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Nonnuclear Consolidation Environmental Assessment

Volume I

Nuclear Weapons Complex Reconfiguration Program

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Acronyms and Abbreviations

ACRONYMS AND ABBREVIATIONS

ADT	average daily traffic
AEC	Atomic Energy Commission
APZ	Accident Potential Zone
AQCR	Air Quality Control Region
CAA	Clean Air Act, as amended
CDR	Conceptual Design Report
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
Complex	Nuclear Weapons Complex
CWA	Clean Water Act, as amended
D&D	decontamination and decommissioning
Department	Department of Energy
DNL	day-night sound levels
DOD	Department of Defense
DOE	Department of Energy
DOI	Department of the Interior
DOT	Department of Transportation
DP	Defense Programs
EA	Environmental Assessment
EIS	Environmental Impact Statement
EM	DOE Office of Environmental Restoration & Waste Management
EPA	Environmental Protection Agency
ES&H	Environment, Safety and Health
FONSI	Finding of No Significant Impact
FWS	United States Fish and Wildlife Service
HAP	Hazardous Air Pollutants
HE	high explosive
HEPA	High Efficiency Particulate Air
HLW	high-level waste
HVAC	heating, ventilation and air conditioning
INEL	Idaho National Engineering Laboratory
IRS	Internal Revenue Service
ISCST	Industrial Source Complex Short Term
KAFB	Kirtland Air Force Base, Albuquerque, NM
KCP	Kansas City Plant
LAMB	Lithium Ambient Battery
LANL	Los Alamos National Laboratory
L_{eq}	equivalent sound level
LLNL	Lawrence Livermore National Laboratory
LLW	low-level waste

LOS	level of service
MCL	maximum contaminant level
MMES	Martin Marietta Energy Systems
MMI	Modified Mercalli Intensity
Mound	Mound Plant
MSL	mean sea level
MWHS	milliwatt heat source
NAAQS	National Ambient Air Quality Standards
NCP	Nonnuclear Consolidation Plan
NEPA	National Environmental Policy Act of 1969, as Amended
NERP	National Environmental Research Park
NESHAP	National Emissions Standards for Hazardous Air Pollutants
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NRC	Nuclear Regulatory Commission
NRHP	National Register of Historic Places
NTS	Nevada Test Site
NWI	National Wetland Inventory
NWS	National Weather Service
OEL	occupational exposure level
ORNL	Oak Ridge National Laboratory
ORR	Oak Ridge Reservation
OSHA	Occupational Safety and Health Administration
P. L.	Public Law
PEIS	Programmatic Environmental Impact Statement
PEL	Permissible Exposure Limit
PHV	peak hour volume
Pinellas	Pinellas Plant
PSD	Prevention of Significant Deterioration
R&D	Research and Development
RAPCA	Regional Air Pollution Control Agency
RCRA	Resource Conservation and Recovery Act, as amended
RD&T	Research, Development, and Testing
RFP	Rocky Flats Plant
ROD	Record of Decision
ROI	region-of-influence
RTF	Replacement Tritium Facility
RTG	Radioisotopic Thermoelectric Generator
SAR	Safety Analysis Report
SARA	Superfund Amendments and Reauthorization Act
SDWA	Safe Drinking Water Act, as amended
Secretary	Secretary of Energy
SHPO	State Historic Preservation Office
SNL	Sandia National Laboratories, Albuquerque
SNM	special nuclear materials
SRS	Savannah River Site

TA	technical area
TCLP	Toxicity Characteristic Leaching Procedure
TLV	Threshold Limit Value
TRU	transuranic
TSCA	Toxic Substances Control Act, as amended
TSP	total suspended particulates
TWA	time-weighted average
USAF	United States Air Force
VOC	volatile organic compounds
VRM	Visual Resource Management
WSRC	Westinghouse Savannah River Company
Y-12	Y-12 Plant, Oak Ridge Reservation

CHEMICALS AND UNITS OF MEASURE

BGY	billion gallons per year
CCl_4	carbon tetrachloride
Ci	curies
CO	carbon monoxide
dB	decibel
dBA	decibel A-weighted
DCE	1,2-dichloroethylene
ft^2	square feet
ft^3	cubic feet
ft^3/s	cubic feet per second
gal	gallon
GPD	gallons per day
GPY	gallons per year
HMX	cyclotetramethylenetetranitramine, or 1,3,5,7-tetranitro-1,3,5,7-tetrazocine
hr	hour/hours
kg	kilogram
kV	kilovolt
kVA	kilovoltampere
kW	kilowatt
lb	pound, pounds
lb/hr	pound per hour, pounds per hour
mg	milligram (one-thousandth of a gram)
mg/L	milligram per liter
MGD	million gallons per day
MGY	million gallons per year
mrem	millirem
MVA	megavoltampere
MW	megawatt
MWh	megawatt hour

NO_2	nitrogen dioxide
NO_x	nitrogen oxides
O_3	ozone
Pb	lead
PCB	polychlorinated biphenyl
pCi/L	picocuries per liter
PETN	pentaerythritol tetranitrate
PM_{10}	particulate matter of aerodynamic diameter (diameter less than 10 micrometers)
ppb	parts per billion
ppm	parts per million
RDX	cyclotrimethylenetrinitramine
SO_2	sulfur dioxide
TATB	triaminotrinitrobenzene
TCA	1,1,1-trichloroethane
TCE	trichloroethylene
TNT	trinitrotoluene
yd^3	cubic yards
µg	microgram (one-millionth of a gram)
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
$\mu g/m^3$	micrograms per cubic meter
µm	micron (one-millionth of a meter)

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

INTRODUCTION

Complex 21. The Department of Energy (DOE) is developing a proposal, known as Complex 21, to reconfigure the Nation's Nuclear Weapons Complex (Complex). The Complex is a set of interrelated facilities that design, manufacture, test, and maintain this country's nuclear weapons stockpile and dismantle the weapons retired from that stockpile. The Complex also produces and recycles the nuclear materials used in building weapons, stores nuclear materials for future use, and conducts surveillance and maintenance activities on the stockpile. These activities ensure the reliability and safety of the stockpiled weapons throughout their operational life.

Many of the Complex facilities, constructed over the past 50 years, were sized to meet stockpile requirements substantially larger and more diverse than those expected in the future. They were designed and built to environmental and safety standards very different from, and less stringent than, those of today. In view of improving international relationships, the Presidential initiatives of September 27, 1991 and January 20, 1992, and the Bush-Yeltsin agreement of June 1992, the requirements for the number and types of nuclear weapons will substantially decrease from current stockpile levels. Additional changes are possible in the future which cannot be foreseen at this time. Therefore, the Complex must provide the flexibility to respond to emerging and future changes. To meet these challenges, the Secretary of Energy (Secretary) has proposed to reconfigure the present Complex into Complex 21. Complex 21 would be smaller, less diverse, and less expensive to operate than the Complex of today.

Nonnuclear Consolidation. The development of Complex 21 has been divided into two parts: the consolidation of the nonnuclear functions, which is the Proposed Action addressed in this Environmental Assessment (EA), and reconfiguration of the nuclear and the research, development, and testing (RD&T) functions.

The nonnuclear element of the Complex manufactures nonnuclear parts of nuclear weapons and tests individual components. Nonnuclear components include electronics, electrical/mechanical assemblies, batteries, wiring, and firing systems. Although production of some of these components involves the handling of small amounts of tritium, their manufacture does not involve the production of nuclear materials, nor the manufacture of principal weapons components from uranium, plutonium, or tritium. Therefore, collectively, the manufacturing activities associated with these components make up the nonnuclear functional element of the Complex. In contrast to high-volume industrial factories, the nonnuclear plants generally produce relatively small quantities of technologically sophisticated products. This type of production results in a large infrastructure with relatively high fixed costs, regardless of the production rate.

Complex 21 would be smaller, less diverse, and less expensive to operate than the Complex of today.

The manufacturing activities discussed in this EA have been grouped into six different categories. These include:

- *Electrical/Mechanical.* This category includes the majority of the activities that will be moved to or remain at the proposed consolidation site and consists of 28 items from Kansas City Plant (KCP), 5 each from Mound Plant (Mound) and Pinellas Plant (Pinellas), and 1 from Rocky Flats Plant (RFP).

- *Tritium Handling.* This category includes four specific tritium handling activities of which three are currently located at Mound and one is at Pinellas.

- *Detonators.* This category consists of the high-power detonator work that is currently at Mound.

- *Beryllium and Pit Support.* These two items are currently located at RFP.

- *Neutron Generators, Cap Assemblies, and Batteries.* This category includes four specialized items (two types of batteries) currently located at Pinellas.

- *Special Products.* This category consists of six unique products (four from RFP and two from Mound) that do not easily fall into any specific category.

The locations of sites involved in the nonnuclear consolidation proposal are illustrated in figure ES-1. The key element of the Proposed Action is consolidation of electrical and mechanical functions at KCP. The No Action alternative and alternatives for consolidating the majority of electrical and mechanical functions at Mound, Pinellas, and RFP were also investigated.

National Environmental Policy Act. The National Environmental Policy Act (NEPA) of 1969, as amended, requires DOE to consider the environmental consequences of an overall program and the subsequent projects and activities before decisions are made. In complying with NEPA, DOE must follow Council on Environmental Quality (CEQ) regulations (40 CFR 1500-1508) as well as DOE's own NEPA implementation regulations 57 FR 15122, August 24, 1992 to be codified at 10 CFR 1021.

The DOE approach for implementing NEPA requirements for the reconfiguration program as a whole has two phases. The first phase involves this EA, which addresses nonnuclear consolidation, and a Programmatic Environmental Impact Statement (PEIS), which addresses reconfiguration of nuclear and RD&T functions of the Complex. During the second phase, decisions on nonnuclear consolidation would be implemented.

If the analysis in this EA supports a finding of no significant impact (FONSI), DOE plans to proceed with nonnuclear consolidation and incorporate the nonnuclear consolidation decisions into the PEIS analysis as actions common to all alternatives. If this EA identifies any significant impacts due to the Proposed Action, then the assessment of environmental impacts for consolidating nonnuclear functions would be incorporated into the PEIS. In this case, no actions would be taken to consolidate the nonnuclear manufacturing activities unless they were included in the PEIS Record of Decision.

- **This Environmental Assessment Addresses Consolidation of Nonnuclear Functions**
- **Programmatic Environmental Impact Statement Will Address Reconfiguration of Nuclear and Research, Development, and Testing Functions**

Time frame. If DOE issues a FONSI in the first half of 1993, building modifications and equipment installation would begin immediately and proceed through 1995. Operations of most functions at

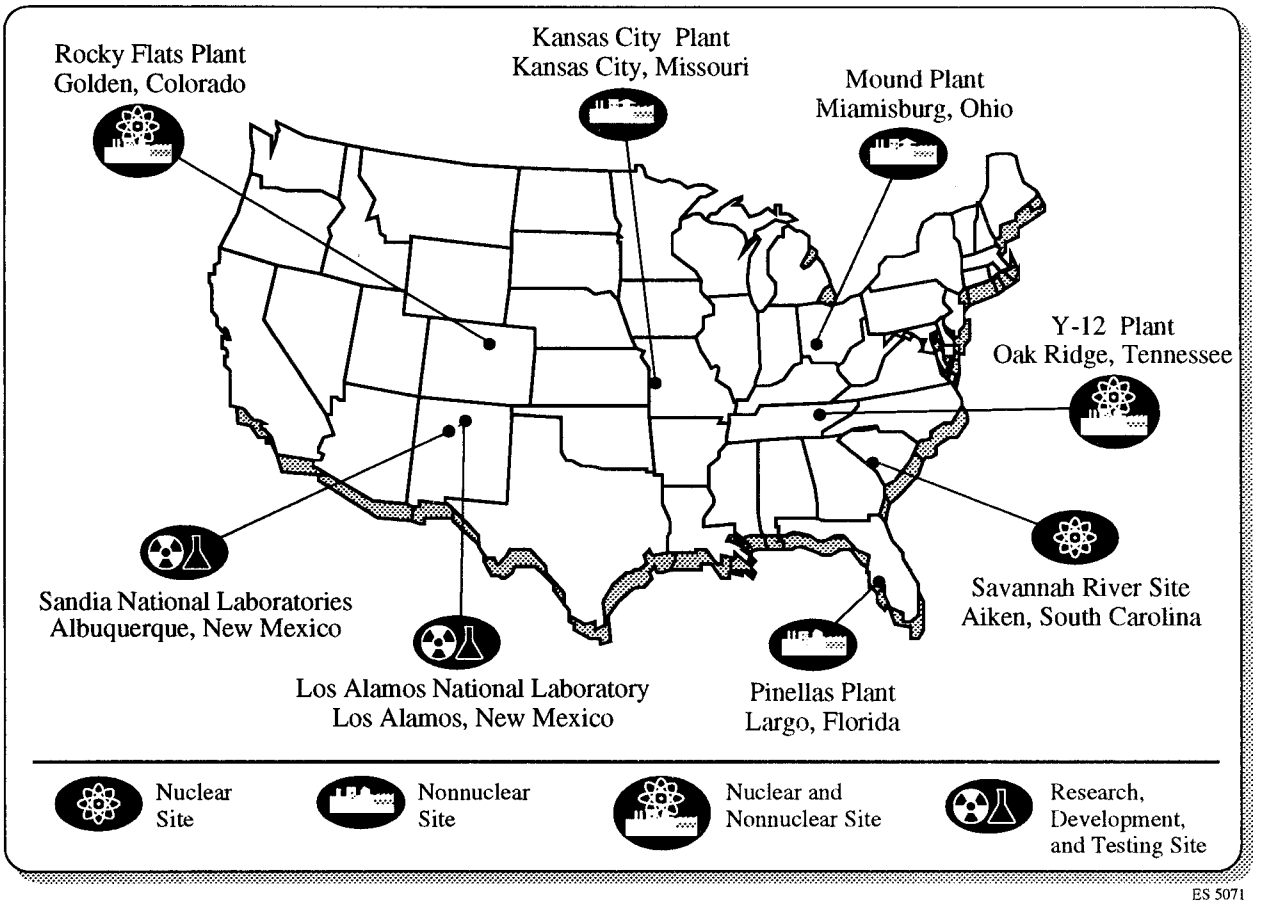

FIGURE ES-1.—***DOE Sites Involved in Nonnuclear Consolidation Proposal.***

receiver sites would be phased in over a 3-year period beginning in late 1994, with full operations achieved around 1997. However, some validation activities could continue beyond this date; therefore, for the purposes of environmental analysis, the year 2000 has been assumed as the year of peak operations following consolidation. It is assumed that operations would continue until the middle of the 21st century.

Issue Identification. Issue identification for this EA was accomplished as part of the larger scoping process for the Complex reconfiguration program. Scoping activities consisted of both internal DOE scoping and public scoping. Public meetings were conducted between March and August 1991 at 15 locations across the country to allow interested parties to speak and present related information. Meetings occurred in the vicinity of all sites that could be affected by nonnuclear consolidation. All comments received through public scoping were systematically organized and reviewed for consideration during the preparation of both the PEIS and this EA. An extensive summary of all comments received during the public scoping process was published in the Implementation Plan (DOE, 1992d).

During the public scoping process, DOE received comments from members of the public; from representatives of interest groups; and from Federal, state, and local officials. DOE received 432 comments specifically related to consolidation of

Proposed Time Frame:

- **1993—Begin Consolidation**
- **1997—Most Operations in Place**
- **2000—Full Validation of All Operations**

Issue Identification for Reconfiguration Program Involved:

- **7-1/2 Month Comment Period**
- **Meetings Held Near All Sites**
- **432 Comments on Nonnuclear Consolidation**

nonnuclear functions. Comments covered a range of environmental and policy-related issues including environmental health, economic impacts of plant closures to local communities, worker and public health and safety, hazardous materials management, surface and groundwater contamination, population encroachment, and privatization of nonnuclear functions.

A review of the comments received was conducted to identify: (1) issues to be analyzed in this EA, and (2) issues that are either not relevant or are outside the scope of this EA. This review established the scope of study, along with internal DOE studies and the CEQ and DOE requirements for implementing NEPA requirements.

PURPOSE OF AND NEED FOR NONNUCLEAR CONSOLIDATION

Purpose. The purpose of nonnuclear consolidation is to effect better management of nonnuclear manufacturing activities within the Complex, to retain technical competence of the workforce, and to decrease the long-term operating costs of these functions. Consolidation would provide DOE with a mechanism to maintain the specialized skill base necessary to produce and test nonnuclear components.

Need. Consolidating nonnuclear facilities is needed because it will size the future nonnuclear manufacturing functions to the foreseeable workload, reduce operating costs, and retain adequate expertise to satisfy future work assignments. Continued operation of the existing large Complex would require maintaining nonnuclear expertise at multiple sites with little or no workload, which could result in a potential loss of technical skills. Consolidating similar nonnuclear manufacturing operations could serve as a mechanism to maintain skills and preserve competencies. Similarly, collocating some nonnuclear manufacturing capabilities with similar RD&T capabilities at the national laboratories could serve as a mechanism to maintain or to enhance skills.

PROPOSED ACTION AND ALTERNATIVES

In developing nonnuclear consolidation alternatives, DOE considered all sites that currently perform nonnuclear manufacturing functions as candidates for the consolidated nonnuclear mission: KCP, Mound, Pinellas, RFP, the Oak Ridge Y-12 Plant (Y-12), and the Pantex Plant (Pantex). DOE assessed nonnuclear manufacturing functions in three groups:

- Candidates for transfer to a primary consolidation site.
- Candidates for transfer to other sites.
- Candidates for privatization.

Each of the 6 potential consolidation sites was rated using 10 performance measures within 4 categories that involved environmental, safety, and health risks, technical risks, consolidation costs, and consolidation time. Through this analysis, KCP

Proposed Action Minimizes:

- **Environmental, Safety, and Health Risks**
- **Technical Risks**
- **Consolidation Costs**
- **Consolidation Time**

ranked first in 6 of the 10 performance measures and first in each of the 4 categories, and was selected as the preferred consolidation site (i.e., the Proposed Action). Mound and RFP ranked first in 2 of the 10 performance measures and Pinellas ranked first in 1. Y-12 and Pantex had no first place rankings in any of the performance measures. Both Mound and Pinellas ranked second in 2 of the 4 categories and RFP ranked second in 1 of the 4 categories. Y-12 and Pantex ranked last in all 4 categories.

Y-12 and Pantex have since been eliminated from further study as primary consolidation sites. Mound, Pinellas, and RFP have been retained for analysis in this EA, along with No Action, as alternatives to the proposed consolidation at KCP.

Figure ES-2 illustrates the Proposed Action, and Table ES-1 provides a comparison of Proposed Action and the three alternatives. The Proposed Action and alternatives are discussed in more detail below.

Kansas City Plant Consolidation. DOE proposes to terminate the weapons manufacturing missions at Mound and Pinellas, and the nonnuclear manufacturing mission at RFP. Enhanced RD&T and prototype fabrication capability would be provided to replace certain weapon production capabilities now located at Mound, Pinellas, and RFP; these enhanced capabilities would be used to satisfy future weapons stockpile needs if and when identified. The remaining nonnuclear manufacturing functions would be consolidated at KCP.

The Proposed Action would result in: the consolidation of the nonnuclear electrical/ mechanical manufacturing capabilities of the Complex at KCP; tritium-handling capabilities at Savannah River Site (SRS) and Los Alamos National Laboratory (LANL); high power detonator capabilities at LANL; and beryllium and pit support functions at LANL or, as an option, at Y-12. The existing RD&T and prototyping capability at Sandia National Laboratories (SNL) would be augmented to provide a limited fabricating capability for future neutron generators and other nonnuclear components.

Mound Plant Alternative. The weapons manufacturing mission at KCP and Pinellas, and the nonnuclear manufacturing mission at RFP would be terminated. Mound would retain all of its existing nonnuclear manufacturing capabilities and receive additional nonnuclear manufacturing capabilities from the other sites.

The Mound alternative would result in: the consolidation of the nonnuclear electrical/ mechanical manufacturing capabilities of the Complex at Mound; tritium-handling capabilities at Pinellas relocated with similar functions at LANL; and beryllium and pit support functions at LANL. The existing RD&T and prototyping capability at SNL would be augmented to provide a limited fabrication capability for future neutron generators and other nonnuclear components.

Key Elements of Proposed Action:

- **Phase out Nonnuclear Functions at Mound, Pinellas, and Rocky Flats Plants**
- **Consolidate Electrical and Mechanical Functions at Kansas City Plant**
- **Transfer Other Functions or Technology Bases to Four Other DOE Sites**

Pinellas Plant Alternative. The weapons manufacturing mission at KCP and Mound, and the nonnuclear manufacturing mission at RFP would be terminated. Pinellas would retain all of its existing nonnuclear manufacturing capabilities and receive additional nonnuclear manufacturing capabilities from the other sites.

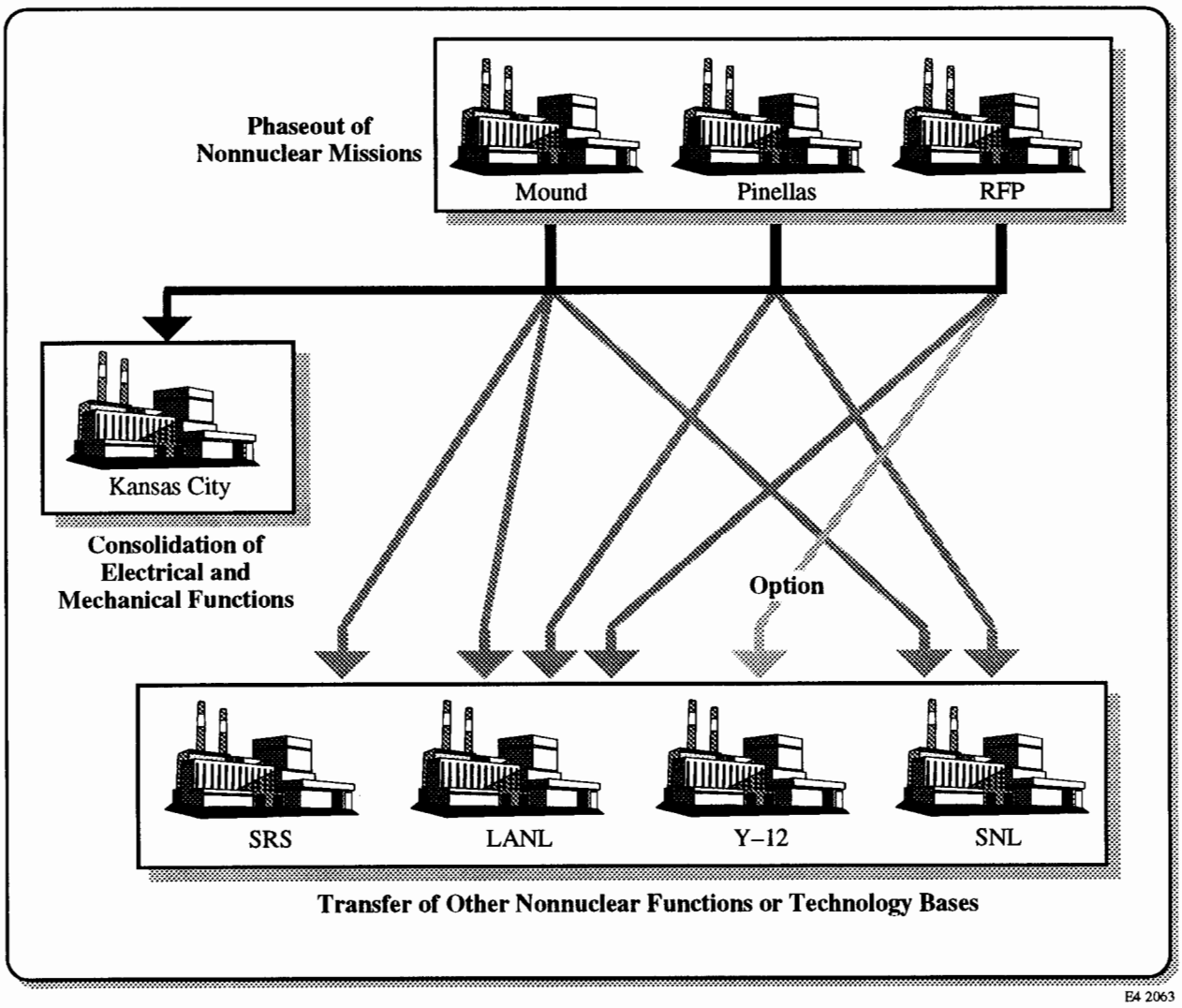

FIGURE ES-2.—*Proposed Action—Schematic Transfer of Nonnuclear Functions.*

The Pinellas alternative would result in: the consolidation of the nonnuclear electrical/mechanical manufacturing capabilities of the Complex at Pinellas; tritium-handling capabilities at Mound relocated with similar functions at SRS; high power detonators at LANL; and beryllium and pit support functions at LANL. The existing RD&T and prototyping capability at SNL would be augmented to provide a limited fabricating capability for other nonnuclear components.

Rocky Flats Plant Alternative. The weapons manufacturing mission at KCP, Mound, and Pinellas would be terminated. RFP would retain all of its existing nonnuclear manufacturing capabilities and receive additional nonnuclear manufacturing capabilities from the other sites.

The RFP alternative would result in: the consolidation of the nonnuclear electrical/mechanical manufacturing capabilities of the Complex at RFP; tritium-handling capabilities at SRS and LANL; and high power detonator capability at LANL. The existing RD&T and prototyping capability at SNL would be augmented to provide a limited fabricating capability for future neutron generators and other nonnuclear components.

TABLE ES-1.—*Proposed Action and Alternatives*

Nonnuclear Manufacturing Functions to be Moved	Alternatives				
	No Action	Proposed Action	Mound Plant Alternative	Pinellas Plant Alternative	Rocky Flats Plant Alternative
Electrical/Mechanical	KCP, Mound, Pinellas, RFP	KCP	Mound	Pinellas	RFP
Tritium Handling at Mound	Mound	SRS	Mound	SRS	SRS
Tritium Handling at Pinellas	Pinellas	LANL	LANL	Pinellas	LANL
Detonator	Mound	LANL	Mound	LANL	LANL
Beryllium and Pit Support	RFP	LANL (Option Y-12)	LANL	LANL	RFP
Neutron Generators, Cap Assemblies, and Batteries	Pinellas	SNL and KCP (LAMB)	SNL and Mound (LAMB)	Pinellas	SNL and RFP (LAMB)
Special Products at RFP	RFP	KCP	Mound	Pinellas	RFP
Special Products at Mound	Mound	LANL (Calorimeters) and SNL (MWHS)	Mound	LANL (Calorimeters) and SNL (MWHS)	LANL (Calorimeters) and SNL (MWHS)

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Notes: LAMB - Lithium Ambient Batteries
MWHS - Milliwatt Heat Source Surveillance

Source: DOE, 1992g.

No Action. Under No Action, the consolidation of nonnuclear functions would not occur. Planned upgrades, renovations, repairs, and maintenance activities necessary to improve Complex compliance with all ES&H and environmental restoration standards would continue irrespective of future Complex configurations. Mound, Pinellas, and RFP would retain their current nonnuclear manufacturing missions but in a standby mode due to lack of work.

Alternatives Eliminated from Further Study. In addition to the KCP, RFP, Mound, and Pinellas consolidation alternatives analyzed in this EA, other alternatives to the Proposed Action were considered but eliminated from further analysis as unreasonable. Alternatives of consolidation at Y-12 and Pantex were examined in the NCP. Based upon 10 performance measures used in the evaluation, consolidation at either Y-12 or Pantex posed substantially greater technical risks, involved substantially greater consolidation costs, and resulted in substantially longer payback times. Therefore, they were considered unreasonable and were eliminated from further evaluation.

Alternatives that would (1) consolidate nonnuclear manufacturing activities at any two of the current three dedicated nonnuclear plants (i.e., Mound and

Pinellas; KCP and Mound; or KCP and Pinellas), (2) consolidate such activities at a nuclear site or a national laboratory, or (3) consolidate all tritium maintenance, processing, and storage activities presently performed at Mound and SRS at Mound instead of SRS were also proposed during the course of preparing this EA.

The Two-Site Study estimated and compared the annual operating and long-term costs for the two-site alternatives with the Kansas City consolidation alternative addressed in the NCP. With regard to long-term cost comparisons, the Two-Site Study supports the conclusion that the preferred alternative of consolidating most nonnuclear manufacturing activities at Kansas City would save between one and a half billion dollars and several billion dollars in life-cycle costs over the two-site consolidation alternatives examined. This conclusion alone renders all of the two-site options unreasonable, and they have, therefore, been eliminated from further analysis in this EA.

In addition, one of the results of the Bush/Yeltsin arms reduction agreement has been to reduce even further the cost effectiveness and increase the technical risks involved in retaining neutron generator production at Pinellas. Thus, the KCP-Pinellas two-site consolidation option (which was the least costly of the two-site options evaluated in the study) has become even less attractive compared to single-site consolidation at KCP.

In addition, as a result of recent workload and budget reductions, the weapons complex has been forced to significantly reduce personnel levels, jeopardizing production competence in many areas. Consolidating like activities at a single site will ensure that there be sufficient work to support a core workforce of technical and production personnel, enabling utilazation and retention of key skills and technical capabilities that are needed to maintain the enduring stockpile. Consolidation at two sites will provide substantially less assurance that this programmatic objective will be achieved.

The environmental impacts of alternatives for consolidating nonnuclear manufacturing activities at a national laboratory or at a nuclear site (other than RFP) are not evaluated in this EA, because the technical risk, cost and time to consolidate render these alternatives unreasonable. As described above, the NCP considered the alternative of consolidating nonnuclear manufacturing activities at RFP, Pantex and Y-12, all nuclear sites. For the reasons discussed, neither Y-12 or Pantex represents a reasonable alternative for such consolidation.

Although the laboratories have experience with many of these technologies, and have designed the components and subsystems to be produced, they do not have the practical experience manufacturing production quantities of many of these components and subsystems. Thus, the technical risk involved in consolidating at a laboratory would be significantly greater than for the other alternatives considered in this EA. In addition, given the large number of technologies to be transferred, the transfer cost (including construction of new facilities) and time involved before such a transfer could be effected would render this alternative unreasonable, particularly in view of the need for near-term consolidation to prevent the loss of production competence in the complex.

The Department has also assessed the comparative costs of consolidation at either Mound or SRS of weapons complex tritium maintenance, processing, and storage activities presently performed at these sites.

Based upon the conclusion of the cost study that consolidation of tritium activities at Mound would involve life-cycle costs nearly two billion dollars greater than such consolidation at SRS, the Department has concluded that Mound constitutes an unreasonable alternative for such consolidation. In addition, notwithstanding the low risk involved, the Department believes that it is not prudent to place hundreds of millions of additional curies of tritium in a densely populated urban area such as that

surrounding Mound, especially when there exists the alternative of consolidating this material at SRS, a large site located away from such a densely populated area.

ENVIRONMENTAL CONSEQUENCES

Proposed Action. DOE has identified no significant environmental impacts associated with the proposal to consolidate nonnuclear activities at the Kansas City Plant. The conclusions of the environmental analyses are as follows:

- *Land Use.* No additional land would be required to implement the project. At KCP, SRS, LANL, Y-12, and SNL, changes and modifications to existing buildings would be compatible with existing land use plans and policies.

- *Air Quality and Acoustics.* The same sites would experience short-term increases in air emissions and noise during building renovations. During operation, minor increases in air emissions and noise would not exceed applicable air quality standards or guidelines. At Mound, Pinellas, and RFP, local air quality and noise improvements could occur due to the phaseout of these facilities.

- *Water Resources.* No disturbance of surface water features would occur at any sites. Increased water usage would not exceed available supplies at any of the sites. At KCP, SRS, LANL, and Y-12, increases in water usage would be less than 1 percent of current usage. At SNL the increase would be less than 4 percent. Water use would decrease due to mission phaseouts at Mound, Pinellas, and RFP.

Environmental Consequences:

- **Proposed Action Has No Significant Environmental Impacts**
- **Other Consolidation Alternatives Require Substantial New Construction and Additional NEPA Documentation**
- **No Action Alternative Does Not Have Significant Environmental Impacts, But Does Not Meet DOE Needs**

- *Geology and Soils.* No significant impacts to geologic resources or soils would occur at any sites.

- *Biotic Resources.* No permanent disturbance of any biotic resources is anticipated from building renovations or operations at any site.

- *Cultural Resources.* There would be no disturbance of prehistoric resources at KCP, SRS, Y-12, or SNL. There would be no adverse effect on historic structures at KCP, SRS, or Y-12. Agency consultation has been initiated with regard to a minor (1/2 acre) ground disturbance at LANL and structures that meet age criteria for eligibility as historic buildings at LANL and SNL. Native American consultation has been initiated at all sites.

- *Socioeconomics.* Changes to socioeconomics and community services at KCP, SRS, LANL, Y-12, and SNL are expected to be minor. Approximately 575 jobs would be created at KCP; 85 at SRS; 60 at LANL; 18 at Y-12; and 350 at SNL. Adverse economic consequences would occur at Mound, Pinellas, and RFP due to the

phaseout of nonnuclear manufacturing activities at these facilities. Approximately 1,200 direct jobs would be lost at Mound, 1,450 direct jobs at Pinellas, and 3,700 direct jobs at RFP.

- *Waste Management.* Nonnuclear manufacturing activities associated with the Proposed Action would have minor waste management effects at KCP, SRS, LANL, Y-12, and SNL. Only small increases in hazardous waste volumes (generally less than 5 percent) would occur. At KCP, sanitary/industrial wastewater effluent would increase 1.7 million gallons per year which is less than 1 percent over the current rate of 310 million gallons per year. Solid nonhazardous waste volumes would increase by 1 percent or less at KCP, SRS, Y-12, and SNL, and by 9 percent at LANL. At Mound, Pinellas, and RFP, nonnuclear production waste streams would be eliminated.

- *Human Health.* No significant adverse human health effects to the public due to radiological or chemical exposure are expected from implementation or operation activities associated with the Proposed Action at any of the sites. A cancer risk to workers at LANL (1.5×10^{-6}) and SNL (6×10^{-6}) due to the use of certain solvents in current operations was predicted using air quality modeling. Potential mitigation measures to reduce these risks include substituting less toxic solvents or modifying the production processes. The frequency and consequences of potential accidents would not increase appreciably at any of the sites.

Alternatives. If either the Mound, Pinellas, or RFP alternatives were selected, substantial new construction would be required. For these alternatives, additional site-specific NEPA documentation would be required.

No Action. The No Action alternative would not result in any significant adverse environmental impacts. However, the No Action alternative would not satisfy the DOE need to size the future nonnuclear manufacturing functions to the foreseeable workload, reduce operating costs, and provide adequate expertise to satisfy the future work assignments.

ENVIRONMENTAL PERMITS AND REGULATIONS

Federal environmental regulations have been established to protect the environment and to control the handling, emission, discharge, and disposal of waste substances. At the Federal level, these environmental regulations are promulgated and enforced by the Environmental Protection Agency, the Department of the Interior, and other agencies. Compliance with these national requirements must be met by all Federal agencies whether they are enforced directly by the Federal Government or the enforcement is delegated to the states. In many cases, these requirements are applied to sources of potential impact through review, approval, and permitting programs that control the release of pollutants or other impacts on the environment. This EA provides an extensive list of permitting and other regulatory requirements that would be observed at each site involved in nonnuclear consolidation.

CHAPTER 1

CHAPTER 1: INTRODUCTION

Chapter One describes the Department of Energy's proposal to reconfigure the Nation's Nuclear Weapons Complex and the nonnuclear consolidation element of that proposal addressed in this document. The strategy for complying with the National Environmental Policy Act, other related actions, and time periods considered in analysis are also described. Chapter One includes discussions of the background of the program, the issue identification process used to define the scope of study, and the specific alternatives that are analyzed. The chapter concludes with reviews of the methods of analysis and the organization of the document.

1.1 THE RECONFIGURATION PROPOSAL: COMPLEX 21

The Department of Energy (DOE) is developing a proposal, known as Complex 21, to reconfigure the Nation's Nuclear Weapons Complex (Complex). The Complex is a set of interrelated facilities that design, manufacture, test, and maintain this country's nuclear weapons stockpile and dismantle the weapons retired from that stockpile. The Complex also produces and/or recycles the nuclear materials used in building nuclear weapons, stores materials for future use, and conducts surveillance and maintenance activities to ensure the reliability and safety of the stockpiled weapons throughout their operational life.

The Complex is administered by the DOE Office of Defense Programs (DP) through its Albuquerque, Nevada, Oak Ridge, Rocky Flats, San Francisco, and Savannah River Field Offices, and consists of government-owned, contractor-operated facilities located at 11 sites around the country. The size, location, and functions of the 11 DOE sites that make up the current Complex are illustrated in figure 1.1-1. The functions shown are the nuclear, nonnuclear, and research, development and testing (RD&T) roles which these sites have carried out in the recent past. Figure 1.1-1 also shows two sites that were formerly part of the weapons complex; these sites are being analyzed as part of the Complex 21 proposal to determine if they should be reassigned weapons missions.

Many of the facilities, constructed over the past 50 years, were sized to meet stockpile requirements substantially larger and more diverse than those expected in the future, and were designed and built to standards very different from, and less stringent than, those of today. In view of improving international relationships, the Presidential initiatives of September 27, 1991 and January 20, 1992, and the Bush-Yeltsin agreement of June 1992, the requirements for the number and types of nuclear weapons will substantially decrease from current stockpile levels. Additional changes are possible in the future which cannot be foreseen at this time. Therefore, the Complex must provide the flexibility to respond to emerging and future changes. To meet these challenges, the Secretary of Energy (Secretary) has proposed to reconfigure the present Complex into Complex 21.

Complex 21 would be smaller, less diverse, and less expensive to operate than the Complex of today. The goal of Complex 21 would be to safely and reliably support whatever nuclear weapons objectives are set by the President and funded by Congress. As stockpile requirements decrease, fewer weapons would be built, which in turn means less manufacturing capacity would be needed. Accordingly, the thrust would be to maintain key

Hanford Site (Hanford)

- 360,000 acres near Richland, Washington (established 1942).
- Formerly used for reactor production of plutonium and chemical processing of DOE spent fuel and irradiated targets to recover enriched uranium and plutonium. Will be considered as a potential addition to the Complex.

Idaho National Engineering Laboratory (INEL)

- 570,000 acres near Idaho Falls, Idaho (established 1949).
- Formerly used for chemical processing of naval reactor spent fuel and DOE-owned research reactor fuels to recover enriched uranium for use as naval and production reactor fuel. Will be considered as a potential addition to the Complex.

Rocky Flats Plant (RFP)

- 6,500 acres between Denver and Boulder, Colorado (established 1952).
- Fabricates finished plutonium parts for nuclear weapons and performs plutonium recycle and recovery.
- Fabricates nonnuclear components from beryllium, stainless steel, and depleted uranium.

Kansas City Plant (KCP)

- 136 acres in Kansas City, Missouri (established 1949).
- Produces electromechanical, electronic, rubber, plastic, and metallurgical components for arming, fuzing, and firing systems; nuclear safety components; and use control components. Performs surveillance and evaluation of components; and designs and produces customized electronic test equipment.

Mound Plant (Mound)

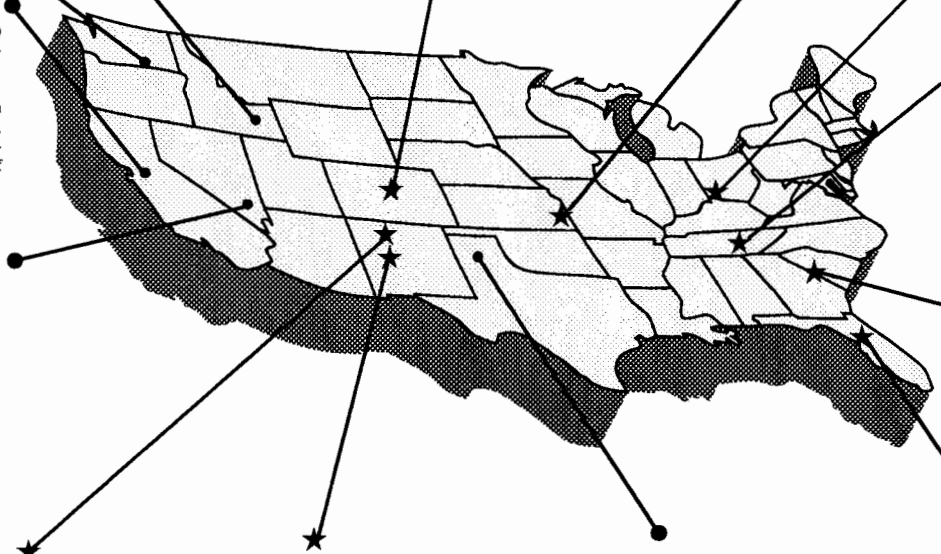
- 306 acres in Miamisburg, Ohio (established 1948).
- Isotope separation and sales. Tritium process development.
- Produces detonators, pyrotechnic devices, explosively actuated timers and firesets, radioisotopic heat source piece parts, mechanical assemblies, flat cable products, and gas transfer systems; conducts stockpile surveillance testing on explosive components and gas transfer systems; and recovers tritium from some retired weapons.

Lawrence Livermore National Laboratory (LLNL)

- 821 acres in Livermore, California (established 1952) plus 7,000 acres in Alameda and San Joaquin Counties.
- Performs nuclear weapons RD&T; basic research in experimental, theoretical, and computational physics; earth and life sciences; chemistry; nuclear engineering; and seismic research that supports verification of nuclear testing treaties.

Nevada Test Site (NTS)

- 882,300 acres, 65 miles northwest of Las Vegas, Nevada (established 1951).
- Conducts underground testing of nuclear weapons and evaluation of the effects of nuclear weapons on military communications systems, electronics, satellites, sensors, and other materials.



Oak Ridge Y-12 Plant (Y-12)

- Located on the 35,300 acre Oak Ridge Reservation near Oak Ridge, Tennessee (established 1942).
- Processes depleted uranium and highly enriched uranium, and fabricates uranium components.
- Produces lithium compounds and parts, precision machining, and specialty subassembly of structural components.

Savannah River Site (SRS)

- 192,000 acres near Aiken, South Carolina (established 1953).
- Formerly produced plutonium: produces tritium and other nuclear materials; chemically processes DOE spent fuel and irradiated targets to recover enriched uranium, plutonium, and tritium; and performs purification and loading of tritium reservoirs.

LEGEND

- Nuclear Elements
- Nonnuclear Elements
- RD&T Functions
- Nuclear and Nonnuclear Site
- ★ Sites Involved in Nonnuclear Consolidation Proposal

Los Alamos National Laboratory (LANL)

- 27,500 acres at Los Alamos, New Mexico (established 1943).
- Performs nuclear weapons RD&T; basic research in experimental, theoretical, and computational physics; earth and life sciences; chemistry; nuclear engineering; and research for arms control verification.

Sandia National Laboratories (SNL)

- 8,300 acres near Albuquerque, New Mexico (established 1948), with major facilities at Livermore, California, and Tonopah Test Range, Nevada.
- Performs design and engineering of nonnuclear components for nuclear weapons systems, ordnance engineering, research for arms control verification, and field and laboratory testing.

