental degradation issues associated with it. The degradation issue was groundwater contamination.

Current Status of the Ranking Unit

In March 1988, the Albuquerque Operations Office (ALO) informed the Survey team that as part of the AL Environmental Restoration Program, a Remedial Investigation (RI) plan is being developed. Field work is scheduled to begin in June, 1988, and a Feasibility Study (FS) under the Comprehensive Environmental Response, Compensation, and Liability Act/Superfund Amendment and Reauthorization Act (CERCLA/SARA) is scheduled to be completed by September 1989.

Sandia National Laboratories, Livermore
Former Fire Extinguisher Training Area

Description of Ranking Unit

The fire training area at SNLL was used for almost 20 years, from 1959 to 1978. Originally, three to four gallons of gasoline or waste solvents were poured onto the ground and ignited for each training session, which occurred approximately four times per year. In later years, gas was poured into metal pans and ignited.

How the Ranking Unit was Modeled

The transport pathway that was modeled was groundwater.

The exposure pathways analyzed included potential ingestion and inhalation of bath water, potential ingestion of groundwater, and potential consumption of crops which were irrigated with groundwater.

Surface soil and air pathways were not modeled because it was assumed the surface soil gasoline contamination was completely combusted. Other exposure scenarios were not modeled for the same reason. There is little reported livestock production in the area, so exposure through consumption of groundwater-contaminated meat was not addressed.

This is believed to be a conservatively modeled ranking unit, since it is assumed that only a small portion of the gas evaporated or was ignited, and that all the gasoline was poured on the ground. Because a significant number of assumptions were made in modeling this ranking unit, the critical data category is "C".

Results of the Risk-Based Modeling

This ranking unit fell into HPI Group 0. This is due to the low inventory of gasoline present at the ranking unit. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are not projected to reach receptors.

Qualifiers to the Risk-Based Ranking

This ranking unit scores for fuel in groundwater. It also models an organic in groundwater. The qualifiers discussed in Section 1.7.5 of this report apply.

Savannah River Plant
Aiken, South Carolina

SRP
M Area Settling Basin

Description of Ranking Unit

The M Area Settling Basin is part of the M Area Hazardous Waste Management Facility, which received process effluent that contained volatile degreaser solvents from the fuel and target fabrication facilities. There is a potential for contaminants from the basin to migrate to underlying groundwater, and a release to groundwater may involve a release to surface water.

How the Ranking Unit was Modeled

The transport pathway modeled was the groundwater to surface water pathway.

The exposure pathways analyzed included the potential for ingestion of fish caught in surface waters and the potential for accidental ingestion of surface water while swimming.

Ingestion of groundwater was not modeled because there are no drinking water wells downgradient from the M Area Settling Basin. The irrigation exposure scenario was not modeled because neither the on-site wells nor surface water are used for this purpose.

The source term data were taken from the M Area Settling Basin and Vicinity Environmental Information Document, the M Area Hazardous Waste Management Facility Post Closure Care Permit Groundwater Monitoring and Corrective Action Program 1987 Annual Report, and the Effectiveness of the M Area Groundwater Remedial Action Program September 1985 - September 1986. Since site-published studies were used to develop the source term, the critical data category for this ranking unit is "A".

Results of the Risk-Based Modeling

The ranking unit resulted in HPI Group 7. The potential for consumption of tetrachloroethylene in fish along with the potential for accidental ingestion of surface water while swimming drove the ranking. Tetrachloroethylene resulted in this HPI Group because of its larger inventory and its higher bioaccumulation factor in fish. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that represent a secondary level of concern from the potential public hazard perspective.

Qualifiers to the Risk-Based Ranking

This ranking unit involves the modeling of organic contaminants in groundwater and surface water. The qualifiers discussed in Section 1.7.5 of this report apply.

Integration Phase Concerns

This ranking unit was identified as having environmental degradation issues associated with it. The degradation issue was groundwater contamination of the shallow aquifer.

Regulatory Aspects of the Ranking Unit

The M-Area hazardous waste management facility (HWMF), part of which is the settling basin, is permitted under South Carolina Hazardous Waste Permit No. SC1890008989. An approved Part B permit was issued on September 30, 1987. The HWMF is currently being closed per a closure plan approved by the South Carolina Department of Health and Environmental Control (SCDHEC) in March 1987.

Current Status of the Ranking Unit

In March 1988, SRP informed the Survey that a permitted remedial action program is underway to remove volatile organic groundwater contamination by air stripping. Since startup in 1985, over 150,000 pounds of volatile organics has been removed from the groundwater. Air and surface water discharges from the air stripper system meet all permitted limits. In addition, vacuum extraction technology is being tested to address vadose zone contamination. Groundwater contamination assessment continues through the use of over 200 monitor wells which surround the contaminated area. Monitoring results and assessments regarding the effectiveness of the remedial action program are provided to SCDHEC on a quarterly and annual basis.

SRP
Unplanned Releases of Tritium

Description of Ranking Unit

The Tritium Production Facility (232/4/8H) has the potential for unplanned tritium releases. Several historical accidental tritium releases have occurred. Such releases of tritium may be inhaled by the surrounding population and assimilated by regional crops consumed by the surrounding population.

How the Ranking Unit was Modeled

The transport pathway modeled was the air release pathway.

The exposure pathways analyzed included the potential for inhalation of tritium by the surrounding population and the potential for consumption of crops and crop-fed livestock products by the surrounding population.

The source term was derived from historical release data. To simulate an unplanned release, an additional 150,000 curies of tritium was added to the annual planned release of 250,000 curies from the Tritium Production Facility stacks (see ranking unit entitled "Tritium Air Sources"). Since a moderate number of assumptions were made in deriving the release rate and in determining the agricultural production data, the critical data category for this ranking unit is "B".

Results of the Risk-Based Modeling

The ranking unit resulted in HPI Group 7. The potential for consumption of tritium in crops and crop-fed livestock products drove the ranking. Accidental tritium releases are the reason for this HPI Group because these areas are responsible for a significant portion of the tritium released to the atmosphere from the SRP. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit

with those environmental problems that represent a secondary level of concern from the potential public hazard perspective. This ranking unit was one of the seven that the Survey is reviewing in more depth. The HPI Group in which this ranking unit falls is characterized as encompassing moderate concentrations. This ranking unit, however, results in low, not moderate, individual doses. These doses are well within regulatory limits for radionuclides.

Regulatory Aspects of the Ranking Unit

Tritium releases from SRP are regulated by the National Emission Standards for Hazardous Air Pollutants (NESHAP) provision of the Clean Air Act. The Federal facilities limit for all radionuclides is 25 mrem/year at the plant boundary. The historical SRP atmospheric dose has been about 1 mrem/year which includes routine and unplanned tritium releases.

Current Status of the Ranking Unit

In March 1988, SRP informed the Survey that the Replacement Tritium Facility, currently being constructed, for process and security reasons will have additional tritium containment features which will lower routine tritium emissions and will further reduce the potential for unplanned releases. Construction is scheduled to be complete in late 1990.

SRP
Tritium Air Sources

Description of Ranking Unit

Approximately 695,000 curies of tritium are released to the atmosphere from the SRP annually. Sources of atmospheric tritium emissions at the SRP include the Tritium Production Facility (232/4/8H), the Heavy-Water Rework Facility (420D), the reactor disassembly and seepage basins (through evaporation), the reactor stacks, the Separations Facility (292F/292H), the F and H Areas seepage basins (through evaporation), and the Receiving Basin for Off-Site Fuels (RBOF) Facility (244H). There is a potential for emissions of tritium to be inhaled by the surrounding population and assimilated by regional crops consumed by the surrounding population.

How the Ranking Unit was Modeled

The transport pathway modeled was the air release pathway.

The exposure pathways analyzed included the potential for inhalation of tritium by the surrounding population and the potential for consumption of crops and crop-fed livestock products by the surrounding population.

The source term was derived from measured release data. Since a moderate number of assumptions were made in deriving the release rate and in determining the agricultural production data, the critical data category for this ranking unit is "B".

Results of the Risk-Based Modeling

The ranking unit resulted in HPI Group 7. The potential for consumption of tritium from the F and H Areas in crops and livestock drove the ranking. Tritium releases from F and H Areas are the reason for this HPI Group because these areas are responsible for a significant portion of the quantity of tritium released to the atmosphere from the SRP. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that represent a secondary level of concern from the potential public hazard perspective. This ranking unit was one of the seven that the Survey is reviewing in more depth. The HPI Group in which this ranking unit falls is characterized as encompassing moderate concentrations. This ranking unit, however, results in low, not moderate, individual doses. These doses are well within regulatory limits for radionuclides.

Regulatory Aspects of the Ranking Unit

Tritium releases from SRP are regulated by the NESHAP provision of the Clean Air Act. The Federal facilities limit for all radionuclides is 25 mrem/year at the plant boundary. The historical SRP atmospheric dose has been about 1 mrem/year which includes routine and unplanned tritium releases.

Current Status of the Ranking Unit

In March 1988, SRP informed the Survey that the total plant release of tritium for 1987 is 540,000 curies, which is higher than the 425,000 curies released in 1986, but less than the 670,000 curies released in 1985. The Replacement Tritium Facility, currently under construction and expected to be in operation in late 1990, is projected by the site to greatly reduce the tritium release from tritium operations.

SRP
Sediments in Steel Creek Corridor

Description of Ranking Unit

Prior to 1961, secondary cooling water and disassembly basin effluents from L- and P- Reactor were discharged to Steel Creek, which empties directly into the Savannah River. Approximately 276 curies of cesium-137 have been released to the creek, and contamination has been measured in the floodplain sediments as well as in the delta. Approximately 67 curies are estimated to remain in the floodplain sediments. Cesium-137 may be entering surface water from these contaminated sediments.

How the Ranking Unit was Modeled

The transport pathway modeled was the direct discharge to surface water pathway.

The exposure pathways analyzed included the potential for ingestion of surface water, the potential for bathing with surface water, the potential for ingestion of fish caught in surface waters, and the potential for accidental ingestion of surface water and direct exposure to surface water during recreational activities.

The irrigation exposure scenario was not modeled because surface water is not used for this purpose.

The source term data were derived from measured and predicted release rates. Since predicted release data were used to develop the source term, the critical data category for this ranking unit is "B".

Results of the Risk-Based Modeling

The ranking unit resulted in HPI Group 6. The potential for consumption of cesium-137 in surface water drove the ranking. Cesium-137 scored this high because of its level of radioactivity. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that represent a secondary level of concern from the potential public hazard perspective.

Integration Phase Concerns

This ranking unit was identified as having environmental degradation issues associated with it. The degradation issue was on-site soil contamination.

SRP
Burial Grounds

Description of Ranking Unit

The Radioactive Waste Burial Grounds, centrally located at the SRP, are burial sites for solid radioactive waste, and are used to store all radioactive shipments from other DOE facilities. There is a potential for contaminants from the burial grounds to migrate to underlying groundwater via rainfall infiltration, and a release to groundwater may involve a release to surface water.

How the Ranking Unit was Modeled

The transport pathway modeled was the groundwater to surface water pathway.

The exposure pathways analyzed included the potential for ingestion of surface water, the potential for bathing with surface water, the potential for ingestion of fish caught in surface waters, and the potential for accidental ingestion of surface water and direct exposure to surface water during recreational activities.

The groundwater transport pathway was not modeled because of the head reversal in this area between the aquifer in which on-site drinking water wells are screened and the overlying formations.

The irrigation exposure scenario was not modeled because neither the on-site wells nor surface water are used for this purpose. The resuspension exposure scenario was not modeled because most of the waste deposited is containerized and then the burial trenches are backfilled with a minimum of 1.2 meters of soil.

The source term data were taken from the Radioactive Waste Burial Grounds Environmental Information Document. Since site-published studies were used to develop the source term, the critical data category for this ranking unit is "A".

Results of the Risk-Based Modeling

The ranking unit resulted in HPI Group 6. The potential for consumption of tritium in surface water drove the ranking. Tritium was the reason for this HPI Group because of its very high solubility and its very low equilibrium coefficient (i.e., low affinity for soils). This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that represent a secondary level of concern from the potential public hazard perspective.

Qualifiers to the Risk-Based Ranking

This ranking unit involves the modeling of organic contaminants in groundwater and surface water. The qualifiers discussed in Section 1.7.5 of this report apply.

Integration Phase Concerns

This ranking unit was identified as having environmental degradation issues associated with it. The degradation issue was groundwater contamination of the shallow aquifer.

Regulatory Aspects of the Ranking Unit

The Radioactive Waste Burial Grounds is being characterized and assessed under the Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) Program as mandated by the SCDHEC/U.S. Environmental Protection Agency (EPA) Region IV.

Current Status of the Ranking Unit

In March 1988, SRP informed the Survey that there has been no change in activity at the active Radioactive Burial Grounds since the Survey was conducted.

SRP
Tritium in Surface Water

Description of Ranking Unit

Releases of wastewaters containing tritium to on-site streams, lakes, and seepage basins occur at SRP. Tritium is released to the streams directly or through migration from seepage basins. Of the 25,030 curies of tritium released in 1985, 18,910 curies were attributed to migration from seepage basins; therefore, 6120 curies were discharged directly to the streams. The releases of wastewaters containing tritium to seepage basins were modeled in the ranking unit entitled "Active Seepage Basins".

How the Ranking Unit was Modeled

The transport pathway modeled was the direct discharge to surface water pathway.

The exposure pathways analyzed included the potential for ingestion of surface water, the potential for bathing with surface water, the potential for ingestion of fish caught in surface waters, and the potential for accidental ingestion of surface water and direct exposure to surface water during recreational activities.

The irrigation exposure scenario was not modeled because surface water is not used for this purpose.

The source term data were derived from the 1985 measured release of tritium to the on-site streams, lakes, and seepage basins. Since this release rate was assumed to remain constant over the projected operational life of the plant, the critical data category for this ranking unit is "B".

Results of the Risk-Based Modeling

The ranking unit resulted in HPI Group 7. The potential consumption of tritium in surface water drove the ranking. Tritium scored this high because of its level of radioactivity. This HPI Group, as explained in Section 1.7.4 of this report would place this ranking unit with those environmental problems that represent a secondary level of concern from the potential public hazard perspective. This ranking unit was one of the seven that the Survey is reviewing in more depth. The HPI Group in which this ranking unit falls is characterized as encompassing moderate concentrations. This ranking unit, however, results in low, not moderate, individual doses. These doses are well within regulatory limits for radionuclides.

Regulatory Aspects of the Ranking Unit

There has been no change in the regulatory status or plant operations regarding the release of tritium to SRP surface waters.

Current Status of the Ranking Unit

In March 1988, SRP informed the Survey that in November 1988 the F/H Effluent Treatment Facility will begin discharging treated effluent to Upper Three Runs Creek. This discharge will result in an increase in plant tritium discharges to the Savannah River. However, concentrations in the Savannah River are predicted by the site to be well below the EPA guide of 20 pCi/mL for a 4-mrem dose.

SRP
Active Seepage Basins

Description of Ranking Unit

The F and H Areas Seepage Basins have been in operation since 1955 for the handling of liquid wastes containing low-level radioactivity and chemicals from the F and H Areas Separations Facilities. The reactor seepage basins have received low-level radioactive wastewater since 1957. Present operation of the seepage basins results in the release of contaminants to the soil column and possibly to groundwater via leachate and rainfall infiltration, and release to groundwater may involve a release to surface water.

How the Ranking Unit was Modeled

The transport pathways that were modeled include the groundwater and the groundwater to surface water pathways.

The exposure pathways analyzed included the potential for ingestion of groundwater, the potential for ingestion of surface water, the potential for bathing

with surface water, the potential for ingestion of fish caught in surface waters, and the potential for accidental ingestion of surface water and direct exposure to surface water during recreational activities.