Pantex Plant (Pantex)

- 10,600 acres near Amarillo, Texas (established 1951).
- Assembles and disassembles nuclear weapons components; performs weapons repair, modification, and disposal; and conducts stockpile evaluation and testing.
- Fabricates high explosive components and assembles high explosives and nonnuclear components.

Pinellas Plant (Pinellas)

- 100 acres in Largo, Florida (established 1957).
- Produces neutron generators, thermal batteries, specialty capacitors, lightning arrestor connectors, frequency devices, magnetic components, and neutron detectors.

FIGURE 1.1-1.—*Current Nuclear Weapons Complex Sites.*

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capabilities in Complex 21 that, if lost, would cause significant and rapid degradation of the overall Complex effectiveness. DOE would continue to purchase some weapons components from the private sector (privatization) where it would be cost effective.

Complex 21 would employ state-of-the-art technology and, to the extent practical, facilities which are flexible enough to accommodate fluctuations in capacity. The number and size of waste streams would be kept to a minimum and would fully comply with environmental laws and regulations. New facilities would be constructed and existing facilities would either be phased out or upgraded to comply with all applicable Federal, state, and local laws, regulations, and orders. Complex 21 would be fully operational early in the 21st century and would sustain the Nation's nuclear deterrent through the middle of that century.

The development of Complex 21 has been divided into two parts, the consolidation of the nonnuclear component and reconfiguration of the nuclear and RD&T components. The following sections summarize the nonnuclear consolidation component and describe DOE's strategy for meeting the requirements of the National Environmental Policy Act.

1.2 NONNUCLEAR CONSOLIDATION

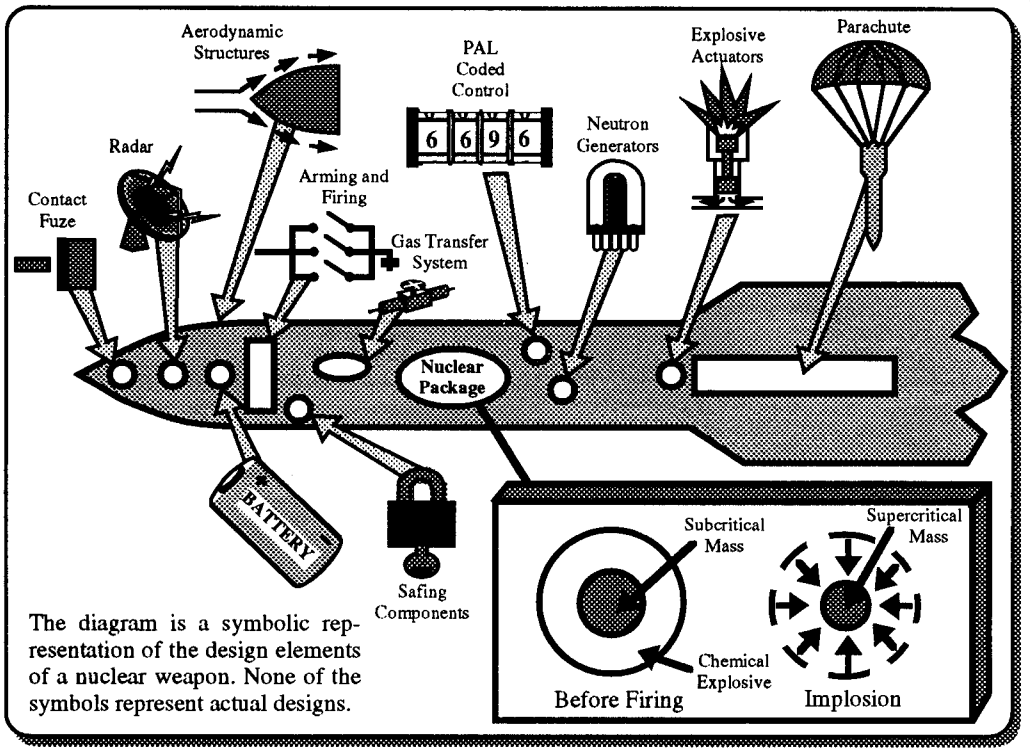
The nonnuclear consolidation proposal is part of the Secretary's larger proposal to downsize the entire Complex. Key elements of this proposal are: closeout of DP nonnuclear functions at the Mound Plant (Mound) in Miamisburg, Ohio, the Pinellas Plant (Pinellas) in Largo, Florida, and the Rocky Flats Plant (RFP) near Golden, Colorado; consolidation of the majority of electrical and mechanical functions at the Kansas City Plant (KCP) in Kansas City, Missouri; and transfer of other functions or technology bases to Los Alamos National Laboratory (LANL) in Los Alamos, New Mexico, Sandia National Laboratories (SNL) in Albuquerque, New Mexico, the Savannah River Site (SRS) near Aiken, South Carolina, and the Y-12 Plant (Y-12) near Oak Ridge, Tennessee. New construction activities would be limited almost exclusively to renovation of existing facilities at consolidation sites. The No Action alternative and alternatives for consolidating the majority of electrical and mechanical functions at Mound, Pinellas, and RFP are also being investigated.

The products and services produced by the nonnuclear element of the Complex are used to manufacture nuclear weapons and test individual components. The components of a nuclear weapon and basic design features are shown in figure 1.1-2. Nonnuclear components include electronics, batteries, wiring, and firing systems. Although some of these components involve small amounts of tritium, their manufacture does not involve the production of nuclear materials, nor the manufacture of principal weapons components from uranium, plutonium, or tritium. Therefore, collectively, the manufacturing activities associated with these components are designated the nonnuclear functional element of the Complex. In contrast to high-volume factories, the nonnuclear plants generally produce relatively small quantities of technologically sophisticated products which have a long shelf life. Certain limited-life components are also produced. This results in a large infrastructure with relatively high fixed costs, irrespective of the production rate.

1.3 NATIONAL ENVIRONMENTAL POLICY ACT CONSIDERATIONS

The National Environmental Policy Act (NEPA) of 1969, as amended, requires DOE to consider the environmental consequences of an overall program and the subsequent projects, activities, and alternatives before they are implemented. In complying with NEPA, DOE must follow Council on Environmental Quality (CEQ) regulations (40 CFR 1500-1508) as well as DOE's own

Nuclear explosions are produced by initiating and sustaining nuclear chain reactions in highly compressed material which can undergo both fission and fusion reactions. Modern strategic, and most tactical, nuclear weapons use a nuclear package with two assemblies: the primary assembly, which is used as the initial source of energy, and the secondary assembly, which provides additional explosive energy release. The primary assembly contains a central core, called the "pit," which is surrounded by a layer of high explosive. The "pit" is typically composed of plutonium-239 and/or highly enriched uranium (HEU), and other materials. HEU contains large fractions of the isotope uranium-235.



The diagram is a symbolic representation of the design elements of a nuclear weapon. None of the symbols represent actual designs.

Primary Detonation

The primary nuclear explosion is initiated by detonating the layer of chemical high explosive that surrounds the "pit" which in turn drives the plutonium-239 into a compressed mass at the center of the primary assembly. This implosion process is illustrated in the inset of the diagram.

Boosting

In order to achieve higher explosive yields from primaries with relatively small quantities of pit material (plutonium-239), a technique called "boosting" is used. Boosting is accomplished by injecting a mixture of tritium (T) and deuterium (D) gas into the pit. The deuterium and tritium are stored in high-pressure reservoirs until the gas transfer system is initiated. The implosion of the pit along with the onset of the fissioning process heats the D-T mixture to the point that the D-T atoms undergo fusion. The fusion reaction produce large quantities of very high energy neutrons which flow through the compressed pit material and produce additional fission reactions.

Secondary Activation

The energy released by the primary explosion activates the secondary assembly. The secondary assembly is composed of lithium deuteride and other materials. As the secondary implodes, the lithium, in the isotopic form lithium-6, is converted to tritium by neutron interactions, and the tritium product in turn undergoes fusion with the deuterium to create the thermonuclear explosion.

Nonnuclear Components

Nonnuclear components include contact fuzes, radar components, aerodynamic structures, arming and firing systems, gas transfer systems, permissive action link (PAL) coded controls, neutron generators, explosive actuators, safing components, batteries, and parachutes.

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FIGURE 1.1-2.—*Nuclear Weapons Design.*

implementation regulations (57 FR 15122), August 24, 1992, to be codified at 10 CFR 1021.

The DOE approach for implementing NEPA requirements for the reconfiguration program has three phases. The first phase involves this Environmental Assessment (EA), which addresses nonnuclear consolidation, and a Programmatic Environmental Impact Statement (PEIS), which addresses reconfiguration of nuclear and RD&T functions of the Complex. During the second phase, decisions on nonnuclear consolidation would be implemented. In addition, project- and site-specific Environmental Impact Statements (EISs) and EAs would be prepared for the nuclear and RD&T reconfiguration to support programmatic decisions published in the Record of Decision associated with the PEIS. During the third phase, final designs would be prepared and construction would begin on any new facilities analyzed in the site-specific EISs or EAs. Monitoring of any mitigation measures identified during the first two phases would be accomplished during the third phase. The first two phases would have to be completed in time to allow renovation of nonnuclear facilities to be completed by about 1995, and construction of nuclear and RD&T facilities to begin around 1995 and be completed by about 2004.

DOE's phased NEPA approach is consistent with CEQ regulations that encourage tiering of environmental documents to eliminate repetitive discussions of the same issues and to focus on the actual issues ripe for decision at each level of environmental review (40 CFR 1502.20). Tiering allows agencies to proceed from a program, plan, or policy EIS to a site-specific statement or analysis.

Recent Presidential initiatives to reduce the nuclear weapons stockpile have provided an opportunity to accelerate nonnuclear consolidation without affecting national defense or the remainder of the reconfiguration program. To help achieve early decisions, the Secretary has decided to conduct an environmental analysis of nonnuclear consolidation separate from the programmatic review of the remainder of the Complex. DOE believes that the NEPA review of the nonnuclear consolidation proposal can and should be separated from the PEIS, since nonnuclear consolidation decisions would neither affect, nor be affected, by the nuclear and RD&T reconfiguration decisions that will be made after the PEIS is published. An important benefit of accelerating nonnuclear consolidation would be an earlier and greater cost saving (DOE, 1991f).

Accordingly, the environmental consequences of the nonnuclear consolidation aspects of Complex 21 have been analyzed in this EA prior to completion of the PEIS. Proceeding with nonnuclear consolidation will require programmatic decisions on where nonnuclear functions would occur as well as the project level decisions regarding nonnuclear consolidation. The costs associated with implementing nonnuclear consolidation, although a factor in the decision process, are not discussed in this EA. If the EA analysis supports a final finding of no significant impact (FONSI), DOE plans to proceed with nonnuclear consolidation and incorporate the nonnuclear consolidation decisions into the PEIS analysis. If this EA identifies any significant impacts resulting from the Proposed Action, then the assessment of environmental impacts for consolidating nonnuclear functions would be incorporated into the PEIS. In this case, no actions would be taken to consolidate the nonnuclear manufacturing activities unless they were included in the PEIS Record of Decision.

Nonnuclear consolidation could involve consolidating certain nonnuclear functions at Y-12 and SRS in facilities that could possibly be phased out during the larger reconfiguration program. The scope of these functions would be very small compared to existing missions at Y-12 and SRS. If the PEIS Record of Decision results in the phaseout or transfer of the Y-12 or SRS DP missions, then the nonnuclear activities discussed in this EA would be included in that subsequent relocation. DOE has determined that the cost savings gained by accelerating nonnuclear consolidation would be much greater than the costs of relocating these missions again

should host facilities be closed as part of the larger reconfiguration program (DOE, 1991f). DOE has not identified any future reconfiguration decisions that would be limited by nonnuclear consolidation.

A project plan will be prepared to provide a framework for proceeding with any final decisions on nonnuclear consolidation. The project plan will include an overall master plan, plus plans for activity transfer and privatization, facility modifications, human resources, and decontamination and decommissioning (D&D) transitions.

1.4 Related Actions

The *Nuclear Weapons Complex Reconfiguration Programmatic Environmental Impact Statement Implementation Plan* (PEIS Implementation Plan) (DOE, 1992d) discussed several DOE actions and associated NEPA activities that have some relationship to both the PEIS and this EA. Of primary importance among these is the PEIS currently being prepared by the DOE Office of Environmental Restoration and Waste Management (EM).

On January 12, 1990, the Secretary decided that DOE would prepare two PEISs: one on reconfiguration and one on DOE's EM Program. The EM PEIS will analyze alternative strategies and policies for conducting DOE's EM program, which not only includes the environmentally responsible management and restoration of nuclear facility sites, but also the protection of worker and public health and safety through the safe disposal of radioactive, hazardous, and mixed (i.e., radioactive and hazardous) wastes. The environmental analysis will support DOE decisions on how to manage processes or facilities for treatment, storage, or disposal of radioactive, hazardous, or mixed wastes; approaches to be used to remediate contaminated sites; treatment technology application or development; land use; and technology and policy considerations for D&D of DOE facilities at the end of their useful lives. A Notice of Intent (NOI) to prepare the EM PEIS was published in the *Federal Register* on October 22, 1990 (55 FR 42633). The results of the scoping process, as well as public comments on a draft EM PEIS Implementation Plan (DOE, 1992a), will be documented in the final EM PEIS Implementation Plan, along with a discussion of alternatives to be evaluated.

The DOE decision to conduct separate NEPA analyses for the reconfiguration and EM programs was based on the separate sets of decisions that each program must address. Among other things, the reconfiguration program will help determine those sites that will carry out the nuclear weapons mission in the long term. The EM program, on the other hand, is directed at alternative strategies and policies for conducting DOE-wide EM waste management and environmental restoration activities. The volume of wastes to be considered by future operation of the Complex is a relatively small portion of the waste to be considered in the EM PEIS. The volume associated with nonnuclear activities is even smaller.

For a short time after generation, DP wastes are managed by the generating facility, while longer-term management of wastes is performed under the auspices of EM. The DP mission provides for the management of wastes, including finding means to minimize waste generation, until DOE either disposes of the wastes or places them in long-term storage. Consequently, this EA provides waste management assessments based upon the projected waste types and waste volumes due to implementation and operation of the Proposed Action and alternatives; the waste treatment, storage, and disposal facilities required to manage these wastes; the current waste types and waste volumes generated; and the existing and planned treatment, storage, and disposal facilities.

1.5 Time Period Considered in Analysis

If DOE issues a final determination of a FONSI in early 1993, building modifications and equipment installation would begin immediately and proceed

through 1995. Operations of most functions at receiver sites would be phased in over a 3-year period beginning in late 1994, with full operations achieved around 1997. However, some validation activities could continue beyond this date; therefore, for the purposes of environmental analysis, the year 2000 has been assumed as the year of peak operations. It was also assumed that operations would continue until the middle of the 21st century.

1.6 BACKGROUND

Recognizing that a comprehensive approach was needed to address current problems of the Complex, Congress directed, in the *National Defense Authorization Act for Fiscal Years 1988/1989* (P.L. 100-180), that a study be conducted and a plan be prepared for modernizing the Complex, taking into account the overall size, productive capacity, technology base, and investment strategy necessary to support long-term security objectives. The product of that study, entitled the *Nuclear Weapons Complex Modernization Report* (Modernization Report) (DOE, 1989), was submitted to Congress on January 12, 1989. It called for extensive modernization of facilities over a 15- to 20-year period. The report also called for a major environmental restoration and waste management program.

Fundamental changes in DOE policy direction and in the structure of international political and military forces raised questions about the continued validity of assumptions underlying the Modernization Report and the adequacy of proposed solutions for the more serious problems of the Complex. Consequently, in September 1989, the Secretary ordered the establishment of a Modernization Review Committee to reexamine the modernization issue. The committee was directed to review the assumptions and recommendations of the original Modernization Report; assess the capacity and capability requirements of the Complex; and review the processes by which immediate and future requirements for maintaining, updating, and cleaning up the Complex are developed.

In August 1990, the Secretary reviewed the progress of the study and issued additional guidance focusing the analysis on the realities of the emerging international security environment. This ensured flexibility to accommodate the likely range of deterrent contingencies and emphasized the objective of achieving a Complex that is smaller, less diverse, and less expensive to operate than the current Complex. Subsequently, the Modernization Review Committee was redesignated the Complex Reconfiguration Committee. The Committee's product, the *Nuclear Weapons Complex Reconfiguration Study* (Reconfiguration Study) (DOE, 1991e), was published in February 1991 and replaced the January 1989 Modernization Report.

The Reconfiguration Study presented an overview of problems within the Complex; outlined a vision of the future Complex, including potential configurations and transitional activities; and described a process for a future Secretarial decision on whether and how to reconfigure the Complex. In preparing the Reconfiguration Study, the Complex Reconfiguration Committee focused on six major areas: stockpile sizing criteria; environment, safety and health (ES&H); Complex configuration; management structure; capital asset management; and the PEIS. Separate study teams, formed for each major area, produced analyses and recommendations. The PEIS Study Team developed a NEPA strategy for reconfiguration, including investigation of the scope and proposed content of the PEIS and any subsequent project-specific EISs. This effort was coordinated with other DOE projects and activities that involve NEPA documentation pertinent to reconfiguration to avoid potential duplications and future conflicts.

To assist with the reconfiguration planning process, DOE chartered several internal panels and work groups. Of primary importance to this EA were the activities of the Privatization Planning Panel and the Nonnuclear Consolidation Plan (NCP) Work Group.

The Privatization Planning Panel was chartered in June 1990 to evaluate nonnuclear functions and identify those functions that could be provided more cost-effectively through the private sector. The panel completed the first phase of its activities and prepared a report describing the privatization potential of DOE's nonnuclear products and manufacturing processes used in the Complex (DOE, 1991b). This document includes a list of processes and products that are candidates for privatization, and reports on the associated costs, benefits, and risks. The panel concluded that most of the activities that could be accomplished more economically by the private sector had already been privatized. Consequently, large-scale privatization did not make sense in the absence of other consolidation decisions. Upon completion of this phase, DOE formed the NCP Work Group to develop a plan for consolidation of nonnuclear functions.

The NCP was prepared in September 1991 (DOE, 1991f) and amended in March 1992 to reflect changing workload requirements. Key aspects of the plan were consolidation of electrical/mechanical functions at one location, relocation of other nonnuclear functions, and phaseout of the mission at certain locations. KCP was identified as the preferred consolidation location.

On December 16, 1991, the Secretary announced his decision to proceed with this EA. A notice of plans to prepare this EA was published in the *Federal Register* on January 27, 1992 (57 FR 3046), and reproduced in the PEIS Implementation Plan (DOE, 1992d). The NCP provided the basis for the proposed action and alternatives identified in the notice. However, the proposal evaluated in this EA incorporates workload reductions resulting from the Bush-Yeltsin agreement of June 1992.

The Proposed Action presented in this document differs somewhat from the Proposed Action published in the Federal Register Notice of January 27, 1992. The changes resulted from an evaluation of options that emerged as the impact of future workload reductions became better defined and the advantages of utilizing the existing RD&T technology base and prototyping capabilities of the National Laboratories became apparent. The Proposed Action changes and the reasons for the changes are:

- The use of existing tritium facilities at LANL, rather than the Replacement Tritium Facility at SRS, for neutron tube target loading could be effected at a lower cost and would provide for the retention of critical skills in the RD&T technology base.

- The expansion of the existing prototyping capability at LANL, rather than utilizing the Pantex Plant, for high power detonator fabrication now done at Mound, could be accomplished at lower cost due to no new construction and would ensure the retention of critical skills.

- The enhancement of existing capability at LANL for beryllium and pit support work has been added as the preferred action and the Y-12 Plant as an option due to potentially lower costs and the benefits of utilizing the existing RD&T technology base.

- Functions such as cap assembly manufacture and the thermal battery technology base from Pinellas and milliwatt heat source surveillance activities from Mound, and calorimeter fabrication functions from Mound, have been added to the existing technology base at SNL and LANL, respectively, to reduce costs and capture the capabilities of the existing technology base for those items.

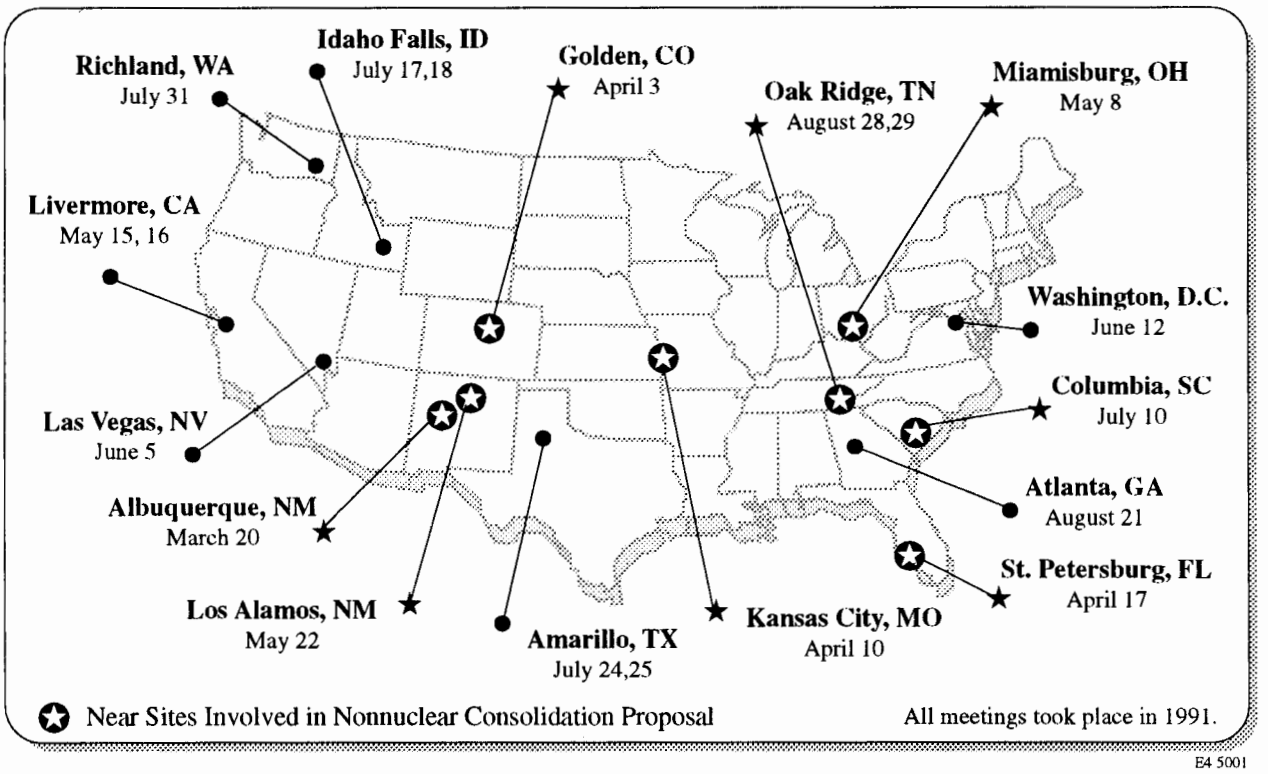

FIGURE 1.7–1.—*Scoping Meeting Locations and Dates.*

1.7 ISSUE IDENTIFICATION PROCESS

Issue identification for this EA was accomplished as part of the larger scoping process for the reconfiguration program. Scoping activities consisted of both internal DOE scoping and public scoping. Internal DOE scoping began with expert working groups that produced the studies that led to the Modernization Report and continued through the Reconfiguration Study. Upon publication of the completed Reconfiguration Study, DOE published an NOI in the *Federal Register* (56 FR 5590) on February 11, 1991, to prepare the PEIS. The NOI, which was reproduced in the PEIS Implementation Plan (DOE, 1992d), marked the beginning of the public scoping phase, which ran through September 30, 1991.

Public meetings were conducted at 15 locations across the country (figure 1.7-1) to allow interested parties to speak and present information. Meetings occurred in the vicinity of all sites that could be affected by nonnuclear consolidation. All comments received through public scoping were systematically organized and reviewed for consideration during the preparation of both the PEIS and this EA. (A comment is defined as a single statement or point of discussion concerning a specific topic raised by an individual.) An extensive summary of all comments received during the public scoping process was published in the Implementation Plan (DOE, 1992d).

During the public scoping process, DOE received a total of 36,984 comments from 16,542 members of the public; representatives of interest groups; and Federal, state, and local officials. Most of the comments (98 percent) were provided by citizens or individuals affiliated with or representing more than 50 interest groups. Of the total comments received, 4,869 were spoken and recorded at public scoping meetings and 32,115 were written and submitted at scoping meetings or received by mail. The total number of comments includes 28,838 comments received via 19 preprinted postcards, form letters, or petition campaigns, involving a total of 13,401 participants.

DOE received a total of 432 comments specifically related to consolidation of nonnuclear functions. Comments covered a range of environmental and policy-related issues including environmental health, economic impacts of plant closures on local communities, worker and public health and safety, hazardous materials management, surface and groundwater contamination, population encroachment, and privatization of nonnuclear functions. A review of the comments received was conducted to identify: (1) issues to be analyzed in this EA and (2) issues that are either not relevant or outside the scope of this EA. This review, along with internal DOE studies and the CEQ and DOE requirements for implementing NEPA, established the scope of study.

The following issues are addressed in this EA through analyses for each potentially affected site:

- Land resources
- Air quality and acoustics
- Water resources
- Geology and soils
- Biotic resources
- Cultural resources
- Socioeconomics
- Waste management
- Human health

In addition to analyses conducted for each site, this EA also provides an overview of D&D requirements and discusses intersite transportation issues.

1.8 Nonnuclear Consolidation Alternatives

In developing nonnuclear consolidation alternatives, the NCP considered all sites that currently perform nonnuclear manufacturing functions as candidates for the consolidated nonnuclear mission: KCP, Mound, Pinellas, RFP, Y-12, and the Pantex Plant near Amarillo, TX. The NCP assessed nonnuclear manufacturing functions in three groups:

- Candidates for transfer to a primary consolidation site (30 functions currently at KCP, 4 at Mound, 9 at Pinellas, and 3 at RFP).
- Candidates for transfer to other sites (7 functions currently at Mound, 3 at Pinellas, and 1 at RFP).
- Candidates for privatization (14 functions currently at KCP, 6 at Mound, 2 at Pinellas, 5 at RFP, and 1 at Y-12).

Each of the 6 potential consolidation sites was rated using 10 performance measures within 4 categories that involved minimizing ES&H risks, technical risks, consolidation costs, and consolidation time. Through this analysis, KCP ranked first in 6 of the 10 performance measures and first in each of the 4 categories and was selected as the preferred consolidation site (i.e., the Proposed Action). Mound and RFP ranked first in 2 of the 10 performance measures and Pinellas ranked first in one. Y-12 and Pantex had no first place rankings in any of the performance measures. Both Mound and Pinellas ranked second in 2 of the 4 categories and RFP ranked second in 1 of the 4 categories. Y-12 and Pantex ranked last in all 4 categories.

Y-12 and Pantex have since been eliminated from further study as primary consolidation sites. Mound, Pinellas, and RFP have been retained for analysis in this EA, along with No Action, as alternatives to the proposed consolidation at KCP.

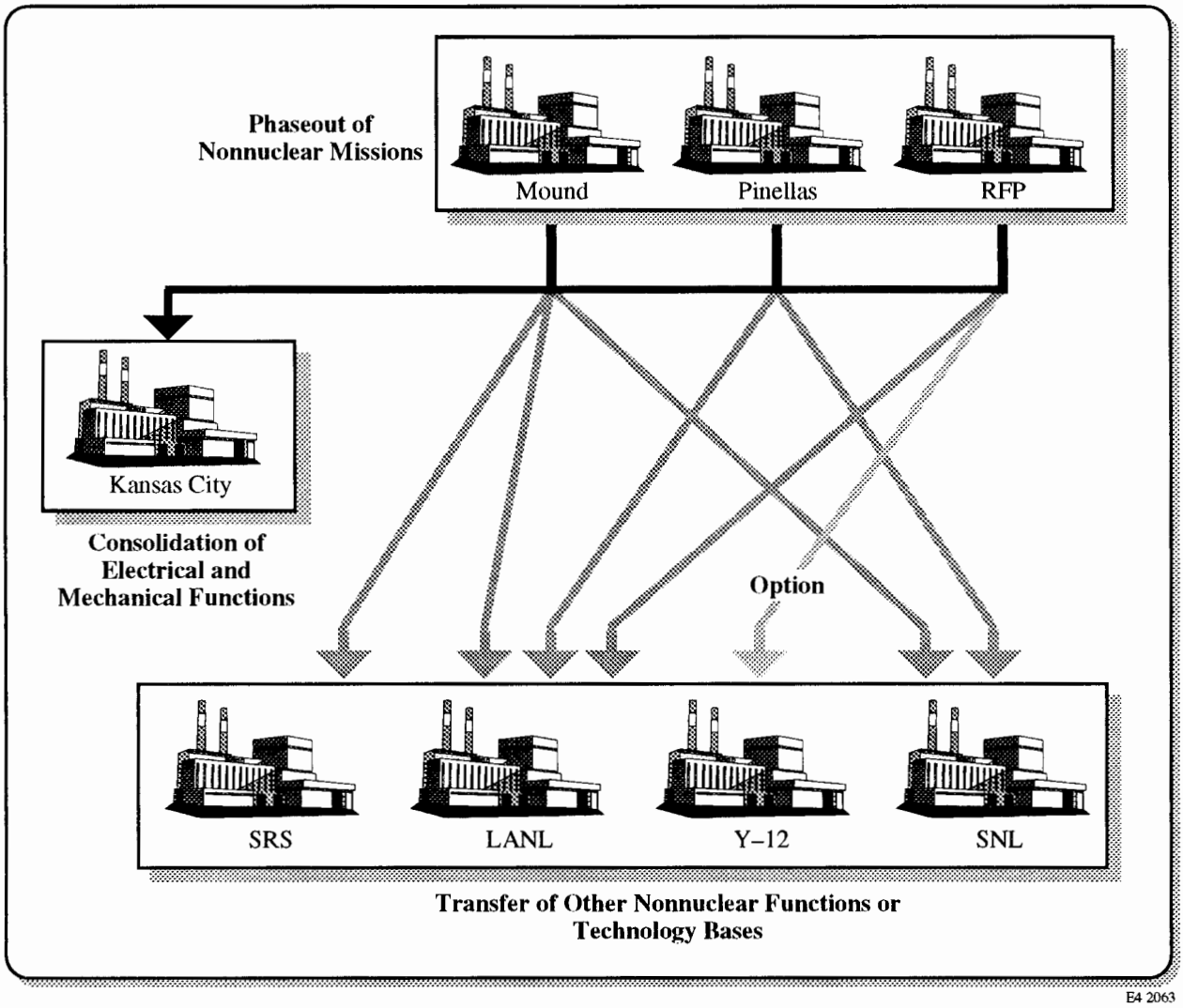

FIGURE 1.8–1.—*Proposed Action—Schematic Transfer of Nonnuclear Functions.*

Because workload requirements have decreased since the NCP was prepared, the alternatives evaluated in this EA vary somewhat from those presented in the NCP. The basic mission changes that would occur with the Proposed Action and alternatives are illustrated in figures 1.8-1 and 1.8-2, respectively. Complete descriptions of the Proposed Action and its alternatives, including the No Action alternative, are provided in chapter 3.

Many nonnuclear weapons components are manufactured and supplied by the private sector. Efforts to privatize certain activities now performed at Complex plants would continue with the Proposed Action and alternatives. Where practical and cost-effective, DOE may transfer the manufacture of some additional selected products to the private sector under existing procurement procedures. However, efforts to increase privatization are likely to be inhibited by the low manufacturing workload anticipated in the future. Several items now manufactured at Mound, Pinellas, and Kansas City may be included in DOE's Manufacturing Development Engineering (MDE) Program and would be candidates for privatization rather than consolidated. The MDE concept would allow weapons components to be manufactured by a private vendor with existing manufacturing capabilities. The DOE design laboratories would provide interface with the vendors for product

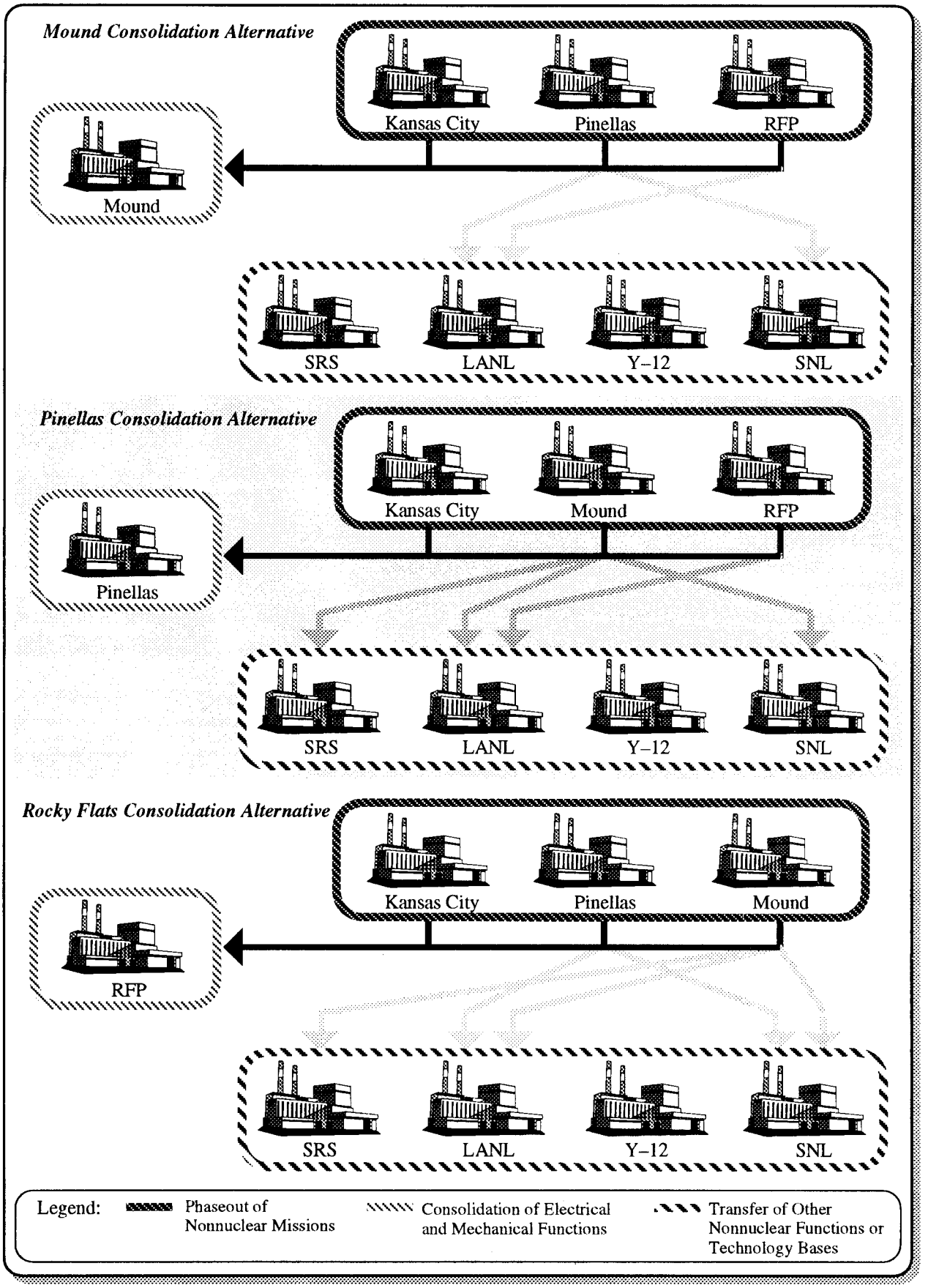

FIGURE 1.8–2.—*Comparison of Alternatives for Nonnuclear Consolidation.*

design, development, manufacturing engineering, and production liaison.

The nonnuclear consolidation proposal does not include components currently manufactured by the private sector or those that may be privatized under the MDE program. In addition, certain nonnuclear manufacturing functions involving depleted uranium, currently performed at RFP, that are scheduled to be phased out prior to 1995 are not included. Nonnuclear functions currently at Y-12 and Pantex are also not included in this consolidation proposal because they are integral to other nuclear functions performed at these sites. Consolidation of these functions will be assessed in the PEIS as part of the larger reconfiguration program. Environmental restoration activities, other investigation and cleanup programs, and facility D&D activities conducted at nonnuclear consolidation sites under the DOE Office of Environmental Restoration and Waste Management are not discussed in detail in this EA.

In addition to the NCP, DOE conducted a separate study (DOE, 1992b) to assess two-site consolidation alternatives. Because this alternative would not meet program objectives that could be achieved by a single consolidation site, no further analysis has been performed in this EA. DOE also considered but eliminated because of cost and proximity to a large population an alternative to consolidate most tritium processing activities at Mound instead of SRS. Additional information about these alternatives is presented in chapter 3, section 3.1.4.

1.9 METHOD OF ANALYSIS

The study methodology used in this EA builds upon environmental analyses conducted for each of the potentially affected DOE sites. The affected environment is described for each environmental resource that may be disturbed by nonnuclear consolidation activities. The geographic study area evaluated is consistent with the requirements of each resource. In all cases, the area is large enough to include possible direct and indirect impacts of consolidation activities. For each environmental resource, the study area depends on the nature of the resource and the manner in which it may be affected by the project.

The existing environmental conditions are described for each of the affected sites and their study area. However, the characterization of the affected environment is not limited to existing conditions. Rather, the environmental baseline includes reasonably foreseeable changes that would be expected with the No Action alternative. The basis for static or changing environmental conditions during the baseline period is discussed. For example, certain functions may go into standby mode under No Action as a result of reduced workloads. In this case, the environmental effects of existing operations would decrease for some resource areas such as air quality and water resources.

For all Proposed Action sites, the level of analytical detail provided in this EA is sufficient to support site-specific decisions. The descriptions are no longer than necessary to understand the effects of the alternatives on the environment (40 CFR 1502.15). To avoid repetition, those effects that are the same under multiple alternatives are discussed once and subsequently referenced.

For each site, the environmental consequences of the proposed consolidation actions (figures 1.8-1 and 1.8-2) were evaluated. Potential environmental consequences of nonnuclear consolidation were evaluated by first analyzing No Action conditions and then assessing environmental effects associated with the alternatives. Environmental consequences at consolidation and phaseout sites could be driven by key aspects of the alternatives during either the implementation or operation phases, such as the following:

- Land area disturbances.
- Resource requirements, including water and construction materials.

- Project employment.
- Air emissions, wastewater effluent, and other waste streams.
- Process technologies and possible associated accidents that could have environmental effects.

For each site, parameters associated with these impact drivers were analyzed to represent the effects of the functions that could be located there.

1.10 ORGANIZATION OF THE EA

The EA is divided into two volumes:

Volume I contains the Preapproval Review Draft Executive Summary and Preapproval Review Draft EA. The Preapproval Review Draft EA Executive Summary summarizes the Nonnuclear Consolidation Proposal and alternatives, and the Proposed Action impacts on the environment. The Preapproval Review Draft EA, which in part relies on the more detailed information presented in the appendixes, discusses the Nonnuclear Consolidation Proposal, the alternatives, and the existing conditions and impacts of the Complex 21 Nonnuclear Consolidation and alternatives. The Preapproval Review Draft EA Executive Summary is also available as a separate publication.

Volume II contains the Nonnuclear Consolidation EA technical and support appendixes. These appendixes provide technical support for the analysis in Volume I and also provide additional information.

This EA has been prepared in accordance with CEQ regulations 40 CFR 1501.4(b) and 1508.9(a) and the DOE NEPA regulations (57 CFR 15122), August 24, 1992, to be codified at 10 CFR 1021. The organization of the remainder of this document is as follows:

- Chapter 2 describes the purpose of and need for the nonnuclear consolidation proposal.
- Chapter 3 describes the Proposed Action and consolidation alternatives, and includes a summary of consolidation alternatives and current operations at existing sites.
- Chapter 4 discusses the affected environment at each site and the environmental consequences of the Proposed Action and alternatives. The analysis of the Proposed Action includes the effects of phasing out the Mound, Pinellas, and RFP nonnuclear functions. This chapter also includes an analysis of the Mound, Pinellas, and RFP alternatives. D&D and intersite transportation are discussed at the end of the chapter.
- Chapter 5 presents environmental compliance and permit requirements associated with the nonnuclear consolidation proposal.

The remainder of the document includes a list of cited references, glossary, and list of individuals who prepared the EA and persons and agencies consulted. The citations that appear in parentheses throughout the document correspond with the reference list on page R-1. These citations refer to the documents that provided information for this EA.

CHAPTER 2

CHAPTER 2: PURPOSE AND NEED

Chapter Two presents the purpose of and need for consolidation of the nonnuclear functions of the Nation's Nuclear Weapons Complex.

2.1 PURPOSE OF AND NEED FOR RECONFIGURATION

The Department of Energy (DOE) has proposed to reconfigure the Nuclear Weapons Complex (Complex) to be smaller, less diverse, and less expensive to operate than the Complex of today. The Complex must be able to safely and reliably support whatever nuclear deterrent stockpile objectives are established in the future by the President and Congress.

Reconfiguration is needed because the nation's nuclear weapons requirements are not as great as in the past, and maintaining the existing large, outdated infrastructure is not an effective use of national resources. The need for reconfiguration is driven by the smaller weapons stockpile sizes anticipated for the foreseeable future; the need to replace oversized, aging, or obsolete facilities; and the long-term saving to be achieved by terminating the weapons complex mission at sites where possible.

With the DOE proposal to reduce the size of the Complex and produce fewer weapons comes the need to ensure that the Complex maintains a core of skilled, knowledgeable people and appropriate facilities. Technical competency — the ability to replicate and improve upon our national experience to design, produce, and maintain reliable nuclear devices — enables this country to safely dismantle nuclear weapons; provide effective surveillance of weapons remaining in the stockpile; understand the weapons systems of other countries; and meet future design, testing, and production needs. The nation has accumulated a storehouse of knowledge over the past 50 years regarding the physics of nuclear energy; the design, operation, and testing of nuclear weapons; the safe and reliable manufacture of weapons; the potential hazards associated with nuclear materials and their manufacturing processes and their waste products; and the amelioration of these hazards. For the most part, that expertise rests within the Complex. Reconfiguration provides a means to ensure that this technical competency is carried well into the next century.

Recent Presidential initiatives to reduce the number and types of nuclear weapons in the national weapons stockpile, particularly the Bush-Yeltsin agreement of June 1992, have resulted in a reduction in the number of weapon types in the stockpile, and a resulting cessation of production of new weapons. This means that there will be substantially reduced weapons workload requirements for the foreseeable future. Significant reductions in staffing at Complex facilities have already occurred and will continue, regardless of whether DOE proceeds with nonnuclear consolidation. Activities at some facilities might, within the next few years, be candidates for termination even without nonnuclear consolidation because there will be no production requirement for certain components for a number of years.

The production capabilities of Complex 21 facilities, including nonnuclear manufacturing, will be based on future production rates and the requirement to maintain specific capabilities. These requirements have been developed by DOE and the Department of Defense (DOD), and approved by the Nuclear Weapons Council. At the low work load levels envisioned for Complex 21, the minimum capability required for stockpile maintenance and new

production would provide more than adequate capacity. Therefore, plant sizing would be based on the minimum capacity required to retain specific capabilities and would be relatively invariant to changes in the capacity required to support the range of stockpile sizes anticipated in the next century. The environmental analyses presented in this document were based on full use of these capabilities. DOE recognizes that actual production rates may be less than design capacity.

2.2 Guiding Principles

The Secretary of Energy (Secretary) has directed that certain principles be used to guide the reconfiguration of the Complex (DOE, 1991d). These principles are:

- Emphasize compliance with laws, regulations, and accepted practices regarding protection of the environment, health, and safety of the public and the Complex workers, and security.
- Safely and reliably maintain the weapons stockpile directed by the President and funded by the Congress.
- Minimize the costs associated with the weapons stockpile.
- Minimize the number of weapons production sites and the size of individual sites.
- To the extent economically justified, maximize transfer of nonnuclear materials production activities to the private sector.
- Maintain redundancy in key capabilities that, if lost, could significantly and rapidly degrade the effectiveness of the Complex.
- Emphasize the use of modular construction to promote minimum ES&H impacts and maximum flexibility to increase Complex capacity should a requirement arise.
- Identify sites that may be transferred to EM for eventual decommissioning, or converted to inactive standby status, while ensuring flexibility to respond to potential arms control breakouts.
- Maintain the capability to decommission the large number of weapons expected to be retired during stockpile downsizing or replacement.

2.3 Purpose of and Need for Nonnuclear Consolidation

Nonnuclear consolidation is a subproposal of the larger reconfiguration proposal. As such, nonnuclear consolidation would serve the same purpose and be triggered by the same need as the reconfiguration proposal. More specifically, the purpose of nonnuclear consolidation is to effect better management of nonnuclear manufacturing activities within the Complex, and to decrease the long-term operating costs of this aspect of the Complex. Consolidation would provide DOE with a mechanism to maintain the specialized skill base necessary to produce and test these components.

DOE proposes to accomplish this consolidation by phasing out the weapons manufacturing mission at two plants (Mound and Pinellas), together with certain nonnuclear work at the Rocky Flats Plant (RFP). The nonnuclear electrical and mechanical manufacturing functions would be consolidated at one site, the Kansas City Plant (KCP), and some specialized manufacturing activities would be combined with similar activities at other facilities within the Complex. The existing research, development, and testing (RD&T) and prototype fabrication capability at two of the national

laboratories would be enhanced to provide certain weapons fabrication capabilities now located at Mound, Pinellas, and RFP. The current weapons manufacturing workload would be downsized to meet lower workload projections. The government-owned, contractor-operated nonnuclear manufacturing facilities at Mound, Pinellas, and RFP would be turned over to the DOE Office of Environmental Restoration and Waste Management (EM) for cleanup, restoration, or decontamination and decommissioning (D&D) as appropriate. The latter activities are not part of this proposal, but will be the subject of separate *National Environmental Policy Act* (NEPA) documentation when specific proposals for those activities are made.

Consolidating nonnuclear facilities at the preferred alternative site will accomplish three objectives: (1) it will size the nonnuclear manufacturing facilities to meet the requirements of the foreseeable workload; (2) it will combine functions that use similar technologies to provide a sufficient workload for maintaining a well-trained and qualified workforce; and (3) reduce operating costs to achieve a near-term savings well in excess of a hundred million dollars a year and long-term savings in excess of a quarter billion dollars annually (DOE, 1991e). Maintaining the existing large Complex would require maintaining similar nonnuclear expertise at multiple sites with little or no workload, which could result in a potential atrophy and attrition of technical skills and increased costs. Consolidating similar nonnuclear manufacturing operations could serve as a mechanism to maintain the skills and preserve the competencies of the workforce. Similarly, where workload projects are very low, collocating some nonnuclear manufacturing capabilities with similar RD&T capabilities at the national laboratories could serve as a mechanism to maintain or sharpen skills of the workforce.

2.4 NEED FOR NONNUCLEAR CAPABILITIES

The products and services of the Complex are needed to design and manufacture nuclear weapons and test individual components. The Complex needs to maintain a nonnuclear capability in order to be able to manufacture nonnuclear components of nuclear weapons, and to test and monitor other components.

A typical nuclear device contains about 6,000 individual components. Of these, about 300 are considered "nuclear components." These nuclear components include the primary and secondary systems of a nuclear device and directly related subsystems. They are made of nuclear materials (isotopes of uranium, plutonium, and tritium) and other materials (such as beryllium, lithium salts, and high explosives). The remaining components are the nonnuclear components. Although some of these components involve small amounts of tritium, their manufacture does not involve the production of nuclear materials, nor the manufacture of principal weapons components from uranium, plutonium, or tritium. Delivery systems for a nuclear device, such as the shell of a missile, are manufactured by DOD and its contractors and are not part of the proposal considered in this EA.

The Complex has already attained a high degree of privatization. Most of the activities that could be accomplished more economically by the private sector are already being procured. Currently, about half (or about 3,000) of the nonnuclear components in a typical nuclear device are purchased by the government from commercial vendors. The nonnuclear consolidation proposal does not include components currently manufactured by the private sector. The remainder of the nonnuclear components (about 2,500 to 3,000) are manufactured in the government-owned, contractor-operated manufacturing facilities that make up the nonnuclear element of the Complex. Consolidating these manufacturing activities makes up the proposal analyzed in this EA. Where practical and cost effective, DOE may transfer the manufacture of some additional selected products to the private sector under existing procurement procedures; however, the nonnuclear consolidation proposal does not include any such speculative transfers since further privatization would likely be inhibited by

the low manufacturing workload that is anticipated in the future.

The Complex also produces products for programs under the direction of other organizations within DOE. These components are used by the producing organization, other governmental agencies, or sold to the private sector. Some of these products are utilized by the weapons complex and other nonnuclear or nuclear production processes. Those products utilized by the weapons complex in nuclear manufacturing have been included in this EA regardless of the organization responsible for production. Those products that are not utilized for weapons manufacture are not part of this proposal and would remain at their current location unless proposed for transfer by their sponsoring organization. Any proposal by the sponsoring organization to transfer the production of these non-weapons mission products would be included in other environmental analyses at that time. The removal of the weapons production mission from Mound and Pinellas will not result in a need to transfer manufacture of products sponsored by this organization to another site because DOE will continue cleanup and decontamination and decomissioning at these sites. Therefore, there will be a continuing infrastructure to support these activities.

CHAPTER 3

CHAPTER 3: PROPOSED ACTION AND ALTERNATIVES

Chapter Three provides a detailed description of the Proposed Action and alternatives for consolidating nonnuclear functions of the Nation's Nuclear Weapons Complex. The chapter begins with a summary of consolidation alternatives: the Proposed Action—consolidation at the Kansas City Plant; other consolidation alternatives; No Action; and alternatives considered but eliminated from further analysis. Discussions of current operations at each potentially affected site follow, along with detailed descriptions of the Proposed Action and other consolidation alternatives.

3.1 SUMMARY OF CONSOLIDATION ALTERNATIVES

The alternatives considered reasonable for consolidating the nonnuclear manufacturing capabilities of the Nuclear Weapons Complex (Complex) were introduced in section 1.8 and are summarized in this section. As shown in table 3.1-1, these alternatives include the Proposed Action—consolidation of nonnuclear functions at the Kansas City Plant (KCP); the alternatives for consolidation at either the Mound, Pinellas, or the Rocky Flats Plants (RFP); and No Action—retain existing missions at current sites. Alternatives considered but eliminated from further analysis are also discussed.

3.1.1 Proposed Action—Kansas City Plant Consolidation

The Department of Energy (DOE) proposes to close out the weapons manufacturing missions at Mound and Pinellas, and the nonnuclear manufacturing mission at RFP. Enhanced research, development, and testing (RD&T) and prototype fabrication capability would be provided to replace certain weapon production capabilities now located at Mound, Pinellas, and RFP; these enhanced capabilities would be used to satisfy future weapons stockpile needs if and when identified. The remaining nonnuclear manufacturing functions would be consolidated at KCP, and the weapons manufacturing workload currently at KCP would be downsized.

The Proposed Action would result in: the consolidation of the nonnuclear electrical/mechanical manufacturing capabilities of the Complex at KCP; tritium-handling capabilities at the Savannah River Site (SRS) and Los Alamos National Laboratory (LANL); detonator capabilities at LANL; and beryllium and pit support functions at LANL or, as an option, at the Y-12 Plant (Y-12). The existing RD&T and prototyping capability at Sandia National Laboratories, Albuquerque (SNL) would be augmented to provide a limited fabricating capability for future neutron generator work and other nonnuclear components. Detailed explanations of all functions associated with nonnuclear consolidation are provided in section 3.2 within the existing site descriptions.

The following actions are proposed:

- *Mission Closeouts*—The weapons manufacturing mission at Mound and Pinellas, and the nonnuclear manufacturing mission at RFP would be terminated.

- *Electrical/Mechanical*—The nonnuclear electrical/mechanical capabilities now at Mound, Pinellas, and RFP would be consolidated at KCP. KCP currently has manufacturing

TABLE 3.1–1.—*Proposed Alternatives for Nonnuclear Manufacturing Consolidation Environmental Assessment*

Nonnuclear Manufacturing Functions to be Moved	Alternatives				
	No Action	Proposed Action	Mound Plant Alternative	Pinellas Plant Alternative	Rocky Flats Plant Alternative
Electrical/Mechanical	KCP, Mound, Pinellas, RFP	KCP	Mound	Pinellas	RFP
Tritium Handling at Mound	Mound	SRS	Mound	SRS	SRS
Tritium Handling at Pinellas	Pinellas	LANL	LANL	Pinellas	LANL
Detonator	Mound	LANL	Mound	LANL	LANL
Beryllium and Pit Support	RFP	LANL (Option Y-12)	LANL	LANL	RFP
Neutron Generators, Cap Assemblies, and Batteries	Pinellas	SNL and KCP (LAMB)	SNL and Mound (LAMB)	Pinellas	SNL and RFP (LAMB)
Special Products at RFP	RFP	KCP	Mound	Pinellas	RFP
Special Products at Mound	Mound	LANL (Calorimeters) and SNL (MWHS)	Mound	LANL (Calorimeters) and SNL (MWHS)	LANL (Calorimeters) and SNL (MWHS)

E4 3171

Notes: LAMB - Lithium Ambient Batteries
MWHS - Milliwatt Heat Source Surveillance

Source: DOE, 1992g.

capabilities similar to those proposed for transfer and has adequate space in its existing facilities to accept them.

- *Tritium Handling*—All tritium-handling capabilities now performed at Mound would be relocated with the tritium functions now performed at SRS. The neutron tube target loading for the current design of neutron generators, now performed at Pinellas, would be completed and capability for future requirements would be provided at existing facilities at LANL.

- *Detonators*—The existing RD&T and prototyping capability at LANL would be enhanced to provide a limited manufacturing capability for high power detonators, now done at Mound. (The existing RD&T technology base for low-power explosives components would be maintained at SNL; the existing capability at Mound to manufacture these components is no longer needed. This is the same as the No Action alternative.)

- *Beryllium and Pit Support*—The existing technology base and prototyping capability at LANL would be enhanced to provide limited manufacturing capability for beryllium and pit support work now done at RFP. As an option, the existing capability at Y-12 would be enhanced for this purpose.

- *Neutron Generators, Cap Assemblies, and Batteries*—Manufacture of the current design of neutron generators at Pinellas would be completed. The existing technology base for neutron generators would be maintained at SNL. Existing RD&T and prototyping capability at SNL would be augmented to provide a limited manufacturing capability for future advanced design neutron generators. Manufacturing capability for cap assemblies would be relocated from Pinellas to existing facilities at SNL. The technology base now housed at Pinellas regarding the manufacture of thermal batteries would be transferred to existing facilities at SNL; manufacture of the batteries would continue to be performed by the private sector. The assembly of lithium ambient batteries from commercially acquired lithium cells would be transferred to KCP.

- *Special Products*—The nuclear grade steels procurement and storage capability, safe secure trailer manufacturing capability, weapons trainer shop, and metrology services would be transferred from RFP to KCP. The calorimeter manufacturing capability and milliwatt heat source surveillance activities would be relocated from Mound to existing facilities at LANL and SNL, respectively.

If the proposed action were implemented, Mound and Pinellas would no longer have a DOE weapons mission and the facilities used to house Defense Programs (DP) mission activities at these locations would be turned over to the DOE Office of Environmental Restoration & Waste Management (EM) for decontamination and decommissioning (D&D) or restoration, if appropriate, as discussed in section 4.4. The DP nonnuclear mission at RFP would also be terminated, and associated nonnuclear facilities turned over to EM for disposition. The capabilities transferred to KCP, SRS, LANL, Y-12, and SNL would, for the most part, be integrated into the existing plant facilities with appropriate plant modifications and some minor renovations.

3.1.2 Other Consolidation Alternatives

Other alternatives considered in this Environmental Assessment (EA) include the consolidation of nonnuclear manufacturing activities at Mound, Pinellas, or RFP. Consolidation of the nonnuclear functions at any of these sites would differ from the Proposed Action in that the consolidation site would retain all of its existing nonnuclear manufacturing capabilities and receive additional nonnuclear manufacturing capabilities from the other sites. The specific actions associated with each of the three consolidation alternatives are discussed in the following paragraphs and shown in table 3.1-1.

3.1.2.1 *Mound Plant Alternative*

The following actions would take place if Mound were the consolidation site:

- *Electrical/Mechanical*—The nonnuclear electrical/mechanical manufacturing functions performed at KCP would be consolidated with those of Pinellas and RFP at Mound. Construction of new facilities at Mound to accommodate these additional functions would be required. KCP, Pinellas, and

the nonnuclear facilities at RFP would be turned over to EM for disposition.

- *Tritium Handling*—The tritium handling capabilities at Pinellas would be relocated with similar functions at LANL. Tritium handling functions at Mound would not be transferred.

- *Detonators*—The high power detonator capabilities at Mound would remain and would not be moved to LANL.

- *Beryllium and Pit Support*—No change from the Proposed Action.

- *Neutron Generators, Cap Assemblies, and Batteries*—No change from the Proposed Action except for lithium ambient batteries, which would be transferred to Mound instead of to KCP.

- *Special Products*—The nuclear grade steels, safe secure trailers, weapons trainer shop, and metrology capabilities from RFP would be transferred to Mound instead of to KCP. The calorimeter manufacturing capabilities and milliwatt heat source surveillance activities would stay at Mound instead of being relocated to LANL and SNL.

3.1.2.2 *Pinellas Plant Alternative*

The following actions would take place if Pinellas were the consolidation site:

- *Electrical/Mechanical*—The nonnuclear electrical/mechanical manufacturing functions performed at KCP would be consolidated with those of Mound and RFP at Pinellas. Construction of new facilities at Pinellas to accommodate these additional functions would be required. KCP, Mound and the nonnuclear facilities at RFP would be turned over to EM for disposition.

- *Tritium Handling*—The tritium handling capabilities at Mound would be relocated with similar functions at SRS. Tritium handling functions at Pinellas would not be transferred.

- *Detonators*—No change from the Proposed Action.

- *Beryllium and Pit Support*—No change from the Proposed Action.

- *Neutron Generators, Cap Assemblies, and Batteries*—These capabilities would remain at Pinellas and would not be relocated to SNL or KCP.

- *Special Products*—The nuclear grade steels, safe secure trailers, weapons trainer shop, and metrology capabilities from RFP would be transferred to Pinellas instead of to KCP. The calorimeter manufacturing capabilities and milliwatt heat source surveillance activities at Mound would be relocated to existing facilities at LANL and SNL, respectively.

3.1.2.3 *Rocky Flats Plant Alternative*

The following actions would take place if RFP were the consolidation site:

- *Electrical/Mechanical*—The nonnuclear electrical/mechanical manufacturing functions performed at KCP would be consolidated with those of Pinellas and Mound at RFP. Construction of new facilities at RFP to accommodate many of these additional functions would be required. KCP,

Pinellas, and Mound would be turned over to EM for disposition.

- *Tritium Handling*—No change from the Proposed Action.

- *Detonators*—No change from the Proposed Action.

- *Beryllium and Pit Support*—The beryllium and pit support capabilities located at RFP would remain and would not be moved to LANL.

- *Neutron Generators, Cap Assemblies, and Batteries*—No change from the Proposed Action except for lithium ambient batteries, which would be transferred to RFP instead of to KCP.

- *Special Products*—The nuclear grade steels, safe secure trailers, weapons trainer shop, and metrology capabilities would remain at RFP. The calorimeter manufacturing capabilities and milliwatt heat source surveillance activities at Mound would be relocated to existing facilities at LANL and SNL, respectively.

3.1.3 No Action

Under No Action, the consolidation of nonnuclear functions would not occur. Planned upgrades, renovations, repairs, and maintenance activities necessary to improve Complex compliance with all ES&H and environmental restoration standards would continue irrespective of future Complex configuration. Mound, Pinellas, and RFP would retain their current nonnuclear manufacturing missions. However, because the projected workload is substantially lower than requirements in the recent past (due to Presidential initiatives to downsize the weapons stockpile), many current facilities would be carried in a standby mode due to lack of work. The existing missions at each site are described in detail in section 3.2.

Many nonnuclear weapons components are manufactured and supplied by the private sector. The nonnuclear consolidation proposal does not include components currently manufactured by the private sector. Where practical and cost effective, DOE may transfer the manufacture of some additional products to the private sector under existing procurement procedures.

Privatization of certain components would continue under all alternatives and is not analyzed in this EA. Certain new privatization actions would be taken under the Manufacturing Development Engineering concept being developed by SNL.

In the Manufacturing Development Engineering concept, SNL, as the laboratory responsible for the design of nonnuclear parts or components, would work directly with private sector production plants. This means that SNL would be responsible for identifying and developing private suppliers and maintaining technology transfer programs for nonnuclear components. SNL would take on increased involvement in process design and manufacturing engineering in addition to its traditional research, development, and design activities. SNL would also provide a backup fabrication capability in the event that the product can no longer be provided commercially. The Manufacturing Development Engineering concept has recently become much more attractive due to the latest workload reductions resulting from the President's stockpile reduction initiative of June 1992. This initiative has made the nonnuclear fabrication capacity requirements small enough so that backup capacity can be adequately provided in the laboratory development area rather than by maintaining a dedicated backup area at a government-owned, contractor-operated weapons production plant.

Several of the items being considered for privatization may be included in the Manufacturing

Development Engineering program, and would be privatized rather than consolidated. Activities now ongoing at KCP, Pinellas, and Mound that would be privatized through Manufacturing Development Engineering are listed in figure 3.1.3-1.

3.1.4 Alternatives Considered But Eliminated From Further Analysis

In addition to the KCP, RFP, Mound and Pinellas consolidation alternatives analyzed in this EA, the NCP also examined the alternatives of consolidation at Y-12 and Pantex. These sites conduct both nuclear and nonnuclear activities associated with the Weapons Complex. Y-12 and Pantex were evaluated based upon the same 4 categories and 10 performance measures used to evaluate the other sites. Based upon these performance measures, the overall ranking of these two sites was so far below any of the other sites examined in the NCP that consolidation at either site would not serve the purposes of nonnuclear consolidation. In this regard, for the performance measures evaluated, consolidation at either Y-12 and Pantex posed substantially greater technical risks, involved substantially greater consolidation cost, and resulted in substantially longer payback times than the other alternatives. Therefore, they are considered to be unreasonable and have been eliminated from further evaluation in this EA.

Alternatives that would (1) consolidate nonnuclear manufacturing activities at any two of the current three dedicated nonnuclear plants (i.e., Mound and Pinellas; KCP and Mound; or KCP and Pinellas), (2) consolidate such activities at a nuclear site or a national laboratory, or (3) consolidate all tritium maintenance, processing, and storage activities presently performed at Mound and SRS at Mound instead of SRS were also proposed during the course of preparing this EA.

To examine primarily the cost-effectiveness of other than a single-site alternative, a Two-Site Nonnuclear Consolidation Study (Two-Site Study), which evaluated the three different two-site configurations for consolidation, was conducted. The Two-Site Study estimated and compared the annual operating and long-term costs for the two-site alternatives with the Kansas City consolidation alternative addressed in the NCP.

In conducting the cost comparison, the Study utilized not only the data from the NCP, but also more recent conceptual design report data prepared to support nonnuclear consolidation activities. The Two-Site Study was completed in August 1992 (DOE, 1992b). In December 1992, an addendum to the Two-Site Study was prepared which considers the revisions to the preferred alternative discussed in this EA resulting from the Bush/Yeltsin agreement and their effect on the conclusions of the Two-Site Study.

Considerations of long-term costs and preservation of production competence are the most critical factors in determining whether the two-site consolidation alternatives are reasonable or unreasonable. With regard to long-term cost comparisons, the Two-Site Study supports the conclusion that the preferred alternative of consolidating most nonnuclear manufacturing activities at Kansas City would save between one and a half billion dollars and several billion dollars in life-cycle costs over the two-site consolidation alternatives examined. This conclusion alone renders all of the two-site options unreasonable, and they have, therefore, been eliminated from further analysis in this EA.

In addition, as the addendum to the Two-Site Study explains, one of the results of the Bush/Yeltsin arms reduction agreement has been to reduce even further the cost effectiveness and increase the technical risks involved in retaining neutron generator production at Pinellas. Thus, the KCP-Pinellas two-site consolidation option (which was the least costly of the two-site options evaluated in the study) has become even less attractive compared to single-site consolidation at KCP.

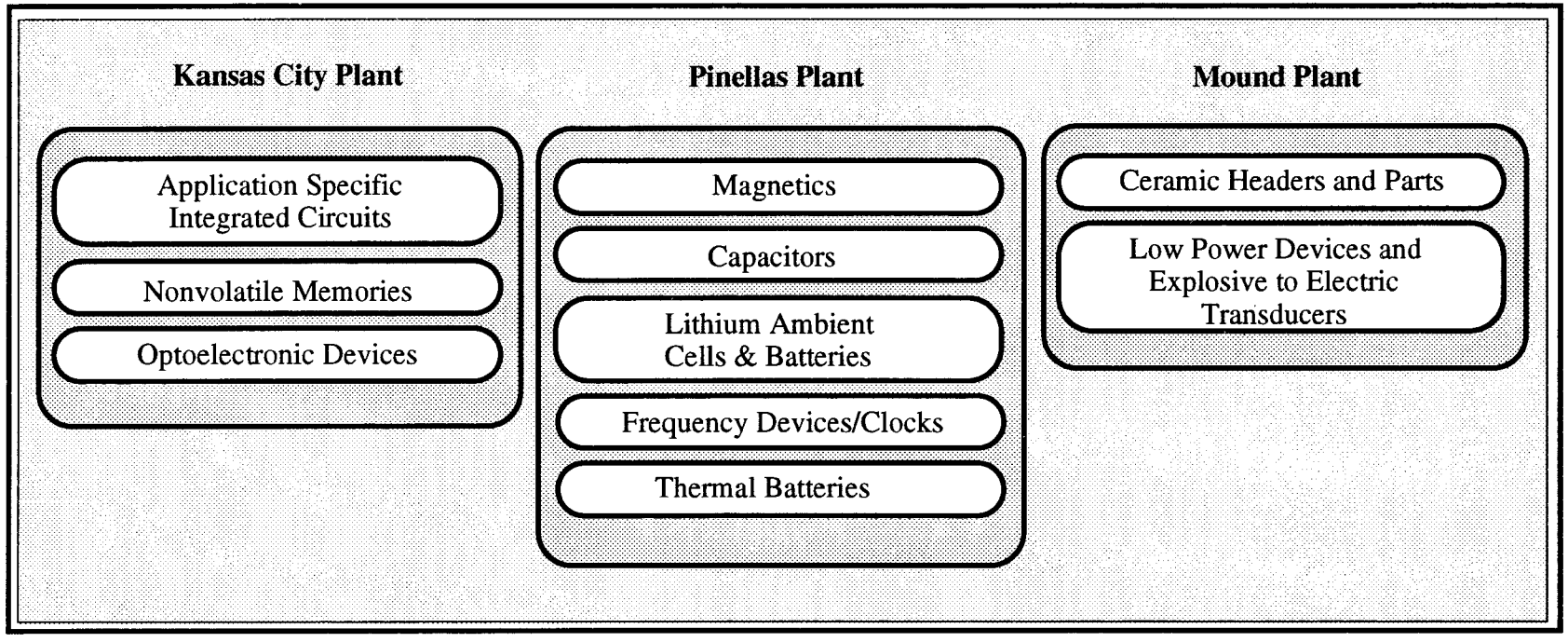

FIGURE 3.1.3–1.—*Components Designed for Privatization via Manufacturing Development Engineering.*

An additional consideration involves the preservation of the production competence in a time of shrinking workloads. National security requirements dictate that DOE maintain capabilities as required to ensure the viability of the enduring nuclear weapons stockpile. These capabilities are needed to support the Stockpile Evaluation Program, limited life component exchanges, and the repair or replacement of weapons components as needed to maintain and upgrade stockpile reliability, safety, and security.

Experience has shown that, even in the absence of new weapons requirements, unanticipated design, production or aging defects in stockpiled weapons require the production of replacement components and subsystems in order to ensure weapon system safety and reliability. However, the current and projected workload is insufficient to effectively maintain production competence in all areas because the workload is dispersed in plants configured for large scale production at the previous "Cold War" levels.

As a result of recent workload and budget reductions, the weapons complex has been forced to significantly reduce personnel levels, jeopardizing production competence in many areas. Consolidating like activities at a single site will ensure that there be sufficient work to support a core workforce of technical and production personnel, enabling utilization and retention of key skills and technical capabilities that are needed to maintain the enduring stockpile. Consolidation at two sites will provide substantially less assurance that this programmatic objective will be achieved.

The environmental impacts of alternatives for consolidating nonnuclear manufacturing activities at a national laboratory or at a nuclear site (other than RFP) are not evaluated in this EA, because the technical risk, cost and time to consolidate render these alternatives unreasonable. As described above, the NCP considered the alternative of consolidating nonnuclear manufacturing activities at RFP, Pantex and Y-12, all nuclear sites. For the reasons discussed, neither Y-12 or Pantex represents a reasonable alternative for such consolidation.

In order to maintain the viability of the enduring stockpile, 179 discrete technologies involving thousands of parts are required at the selected consolidation site. Of this number, 162 technologies are already in use at the KCP. Therefore, very few would have to be transferred from the alternative sites.

Although the laboratories have experience with many of these technologies, and have designed the components and subsystems to be produced, they do not have the practical experience manufacturing production quantities of many of these components and subsystems. Only in a selected few instances has the Department determined that intricate technologies can best be preserved at a laboratory, e.g. neutron generators and high-power detonators (for which there will be a long hiatus in production requirements). However, the same reasoning does not hold true for the thousands of parts that would have to be manufactured or procured by the laboratories if nonnuclear manufacturing activities were consolidated there, and for which manufacturing capability must be maintained on a continual basis to maintain the enduring stockpile. Thus, the technical risk involved in consolidating at a laboratory would be significantly greater than for the other alternatives considered in this EA. In addition, given the large number of technologies to be transferred, the transfer cost (including construction of new facilities) and time involved before such a transfer could be effected would render this alternative unreasonable, particularly in view of the need for near-term consolidation to prevent the loss of production competence in the complex. Consolidation at nuclear sites other than those already considered and dismissed would be subject to the same obstacles, with the technical risk being even greater because nuclear sites other than those considered in the NCP have little or no experience in any of the technologies required for nonnuclear manufacturing activities.

The Department has also assessed the comparative costs of consolidation at either Mound or SRS of weapons complex tritium maintenance, processing, and storage activities presently performed at these sites. These activities collectively involve hundreds of millions of curies of tritium. The cost study concluded that the life-cycle costs of consolidation of such work at Mound would be nearly two billion dollars greater than life-cycle consolidation costs at SRS.

In addition, the Department has assessed the comparative radiological risk to the public from consolidating the tritium activities discussed above at either Mound or SRS. The assessment was based upon a study of the quantitative risks of consolidated tritium activities for both normal operations and accident conditions. For both normal and accident conditions, the conclusion of the assessment is that the radiological risk to the population at either site from consolidated tritium activities is very low.

Based upon the conclusion of the cost study that consolidation of tritium activities at Mound would involve life-cycle costs nearly two billion dollars greater than such consolidation at SRS, the Department has concluded that Mound constitutes an unreasonable alternative for such consolidation. In addition, notwithstanding the low risk involved, the Department believes that it is not prudent to place hundreds of millions of additional curies of tritium in a densely populated urban area such as that surrounding Mound, especially when there exists the alternative of consolidating this material at SRS, a large site located away from such a densely populated area.

3.2 CURRENT OPERATIONS AT EXISTING SITES

This section discusses the current operations at each of the eight sites which could potentially be affected by the Proposed Action and alternatives. For each site, a brief description of the site and its location is presented. Discussions of each site's missions, facility/process description, waste management activities, and utility and resource requirements follow. Included under the facility/process description at each site is a discussion of safety and accidents. The activities conducted at each site involve unique applications of industrial processes utilizing hazardous, explosive, and at some sites radioactive materials. Both design and operating precautions are employed to reduce the probabilities of accidents and to mitigate the consequences of those which might occur. In developing the safety and accident sections, documents from each of the sites were reviewed for information on accidental releases of chemical or radioactive materials. The documents included "Unusual Occurrence Reports," "Annual Environmental Reports," and other sources providing accidental release information. Due to lower production levels, the time period of the review (1986-1990) was chosen as being more representative of future activity levels at the various sites. The results of these reviews are summarized for each site in subsequent sections.

3.2.1 Kansas City Plant

KCP is situated on approximately 141 acres of the 300-acre Bannister Federal Complex located within incorporated city limits 12 miles south of the downtown center of Kansas City, MO (figure 3.2.1-1). Of this area, 122 acres are allocated to DOE and 14 acres are on loan from the General Services Administration. The plant shares the Bannister Federal Complex site with other Federal agencies: General Services Administration, the Department of Defense Finance and Accounting Service, the Federal Aviation Administration, the National Archives and Records Center, and the Internal Revenue Service among others (KC ASAC, 1991a).

3.2.1.1 *Kansas City Plant Missions*

KCP is a government-owned, contractor-operated facility which produces and procures nonnuclear electrical, electronic, electromechanical, mechanical, plastic, and nonfissionable metal components for the DOE nuclear weapons program. Work is performed under a management and operating contract between Allied-Signal, Inc. and DOE (KC ASAC, 1991b).

KCP's primary missions are:

- Fabrication, assembly, and procurement of:
  - Electrical and electronic components.
  - Electromechanical and precision mechanisms.
  - Rubber and plastics; foams and honeycomb components.
  - Handling equipment and shipping containers.
  - Telemetry equipment.

- Performance of:
  - Product acceptance and field test equipment.
  - Surveillance activities to ensure reliability of nuclear stockpile.
  - Pollution prevention.
  - Waste management.
  - Maintenance of process capability program.

KCP's shared missions with the National Laboratories are:

- Metal structures and general machining.

- Development and production engineering.

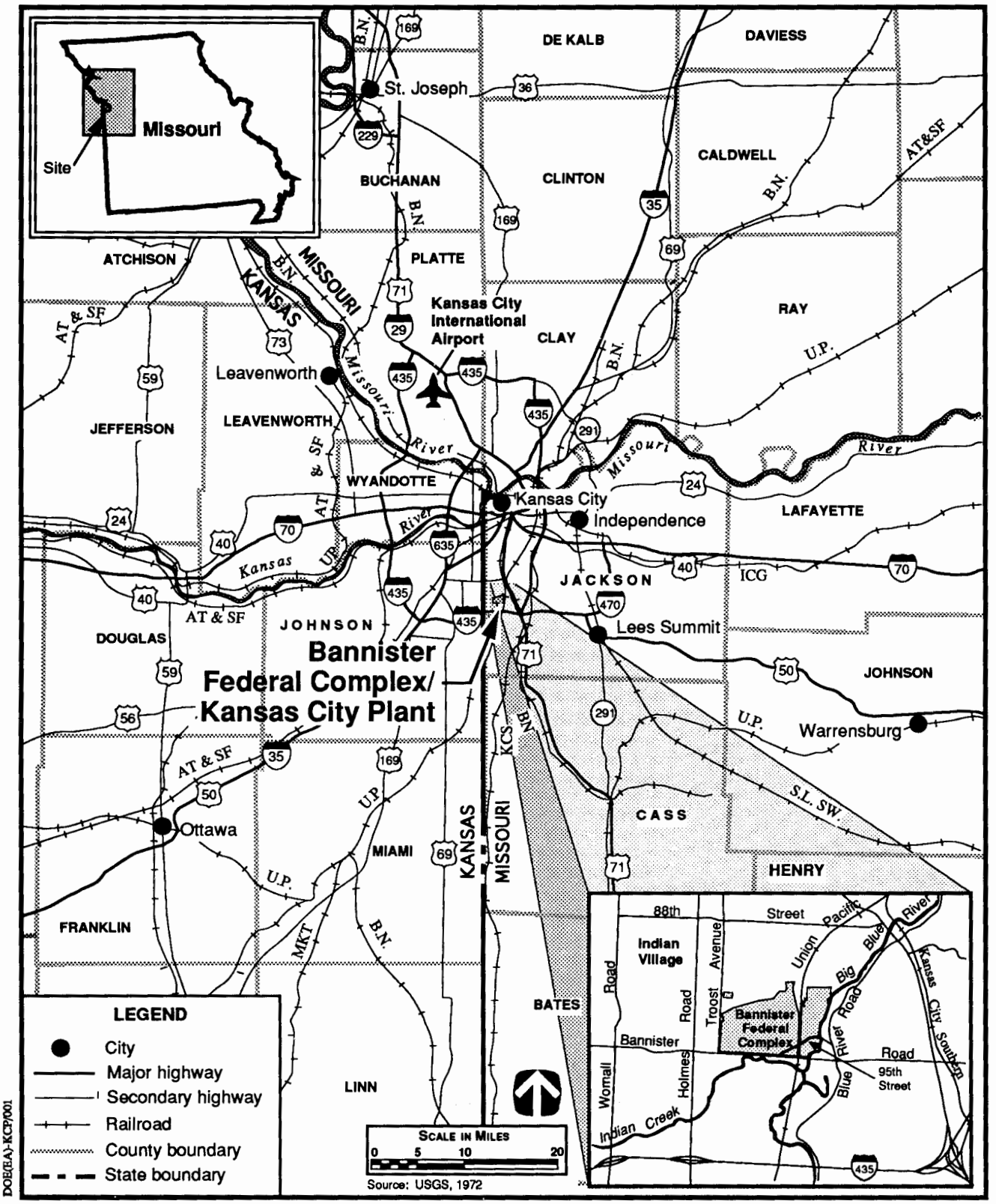

FIGURE 3.2.1-1—***Kansas City Plant, Missouri, and Region.***

3.2.1.2 *Facility/Process Description*

KCP includes approximately 3.2 million ft^2 of various building space. The majority of this space is contained within four main buildings (figure 3.2.1-2).

The weapons-related operations at KCP covered by this EA are all electrical, mechanical, and plastic products. The specific manufacturing activities are presented in table 3.2.1-1. A more detailed discussion is presented in appendix A.1.

KCP does not process special nuclear materials. KCP has a health physical program consistent with industrial radiography and electronic manufacturing.

The production workload at KCP has been declining over the past few years, and several reductions in the workforce have occurred. The workforce at the plant in September 1992 consisted of approximately 4,473 employees (DOE, 1992e).

Effluents and Emissions. Operations at KCP do not discharge radioactive water pollutants. Pretreated industrial process wastewaters and untreated sanitary wastewater are discharged to the Kansas City, MO wastewater treatment plant. Wastewater effluent from current operations at KCP is discussed in sections 4.1.1.3.

KCP operations do not release radioactive air pollutants. KCP has multiple volatile organic compound and fugitive sources from degreasing, cleaning, and surface coating operations. KCP's four boilers are the primary sources of criteria air pollutants. Major hazardous air pollutant sources at KCP include the metal plating facility, metal degreasing, wastewater treatment, and boiler operations. The concentrations of criteria and hazardous air pollutants from current operations at KCP are discussed in section 4.1.1.2. The emission rates for these pollutants are shown in appendix D.2.1.1.

Safety and Accidents. The review of historical information at KCP indicated that during the period 1986-1990, two accidental releases occurred which resulted in hazardous material reaching offsite locations. However, these incidents resulted in no significant adverse impact. In 1987, about 10 to 15 gallons of perchloroethylene were released into the storm sewer system. This release was reported under the requirements of Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and Superfund Amendments and Reauthorization Act (SARA) because of the amount released. Analysis of samples at the affected outfall indicated perchloroethylene concentrations were less than the instrument detection limit of 0.005 milligrams per liter (mg/L). In 1990, 200-500 gallons of #6 fuel oil were discharged into an onsite drainage ditch; a small amount entered the outfall. This release was also appropriately reported under CERCLA regulations. The third incident involved radioactive contamination from a leaking Promethium-147 sealed source used in a beta backscatter measuring system. This release was discovered in 1989. Surveys revealed contamination in other facility laboratories and adjacent areas, as well as the residence of one laboratory worker. Bioassays of personnel indicated no uptake of the Promethium-147 and the minor offsite contamination was cleaned up. These incidents were reported and investigated. Lessons learned were applied, appropriate corrective action(s) were instituted, and follow-up was performed in accordance with DOE order requirements.

Improvements Required to Continue/Comply with ES&H Requirements. Environmental safety and health (ES&H) projects planned for start by the end of 1993, (CAMP, 1992) are:

- Replacement of the KCP current Emergency Notification System with an electronically supervised plant-wide system and a non-emergency public address system. Completion of this project is planned in 1997.

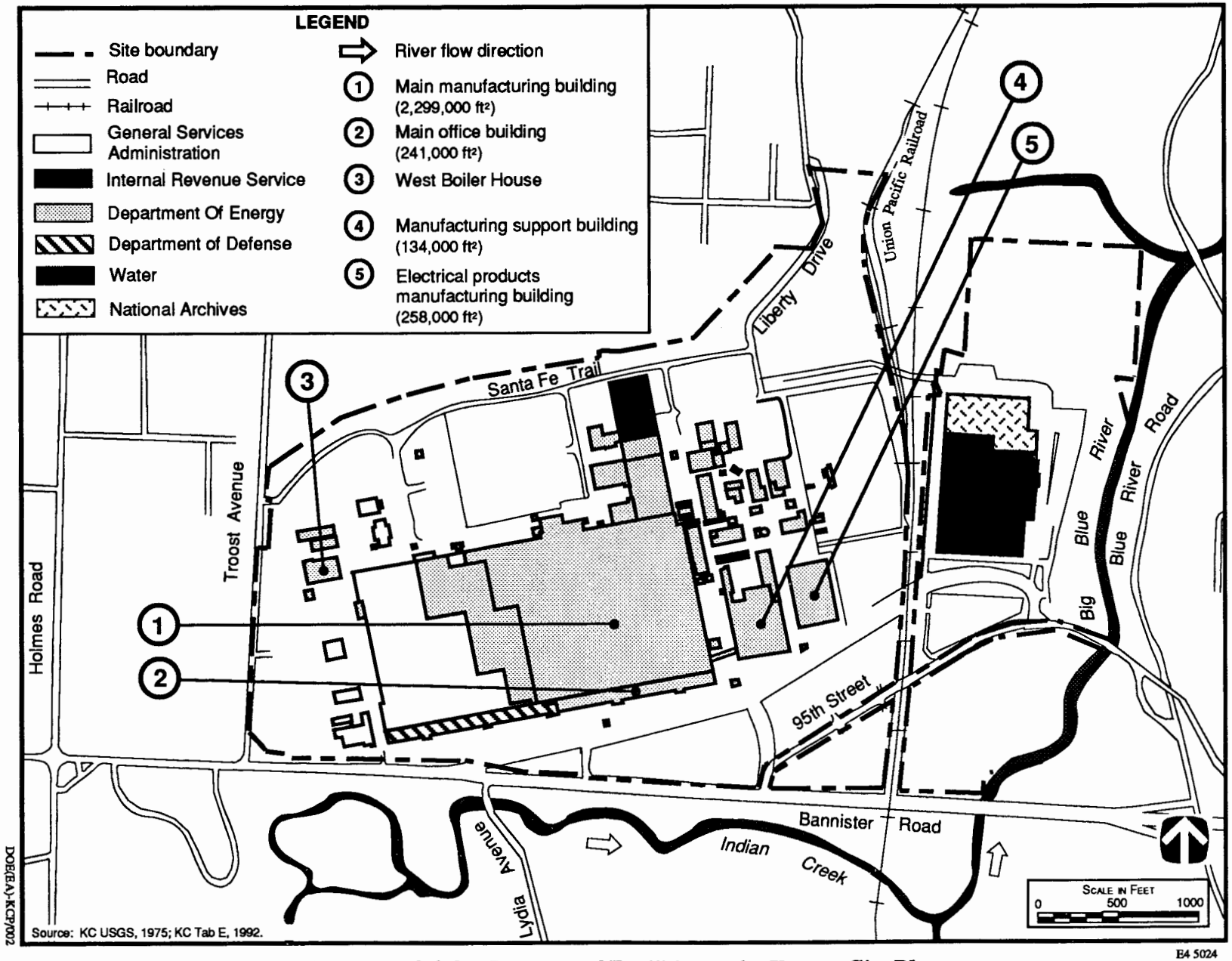

FIGURE 3.2.1-2—*Location of Facilities at the Kansas City Plant.*

TABLE 3.2.1–1.—*Kansas City Plant: Nonnuclear Manufacturing Activities Considered for Consolidation* [Page 1 of 2]

Electrical/Mechanical Products	
Squib Valve Assembly	Manufacture of valve bodies for pyrotechnically-driven (explosively activated) devices.
Hybrid Microcircuit Assembly	Assembly of hybrid microcircuits resistor/conductor networks for radars, programmers, timers and firesets.
Hybrid Microcircuit Assembly for Joint Test Assemblies	Assembly of hybrid microcircuit networks interconnected with active (transistors and integrated circuits) and passive (resistors and capacitors) components for Joint Test Assemblies which are weapons with the nuclear components removed so that they can be tested in their intended delivery mode.
Microminiature Electrical Assembly	Manufacture of hybrid microcircuits that perform multiple electronic functions in weapons systems such as switches, radars, programmers, firesets, clocks, and telemetry.
Telemetry Assembly	Manufacture of telemetry assemblies and neutron detectors for Joint Test Assemblies, and test component firing systems that provide data on warhead performance in flight tests and high energy transfer systems for use in underground testing at the Nevada Test Site (NTS).
Radar Assembly	Manufacture of radars used in weapons fuzing systems for bombs and warheads.
Timers, Programmers, & Trajectory Sensing Signal Generators	Manufacture of electronic assemblies which accept environmental data, verify correctness of that data, and produce predetermined and sequenced output functions for the weapon.
Test Equipment Design & Fabrication	Manufacture of test equipment capable of performing electrical and mechanical test equipment design and fabrication.
Cellular Silicone & Filled Elastomers	Manufacture of cellular silicone pads that are used to cushion components.
Foam Molding	Manufacture of structural urethane foam component supports.
Syntactic Foam Molding & Plastic Machining	Manufacture of foam supports which are capable of withstanding higher operating temperatures than conventional foam molding supports.
Laminates & Desiccants	Manufacture of desiccant powders and resins used to provide a dry environment in sealed nuclear assemblies, and the production of plastic laminates.
Noncryptographic Coded Switch Assembly	Manufacture of electronic devices that permit the controlled use of nuclear weapons upon proper authorization and to prevent unauthorized use under all conditions.
Strong Link Switch Assembly	Manufacture of complex electromechanical safety devices used in all modern weapons programs.
Fire Set Assembly	Manufacture of high voltage circuitry firing systems capable of supplying the energy required to initiate a weapon system.
Composite Structures	Manufacture of fiber reinforced molding resins.
Stockpile Support	Evaluation of components and subsystems removed from stockpile for reuse, systems testing, or component cycle testing.
Category F Permissive Action Link Electronics Assembly	Manufacture of electronic assemblies that are part of the weapon's nuclear surety (safety, security, and survivability) system.