The irrigation exposure scenario was not modeled because neither the on-site wells nor surface water are used for this purpose. The groundwater transport pathway was not modeled for the F and H Areas Seepage Basins because of the head reversal in the F and H Areas between the aquifer in which on-site drinking water wells are screened and the overlying formations.

The source term data were taken from the following Environmental Information Documents: F Area Seepage Basins, H Area Seepage Basins, and Reactor Seepage Basins. Since site-published studies were used to develop the source term, the critical data category for this ranking unit is "A".

Results of the Risk-Based Modeling

The ranking unit resulted in HPI Group 6. The potential for consumption of tritium in surface water drove the ranking. Tritium was the driving constituent for this HPI Group because of its higher solubility, its very low equilibrium coefficient (i.e., low affinity for soils), and its level of radioactivity. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that represent a secondary level of concern from the potential public hazard perspective.

Integration Phase Concerns

This ranking unit was identified as having environmental degradation issues associated with it. The degradation issue was groundwater contamination of the shallow aquifer.

Regulatory Aspects of the Ranking Unit

The F- and H-Area Seepage Basins are regulated under RCRA.

Current Status of the Ranking Unit

In March 1988, SRP informed the Survey that as mandated under RCRA, discharges to the F- and H-Area Seepage basins will cease in November 1988. The basins will be closed under closure plans which will be approved by SCDHEC. The closure plans are currently being prepared and the site intends to submit them to SCDHEC during April 1988.

SRP
H Area Drainage Ditch

Description of Ranking Unit

A previous liquid waste spill in the 241 H Area Tank Farm resulted in cesium-137 contamination of soil and sediment along a drainage ditch that currently discharges through Outfall H008. Cesium-137 may be entering surface water from these contaminated soils and sediments.

How the Ranking Unit was Modeled

The transport pathway modeled was the direct discharge to surface water pathway.

The exposure pathways analyzed included the potential for ingestion of surface water, the potential for bathing with surface water, the potential for ingestion of fish caught in surface waters, and the potential for accidental ingestion of surface water and direct exposure to surface water during recreational activities.

The irrigation exposure scenario was not modeled because surface water is not used for this purpose.

The source term data were derived from the report, Waste Management Operations, Final Environmental Impact Statement (ERDA-1537, September 1977).

Since a published study was used to develop the source term, the critical data category for this ranking unit is "A".

Results of the Risk-Based Modeling

The ranking unit resulted in HPI Group 4. The potential for consumption of cesium-137 in surface water drove the ranking. Cesium-137 was the reason for this HPI Group because of its level of radioactivity. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that present a tertiary level of concern from the potential public hazard perspective.

SRP
Animal Contamination

Description of Ranking Unit

Analyses have identified elevated concentrations of cesium-137 in deer and hogs at the SRP. These concentrations may result in doses to members of the public who consume the contaminated animals.

How the Ranking Unit was Modeled

The exposure pathway modeled was the potential for ingestion of animal meat.

Annual hunts are conducted at SRP to control the deer and hog population and to reduce animal-automobile accidents. The 1985 hunts yielded 1,022 deer and 78 hogs, while the 1984 hunt yielded 1,038 deer and 104 hogs. The average of the two years' hunts was used in modeling this ranking unit. All animals were monitored for radioactivity with portable sodium-iodide detectors before they were released for consumption by the hunters. Average measured radiation levels of 7 pCi/g in deer meat and 3 pCi/g in hog meat were reported in the SRP Environmental Report for 1985, Vol. I. The average measured radiation level in off-site deer meat reported was 6 pCi/g; therefore, it was assumed that the difference (1 pCi/g) was attributable to exposure received by on-site deer. It should be noted that the difference could be statistically insignificant. There were no background data presented for hog meat. Dressed weights of 30 lb and 86.4 lb were assumed for individual deer and hogs, respectively. It was assumed, then, that four people consumed the meat of

one animal over a one-year period. Since a moderate number of assumptions were made in determining the population that consumes the animal meat and concerning the significance of the measured levels relative to background, the critical data category for this ranking unit is "B".

Results of the Risk-Based Modeling

The ranking unit resulted in HPI Group 5. The potential for consumption of cesium-137 in deer meat drove the ranking. The potential for consumption of cesium-137 in hog meat also resulted in HPI Group 5. Cesium-137 scored in this HPI Group because of its level of radioactivity. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that present a tertiary level of concern from the potential public hazard perspective.

SRP
Airborne Mercury Emissions

Description of Ranking Unit

Mercury is used in process operations in the H Area Separations Facility and the H Area Tritium Facility, which results in emissions of mercury to the following process stacks: 292H Main Stack, 232H Stacks 1 & 2, 234H Stack, 242H Evaporator Stack, 241F/H Stacks, and 242F Stack. There is a potential for stack emissions of mercury to be inhaled by the surrounding population.

How the Ranking Unit was Modeled

The transport pathway modeled was the air release pathway.

The exposure pathways analyzed included the potential for inhalation of mercury by the surrounding population and the potential for consumption of crops and crop-fed livestock products by the surrounding population.

The source term was derived from measured release data. Since a moderate number of assumptions were made in deriving the release rate and in determining the agricultural production data, the critical data category for this ranking unit is "B".

Results of the Risk-Based Modeling

The ranking unit resulted in HPI Group 4. The potential consumption of mercury in crops and livestock drove the ranking. Mercury was the driving constituent for this HPI Group because of its toxicity and because of the quantity released. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that present a tertiary level of concern from the potential public hazard perspective.

Regulatory Aspects of the Ranking Unit

The air emission of mercury from SRP is within the Clean Air Act standard of 200 lb/year. Mercury emissions are also within the limit (0.25 $\mu g/m^3$ at plant boundary) of the SCDHEC Air Toxic Policy.

Current Status of the Ranking Unit

In March 1988, SRP informed the Survey that recent studies by the site indicated that the annual air emissions of mercury from SRP should be less than 12 lb/yr: 6.3 lb/yr (with a maximum theoretical capacity of 10.8 lb/yr) from H Canyon operations, 0.5 lb/yr from tritium operations, and less than 0.5 lb/yr from waste tank farms operations. The site reports that because of the mercury reduction program, H Canyon operations uses only about 18 percent of the mercury used in the previous years, thus the air emission of mercury has decreased from 64.5 lb/yr in 1986 (maximum theoretical capacity of 104.0 lb/yr) to 6.3 lb/yr in 1987 (with a maximum theoretical capacity of 10.8 lb/yr).

SRP
New TNX Basin

Description of Ranking Unit

Since 1980, the New TNX Basin has received wastewater discharged from the TNX engineering development facility and is located in the CMX-TNX Area, approximately 2,000 feet from the Savannah River. Outfalls from this basin discharge to a marshy area and may eventually reach surface water.

How the Ranking Unit was Modeled

The transport pathway modeled was the direct discharge to surface water pathway.

The exposure pathways analyzed included the potential for ingestion of surface water, the potential for bathing with surface water, the potential for ingestion of fish caught in surface waters, and the potential for accidental ingestion of surface water and direct exposure to surface water during recreational activities.

The irrigation exposure scenario was not modeled because surface water is not used for this purpose.

The source term data were taken from the New TNX Basin Environmental Information Document. Since site-published studies were used to develop the source term, the critical data category for this ranking unit is "A".

Results of the Risk-Based Modeling

The ranking unit resulted in HPI Group 3. The potential for consumption of uranium-238 in surface water drove the ranking. Uranium-238 was the reason for this HPI Group because of its level of radioactivity. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are characterized as generally reaching receptors at levels below those used in regulatory decisions.

Regulatory Aspects of the Ranking Unit

On September 30, 1987, the New TNX Basin was listed in the SRP Hazardous Waste Part B Permit issued by the SCDHEC and declared a solid waste management unit per Part V.a.1 of the permit. As required by the permit, an RFI is to be completed, and that process has started with the development of a guidance document

scheduled to be issued April 1988. Based upon the results of the RFI, characterization data and closure options for the basin will be evaluated.

Current Status of the Ranking Unit

In March 1988, SRP informed the Survey that the New TNX Basin is currently an active waste site. The basin is slated to be inactive by June 1988 when the TNX Effluent Treatment Facility (ETF) becomes operational.

SRP
Savannah River Swamp

Description of Ranking Unit

Past effluent discharges from P Reactor to Steel Creek have contaminated (mostly with cesium-137) the Savannah River Swamp, part of which is on private property known as the Steel Creek Plantation. Steel Creek Landing, which is located adjacent to SRP, was selected to be the ranking unit. This area is used by the local community for recreational activities; therefore, a potential for exposure through direct exposure to the contaminated swamp soils and sediment exists.

How the Ranking Unit was Modeled

The exposure pathway modeled was the potential for direct exposure to contaminated soils and sediments during recreational activities.

Groundwater exposure scenarios were not modeled because there are no wells downgradient from the Steel Creek Plantation, and resuspension was not modeled because the swamp soils and sediments are too wet. The surface water exposure scenarios associated with this ranking unit were modeled in the ranking unit entitled Sediments in Steel Creek Corridor".

The source term data were taken from measured swamp radiation levels reported in the SRP Environmental Report for 1985, Vol. II. Since a moderate number of assumptions were made in determining the population participating in recreational activities at Steel Creek Landing, the critical data category for this ranking unit is "B".

Results of the Risk-Based Modeling

The ranking unit resulted in HPI Group 3 for cesium-137. This is due to measured radiation levels in the swamp and sediment. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are characterized as generally reaching receptors at levels below those used in regulatory decisions.

Integration Phase Concerns

This ranking unit was identified as having environmental degradation issues associated with it. The degradation issue was off-site soil contamination.

SRP
Old TNX Basin

Description of Ranking Unit

Between 1958 and 1980, the Old TNX Basin received wastewater discharged from the TNX development facility. The basin is located in the CMX-TNX Area, approximately 1,000 feet from the Savannah River. The outfall from this basin discharged to a marshy area and may have eventually reached surface water. The basin was filled with soil and a clay cap was placed over the top in 1981, but decontamination of the outfall delta has not occurred. The ranking unit modeled was the marshy outfall delta.

How the Ranking Unit was Modeled

The transport pathway modeled was the direct discharge to surface water pathway.

The exposure pathways analyzed included the potential for ingestion of surface water, the potential for bathing with surface water, the potential for ingestion of fish caught in surface waters, and the potential for accidental ingestion of surface water and direct exposure to surface water during recreational activities.

The irrigation exposure scenario was not modeled because surface water is not used for this purpose.

The source term data were taken from the Old TNX Basin Environmental Information Document. Since site-published studies were used to develop the source term, the critical data category for this ranking unit is "A".

Results of the Risk-Based Modeling

The ranking unit resulted in HPI Group 1. The potential for consumption of thorium-232 in fish along with the potential for accidental ingestion of surface water and direct exposure to surface water during recreational activities drove the ranking. Thorium-232 was the reason for this HPI Group because of its level of radioactivity. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are characterized as generally reaching receptors at levels below those used in regulatory decisions.

Integration Phase Concerns

This ranking unit was identified as having environmental degradation issues associated with it. The degradation issue was on-site soil contamination. Therefore, the ranking for this ranking unit was adjusted.

Regulatory Aspects of the Ranking Unit

The Old TNX Seepage Basin is being characterized and assessed under the RFI Program as mandated by the SCDHEC/EPA Region IV.

Current Status of the Ranking Unit

In March 1988, SRP informed the Survey that there has been no change in activity at this site since the Survey was conducted.

SRP
1,1,1-Trichloroethane Release from M Area

Description of Ranking Unit

There are atmospheric emissions of 1,1,1-trichloroethane from degreasing operations in the fuel and target fabrication facilities (313M, 320M, and 321M). There is a potential for emissions of 1,1,1-trichloroethane to be inhaled by the surrounding population and deposited on regional crops consumed by the surrounding population.

How the Ranking Unit was Modeled

The transport pathway modeled was the air release pathway.

The exposure pathways analyzed included the potential for inhalation of 1,1,1-trichloroethane by the surrounding population and the potential for consumption of crops and crop-fed livestock products by the surrounding population. The source term was derived from measured release data. Since a moderate number of assumptions were made in deriving the release rate and in determining the agricultural production data, the critical data category for this ranking unit is "B".

Results of the Risk-Based Modeling

The ranking unit resulted in HPI Group 1. The potential for inhalation of 1,1,1-trichloroethane drove the ranking. Emissions of 1,1,1-trichloroethane resulted in this HPI Group because of its toxicity. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are characterized as generally reaching receptors at levels below those used in regulatory decisions.

Regulatory Aspects of the Ranking Unit

The emission of Freon-113 or 1,1,1-trichloroethane to the atmosphere is not currently regulated by Federal or state agencies.

Current Status of the Ranking Unit

In March 1988, SRP informed the Survey that 1,1,1-trichloroethane has been replaced by Freon-113 in the M-Area degreasing operation since early 1988. The emission rate of Freon-113 is about the same as that for 1,1,1-trichloroethane, i.e., 200 tons/yr. The hazard to humans from Freon-113 is estimated to be about one-third of the hazard from 1,1,1-trichloroethane (based on OSHA permissible exposure limits: 350 ppm vs. 1000 ppm). To eliminate the emission of these ozone-depleting chlorofluorocarbons to the atmosphere, SRP is expecting to use a biodegradable detergent for all 300 Area processes by mid-1989.

SRP
Sanitary Sludge Lagoon

Description of Ranking Unit

The Sanitary Sewage Sludge Disposal Lagoon is an unlined surface impoundment south of the Central Shops Area of SRP. Since 1972, the lagoon has been used to dispose of sanitary sewage sludge from the 17 package wastewater treatment plants at SRP. Present operation of the sludge disposal lagoon results in the release of sludge contaminants to the soil column and possibly to groundwater as sludge liquid infiltrates, and a release to groundwater may involve a release to surface water.

How the Ranking Unit was Modeled

The transport pathways that were modeled include the groundwater and the groundwater to surface water pathways.

The exposure pathways analyzed included the potential for ingestion of groundwater, the potential for ingestion of fish caught in surface waters, and the potential for accidental ingestion of surface water while swimming.

The irrigation exposure scenario was not modeled because neither the on-site wells nor surface water are used for this purpose.

There is no information available on the types and concentrations of contaminants present in the sludge or the lagoon. The source term data were derived from an EPA report discussing the toxic contaminants likely to be found in leachate from municipal sludges. Since a significant number of assumptions were made in determining the source term for this ranking unit, the critical data category for this ranking unit is "C".

Results of the Risk-Based Modeling

The ranking unit resulted in HPI Group 0 for both transport scenarios for all of the contaminants modeled. This ranking unit resulted in this HPI Group because of the small inventories of the contaminants modeled. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are not projected to reach receptors.

Qualifiers to the Risk-Based Ranking

This ranking unit involves the modeling of organic contaminants in groundwater and surface water. The qualifiers discussed in Section 1.7.5 of this report apply.

Regulatory Aspects of the Ranking Unit

A Best Management Practices (BMP) plan for the disposal site is being developed. Once the plan is developed, the sludge will be removed and the lagoon closed per the approved closure plan.

Current Status of the Ranking Unit

In March 1988, SRP informed the Survey that since the time of the Survey, representative core samples have been collected of the sanitary sludge in this lagoon as part of a SCDHEC-approved closure plan (March 12, 1986). These data show that contaminant concentration levels are within acceptable EPA and SCDHEC guidelines for land application of sanitary sludge. The closure plan calls for sludge to be removed and applied to SCDHEC-approved disposal areas, and the basin will be closed per a SCDHEC-approved closure plan.

SRP
K, L, P, & R Areas Nonradioactive Pits and Piles

Description of Ranking Unit

This ranking unit is an aggregation of inactive nonradioactive waste sites in K, L, P, & R Areas, including K, L, & R Areas Burning/Rubble Pits, Road A Chemical Basin, CMP Pits, L Area Oil & Chemical Basin, and L Area Acid/Caustic Basin. There is a potential for contaminants from these waste sites to migrate to underlying groundwater via leachate and rainfall infiltration, and a release to groundwater may involve a release to surface water.