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TABLE 3.2.1–1.—*Kansas City Plant: Nonnuclear Manufacturing Activities Considered for Consolidation*—Continued [Page 2 of 2]

Electrical/Mechanical Products	
Special Products - Special Electronics Assembly	Electronic products requiring special area exclusion.
Cryptographic-Coded Switch Assembly	Assembly of Permissive Action Link Switch Adaptors, an electronic device designed to provide an "electrical block" to the arming switch of the weapon.
T-Gear Containing Cryptographic Keying Material	Manufacture of keying material used to code and recode Permissive Action Link devices in weapons. The presence of these codes prevents unauthorized access to weapons.
MK 5 Arming, Fuzing, and Firing Set Assembly	Manufacture of arming, fuzing, and firing set assemblies.
B83 Weapon Subassembly	Assembly of electronic and mechanical structures into a case structure that provides distance, timing, velocity sensing, velocity control, and electrical power for weapon assemblies.
Machining Technology	Activity providing a variety of traditional and non-traditional metal removing processes.
Other Mechanical Technology	Activity providing support for mechanical product manufacturing.
Plastics Technology	Manufacture of a wide range of polyurethane foam components, epoxy encapsulants, and modified commercial products for the nuclear weapons complex.
Electrical/Electronic Fabrication & Assembly Technology	Manufacture of printed wiring assemblies which are used in weapon timers, programmers, trajectory sensing devices, and various other electrical/electronic components.
Secondary Support Areas	Activity providing support functions that service nearly all production lines, some of which are uniquely tailored to meet special weapon requirements.

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- A planned Chemical Sampling Facility upgrade will expand the Polymer Building to provide a dedicated area with required personnel protection and environmental controls to dispense hazardous and non-hazardous materials. Completion is planned for 1993.

- KCP plans to upgrade the HVAC system in the Foam Molding Area to comply with ventilation requirements for control of hazardous air contaminants in compliance with 29 CFR 1910.94. Completion is planned for 1994.

- Configuration Records Fire Protection is planned to upgrade a classified document storage area. Fire protection and life safety systems will be upgraded to provide personnel and document protection to ensure compliance with regulations. Completion is planned for 1993.

- An additional Air Monitoring Station is planned to house equipment to monitor ambient air quality to ensure compliance with state and national standards. Completion is planned for 1994.

- Explosive Actuated Device Storage Facility is planned to provide a segregated storage area for Class C Explosive Actuated Devices as required

by DOE Explosives Safety Manual. Completion is planned for 1994.

3.2.1.3 *Waste Management*

Waste operations at KCP involve management of four broad waste types: low-level waste (LLW), mixed waste, hazardous/toxic waste, and nonhazardous waste. KCP also generates small quantities of hazardous and mixed waste which are considered classified for national security reasons due to the nature of the generating process and/or composition. The quantity of classified waste is included in the hazardous and mixed waste quantities that follow. Because no classified waste will be generated as a result of any of the proposed activities that would be consolidated, there is no further discussion in this EA of classified waste generation or management. Table 3.2.1-2 presents a summary of the annual waste generation of KCP under No Action. A detailed description of the waste stream generation processes/activities, onsite management, storage and treatment capabilities and ultimate disposition is presented in appendix A.1.

Radioactive Waste Streams and Management. KCP generates small quantities of LLW. Activities which generate LLW are the disassembly and testing of irradiated components, scheduled replacement of tritium exit signs, disposal of X-ray sources, and small amounts of contaminated cleanup towels, disposable gloves, and packing materials. Less than one gallon per year of LLW is generated. Periodically, the liquid LLW is solidified into concrete or plaster of Paris for final handling and disposal.

The solid LLW is accumulated and stored in one controlled access facility used to store both LLW and mixed waste. LLW is stored onsite temporarily using DOE-approved containers until sufficient quantities accumulate to warrant shipment to approved LLW disposal facilities at LANL and the Nevada Test Site (NTS). The last shipment of solid LLW took place in May 1985. The current inventory

TABLE 3.2.1–2.—*Kansas City Plant: Waste Management (1991)*

Waste Type	Quantity Generated	Storage Capacity	Treatment Capacity	Disposal Method
Hazardous/Toxic				
Liquid	183,000 gal	44,000 gal	None	Offsite
Solid	46,000 ft^3	83,000 ft^3	None	Offsite
Nonhazardous				
Liquid[a]	310 million gal	None	1 MGD	Offsite-Sewer System Outfall
Solid	105,300 ft^3	None	None	Offsite
LLW				
Liquid	<1 gal[b]	5,280 gal[c]	None	None
Solid	15 ft^3	705 ft^3[c]	None	Offsite-DOE
Mixed				
Liquid	None	c	None	None
Solid	None	c	None	None

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[a] Industrial wastewater.

[b] Any liquid LLW is periodically solidified into concrete or plaster of Paris and handled and disposed as solid LLW.

[c] KCP has a 250 ft^2 storage area than can store LLW and/or mixed waste. This translates into 5,280 gallons, or 705 ft^3.

Source: KC ASAC, 1992a and j.

of LLW in storage is 245 ft^3. Approximately 15 ft^3 of LLW is generated annually.

Mixed Waste. Through process changes KCP no longer generates mixed waste. Mixed waste prior to these process changes consisted of discarded electronic assemblies which contain gap tubes and printed circuit boards, equipment sources in lead shielding, and a small amount of clean-up materials which contain used solvents.

All KCP mixed waste is stored with LLW in one controlled access, *Resource Conservation and Recovery Act* (RCRA) storage facility. At the present time, there are no DOE or commercial facilities available for the treatment and disposal of this waste. The current inventory of mixed waste at KCP is 195 ft^3.

Hazardous/Toxic Waste Streams and Management. Hazardous waste is generated by a number of activities at KCP and consists of wastes such as acidic and alkaline liquids, solvents, oils/coolants, and polychlorinated biphenyl (PCB) liquids and solids. Processes such as plating, etching, electronic assembly, metals and plastics machining and forming, and wastewater treatment are the principal generators.

KCP currently operates 11 RCRA interim status waste storage areas for containerized nonradioactive hazardous wastes, and six bulk storage tanks for nonradioactive hazardous wastes (appendix A.1). These facilities are for temporary storage of wastes prior to disposal. The container storage and tank storage facilities have total design capacities of 44,000 gal for liquid and 83,000 ft^3 for solid hazardous/toxic wastes.

No hazardous waste treatment, as defined under RCRA, is performed onsite at KCP. The plant does operate a solvent reclamation/distillation unit and an industrial wastewater pretreatment facility which are exempted from RCRA standards.

KCP does not dispose of waste onsite, although onsite disposal and leaks/discharges did occur in the past. On March 6, 1989, EPA requested DOE to enter into an RCRA section 3008(h) Administrative Order on Consent. On June 23, 1989, DOE and Environmental Protection Agency (EPA) Region VII signed the order. The provisions of the order require that DOE conduct all assessment and remediation activities regulated under the Order in accordance with approved environmental restoration remediation schedules. The KCP Environmental Restoration Program serves to identify the nature and extent of environmental contamination at inactive waste sites. The site investigations conducted to date have indicated that hazardous waste constituents found in the soil and groundwater at KCP are associated with past regulated hazardous waste management and solid waste management units.

Hazardous wastes generated at KCP are manifested and shipped under contracts with licensed and permitted hazardous waste transporters to RCRA- and TSCA-permitted incineration, reclamation, or disposal facilities. In addition, procedures have been developed by KCP to evaluate all prospective treatment, storage, and disposal sites to ensure that the facilities are operating in accordance with all applicable regulations. An annual reevaluation site visit is conducted for all treatment, storage or disposal facilities utilized by KCP.

Nonhazardous Waste Streams and Management. Nonhazardous wastes are generated routinely and include general plant refuse such as paper, cardboard, glass, wood, plastics, scrap, metal containers, etc. Nonhazardous wastes are segregated and recycled whenever possible. The wastes are put in 8-, 20-, and 42-yd^3 metal roll-off boxes for tractor/trailer transport to a sanitary landfill. Industrial wastewaters are discharged to the industrial wastewater treatment facility or to the sanitary sewer in compliance with Kansas City, MO sewer use ordinance provisions and permit discharge limits.

TABLE 3.2.1–3.—*Kansas City Plant: Existing Resource Requirements*

Utility Resources	Average Daily Consumption	Peak Demand	System Capacity
Electricity	521,000 kWh	35,000 kW	100,000 kW
Natural Gas	1,847,000 ft^3	195,000 ft^3/hr	1,800,000 ft^3/hr
Water	1,443,000 gal	3,000 gpm	22,000 gpm
Chemical Resources	**Total Annual Consumption**		**Storage Capacity**
Nitrogen	2,393,000 gal		40,800 gal
Argon	871,000 ft^3		a
Helium	0 ft^3		0 ft^3
Hydrogen	0 ft^3		0 ft^3
Liquid Carbon Dioxide	73,000 gal		6,100 gal

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Table assumes that KCP operates 365 days per year. Numbers in this table represent 1991 baseline utilities and 1991 emissions inventory.

[a] Procured from commercial sources. No onsite bulk storage.

Source: KC ASAC, 1992f and i.

3.2.1.4 *Utility and Resource Requirements*

The utilities at KCP include the following: electrical power; potable, process, and fire protection water; steam and condensate; natural gas and fuel oil; and compressed air. The support systems include sanitary sewage disposal, drainage and storm sewers, chemical storage, and communications.

KCP has two primary energy needs: electricity and boiler fuel. Electricity is provided by the Kansas City Power and Light Company and the Missouri Public Service Company. Boiler fuel, natural gas, and fuel oil for emergency backup only is obtained from the Defense Fuel Supply Center Contract. Table 3.2.1-3 lists KCP's existing resource requirements.

There are no onsite surface water withdrawals (KC DOE, 1989a). The Kansas City, MO municipal water supply system provides all drinking and process water for KCP. The present chemical storage capabilities are adequate for the existing KCP mission.

3.2.2 Mound Plant

The Mound Plant (Mound) is located in the greater Dayton area in Montgomery County within the city limits of Miamisburg, Ohio (figure 3.2.2-1). Mound is a government-owned, contractor-operated facility operated by EG&G Mound Applied Technologies, Inc. Mound has been operating since 1948 on the 306-acre site.

Figure 3.2.2-2 shows the local setting and facilities of Mound. The site lies south and west of Mound Road in Miamisburg. Tracks of the Consolidated Rail Corporation 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.

3.2.2.1 *Mound Plant Missions*

Mound manufactures nonnuclear components for nuclear weapons assembled at other DOE Complex sites. Work is performed under a contract between EG&G, Inc. and DOE.

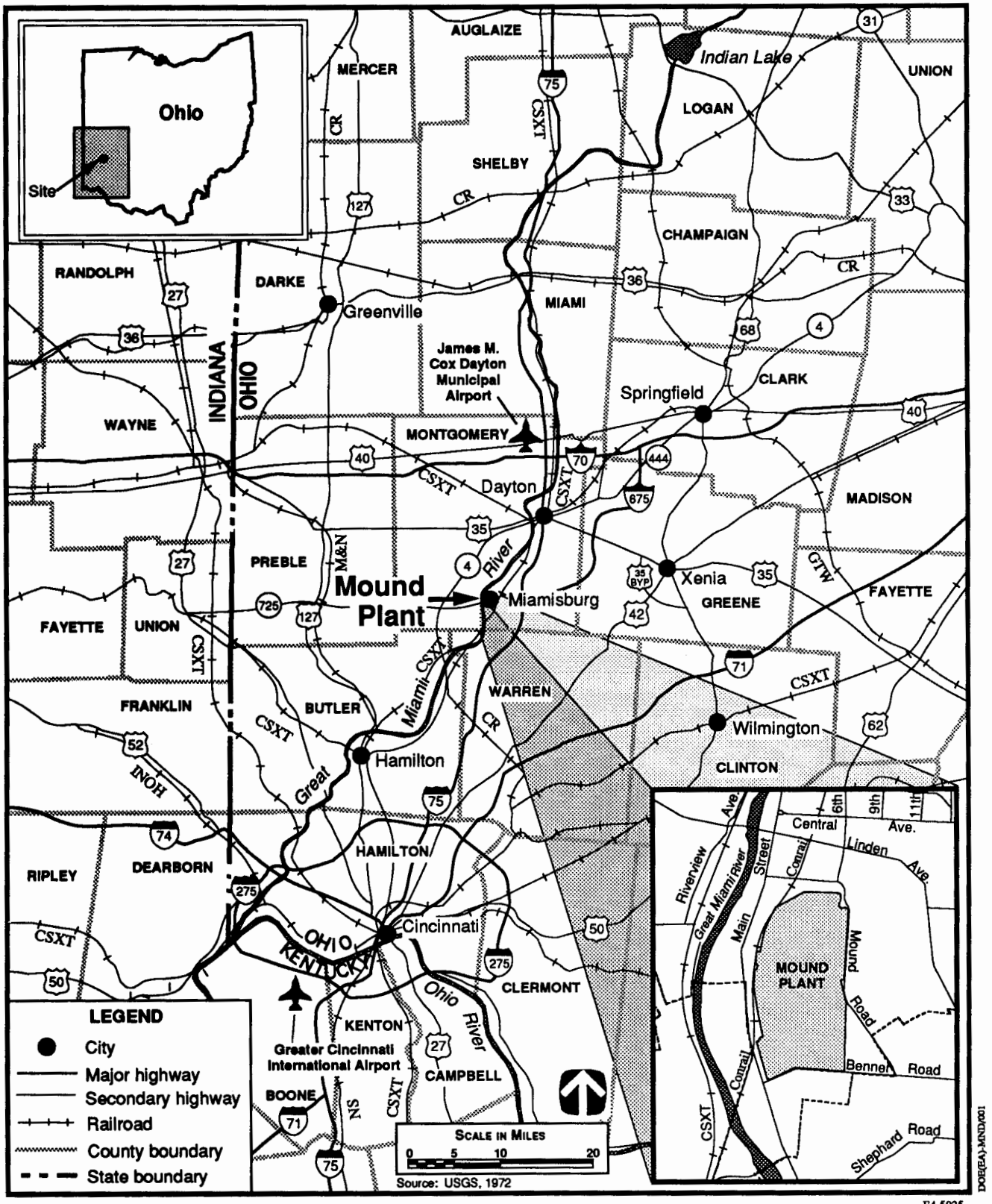

FIGURE 3.2.2-1—*Mound Plant, Ohio, and Region.*

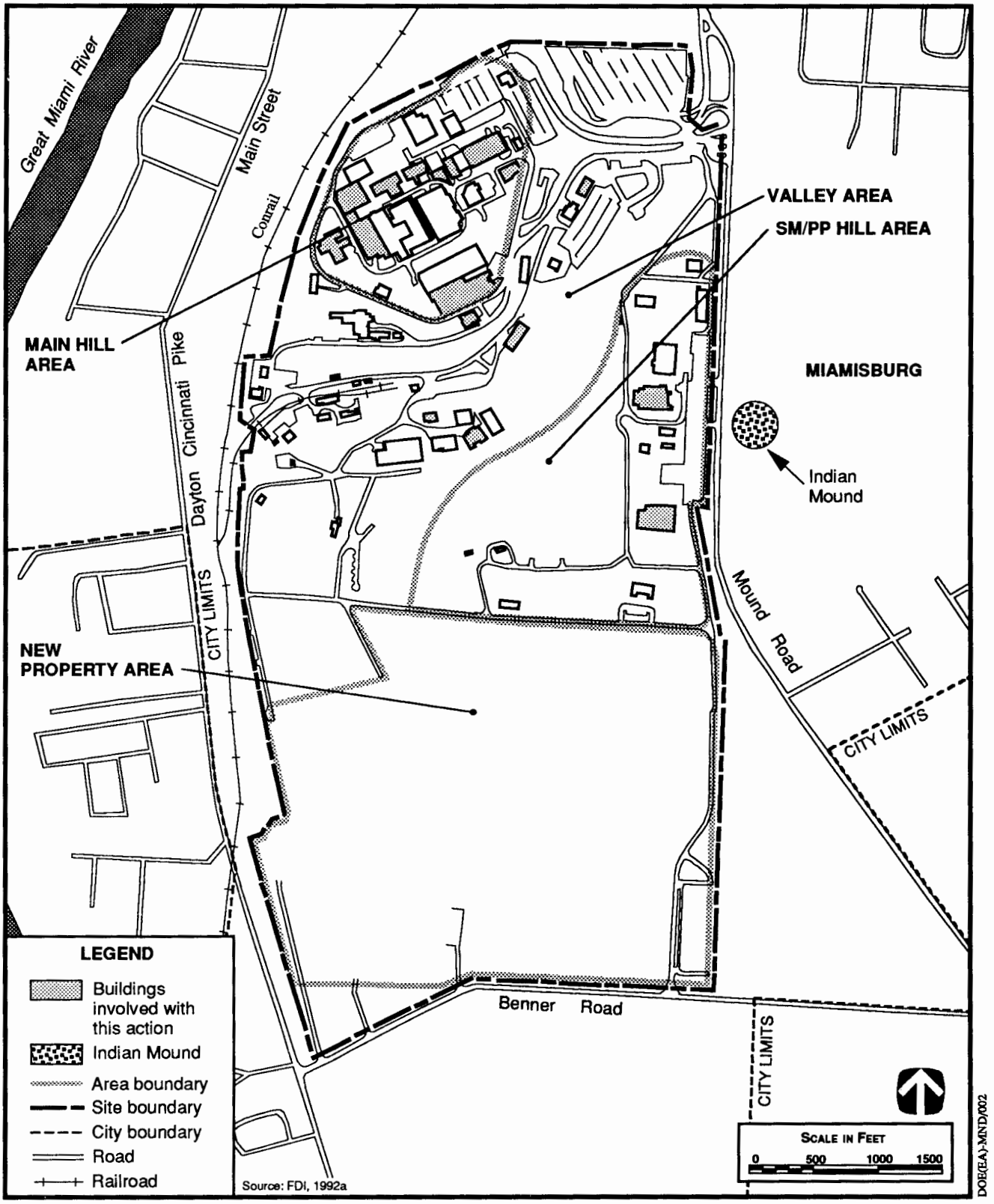

FIGURE 3.2.2-2—*Location of Facilities at the Mound Plant.*

Mound's primary missions are:

- Fabrication, assembly, and procurement of:
  - Detonators, firesets, and pyrotechnic devices.
  - Flexible circuits.
  - Explosively actuated timers and generators.
  - Powder and thermite processing.
- Explosive and reservoir surveillance testing.
- Design and production of calorimeters (non-DP mission).
- Stable isotope separation and sales (non–DP mission).
- Isotope heat source piece part fabrication (non-DP mission).
- Radioisotopic Thermoelectric Generator (RTG) heat source fabrication and qualification (non-DP mission).
- Commercial tritium sales/inertial confinement fusion target loading (non-DP mission).
- Tritiated aqueous waste recovery.
- Savannah River operational capability.
- Solid storage transfer systems.
- Nuclear materials safeguards.
- Performance of surveillance activities to insure reliability of nuclear stockpile.
- Pollution prevention.
- Waste management.
- Storage of nuclear materials.
- Maintenance of process capability program.

Mound's shared missions with the National Laboratories are:

- Development and production engineering support.
- Maintenance of a standards and calibration facility.

The majority of Mound's work is done for DP. However, it has a number of non-DP related activities that will be affected by this consolidation as indicated above. Some of these, such as calorimeters which are required by DP for nuclear inventory control and inertial confinement fusion target loading which is required to be collocated with an operating tritium handling activity, would be moved as a part of this action and are covered in the EA. The RTGs, which are used as power sources for spacecraft, and isotope separation and sales, which include development of isotope separation methods for biomedical applications, molecular science research, and worldwide sales would not be moved.

Non-DP activities would continue to receive support, related to security, non-destructive testing, waste disposal, public relations, finance, plant engineering and maintenance, and health and safety programs. Should there be a decision to terminate the weapons complex missions at Mound, a substantial infrastructure will remain there for a number of years to support the ongoing D&D and site cleanup activities conducted by the DOE Office of Environmental Restoration and Waste Management. Therefore, the DOE Office of Nuclear Energy's commercial stable isotope separation and sales program will not be appreciably affected by termination of the weapons complex missions, and decisions regarding the future of the isotope program will be made independent of such termination.

TABLE 3.2.2–1.—*Mound Plant: Nonnuclear Manufacturing Activities Considered for Consolidation*

Electrical/Mechanical Products	
Flat Cable Products	Manufacture of cables used to detonate the main explosive charge of the weapon.
Round Wire Detonator Cables	Manufacture of detonator cables used to ignite various explosive devices used in weapons systems.
Mechanical Assemblies	Manufacture of electro-mechanical devices used as detonator safing stronglink mechanisms.
Nonnuclear Acorn	Manufacture of nonnuclear components of reservoirs.
Plastic Headers	Manufacture of molded plastic devices having imbedded electrode wires, to which bridgewires (very thin wires designed to explode upon application of current) are ultimately attached.
Special Products	
Milliwatt Heat Source Surveillance	Environmental storage and testing of inert, nonradioactive heat source containers.
Calorimeters	Activity providing calibration, manufacture, assembly, and development of calorimeters.
Tritium Handling	
Gas Transfer Systems	Activity providing the development of processes and components for the manufacture of gas transfer systems.
Reservoir Surveillance Operations	Activity providing assessment of quality, reliability, and safety of gas transfer systems, including pre-production evaluations, gas transfer system functions, material testing, and product acceptance testing.
Commercial Sales/Inertial Confinement Fusion (ICF) Target Loading	Activity providing the commercial sale and filling of tritium containers for use in private industry and the loading of targets for fusion research.
Detonators	
High Power Detonators	Manufacture detonator assemblies used in explosive devices. This action includes the processing of organic explosive crystal powders, destructive testing of explosive components, and the surveillance of explosive components including stockpile, shelf life, and accelerated aging evaluations.

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Source: KC ASAC, 1992e.

Similarly, the decision whether the Office of Nuclear Energy's RTG activities remain at Mound or move to another DOE site will be unaffected by the nonnuclear consolidation decision. Whether these facilities will remain at Mound is driven by decision on the production or procurement of Pu-238 and not nonnuclear consolidation. If a decision is made to terminate the weapons complex mission at Mound, and a determination is made to retain the RTG work at the site, the overhear costs for that program may increase by approximately two million dollars annually.

3.2.2.2 *Facility/Process Description*

There are 158 buildings and facilities at Mound. Total floor area at Mound is approximately 1,400,000 ft^2 (Mound, 1991).

The DP activities at Mound consist of both weapons and non-weapons activities and for the purpose of this analysis have been divided into electrical and mechanical products, special products, tritium handing, and high explosives. The specific manufacturing activities are presented in table

3.2.2-1. A more detailed discussion is presented in appendix A.2.

The workforce at Mound in September 1992 was approximately 1,719 employees (DOE, 1992e).

Effluents and Emissions. Normal operations at Mound release small quantities of tritium (less than 10 curies per year for the total site) to surface waters. Concentrations of these releases are discussed in section 4.1.6.3. Pretreated industrial process wastewater and sanitary wastewater are discharged to the Great Miami River through NPDES permitted outfalls. Wastewater effluents from current operations at Mound are discussed in section 4.1.6.3.

Normal Mound operations release less than 1,800 curies per year of tritium to the atmosphere for the entire site. Tritium releases are discussed in section 4.1.6.2 and the associated human health impacts are discussed in section 4.1.6.9. The major source of criteria air pollutants at Mound are the two boilers associated with the steam plant and the Keystone heat exchanger. Other sources include fugitive particulate emission sources from process operations, laboratory, and vehicle emissions. Hazardous/toxic air pollutants emission sources at Mound would be from the glass melter facility when operating and various laboratory operations. Predominant hazardous/toxic air pollutant emissions include acetone, nitric acid, 1,1,1-trichloroethane (TCA) and isopropyl alcohol. The concentrations of criteria air pollutant and hazardous/toxic air pollutants from current operations at Mound are discussed in section 4.1.6.2. The emission rates for these pollutants are shown in appendix D.2.1.2.

Safety and Accidents. The review of historical information at Mound indicated that during the period 1986-1990, four accidental releases occurred that resulted in material reaching offsite locations. Three were chemical in nature and one involved radioactive material. The chemical incidents involved two releases of calcium chloride brine to the plant storm sewer in 1987 (one release was 2,100 gallons and the other 475 gallons) and one release of 2,250 gallons of ethylene glycol to the sanitary sewer system in 1988. The radiological release occurred in 1989, when an estimated 37,000 curies (Ci), or 3.7 grams, of tritium gas were released. The maximum hypothetical offsite exposure from this estimated release was calculated to be 0.004 millirem (mrem). Compared to the EPA standard of 75 mrem, this release did not result in significant adverse impacts offsite. These incidents were reported and investigated. Lessons learned were applied, appropriate corrective action(s) were instituted, and follow-up was performed in accordance with DOE order requirements.

Improvements Required to Continue/Comply with ES&H Requirements. ES&H Projects planned for start prior to the end of 1993 (CAMP, 1992) include:

- Replacement of Mounds' current Emergency Notification System, including the existing fire alarm and radio system, with a new emergency paging and announcement system and a new personnel accountability system. Completion of this project is planned for 1998.

- A site drainage control project, planned for completion in 1998, would provide upgraded stormwater management facilities. This project would include stormwater containment basins, concrete lined channels, piping, curbing, and berms which would increase stormwater containment capacity; reduce erosion, flooding and pooling; reduce the amount of stormwater running offsite in an uncontrolled manner; and reduce the groundwater recharge from potentially contaminated stormwater.

- An offsite drainage containment project, planned for completion in 2001, would provide an impervious conduit to

TABLE 3.2.2–2.—*Mound Plant: Waste Management (1991)*

Waste Type	Quantity Generated	Storage Capacity	Treatment Capacity	Disposal Method
Hazardous/Toxic	5,348 ft^3 [a]			
Liquid		14,686 gal	None	Offsite
Solid		2,880 ft^3	b	Offsite
Nonhazardous				
Liquid	47.4 million gal	c	130,000 GPD	Offsite-NPDES Outfall
Solid	140,130 ft^3	21,492 ft^3	None	Offsite
LLW	176,678 ft^3 [a]			
Liquid		d	d	Offsite-NPDES Outfall
Solid		123,000 ft^3 [c]	e	Offsite-DOE
Mixed	15 ft^3 [a]			
Liquid		325.2 gal	None	None
Solid		1,600 ft^3	None[f]	None

E4 3938

[a] Includes both liquid and solid.
[b] Burn Area has treated an average of 42 ft^3/yr of explosive/reactive wastes.
[c] Additional capacity is obtained as required by renting commercial trailers.
[d] The Waste Disposal Plant has four influent tanks having a combined storage capacity of 120,000 gallons of alpha wastewater. On the average, 30,000 gallons per week of alpha wastewater are treated and discharged to the Great Miami River. A pipeline influent system treats approximately 30,000 gallons per year of tritiated wastewater.
[e] Sludges produced in the clariflocculator from the above process are held in two 1,000-gallon tanks until solidified in 55-gallon drums.
[f] When available in 1994, the glass melter thermal treatment unit is expected to have a treatment capacity of 740 ft^3/yr.

Source: FDI, 1992a; MD DOE, 1991c; MD EG&G, 1992b.

transport Mound's drainage to the Great Miami River. The purpose of this project is to protect the underlying Buried Valley Aquifer.

- Technical Building Life Safety Code upgrades are expected to be completed in 1998. This project would provide for the necessary upgrades to bring the Technical Building into compliance with the current Life Safety Code. The project includes providing new delivery access for the building, modifying the tunnel, constructing new corridors, electrical upgrades, and fire protection upgrades.

3.2.2.3 *Waste Management*

Waste management operations at Mound consist of five broad waste types: transuranic (TRU), LLW, mixed waste, hazardous/toxic waste, and non-hazardous waste. Because there are no TRU wastes associated with any of the proposed activities that would be consolidated, there is no discussion in this EA of TRU waste generation and management. Table 3.2.2-2 presents the existing annual waste generation of Mound. A detailed description of the waste stream generation processes/activities, onsite management, storage and treatment capabilities, and ultimate disposition is presented in appendix A.2.

Radioactive Waste Streams and Management. LLW wastes consist of paper, wood, building debris and soil contaminated with plutonium-238,

plutonium-239, and thorium; and paper, wood, plastic, and scrap equipment contaminated with tritium. Currently, approximately 70 percent of the LLW generated at Mound is a result of ongoing D&D activities.

Liquid waste treatment at Mound is confined to plutonium-238. This liquid waste is treated in the Waste Disposal Facility for the precipitation of plutonium-238 and the solidification of the sludge with concrete. Low-level tritium contaminated liquid wastes are not treated but are transported in doubly enclosed above-ground pipelines to the Waste Disposal Annex Facility where the liquids are solidified with cement in 55-gallon steel drums. The remaining low-level liquid wastes are stored onsite. Additional low-level management facilities are described in appendix A.2.

All solid LLW is transported by commercial carriers in closed vans to NTS for burial. Prior to shipment, solid LLW is staged in Building 31 (boxes) or Building 23 (drums). As of the end of September 1992, there were approximately 160,382 ft^3 of LLW at the plant awaiting shipment.

Mixed Waste. Mound's low-level radioactive mixed waste is generated from scintillation vials, lead residue and bricks, PCBs, and contaminated mercury. Low-level mixed waste is containerized and stored in Building 23 at Mound pending completion of waste characterization and identification of an acceptable waste treatment/ disposal option by DOE.

Mound is now planning the construction of a 5,300 ft^2 radioactive waste storage facility. Conceptual design has been completed and the facility is scheduled to be operational by June 1994. This building will allow the use of Building 23 exclusively for mixed waste storage.

Mound is finding it difficult to comply with land disposal restrictions and waste storage time limits for its mixed wastes, since disposal options are not available. It is anticipated that Mound's glass melter thermal treatment unit would be available for treatment of much of this waste in 1994 and is expected to have a treatment capacity of 740 ft^3/yr. The glass melter would be used to burn hazardous waste and mixed waste and vitrify the bottom ash. An RCRA Part B permit application, and a Trial Burn Plan for the glass melter have been submitted for EPA approval. Mound has no current or planned onsite disposal facilities for radioactive wastes.

Hazardous/Toxic Waste Streams and Management. Hazardous/toxic wastes are generated in several production and laboratory facilities at Mound. The quantity of the wastes and the disposal methods for each are summarized in table 3.2.2-2.

The current storage and treatment facilities at Mound are listed in appendix A.2. Preconceptual design and budget planning is underway for construction of a new hazardous waste storage facility that would improve waste handling and loading operations and reduce chances of waste spills. The new facility would also permit better separation of incompatible wastes and provide climate-controlled storage of wastes to prevent container pressurization or rupture due to high or low temperatures. The addition of the new facility, which incorporates 7,800 ft^2 of storage space, when combined with the existing 2,400 ft^2 of Building 72, would result in 10,200 ft^2 of available hazardous waste storage area inside the 23,994 ft^2 facility. Mound has submitted a revised RCRA Part A and B permit application which is currently being processed by the state.

There are no active onsite disposal facilities for hazardous wastes at Mound. The only wastes currently treated onsite are explosives and pyrotechnics. Several hundred pounds of these materials are treated annually by open burning and by use of a retort. All other hazardous wastes are treated and disposed of offsite by RCRA-permitted commercial contractors. Prior to offsite shipment, all hazardous/toxic waste is packaged in Department of Transportation (DOT)-approved containers, mostly 55-gallon drums, manifested and shipped

under contract with RCRA-permitted transporters to RCRA and TSCA-approved facilities for treatment or disposal depending on the waste form. Some lead-acid batteries and excess laboratory chemicals are also sent offsite for recycle or reuse. Mound has a program to monitor the offsite management of its hazardous wastes by commercial facilities on a regular basis. Records and manifests are maintained of all hazardous wastes picked up from Mound generators that are shipped offsite for treatment or disposal.

Nonhazardous Waste Streams and Management. Nonhazardous wastes are generated routinely and include general plant refuse such as paper, cardboard, glass, wood, plastics, scrap, metal containers, etc. Nonhazardous wastes are segregated and recycled whenever possible. Metallic and wood waste, stored in a salvage area, is sold periodically by lot sale as surplus. Trash is accumulated onsite and taken to the local sanitary landfill on a regular basis.

3.2.2.4 *Utility and Resource Requirements*

The P-Building at Mound serves both as a primary distribution center for natural gas, fuel oil, and electrical power and for providing other services such as: compressed air; ethylene glycol cooling; potable, process, and fire protection water; and steam and condensate.

The support systems at Mound include: sanitary sewage disposal; drainage and storm sewers; and communications.

Mound's electrical distribution system consists of a "dual primary selective" 13 kV (kilovolt) system with three service entrances supplied by Dayton Power and Light Company. An automatic transfer scheme is used to prevent prolonged facility outages. Mound's primary electric service is meeting current demands.

The Dayton Power and Light Company supplies natural gas to Mound. Annual consumption at Mound is approximately 3 million cubic feet.

Mound furnishes its own potable water, cooling water, fire water (sprinklers and hydrants), storm-water drainage, and sanitary sewage system. The distribution of water to the entire plant is through two separate underground networks, one for fire protection and the other for potable/process water. The current water usage at Mound ranges from 18 to 25 million gallons per month and water consumption averages about 700 gallons per minute during peak periods. Nearly 75 percent of water consumed at Mound is process water. Less than

TABLE 3.2.2–3.—*Mound Plant: Existing Resource Requirements*

Utility Resources	Average Daily Consumption	Peak Demand	System Capacity
Electricity	179,000 kWh	11,700 kW	18,800 kW
Natural Gas	8,000 ft^3	332 ft^3/hr	339 ft^3/hr
Water	475,000 gal	600 gpm	1,600 gpm
Chemical Resources	**Total Annual Consumption**		**Storage Capacity**
Nitrogen	20,900 gal		36,500 gal
Argon	139,000 gal		8,400 gal
Helium	47,000 ft^3		60,000 ft^3
Hydrogen	3,300 ft^3		0 ft^3

E4 3503

Table assumes that Mound operates 365 days per year.

Source: MD EG&G, 1992a, b and c.

100,000 gallons per day (GPD) is for domestic water usage (Mound, 1988).

The present chemical storage area is sufficient for current Mound missions. Existing resource requirements are summarized in table 3.2.2-3.

3.2.3 Pinellas Plant

The Pinellas Plant (Pinellas) located in Pinellas County in Largo, FL, and operated by Martin Marietta Specialty Components, Inc., manufactures specialized products for nuclear weapons and their associated systems. Martin Marietta took over operation of this plant from General Electric Neutron Devices in June 1992. Plant operations include the manufacture of neutron generators, lightning arrestor connectors, neutron tube loading, thermal and lithium ambient batteries, capacitors and super capacitors, encapsulated magnetics, frequency devices, neutron detectors, optoelectronics, and others.

The plant site consists of approximately 100 acres with 23 buildings. The plant is located in Pinellas County between the Cities of Clearwater and St. Petersburg (figure 3.2.3-1). Pinellas County is located on a peninsula bordered by the Gulf of Mexico to the west, and Tampa Bay to the east and south.

3.2.3.1 *Pinellas Plant Missions*

The mission of Pinellas is totally devoted to DP activities and involves small volume production of nonnuclear components of selected technologies that require strict control of materials and processes in an ultraclean environment. This includes process development, design, production, testing and laboratory functions for these components.

Pinellas' primary missions are:

- Fabrication and assembly of:
  - Neutron generators.
  - Cap assembly.
  - Magnetics.
  - Optoelectronics devices.
  - Frequency devices.
  - Neutron detectors.
  - Transducers.
  - Support pads.
  - Ceramics.
  - Lightning arrestor connectors.
  - Specialty capacitors and switches.
  - Product testers.
  - Other small electronic components.
- Fabrication and procurement of thermal batteries.
- Performance of surveillance activities to ensure reliability of nuclear stockpile.
- Pollution prevention.
- Waste management.
- Storage of nuclear material.
- Maintain process capability program.

Pinellas' shared mission with the National Laboratories is development and production engineering.

3.2.3.2 *Facility/Process Description*

The plant facility contains over 700,000 ft^2 of manufacturing space, laboratories, offices and support space. Figure 3.2.3-2 shows the Pinellas layout. Specific nonnuclear manufacturing activities at Pinellas are presented in table 3.2.3-1. A more detailed discussion of these activities is presented in appendix A.3.

The workforce at the plant in September 1992 was approximately 1,025 employees (DOE, 1992e).

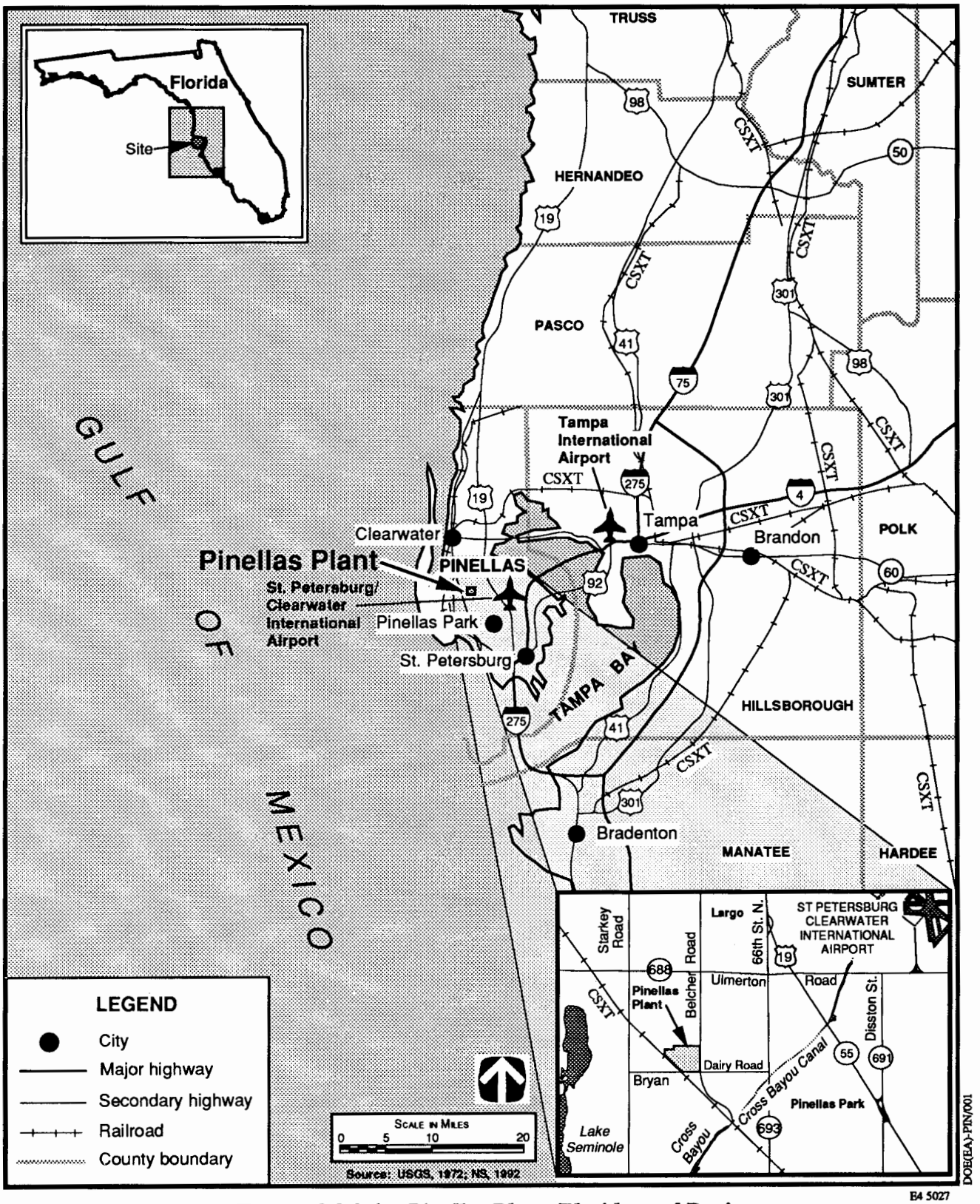

FIGURE 3.2.3-1—***Pinellas Plant, Florida, and Region.***

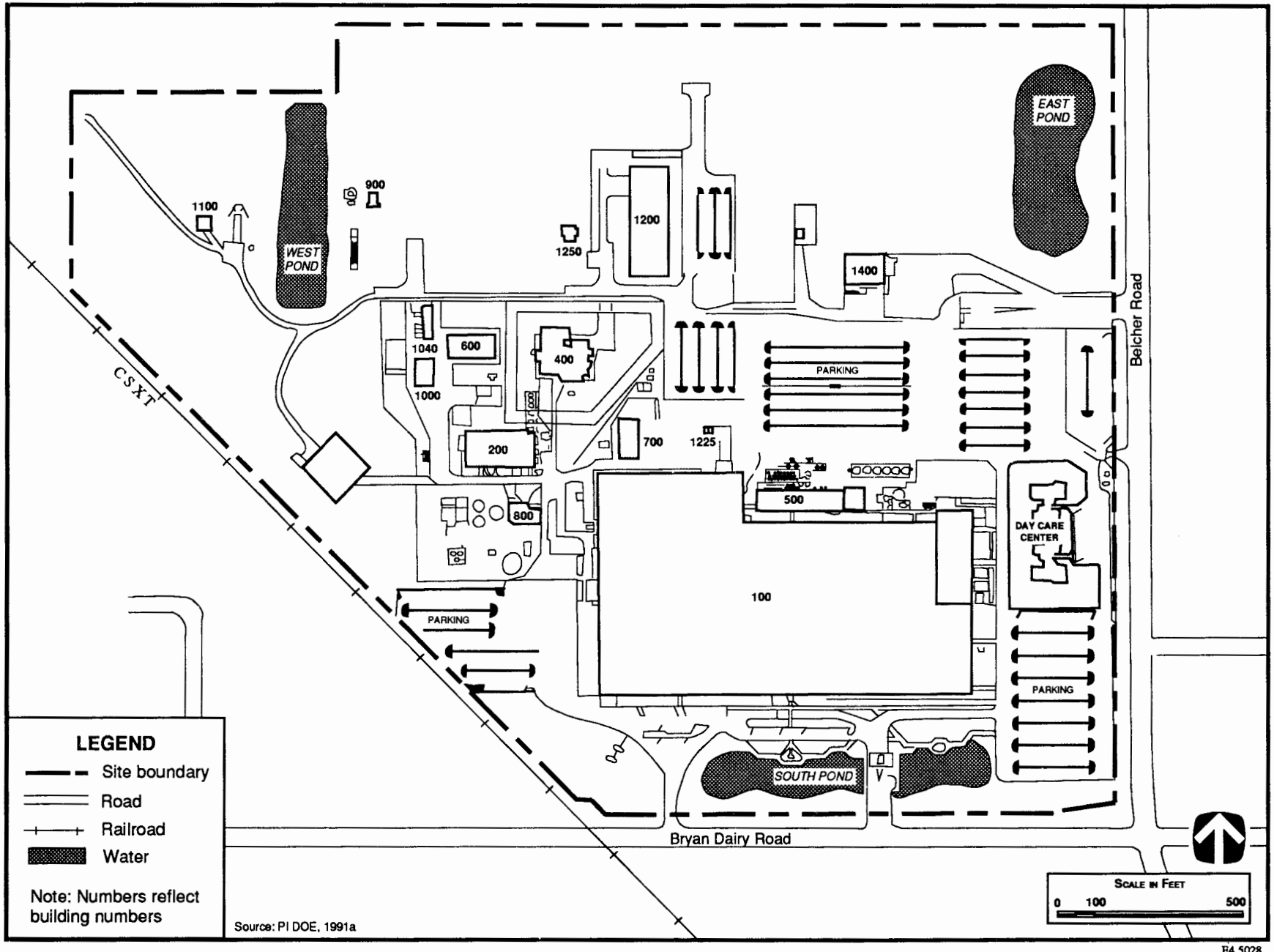

FIGURE 3.2.3-2—*Location of Facilities at the Pinellas Plant.*

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TABLE 3.2.3–1.—*Pinellas Plant: Nonnuclear Manufacturing Activities Considered for Consolidation*

Neutron Generators, Cap Assemblies, & Batteries	
Thermal Batteries	Development and backup production capabilities for the manufacture of thermal batteries, a long shelf-life battery that uses an exothermic (heat generating) chemical reaction to produce electricity.
Lithium Ambient Batteries	Activities involve procuring lithium anode cells commercially and then building them into battery assemblies.
Neutron Generators	Manufacture of neutron generators which provide a controlled source of neutrons.
Cap Assemblies	Manufacture of a weapons component used with gas transfer systems.
Electrical/Mechanical Products	
Neutron Detectors	Manufacture of electronic detectors used to verify the output of neutron generators in joint test assemblies.
Optoelectronics Assemblies	Manufacture of electrical devices using light rather than electrical conductivity to transfer information, perform switching functions, and act as sensors.
Lightning Arrestor Connectors	Manufacture and testing of electrical connectors for weapons cables that are designed to short circuit lightning strike pulses to ground.
Support Pads	Manufacture of molded pads that are used to protect weapons components within the weapon assembly.
Transducers	Manufacture of mechanical shock sensing devices used in weapons testing sequences.
Tritium Handling	
Neutron Tube Target Loading	Activities involve tritium loading (exposing materials to gaseous tritium) of targets for neutron generator tubes.

B4 3504

Source: KC ASAC, 1992e.

Effluents and Emissions. During operations at Pinellas, small quantities of tritium are discharged to the Pinellas County Sewer System along with industrial and sanitary wastewater. These releases and measured concentrations are discussed in section 4.1.7.3. Pretreated industrial process wastewater and sanitary wastewater are discharged to the Pinellas County wastewater treatment facility in compliance with the Pinellas County Sewage System permit discharge limits. Wastewater effluents from current operations at Pinellas are discussed in section 4.1.7.3.

Normal operations at Pinellas release small amounts of tritium to the atmosphere. The tritium releases are discussed in section 4.1.7.2 and the associated health impacts are discussed in section 4.1.7.9. The major sources of criteria air pollutants at Pinellas are the boiler and diesel generators in Building 500. Buildings 700, 1040, and Building 100 grinding and million operations are also sources. Hazardous/toxic air pollutants include acids, resin compounds, and common industrial solvents. The concentration of criteria pollutants and hazardous/toxic air pollutants from current operations at Pinellas are discussed in section 4.1.7.2. The emission rates for these pollutants are discussed in appendix D.2.1.3.

Safety and Accidents. The review of historical information at Pinellas indicated that, during the period 1986-1990, seven minor accidental releases occurred which resulted in material reaching offsite locations. These incidents resulted in no significant adverse impact. The chemical incidents involved the release of high pH industrial wastewater to the public sewer system on three occasions in 1990: 10,000 gallons, 305 gallons, and 400 gallons. None of these releases was required to be reported under the requirements of CERCLA and SARA since the

quantities released were below the regulatory threshold and not "into the environment." The radiological incidents were of minor nature with no public impact. These incidents were reported and investigated and involved the release of 1.45 Ci of gaseous tritium, 39 Ci of radioactive Krypton gas, 27 Ci of unidentified airborne radioactive material, and approximately 1 Ci, or 1.1 cubic centimeter, of tritiated water, respectively. These incidents were reported and investigated. Lessons learned were applied, appropriate corrective action(s) were instituted, and follow-up was performed in accordance with DOE Order requirements.

Improvements Required to Continue/Comply with ES&H Requirements. ES&H projects planned to start prior to the end of 1993 (CAMP, 1992) include:

- Construction of a new fire protection services facility of 4,800 ft^2. Completion is planned for 1993 (PI DOE, 1992c).

- Renovation of the health physics drain system to meet EPA Compliance Standards is planned for completion in 1993.

3.2.3.3 *Waste Management*

Waste operations at Pinellas involve management of three waste types: LLW, hazardous/toxic waste and nonhazardous waste. Table 3.2.3-2 presents a summary of the annual waste generation of Pinellas. A detailed description of the waste stream generation processes/activities, onsite management, storage and treatment capabilities and ultimate disposition is presented in appendix A.3.

Radioactive Waste Streams and Management. All radioactive waste generated at the plant is LLW. Systems and supporting equipment used to load neutron generators and other materials with tritium gas and laboratory analytical equipment, are sources of tritium gas waste streams. Tritium is managed as aqueous, gaseous, and solid material.

The Tritium Recovery System is the onsite treatment facility that reduces gaseous tritium discharges. The primary source of tritium entering the Tritium Recovery System is from pumps in tritium processing systems, which are closed systems piped to the Tritium Recovery System. Since 1989, the Tritium Recovery System has converted residual tritium to tritiated water for disposal using a high-temperature converter that oxidizes the tritium gas and captures the resulting water in molecular sieve columns which are shipped as solid LLW to SRS for disposal.

Areas using tritium are provided with drains connected to a storage tank facility consisting of three 10,000-gallon tanks. Prior to releasing wastewater from these tanks, sampling and analysis is performed to verify that the contents meet the Pinellas Plant's as low as reasonably achievable levels prior to discharge to the chemical treatment system. If levels exceed the self-imposed as low as reasonably achievable standard, the wastewater is disposed of by an alternate method such as solidification for offsite disposal.

Solid LLW is generated in small quantities and consists of scrapped equipment and by-products of decontamination, effluent control, analytical procedures, and scrapped product. Tritium contaminated compactible solid waste consisting mostly of paper products and protective clothing are compacted directly in DOT Specification 17C 55-gallon steel drums with a hydraulic drum compactor. Because Pinellas does not have a long-term storage capacity, solid LLW generated at the plant site is shipped to the SRS burial site for final disposal. As of November 1992, the current inventory of LLW at Pinellas was 1,984 ft^3 or 270 drums. The holding period for this waste at Pinellas is less than one year. Solid LLW generation volumes are shown in appendix A.3.

TABLE 3.2.3–2.—*Pinellas Plant: Waste Management (1991)*

Waste Type	Quantity Generated	Storage Capacity	Treatment Capacity	Disposal Method
Hazardous/Toxic				
Liquid	49,555 gal	24,500 gal	b	Offsite
Solid	110 ft^3	a	c	Offsite
Nonhazardous				
Liquid	65.8 million gal	None	110 MGY	Offsite-Sewer System Outfall
Solid	3,942 ft^3	None	None	Offsite
LLW				
Liquid	0 gal	30,000 gal	None	None
Solid	2,090 ft^3[a]	a	None	Offsite-DOE
Mixed	None	a		
Liquid			None	None
Solid			None	None

E4 3505

[a] Additional storage capacity requirements depend upon the existing storage requirements, existing storage capacity, and existing permit conditions.

[b] Trim wastewater treatment of water reactive metals, 14 ft^3 of calcium materials or 4 ft^3 of lithium contaminated solids in separative batch operations.

[c] Thermal treatment facility for explosives, maximum quantities treated at any one time are 2 pounds of heat powder and 1/8 pound of heat powder in the steel pan, and 10 squib charges in the cast iron vessel.

Source: PI MMSC, 1992a.

Mixed Waste. Pinellas does not produce mixed waste and does not expect to produce mixed waste in the future.

Hazardous/Toxic Waste Streams and Management. Hazardous/toxic waste generated at Pinellas consists of: (1) halogenated and nonhalogenated solvents, both ignitable and toxic; (2) spent plating bath solutions; (3) spent electroplating strippers; (4) flammable solids and liquids; (5) lithium silica and thermal batteries; (6) aqueous and solid wastes contaminated with heavy metals; (7) off-specification new materials; (8) sludges; and (9) lab packs.

Pinellas has an approved RCRA Part B permit, composed of two separate permits administered by the Florida Department of Environmental Regulation and EPA. Each of the hazardous waste storage and treatment activities described below are covered by the RCRA permit.

Hazardous waste operations consist of storage and treatment units. Appendix A.3 describes in detail the hazardous waste container and tank storage units at Pinellas. Included are two 5,000- and one 2,000-gallon storage tanks, and a container storage building. Hazardous wastes are not permanently stored or disposed of at Pinellas.

Annually, Pinellas manifests and ships approximately 100 drums of hazardous waste, 3,500 gallons of ignitable hazardous waste, and 300 drums of hazardous laboratory waste under contract with licensed RCRA-permitted transporters for offsite disposal at commercial RCRA-permitted disposal facilities and DOE sites. Appendix A.3 shows the offsite disposition of the hazardous wastes, and provides projected quantities of hazardous wastes to be shipped offsite in 1992.

Pinellas has a program to monitor the offsite management of its hazardous wastes by commercial facilities on a regular basis. The contractor facilities

are inspected by Pinellas waste management personnel.

There are no approved commercial facilities available to treat Pinellas' explosive wastes; therefore, onsite open burn thermal treatment is provided for the chemical and thermal treatment of reactive and Class C explosive materials. Pinellas is currently operating in accordance with the plant's hazardous waste operating permit and interim status under 40 CFR Subpart X for open burning/open detonation of heat powder, heat paper, and small charge Class C explosives. The materials undergoing thermal treatment include heat powder (iron shavings and potassium perchlorate), heat paper (metallic zirconium and barium chromate), and explosive primer components.

The heat powder, heat paper, and squibs are generated from production of thermal batteries. They are burned in a specially designed stainless steel pan. The powder or pellets are burned in two pound batches using a small amount of petroleum to initiate the burn. The residue from this process is disposed offsite as nonhazardous waste. Heat paper is treated in the same manner as heat powder, except the residue which contains barium and chromium is collected and disposed of offsite as hazardous waste. Annually, less than 100 pounds of explosive wastes are burned onsite.

The Reactive Metals Treatment facility is used for the reaction of calcium metal, calcium bimetal and lithium-contaminated solids, which are hazardous due to reactivity. The calcium metal and bimetal are off-specification materials from laboratory and production areas. The lithium-contaminated solids (finger cots, paper wipes, and gloves) are generated from the production and inspection of thermal batteries. The metal residue from the reaction vessels is nonhazardous and is disposed of as solid waste at the local sanitary landfill.

Nonhazardous Waste Streams and Management. Nonhazardous wastes are generated routinely and include general plant refuse such as paper, cardboard, glass, wood, plastics, scrap, metal containers, etc. Nonhazardous wastes such as scrap metal and cardboard are segregated and recycled whenever possible. Trash is accumulated onsite and taken to the local sanitary landfill.

3.2.3.4 *Utility and Resource Requirements*

Pinellas resource requirements are summarized in table 3.2.3-3. Electric power is purchased from

TABLE 3.2.3–3.—*Pinellas Plant: Existing Resource Requirements*

Utility Resources	Average Daily Consumption	Peak Demand	System Capacity
Electricity	150,000 kWh	8,700 kW	17,200 kW
Natural Gas	1,500 ft^3	9,200 ft^3/hr	9,220 ft^3/hr
Water	135,000 gal	200 gpm	900 gpm
Chemical Resources	**Total Annual Consumption**		**Storage Capacity**
Nitrogen	1,500,000 gal		48,000 gal
Argon	225,000 gal		12,200 gal
Helium	unknown		unknown
Hydrogen	78,000 gal		20,000 gal
Oxygen	1,200 gal		600 gal

E4 3511

Table assumes that Pinellas operates 365 days per year.

Source: PI MMSC, 1992a.

Florida Power Corporation. Emergency service is provided by four diesel engine-driven generators. One-third of the emergency power is used for emergency lighting and the balance serves critical building services and process loads (PI GE, 1986).

Municipal water is the only source of water used at the plant and is supplied by the Pinellas County Water System. Process equipment cooling water is supplied by 15 operating equipment cooling water recirculators that range in size from 6 to 100 gallons per minute. A demineralized water distribution system has a capacity of 345,600 GPD (PI GE, 1986).

Pinellas uses four types of gas systems in production activities. The cryogenic gases used are hydrogen, nitrogen, argon, and liquid oxygen.

Fuel types at Pinellas include natural gas, No. 2 fuel oil, and gasoline. The regular use of natural gas was eliminated in 1983 with the installation of three heat pumps; however, a backup boiler using natural gas is still maintained. The No. 2 fuel oil is used for the boiler and emergency diesel generators (PI GE, 1986).

Stored chemicals are being reduced due to decreased production schedules. The present chemical storage area is adequate for the Pinellas mission (PI DOE, 1992b).

3.2.4 Rocky Flats Plant

The Rocky Flats Plant (RFP) is located in northern Jefferson County, Colorado approximately 16 miles northwest of downtown Denver (figure 3.2.4-1). Other nearby communities include Boulder, Arvada, and Golden. The main plant shown in figure 3.2.4-2 is a 384-acre complex consisting of manufacturing, chemical processing, laboratory, and support facilities. It is situated within a 6,550-acre natural preserve which functions as the plant's buffer zone. Currently, RFP has 3 million ft^2 of floor space in 436 buildings and facilities.

3.2.4.1 *Rocky Flats Plant Mission*

Since it began operation, the primary mission of RFP has been to fabricate the plutonium components (or "pits") for nuclear weapons and to carry out associated plutonium processing and waste management activities. RFP also has been engaged in the manufacture of non-plutonium components for weapons from materials such as stainless steel and beryllium. The principal nonnuclear manufacturing operations performed at RFP are metal forging, fabrication, assembly, and chemical processing. There also is heavy emphasis on production-related research.

Due to the evolving role of Rocky Flats, the primary mission has become a combination of the following actions:

- Stabilize materials for storage and shipment.
- Store/transport Special Nuclear Materials (SNM).
- Provide SNM safeguards, security, and surveillance.
- Maintain an analytical laboratory within the complex.
- Transition to prepare for D&D of four major plutonium handling buildings.
- Process and ship existing wastes and residues.
- Monitor site for environmental compliance.
- Continue environmental restoration and waste management activities.
- Support the transfer to LANL of functions associated with the Stockpile Surveillance Program.

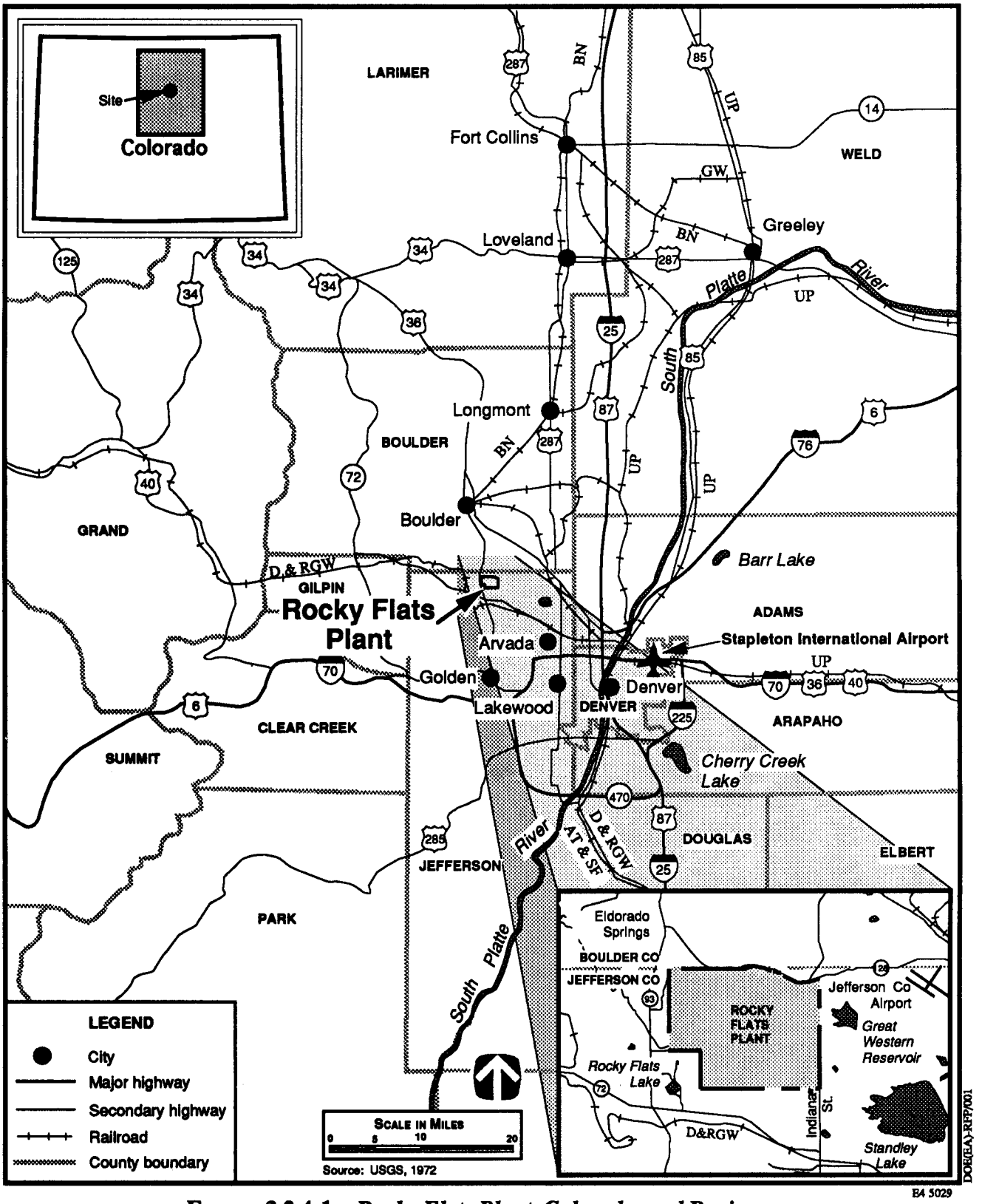

FIGURE 3.2.4-1—*Rocky Flats Plant, Colorado, and Region.*

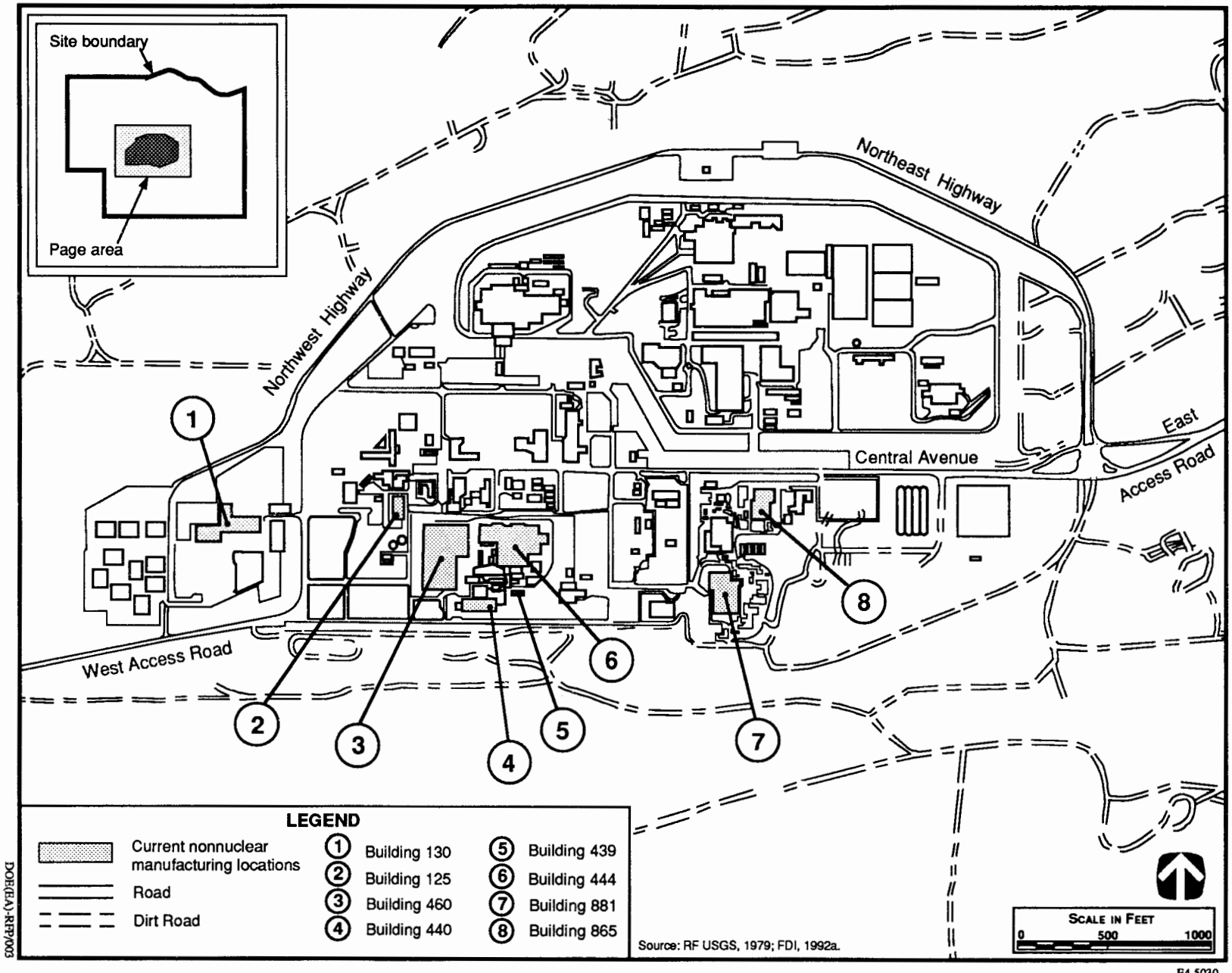

FIGURE 3.2.4-2—*Location of Facilities at the Rocky Flats Plant.*

TABLE 3.2.4–1.—*Rocky Flats Plant: Nonnuclear Manufacturing Activities Considered for Consolidation*

Electrical/Mechanical Products	
Reservoirs	Manufacture, assembly, and shipping of weapon gas stainless steel reservoir assemblies.
Special Products	
Safe Secure Trailers	Manufacture, repair, and refurbishment of safe and secure highway semi-tractor trailers used to transport weapon components and material.
Weapon Trainer Shop	Activity providing weapon component and assembly illustrations as well as display and instructional models for use within the DOE weapons complex and the Department of Defense (DOD).
Metrology Services	Activity involving the calibration of dimensional standards such as thread gages, height blocks, comparator charts, special design gauges, surface plates, and optical flats.
Nuclear Grade Steels/Oxnard	Activity involving the procurement, certification, and storage of bulk stock for a variety of metals for the DOE nuclear weapons complex.
Beryllium & Pit Support	
Beryllium Technology	Activity involving the machining, refining, melting, atomizing, and forming of beryllium metal.
Pit Support Functions	Activity involving the machining and joining of various pit interface components.

E4 3509

Source: KC ASAC, 1992e.

- Maintain the weapons complex plutonium component production capability in a contingency status.

DOE has prepared a Transition Plan apprising the Congress about proposed mission plan changes from weapons production to remediation and environmental cleanup for RFP.

3.2.4.2 *Facility/Process Description*

Nonnuclear manufacturing and support activities are located in Buildings 125, 130, 439, 440, 444, 460, 865, and 881 (figure 3.2.4-2). The nonnuclear activities occupy approximately 445,000 ft^2 of space, including 60,000 ft^2 of outside storage space. With reduced workloads, this amount of space is expected to be reduced by approximately one-half (RF DOE, 1992a). The proposed Rocky Flats Transition Plan would declare Buildings 439, 440, 444, 460, and 865 as surplus as a result of relocating RFP's nonnuclear manufacturing activities.

Nonnuclear manufacturing activities at RFP are listed in table 3.2.4-1. A more detailed discussion of these activities is contained in appendix A.4.

As of September 1992, RFP employed approximately 7,299 workers (DOE, 1992e).

Effluents and Emissions. Activities which are the subject of this EA do not under normal operating conditions, release radioactive water pollutants. Wastewater effluents from RFP processing activities are treated and used for process make-up water and do not discharge offsite. A small fraction (approximately 3%) of the effluent discharged from the sewage treatment plant is comprised of make-up water. Sanitary wastewater is treated at the sewage treatment plant and discharged to Pond B-3 located on South Walnut Creek. Stormwater runoff

from the plant is conveyed by several ditches and culverts to the terminal ponds (A-4, B-5, and C-2) located on the east side of the buffer zone. The ponds restrict offsite discharges and allow water testing and, if necessary, treatment to meet water quality standards. Water is transferred from Pond B-5 to Pond A-4. Pond A-4 water is released to Walnut Creek in compliance with NPDES permit discharge limits. Water from Pond C-2 is transferred to the Broomfield Diversion Ditch located east of the plant boundary, or in an emergency, to Ponds A-4 or B-5. Discharges into Woman Creek from Pond A-4 contain radionuclides, but are in compliance with NPDES permit discharge limits and meets applicable water quality standards. Water effluents from current operations at RFP are discussed in section 4.1.8.3.

Activities which are the subject of this EA do not under normal operating conditions release radioactive air pollutants to the environment. The major sources of criteria pollutants at RFP are the steam plant boilers. Other sources include various small boilers, diesel generators, and various manufacturing operations. Hazardous/toxic air pollutant sources include laboratories and manufacturing facilities. RFP hazardous/toxic air pollutants include beryllium, carbon, tetrachloride, hydrocarbon vapors, trichlorotrifluoroethane and ammonia. Only trace amounts of beryllium are released at RFP. The beryllium emissions in 1990 were 8.2 grams compared to the state daily limit of 10 grams over a 24-hour period. The concentrations of criteria pollutants and hazardous/toxic air pollutants from current operations at RFP are discussed in section 4.1.8.2. The emission rates for these pollutants are shown in appendix D.2.1.4.

Safety and Accidents. The review of historical information at RFP indicated that during the period 1986-1990, seven known incidents of offsite contamination occurred as a result of accidental releases. However, these incidents resulted in no significant adverse impact. All involved the release of radiological material and were not associated with the activities that are the subject of this EA. The incidents were as follows: in 1988 an employee was contaminated and contamination was found in his automobile; in 1989 contamination was found in a rail car from RFP at the DOE Pantex Plant, contaminated boxes were found in a rail car from RFP at the DOE Idaho National Engineering Laboratory (INEL); and in 1990 a contaminated electric motor was discovered in an offsite warehouse, and four contaminated static strip inverters were discovered in an offsite warehouse. These incidents were reported and investigated. Lessons learned were applied, appropriate correction action(s) were instituted, and follow-up was performed in accordance with DOE order requirements.

Improvements Required To Continue/Comply with ES&H Requirements. The ES&H projects at RFP nonnuclear manufacturing facilities that are planned to start prior to the end of 1993 include the following (CAMP, 1991). These projects may be modified as a result of continuing transition planning.

- Replace and/or modify fire and security alarm systems in nearly all buildings at RFP to bring these facilities up to current DOE orders and National Fire Protection Association standards. This project is planned to be completed in 1998.

- Upgrade, refurbish, or replace facilities and utility systems in manufacturing and support buildings. Included in this project is the restoration of heating, ventilation, and air conditioning (HVAC) systems for 26 nonnuclear manufacturing and support buildings, electrical power distribution equipment in approximately 30 primarily non-nuclear manufacturing buildings, replacement of a water treatment plant, and modification to the Plant Data Acquisition and Control System. Completion of this project is planned for 1998.

- Provide complete fire protection packages for seven laboratories/ buildings including installation of automatic sprinklers and a fire suppression system to meet DOE orders. Completion of this project is planned for 1993.

- Replace the RFP plating laboratory to meet current environmental and safety standards. Completion of this project is planned for 1993.

- Develop a flexible beryllium machining system to minimize occupational exposure to beryllium by consolidating and automating multiple machine tool operations. Completion of this project is planned for 1993.

- Provide sampling port toxic air monitoring system capable of operating continuously without a full-time operator. Completion of this project is planned for 1996.

3.2.4.3 *Waste Management*

Waste management operations at RFP involve management of six broad waste types: TRU waste, LLW, mixed waste, residues, hazardous/toxic waste, and nonhazardous wastes. Because there are no TRU wastes or residues associated with any of the proposed activities that would be consolidated, there is no discussion of TRU waste or residue in this EA. Table 3.2.4-2 presents a summary of the annual waste generation of RFP under No Action. Appendix A.4 addresses the principal RFP treatment facilities and the categories of waste treated.

Radioactive Waste Streams and Management. Approximately 15 million gallons per year (MGY) of liquid LLW and 14,300 ft^3/yr of solid LLW were generated in 1991 from activities at RFP. Liquid LLW streams generated from laundry wastewater,

TABLE 3.2.4–2.—*Rocky Flats Plant: Waste Management (1991)*

Waste Type	Quantity Generated	Storage Capacity	Treatment Capacity	Disposal Method
Hazardous/Toxic		9,280 ft^3 [b]		
Liquid	280,000 gal[a]	c	None	Offsite
Solid	7,940 ft^3 [a]	c	None	Offsite
Nonhazardous				
Liquid	7,855,100 gal[a]	c	150 MGY	Onsite
Solid	21,770 ft^3 [a]	None	None	Onsite
LLW				
Liquid	15,000,000 gal	27,674 gal[c]	18.4 MGY	None
Solid	14,300 ft^3	160,272 ft^3 [c]	None	Offsite-DOE
Mixed				
Liquid	9,480,000 gal	None	13.7 MGY[d]	None
Solid	23,300 ft^3	710,548 ft^3 [c]	None	None

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[a] Some fraction of the recycled wastes would be added to these quantities, but how much is unknown.
[b] Includes both liquid and solid.
[c] Additional storage capacity requirements depend upon the existing storage requirements, existing storage capacity, and existing permit conditions.
[d] Treatment of process waste water is based on the operating capability of the evaporator which is 2,100 gallons per hour.

Source: RF EG&G, 1992b, e.

plant waste, pond water, and effluent from precipitation processes are treated by the evaporation process located in Building 374. The sewage sludge solid by-product of the sanitary wastewater treatment process is currently identified and managed as LLW. The sludge produced is dried, packaged and currently stored onsite pending approval for offsite disposal at NTS. NTS has approved the shipment of LLW from Building 559. Shipment of LLW from other buildings could follow after inspection by NTS personnel to ensure that the LLW meets the NTS waste acceptance criteria.

In 1993, approximately 83,686 ft^3 of waste are planned to be shipped offsite. All waste forms must be certified before they may be shipped.

Mixed Waste. RFP's RCRA permits specify storage locations and volume limits for low-level mixed waste stored onsite. Presently, RFP permitted storage capacity for low-level mixed waste is 710,548 ft^3 including interim status units currently storing pondcrete and saltcrete. Pondcrete is a solidified mixture of (waste) sludge from solar ponds and Portland Cement. Saltcrete is the low-level mixed waste form originating from the low-level wastewater evaporation system. The brine resulting from concentration of wastewater by the evaporator is dried to low-level mixed salt and then remixed with brine and Portland Cement. The result is a solid waste form called saltcrete, which is packaged for shipment and disposal in plywood boxes (RF DOE, 1991b).

The construction of new waste storage buildings is being considered to consolidate waste storage and improve efficiency. A new 25,000 ft^2 centralized waste storage facility, which would consolidate low-level, low-level mixed, and hazardous wastes, is scheduled to be completed in June 1993. An additional 19,440 ft^3 of low-level mixed waste storage capacity would be available, allowing RFP to extend permitted storage capacity well beyond 1993 (RF DOE, 1991b).

Low-level mixed shipments to NTS were suspended in May 1990 when the RCRA Land Disposal Restriction went into effect. Permits pertaining to shipments of this waste to NTS have been submitted; however, action is still pending with the State of Nevada. RFP is presently developing a compliance agreement with the State of Colorado to stipulate the provisions for the storage of Land Disposal Restriction mixed wastes at RFP pending the development of treatment and disposal facilities for these wastes.

Hazardous/Toxic Waste Streams and Management. During 1991, 280,000 gallons of liquid hazardous/toxic waste and 7,940 ft^3 of solid hazardous/toxic waste were generated. The hazardous waste consisted of spent solvents, solvent-contaminated combustibles, waste oils, and paint products. RFP has a hazardous waste permit storage capacity of 9,280 ft^3. RFP does not dispose of hazardous/toxic wastes on the plant site. All hazardous/toxic wastes are manifested and shipped offsite under contract with licensed and RCRA-permitted transporters to commercial RCRA- and TSCA-permitted disposal facilities. RFP has a program to monitor the offsite management of its hazardous waste by commercial facilities on a regular basis.

Nonhazardous Waste Streams and Management. Nonhazardous wastes are generated routinely and include general plant refuse such as paper, cardboard, glass, wood, plastics, scrap, metal containers, etc. Nonhazardous wastes are segregated and recycled whenever possible. The amount of recycled paper from all of RFP in 1990 was 141 tons, a 23 percent increase from 1989. Scrap metal sales in 1990 included steel, aluminum, copper, and lead.

The onsite sanitary landfill accepts all nonhazardous, nonradioactive solid waste generated at RFP. The present landfill, which began operations in 1968 will discontinue operations when the new landfill is opened. Closure of the current landfill is a requirement of an interagency agreement. A site for the new landfill has been recommended by the

preliminary conceptual design document. Construction of the first cell is scheduled to begin in March 1994, with completion scheduled for February 1995. There will be a total of 4 cells constructed, each with an expected life of 5 years.

Sanitary liquid sewage wastes from plant cafeterias, lavatory sinks, toilets, showers, and other drains located outside of the process areas are treated in the onsite sewage treatment plant using an activated sludge process. The treatment plant discharges onsite to Pond B-3.

3.2.4.4 *Utility and Resource Requirements*

Most plant utility needs are filled by combinations of under- and above-ground utilities, which provide for water, electrical, steam and condensate-return lines and sanitary sewer piping. The majority of the RFP utility systems are 30 years old, and their condition varies. Existing resource requirements are summarized in table 3.2.4-3.

The RFP site is provided with electrical power through four primary 115 kV Public Service of Colorado feeder lines which connect to RFP through a ring bus and a single 7.5 megavoltampere (MVA) substation. The existing RFP substations are designed to support 34.5 MVA. A current project will remove the 7.5 MVA substation and replace two existing 5 MVA substations with a single 21 MVA substation. This project will increase the RFP capacity to 38 MVA continuous with 64.4 MVA peaks. Current peak electrical demand is 26 MVA. No new lines from Public Service Company are currently planned for the RFP electrical distribution system.

The RFP site has limited groundwater sources within the plant complex and obtains all raw water through the Denver Municipal Water District. The district supplies 139 million gallons of raw water annually (318,000 GPD average daily consumption) with unguaranteed supply to 1.5 million gallons per day (MGD). The water treatment facility can process 1 MGD.

Existing chemical storage facilities for solid, liquid and gaseous chemicals are adequate for the current RFP mission.

RFP has an extensive domestic wastewater treatment system consisting of primary, secondary and tertiary treatment using an activated sludge and is separated from the process waste stream to preclude contaminating local water sources. The solids are heat digested. The sanitary sewage system processes an average of 250,000 gallons with a 480,000-gallon treatment capacity. All plant effluents are monitored

TABLE 3.2.4–3.—*Rocky Flats Plant: Existing Resource Requirements*

Utility Resources	Average Daily Consumption	Peak Demand	System Capacity
Electricity	18,700 kWh	22,000 kW	22,000 kW
Natural Gas	1,800 million ft^3	208 million ft^3/hr	600 million ft^3/hr
Water	318,000 gal	500 gpm	700 gpm
Chemical Resources	**Total Annual Consumption**		**Storage Capacity**
Nitrogen	12,230,000 gal		120,000 gal
Argon	17,500,000 ft^3		2,800 ft^3
Helium	1,700,000 ft^3		122,000 ft^3
Hydrogen	0 ft^3		0 ft^3

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Table assumes that RFP operates 365 days per year.

Source: RF DOE, 1992a, c, d, e and f.

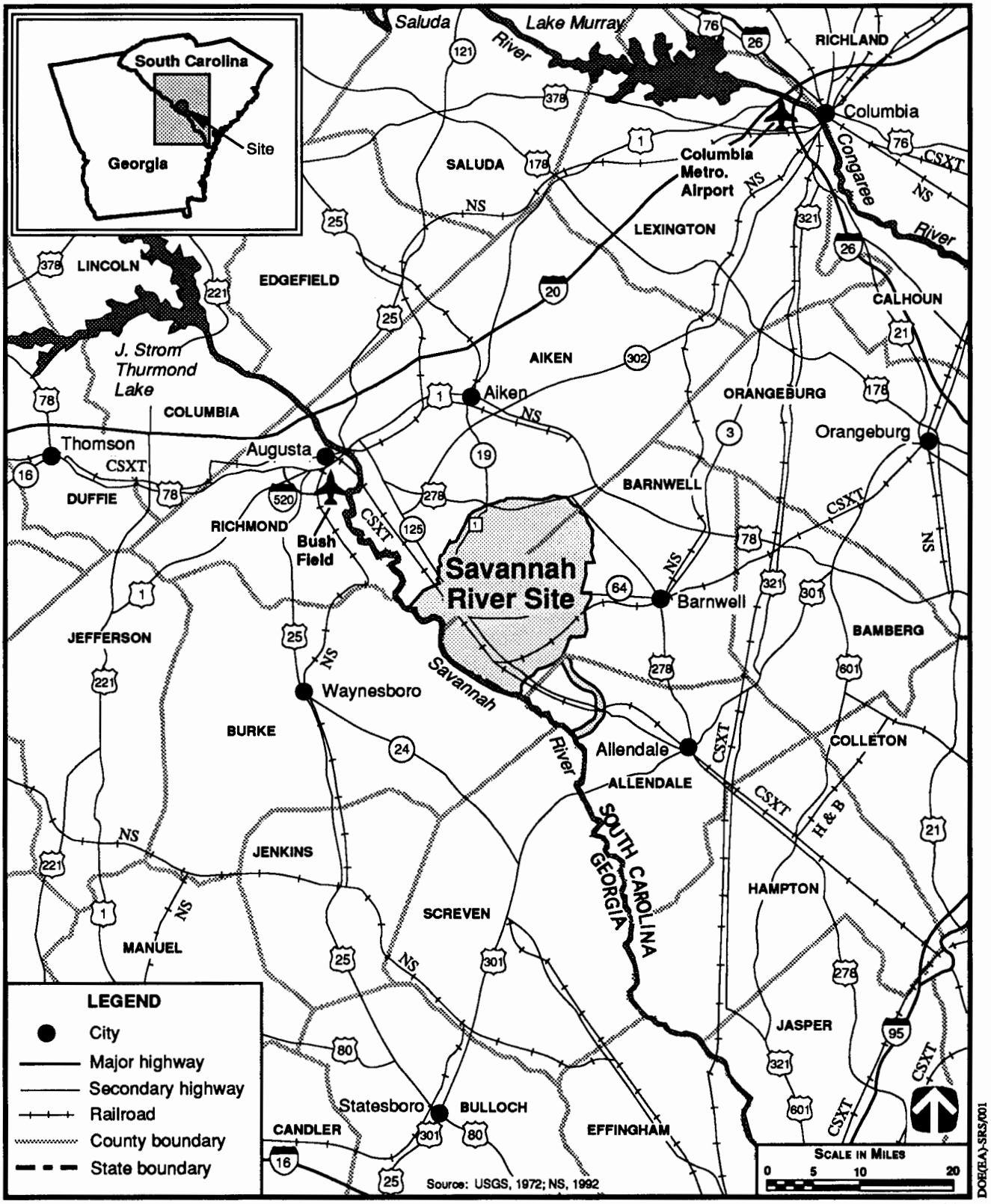

FIGURE 3.2.5-1—*Savannah River Site, South Carolina, and Region.*

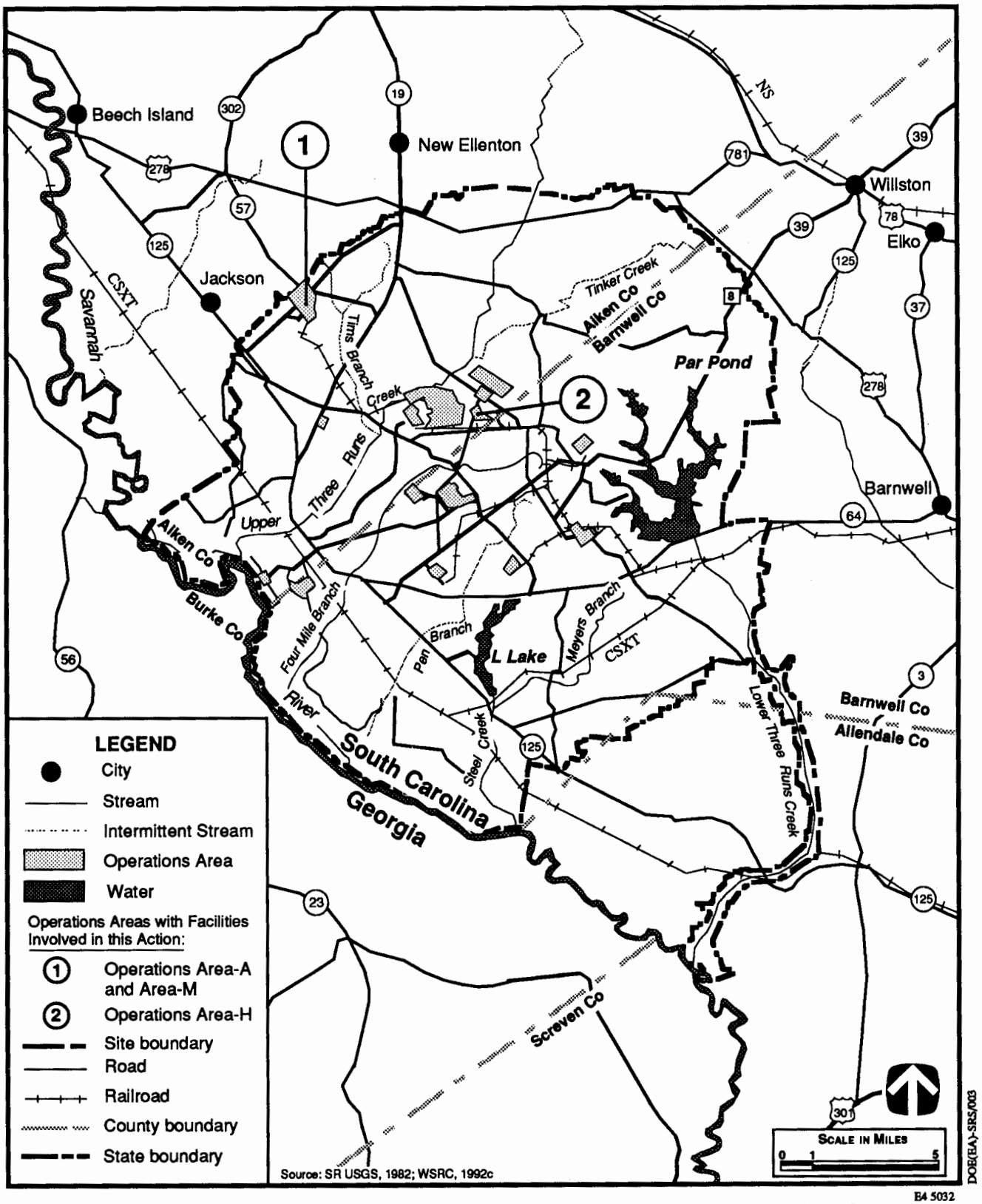

FIGURE 3.2.5-2—*Location of Operations Areas at the Savannah River Site.*

to detect unauthorized releases through the sanitary sewage system, with water diversion, retention and holding facilities to recycle through the liquid waste treatment system if necessary.