How the Ranking Unit was Modeled

The transport pathways that were modeled include the groundwater and the groundwater to surface water pathways.

The exposure pathways analyzed included the potential for ingestion of groundwater, the potential for ingestion of surface water, the potential for bathing with surface water, the potential for ingestion of fish caught in surface waters, and the potential for accidental ingestion of surface water while swimming.

The irrigation exposure scenario was not modeled because neither the on-site wells nor surface water are used for this purpose.

The source term data were taken from the following Environmental Information Documents: Burning/Rubble Pits, Road A Chemical Basin, CMP Pits, L Area Oil and Chemical Basin, Acid/Caustic Basins, and Selection of Chemical Constituents and Estimation of Inventories for Environmental Analysis of Savannah River Plant Waste Sites. Since site-published studies were used to develop the source term, the critical data category for this ranking unit is "A".

Results of the Risk-Based Modeling

The ranking resulted in HPI Group 1. The potential for consumption of tetrachloroethylene in fish along with the potential for accidental ingestion of surface water while swimming drove the ranking. Tetrachloroethylene was the reason for this HPI Group because of its very high solubility, its very low equilibrium coefficient (i.e., low affinity for soils), and its bioaccumulation factor in fish. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are characterized as generally reaching receptors at levels below those used in regulatory decisions.

Qualifiers to the Risk-Based Ranking

This ranking unit involves the modeling of organic contaminants in groundwater and surface water. The qualifiers discussed in Section 1.7.5 of this report apply.

Regulatory Aspects of the Ranking Units

These inactive nonradioactive pits and piles are being characterized and assessed under the RFI Program as mandated by the SCDHEC/EPA Region IV. The Road A Chemical Basin, CMP Pits, L Area Oil & Chemical Basin and the L Area Acid/Caustic Basin are also addressed under the RFI Program.

Current Status of the Ranking Unit

In March 1988, SRP informed the Survey that there has been no change in activity at these sites since the Survey was conducted.

SRP
C, F, H, & CS Areas Nonradioactive Pits and Piles

Description of Ranking Unit

This ranking unit is an aggregation of inactive nonradioactive waste sites in C, F, H, & CS Areas, including C & F Areas Burning/Rubble Pits, Ford Building Seepage Basin, Old H Area Seepage Basin, Hydrofluoric Acid Spill Area, and Radioactive Waste Burial Ground No. 643-G. There is a potential for contaminants from these waste sites to migrate to underlying groundwater via leachate and rainfall infiltration, and a release to groundwater may involve a release to surface water.

How the Ranking Unit was Modeled

The transport pathways that were modeled include the groundwater and the groundwater to surface water pathways.

The exposure pathways analyzed included the potential for ingestion of groundwater, the potential for ingestion of surface water, the potential for bathing with surface water, the potential for ingestion of fish caught in surface waters, and the potential for accidental ingestion of surface water while swimming.

The groundwater transport pathway was not modeled for the F Area waste sites because of the head reversal in the F and H Areas between the aquifer in which on-site drinking water wells are screened and the overlying formations. The irrigation exposure scenario was not modeled because neither the on-site wells nor surface water are used for this purpose.

The source term data were taken from the following Environmental Information Documents: Burning/Rubble Pits, Ford Building Seepage Basin, Old F Area Seepage Basin, Hydrofluoric Acid Spill Area, Radioactive Waste Burial Grounds, and Selection of Chemical Constituents and Estimation of Inventories for Environmental Analysis of Savannah River Plant Waste Sites. Since site-published studies were used to develop the source term, the critical data category for this ranking unit is "A".

Results of the Risk-Based Modeling

The ranking unit resulted in HPI Group 3. The potential for consumption of trichloroethylene in fish along with the potential for accidental ingestion of surface water while swimming drove the ranking. Trichloroethylene was the reason for this HPI Group because of its very high solubility, its very low equilibrium coefficient (i.e., low affinity for soils), and its bioaccumulation factor in fish. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are characterized as generally reaching receptors at levels below those used in regulatory decisions.

Qualifiers to the Risk-Based Ranking

This ranking unit involves the modeling of organic contaminants in groundwater and surface water. The qualifiers discussed in Section 1.7.5 of this report apply.

Regulatory Aspects of the Ranking Unit

These inactive radioactive pits and piles are being characterized and assessed under the RFI Program as mandated by the SCDHEC/EPA Region IV.

Current Status of the Ranking Unit

In March 1988, SRP informed the Survey that the inactive H-Area Seepage Basin is being addressed under RCRA. A closure plan is currently being developed for this basin, and it will be submitted to SCDHEC in April 1988. There has been no change in activity at all other sites since the Survey was conducted.

SRP
A & M Areas Nonradioactive Pits and Piles

Description of Ranking Unit

This ranking unit is an aggregation of inactive nonradioactive waste sites located in A & M Areas, which includes A Area Burning/Rubble Pits, Silverton Road Waste Site, Metallurgical Laboratory Basin, Metals Burning Pit/Miscellaneous Chemical Basin, and Savannah River Laboratory Seepage Basin. There is a potential for contaminants from these waste sites to migrate to underlying groundwater, and a release to groundwater may involve a release to surface water.

How the Ranking Unit was Modeled

The transport pathway modeled was the groundwater to surface water pathway.

The exposure pathways analyzed included the potential for ingestion of surface water, the potential for bathing with surface water, the potential for ingestion of fish caught in surface waters, and the potential for accidental ingestion of surface water while swimming.

Ingestion of groundwater was not modeled because there are no drinking water wells downgradient from A and M Areas. The irrigation exposure scenario was not modeled because surface water is not used for this purpose.

The source term data were taken from the following Environmental Information Documents: Metallurgical Laboratory Basin, Savannah River Laboratory Seepage Basins, Silverton Road Waste Site, and Selection of Chemical Constituents and Estimation of Inventories for Environmental Analysis of Savannah River Plant Waste Sites. Since site-published studies were used to develop the source term, the critical data category for this ranking unit is "A".

Results of the Risk-Based Modeling

The ranking unit resulted in HPI Group 3. The potential for consumption of tetrachloroethylene in fish along with the potential for accidental consumption of surface water while swimming drove the ranking. Tetrachloroethylene was the reason for this HPI group because of its very high solubility, its very low equilibrium coefficient (i.e., low affinity for soils), and its bioaccumulation factor in fish. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are characterized as generally reaching receptors at levels below those used in regulatory decisions.

Qualifiers to the Risk-Based Ranking

This ranking unit involves the modeling of organic contaminants in groundwater and surface water. The qualifiers discussed in Section 1.7.5 of this report apply.

Regulatory Aspects of the Ranking Unit

These inactive sites are currently being characterized and assessed under the RFI Program as mandated by the SCDHEC/EPA Region IV.

Current Status of the Ranking Unit

In March 1988, SRP informed the Survey that there has been no change in activity at this site since the Survey was conducted.

SRP
D & TNX Areas Nonradioactive Pits and Piles

Description of Ranking Unit

This ranking unit is an aggregation of inactive nonradioactive waste sites located in D & TNX Areas, including the D Area Burning/Rubble Pit and TNX Burying Ground. There is a potential for contaminants from these waste sites to migrate to underlying groundwater, and a release to groundwater may involve a release to surface water.

How the Ranking Unit was Modeled

The transport pathway modeled was the groundwater to surface water pathway.

The exposure pathways analyzed included the potential for ingestion of surface water, the potential for bathing with surface water, the potential for ingestion of fish caught in surface waters, and the potential for accidental ingestion of surface water while swimming.

Ingestion of groundwater was not modeled because there are no drinking water wells downgradient from these waste sites. The irrigation exposure scenario was not modeled because surface water is not used for this purpose.

The source term data were taken from the following Environmental Information Documents: Burning/Rubble Pits, TNX Burying Ground, and Selection of Chemical Constituents and Estimation of Inventories for Environmental Analysis of Savannah River Plant Waste Sites. Since site-published studies were used to develop the source term, the critical data category for this ranking unit is "A".

Results of the Risk-Based Modeling

The ranking unit resulted in HPI Group 0 for tetrachloroethylene. This ranking unit resulted in this HPI Group because of its very small inventory. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are not projected to reach receptors.

Qualifiers to the Risk-Based Ranking

This ranking unit involves the modeling of organic contaminants in groundwater and surface water. The qualifiers discussed in Section 1.7.5 of this report apply.

Regulatory Aspects of the Ranking Unit

The D Area inactive radioactive pits and piles are being characterized and assessed under the RFI Program as mandated by the SCDHEC/EPA Region IV.

Current Status of the Ranking Unit

In March 1988, SRP informed the Survey that there has been no change in activity at these sites since the Survey was conducted.

SRP
F & H Areas Miscellaneous Radioactive Surface Contamination

Description of Ranking Unit

This ranking unit is an aggregation of the radioactive surface contamination that exists in the F and H Areas of the SRP. There is a potential for contaminants from the soils to migrate to underlying groundwater via rainfall infiltration, and a release to groundwater may involve a release to surface water.

How the Ranking Unit was Modeled

The transport pathways modeled included the groundwater to surface water and the overland runoff to surface water pathways.

The exposure pathways analyzed included the potential for ingestion of surface water, the potential for bathing with surface water, the potential for ingestion of fish caught in surface water, and the potential for accidental ingestion of surface water and direct exposure to surface water during recreational activities.

The irrigation exposure scenario was not modeled because neither the on-site wells nor surface water are used for this purpose. The resuspension transport scenario was not modeled because measures have been taken to contain or minimize the spread of the contaminated soils. The groundwater transport pathway was not modeled because of the head reversal in the F and H Areas between the aquifer in which on-site drinking water wells are screened and the overlying formations.

The source term data were derived from Sites of Radioactive Contamination on the Savannah River Plant. Since a significant number of assumptions were made in determining the source term, the critical data category for this ranking unit is "C".

Results of the Risk-Based Modeling

The ranking unit resulted in HPI Group 0 for thorium-230. This ranking unit resulted in this HPI Group because of the very small inventories of the contaminants modeled. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are not projected to reach receptors.

Qualifiers to the Risk-Based Ranking

This ranking unit includes overland runoff of contaminated soil. The qualifiers discussed in Section 1.7.5 of this report apply.

SRP
A & M Areas Miscellaneous Radioactive Surface Contamination

Description of Ranking Unit

This ranking unit is an aggregation of the radioactive surface contamination that exists in the A and M Areas of the SRP. There is a potential for contaminants from the soils to migrate to underlying groundwater via rainfall infiltration, and a release to groundwater may involve a release to surface water.

How the Ranking Unit was Modeled

The transport pathways modeled included the groundwater to surface water and the overland runoff to surface water pathways.

The exposure pathways analyzed included the potential for ingestion of surface water, the potential for bathing with surface water, the potential for ingestion of fish caught in surface water, and the potential for accidental ingestion of surface water and direct exposure to surface water during recreational activities.

Ingestion of groundwater was not modeled because there are no drinking water wells downgradient from A and M Areas. The irrigation exposure scenario was not modeled because surface water is not used for this purpose. The resuspension transport scenario was not modeled because measures have been taken to contain or minimize the spread of contaminated soils.

The source term data were derived from Sites of Radioactive Contamination on the Savannah River Plant. Since a significant number of assumptions were made in determining the source term, the critical data category for this ranking unit is "C".

Results of the Risk-Based Modeling

The ranking unit resulted in HPI Group 0 for all the contaminants. This ranking resulted in this HPI Group because of the very small inventories of the contaminants modeled. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are not projected to reach receptors.

Qualifiers to the Risk-Based Ranking

This ranking unit includes overland runoff of contaminated soil. The qualifiers discussed in Section 1.7.5 of this report apply.

SRP
L & P Areas Miscellaneous Radioactive Surface Contamination

Description of Ranking Unit

This ranking unit is an aggregation of the radioactive surface contamination that exists in the L and P Areas of the SRP. There is a potential for contaminants from the soil to migrate to underlying groundwater via rainfall infiltration, and a release to groundwater may involve a release to surface water.

How the Ranking Unit was Modeled

The transport pathways modeled included the groundwater, the groundwater to surface water, and the overland runoff to surface water pathways.

The exposure pathways analyzed included the potential for ingestion of groundwater, the potential for ingestion of surface water, the potential for bathing with surface water, the potential for ingestion of fish caught in surface water, and the potential for accidental ingestion of surface water and direct exposure to surface water during recreational activities.

The irrigation exposure scenario was not modeled because neither the on-site wells nor surface water are used for this purpose. The resuspension transport scenario was not modeled because measures have been taken to contain or minimize the spread of the contaminated soils.

The source term data were derived from Sites of Radioactive Contamination on the Savannah River Plant. Since a significant number of assumptions were made in determining the source term, the critical data category for this ranking unit is "C".

Results of the Risk-Based Modeling

The ranking unit resulted in HPI Group 0 for cesium-137, the only contaminant modeled. This ranking unit resulted in this HPI Group because of the very small inventory of cesium-137. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are not projected to reach receptors.

Qualifiers to the Risk-Based Ranking

This ranking unit includes overland runoff of contaminated soil. The qualifiers discussed in Section 1.7.5 of this report apply.

SRP
211 F/H Areas Treatment Tanks and Associated Piping

Description of Ranking Unit

Chemical feed and waste storage tanks in the 211 F/H Areas have inadequate containment should a catastrophic release occur. Such a potential release might transport radiological materials to surface water via outfall ditches. A nitric acid spill from Building 211-H that occurred January 1, 1987, was defined to be the ranking unit.

How the Ranking Unit was Modeled

The transport pathway modeled was the direct discharge to surface water pathway.

The exposure pathways analyzed included the potential for ingestion of surface water, the potential for bathing with surface water, the potential for ingestion of fish caught in surface water, and the potential for accidental ingestion of surface water and direct exposure to surface water during recreational activities.

The irrigation exposure scenario was not modeled because surface water is not used for this purpose.

The source term data were derived from a report describing the nitric acid spill from Building 211-H at the SRP. Since a moderate number of assumptions were made in determining the source term, the critical data category for this ranking unit is "B".

Results of the Risk-Based Modeling

The ranking unit resulted in HPI Group 8. The potential for consumption of plutonium-239 in surface water drove the ranking. Plutonium-239 resulted in this HPI Group because of its level of radioactivity. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems of most concern from the perspective of the potential public hazard.

Regulatory Aspects of the Ranking Unit

The site BMP plan prepared at the request of SCDHEC under the National Pollutant Discharge Elimination System (NPDES) permit included a series of projects to provide spill containment and diking for all 211 F/H radioactive and nonradioactive tanks and vessels.

Current Status of the Ranking Unit

In March 1988, SRP informed the Survey that since the Survey, project work to provide spill containment is nearly complete. All radioactive tanks/vessels are now diked and controlled. All nonradioactive tanks/vessels are now being diked and will be completed in calendar year 1988 according to the site. All 211 F/H tanks/vessels

will be provided with dikes that can contain 100 percent of the largest vessel and a 50-year rainfall event.

SRP
C, F, H, & CS Areas Underground Storage Tanks

Description of Ranking Unit

The SRP uses approximately 75 underground storage tanks (USTs) to store petroleum products. It was estimated that 25 percent of these tanks are located in the C, F, H, & CS Areas. Due to the number, size, age, and spatial distribution of these tanks, significant quantities of petroleum products could be leaking to the subsurface soil and migrating to the groundwater, and a release to groundwater may result in a release to surface water. In addition, the tanks have not been leak-tested. Therefore, the standard release scenario for USTs described in Section 1.7.7 of this report was used to assess the potential release.

How the Ranking Unit was Modeled

The transport pathways modeled included the groundwater and the groundwater to surface water pathways.

The exposure pathways analyzed included the potential for ingestion of groundwater, the potential for ingestion of surface water, the potential for bathing with surface water, the potential for ingestion of fish caught in surface water, and the potential for accidental ingestion of surface water while swimming.