The existing Western Natural Gas Pipeline is adequately sized for the future. The current supply is on an interruptible basis which would have to be changed if any new facilities are built with gas heating.

3.2.5 Savannah River Site

Savannah River Site (SRS) occupies a 300-square-mile area 12 miles south of Aiken, SC, and approximately 16 miles southeast of Augusta, GA (figures 3.2.5-1 and 3.2.5.-2). SRS contains 15 major production, service, research and development (R&D) areas capable of supporting nuclear materials production and processing operations.

3.2.5.1 *Savannah River Site Mission*

The primary SRS mission is to produce tritium and SNM for national defense. The site is operated by Westinghouse Savannah River Company (WSRC), Inc. under contract to DOE.

SRS' primary missions are:

- Production of nuclear materials for weapons.
- Production of other isotopes for both weapons and nonweapons applications.
- Supporting the viability of the stockpile through recycle of limited-life components.
- Processing and storage of nuclear materials.
- Pollution prevention.
- Waste management.
- Heavy water recovery and purification.
- Nonweapons work.
- Californium sources.
- Maintaining process capability program.

3.2.5.2 *Facilities/Process Description*

SRS contains over 3,000 facilities, including 740 buildings with 5.5 million ft^2 of floor area. Current operating facilities include the production reactors, a fuel and target fabrication plant, chemical separations plants, and the Savannah River Technology Center (a process development laboratory to support production operations). Operating areas are generally classified as Raw Materials, Heavy Water, Reactor, Waste Management, Defense Waste Processing and, of particular interest for nonnuclear operations, Separations (the 200 Area). The Separations Area, further subdivided into the 200-F and 200-H areas, contains approximately 17 major facilities. The key facilities, from the tritium handling standpoint, are discussed below.

The Extraction and Tritium Purification Facility (Building 232-H) contains the tritium target processing equipment. After irradiation in the reactor, followed by appropriate cooling and disassembly, targets are processed to provide virgin tritium. Building 234-H receives tritium from Building 232-H for reservoir filling, packaging, and shipment to support the weapons stockpile. This facility also empties reservoirs returned from the field to recover and purify tritium for reuse.

Starting in late 1993, the new Replacement Tritium Facility (RTF, Building 233-H) would assume the tritium processing functions of Building 234-H. The RTF incorporates state-of-the-art technology for tritium storage, enrichment, and pumping to enhance

safeguards and security and to prevent significant tritium losses to the environment. All process operations are located within the reinforced concrete, underground, seismic resistant structure. Process equipment and operations are contained within nitrogen blanketed glove boxes for secondary containment. Stripper systems remove tritium from the recirculating nitrogen in the glove boxes if a process leak occurs.

The Materials Test Facility, also located in Building 232-H, conducts life storage of filled reservoirs, metallography, and reservoir failure analysis. The reclamation facility, located in Building 238-H, rebuilds used reservoirs for the stockpile. If the resevoirs were not reclaimed they would be disposed of as radioactive waste.

The workforce at Savannah River in September 1992 was approximately 21,478 employees (DOE, 1992e).

Effluents and Emissions. SRS discharges wastewater into Savannah River via onsite tributaries under a site NPDES permit. These discharges are primarily cooling water effluent from the reactor, but also include pretreated domestic and industrial wastewater some of which contains small amounts of radioactive and nonradioactive contaminants. Water effluents from current operations at SRS are discussed in section 4.1.2.3.

Normal SRS production operations routinely release trace quantities of tritium to the atmosphere. The tritium releases are discussed in section 4.12.2 and the associated health impacts are discussed in section 4.1.2.9. The major sources of criteria air pollutants at SRS are the 13 coal burning boilers for producing steam and electricity; fuel and target fabrication and powering facilities; and continuously operating diesel generators. Other emissions include fugitive particulate emissions from coal piles and coal processing facilities and vehicles. Hazardous/toxic air pollutant sources include the various SRS operations. Hazardous/toxic air pollutant emissions include Freon-113, nitric acid, and 1,1,1-trichloroethane. The concentrations of criteria pollutants and hazardous/toxic air pollutants from current operations at SRS are discussed in section 4.1.2.2. The emissions rates for these pollutants are shown in appendix D.2.1.5.

Safety and Accidents. The review of historical information at SRS indicated that during the period 1986-1990, three accidental chemical/radiological releases occurred and were reported under the requirements of CERCLA and SARA because of the quantities released. These included the release of 2 to 3 gallons of wastewater treatment sludge in 1986 and two incidents in 1989 involving the release of acidic wastewater with trace amounts of radioactivity and high-level waste to the soil. However, these incidents resulted in no significant adverse impacts. Of the numerous releases of radioactive materials, 17 were associated with tritium production and handling activities. However, none of these releases resulted in a significant offsite impact. These incidents resulted in approximately 37,700 Ci of tritium being released to the environment. The largest release was 20,000 Ci and occurred in 1988. These incidents were reported and investigated. Lessons learned were applied, appropriate corrective actions were instituted, and follow-up was performed in accordance with DOE order requirements.

Improvements Required to Continue/Comply with ES&H Requirements. SRS ES&H Projects planned to start prior to the end of 1993 have been identified for the H-Area tritium handling facilities (CAMP, 1992). A brief description of the projects follows:

- SRS plans to provide a permanent Butler Building in the H-Area for 10 to 15 portal monitors to scan personnel for low levels of radioactive contamination. This action will help ensure SRS compliance with DOE Order 5480.11 which requires determinations and documentation of personnel radiation exposure. The building will have

additional space for heath physics support contamination response, a fast scan unit, dosimeter issuance and maintenance needs. This project is planned for completion in 1994.

The remaining projects are planned for completion in 1993.

- Sanitary wastewater treatment capacity will be increased 80,000 GPD in the H-Area by the installation of a new equalization basin and wastewater treatment plant.

- Another H-Area improvement in the processing of sanitary wastewater calls for the installation of a new lift station with a large wet well and four pumps to handle the increased flow.

- A temperature controlled, covered access corridor between buildings 233-H and 234-H to connect the new facility (233-H) to the existing facility.

3.2.5.3 *Waste Management*

Waste management operations at SRS consist of six broad waste types: high-level waste (HLW), TRU, LLW, mixed waste, hazardous/toxic waste, and non-hazardous waste. Because there is no HLW or TRU waste associated with any of the proposed activities that would be consolidated, there is no discussion in this EA of HLW or TRU waste generation and management. Table 3.2.5-1 presents the annual waste generation at SRS.

Radioactive Waste Streams and Management. The following materials are examples of solid LLW that are routinely handled:

- Operating and laboratory waste: small equipment, protective clothing, analytical waste, decontamination residue, plastic sheeting, and gloves.

- Contaminated equipment: obsolete or failed tanks, pipe, and jumpers.

- Reactor-related wastes.

TABLE 3.2.5–1.—*Savannah River Site: Waste Management (1991)*

Waste Type	Quantity Generated	Storage Capacity	Treatment Capacity	Disposal Method
Hazardous/Toxic	3,100 ft^3 [a]		None	Offsite
Liquid		22,382 ft^3		
Solid				
Nonhazardous				
Liquid	185,000,000 gal	None	90,000 GPD	Offsite-NPDES Outfall
Solid	753,000 ft^3 [b]	None	None	Onsite Landfill
LLW				
Liquid	20,092,080 gal	None	14,784,000 GPY	None
Solid	763,732 ft^3	None	3,177,000 ft^3/yr	Onsite Burial
Mixed				
Liquid	47,427gal	None	1,161,600 GPY	None
Solid	1,169 ft^3	157,500 ft^3	1,050,000 ft^3/yr	None

E4 3921

[a] Includes both solid and liquid.
[b] Following compaction; original volume 3,011,000 ft^3.

Source: DOE, 1991c and h; SR DOE, 1992c and g.

Rigid metal containers are now used in most cases with building debris, soil, and other bulky material being still shipped to the burial ground in a noncontainerized form. LLW volumes are being reduced by 8:1 to 10:1 through compaction processes in H-Area and M-Area.

The site known as the Solid Waste Disposal Facility, E-Area, which occupies 195 acres between the F- and H-Separation Areas, is at its capacity. LLW are now buried in a 100-acre site in the north portion of E-Area. It is projected to meet solid LLW storage/ disposal requirements for the next 20 years. The site includes the radioactive waste burial ground, the Mixed Waste Management Facility, and the F- and H-Area seepage basins. This facility is designed to meet the performance objectives of DOE Order 5820.2A, including the EPA effective dose equivalent of 4 mrem per year for groundwater at the facility's perimeter.

Mixed Waste. SRS generates mixed wastes such as lead, oil, spent scintillation fluid, incinerable mixed waste, benzene, contaminated mercury, nonincinerable mixed waste, and PCBs. The SRS facilities designed to store, treat and dispose of mixed wastes includes an interim storage complex called the Mixed Waste Storage Facility, the Waste Solidification and Disposal Facility (planned for 1995), the Consolidated Incineration Facility (planned for 1993), and the new Hazardous Waste/ Mixed Waste Disposal Facility (planned for 1992). Mixed waste is stored in RCRA-approved SRS storage facilities on a interim basis until treatment or disposal facilities are built and permitted. SRS is presently developing a compliance agreement with the State of South Carolina to stipulate the provisions for the storage of Land Disposal Restriction mixed wastes at SRS pending the development of treatment and disposal facilities for these wastes.

Hazardous/Toxic Waste Streams and Management. Typical hazardous wastes are lead, mercury, cadmium, 1,1,1-trichloroethane, leaded oil, Freon, benzene, and paint solvent. All hazardous waste treatment, storage and disposal facilities at the SRS are either fully permitted, have interim status, or are operating pursuant to enforceable agreements with regulations while other waste management facilities are being developed. Waste is stored in DOT-approved containers.

Hazardous wastes are manifested and shipped offsite under contract with licensed RCRA-permitted transporters to RCRA/Toxic Substance Control Act (TSCA)-permitted commercial disposal facilities. Chlorinated hydrocarbons, and lead batteries are sold to commercial recyclers.

Nonhazardous Waste Streams and Management. Garbage, paper, cardboard and scrap metal are recycled where possible. The incinerable portion of the waste stream is sent to an incineration facility, and the ash is then sent to the onsite sanitary landfill. The nonincinerable portion of the waste stream is compacted before disposal at the onsite sanitary landfill. Nonhazardous waste oil is burned for energy recovery at the SRS powerhouse. Asbestos and rubble are sent to the onsite sanitary landfill. Powerhouse ash is sent to the ash basin and to land reclamation, while domestic sewage is sent to the onsite sanitary treatment plant. After treatment of domestic sewage, the sludge is sent to land reclamation, and the treated effluent discharged to an NPDES outfall.

Sanitary solid waste is disposed of onsite in the sanitary landfill. The northern expansion section would be utilized from 1992 until 1997 if current generation rates continue. The northern expansion would cease operation when the new onsite sanitary landfill, with a 20-year capacity, is available in 1996.

3.2.5.4 *Utility and Resource Requirements*

Support facilities within the 200-H Area consist of utility systems for water, steam, electricity, sewage and chemical separations. Existing resource requirements are summarized in table 3.2.5-2. Electricity is supplied from the 115 kV plant system through two 7,500 kilovoltampere (kVA), 115/13.8

TABLE 3.2.5–2.—*Savannah River Site: Existing Resource Requirements*

Utility Resources	Average Daily Consumption	Peak Demand	System Capacity
Electricity	38,000 kWh	2,000 kW	35,000 kW
Natural Gas	N/A	N/A	N/A
Water	576,000 gal	500 gpm	2,000 gpm[a]
Chemical Resources	**Total Annual Consumption**		**Storage Capacity**
Nitrogen	160,000 gal		3,000 gal
Argon	1,300,000 ft^3		60,000 ft^3
Helium	10,000 ft^3		1,800 ft^3
Hydrogen	3,600 ft^3		600 ft^3
Deuterium	2,300 ft^3		400 ft^3

E4 3835

Table assumes SRS operates 365 days per year. Table addresses resource requirements for H-Area Tritium Handling facilities and H Area utilities.

[a] Includes firewater.

Source: SR DOE, 1992c.

kV transformers in Building 251-H. Either transformer is capable of carrying the area electrical load. Emergency power to critical equipment is primarily supplied from diesel generators; however, some equipment is supplied with emergency power from batteries.

The water supply comes from five wells and is combined to create two different systems. One system, consisting of two wells and a separate treatment building, supplies process cooling water to Building 242-H (waste tanks and make-up water for Building 283-H cooling tower). The other system, consisting of three wells and a separate treatment building, supplies water to domestic and service water ground storage tanks. Steam is provided from two sources: 200-F and steam generation within the area. The F-H steam line is a 10-inch line approximately 2.2 miles long with a capacity of 80,000 lb/hr. Within the 200-H Area, there are three stoker-fired boilers with a capacity of 30,000 lb/hr each. Total capacity in the area is almost 150,000 lb/hr.

The sewage treatment plant within the 200-H Area is too small to meet current demand. A new sewage treatment facility is being planned and sewage lines are currently being relined. Process sewers and storm sewers are adequate.

A plant that chemically processes materials which have been reactor-irradiated is located in the 200-H separations area. The 200-H Area plant recovers enriched uranium and other isotopes from irradiated fuel and puts them in a desired form for shipment or storage. The present storage capacity for chemical resources is adequate to support existing missions.

3.2.6 Los Alamos National Laboratory

Los Alamos National Laboratory (LANL) is located in north-central New Mexico adjacent to the Los Alamos townsite. It is about 62 miles northeast of Albuquerque and 25 miles northwest of Santa Fe. The laboratory is situated on approximately 43 square miles located mostly in Los Alamos County but with 5.6 square miles located in Santa Fe County (figure 3.2.6-1).

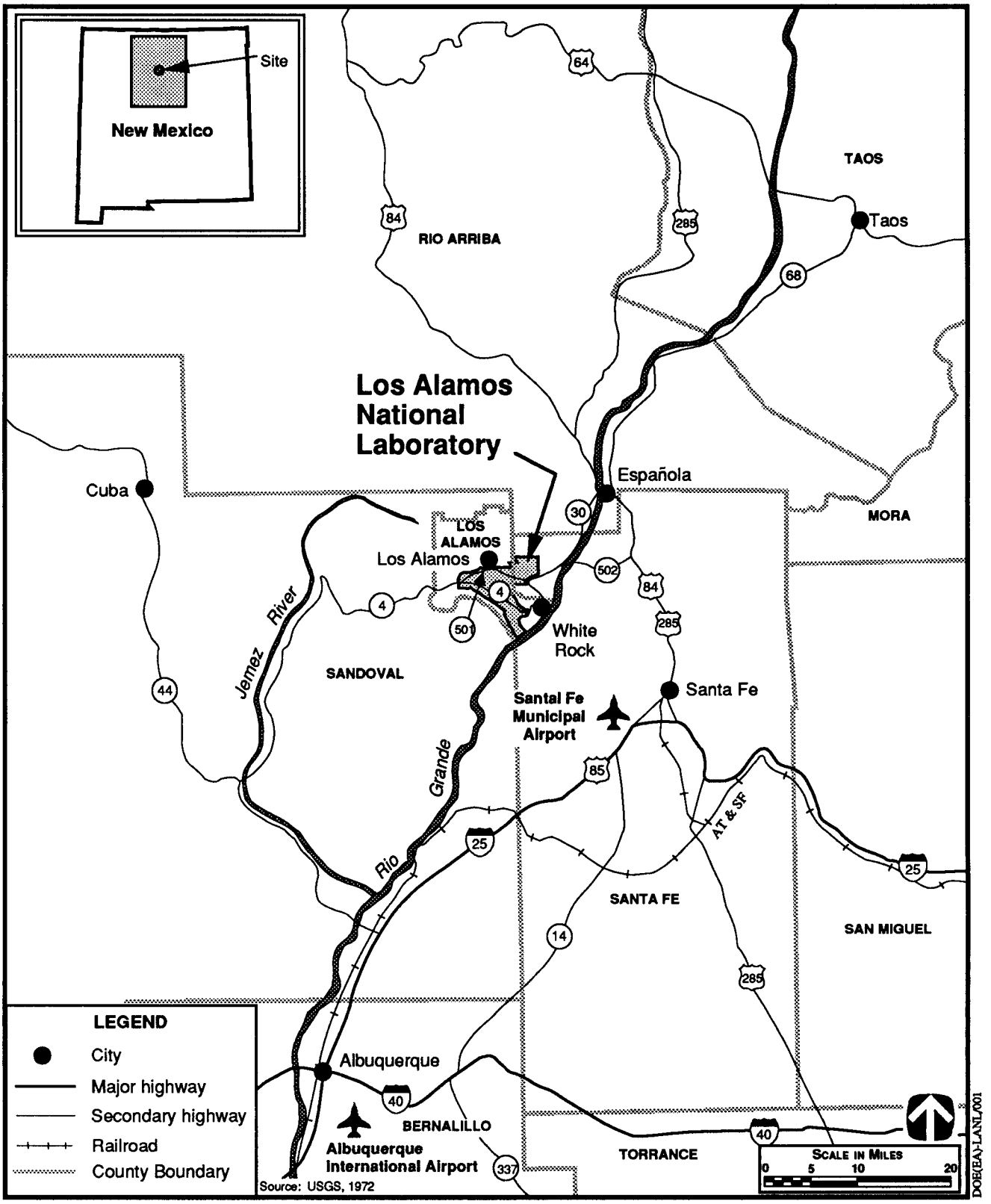

FIGURE 3.2.6-1—*Los Alamos National Laboratory, New Mexico, and Region.*

3.2.6.1 *Los Alamos National Laboratory Missions*

LANL's basic mission as one of the DOE Defense Laboratories is to perform RD&T necessary to maintain and advance the critical technologies and core competencies required to produce nuclear weapons. The laboratory is operated by the University of California under contract to DOE.

LANL's primary missions are:

- Weapons RD&T, including:
  - Advanced weapons concepts, designs, and technologies.
  - Preparation for testing limitations.
  - Technological surprise.
  - Research in support of the stockpile memorandum including dismantlement.
  - Weapons surety.
  - Complex 21 technology development.
- Plutonium R&D.
- Tritium R&D.
- Arms control and treaty verification technology.
- Nonweapons R&D.
- Nuclear Fusion.
- Geothermal Energy.
- Nuclear science.
- Environmental science.
- Energy science.
- Intelligence.
- Laser isotope separation.
- Advanced conventional munitions.
- Environmental R&D including storage and management of radioactive waste.
- Nuclear materials processing R&D and storage.
- Technology commercialization.
- Stockpile surveillance.
- Pollution prevention.
- Waste management.
- Strategic Defense Initiative.
- Threat assessment.
- Advanced concepts research.
- Space technology.
- Nonproliferation.
- Emergency response.
- Underground nuclear testing.
- War Reserve surveillance of selected compounds.

LANL's shared missions are:

- R&D to support development and production engineering.
- Nuclear effects, vulnerability, and lethality assessment.

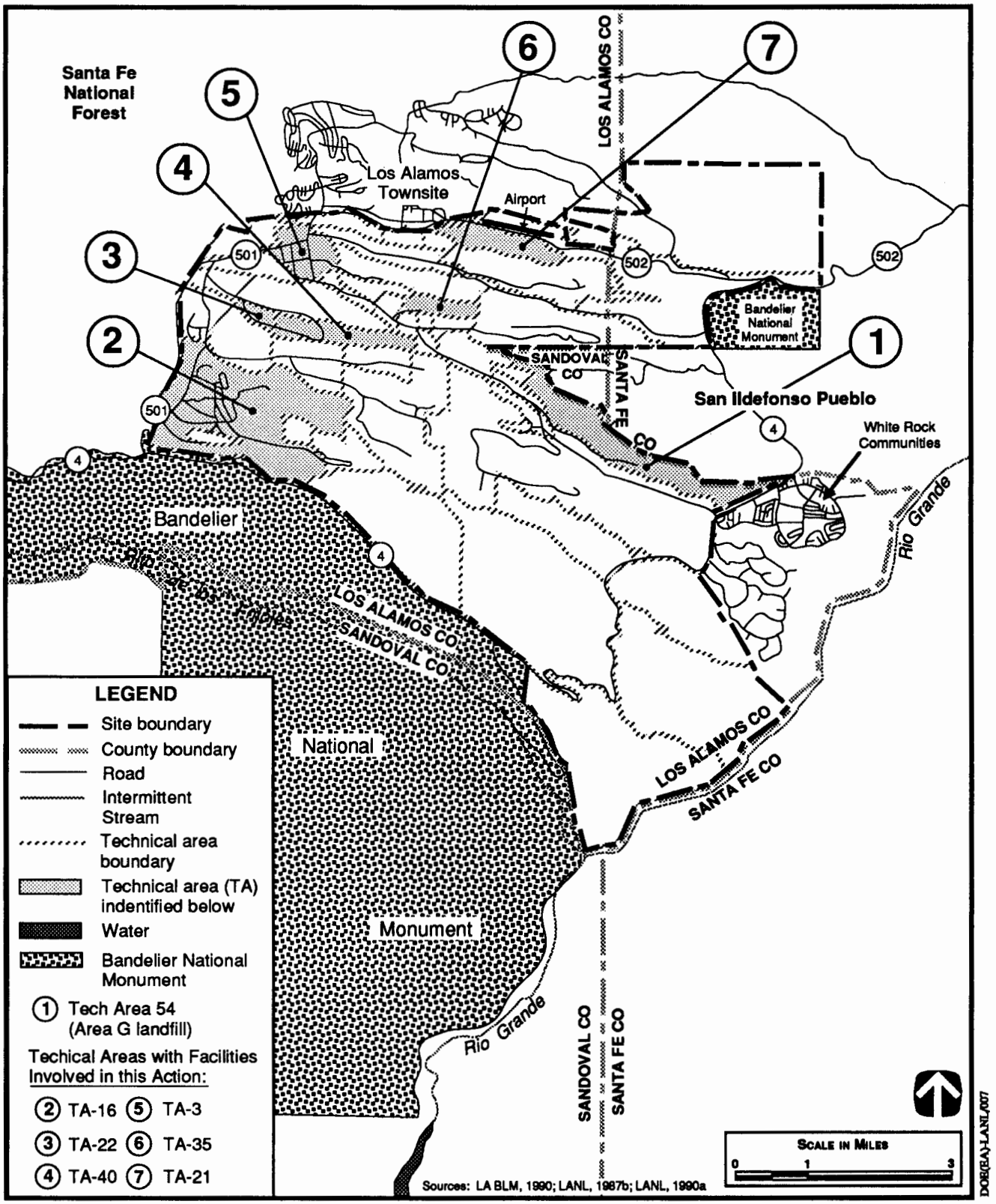

FIGURE 3.2.6-2—*Location of Facilities at Los Alamos National Laboratory.*

3.2.6.2 *Facility/Process Description*

LANL has developed facilities at many separate technical areas (TA) throughout the site. Currently, 38 of these TAs are active and figure 3.2.6-2 depicts the specific areas that would be affected by this action.

LANL consists of 1,835 buildings totaling about 7.3 million ft^2. As of September 1992, LANL had approximately 7,450 full-time employees. In addition, there are over 2,400 part-time, casual or affiliate-status employees, and 3,100 DOE, contract, or program-related personnel. (The major sub-contractors for LANL are Johnson Controls, Inc. with about 1,500 personnel, and Protection Technology, with about 150 personnel.) This has a large economic impact on the surrounding counties since 35 percent of these workers live outside Los Alamos County.

The following discussion provides additional information on the technical areas (TA-3, -16, -21, -22, -35 and -40) that are under consideration to receive additional nonnuclear functions.

- TA-3 (South Mesa Site) is the main technical area of the laboratory. It has three million gross ft^2 of building floor space (about half of the laboratory total) and occupies 359 acres of land. The main functions that occur in this area are administrative and technical support, theoretical and computational science, materials science, earth science, space science, and applied physics. Significant facilities include the Administration Building; the Otowi Building (largely for administrative support); the Technical Shops Building; the Chemistry and Metallurgy Research Building (which contains SNM), and the Sigma Building. The latter two include materials science and nuclear materials chemistry. Approximately 70 percent of all building space in TA-3 is greater than 30 years old, but the age and condition of specific facilities vary considerably.

- TA-16 (S Site) is the weapons engineering area. It occupies 2,006 acres and has 575,000 gross ft^2 of building space. Activities include research, design development, prototype manufacturing, and environmental testing. Approximately 87 percent of the building space exceeds 30 years of age; many of the oldest structures are planned for decontamination, decommissioning or disposal.

- TA-21 (DP Site) is a former radioactive materials processing facility. It has 311 acres and 274,000 gross ft^2 of space. Remaining functions include nuclear chemistry RD&T, the Tritium Systems Test Assembly Building, and the Salt Facility. Most of the western portion of TA-21 is undergoing decontamination, decommissioning, or disposal.

- TA-22 (TD Site) develops detonators for nuclear weapons. It occupies 86 acres and has 73,000 gross ft^2 of building space.

- TA-35 (Ten Site) has a mixture of experimental science activities. It occupies 149 acres and has 551,000 gross ft^2 of building space. Significant facilities include the Target Fabrication Building (for laser fusion), the former Antares Laser Complex, and the Nuclear Safeguards Laboratory.

- TA-40 abuts the east side of TA-22 and is also in the High Explosives Research and Development and Testing area. The mission of TA-40 is explosives testing and characterization. The site is remote and surrounded by undeveloped open space with blast buffer zones contained

within LANL boundaries (LANL, 1990a).

Effluents and Emissions. Normal operations at LANL result in releases of small quantities of tritium to surface water. These releases are discussed in section 4.1.3.3. Pretreated industrial wastewater and sanitary wastewater are discharged to various canyons at the site. Wastewater effluents from current operations at LANL are discussed in section 4.1.3.3.

Normal LANL operations release tritium to the atmosphere. The tritium releases are discussed in section 4.13.2 and the associated health impacts are discussed in section 4.1.3.9. The major sources of criteria air pollutants at LANL are the steam plant and power plant, beryllium operations, the asphalt plant, the burning of high explosive (HE) waste, and the lead pouring facility. Other emissions include fugitive particulate emissions from waste-burial activities and coal piles, and other process emissions. Hazardous/toxic air pollutant sources at LANL include various laboratories and process operations. Hazardous/toxic air pollutants include, but are not limited to, acetone, ammonia, methyl alcohol, methyl ethyl acetone, and hydrogen chloride. The concentrations of criteria pollutants and hazardous/toxic air pollutants from current operations at LANL are discussed in section 4.1.3.2. The emissions rates for these pollutants are shown in appendix D.2.1.6.

Safety and Accidents. The review of historical information at LANL indicated that during the period 1986-1990, twelve known incidents of offsite contamination occurred as a result of accidental releases. However, these incidents resulted in no significant adverse environmental or health impacts. All but one incident involved the release of radiological materials. One involved the release of 0.4 Ci of mixed fission products to the atmosphere in 1989. Ten incidents involved the release of tritium. A total of 11,485 Ci of tritium were released to the atmosphere as a result of these incidents. The largest release involved 5,800 Ci of tritium and occurred in 1988. These incidents were reported and investigated. Lessons learned were applied, appropriate corrective actions were instituted, and follow-up was performed in accordance with DOE order requirements.

Improvements Required to Continue/Comply with ES&H Requirements. ES&H Projects affecting the technical areas in question, which are planned to start prior to the end of 1993 have been identified (CAMP, 1992). They are:

- A project consisting of interim upgrades to the Chemical and Metallurgy Building is planned for completion in 1998. Upgrades include compliance studies, continuous air monitoring, and instrumentation upgrades, High Efficiency Particulate Air (HEPA) filter motor upgrades, HEPA filter additions, electrical system modifications and upgrades, eyewash system additions, stack monitor system additions, duct modifications and upgrades, sanitary sewer modifications, perimeter safeguard additions, acid drain modifications, wing 1 HVAC upgrades, and as-built drawings.

- LANL plans to replace portions of the Infrastructure Support Facility Gas Line. The project is expected to be completed in 1993. The project would replace portions of the 130 miles of underground natural gas transmission pipeline that serves Los Alamos from Bloomfield, NM. The work would also include replacement of valve stations along portions of the line.

- Construction of a new contaminated clothing laundry facility is planned for 1993. The facility will consist of a 3,000 ft^2 building to launder laboratory anti-contamination protective clothing.

TABLE 3.2.6-1.—*Los Alamos National Laboratory: Waste Management (1991)*

Waste Type	Quantity Generated	Storage Capacity	Treatment Capacity	Disposal Method
Hazardous/Toxic	20,480 ft^3 [a]	17,710 ft^3 [a]		
Liquid			None	Offsite/Onsite Incinerator
Solid			None	Offsite/Onsite Landfill
Nonhazardous				
Liquid	183,000,000 gal	None	280 MGY	Offsite-NPDES Outfall
Solid	302,200 ft^3	None	None	Onsite Burial
LLW				
Liquid	5,787,430 gal	175,000 gal	200 GPM	None
Solid	203,600 ft^3	None	None	Onsite Burial & Offsite Landfill
Mixed	5,200 ft^3 [a]	86,426 ft^3 [a]	None	None

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[a] Includes both liquids and solids.

Source: LANL, 1992a, b, c, and d.

3.2.6.3 *Waste Management*

Waste management operations at LANL consist of five broad waste types: TRU, LLW, mixed waste, hazardous/toxic waste, and nonhazardous waste. Because there are no TRU wastes associated with any of the proposed activities that would be consolidated, there is no discussion in this EA of TRU waste generation and management. Table 3.2.6-1 presents the annual waste generation at LANL under No Action.

Radioactive Waste Streams and Management. Liquid LLW is generated from many areas throughout Los Alamos. Los Alamos has two onsite liquid LLW treatment facilities. Liquid LLW treatment facilities at Los Alamos include a 250-gallons-per-minute chemical treatment and ion-exchange plant and a 125-gallons-per-minute chemical treatment plant. A project providing for the construction of a facility for the solidification and subsequent volume reduction of radioactive liquid waste treatment plant sludge containing plutonium, americium, and other radionuclides is planned at Los Alamos. Construction completion is anticipated by March 1997. The existing radioactive liquid waste treatment plant generates LLW sludge that is high in water content. This facility would allow for an approximately 80 percent reduction in sludge volume and result in a more stable form for burial or shipment offsite. Construction completion is anticipated in March 1997.

Solid LLW such as paper, plastic, glassware, rags, etc., are separated into compactible and noncompactible materials. They are then packaged and transported to an onsite location for compaction/burial. The Area-G landfill, located at TA-54, is Los Alamos' LLW burial area. LLW items such as large equipment and much of the D&D wastes generally are not packaged but delivered to the burial site in covered or enclosed vehicles.

Mixed Waste. Mixed LLW includes solvents, pyrophoric substances, spray cans, scintillation vials, miscellaneous reagent chemicals, uranium chips and turnings, vacuum pump oil contaminated with

mercury, LLW sludge from one of the liquid LLW treatment plants, and other contaminated material. The State of New Mexico identified sludge from the industrial waste treatment plant at TA-50-1 as a waste stream that should be regulated as mixed LLW because of the presence of trace (parts per billion (ppb) to parts per million (ppm)) levels of listed organic solvents. Approximately 400 to 500 55-gallon drums of this waste are generated annually. Currently, Los Alamos does not dispose of mixed LLW. The waste is stored at TA-54 and Areas -L and -G. All LLW mixed packages are planned to be transported by commercial carriers in closed vans to the NTS for burial after NTS is permitted.

A project providing for the construction of a 4,300 ft^2 facility for accumulating, inspecting, and maintaining mixed LLW until adequate treatment and/or disposal methods have been developed and constructed is planned with completion anticipated in December 1993.

Construction of a hazardous waste treatment facility to consolidate all existing onsite hazardous waste treatment processes is planned to be completed by spring of 1994. This facility also will accommodate new treatment processes for hazardous and mixed wastes currently being accumulated and stored. Provisions for the storage of this waste until suitable treatment and disposal facilities are available will be developed in a compliance agreement with the State of New Mexico.

A project providing for the construction of a LLW/ mixed waste incinerator for the thermal destruction of combustible wastes is also planned at Los Alamos. The incinerator would reduce significantly the volume of LLW committed to land burial and would provide thermal destruction of chemical constituents in mixed waste. The incinerator would treat volatile ignitable mixed wastes that are currently being stored onsite. Construction completion is anticipated in June 1997.

Hazardous/Toxic Waste Streams and Management. Los Alamos produces a wide variety of hazardous/toxic wastes. Small volumes of RCRA-characteristic and RCRA-listed wastes occur as a result of ongoing research. Primary laboratory sites for basic and applied chemistry RD&T generate typical chemical wastes consisting primarily of laboratory reagent chemicals, pump oil, solvents, test samples, and miscellaneous laboratory wastes. Significant volumes of beryllium, lithium hydride, and magnesium turnings are generated from the main shops department. Plating solutions containing chromates and cyanides, acid or base wastes heavily contaminated with copper, and nitric and sulfuric acid wastes are also generated.

HE waste is generated during processing and testing of various materials. Processing includes pressing, machining, and casting HE. Waste is produced as discrete pieces of HE, chips, machine cuttings, and powder. The chips, cuttings, and powder usually are in the form of waterborne suspensions, collected in specially designed accumulating and settling sump tanks. Wastes also consist of materials contaminated with HE: paper, oils, solvents, wood, machine tools, fixtures, etc. Chemically, the wastes consist of cyclotetramethylenetetranitramine (HMX), cyclotrimethylenetrinitramine (RDX), trinitrotoluene (TNT), pentaerythritol tetranitrate (PETN), ammonium nitrate, barium nitrate, boric acid, triaminotrinitrobenzene (TATB), nitrocellulose, tetryl, nitroguanidine, and various plastic binders. All HE hazardous waste and potentially contaminated HE waste is picked up and delivered to the TA-16 (5-site) incinerator flashpad where it is burned. Ash residue is drummed and buried at the TA-54 burial ground in compliance with RCRA. All developer and fix photo waste are sent out of state for incineration. LANL is negotiating to establish a recycling program with a commercial vendor.

All hazardous waste treatment, storage, and disposal facilities at Los Alamos are either fully permitted, have interim status, or are operating pursuant to enforceable agreements with the regulators while other waste management facilities are being developed. Many hazardous wastes are sent off-

site for disposal. Los Alamos has an EPA Letter of Authorization allowing disposal of PCB-contaminated articles at the TA-54 Area -G landfill. Most of the hazardous waste is incinerated and only the residual ash is landfilled. Los Alamos does not landfill RCRA-hazardous waste onsite, but contracts with certified transporters to deliver hazardous waste to commercial RCRA-permitted disposal facilities. Before waste is sent offsite, the potential disposal facility is inspected by Los Alamos personnel. Operating records and permits are also reviewed.

Nonhazardous Waste Streams and Management. Nonhazardous wastes are generated routinely and include general facility refuse such as paper, cardboard, glass, wood, plastics, scrap, metal containers, etc. Nonhazardous wastes are segregated and recycled whenever possible. Trash is accumulated onsite and taken to the county sanitary landfill on a regular basis.

The Los Alamos County sanitary landfill is located on property owned by DOE and is operated under a special use permit. Approximately one-third of the domestic solid waste disposed of at the county landfill originates from LANL. The Area -J landfill, operated and under the administrative control of LANL, receives nonhazardous, nonradioactive solid waste.

A new sanitary wastewater treatment plant and collection system to replace 8 existing treatment facilities and 30 existing septic tanks is nearing completion. The new treatment plant would enable reuse of the treated wastewater for cooling water and irrigation. The plant and collection system is designed to meet the requirements of LANL's Federal Facilities Compliance Agreement which is currently being negotiated.

3.2.6.4 *Utility and Resource Requirements*

The LANL utility system has 400 miles of lines providing electricity, telecommunications, water, sanitary sewer, radioactive liquid waste, and natural gas distribution within the laboratory. Existing resource requirements are summarized in table 3.2.6-2.

Electricity to Los Alamos is supplied by a Los Alamos County/DOE power pool over two 115 kV lines (one from Santa Fe and one from Albuquerque). Substations in TA-3, -5, and -53

TABLE 3.2.6–2.—*Los Alamos National Laboratory: Existing Resource Requirements*

Utility Resources	Average Daily Consumption	Peak Demand	System Capacity
Electricity	1,045,000 kWh	87,000 kW	120,000 kW[a]
Natural Gas	4,200,000 ft^3	417,000 ft^3/hr	500,000 ft^3/hr
Water	4,100,000 gal	6,600 gpm	6,900 gpm

Chemical Resources	Total Annual Consumption	Storage Capacity
Liquid Nitrogen	1,189,00 gal	5,500 gal
Argon	11,486,000 ft^3	1,125,000 ft^3
Helium	1,066,000 ft^3	67,000 ft^3
Hydrogen	35,000 ft^3	1,100 ft^3
Oxygen	5,057,000 gal	135,000 gal
Carbon Dioxide	686,000 ft^3	96,200 ft^3

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Table assumes LANL operates 365 days per year.

[a] Electrical system capacity in 1992 was 90,000 kW. By the end of 1995, the capacity will be increased by 30,000 kW.

Source: LANL, 1992e.

provide 13.2 kV service throughout the laboratory. There is also a 20 megawatt (MW) gas-fired generating plant in TA-3. LANL's total annual consumption of power is considerably below the transmission capacity of the system.

Natural gas used by the laboratory comes from the San Juan Basin in northwest NM. The lines are owned by DOE but operated and maintained by the Gas Company of New Mexico under contract to DOE. Natural gas is distributed to buildings directly, or to three central steam plants (TA-3, 16, and 21), and a standby plant for fueling the heating system. All plants also maintain reserves of fuel oil.

Water for the laboratory and adjacent areas (including Los Alamos townsite, White Rock and Bandelier National Monument) primarily comes from three DOE-owned well fields and surface water from the Jemez Mountains. The system depends on gravity flow for distribution from high elevation terminal storage facilities. Between 1972 and 1981, the average annual production for the entire system was approximately one billion gallons of water, with a peak of 1.7 billion gallons in 1976 for the laboratory and county.

The existing sanitary sewer system includes nine treatment facilities. Consolidation of the LANL sanitary wastewater treatment system is underway and would eliminate eight of the existing treatment facilities. In addition, approximately 70 septic tanks are dispersed throughout laboratory areas not served by the existing sanitary sewer system.

The present chemical storage capacity is adequate for the laboratory's existing mission.

3.2.7 Y-12 Plant

The Oak Ridge Reservation (ORR), within which Y-12 is located, lies southwest of the city of Oak Ridge, TN, but within the incorporated city limits (figure 3.2.7-1). The largest city in the area is Knoxville, located approximately 30 miles to the southeast.

Within the 35,252 acre ORR, the DOE has three primary complexes (figure 3.2.7-2). These are the Oak Ridge Y-12 Plant, Oak Ridge National Laboratory (ORNL), and the K-25 Site (formerly the Oak Ridge Gaseous Diffusion Plant). The primary facilities at Y-12 are shown in figure 3.2.7-3. Y-12 is operated for DOE by Martin Marietta Energy Systems, Inc.

3.2.7.1 *Y-12 Plant Missions*

Y-12's primary mission is the production of nuclear weapons components involving the fabrication of various forms of materials into components, certification of the fabricated components, and the production of subassemblies from some components.

Y-12 primary missions are:

- Fabrication and assembly of uranium parts and lithium parts.
- Precision machining.
- Specialty subassembly processing.
- Inspection of precisional components.
- SST vehicle maintenance.
- Pollution prevention.
- Waste management.
- Processing and storage of highly enriched uranium materials.
- Performance of stockpile surveillance activities to ensure reliability of nuclear stockpile.

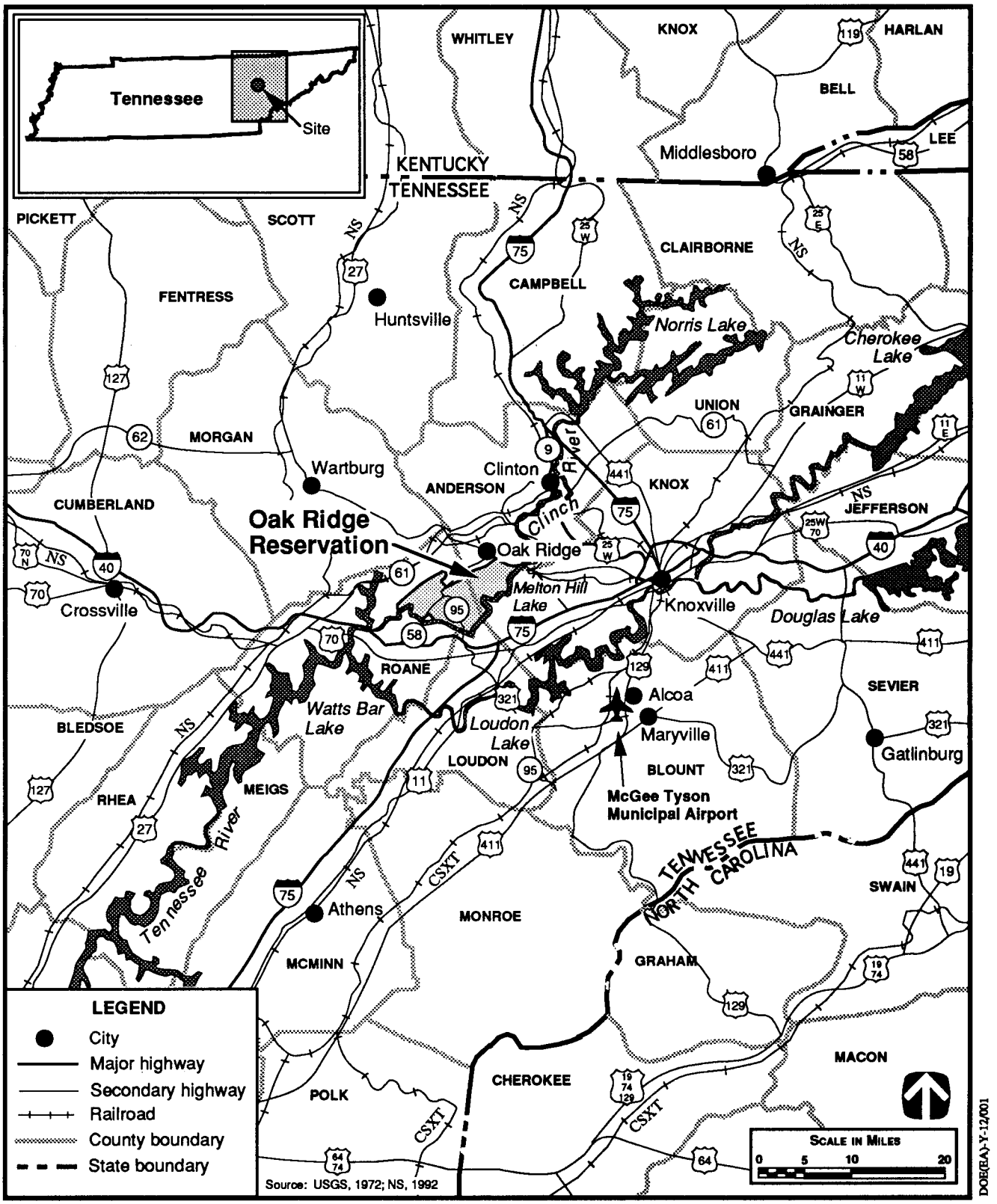

FIGURE 3.2.7-1—***Oak Ridge Reservation, Tennessee, and Region.***

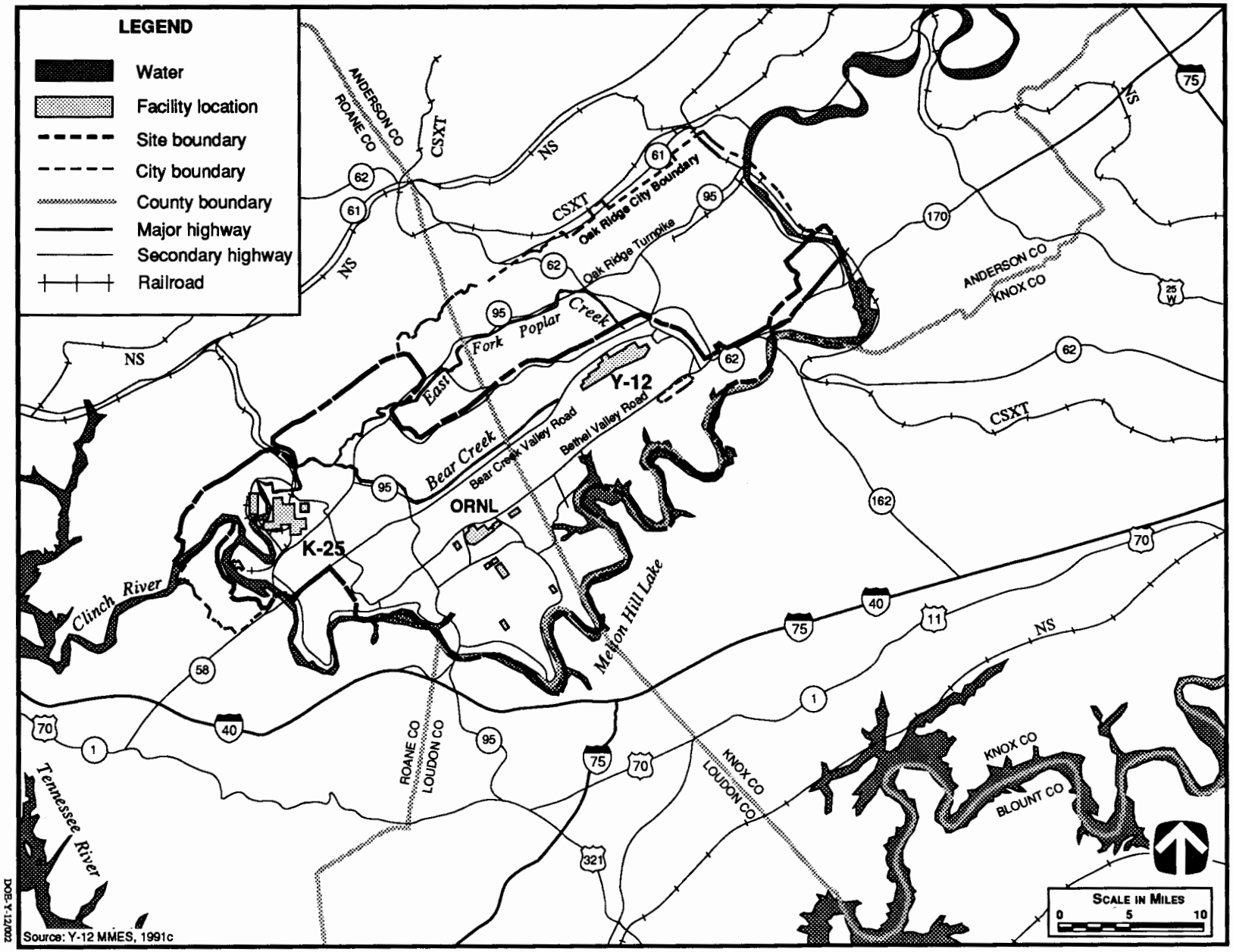

FIGURE 3.2.7-2—*Location of Facilities at the Oak Ridge Reservation.*

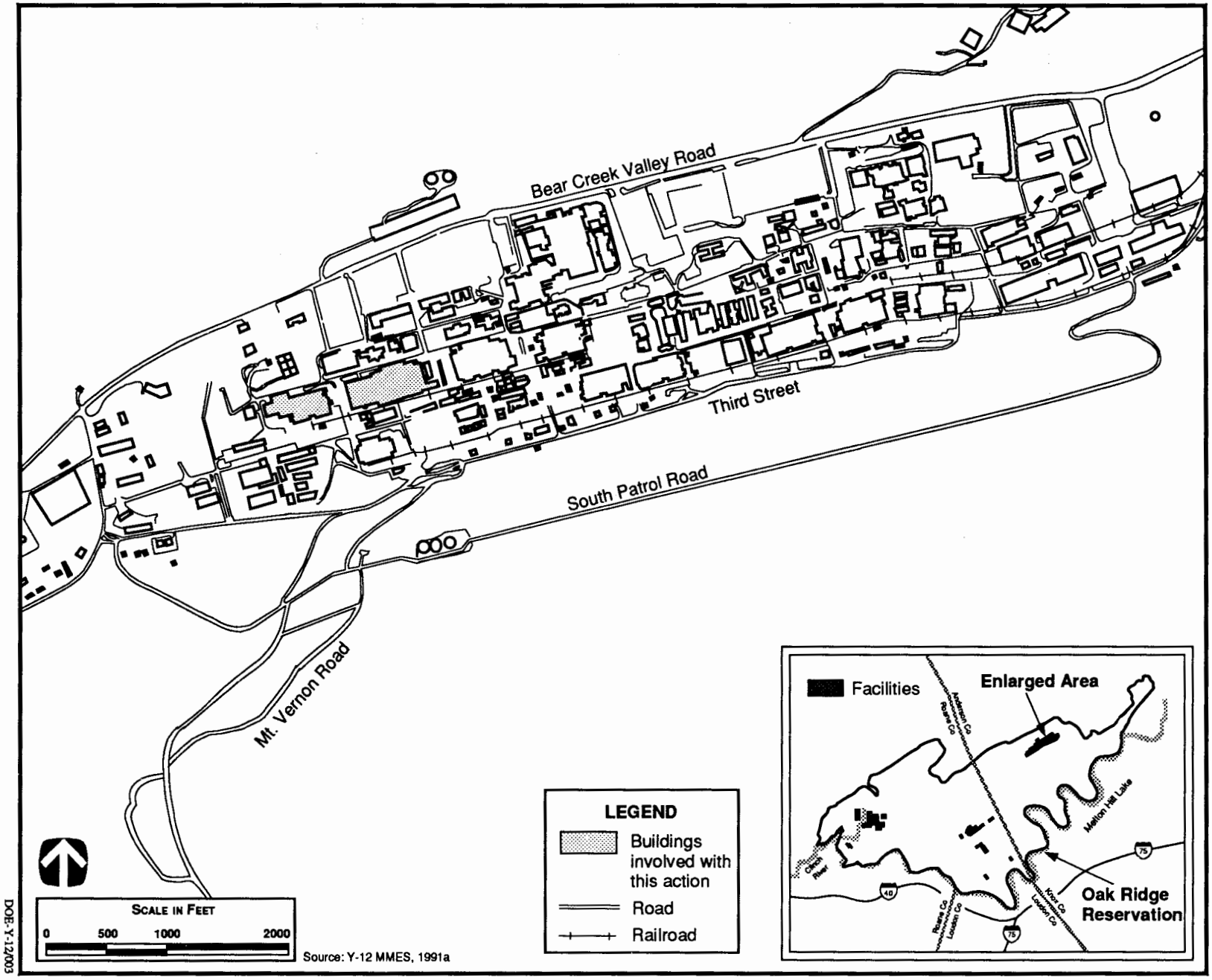

FIGURE 3.2.7-3—*Location of Facilities at the Oak Ridge Reservation Y-12 Plant.*

- Maintain process capability program.
- Special production for design laboratories.
- Storage of strategic quantities of lithium compounds.

Y-12's shared mission with the National Laboratories is development and production engineering support.

3.2.7.2 *Facility/Process Description*

Y-12 is located in Oak Ridge, TN, on the 35,252 acre DOE ORR. The plant site consists of approximately 811 acres, 630 of which are enclosed by security fencing. The site contains 492 buildings or other structures totaling 7.2 million ft^2. The site is utilized by DP in support of Nuclear Weapons Production and Surveillance, and Nuclear Materials Production mission assignments. These activities are housed in approximately 425 of the 492 buildings containing 5.4 million ft^2. The Oak Ridge National Laboratory (ORNL), whose primary facilities are located elsewhere on the ORR, utilizes approximately 47 buildings containing 1.5 million ft^2. These facilities are not related to the Y-12 DP mission. Also located on the Y-12 site are approximately 20 buildings containing 300,000 ft^2 which house support activities and several organizations of the DOE Oak Ridge Field Office.

As of September 1992, Y-12 had approximately 5,384 employees (DOE, 1992e).

Effluents and Emissions. Normal operations at Y-12 do not discharge radioactive water pollutants as a result of activities which are the subject of this EA. Pretreated industrial wastewater and sanitary wastewater are discharged to Bear Creek, East Fork Poplar Creek, McCoy Branch and Ken Hollow quarry. Wastewater effluent from current operations at Y-12 are discussed in section 4.1.4.3.

Normal Y-12 operations do not release radioactive air pollutants to the environment as a result of activities which are the subject of this EA. The major sources of criteria air pollutants at Y-12 are the steam plant and two commercial oil-fired boilers in Building 7602 and 7608. Other sources include fugitive particulate emissions from coal piles, other process emissions, and vehicles. Hazardous/toxic air pollutant sources at Y-12 include various laboratories and process operations. Hazardous/toxic air pollutants include, but are not limited to, methanol, nitric acid, Freon-113, hydrochloric acid, and TCA. The concentrations of criteria pollutants and hazardous/toxic air pollutants from current operations at Y-12 are discussed in section 4.1.4.2. The emissions rates for these pollutants are shown in appendix D.2.1.7.

Safety and Accidents. The review of historical information at Y-12 indicated that during the period 1986-1990, 95 accidental releases were reportable under the requirements of CERCLA and SARA or the Clean Water Act (CWA). These mostly involved the release of petroleum products, mercury, asbestos, and sewage. However, none of these releases resulted in a significant adverse impact offsite. These incidents were reported and investigated. Lessons learned were applied, appropriate corrective actions were instituted, and follow-up was performed in accordance with DOE order requirements.

Improvements Required to Continue/Comply with ES&H Requirements. ES&H Projects planned for start prior to the end of 1993 which affect Y-12 include:

- ORR plans to provide upgrades in several life safety areas. This includes egress systems, fire protection systems, electrical equipment, and emergency power equipment required to meet the OSHA, the National Fire Protection Association Codes, and DOE Orders and policies. This project is scheduled for completion in 1997.

- The Emergency Notification System would be replaced for portions of the protected, limited, and eastern areas of Y-12. The proposed Emergency Notification System is intended to ensure a reliable, available emergency warning system as well as comprehensive monitoring and testing capabilities from the plant shift superintendent's office. Emergency Notification System replacement will be complete in 1995.

- A new hazardous materials handling vehicle would be procured and equipped to meet response requirements. Procurement is expected to be in 1993.

- Powered platforms to be used by maintenance personnel throughout the plant would be procured beginning in 1993 and would be complete by 1995. This project would replace existing platforms designated as potential safety hazards.

- All Y-12 nonhazardous laboratory drains, except roof drains, would be rerouted to discharge to the sanitary sewer line. Internal piping alterations and lines would be provided to existing manholes modified to accept the new drain lines. This action is to comply with pending NPDES regulations.

- The cooling tower water chemical treatment program would be replaced with an ozonation system to be installed at two cooling towers. Ozonation would reduce the amount of wastewater discharged from cooling towers. Project completion is scheduled for 1995.

- A 10,000-gallon storage tank would be installed in the west tank farm. Piping, pumps, level indicators and controls, and alarms are included as part of the project. The tank would replace the current practice of pumping directly into a diked tanker trailer and reduce the potential for accidental spills. Installation is expected to be complete in 1995.

- Building 9206 would be improved to meet seismic standards. This would include changes to building structure, appurtenances, attachments, and selected utilities and process systems within the building. These upgrades and improvements would bring the building toward compliance with seismic criteria now in place. Completion is expected in 1996.

3.2.7.3 *Waste Management*

Waste management operations at Y-12 consist of four broad waste types: LLW, mixed waste, hazardous/toxic waste, and nonhazardous waste. Table 3.2.7-1 presents the annual waste generation at Y-12 under No Action.

Radioactive Waste Streams and Management. Machining operations use stock materials, including steel, stainless steel, aluminum, depleted uranium, and other metals which result in significant quantities of machine turnings and fines as a waste product. Uranium contaminated industrial trash is generated by daily operations throughout the plant. These operations include janitorial services, floor sweepings in production areas, and production activities.

Long-term Y-12 storage options include storage in warehouses, tanks, and vaults at Y-12, as well as storage of Y-12 mixed or hazardous wastes in buildings at the K-25 Site.

The Y-12 Central Pollution Control Facility generates a low-level uranium-contaminated RCRA

TABLE 3.2.7-1.—*Oak Ridge Reservation Y–12 Plant: Waste Management (1991)*

Waste Type	Quantity Generated	Storage Capacity	Treatment Capacity	Disposal Method
Hazardous/Toxic	48,963 ft^3 [a]			[b]
Liquid (organic)		None	3M lb/yr[b]	None
Liquid (aqueous)		None	5.4M gal/yr[c]	None
Solid (sludges)		1.25M gal[e]	None	None
Solid (other)		None	None	Onsite Burial[f]
Nonhazardous				
Liquid	2.07M gal	None	6 MGY	Offsite-NPDES Outfall
Solid	289,110 ft^3	None	None	Onsite Burial[f]
LLW	60,420 ft^3 [a]			
Liquid (organic)		152,000 gal[b]	3M lb/yr[c]	None
Liquid (aqueous)		None	5.4M gal/yr[d]	None
Solid (metal scrap)		[i]	None	[j]
Solid (non-metallics)		[k]	[l]	None
Solid (sludges)		1.25M gal	None	None
Mixed	99,335 ft^3 [a]			
Liquid		152,000 gal[h]	3M lb/yr[c]	None
Solid		1.25M gal	None	None

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[a] Includes both liquid and solid.
[b] Currently, all RCRA-hazardous wastes are stored at the Y-12 Plant or the K-25 Site awaiting further disposal. These wastes are not being sent offsite to RCRA-permitted commercial facilities.
[c] The K-25 TSCA incinerator 1993 capacity for burning liquid organics. Capacity based on funding.
[d] Combined throughout capacity of West End Treatment Facility and Central Pollution Control Facility waste treatment facilities.
[e] West End Tank farm sludge storage capacity provided by approximately 2.5 tanks, 500,000 gallons each.
[f] New landfill to open; estimate 1994 with 43 year capacity at 160,000 yd^3/yr (uncompacted) fill rate. 186M ft^3 (uncompacted) capacity for disposal of Hazardous/Toxic solids (other) also applies for nonhazardous solid waste. The Y-12 sanitary landfill currently in use has a design capacity of 640,000 yd^3 and is anticipated to reach its limit in late 1993 or early 1994.
[g] Approximate Central Pollution Control Facility/West End Treatment Facility NPDES permit annual discharge volume limits for East Fork Poplar Creek.
[h] 3 x 40,000 gallon tanks in OD09 waste oil/solvent storage facility plus [(4 x 6,500 gallons) + (2 x 3,000 gallons)] in OD10 (flammables storage).
[i] Capacity of the Y-12 Salvage Yard depends on how high scrap is stacked and ability to compact the waste.
[j] Future ability to clean, segregate, recycle, and sell scrap metal, equipment still to be determined.
[k] PCB-Contaminated solids also contaminated with uranium stored in 9720-9 (RCRA/PCB Warehouse), 9720-58 (RCRA and PCB Container Storage Area), and 9404-7 (PCB Drum Storage Facility).
[l] LLW non-metallic (non TSCA, non-RCRA hazardous) wastes such as construction debris are supercompacted and/or incinerated offsite at a local commercial waste treatment facility.

Source: Y-12 MMES, 1992f.

hazardous sludge, which is collected and sent to the West Tank Farm.

The Waste Feed Preparation Facility processes and prepares solid LLW for volume reduction by an outside contractor or storage at Y-12. The facility utilizes a 200-ton capacity baler to reduce the waste volume to one-eighth of its original size. Waste comes to the facility from areas known to generate contaminated materials, or from dumpsters that were analyzed at the Trash Monitoring Station and deemed to be above the radioactive acceptability limits for the sanitary landfill. The compacted bales are placed in DOT-approved metal boxes and staged

in an adjacent warehouse prior to offsite incineration or storage at Y-12.

The Certification & Staging Facility is a proposed FY 1996 line item project to provide a facility that would determine the isotopic content of heterogeneous solid low-level and mixed waste contained in either 96-ft^3 boxes of 55-gallon drums. In addition to radiological characterization, the facility would also provide remote inspection of waste containers via real-time radiography. If the project remains on schedule, the facility should be operational in the year 2000.

The Y-12 Plant does not have onsite disposal facilities for LLW. The Old Salvage Yard is used as a staging area for solid LLW scrap metal. The contaminated scrap is being placed in boxes and would eventually be transferred to above grade storage pads. Planned LLW disposal facilities scheduled to be operational in 1996 will serve waste generators from all three DOE facilities on the ORR. The planned facilities would have up to 40 years capacity available to dispose of LLW.

Mixed Waste. Y-12 generates mixed wastes from the following operations: metal plating, maintenance of sodium/potassium-cooled equipment, machine cooling and machine cleaning associated with the forming and machining of nuclear weapon parts, general cleaning activities that involve regulated solvents or acidic and caustic cleaners. Non-defense process activities generating mixed wastes are wastewater treatment activities at the West End Treatment Facility and the Central Pollution Control Facility, environmental restoration activities, D&D, and storm sewer sludge cleanout activities.

Y-12 has a number of container and tank storage facilities with capacity available for management of mixed wastewater treatment sludges, RCRA/TSCA mixed waste, organic liquid mixed waste, solid mixed wastes, flammable liquid mixed wastes, lab-pack mixed wastes and classified mixed wastes. The lack of available outlets for uranium-contaminated solid wastes forces many combustible flammable wastes generated at Y-12 into long-term storage. An increased capacity for the storage of ignitable solid wastes is required due to the impending closure of the Interim Drum Yard in 1993. The Containerized Waste Storage Area would provide storage for most wastes stored at the Interim Drum Yard after closure. The Production Waste Storage Facility, scheduled for start-up in 1995, would provide several years of storage capability for mixed classified wastes.

Y-12 has no operating onsite disposal facilities for mixed wastes. The West End Treatment Facility/West Tank Farm treats mixed acid wastes generated by Y-12 Plant Production operations. The Certification and Staging Facility planned for design in 1996 would ensure that mixed solid waste generated by defense and restoration activities at Y-12 meets the waste acceptance criteria of the receiving treatment, storage, or disposal facility. The Mixed Waste Treatment Facility, a proposed 1995 line item planned for construction to begin in 1997 would provide treatment capability for mixed soils and sludges. With a sufficient capacity to treat 1,400,000 ft^3 per year, the Mixed Waste Treatment Facility is intended to remove and segregate hazardous and radioactive components of the mixed wastes prepare mixed wastes for ultimate disposal, when suitable disposal facilities are available. Present plans call for the Mixed Waste Treatment Facility to treat mixed wastes from Y-12, K-25 and ORNL.

Hazardous/Toxic Waste Streams and Management. Y-12 generates a large variety of hazardous/toxic wastes. Major waste-generating activities at Y-12 include construction/demolition activities that produce large volumes of contaminated wastes, including lumber, concrete, metal objects, soil, and roofing materials.

Plating waste solutions are generated by metal-plating operations, and reactive wastes and waste laboratory chemicals are generated from various laboratory activities. Sludges are generated as a result of treating process wastes at multiple sites,

and waste oils and solvents are generated from machining and cleaning operations. Contaminated soil, soil solutions, and soil materials are generated from RCRA closure activities.

RCRA wastes generated at the Y-12 Plant were either treated and discharged (in the case of wastewaters) or shipped offsite to permitted, approved disposal facilities (in the case of solids). Due to the moratorium on offsite shipments from Y-12, RCRA wastes that are not discharged are being stored in permitted facilities.

Nonhazardous Waste Streams and Management. The average annual discharge rates from the Central Pollution Central Facility and the West End Treatment Facility are 870,000 gal/yr; and 1.2 MGY, respectively. The NPDES annual discharge volume permit limit for East Fork Popular Creek is 6 MGY. Major waste-generating activities at Y-12 include construction/demolition activities that produce large volumes of non-contaminated wastes, including lumber, concrete, metal objects, soil, and roofing materials.

Noncontaminated industrial trash is generated by daily operations throughout the plant. These operations include janitorial services, floor sweeping in production areas, and production activities.

The Y-12 Centralized Sanitary Landfill II is a state-permitted facility accepting combustibles, decomposed materials, and other industrial wastes, as well as certain special wastes such as asbestos, beryllium oxide, aerosol cans, and fly ash. The Y-12 Spoil Area I is a state-permitted shallow land burial facility for the disposal of noncontaminated rubble and construction spoil, including asphalt, brick, block, brush, concrete, dirt, tile, and other similar materials.

The new salvage yard is used for the staging and public sale of nonradioactive, nonhazardous scrap metal. The Y-12 Plant is restricted from sending any scrap metals offsite. Scrap metal sorting continues however, in anticipation of future provisions for clean scrap metal consolidation/ recycle/resale.

TABLE 3.2.7-2.—*Oak Ridge Reservation Y-12 Plant: Existing Resource Requirements*

Utility Resources	Average Daily Consumption	Peak Demand	System Capacity
Electricity	1,320,000 kWh	70,000 kW	300,000 kW
Natural Gas[a]	N/A	N/A	N/A
Raw Water	7,000,000 gal	5,000 gpm	17,000 gpm

Chemical Resources	Total Annual Consumption	Storage Capacity
Nitrogen	4,027,770,000 gal	46,083,000 gal
Argon	90,000,000 ft^3	3,430,000 ft^3
Helium	4,464,000 ft^3	707,000 ft^3
Hydrogen	5,475,600 ft^3	234,000 ft^3
Oxygen	44,886,000 gal	30,672,000 gal

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Table assumes that Y-12 operates 365 days per year.

[a] The Y-12 Plant steam boiler currently consumes natural gas. Natural gas will become a backup boiler fuel in 1993 when the steam boiler plant reverts to burning coal using a clean coal burning technology approved by the state of Tennessee.

Source: Y-12 MMES, 1992a.

3.2.7.4 *Utility and Resource Requirements*

Major underground utility systems that serve the Y-12 site include raw and treated water, the sanitary sewer system, and natural gas pipelines. Major above-ground systems include steam and condensate, demineralized water, plant and instrument air, and electrical distribution. Two major utility facilities are located at Y-12: the water treatment plant and the steam plant.

Electrical power is procured from the Tennessee Valley Authority and transmitted throughout the plant by three 161kV overhead radial feeders and one 161kV interconnecting overhead feeder. Table 3.2.7-2 lists Y-12's utility and chemical resource requirements.

The source of raw water for Y-12 is Clinch River water impounded by the Melton Hill Dam. The filtration plant, with its 7-million-gallon storage reservoir, is the source of treated water for Y-12. The treated water supplies the fire protection system, process operations, sanitary requirements, and boiler feed at the steam plant. Heating and process steam is supplied by the main steam plant, which houses four boilers.

Chemical needs include industrial gases (argon, helium, hydrogen, nitrogen, and oxygen) delivered in an above-ground distribution system. The present handling and storage area is adequate for the Y-12 mission.

Y-12 has two primary energy needs: natural gas and electricity. Natural gas is used for process furnaces and laboratory needs. The Y-12 natural gas system is supplied by a pipeline from the East Tennessee Natural Gas Company. Beginning in 1993, coal would be used in place of natural gas for process furnaces. As a result, an estimated 100,000 tons of coal per year would be required for the Y-12 missions. This is up from the 15 to 30 tons per year used from 1990 to 1992.

3.2.8 Sandia National Laboratories

Sandia National Laboratories maintains facilities in three locations: Albuquerque, NM; Livermore, CA; and Tonopah, NV. The facilities discussed in this document only refer to the Albuquerque location (SNL) which is located adjacent to the city of Albuquerque (figures 3.2.8-1 and 3.2.8-2). The site is approximately 6.5 miles east of downtown Albuquerque. SNL consists of 8,300 acres on Kirtland Air Force Base (KAFB) allocated to DOE.

3.2.8.1 *Sandia National Laboratories Missions*

SNL's basic mission as one of the DOE Defense Laboratories is to perform the RD&T necessary to maintain and advance the critical technologies and core competencies required to produce nuclear weapons. The laboratory is operated by AT&T under contract to DOE.

SNL's primary missions are:

- Weapons research, development, and testing, including:
  - Advanced weapons concepts, designs, and technologies.
  - Preparation for testing limitations.
  - Technological surprise.
  - Research in support of the stockpile memorandum, including dismantlement.
  - Weapons surety.
  - Complex 21 technology development.
- Nuclear weapons systems ordnance engineering.
- Nonnuclear component design and development.
- Field and lab testing.
- Manufacturing engineering.

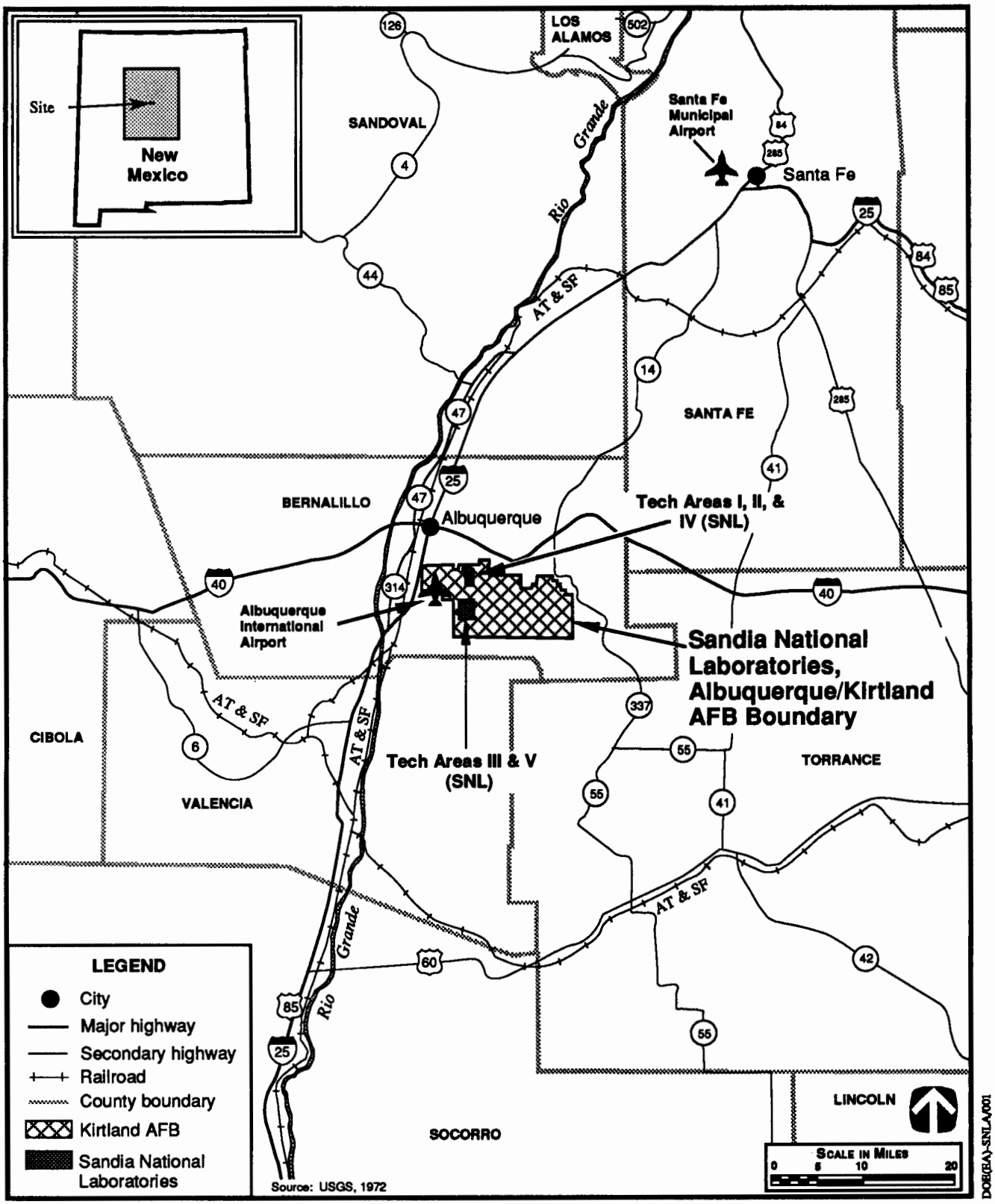

FIGURE 3.2.8-1—***Sandia National Laboratories, Albuquerque, New Mexico, and Region.***

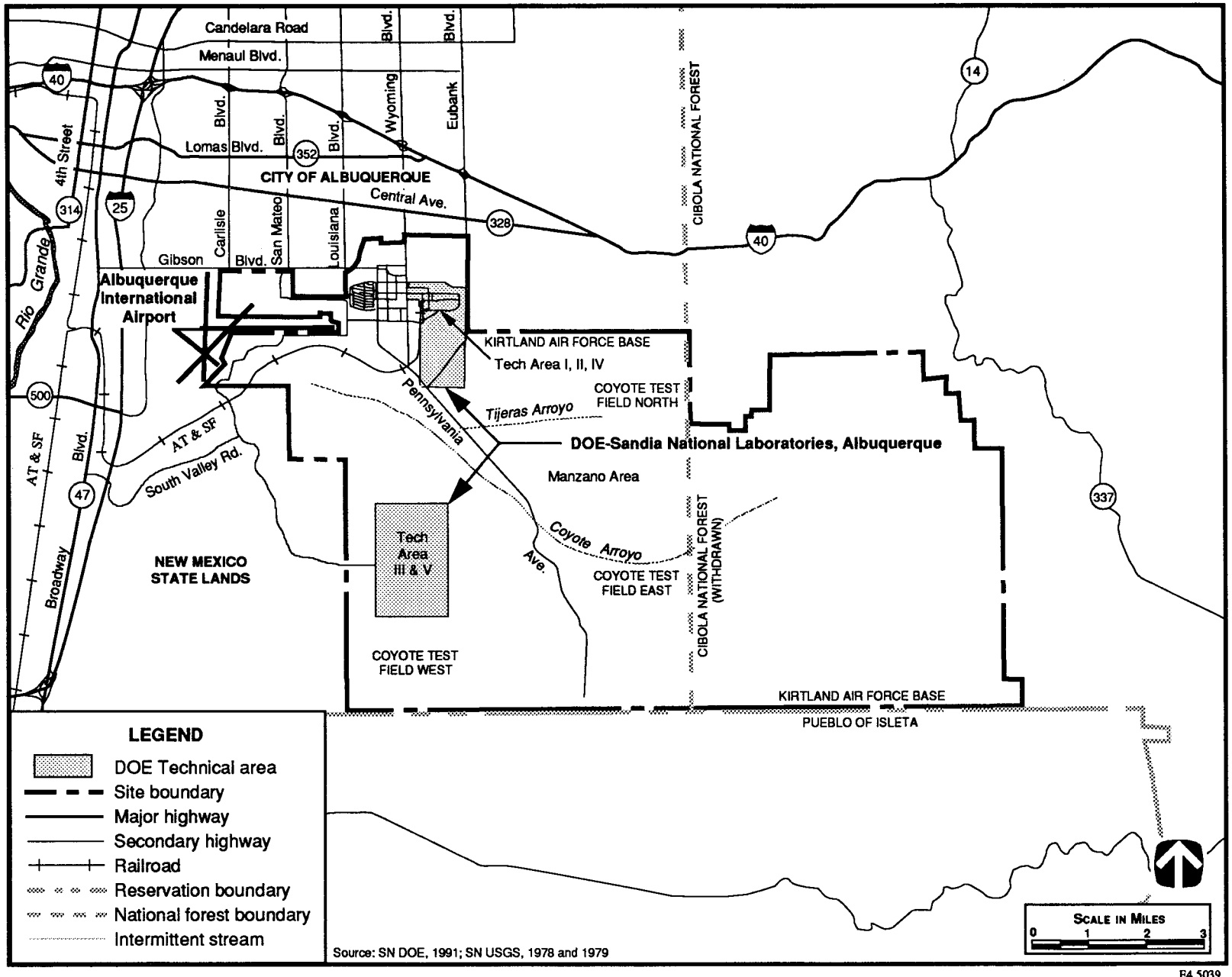

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FIGURE 3.2.8-2—*Location of Facilities at Sandia National Laboratories, Albuquerque.*

- Verification and control technologies.
- Safeguards and security.
- Nonweapons work.
- Particle beam technology.
- Intelligence.
- Advanced military technology.
- Radiation-hardened microelectronics.
- Nuclear Regulatory Commission (NRC) R&D.
- Activities for non-Federal entities.
- Technology commercialization.
- Performance of surveillance activities to insure reliability of stockpile.
- Pollution prevention.
- Waste management.
- Strategic Defense Initiative.
- Threat assessment.
- Advanced concepts research.
- Space technology.
- Nonproliferation.
- Emergency response.
- Underground nuclear testing.
- Energy Sciences.
- Environmentally conscious manufacturing.
- Energy Systems development.

SNL's shared missions are:

- R&D to support development and production engineering.
- Nuclear effects, vulnerability, and lethality assessment.

3.2.8.2 *Facility/Process Description*

SNL uses facilities at five Technical (Tech) Areas and a Test Field (figure 3.2.8-2).

- Tech Area I—Administration, site support, technical support, component development, research, energy programs, microelectronics, defense programs, and exploratory systems.
- Tech Area II—Testing explosive components.
- Tech Area III—Testing and simulating a variety of natural and induced environments, including two rocket sled tracks, two centrifuges, and a radiant heat facility.
- Tech Area IV—A remote site for pulsed power sciences such as X-ray, gamma-ray, and particle beam fusion accelerators.
- Tech Area V—The remote area for experimental and engineering reactors and particle accelerators.
- Coyote Test Field—Land parcels scattered throughout the Coyote Test Field used for testing.

There are currently 560 major buildings totaling 4 million ft^2 spread over Tech Areas I, II, III, IV, V,

and the Coyote Test Field. This action would involve existing facilities only in Tech Areas I and III.

As of September 1992, SNL had approximately 8,473 employees (DOE, 1992e).

Effluents and Emissions. Normal operations at SNL release small quantities of tritium to surface waters. These releases are discussed in section 4.1.5.3. Pretreated industrial wastewater and sanitary wastewater are discharged to the city of Albuquerque's wastewater treatment plant and KAFB sewage lagoons. None of the industrial or sanitary wastewater discharges go directly to surface water channels. Wastewater effluents from current operations at SNL are discussed in section 4.1.5.3.

Normal SNL operations release tritium to the environment. The tritium releases are discussed in section 4.1.5.2 and the associated health impacts are discussed in section 4.1.5.9 The major sources of criteria air pollutants at SNL are the steam plant at Tech Area I; paint shops, toxic machine shops, process development laboratory, emergency diesel generator plant, and solvent spray booth, all located in Tech Area I; and explosive testing at Tech Area II. Other emissions include fugitive particulate emissions from waste-burial activities, other process emissions, and vehicles. Hazardous/toxic air pollutant sources include various laboratories and miscellaneous operations. Hazardous/toxic air pollutants include, but are not limited to, TCA, toluene, and xylene. The concentrations of criteria pollutants and hazardous/toxic air pollutants from current operations at SNL are discussed in section 4.1.5.2. The emission rates for these pollutants are shown in appendix D.2.1.8.

Safety and Accidents. The review of historical information at SNL indicated that during the period 1986-1990, one accidental release was reported under the requirements of CERCLA and SARA because of the quantity released. This involved the release in 1987 of 30 pounds of capacitor oil containing PCBs. Additionally, there have been numerous releases of lead associated with rocket tests which were reported to the National Response Center and the appropriate approval received before the tests were conducted. However, none of these releases resulted in a significant adverse impact offsite. These incidents were reported and investigated. Lessons learned were applied, appropriate corrective actions were instituted, and follow-up was performed in accordance with DOE order requirements.

Improvements Required to Continue/Comply with ES&H Requirements. ES&H Projects planned to start prior to the end of 1993 (CAMP, 1991) include:

- The Robotic Manufacturing Science & Engineering Laboratory and Program Support Center projects would eliminate the serious problems of ventilation, chemical handling and storage, access to hazardous materials, structural deterioration, unsafe co-mingling of activities, and extreme overcrowding caused by the use of temporary and substandard buildings. Completion of this project is planned for 1996.

- The Fire Protection Main to Building 9925 project would enhance the fire response capability to remote facilities. Completion of this project is planned for 1995.

- The Acid Waste Neutralization System Upgrade would lower the probability of pH and fluoride excursions in the Microelectronics Development Laboratory's wastewater. Completion of this project is planned for 1995.

- The Closed Loop Rinse Water Pretreatment System is required to assure meeting all Albuquerque wastewater requirements while minimizing water usage. This project is scheduled for completion in 1993.

- The Vacuum Plasma Spray Chamber and Plating Process Control project would replace outdated equipment. This project is scheduled for completion in 1993.

3.2.8.3 *Waste Management*

Waste management operations at the SNL consist of five broad waste types: TRU, LLW, mixed waste, hazardous/toxic waste, and nonhazardous waste. Because there are no TRU wastes associated with any of the proposed activities that would be consolidated, there is no discussion in this EA of TRU waste generation and management. Table 3.2.8-1 represents the annual waste generation at SNL under No Action.

Radioactive Waste Streams and Management. Radioactive waste at SNL is generated in both technical and remote test areas as the result of RD&T activities. Most of the waste consists of contaminated equipment, combustible decontamination materials and cleanup debris.

All LLW and mixed waste are being temporarily stored at generator sites or above ground in transportation containers at the inactive Technical Area III disposal site. Approximately 1,600 ft^3 of waste was accepted at the Technical Area III storage site during 1990. The waste consisted primarily of fission product and uranium-contaminated waste on a volumetric basis, and tritium-contaminated waste on an activity basis. All LLW packages are currently stored onsite pending approval to be transported by commercial carriers in closed vans to NTS for disposal.

Mixed Wastes. Mixed wastes include radioactively-contaminated oils and solvents, radioactively-contaminated or activated lead, or other heavy metals. Other mixed wastes may be generated as a result of weapons tests. Construction of the Radioactive and Mixed Waste Management Facility was completed in 1990. This 6,000 ft^2 facility has waste acceptance criteria and serves as a centralized packaging and storage facility for LLW and mixed waste. Waste will be stored at this facility until suitable treatment and disposal facilities are available for the disposal of these wastes in accordance with the provisions of RCRA. SNL is

TABLE 3.2.8–1.—*Sandia National Laboratories, Albuquerque: Waste Management (1991)*

Waste Type	Quantity Generated	Storage Capacity	Treatment Capacity	Disposal Method
Hazardous/Toxic				
Liquid	198,450 gal	70,000 gal[a]	None	Offsite
Solid	4,500 ft^3		None	Offsite
Nonhazardous				
Liquid	200,000,000 gal	None	None	Offsite-Sewer System
Solid	800,000 ft^3	None	None	KAFB Landfill
LLW		50,000 gal[a]		
Liquid	4,160 gal		None	None
Solid	2,355 ft^3		None	Offsite DOE
Mixed		25,000 gal[a]		
Liquid	480 gal		None	None
Solid	115 ft^3		None	None

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[a] Includes both solid and liquid.

Source: SNL, 1992a and f.

currently developing a compliance agreement to be negotiated with the State of New Mexico to stipulate the provisions of the storage of these wastes pursuant to the terms of the Land Disposal Restrictions of RCRA.

Hazardous/Toxic Waste Streams and Management. Hazardous/toxic chemical wastes are generated at SNL by the numerous research and development activities conducted throughout the facilities. Major waste generators include the development shops (i.e., plating, plastics, glass) and chemical laboratories. Wastes consist of a large number of different reagents, chemicals, solvents, caustics, acids, and other general laboratory wastes. Chemical wastes generated by SNL RD&T activities are collected from generator locations, segregated according to DOT Hazard Class, and transported to the Hazardous Waste Management Facility for storage.

There are no active onsite disposal facilities for hazardous/toxic wastes at SNL. All RCRA-regulated wastes are manifested and shipped under contract with licensed RCRA-permitted transporters offsite to RCRA-permitted treatment, storage, and disposal facilities.

Nonhazardous Waste Streams and Management. SNL contains over 15 miles of sewer lines interconnected with those of KAFB. SNL has five categorical pretreatment operations and three general wastewater streams discharging to the city of Albuquerque's sewer system. These discharges are regulated by the Albuquerque Public Works Department.