The groundwater transport pathway was modeled as if the tanks were only located in the C and CS Areas because of the head reversal in the F and H Areas between the aquifer in which on-site drinking water wells are screened and the overlying formations. The irrigation exposure scenario was not modeled because neither the on-site wells nor surface water are used for this purpose.

The source term data were derived from a data base listing of SRP tanks. Since a moderate number of assumptions were made in developing the source term, the critical data category for this ranking unit is "B".

Results of the Risk-Based Modeling

The ranking unit resulted in HPI Group 4. The potential for consumption of diesel fuel in fish along with the potential for accidental ingestion of surface water while swimming drove the ranking. Diesel fuel was the reason for this HPI Group because of its toxicity and its bioaccumulation factor in fish. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that present a tertiary level of concern from the potential public hazard perspective.

Qualifiers to the Risk-Based Ranking

This ranking unit scores for fuel in groundwater and involves the modeling of organic contaminants in groundwater and surface water. The qualifiers discussed in Section 1.7.5 of this report apply.

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Regulatory Aspects of the Ranking Unit

DOE-SR and SCDHEC have amended the Memorandum of Agreement (MOA) to include underground storage tanks. When the MOA is signed, SRP will be regulated under SCDHEC UST regulations.

Permit applications for a new service station underground tank in H Area, the replacement of the two underground fuel storage tanks at the CS and the replacement of the two underground fuel storage tanks at the Central Shops (CS) service station were submitted to SCDHEC in March 1988. These tanks have a double-walled steel design with interstitial monitoring, cathodic protection, and sacrificial anodes.

Current Status of the Ranking Unit

In March 1988, SRP informed the Survey that ten underground fuel storage tanks in CS have been tested using the Hunter Leak-Locator precision test. Eight of the ten tanks passed the test. The remaining two failed the test with results indicating a leak in the piping system. One tank has been excavated and the piping repaired.

SRP
D & TNX Areas Underground Storage Tanks

Description of Ranking Unit

The SRP uses approximately 75 USTs to store petroleum products. It was estimated that 25 percent of these tanks are located in the D and TNX Areas. Due to the number, size, age, and spatial distribution of these tanks, significant quantities of petroleum products could be leaking to the subsurface soil and migrating to the groundwater, and a release to groundwater may involve a release to surface water. In addition, the tanks have not been leak-tested. Therefore, the standard release scenario for USTs discussed in Section 1.7.7 of this report was used to assess the potential release.

How the Ranking Unit was Modeled

The transport pathway modeled was the groundwater to surface water pathway.

The exposure pathways analyzed included the potential for ingestion of surface water, the potential for bathing with surface water, the potential for ingestion of fish caught in surface water, and the potential for accidental ingestion of surface water while swimming.

Ingestion of groundwater was not modeled because there are no drinking water wells downgradient from D and TNX Areas. The irrigation exposure scenario was not modeled because surface water is not used for this purpose.

The source term data were derived from a database listing of SRP tanks. Since a moderate number of assumptions were made in developing the source term, the critical data category for this ranking unit is "B".

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Results of the Risk-Based Modeling

The ranking unit resulted in HPI Group 4. The potential for consumption of diesel fuel in fish along with the potential accidental ingestion of surface water while swimming drove the ranking. Diesel fuel was the reason for this HPI Group because of its toxicity and its bioaccumulation factor in fish. The HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that present a tertiary level of concern from the potential public hazard perspective.

Qualifiers to the Risk-Based Ranking

This ranking unit scores for fuel in groundwater and involves the modeling of organic contaminants in groundwater and surface water. The qualifiers discussed in Section 1.7.5 of this report apply.

Regulatory Aspects of the Ranking Unit

DOE-SR and SCDHEC have amended the MOA to include USTs. When the MOA is signed, SRP will be regulated under SCDHEC UST regulations.

A permit application to replace the underground fuel storage tank at the D Area service station was submitted to SCDHEC in March 1988. The tank is a double-walled steel design with interstitial monitoring, cathodic protection, and sacrificial anodes.

Current Status of the Ranking Unit

In March 1988, SRP informed the Survey that it has been confirmed that the two USTs at TNX were abandoned in place in 12/85 and filled with sand.

SRP
K, L, P, & R Areas Underground Storage Tanks

Description of Ranking Unit

The SRP uses approximately 75 USTs to store petroleum products. It was estimated that 25 percent of these tanks are located in the K, L, P, & R Areas. Due to the number, size, age, and spatial distribution of these tanks, significant quantities of petroleum products could be leaking to the subsurface soil and migrating to the groundwater, and a release to groundwater may involve a release to surface water. In addition, the tanks have not been leak-tested. Therefore, the standard release scenario for USTs discussed in Section 1.7.7 of this report was used to assess the potential release.

How the Ranking Unit was Modeled

The transport pathways modeled were the groundwater and the groundwater to surface water pathways.

The exposure pathways analyzed included the potential for ingestion of groundwater, the potential for ingestion of fish caught in surface water, and the potential for accidental ingestion of surface water while swimming.

The irrigation exposure scenario was not modeled because neither the on-site wells nor surface water are used for this purpose.

The source term data were derived from a data base listing of SRP tanks. Since a moderate number of assumptions were made in developing the source term, the critical data category for this ranking unit is "B".

Results of the Risk-Based Modeling

The ranking unit resulted in HPI Group 3. The potential for consumption of diesel fuel in groundwater well drinking water drove the ranking. Diesel fuel was the reason for this HPI Group because of its toxicity and the ranking unit's proximity to receptor locations. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are characterized as generally reaching receptors at levels below those used in regulatory decisions.

Qualifiers to the Risk-Based Ranking

This ranking unit scores for fuel in groundwater and involves the modeling of organic contaminants in groundwater and surface water. The qualifiers discussed in Section 1.7.5 of this report apply.

Regulatory Aspects of the Ranking Unit

DOE-SR and SCDHEC have amended the MOA to include USTs. When the MOA is signed, SRP will be regulated under SCDHEC UST regulations.

A permit application to replace the underground fuel storage tanks at the K, L, and P area service stations was submitted to SCDHEC in March 1988. All tanks are a double-walled steel design with interstitial monitoring, cathodic protection, and sacrificial anodes.

Current Status of the Ranking Unit

In March 1988, SRP informed the Survey that the UST at the Par Pond boathouse (735-7G) was tested using the Petrotite precision test as part of the sampling effort. The tank failed the test. The tank and all contaminated soil were removed in March 1988.

SRP
A & M Areas Underground Storage Tanks

Description of Ranking Unit

The SRP uses approximately 75 USTs to store petroleum products. It was estimated that 25 percent of these tanks are located in the A & M Areas. Due to the number, size, age, and spatial distribution of these tanks, significant quantities of petroleum products could be leaking to the subsurface soil and migrating to the groundwater, and a release to groundwater may involve a release to surface water. In addition, the tanks have not been leak-tested. Therefore, the standard release scenario for USTs discussed in Section 1.7.7 of this report was used to assess the potential release.

How the Ranking Unit was Modeled

The transport pathway modeled was the groundwater to surface water pathway.

The exposure pathways analyzed included the potential for ingestion of surface water, the potential for bathing with surface water, the potential for ingestion of fish caught in surface water, and the potential for accidental ingestion of surface water while swimming.

The irrigation exposure scenario was not modeled because surface water is not used for this purpose.

The source term data were derived from a data base listing of SRP tanks. Since a moderate number of assumptions were made in developing the source term, the critical data category for this ranking unit is "B".

Results of the Risk-Based Modeling

The ranking unit resulted in HPI Group 4. The potential for consumption of diesel fuel in fish along with the potential for accidental ingestion of surface water while swimming drove the ranking. Diesel fuel was the reason for this HPI Group because of its toxicity and its bioaccumulation factor in fish. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that present a tertiary level of concern from the potential public hazard perspective.

Qualifiers to the Risk-Based Ranking

This ranking unit scores for fuel in groundwater and involves the modeling of organic contaminants in groundwater and surface water. The qualifiers described in Section 1.7.5 of this report apply.

Regulatory Aspects of the Ranking Unit

DOE-SR and SCDHEC have amended the MOA to include USTs. When the MOA is signed, SRP will be regulated under SCDHEC UST regulations.

A permit application to replace the three existing underground fuel storage tanks at the A Area service station with two tanks was submitted to SCDHEC in March 1988. Both tanks are a double-walled steel design with interstitial monitoring, cathodic protection, and sacrificial anodes.

SRP
Depleted Uranium Storage

Description of Ranking Unit

The SRP depleted uranium storage areas are used for the storage of drums of depleted uranium oxide (UO_3) powder generated during the isotope separations process at the 200F-Area. In total, 27,860 drums are stored on-site, 14,080 in F & TC/U Areas, and 13,780 in CS & R Areas and Gunsite 51. The UO_3 storage areas are of concern because of the potential for a future release of this material to the

environment resulting from drum corrosion and collapse. If the drums collapse, uranium-238 and uranium-235 may be released to the air because the powder is very fine and easily resuspended. Such an event could result in the potential for the powder to be inhaled by the surrounding population and deposited on regional crops consumed by the surrounding population. In addition, the powder could be deposited, and subsequently eroded with runoff to surface water.

How the Ranking Unit was Modeled

The transport pathways modeled included the resuspension of surface soil and the overland runoff to surface water pathways.

The exposure pathways analyzed included the potential for inhalation of depleted uranium oxide powder by the surrounding population, the potential for consumption of crops and crop-fed livestock products by the surrounding population, the potential for ingestion of surface water, the potential for bathing with surface water, the potential for ingestion of fish caught in surface water, and the potential for accidental ingestion of surface water during recreational activities.

Migration to groundwater was not modeled because of the low solubility of the powder. The irrigation exposure scenario was not modeled because surface water is not used for this purpose.

The source term data were derived from an inventory of the drums at SRP that contain depleted uranium oxide powder. Since a moderate number of assumptions were made in developing the source term, the critical data category for this ranking unit is "B".

Results of the Risk-Based Modeling

The ranking unit resulted in HPI Group 1. The potential for inhalation of uranium-238 and the potential for consumption of uranium-238 in crops and crop-fed livestock products, with 10 percent of the drums in the F & TC/U Areas collapsing, drove the ranking. Uranium-238 was the reason for this HPI Group because of its greater relative inventory. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are characterized as generally reaching receptors at levels below those used in regulatory decisions.

Qualifiers to the Risk-Based Ranking

This ranking unit includes overland runoff of contaminated soil. The qualifiers discussed in Section 1.7.5 of this report apply.

Regulatory Aspects of the Ranking Unit

There is no change in the regulatory status for the storage of uranium oxide. Uranium oxide is not regulated by EPA.

Current Status of the Ranking Unit

In March 1988, SRP informed the Survey that storage buildings in the F Area have been completed for all drums now stored outdoors in F Area. These buildings can also contain the majority of uranium oxide stored elsewhere on-site. Programs to

relocate over 30,000 drums of uranium oxide now on-site to these buildings are now in the planning stages.

Y-12 Plant
Oak Ridge, Tennessee

Y-12
Coal Ash Retention Pond/Rogers Quarry

Description of Ranking Unit

Fly ash and bottom ash slurry from the Y-12 Steam Plant is pumped to the top of Chestnut Ridge; from there, it flows into Rogers Quarry. The quarry serves as a settling pond, retaining the solids. Effluent from the pond eventually flows into surface water, carrying with it sulfate, boron, and arsenic. These pollutants also may pass through the unlined bottom of the quarry and may be transported to the surface water via the groundwater.

How the Ranking Unit was Modeled

The transport pathways that were modeled included potentially contaminated groundwater discharging to surface water and direct discharges to surface water.

The exposure pathways analyzed included potential accidental ingestion of surface water during recreational activities, potential consumption of fish caught in surface waters, potential ingestion of surface water, and potential ingestion of irrigated crops and livestock watered with surface water.

The exposure scenario of consumption of contaminated groundwater was not modeled due to the exclusive use of surface water for drinking by the surrounding communities, and because of the Survey team's assessment that surface water was the primary transport and exposure pathway.

The waste constituents modeled were sulfate, arsenic, and boron. The modeling was accomplished by back-calculating the pollutant inventories and fluxes from the measured surface water concentrations in the quarry outfall. The assumption was made that the pollutants were evenly divided between the two transport scenarios (i.e., half via the surface water route and half via the groundwater route). The recreational and utilization exposure was modeled for the downstream surface waters over a distance of 50 miles. Because of the back-calculation of the inventories, the critical data category for this ranking unit is "B".

Results of the Risk-Based Modeling

The ranking unit resulted in an HPI Group 8 for arsenic. This HPI Group is driven by arsenic's high toxicity. The arsenic values are based on current Environmental Protection Agency (EPA) cancer potency factors. These factors are currently under review and EPA has proposed that they are overly conservative. However, for modeling purposes, these values have been and will be used until EPA provides new values. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems of most concern from the perspective of the potential public hazard. This ranking unit was one of the seven that the Survey is reviewing in more depth. The Survey feels that this ranking unit is important, but that arsenic should not be considered the most important aspect of the ranking.

Current Status of the Ranking Unit

In March 1988, the site informed the Survey the following steps have been taken to mitigate the effects of this ranking unit:

- As an interim action, natural gas will be used as the primary fuel to reduce the amount of fly ash placed in Rogers Quarry.
- To eliminate the need for Rogers Quarry, a dry fly ash collector, bottom ash de-watering unit, and an ash landfill unit are to be constructed under the Steam Plant Ash Disposal Facility, a proposed line item in FY 90.
- Investigations are under way to determine the best remedial actions for the ash pond and Rogers Quarry after the ash disposal has ceased.

Y-12
Off-Site Floodplain Contamination in EFPC and BC

Description of Ranking Unit

Past wastewater disposal practices, along with accidental loss and spillage of process materials, have resulted in contamination of the floodplain of East Fork Poplar Creek (EFPC) and Bear Creek (BC). These contaminants may be released to surface water. Bear Creek does not leave the Oak Ridge Reservation; however, it does leave the Y-12 Plant site and therefore is considered "off-site".

How the Ranking Unit was Modeled

The transport pathway modeled was direct discharge of potential contaminants to surface water.

The exposure pathways analyzed included potential accidental ingestion of surface water during recreational activities, potential consumption of fish caught in surface waters, potential ingestion of surface water, and potential ingestion of irrigated crops and livestock watered with surface water.

The exposure scenario of consumption of contaminated groundwater was not modeled due to the exclusive use of surface water by the surrounding communities for drinking purposes and because of the Survey team's assessment that surface water was the primary transport and exposure pathway.

The modeling was applied to the contaminants in the floodplain soil. The recreational and utilization exposure was modeled for the downstream surface waters over a distance of 50 miles. Because an areal extent of contamination was assumed in deriving the source term, the critical data category is "B".

Results of the Risk-Based Modeling

This ranking unit fell into HPI Group 7, due to the high toxicity of arsenic. The arsenic values are based on current EPA cancer potency factors. These factors are currently under review and EPA has proposed that they are overly conservative. However, for modeling purposes, these values have been and will be used until EPA provides new values. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that represent a secondary level of concern from the potential public hazard perspective.

Qualifiers to the Risk-Based Ranking

This ranking unit involves the modeling of organic contaminants in surface water. The qualifiers discussed in Section 1.7.5 of this report apply.

Integration Phase Concerns

This ranking unit was identified as having environmental degradation issues associated with it. The degradation issue was off-site soil contamination.

Regulatory Aspects of the Ranking Unit

In March 1988, the site informed the Survey that a Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) work plan has been prepared and submitted to the appropriate regulatory agencies. This RFI was prepared as directed in part II.A.2 of the RCRA Part B Permit.

Current Status of the Ranking Unit

In March 1988, the site informed the Survey that an investigation on potential remedial alternatives has been prepared. It is anticipated that the remedial action(s) will require an Environmental Impact Statement.

Y-12
Bear Creek Valley Waste Disposal Area

Description of Ranking Unit

Within the Bear Creek Valley Waste Disposal Area are numerous disposal pits and landfills containing a variety of contaminants that can be transported off-site by surface runoff, through movement within the groundwater, or by air transport as a result of landfill off-gassing through cover vents. The waterborne pollutants may enter surface water.

How the Ranking Unit was Modeled

The transport pathways modeled were gaseous releases, overland runoff, and groundwater discharge to surface water.

The exposure pathways analyzed included potential inhalation of gaseous contaminants, potential accidental ingestion of surface water during recreational activities, potential consumption of fish caught in surface water, potential ingestion of surface water, and potential consumption of crops and livestock irrigated with surface water.

The exposure scenario of consumption of contaminated groundwater was not modeled due to the exclusive use of surface water for drinking by the surrounding communities, and because of the Survey team's assessment that surface water was the primary transport and exposure pathway.

The waste constituents modeled were arsenic, cadmium, 1,2-dichloroethane, nitrate, selenium, 1,1,1-trichloroethane, trichloroethylene, tetrachloroethylene, and uranium-238. The modeling was accomplished by back-calculating constituent

inventories from groundwater plume concentrations of volatile organic compounds, heavy metals, radioactivity, and nitrate. The recreational and utilization exposure was modeled for the downstream surface waters over a distance of 50 miles. Because of the back-calculations, the critical data category for this ranking unit is "B".

Results of the Risk-Based Modeling

For surface water being recharged by groundwater, the ranking unit resulted in HPI Group of 8 for arsenic. The HPI Group for arsenic is driven by its high toxicity. This is also a result of natural arsenic being dissolved and transported in solution by acids from the waste disposal area. The values for arsenic are based on current EPA cancer potency factors. These factors are currently under review and EPA has proposed that they are overly conservative. However, for modeling purposes, these values have been and will be used until EPA provides new values. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems of most concern from the perspective of the potential public hazard. This ranking unit was one of the seven that the Survey is reviewing in more depth. The Survey feels that this ranking unit is important, but that arsenic should not be considered the most important aspect of the ranking.

Qualifiers to the Risk-Based Ranking

This ranking unit includes overland runoff of contaminated soil and involves the modeling of organic contaminants in groundwater and surface water. The qualifiers discussed in Section 1.7.5 of this report apply.

Integration Phase Concerns

This ranking unit was identified as having environmental degradation issues associated with it. The degradation issue was the potential to impact plant life in the area.

Regulatory Aspects of the Ranking Unit

Closure is required under the directives of the RCRA Part B permit.

Current Status of the Ranking Unit

In March 1988, the site informed the Survey that remedial actions for Bear Creek Valley Disposal Area are to be conducted under two funded programs. The first is the Disposal Area Remedial Action, a sub-project of the Environmental Improvement program. The second, Closure and Post Closure Activities project (CAPCA), is funded under the Environmental Restoration Budget Category. The site reported that these closure plans have been submitted to and approved by the appropriate regulatory agencies. Closure schedules are currently under negotiation with the regulators; however, closures will begin on or before November 1988.

Y-12
Process Water Discharges

Description of Ranking Unit

Numerous waste streams discharge directly into New Hope Pond (NHP) and into EFPC. The NHP outfall flows directly into EFPC, which discharges to off-site surface waters. At the time of the on-site portion of the Survey, some of these waste streams were untreated process discharges. The untreated discharges led to National Pollutant Discharge Elimination System (NPDES) noncompliances.

How the Ranking Unit was Modeled

The transport pathway that was modeled was direct discharge of potential contaminants to surface water.

The exposure pathways analyzed included potential accidental ingestion of surface water during recreational activities, potential consumption of fish caught in surface waters, potential ingestion of surface water, and potential ingestion of crops and livestock irrigated with surface water.

The exposure scenario of consumption of potentially contaminated groundwater was not modeled due to the exclusive use of surface water for drinking by the surrounding communities, and because of the Survey team's assessment that the surface water was the primary transport and exposure pathway.

The waste constituents modeled were oil, nitrate, cadmium, and copper. The unit was modeled using the measured concentrations of the waste constituents in the pond outfall along with the discharge flow rate data for EFPC. It was assumed that the pond outfall flow constituted the entire flow of a creek into which it discharged. The recreational and utilization exposure was modeled for the downstream surface waters over a distance of 50 miles. Because monitored and measured data were used to model this ranking unit, the critical data category is "A".

Results of the Risk-Based Modeling

This ranking unit resulted in an HPI Group 6 for oil. The HPI Group for oil is driven by its large inventory in comparison to other potential contaminants in the discharge. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that represent a secondary level of concern from the potential public hazard perspective.

Qualifiers to the Risk-Based Ranking

This ranking unit scores for oil, and involves the modeling of organic contaminants in surface water. The qualifiers discussed in Section 1.7.5 of this report apply.

Integration Phase Concerns

This ranking unit was identified as having environmental degradation issues associated with it. The degradation issue was contaminants to surface water bodies.

Regulatory Aspects of the Ranking Unit

Facilities to treat process water discharges are necessary to comply with the requirements as specified in NPDES permit #TN0002968.

Current Status of the Ranking Unit

In March 1988, the site informed the Survey that eleven of twelve facilities to treat water discharges are now complete. The Steam Plant Wastewater Treatment Facility is on line and will attain compliance in the near future. The Biology Wastewater Facility is scheduled to attain compliance in March 1989.

Y-12
On-Site Mercury Contamination

Description of Ranking Unit

Current environmental contamination has resulted from the large-scale use of mercury from 1950 to 1963 in lithium isotope separation processes. The UCND Mercury Task Force concluded that 2.0 million pounds of mercury were not accounted for or lost. Known losses to the environment in air, soil, water, and sediment are estimated to be 733,000 pounds of the 2.0 million pounds total. Much of the mercury lost to the surface water system was in soluble form or present as a finely divided suspension. Mercury is adsorbed onto silt particles and can be moved downstream from a source by sediment transport. Approximately 75 lb/yr of mercury are discharged directly from NHP into EFPC. An estimated 500 lb/yr of mercury are leaving the EFPC watershed (from NHP discharges and resuspension of mercury-contaminated sediments in EFPC) and entering off-site surface water.

How the Ranking Unit was Modeled

The transport pathways that were modeled were overland runoff, direct discharge to surface water, and volatilization of mercury.

The exposure pathways analyzed included potential inhalation of mercury, potential accidental ingestion of surface water during recreational activities, potential consumption of fish caught in surface water, potential ingestion of surface water, and potential ingestion of crops irrigated and livestock watered with surface water.

The exposure scenario of consumption of contaminated groundwater was not modeled due to the exclusive use of surface water for drinking by the surrounding communities, and because of the Survey team's assessment that surface water was the primary transport and exposure pathway. The recreational and utilization exposure was modeled for the downstream surface waters over a distance of 50 miles. Because measured and monitored data were used for modeling purposes for this ranking unit, the critical data category is "A".

Results of the Risk-Based Modeling

This ranking unit resulted in HPI Group 6 for mercury discharged directly into the surface water systems near the site. This score was driven by the large inventory of mercury lost to the environment and its high toxicity. This HPI Group, as explained

in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that represent a secondary level of concern from the potential public hazard perspective.

Qualifiers to the Risk-Based Ranking

This ranking unit includes overland runoff of contaminated soil. The qualifiers discussed in Section 1.7.5 of this report apply.

Integration Phase Concerns

This ranking unit was identified as having environmental degradation issues associated with it. The degradation issues were on-site soil contamination and contaminants to surface water bodies.

Current Status of the Ranking Unit

In March 1988, the site informed the Survey that a Storm Sewer Rehabilitation program to eliminate contamination of water from mercury in the storm sewer system was completed in December 1987. Any contaminated soils identified were removed and placed in an approved storage site.

Y-12
Groundwater Contamination in the Main Y-12 Plant Area

Description of Ranking Unit

Groundwater in the Y-12 Main Plant area is contaminated with plumes of sulfate, nitrate, and chloride. Sulfate concentrations as high as 3,900 mg/L, nitrate as high as 1,520 mg/L, and chloride as high as 170 mg/L have been measured. These pollutants are transported with the groundwater and may eventually enter surface water.

How the Ranking Unit was Modeled

The transport pathway that was modeled was groundwater discharging to surface water.

The exposure pathways that were modeled were potential accidental ingestion of surface water during recreational activities, potential consumption of fish caught in surface waters, potential ingestion of surface water, and potential consumption of crops irrigated and livestock watered with surface water.

The exposure scenario of consumption of contaminated groundwater was not modeled due to the exclusive use of surface water for drinking by the surrounding communities, and because of the Survey team's assessment that surface water was the primary transport and exposure pathway.

The waste constituents modeled were sulfate and nitrate. More recent data supplied by the site could not be used for modeling due to time constraints. The recent data indicate that organic contaminants and metals are also present. The modeling was accomplished by back-calculating the inventories from the measured plume concentrations as these were the only data available at the time of the

Survey. The recreational and utilization exposure was modeled for the downstream surface waters over a distance of 50 miles. Because a moderate number of assumptions were made in developing the source term from back-calculations, the critical data category for this ranking unit is "B".

Results of the Risk-Based Modeling

This ranking unit fell into HPI Group 4. The ranking unit scores for sulfate as a result of its large inventory and moderate toxicity. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that present a tertiary level of concern from the potential public hazard perspective.

Integration Phase Concerns

This ranking unit was identified as having environmental degradation issues associated with it. The degradation issue was groundwater contamination.

Current Status of the Ranking Unit

In March 1988, the site informed the Survey that the following actions have been taken to mitigate the effects of this ranking unit.

- In order to minimize the impact on the groundwater in the main plant area, a Steam Plant Wastewater Treatment Facility was constructed and is in trial operation and is expected to attain compliance in the near future.
- Studies are underway to assess the impact the S-3 ponds have had on the groundwater in this area. If these studies conclude that groundwater treatment is appropriate, a Groundwater Treatment Facility will be constructed under the Closure and Post- Closure program.

Y-12
Chestnut Ridge Sediment Disposal Basin

Description of Ranking Unit

The Chestnut Ridge Sediment Disposal Basin has been used for the storage of sludge dredged from the bottom of NHP. The basin is a man-made unlined impoundment with a design capacity of 30,000 cubic yards. The sludge contains uranium-238, arsenic, cadmium, copper, lead, mercury, nickel, and silver. Metals leached from the impoundments could be transported to the groundwater and subsequently enter surface water.

How the Ranking Unit was Modeled

The transport pathway that was modeled was groundwater discharge to surface water.

The exposure pathways analyzed included potential ingestion of surface water during recreational activities, potential consumption of fish caught in surface

waters, potential ingestion of surface water, and potential ingestion of crops irrigated and livestock watered with surface water.

The exposure scenario of consumption of contaminated groundwater was not modeled due to the exclusive use of surface water for drinking by the surrounding communities, and because of the Survey team's assessment that surface water was the primary transport and exposure pathway.

More recent data supplied by the site could not be used for modeling since they are not currently in a format that would allow contaminant inventories and plumes to be readily extracted. The recent data indicate that volatile organic compounds (VOCs) are the contaminants of concern. Therefore, modeling of the metals was accomplished by back-calculating the inventories based on sediment samples and using the density of river mud to represent sludge density. The recreational and utilization exposure was modeled for the downstream surface waters over a distance of 50 miles. Because a moderate number of assumptions were made in developing the source term from back-calculations, the critical data category for this ranking unit is "B".

Results of the Risk-Based Modeling

This ranking unit fell into HPI Group 4 for arsenic. The HPI Group for arsenic is driven by its large inventory and high toxicity. The HPI value for arsenic is based on current EPA cancer potency factors. These factors are currently under review and EPA has proposed that they are overly conservative. However, for modeling purposes, these values have been and will be used until EPA provides new values. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that present a tertiary level of concern from the potential public hazard perspective.

Regulatory Aspects of the Ranking Unit

A closure plan was prepared under the directives of the RCRA Part B permit.

Current Status of the Ranking Unit

In March 1988, the site informed the Survey that groundwater monitoring at the security pits and the sediment disposal basin to determine the presence and extent of groundwater contamination is on-going.

Y-12
Chestnut Ridge Security Pits

Description of Ranking Unit

The Chestnut Ridge Security Pits are south of the Y-12 Main Plant area on Chestnut Ridge. The security pits consist of seven trenches within two plots of land. These pits are used for the disposal of classified materials, and do not contain systems to prevent trench leakage. There is the potential for contaminants to leach into the groundwater and subsequently enter surface water.

How the Ranking Unit was Modeled

The transport pathway that was modeled was groundwater to surface water.

The exposure pathways analyzed included potential accidental ingestion of surface water during recreational activities, potential consumption of fish caught in surface waters, potential ingestion of surface water, and potential consumption of crops irrigated and livestock watered with surface water.

The exposure scenario of the consumption of contaminated groundwater was not modeled due to the exclusive use of surface waters for drinking by the surrounding communities, and because of the Survey team's assessment that surface water contaminated by groundwater was the primary transport and exposure pathway.

The waste constituents modeled were arsenic, barium, chromium, lead, and uranium. The modeling was accomplished by back-calculating the inventories from monitoring-well sampling data available at the time of the Survey. The recreational and utilization exposure was modeled for the downstream surface waters over a distance of 50 miles. Due to time constraints, the more recent data supplied by the site could not be analyzed, although they indicate that VOCs are the contaminants of concern. Because a moderate number of assumptions were made in developing the source term from back-calculations, the critical data category for this ranking unit is "B".

Results of the Risk-Based Modeling

This ranking unit fell into HPI Group 4 for arsenic. The HPI Group was driven by arsenic's large inventory and its high toxicity. The HPI Group for arsenic is based on current EPA cancer potency factors. These factors are currently under review and EPA has proposed that they are overly conservative. However, for modeling purposes, these values have been and will be used until EPA provides new values. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that present a tertiary level of concern from the potential public hazard perspective.

Integration Phase Concerns

This ranking unit was identified as having environmental degradation issues associated with it. The degradation issue was groundwater contamination.

Regulatory Aspects of the Ranking Unit

A closure plan was prepared under the directives of the RCRA Part B permit.

Current Status of the Ranking Unit

In March 1988, the site informed the Survey that groundwater monitoring at the security pits and the sediment disposal basin to determine the presence and extent of groundwater contamination is on-going.

Y-12
Hydrogen Fluoride Emissions

Description of Ranking Unit

Uranium processing operations release hydrogen fluoride to the atmosphere. During the period of 1981 through 1985, emissions ranged between 14,000 and 22,000 kg/yr. The emissions originate as stack releases from Buildings 9206 and 9212.

How the Ranking Unit was Modeled

The transport pathway that was modeled was a gaseous release to the atmosphere.

The exposure pathways analyzed included potential inhalation of the vapors and potential consumption of crops and livestock contaminated by the vapors.

Since it is a gaseous release, other transport and exposure scenarios were not considered.

Population and agricultural production data for the counties within a 50-mile radius of the Y-12 Plant were used to model exposure resulting from inhalation of hydrogen fluoride and ingestion of potentially contaminated crops and livestock. Because a moderate number of assumptions were made in developing the source term, the critical data category for this ranking unit is "B".

Results of the Risk-Based Modeling

This ranking unit fell into HPI Group 3 for Building 9212 and for Building 9206 due to the small quantity of hydrogen fluoride being emitted. The HPI Group for this ranking unit was driven by the ingestion of fluoride from contaminated crops and livestock. This HPI Group, as explained in Section1.7.4 of this report, would place this ranking unit with those environmental problems that are characterized as generally reaching receptors at levels below those used in regulatory decisions.

Integration Phase Concerns

This ranking unit was identified as having environmental degradation issues associated with it. The degradation issue was the potential to impact plant life in the area.

Current Status of the Ranking Unit

In March 1988, the site informed the Survey that in order to reduce emissions, construction of the hydrogen fluoride scrubbers was completed in October of 1987. Start-up is anticipated in fiscal year (FY) 1988.

Y-12
Dust and Smoke Emissions

Description of Ranking Unit

The emissions that constitute this ranking unit are generated at three different sources within the Y-12 Plant. Coal dust is generated at the Y-12 Steam Plant as a result of coal handling and transfer operations. A paper shredder releases 1,000 lb of paper dust to the atmosphere each year and an incinerator produces 7 lb (estimated) of particulate emissions for each 2,000 lb of material burned. These airborne particulate emissions are transported off-site and potentially can affect populations downwind of the sources.

How the Ranking Unit was Modeled

The potential transport pathway that was modeled was a stack release to the atmosphere.

The potential exposure pathway that was analyzed was inhalation.

Because it is an air release, other transport pathways were not considered. Exposure would occur only through the inhalation route; therefore, other exposure pathways were not considered.

The quantity of coal dust emissions was estimated using the methodology provided in EPA AP-42 (EPA's emissions factor reference book). The paper shredder emission estimate was obtained from the Y-12 permit application. The incinerator emission factor was obtained from Oak Ridge documentation. Population exposure was modeled for a distance of 50 miles from the plant. The emissions were modeled as carbon. Because a moderate number of assumptions were made in developing the source term, the critical data category for this ranking unit is "B".

Results of the Risk-Based Modeling

The HPI Group for this ranking unit was 1 due to the low inventory of carbon from coal transfer operations and the incinerator. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are characterized as generally reaching receptors at levels below those used in regulatory decisions.

Current Status of the Ranking Unit

In March 1988, the site informed the Survey that in order to reduce emissions, installation of coal dust control equipment was initiated and will be completed in FY 1995. In addition, installation of new equipment for emission control from the Classified Waste Paper Disposal Facility is expected to be completed in FY 1994, and an interim upgrade will be completed in FY 1988.

Y-12
UNC Site

Description of Ranking Unit

The United Nuclear Corporation (UNC) Site is an excavated burial trench on the crest of Chestnut Ridge. In June 1982, the UNC Site received approximately 29,000 fifty-five-gallon drums of contaminated soil and waste sludges from the UNC Cold Scrap Recovery Facility in Rhode Island. To eliminate free liquids, the wastes were mixed with concrete and proprietary solidification materials. Deteriorating drums at the UNC Site may release high-nitrate waste into the soil. These wastes could eventually migrate to groundwater and increase nitrate concentrations to levels above the standards in the immediate vicinity. Wastes leaching from the drums would eventually contaminate the groundwater and subsequently enter surface water.

How the Ranking Unit was Modeled

The transport pathway that was modeled was groundwater to surface water.

The exposure pathways that were analyzed were potential accidental ingestion of surface water during recreational activities, potential consumption of fish caught in surface waters, potential ingestion of surface water, and potential consumption of crops irrigated and livestock watered with surface water.

The exposure scenario of the consumption of contaminated groundwater was not modeled due to the exclusive use of surface waters for drinking by the surrounding communities, and because of the Survey team's assessment that surface water contaminated by groundwater was the primary transport and exposure pathway.

The UNC Site was modeled as a landfill and the total inventory for nitrate was taken from Pathways Analysis for UNC Disposal Pit Y-12 Plant (December 1986). The recreational and utilization exposure was modeled for the downstream surface waters over a distance of 50 miles. Because measured and monitored data were used in the modeling, the critical data category for this ranking unit is "A".

Results of the Risk-Based Modeling

This ranking unit fell into HPI Group 1 for nitrate due to its low inventory and relatively low toxicity. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are characterized as generally reaching receptors at levels below those used in regulatory decisions.

Regulatory Aspects of the Ranking Unit

In March 1988, the site informed the Survey that a closure plan for the UNC Site has been submitted to the appropriate regulators. Informal comments were received from Tennessee Department of Health and Environment requesting additional information. The requested information has been sent.

Y-12
Soil Contamination in the Main Plant Area

Description of Ranking Unit

Soils in the area of the Z-Oil System and the storage yard east of Building 9204-1 may be contaminated with polychlorinated biphenyls (PCBs). The Z-Oil system is a heat transfer system consisting of a series of buildings, vaults, storage tanks, pumps, and associated piping. Throughout its existence, the Z-Oil System has been known to leak transfer fluid to the environment. The system has a fluid capacity of 228,000 gallons; however, it has never contained more than 175,000 gallons of heat transfer fluids. In 1981, the system had a PCB concentration (assumed to be Aroclor-1260) of 70 ppm. In December 1984 and July 1985, several portions of the system were tested and the highest PCB concentration was 20 ppm.

How the Ranking Unit was Modeled

The transport pathways that were modeled were direct exposure, resuspension of surface soils, and overland runoff.

The exposure pathways modeled were potential direct exposure, potential inhalation of resuspended soils, potential accidental ingestion of surface water during recreational activities, potential consumption of fish caught in surface waters, potential ingestion of surface water, and potential consumption of crops irrigated and livestock watered with surface water.

The exposure scenario of consumption of contaminated groundwater was not modeled due to the exclusive use of surface water for drinking by the surrounding communities, and because of the Survey team's assessment that surface water was the primary transport and exposure pathway.

It is assumed that the operational life of the system is from 1971 to 2027. The ranking unit was modeled assuming a leak rate of 400 gallons of heat transfer fluid at a concentration of 70 ppm between 1971-1985, and a concentration of 20 ppm between 1985-2027. The inhalation exposure pathways were modeled using population data within a 50-mile radius of the Y-12 Plant. The recreational and utilization exposure was modeled for the downstream surface waters over a distance of 50 miles. Because a moderate number of assumptions were made in developing the source term, the critical data category for this ranking unit is "B".

Results of the Risk-Based Modeling

This ranking unit fell into HPI Group 0 for external exposure and inhalation pathways, and HPI Group 0 for surface water pathways. This HPI Group is due to the low concentration of Aroclor-1260 in the transfer fluid, and Aroclor's high equilibrium coefficient (i.e., high affinity for soils). This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that are not projected to reach receptors.

Qualifiers to the Risk-Based Ranking

This ranking unit includes runoff of contaminated soil. It also models an organic in surface water. The qualifiers discussed in Section 1.7.5 of this report apply.

Y-12
Inadequate Containment of Spills and Leaks

Description of Ranking Unit

The lack of adequate spill containment facilities at many of the drum storage areas and the aboveground storage tank and transfer stations has resulted in, or could result in environmental contamination.

How the Ranking Unit was Modeled

The transport pathways that were modeled were resuspension of surface soils, overland runoff, and groundwater to surface water.

The exposure pathways analyzed included potential inhalation of resuspended soils, potential accidental ingestion of surface water during recreational activities, potential consumption of fish caught in surface waters, potential ingestion of surface water, and potential consumption of crops irrigated and livestock watered with surface water.

Consumption of contaminated groundwater was not modeled due to the exclusive use of surface water for drinking by the surrounding communities.

Drum inventory data for Buildings 9720-2 and 9720-9 were used as typical inventories and a typical aboveground storage tank was assumed to contain 10,000 gallons of a 50 percent solution of nitric acid. The standard release scenario for drums and aboveground tanks as described in Section 1.7.7 of this report was used to assess the potential release. The constituents modeled were nitric acid, oil, methylene chloride, 1,1,1-trichloroethane, tetrachloroethylene, acetonitrile, Aroclor-1260, uranium-238, methyl ethyl ketone, and sodium hydroxide. For surface water the recreational and utilization exposure was modeled for a distance of 50 miles downstream. Because a significant number of assumptions were made in developing the source term, the critical data category for this ranking unit is "C".

Results of the Risk-Based Modeling

Surface water recharged by groundwater fell into HPI Group 7 for tetrachloroethylene. This HPI Group is driven by tetrachloroethylene's large inventory, low equilibrium coefficient (i.e., low affinity for soils), and high toxicity factor. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that represent a secondary level of concern from the potential public hazard perspective.

Qualifiers to the Risk-Based Ranking

This ranking unit includes overland runoff of contaminated soil and involves the modeling of organic contaminants in groundwater and surface water. The qualifiers discussed in Section 1.7.5 of this report apply.

Y-12
Leaking Drums at Salvage Yard

Description of Ranking Unit

The Y-12 Salvage Yard in the Main Plant area has been used for oil drum storage since 1974. The storage areas consist of two outdoor, unsheltered gravel pads, one approximately 160 by 85 feet, and the other approximately 170 by 85 feet. The gravel, soil, and standing water in the oil drum storage area were discolored and some drums were deteriorating. The potential exists for the contents of the drums (i.e., tetrachloroethylene, 1,1,1-trichloroethane, toluene, xylene, methyl ethyl ketone, oil, uranium-238, and uranium-235) to enter surface water from overland surface water runoff or by leaching into the groundwater, which recharges local surface water bodies.

How the Ranking Unit was Modeled

The potential transport pathways modeled were volatilization of contaminants, overland runoff, and groundwater to surface water.

The exposure pathways modeled were potential inhalation of contaminants, potential accidental ingestion of surface water during recreational activities, potential consumption of fish caught in surface waters, potential ingestion of surface water, and potential consumption of crops irrigated and livestock watered with surface water.

The potential exposure scenario of direct consumption of contaminated groundwater was not modeled due to the exclusive use of surface water for drinking by the surrounding communities.

Drum inventory data collected during the Survey were used as a typical inventory. For modeling purposes, based on the Survey team's assessment, it was assumed that 2,000 gallons were released to the environment annually from spills associated with transfer operations. For leaking drums, the standard release scenario, as described in Section 1.7.7 of this report, was used. For surface water, the recreational and utilization exposure was modeled for a distance of 50 miles downstream. For inhalation and contaminated soil exposure pathways, agricultural and population data within a 50-mile radius of the Y-12 Plant were used. Because a moderate number of assumptions were made in developing the source term, the critical data category for this ranking unit is "B".

Results of the Risk-Based Modeling

For surface waters recharging with groundwater, this ranking unit fell into HPI Group 6 for both tetrachloroethylene and 1,1,1-trichloroethane. These HPI Groups are due to the high toxicities of the constituents and the large inventories of tetrachloroethylene and 1,1,1-trichloroethane at the oil drum salvage yard. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that represent a secondary level of concern from the potential public hazard perspective.

Qualifiers to the Risk-Based Ranking

This ranking unit includes overland runoff of contaminated soil and involves the modeling of organic contaminants in groundwater and surface water. The qualifiers discussed in Section 1.7.5 of this report apply.

Y-12
Underground Storage Tanks for Non-Waste Toxic and Hazardous Substances

Description of Ranking Unit

Currently there are 14 in-service and an additional 19 out-of-service underground storage tanks (USTs) at Y-12. All the in-service tanks are more than 15 years old, are constructed of steel, and lack corrosion protection. There is a potential for some of the tanks to leak. Wastes lost from the tanks would be transported to the groundwater and subsequently to surface water.

How the Ranking Unit was Modeled

The transport scenario that was modeled was groundwater to surface water.

The exposure pathways analyzed included potential accidental ingestion of surface water during recreational activities, potential consumption of fish caught in surface waters, potential ingestion of surface water, and potential consumption of crops irrigated and livestock watered with surface water.

The exposure scenario of consumption of contaminated groundwater was not modeled due to the exclusive use of surface water for drinking by the surrounding communities, and because of the Survey team's assessment that surface water was the primary transport and exposure pathway.

The standard release scenario for underground tanks described in Section 1.7.7 of this report was used to assess the potential release. The waste constituents derived from the Y-12 Plant UST inventory were gasoline, oil, and methanol. The modeling was accomplished by assuming that the tanks constituted one large unit in the center of the Y-12 Plant. The recreational and utilization exposure was modeled for the downstream surface waters over a distance of 50 miles. Because a moderate number of assumptions were made in developing the source term, the critical data category for this ranking unit is "B".

Results of the Risk-Based Modeling

This ranking unit fell into HPI Group 5 for gasoline. This was based on the toxicity and high inventory for gasoline. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that present a tertiary level of concern from the potential public hazard perspective.

Qualifiers to the Risk-Based Ranking

This ranking unit scores for fuel in groundwater and involves the modeling of organic contaminants in groundwater and surface water. The qualifiers discussed in Section 1.7.5 of this report apply.

Y-12
Underground Storage Tanks for Waste Materials

Description of Ranking Unit

Currently there are 20 underground storage tanks (USTs) at the Y-12 Plant that contain wastes, some of which are hazardous or mixed waste. The group contains steel and concrete tanks, none of which are corrosion-protected. There is a potential for some of the tanks to leak. Therefore, the standard release scenario for underground tanks described in Section 1.7.7 of this report was used to assess the potential release. Wastes lost from the tanks would be transported to the groundwater and subsequently to surface water.

How the Ranking Unit was Modeled

The transport pathway that was modeled was groundwater to surface water.

The exposure pathways that were analyzed were potential accidental ingestion of surface water during recreational activities, potential consumption of fish caught in surface waters, potential ingestion of surface water, and potential consumption of crops irrigated and livestock watered with surface water.

The exposure scenario of consumption of contaminated groundwater was not modeled due to the exclusive use of surface water for drinking by the surrounding communities, and because of the Survey team's assessment that surface water was the primary transport and exposure pathway.

The waste constituents derived from Y-12 Plant UST inventory were uranium-238, tetrachloroethylene, PCB-1260, beryllium, and mercury. The modeling was accomplished by assuming that the tanks constituted one large unit in the center of the Y-12 Plant. The recreational and utilization exposure was modeled for the downstream surface waters over a distance of 50 miles. Because a moderate number of assumptions were made in developing the source term, the critical data category for this ranking unit is "B".

Results of the Risk-Based Modeling

This ranking unit fell into HPI Group 4 for tetrachloroethylene. The HPI Group for tetrachloroethylene was driven by its low equilibrium coefficient (i.e., low affinity for soils) and high toxicity. This HPI Group, as explained in Section 1.7.4 of this report, would place this ranking unit with those environmental problems that present a tertiary level of concern from the potential public hazard perspective.

Qualifiers to the Risk-Based Ranking

This ranking unit involves the modeling of organic contaminants in groundwater and surface water. The qualifiers discussed in Section 1.7.5 of this report apply.

APPENDIX B
SURVEY FINDINGS ASSOCIATED WITH RANKING UNITS

This appendix identifies the Environmental Survey findings associated with each ranking unit. Findings are organized by the following technical areas: air, soil, surface water, groundwater, active waste management, toxic and chemical handling, radiation, quality assurance/quality control, and inactive waste sites and releases.

Roman numerals refer to the category in which the finding has been placed. Thus, Category II findings have a Roman numeral II, while a Roman numeral III represents a Category III finding. The second number refers to the specific finding in the category. Thus, an Air III-4 refers to the fourth air Category III finding in the Preliminary Report for that site.

In reviewing the findings that apply to a ranking unit, the reader should be aware that many findings have multiple aspects. Due to the rules applied in developing ranking units (see Section 1.7.3 of this report), some findings are included in more than one ranking unit, while others are grouped together with related findings into a single ranking unit. In addition, for some findings, only a part of the finding was ranked. The remainder may have required the Survey sampling results or may have focused on an aspect that was beyond the focus of this ranking (see Section 1.8 of this report). Therefore, in reviewing any findings pertaining to a ranking unit, the reader should focus on the aspect of the finding that is included in the ranking unit.

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Feed Materials Production Center (Fernald)

Title of Ranking Unit:	Fernald Airborne Releases
Supporting Survey Findings:	Air II-2, II-4, II-6, and III-1, Soil II-1, III-1, and III-2, and Groundwater II-1 (portion), II-2 (portion), and II-4 (portion)
Title of Ranking Unit:	Fernald Contamination from Liquid Discharges
Supporting Survey Findings:	Surface Water II-1, III-1, III-2, III-3, Groundwater II-1 (portion), II-2 (portion), and II-4 (portion)
Title of Ranking Unit:	Fernald Contaminant Release from Waste Pits
Supporting Survey Findings:	Inactive Waste III-1 and III-3, Groundwater II-1 (portion), II-2 (portion), II-3, and II-4 (portion)
Title of Ranking Unit:	Fernald Perchloroethylene Emissions
Supporting Survey Findings:	Air II-3
Title of Ranking Unit:	Fernald Off-site Direct Radiation
Supporting Survey Findings:	Radiation II-1 (portion)
Title of Ranking Unit:	Fernald Inactive Fly Ash Pile
Supporting Survey Findings:	Inactive Waste II-2
Title of Ranking Unit:	Fernald Releases from K-65 Silo
Supporting Survey Findings:	Air II-1 (portion) and Radiation II-1 (portion)
Title of Ranking Unit:	Fernald Potential Releases from Anhydrous Hydrogen Fluoride Tank
Supporting Survey Findings:	Air II-7 and Toxics and Chemicals II-1
Title of Ranking Unit:	Fernald Tank Farm Spill Containment
Supporting Survey Findings:	Toxics and Chemicals II-2

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Title of Ranking Unit:	Fernald Potential for Leaks from Underground Storage Tanks
Supporting Survey Findings:	Inactive Waste II-1
Title of Ranking Unit:	Fernald Potential Future Releases of Thorium
Supporting Survey Findings:	Air II-8
Title of Ranking Unit:	Fernald Potential for Future Leaks from Waste Drums
Supporting Survey Findings:	Active Waste II-3

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Hanford Site

Title of Ranking Unit:	Hanford Solid Waste Disposal Sites in the Vicinity of the 100 Area
Supporting Survey Findings:	Active Waste III-2, Inactive Sites II-1 (portion), Inactive Sites III-3 (portion), Inactive Sites III-4, Inactive Sites III-7 (portion)
Title of Ranking Unit:	Hanford Solid Waste Disposal Sites in the Vicinity of the 200 Area
Supporting Survey Findings:	Active Waste III-2, Inactive Sites II-1 (portion), Inactive Sites III-3 (portion), III-7 (portion)
Title of Ranking Unit:	Hanford Solid Waste Disposal Sites in the Vicinity of the 300/400 Areas
Supporting Survey Findings:	Active Waste III-2, Inactive Sites II-1 (portion), II-2, III-3 (portion), III-7 (portion)
Title of Ranking Unit:	Hanford Active Liquid Process Discharges in the 100 Area
Supporting Survey Findings:	Surface Water II-1, III-1, Groundwater III-1, Active Waste II-1, Radiation III-2
Title of Ranking Unit:	Hanford Active Liquid Process Discharges in the 200 Area
Supporting Survey Findings:	Surface Water II-1, Groundwater III-1, Active Waste II-1, Radiation III-2
Title of Ranking Unit:	Hanford Active Liquid Process Discharges in the 300/400 Areas
Supporting Survey Findings:	Surface Water II-1, Groundwater III-1, Active Waste II-1, III-1, Radiation III-2

Title of Ranking Unit:	Hanford Inactive Liquid Process Discharges in the 100 Area
Supporting Survey Findings:	Surface Water II-1, III-1 Groundwater III-1 (portion), Radiation III-2 (portion), Inactive Sites II-1 (portion), III-6, III-9, III-13
Title of Ranking Unit:	Hanford Inactive Liquid Process Discharges in the 200 Area
Supporting Survey Findings:	Surface Water II-1, Groundwater III-1 (portion), Radiation III-2, Inactive Sites II-1 (portion), III-1
Title of Ranking Unit:	Hanford Inactive Liquid Process Discharges in the 300 Area
Supporting Survey Findings:	Surface Water II-1, Groundwater III-1 (portion), Radiation III-2, Inactive Sites II-1 (portion), III-5
Title of Ranking Unit:	Hanford Carbon Tetrachloride Emissions from the Z-Plant
Supporting Survey Findings:	Air III-1
Title of Ranking Unit:	Hanford Past Leaks from Single Shell Tanks
Supporting Survey Findings:	Soil III-2 (portion), Inactive Sites II-1 (portion)
Title of Ranking Unit:	Hanford Potential for Future Releases from Single Shell Tanks and Associated Piping
Supporting Survey Findings:	Soil III-2 (portion), Air III-3
Title of Ranking Unit:	Hanford Potential Releases from Aboveground Product Tanks
Supporting Survey Findings:	Toxics and Chemicals II-2 (portion)
Title of Ranking Unit:	Hanford Herbicide Disposal in Inactive Waste Site
Supporting Survey Findings:	Inactive Sites III-8
Title of Ranking Unit:	Hanford 100 N Area Spills
Supporting Survey Findings:	Inactive Sites III-12

Title of Ranking Unit:	Hanford Surface Contamination due to Intrusion into Buried Waste
Supporting Survey Findings:	Soil III-1

Idaho National Engineering Laboratory

Title of Ranking Unit:	INEL Potential for PCB Release from Transformers
Supporting Survey Findings:	Toxics and Chemicals II-1
Title of Ranking Unit:	INEL Air Impacts from ICPP Stacks
Supporting Survey Findings:	Air II-1
Title of Ranking Unit:	INEL Active Percolation Pond and Ditches at ICPP and TRA
Supporting Survey Findings:	Waste Management III-1 (portion)
Title of Ranking Unit:	INEL Active Percolation Pond and Ditches at ANL-West
Supporting Survey Findings:	Waste Management III-1 (portion), III-2
Title of Ranking Unit:	INEL Other Active Percolation Ponds
Supporting Survey Findings:	Waste Management III-1 (portion)
Title of Ranking Unit:	INEL Inactive Gravel Pits at ICPP
Supporting Survey Findings:	Inactive Sites III-1 (portion)
Title of Ranking Unit:	INEL TCE in Drinking Water Well
Supporting Survey Findings:	Groundwater III-3
Title of Ranking Unit:	INEL Unsaturated Zone Inactive Injection Wells at PBF
Supporting Survey Findings:	Inactive Sites III-2 (portion)
Title of Ranking Unit:	INEL Inactive Injection Wells at TRA and ICPP
Supporting Survey Findings:	Inactive Sites III-2 (portion)
Title of Ranking Unit:	INEL Inactive CFA Landfills and Lead Storage Areas
Supporting Survey Findings:	Inactive Sites III-3 (portion)

Title of Ranking Unit:	INEL Significant Petroleum Spills
Supporting Survey Findings:	Inactive Sites III-5 (portion)
Title of Ranking Unit:	INEL Significant Spills Involving Metals
Supporting Survey Findings:	Inactive Sites III-5 (portion)
Title of Ranking Unit:	INEL Volatile Organics and Radionuclides Released to Groundwater at RWMC
Supporting Survey Findings:	Groundwater III-2

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Kansas City Plant

Title of Ranking Unit:	Kansas City Underground Tank Farm
Supporting Survey Findings:	Groundwater III-1 (portion), Active Waste III-1 (portion), Inactive Waste III-2
Title of Ranking Unit:	Kansas City Underground Storage Tanks
Supporting Survey Findings:	Active Waste III-1 (portion), Inactive Waste III-3, III-6
Title of Ranking Unit:	Kansas City Northeast Area
Supporting Survey Findings:	Groundwater III-1 (portion), Inactive Waste III-7
Title of Ranking Unit:	Kansas City Old Railroad Dock
Supporting Survey Findings:	Groundwater III-1 (portion), Inactive Waste III-4
Title of Ranking Unit:	Kansas City Emissions of VOCs to the Atmosphere
Supporting Survey Findings:	Air III-1
Title of Ranking Unit:	Kansas City Inadequate Protection of Waste Management Facilities Against Floods
Supporting Survey Findings:	Active Waste II-1
Title of Ranking Unit:	Kansas City Release of PCBs, Metals, and Organics to the Environment
Supporting Survey Findings:	Surface Water III-1, Toxics and Chemicals III-1, Inactive Waste III-5 (portion)
Title of Ranking Unit:	Kansas City Southeast Parking Lot
Supporting Survey Findings:	Groundwater III-2 (portion), Inactive Waste III-8
Title of Ranking Unit:	Kansas City Elevated Levels of Arsenic in Groundwater
Supporting Survey Findings:	Groundwater III-2 (portion)
Title of Ranking Unit:	Kansas City PCBs in Subsurface Soils
Supporting Survey Findings:	Inactive Waste III-3 (portion), III-5 (portion)

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Title of Ranking Unit: Kansas City Classified Burial Trenches
Supporting Survey Findings: Inactive Waste III-9

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Los Alamos National Laboratory

Title of Ranking Unit:	LANL Radionuclide Sediment Contamination in Water and Ancho Canyons
Supporting Survey Findings:	Soil III-1 and Surface Water III-1
Title of Ranking Unit:	LANL Contamination at the Firing Sites
Supporting Survey Findings:	Soil III-2 and Inactive Waste III-6
Title of Ranking Unit:	LANL Sediment Contamination from Outfalls
Supporting Survey Findings:	Surface Water II-1, II-2, and III-3
Title of Ranking Unit:	LANL Contamination from TA-54 Active Waste Management Units
Supporting Survey Findings:	Groundwater III-1 and Active Waste II-1, II-2, and III-5
Title of Ranking Unit:	LANL Area P
Supporting Survey Findings:	Active Waste III-6
Title of Ranking Unit:	LANL Potential for Future Releases from Radioactive Waste Tanks
Supporting Survey Findings:	Active Waste III-7
Title of Ranking Unit:	LANL Potential for PCB Releases from Transformers
Supporting Survey Findings:	Toxics and Chemicals II-1
Title of Ranking Unit:	LANL Potential for Future Releases from Product Drums
Supporting Survey Findings:	Toxics and Chemicals II-2
Title of Ranking Unit:	LANL Past Liquid Releases
Supporting Survey Findings:	Toxics and Chemicals III-1 and III-5, Inactive Waste III-2

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Title of Ranking Unit:	LANL Potential for Future Releases from Underground Tanks
Supporting Survey Findings:	Toxics and Chemicals III-2
Title of Ranking Unit:	LANL Former Liquid Disposal
Supporting Survey Findings:	Inactive Waste III-1
Title of Ranking Unit:	LANL Potential Leaks from Abandoned or Removed Underground Storage Tanks
Supporting Survey Findings:	Inactive Waste III-3
Title of Ranking Unit;	LANL Closed Landfills and Burn Pits
Supporting Survey Findings:	Inactive Waste III-5
Title of Ranking Unit:	LANL TA-1
Supporting Survey Findings:	Inactive Waste III-9
Title of Ranking Unit:	LANL Potential Future Releases from Nonradioactive Aboveground Tanks
Supporting Survey Findings:	Toxics and Chemicals III-3 and III-4, Active Waste III-4

Lawrence Livermore National Laboratory

Title of Ranking Unit:	Livermore Integrity of Sanitary Sewer Systems
Supporting Survey Findings:	Surface Water III-1
Title of Ranking Unit:	Livermore Groundwater Contamination at Southwest Area
Supporting Survey Findings:	Groundwater III-1 (portion), and Inactive Sites III-1
Title of Ranking Unit:	Livermore Gasoline Spill at Building 403
Supporting Survey Findings:	Groundwater III-1 (portion) and Inactive Sites III-2
Title of Ranking Unit:	Livermore Groundwater Contamination in Southeast Corner
Supporting Survey Findings:	Groundwater III-1 (portion) and Inactive Sites III-3
Title of Ranking Unit:	Livermore Groundwater Contamination from East Traffic Circle Landfill
Supporting Survey Findings:	Groundwater III-1 (portion) and Inactive Sites III-4
Title of Ranking Unit:	Livermore Groundwater Contamination from Taxi Strip and Old Salvage Yard
Supporting Survey Findings:	Groundwater III-1 (portion) and Inactive Sites III-5 and III-6
Title of Ranking Unit:	Livermore Potential Release of PCB from Transformers and Capacitors
Supporting Survey Findings:	Toxics and Chemicals II-1 and II-2
Title of Ranking Unit:	Livermore Site 300 - Oily Waste at the Building 865 Complex
Supporting Survey Findings:	Surface Water III-5
Title of Ranking Unit:	Livermore Site 300 - Groundwater Contamination from 834 Complex
Supporting Survey Findings:	Groundwater III-2 (portion) and Inactive Sites III-10

Title of Ranking Unit:	Livermore Site 300 - Groundwater Contamination from Landfills
Supporting Survey Findings:	Groundwater III-2 (portion) and Inactive Sites III-8 and III-9
Title of Ranking Unit:	Livermore Site 300 - PCB Contamination from Landfill 6
Supporting Survey Findings:	Inactive Sites III-8 and III-9
Title of Ranking Unit:	Livermore Site 300 - HE Process Wastewater Lagoons
Supporting Survey Findings:	Inactive Sites III-12

Mound Facility

Title of Ranking Unit:	Mound Soil Contamination in Area S-1
Supporting Survey Findings:	Soil III-1
Title of Ranking Unit:	Mound Soil Contamination in Area S-7
Supporting Survey Findings:	Soil III-2 (portion)
Title of Ranking Unit:	Mound Soil Contamination on the SM/PP Hill
Supporting Survey Findings:	Soil III-2 (portion) and III-3 (portion)
Title of Ranking Unit:	Mound Tritium Contamination in the Main Hill Groundwater
Supporting Survey Findings:	Groundwater II-1
Title of Ranking Unit:	Mound Soil Contamination in the Valley Locations
Supporting Survey Findings:	Soil III-2 (portion) and III-3 (portion)
Title of Ranking Unit:	Mound Soil Contamination in the Canal
Supporting Survey Findings:	Inactive Sites III-1
Title of Ranking Unit:	Mound Inactive Leach Pit
Supporting Survey Findings:	Inactive Sites III-3 and Groundwater III-1
Title of Ranking Unit:	Mound SM/PP Hill Drum Storage Area
Supporting Survey Findings:	Waste Management II-1
Title of Ranking Unit:	Mound Hazardous Air Emissions - Vents
Supporting Survey Findings:	Air II-4
Title of Ranking Unit:	Mound Potential Leakage from Underground Tanks
Supporting Survey Findings:	Toxics and Chemicals III-1 and III-2

Nevada Test Site

These findings are based on the Status Report and do not necessarily reflect findings as they will be categorized in the Preliminary Report.

Title of Ranking Unit:	Nevada Test Site Wastewater Lagoons in Drainage Swales
Supporting Survey Findings:	Surface Water II-6
Title of Ranking Unit:	Nevada Test Site Soil Contamination by Hazardous Chemicals
Supporting Survey Findings:	Toxics and Chemicals II-3 and Waste Management II-2 (portion)
Title of Ranking Unit:	Nevada Test Site Fuel Spill - Desert Rock Airstrip
Supporting Survey Findings:	Inactive Sites III-9
Title of Ranking Unit:	Nevada Test Site Contamination of Soils with Radionuclides
Supporting Survey Findings:	Soil III-1, Inactive Sites III-2 and III-13
Title of Ranking Unit:	Nevada Test Site Subsurface Soil Contamination
Supporting Survey Findings:	Soil III-2, Groundwater III-2 and III-5 (portion), Surface Water II-2 (portion), II-3 (portion), Groundwater III-1, Radiation III-2, and Inactive Sites III-1
Title of Ranking Unit:	Nevada Test Site Near Surface Soil Contamination from Waste and Wastewater Disposal Practices
Supporting Survey Findings:	Surface Water II-2 (portion), and II-3 (portion), and Soil III-3, Groundwater III-4, III-5 (portion), and III-6, Waste Management II-1 (portion) and III-1, and Inactive Sites III-12, III-14, and III-15
Title of Ranking Unit:	Nevada Test Site Tunnel Ponds
Supporting Survey Findings:	Groundwater III-3

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Title of Ranking Unit:	Nevada Test Site Potential for Leaks from PCB Transformers
Supporting Survey Findings:	Toxics and Chemicals II-1
Title of Ranking Unit:	Nevada Test Site Potential for Leaks from Underground Storage Tanks
Supporting Survey Findings:	Toxics and Chemicals II-2 and Inactive Sites III-5
Title of Ranking Unit:	Nevada Test Site Potential for Release from Hazardous Materials and Waste Storage Areas in NTS
Supporting Survey Findings:	Waste Management III-2, Toxics and Chemicals III-1 and III-2 (portion)

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Pantex Facility

Title of Ranking Unit:	Pantex Fluoride Emissions
Supporting Survey Findings:	Air III-1
Title of Ranking Unit:	Pantex Potential Future Releases from Non-Tank Sources
Supporting Survey Findings:	Waste Management III-4, III-5, Toxics and Chemicals III-1, III-6
Title of Ranking Unit:	Pantex Potential Future Releases from Underground Tanks
Supporting Survey Findings:	Toxics and Chemicals III-3
Title of Ranking Unit:	Pantex Asbestos
Supporting Survey Findings:	Toxics and Chemicals III-5
Title of Ranking Unit:	Pantex Contaminated Surface Soils - Not Accessible
Supporting Survey Findings:	Inactive Sites III-3, Waste Management III-2
Title of Ranking Unit:	Pantex Contaminated Surface Soils - Accessible
Supporting Survey Findings:	Inactive Sites III-1
Title of Ranking Unit:	Pantex Landfills
Supporting Survey Findings:	Inactive Sites III-5, III-6, Waste Management III-1
Title of Ranking Unit:	Pantex Firing Site 15
Supporting Survey Findings:	Soil III-4
Title of Ranking Unit:	Pantex Depleted Uranium Contamination Sites
Supporting Survey Findings:	Soil III-1, III-2
Title of Ranking Unit:	Pantex Ditches
Supporting Survey Findings:	Surface Water III-2
Title of Ranking Unit:	Pantex PCB Release

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Supporting Survey Findings:	Toxics and Chemicals III-2
Title of Ranking Unit:	Pantex Playas
Supporting Survey Findings:	Groundwater III-1, Surface Water III-1
Title of Ranking Unit:	Pantex Known Liquid Releases
Supporting Survey Findings:	Inactive Sites III-2
Title of Ranking Unit:	Pantex Potential Future Releases from Aboveground Tanks
Supporting Survey Findings:	Toxics and Chemicals III-3

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Pinellas Plant

Title of Ranking Unit:	Pinellas Past Releases from HP Tanks
Supporting Survey Findings:	Groundwater II-1 (portion), and Inactive Sites III-2 (portion)
Title of Ranking Unit:	Pinellas Past Releases from Inactive Underground Storage Tanks
Supporting Survey Findings:	Inactive Sites III-2 (portion)
Title of Ranking Unit:	Pinellas Potential Releases from Active Underground Storage Tanks
Supporting Survey Findings:	Inactive Sites III-2 (portion)
Title of Ranking Unit:	Pinellas 4.5 Acre Site
Supporting Survey Findings:	Groundwater II-1 (portion), Inactive Sites III-1 (portion)
Title of Ranking Unit:	Pinellas Eastern Sites
Supporting Survey Findings:	Surface Water III-2, Groundwater II-1, III-1, Inactive Sites III-1
Title of Ranking Unit:	Pinellas Western Sites
Supporting Survey Findings:	Inactive Sites III-1 (portion) and III-2 (portion), and Groundwater II-1 (portion), and III-1 (portion)

Portsmouth Uranium Enrichment Complex

Title of Ranking Unit:	Portsmouth East Central Area Inactive Sites
Supporting Survey Findings:	Groundwater III-1, Soil III-1 (portion), Inactive Waste III-1 (portion)
Title of Ranking Unit:	Portsmouth South Area Inactive Sites
Supporting Survey Findings:	Groundwater III-1, Soil III-1 (portion), Inactive Waste III-3 (portion), Surface Water II-2
Title of Ranking Unit:	Portsmouth North Area Inactive Sites
Supporting Survey Findings:	Groundwater III-1, Soil III-1 (portion), Inactive Waste III-2 (portion)
Title of Ranking Unit:	Portsmouth Chromium Lagoon
Supporting Survey Findings:	Inactive Waste III-4 (portion)
Title of Ranking Unit:	Portsmouth Technetium Air Releases
Supporting Survey Findings:	Air III-1
Title of Ranking Unit:	Portsmouth Chromium Air Releases
Supporting Survey Findings:	Air III-3
Title of Ranking Unit:	Portsmouth Unscheduled Air Releases
Supporting Survey Findings:	Air II-2
Title of Ranking Unit:	Portsmouth Coal Pile Runoff
Supporting Survey Findings:	Surface Water II-1
Title of Ranking Unit:	Portsmouth Potential Future Releases from Underground Storage Tanks
Supporting Survey Findings:	Active Waste III-1

Title of Ranking Unit:	Portsmouth Potential Future Releases from Above-ground Tanks
Supporting Survey Findings:	Toxics and Chemicals III-1
Title of Ranking Unit:	Portsmouth Recirculating Cooling Water System
Supporting Survey Findings:	Inactive Waste III-1 (portion)

Rocky Flats Plant

Title of Ranking Unit:	Rocky Flats 903 Pad/Plutonium in Soils
Supporting Survey Findings:	Soil III-1, Soil III-2, Inactive Waste III-6
Title of Ranking Unit:	Rocky Flats Solar Evaporation Ponds
Supporting Survey Findings:	Groundwater III-1, Inactive Waste III-3
Title of Ranking Unit:	Rocky Flats Abandoned Process Wastewater Collection System
Supporting Survey Findings:	Inactive Waste III-8
Title of Ranking Unit:	Rocky Flats PCB Transformer
Supporting Survey Findings:	Toxics and Chemicals III-2
Title of Ranking Unit:	Rocky Flats VOCs in Groundwater
Supporting Survey Findings:	Groundwater III-1, Inactive Waste III-4, III-5, III-6, III-7
Title of Ranking Unit:	Rocky Flats Underground Product Storage Tanks
Supporting Survey Findings:	Toxics and Chemicals III-3, Inactive Waste III-9
Title of Ranking Unit:	Rocky Flats Pesticide Shed
Supporting Survey Findings:	Toxics and Chemicals III-1

Sandia National Laboratories, Albuquerque

Title of Ranking Unit:	Sandia Albuquerque Radioactive Burial Grounds
Supporting Survey Findings:	Active Waste II-1 and III-3
Title of Ranking Unit:	Sandia Albuquerque SNL Underground Storage Tanks
Supporting Survey Findings:	Toxics and Chemicals III-2
Title of Ranking Unit:	Sandia Albuquerque Potential Releases of PCBs from Transformers at SNL
Supporting Survey Findings:	Toxics and Chemicals III-1
Title of Ranking Unit:	Sandia Albuquerque Orphaned Chemicals
Supporting Survey Findings:	Toxics and Chemicals II-1
Title of Ranking Unit:	Sandia Albuquerque Toxic Discharge to Technical Area 1 Sewers
Supporting Survey Findings:	Surface Water II-1 and Groundwater III-1 (portion)
Title of Ranking Unit:	Sandia Albuquerque Inactive Solid Disposal Areas
Supporting Survey Findings:	Inactive Sites III-2
Title of Ranking Unit:	Sandia Albuquerque Inactive Liquid Disposal Areas
Supporting Survey Findings:	Inactive Sites III-2
Title of Ranking Unit:	Sandia Albuquerque Liquid Spills and Discharges
Supporting Survey Findings:	Inactive Sites III-3, III-6
Title of Ranking Unit:	Sandia Albuquerque Drum Storage at Tonopah
Supporting Survey Findings:	Tonopah Active Waste II-1
Title of Ranking Unit:	Sandia Albuquerque Soil Contamination Areas at Tonopah
Supporting Survey Findings:	Tonopah Inactive Sites III-1 (portion), and Tonopah Groundwater III-1 (portion)

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Title of Ranking Unit:	Sandia Albuquerque Septic Tank Discharges from Area 3 at Tonopah
Supporting Survey Findings:	Tonopah Groundwater III-1 (portion)
Title of Ranking Unit:	Sandia Albuquerque Radioactively Contaminated Soils at Tonopah
Supporting Survey Findings:	Tonopah Inactive Sites III-1 (portion)
Title of Ranking Unit:	Sandia Albuquerque ITRI Underground Storage Tanks
Supporting Survey Findings:	Inactive Sites III-5
Title of Ranking Unit:	Sandia Albuquerque Potential Releases of PCBs from Transformers at ITRI
Supporting Survey Findings:	Toxics and Chemicals III-3
Title of Ranking Unit:	Sandia Albuquerque Inactive ITRI Sewage Lagoon
Supporting Survey Findings:	Inactive Sites III-7
Title of Ranking Unit:	Sandia Albuquerque ITRI Active Lagoons
Supporting Survey Findings:	Groundwater II-1 (portion)
Title of Ranking Unit:	Sandia Albuquerque ITRI Hot Ponds
Supporting Survey Findings:	Groundwater II-1 (portion)
Title of Ranking Unit:	Sandia Albuquerque ITRI Leaking Drums
Supporting Survey Findings:	Toxics and Chemicals II-2

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Sandia National Laboratories, Livermore

Title of Ranking Unit:	Sandia Livermore Diesel Fuel Tank Area
Supporting Survey Findings:	Sandia Surface Water III-1 and Sandia Inactive Sites III-1
Title of Ranking Unit:	Sandia Livermore Former Fire Extinguisher Training Area
Supporting Survey Findings:	Sandia Inactive Sites III-5

Savannah River Plant

Title of Ranking Unit:	Savannah River Sanitary Sludge Lagoon
Supporting Survey Findings:	Active Waste II-1
Title of Ranking Unit:	Savannah River Depleted Uranium Storage
Supporting Survey Findings:	Active Waste III-1
Title of Ranking Unit:	Savannah River New TNX Basin
Supporting Survey Findings:	Surface Water II-1
Title of Ranking Unit:	Savannah River Sediments in Steel Creek Corridor
Supporting Survey Findings:	Surface Water II-3
Title of Ranking Unit:	Savannah River 211 F and H Treatment Tank and Associated Piping
Supporting Survey Findings:	Surface Water II-2
Title of Ranking Unit:	Savannah River Old TNX Basin
Supporting Survey Findings:	Surface Water III-1
Title of Ranking Unit:	Savannah River M Area Settling Basin
Supporting Survey Findings:	Groundwater III-1
Title of Ranking Unit:	Savannah River Active Seepage Basins
Supporting Survey Findings:	Groundwater II-1, III-1
Title of Ranking Unit:	Savannah River Burial Grounds
Supporting Survey Findings:	Groundwater III-1
Title of Ranking Unit:	Savannah River H Area Drainage Ditch
Supporting Survey Findings:	Soil III-1, Surface Water III-5
Title of Ranking Unit:	Savannah River Animal Contamination
Supporting Survey Findings:	Soil III-2

Title of Ranking Unit:	Savannah River Savannah River Swamp
Supporting Survey Findings:	Direct Radiation III-1
Title of Ranking Unit:	Savannah River Airborne Mercury Releases
Supporting Survey Findings:	Air III-3, Soil III-3
Title of Ranking Unit:	Savannah River Tritium Air Sources
Supporting Survey Findings:	Air III-1, and III-2
Title of Ranking Unit:	Savannah River Unplanned Releases of Tritium
Supporting Survey Findings:	Air III-1, III-2, and Surface Water III-6
Title of Ranking Unit:	Savannah River 1,1,1-Trichloroethane Release from M Area
Supporting Survey Findings:	Air III-6
Title of Ranking Unit:	Savannah River A and M Areas Nonradioactive Pits and Piles
Supporting Survey Findings:	Inactive Waste III-2
Title of Ranking Unit:	Savannah River D and TNX Areas Nonradioactive Pits and Piles
Supporting Survey Findings:	Inactive Waste III-2
Title of Ranking Unit:	Savannah River C, F, H, and CS Areas Nonradioactive Pits and Piles
Supporting Survey Findings:	Inactive Waste III-2
Title of Ranking Unit:	Savannah River K, L, P, and R Areas Nonradioactive Pits and Piles
Supporting Survey Findings:	Inactive Waste III-2
Title of Ranking Unit:	Savannah River A and M Areas Miscellaneous Radioactive Surface Contamination
Supporting Survey Findings:	Inactive Waste III-2

Title of Ranking Unit:	Savannah River F and H Areas Miscellaneous Radioactive Surface Contamination
Supporting Survey Findings:	Inactive Waste III-2
Title of Ranking Unit:	Savannah River L and P Areas Miscellaneous Radioactive Surface Contamination
Supporting Survey Findings:	Inactive Waste III-2
Title of Ranking Unit:	Savannah River A and M Areas Underground Storage Tanks
Supporting Survey Findings:	Toxics and Chemicals II-1
Title of Ranking Unit:	Savannah River C, F, H, and CS Areas Underground Storage Tanks
Supporting Survey Findings:	Toxics and Chemicals II-1
Title of Ranking Unit:	Savannah River D and TNX Areas Underground Storage Tanks
Supporting Survey Findings:	Toxics and Chemicals II-1
Title of Ranking Unit:	Savannah River K, L, P, and R Areas Underground Storage Tanks
Supporting Survey Findings:	Toxics and Chemicals II-1
Title of Ranking Unit:	Savannah River Tritium in Surface Water
Supporting Survey Findings:	Surface Water III-6

Y-12 Plant

Title of Ranking Unit:	Y-12 Off-site Floodplain Contamination in East Fork Poplar Creek and Bear Creek
Supporting Survey Findings:	Inactive Waste III-14
Title of Ranking Unit:	Y-12 Bear Creek Valley Waste Disposal Area
Supporting Survey Findings:	Air III-5, Surface Water III-3, Groundwater III-1, Inactive Waste III-1 and III-7
Title of Ranking Unit:	Y-12 Groundwater Contamination in the Main Y-12 Plant Area
Supporting Survey Findings:	Groundwater III-3, Inactive Waste III-5
Title of Ranking Unit:	Y-12 Coal Ash Retention Pond/Rogers Quarry
Supporting Survey Findings:	Groundwater III-4 (portion), Surface Water III-4
Title of Ranking Unit:	Y-12 Underground Storage Tanks for Waste Materials
Supporting Survey Findings:	Active Waste III-1
Title of Ranking Unit:	Y-12 Chestnut Ridge Sediment Disposal Basin
Supporting Survey Findings:	Groundwater III-4 (portion)
Title of Ranking Unit:	Y-12 Chestnut Ridge Security Pits
Supporting Survey Findings:	Groundwater III-4 (portion)
Title of Ranking Unit:	Y-12 UNC Site
Supporting Survey Findings:	Groundwater III-4
Title of Ranking Unit:	Y-12 Dust and Smoke Emissions
Supporting Survey Findings:	Air III-6, III-8
Title of Ranking Unit:	Y-12 Underground Storage Tanks for Non-Waste Toxic and Hazardous Substances
Supporting Survey Findings:	Active Waste III-1 (portion)

Title of Ranking Unit:	Y-12 Untreated Process Water Discharges
Supporting Survey Findings:	Surface Water III-2
Title of Ranking Unit:	Y-12 Soil Contamination in the Main Plant Area
Supporting Survey Findings:	Active Waste II-1, Toxics and Chemicals III-1, Inactive Waste III-3
Title of Ranking Unit:	Y-12 Leaking Drums at the Salvage Yard
Supporting Survey Findings:	Active Waste II-1, Toxics and Chemicals III-1, Inactive Waste III-3
Title of Ranking Unit:	Y-12 Inadequate Containment of Spills and Leaks
Supporting Survey Findings:	Toxics and Chemicals III-2
Title of Ranking Unit:	Y-12 Hydrogen Fluoride Emissions
Supporting Survey Findings:	Air III-3
Title of Ranking Unit:	Y-12 On-site Mercury Contamination
Supporting Survey Findings:	Soil III-3, Surface Water III-2, Groundwater III-2, Inactive Waste III-2