Nonhazardous solid sanitary wastes are generated routinely and include general plant refuse such as paper, cardboard, glass, wood, plastics, scrap, metal containers, etc. Nonhazardous wastes are segregated and recycled whenever possible. SNL operates a number of salvage/scrap yards throughout the technical and remote areas where surplus equipment is sold to offsite vendors. Trash is collected and taken to the KAFB sanitary landfill on a regular basis.

3.2.8.4 *Utility and Resource Requirements*

Electricity is supplied to SNL and much of southeast Albuquerque through the Public Service Company of New Mexico's switching station on Eubank Boulevard. Voltage is stepped down through transformers to 46 kV for distribution through four feeders. Feeder No. 1 serves Tech Areas III-V and outlying areas; Feeder No. 2 serves the Radiant Heat Facility in Tech Area III; and Feeders 3 & 4 supply Tech Area I.

KAFB is responsible for the overall natural gas system. The distribution system in Tech Areas I, II, & IV is owned by DOE and operated by SNL. Natural gas is purchased from KAFB, which buys it commercially. Fuel oil is stored in Tech Area I for refueling remote-site tanks and for emergency supply to the steam plant. The steam plant in Tech Area I supplies steam both to that area and to KAFB for space heating, hot water converters, absorption chillers, and processes.

Responsibility for water storage and transmission rests with KAFB, with SNL handling distribution only to its own facilities. Remote test areas in Coyote Canyon have water trucked to them.

SNL is responsible for the collection system in its Tech Areas and in Coyote Test Field, while KAFB is responsible for the system base-wide. Tech Areas I and IV are tied into the KAFB system, while Areas II, III, V, and Coyote Test Field have septic tanks and sewage lagoons independent of the main system. The present chemical storage capability is adequate for SNL's existing missions. The existing resource requirements are summarized in table 3.2.8-2.

TABLE 3.2.8–2.—*Sandia National Laboratories, Albuquerque: Existing Resource Requirements*

Utility Resources	Average Daily Consumption	Peak Demand	System Capacity
Electricity	32,000 kWh	5,000 kW	50,000 kW
Natural Gas	1,500,000 ft^3	250,000 ft^3/hr	250,000 ft^3/hr[a]
Water	1,000,000 gal	1,400 gpm	2,800 gpm[a]

Chemical Resources	Total Annual Consumption	Storage Capacity
Nitrogen	720,000 gal	72,000 gal
Argon	400,000 gal	46,000 gal
Helium	b	b
Hydrogen	760,000 ft^3	76,000 ft^3
Oxygen	50,000 gal	5,000 gal

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Table assumes that SNL operates 365 days per year.

[a] Sandia's water and natural gas systems are extensive and complex. Peak system capacity estimates should not be considered definitive.
[b] Helium is supplied in small, portable bottles at the usage site. Cumulative site and usage figures are not available.

Source: SNL, 1992b.

3.3 PROPOSED ACTION—KANSAS CITY PLANT CONSOLIDATION

The Proposed Action is summarized in section 3.1.1 of this chapter; detailed descriptions of all activities involved with this action are presented here. Function transfers for the Proposed Action are illustrated in figure 3.3-1. The proposed facility modifications required to support each relocated function are discussed for each of the potentially affected sites. Table 3.3-1 shows the anticipated workforce requirements for this action.

3.3.1 Consolidate Electrical/Mechanical Functions at the Kansas City Plant

The electrical/mechanical functions to be consolidated at KCP would be situated within existing buildings at the KCP site as shown in figure 3.3.1-1.

Nonnuclear electrical/mechanical manufacturing functions from Mound, Pinellas, and RFP described in sections 3.2.2, 3.2.3, and 3.2.4, respectively would be consolidated at KCP. These functions consist of the 15 specific activities listed in table 3.3.1-1.

Under the Proposed Action, no new buildings or additional parking would be required at KCP. Interior modification, demolition, and remedial measure requirements are summarized in table 3.3.1-2. Anticipated construction material resource requirements for the consolidation of nonnuclear manufacturing activities at KCP are listed in table 3.3.1-3.

Buildings that would receive relocated activities include the Main Manufacturing Building, the Manufacturing Support Building, and the Electrical Products Manufacturing Building. The proposed activities would be incorporated into the existing product lines or moved into space either that is currently vacant or that can be made available by rearranging other items. There would be a substantial amount of interior renovation such as relocation of walls, utilities, and equipment, and the construction or renovation of special facilities such as clean rooms.

A process waste assessment was conducted for each of the component manufacturing operations to be transferred to Kansas City. Table 3.3.1-4 presents a summary of the additional waste types and volumes of the liquid and solid wastes to be generated by the transfer of activities to KCP. Appendix B.1 provides more detailed discussion and summary tables of the process waste assessment data for each component production operation. The management and disposal of generated waste and effluents is also discussed in appendix B.1. Appendix D details air emissions.

As a result of this consolidation, certain hazardous chemicals of particular concern because of their possible release during potential accidents (discussed in detail in appendix F and included in table F5.1) would be used in activities transferred to KCP. These chemicals are toluene diisocyanate and methylene dianiline. In 1991, KCP used 5,960 lb of toluene diisocyanate as a curing agent in a polyurethane molding process and 145 lb of methylene dianiline in a number of epoxy resin lamination processes. Processes that would be transferred as a result of this consolidation would cause negligible or no increases in the annual use of these chemicals. The consolidation would add 12 lb of toluene diisocyanate, used as a curing agent in a polyurethane compound, and 3 lb of methylene dianiline, used in "Z" Hardener as part of an epoxy encapsulating material.

The impacts of chemicals associated with normal operations are discussed in section 4.1.1.9.

No new support facilities (e.g., storage facilities, electrical substations or power plants, and water treatment facilities) would be required.

Estimates of the anticipated additional total operations resource requirements resulting from the consolidation of electrical and mechanical nonnuclear manufacturing activities at KCP are shown in table 3.3.1-5.

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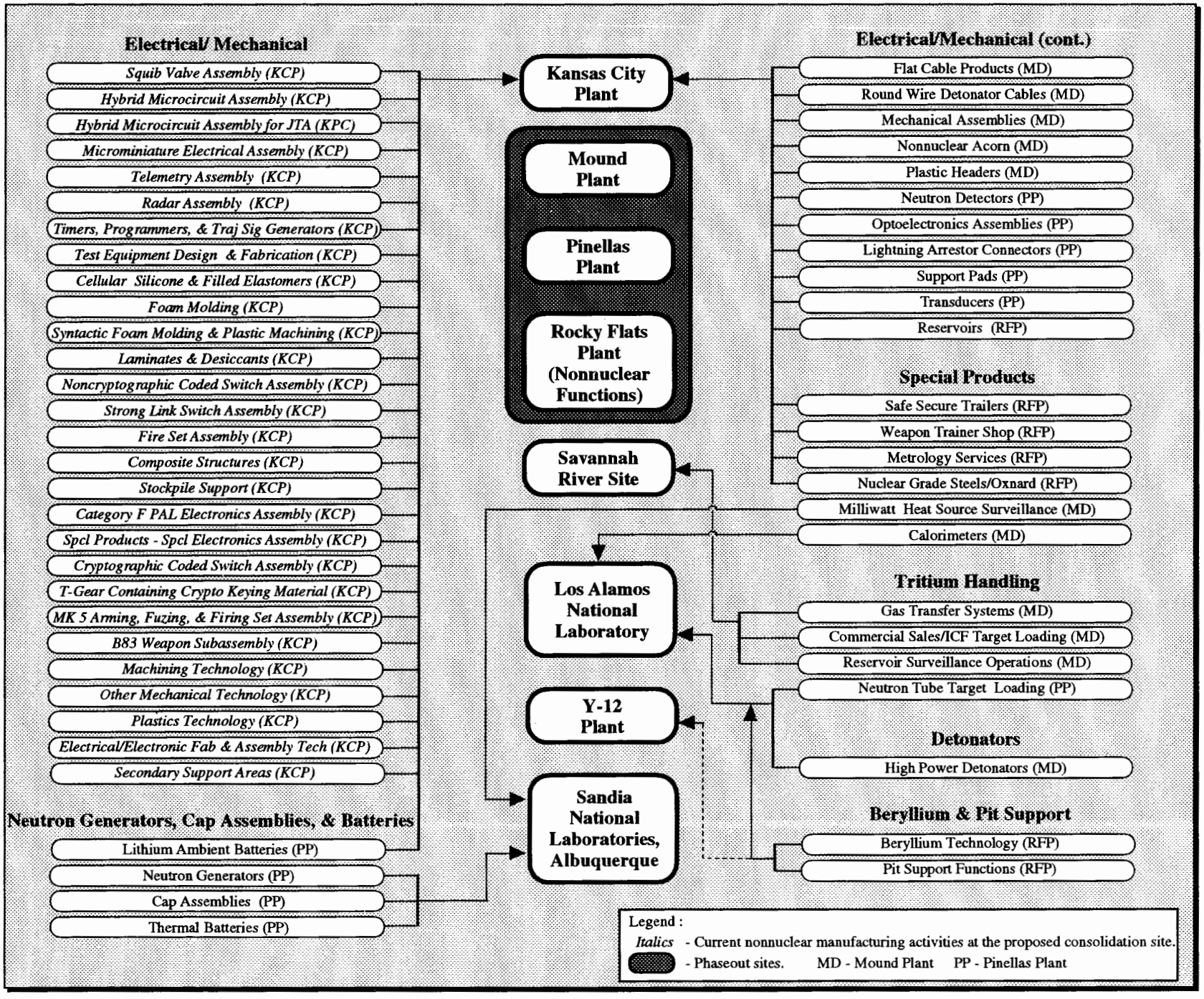

FIGURE 3.3-1.—*Consolidation of Electrical/Mechanical Products at the Kansas City Plant.*

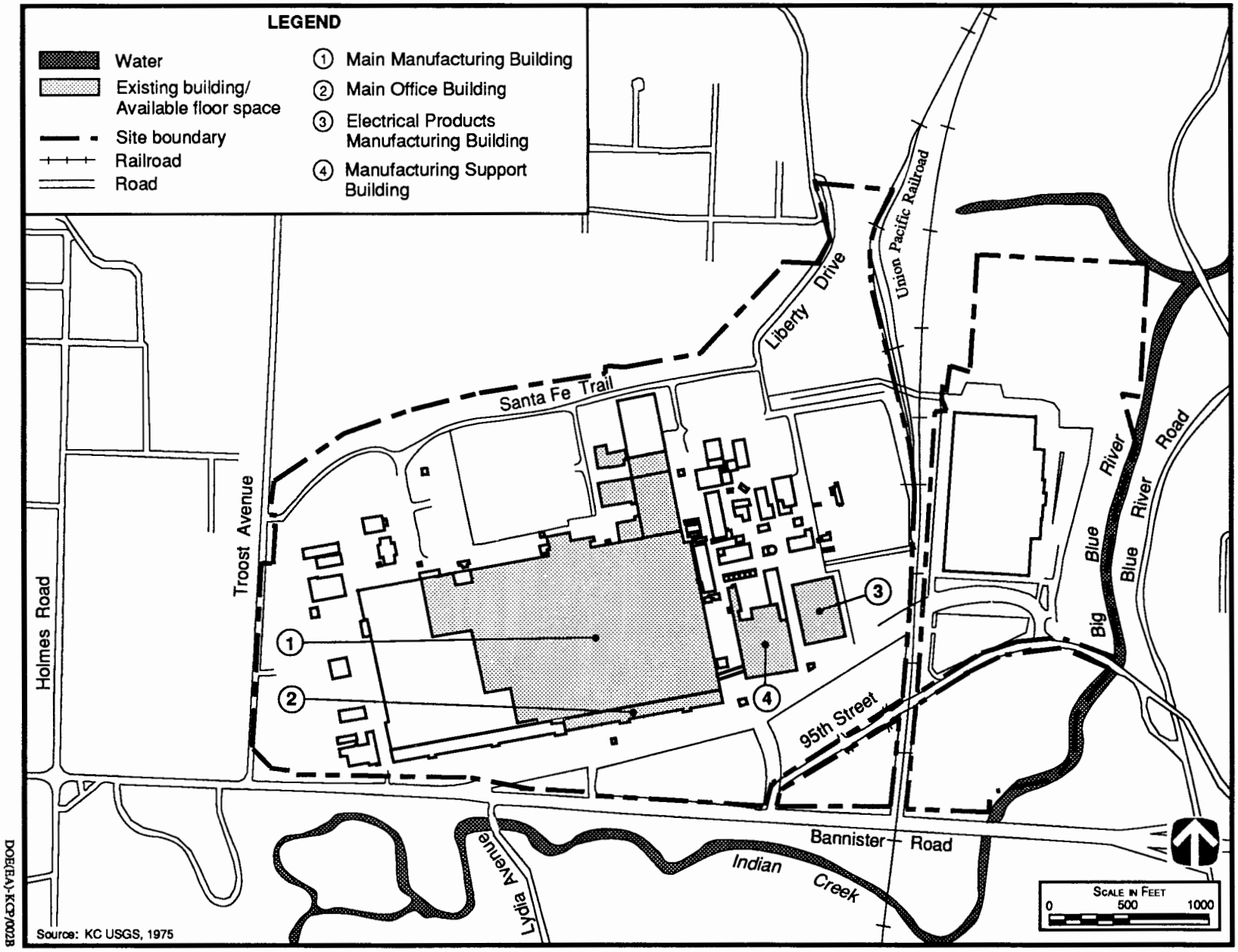

FIGURE 3.3.1-1—*Proposed Location of New Operations at the Kansas City Plant.*

TABLE 3.3-1.—*Estimated Additional Peak Construction/ Operations Workforce Requirements—Proposed Action*

Site	Construction Workforce	Operations Workforce
Kansas City Plant	80	575
Savannah River Site	45	85
Los Alamos National Laboratory	81	80
Y-12 Plant	162	8
Sandia National Laboratories, Albuquerque	93	350
Total	461	1,098

E4 3874

Source: DOE, 1991f and 1992e; FDI, 1992a; KC ASAC, 1992d; LANL, 1992a, b, c, and d; SNL, 1992a; SR DOE, 1992b.

TABLE 3.3.1-1.—*Kansas City Plant—Proposed Action*

Activity	Space Req. (ft^2)	Location	Donor Site
Support Pads	460	MMB	Pinellas
Optoelectronics Assemblies	2,500	MMB & MSB	Pinellas
Neutron Detectors	700	MMB	Pinellas
Lightning Arrestor Connectors	4,000	MMB & EPMB	Pinellas
Transducers	500	MMB	Pinellas
Lithium Ambient Batteries	1,200	MMB	Pinellas
Flat Cable Products	8,800	MMB	Mound
Mechanical Assemblies	2,200	MMB	Mound
Round Wire Detonator Cables and Plastic Headers	1,000	MMB	Mound
Reservoirs and Nonnuclear Acorn	31,600	MMB & MSB	Mound & RFP
Nuclear Grade Steels/Oxnard	8,800	MMB	RFP
Safe Secure Trailers	29,400	MMB	RFP
Weapon Trainer Shop	6,800	MMB	RFP
Metrology Services	0	MMB	RFP
Total	97,960		

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MMB - Main Manufacturing Building
MSB - Manufacturing Support Building
EPMB - Electrical Products Manufacturing Building

Source: KC ASAC, 1992d.

TABLE 3.3.1-2.—*Kansas City Plant: Interior Construction/Modification Requirements—Proposed Action* [Page 1 of 3]

Relocated Activity	Construction/Modification & Demolition	Remedial Measures	Mechanical & Electrical
Support Pads This activity would be located within an existing welding department in the MMB and would require modifications necessary to accommodate the equipment that would be moved from Pinellas.	Modify existing and install new acoustical spray rooms; relocate a pair of doors; rearrange existing equipment; remove and replace coreboard partitions.	None	Temporarily disconnect existing electrical utility service and reinstall after modifying existing acoustical spray room.
Optoelectronics Assemblies This activity would be moved into existing departments and vacant space in the MMB and MSB requiring modifications necessary to accommodate the equipment that would be moved from Pinellas. In addition to building a new clean room in the MMB, a hydrogen furnace would be installed in Building 96.	Remove floor tile, coreboard partitions, and doors; construct hydrogen furnace/metallization work area.	Remove asbestos floor tiles, and mastic.	Remove and replace utility piping, ductwork, and vents, including compressed air, city and chilled water, steam, gaseous and liquid nitrogen, argon, helium, and hydrogen piping; install new HEPA filter modules, hydrogen furnace, and air handling unit and ductwork; remove and replace transformer and panel board; install ordinary hazard sprinkler system in the clean room; rearrange existing electrical services; install fire alarm and communications system; install additional power and lighting.
Neutron Detectors This process would be integrated into the Telemetry Laboratory area in the MMB.	Rearrange existing equipment and install banker's partition within an existing department.	None	Relocate utility piping; install carbon dioxide piping system; install new transformer and low voltage panelboard; relocate receptacles.
Lightning Arrestor Connectors This would be located primarily in the EPMB with two processes (testing and lead mixing) integrated into appropriate laboratory areas in the MMB.	Rearrange existing equipment; construct Lead Titinate room and install new Class 100 clean room and banker's partitions.	None	Remove existing ductwork and utility piping; install new compressed air, chilled water, gaseous nitrogen piping; modify existing sprinkler systems; remove and replace existing electrical utilities, including receptacles, bus tap switches, and miscellaneous wiring; install low voltage panelboard, additional power, and lighting.
Transducers This process would be integrated into the Telemetry Laboratory area in the MMB.	Rearrange existing equipment within an existing department.	None	Modify existing exhaust systems, vacuum pump, compressed air, chilled water, and gaseous nitrogen piping systems; install liquid nitrogen dewars, argon gas, and deionized water bottles; install dust collection system.

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Footnotes at end of table.

TABLE 3.3.1-2.—*Kansas City Plant: Interior Construction/Modification Requirements—Proposed Action*— Continued [Page 2 of 3]

Relocated Activity	Construction/Modification & Demolition	Remedial Measures	Mechanical & Electrical
Lithium Ambient Batteries This activity would be located in the MMB requiring the rearrangement and excessing of equipment to provide space for equipment that would be moved from Pinellas.	Remove and replace existing coreboard partitions and crib fence; install new 8 foot high coreboard partitions.	None	Modify existing and install new exhaust systems with monitors and alarms. Modify existing gaseous and liquid nitrogen piping systems. Rearrange existing electrical services.
Flat Cable Products This activity would be moved into three areas in the MMB which would require modifications necessary to accommodate the equipment that would be moved from Pinellas in addition to building a new clean room.	Remove gypsum wallboard partitions; construct an addition to an existing Class 10,000 clean room.	Remove PCB contaminated concrete floor and asbestos floor tiles and pipe insulation.	Remove and replace utility piping, ductwork, and drains; including compressed air, city, deionized, and chilled water, steam, gaseous nitrogen piping; install new HEPA filters, air handling unit, and ductwork; modify sprinkler system; remove and replace transformer and panel board; rearrange existing electrical services; install fire alarm and communications system; install additional power and lighting.
Mechanical Assemblies This product line would be integrated into five specific areas of the MMB.	Remove and replace existing vinyl floor tile; modify an existing Class 100,000 clean room.	None	Remove and replace utility piping, ductwork, and drains; including compressed air and gaseous nitrogen piping; install city, deionized, and chilled water, steam; install new HEPA filters, air handling unit, and ductwork; modify sprinkler system; rearrange existing electrical services; install additional power and lighting.
Round Wire Detonator Cables This product line would be integrated into the flex cables department and installed on existing workbenches located in the MMB.	No rearrangement of existing space and equipment required. Consolidation on existing workbenches.	None	None
Plastic Headers This technology would be absorbed into an existing department in the MMB without additional equipment, construction, or rearrangement being required.	Additional space requirements included with Round Wire Detonator Cables.	None	None

E4 3779-2

Footnotes at end of table.

TABLE 3.3.1-2.—*Kansas City Plant: Interior Construction/Modification Requirements —Proposed Action*—Continued [Page 3 of 3]

Relocated Activity	Construction/Modification & Demolition	Remedial Measures	Mechanical & Electrical
Reservoirs and Nonnuclear Acorn This product line would make use of existing departments, requiring relocation and rearrangement of existing equipment, and vacant space, requiring removal and replacement of concrete floor, and modifications necessary to accommodate new production equipment in the MMB and MSB.	Remove concrete floor, coreboard and sheetrock walls; construct chase walls and acoustical ceiling; modify existing vacant area in MMB.	None	Install new HEPA filters, air handling unit, ductwork, and steam to water heat exchanger; install hydrogen detection system and additional power and lighting.
Nuclear Grade Steels/Oxnard This activity would be placed in existing vacant space in the MMB which would require modifications necessary to accommodate the equipment that would be moved from Rocky Flats.	Remove concrete floor; construct bridge crane superstructure and footings; modify existing vacant area in MMB.	None	Install deionized water system with pump and utility piping; modify existing utilities; install additional power and lighting.
Safe Secure Trailers This technology would be placed in two existing departments in the MMB and would require the relocation of storage racks to an existing vacated storage area.	Remove concrete floor and masonry wall; construct four bridge crane superstructures and footings; construct new masonry and reinforced concrete walls, ceiling openings, and overhead door openings.	None	Install new air handling unit, and ductwork; remove and replace existing electrical services; install additional power and lighting.
Weapon Trainer Shop This activity would be moved into vacated space within an existing department in the MMB and would require only minor modifications.	Remove and replace metal stud and gypsum wallboard partitions; cut opening in two-hour fire rated wall for new vehicle fire door, ceiling openings.	None	Install new dust collector/filter and ductwork; remove and replace existing electrical services; install additional power and lighting.
Metrology Services This activity would be incorporated into an existing department in the MMB. This activity requires no additional equipment or space at KCP.	No space requirements.	None	None

E4 3779-3

Source: KC ASAC, 1992e.

TABLE 3.3.1-3.—*Kansas City Plant: Estimated Construction Material/ Resource Requirements—Proposed Action*

Materials/Resources	Requirement
Utilities:	
Electricity	a
Water	a
Solids:	
Concrete	1,000 yd^3
Steel (structural, rebar, ductwork, and piping)	180 tons
Other[b]	90,000 ft^2
Liquid Fuels	0 gal
Gases	0 ft^3

E4 3469

[a] These materials will be supplied from existing plant distribution systems with negligible impact.
[b] Includes 65,000 ft^2 of wall materials and 24,000 ft^2 of floor tile.

Source: KC ASAC, 1992a.

TABLE 3.3.1-4.—*Kansas City Plant: Estimated Additional Annual Waste Generation—Proposed Action*

Waste Type	Quantity
Hazardous/Toxic	
Liquid	8,132 gal
Solid	108 ft^3
Nonhazardous	
Liquid	1,676,394 gal
Solid	282 ft^3
LLW	
Liquid	None
Solid	None
Mixed	
Liquid	None
Solid	None

E4 3780

Source: KC ASAC, 1992a.

TABLE 3.3.1-5.—*Kansas City Plant: Estimated Additional Operations Resource Requirements—Proposed Action*

Utility Resources	Average Daily Consumption	Peak Demand
Electricity	19,000 kWh	5,800 kW
Natural Gas	8,000 ft^3	8,000 ft^3/hr
Water	1,600 gal	60 GPM

Chemical Resources	Annual Consumption
Nitrogen	2,966 gal
Argon	2,000,000 ft^3
Helium	800,000 ft^3
Hydrogen	7,500 ft^3
Oxygen & Acetylene	56,000 ft^3

E4 3471

Table assumes KCP operates 365 days per year.

Source: KC ASAC, 1992a, e and i.

3.3.2 Savannah River Site

Tritium handling functions at Mound, discussed in section 3.2.2, would be relocated to SRS. Potential facility modification and resource requirements at SRS are discussed below.

Tritium handling activities discussed in section 3.2.2, to be relocated to SRS, would be situated within existing buildings at SRS as shown in figures 3.3.2-1 and 3.3.2-2. Table 3.3.2-1 lists the planned location of the relocated products and provides estimates of space requirements. No new support facility construction would be required to accommodate new products.

All proposed activities could be accommodated in six buildings in the H-Area, and one building in the 700-Area. The Replacement Tritium Facility (RTF), currently under construction (Building 233-H), would provide much of the needed space for the tritium handling activities and would receive the most extensive modifications with the addition of a mezzanine and an upgraded or additional exhaust plenum. Interior construction/modification requirements at SRS are addressed in table 3.3.2-2. Anticipated construction material/resource requirements for the consolidation of tritium handling activities at SRS are listed in table 3.3.2-3.

As a result of tritium handling processes being transferred to SRS, tritium is of particular concern because of its possible release during potential accidents. The maximum increase of tritium would be 3 to 4 percent above the quantity presently handled and stored at SRS.

The impacts of tritium and chemicals associated with normal operations are discussed in section 4.1.2.9.

Table 3.3.2-4 presents the anticipated additional annual waste generation volume at SRS. A partial list of waste items resulting from the tritium handling activities is discussed below and in greater detail along with treatment and management in appendix B.2. Effluents are also discussed in appendix B.2 while air emissions are covered in appendix D.

- *Reservoir Surveillance Operations*—Waste generated would be low level compactible and non-compactible waste from nitrogen and argon blanketed glove boxes (approximately 200 ft^3 year). Waste would also be generated by decontamination of tritium-contaminated components, gloves, etc. In addition, waste would be generated from non-repairable contaminated equipment.

- *Gas Transfer Systems*—Materials containing tritium and materials contaminated with tritium would be processed in a vacuum furnace. Residual material would be transferred to the SRS burial ground for waste disposal.

- *Commercial Sales/Inertial Confinement Fusion Target Loading*—LLW would consist of alcohol, cleaning cloths, and gloves contaminated with tritium.

Beside modifying utilities in existing buildings, the relocation of tritium handling activities would not require new utility services.

Anticipated resource requirements resulting from the consolidation of tritium handling activities at SRS are provided in table 3.3.2-5.

Text continues on page 3-87.

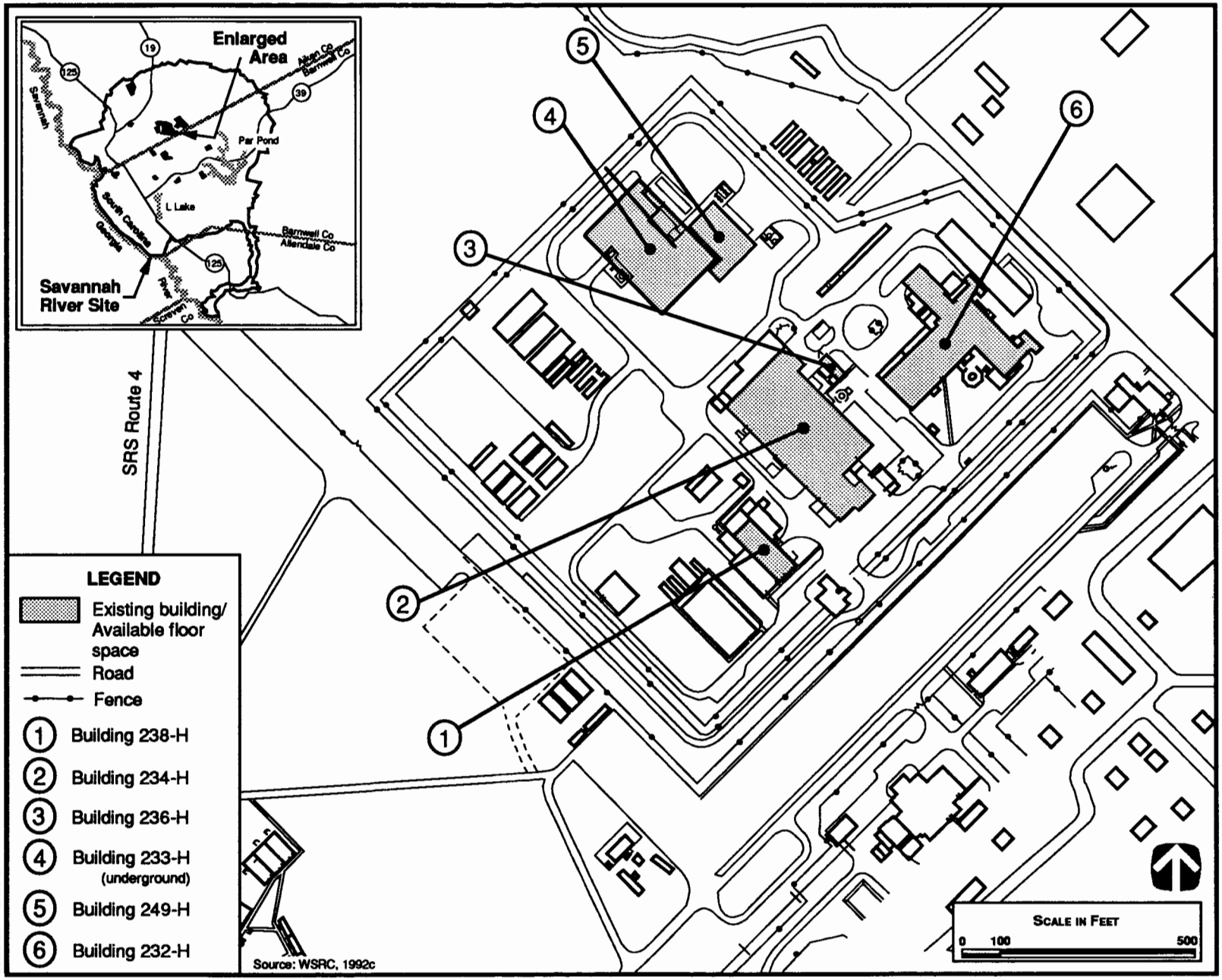

FIGURE 3.3.2-1—*Proposed Location of New Operations at the Savannah River Site, H-Area.*

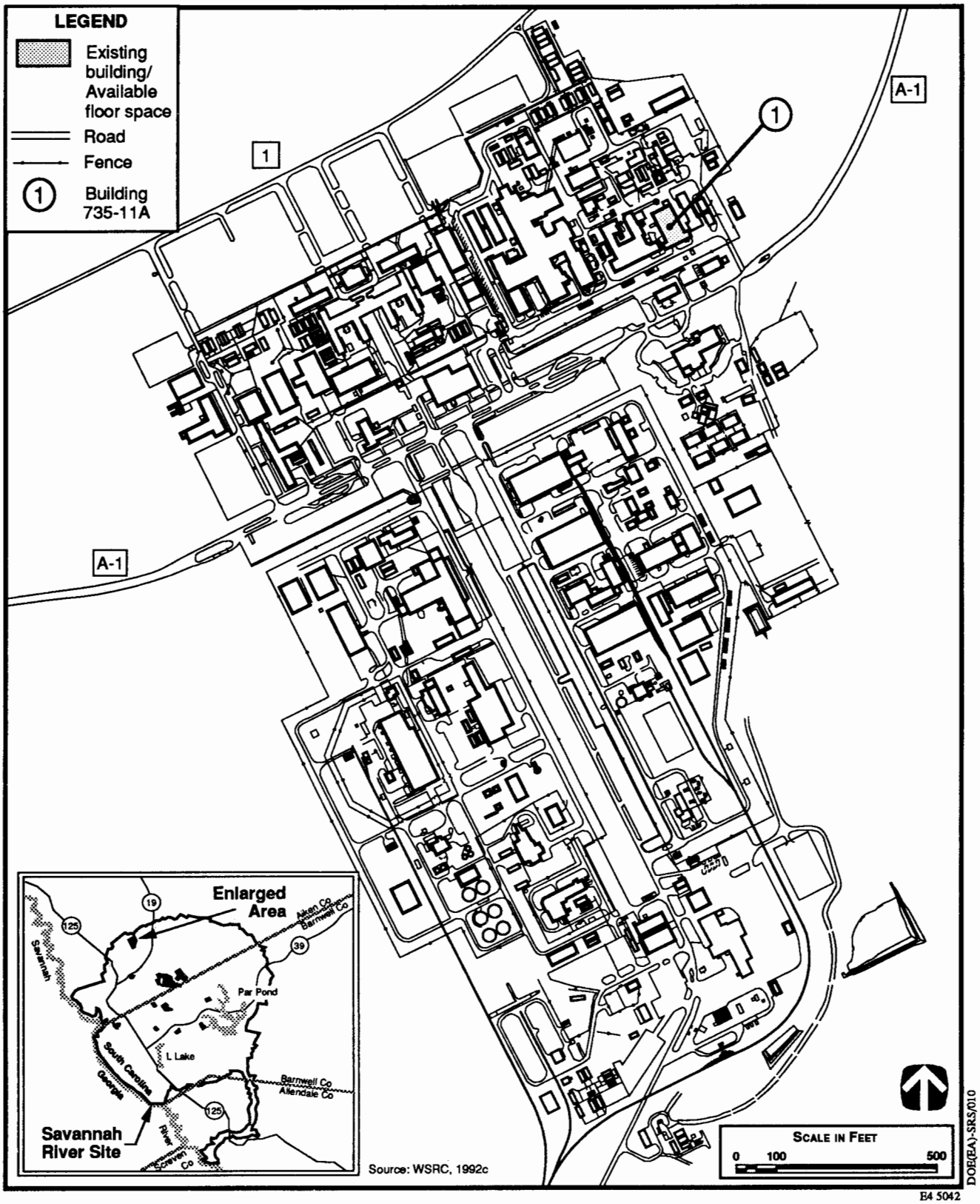

FIGURE 3.3.2-2—***Proposed Location of New Operations at the Savannah River Site, A-Area.***

TABLE 3.3.2-1.—*Savannah River Site: Proposed Action*

Activity	Space Req (ft^2)	Location	Donor Site
Commercial Sales/Inertial Confinement Fusion (ICF) Target Loading	1,000	Bldgs. 233H and 234H	Mound
Gas Transfer Systems	4,300	Bldgs. 232H and 735-11A	Mound
Reservoir Surveillance Operations	5,000	Bldgs. 232H, 233H, 234H, 236H, 238H, and 249H	Mound
Total	10,300		

E4 3285

Source: SR DOE, 1992a.

TABLE 3.3.2-2.—*Savannah River Site: Interior Construction/Modification Requirements—Proposed Action*

Relocated Activity	Construction/Modification & Demolition	Remedial Measures	Mechanical & Electrical
Gas Transfer Systems This activity would be located in two separate buildings. Building 735-11A would require modifications in order to provide space to install manufacturing development equipment. Building 232-H would require mechanical modifications and installation of additional equipment.	Remove walls to combine three rooms into one room.	None	Install new helium and argon tank systems, gas handling manifold, refrigeration units, dumbwaiter, and piping systems; modify existing communications and fire protection systems; install additional power and lighting.
Commercial Sales/ Inertial Confinement Fusion (ICF) Target Loading This activity would be located in two separate buildings both of which would require no building modifications.	No structural or architectural modifications required.	None	Modify existing utilities; install additional lighting.
Reservior Surveillance Operations This activity would be located in five separate buildings. Building 233-H would require extensive modifications and rearrangements. Building 249-H would require some mechanical and electrical modifications. Existing facilities and equipment would be used in buildings 232-H, 236-H, and 238-H.	Construct wall and mezzanine structure; construct access road to new nitrogen and argon tanks; install electrical dumbwaiter.	None	Modify existing HVAC system; install new nitrogen and argon tank systems and piping systems; modify existing communications and fire protection systems; install additional power and lighting.

E4 3781

Source: SR DOE, 1992a.

TABLE 3.3.2-3.—*Savannah River Site: Estimated Construction Material/ Resource Requirements—Proposed Action*

Materials/Resources	Requirement
Utilities:	
Electricity	1000 kWh
Water	600 GPD
Solids:	
Concrete	230 yd^3
Steel (structural, rebar, ductwork, and piping)	154 tons
Other (electrical cable)	75,000 ft
Liquid Fuels	0 gal
Gases	0 ft^3

E4 3472

Source: SR DOE, 1992b.

TABLE 3.3.2-4.—*Savannah River Site: Estimated Additional Annual Waste Generation—Proposed Action*

Waste Type	Quantity
Hazardous/Toxic	
Liquid	None
Solid	None
Nonhazardous	
Liquid	301,125 gal
Solid	1,000 ft^3
LLW	
Liquid	None
Solid	500 ft^3
Mixed	
Liquid	None
Solid	None

E4 3782

Source: SR DOE, 1992a and b.

TABLE 3.3.2-5.—*Savannah River Site: Estimated Additional Operations Resource Requirements—Proposed Action*

Utility Resources	Average Daily Consumption	Peak Demand
Electricity	2,700 kWh	650 kW
Natural Gas	NA	NA
Water	144,000 gal	100 GPM

Chemical Resources	Annual Consumption
Nitrogen	4,442 gal
Argon	500,000 ft^3
Helium	400 ft^3
Hydrogen	400 ft^3
Deuterium	450 ft^3

E4 3474

Source: SR DOE, 1992a and b.

3.3.3 Los Alamos National Laboratory

High power detonators and calorimeters from Mound; neutron tube target loading from Pinellas; and beryllium technology and pit support functions from RFP are proposed for relocation to LANL. The option to the Proposed Action to relocate beryllium technology and pit support to Y-12 is discussed in section 3.3.4. Relocated functions and activities would be situated within existing buildings as indicated in table 3.3.3-1 and figures 3.3.3-1 through 3.3.3-1f. Descriptions of the functions to be relocated are presented in section 3.2 and appendix A.

Interior construction/modification requirements to existing buildings and facilities at LANL are addressed in table 3.3.3-2, and the anticipated construction material/resource requirements in table 3.3.3-3.

As a result of this consolidation, certain hazardous chemicals of particular concern because of their possible release during potential accidents (discussed in detail in appendix F and included in table F5.1) would be used in activities transferred to LANL. These chemicals are beryllium compounds: beryllium oxide and beryllium sulfate, and tritium. LANL currently has on hand approximately 2,000 lb of beryllium and beryllium compounds. Under consolidation, the beryllium compounds would be used for coating graphite crucibles and molds to prevent exothermic reaction of molten beryllium with graphite in the vacuum induction and gas atomization melting processes. Processes that would be transferred as a result of this consolidation would increase the amount of beryllium and beryllium compounds on hand by 8,000 lb to 10,000 lb. The maximum increase of tritium would be 5 percent above the quantity presently handled and stored at LANL. The impacts of tritium and chemicals associated with normal operations are discussed in section 4.1.3.9.

Additional annual waste generation volumes at LANL due to relocation of the nonnuclear manufacturing activities are shown in table 3.3.3-4. Appendix B.3 provides details on the effluents and additional wastes associated with each of the relocated functions. Appendix D provides details on the air emissions associated with the relocated functions. LLW would be generated from neutron tube target loading functions and calorimeters. Noncompactible materials may include metal shavings, and non-repairable contaminated equipment such as disabled pumps, motors, etc.

The high power detonators, beryllium technology, and pit support functions would generate liquid and solid wastes. The high power detonators would generate 7,000 gallons per year (GPY) of HE contaminated solvents, and 3,200 ft^3/yr of solid scrap HE, and HE-contaminated solid wastes. Beryllium technology and pit support functions would generate 508 GPY of liquid hazardous waste and 100 ft^3 of solid hazardous wastes. There would be no beryllium-contaminated effluent discharged from the beryllium function. All potentially beryllium-contaminated water would be collected for special processing.

Besides modifying utilities in existing buildings and providing utility connections to the new administration building for the calorimeter function, no new utility services or support facilities are required.

Table 3.3.3-5 provides estimates of additional anticipated operations resource requirements.

Text continues on page 3-97.

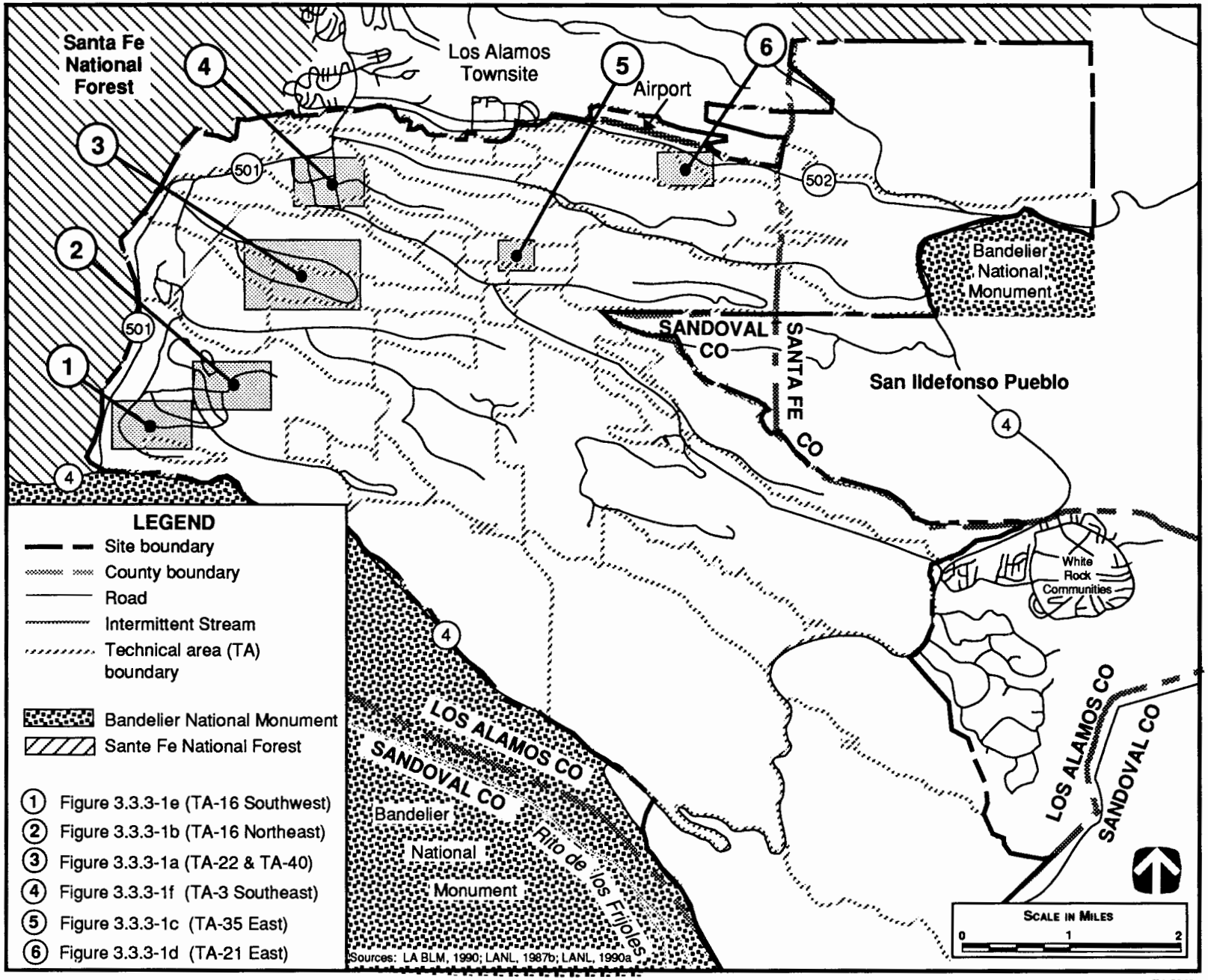

FIGURE 3.3.3-1—*Los Alamos National Laboratory-Locator Map.*

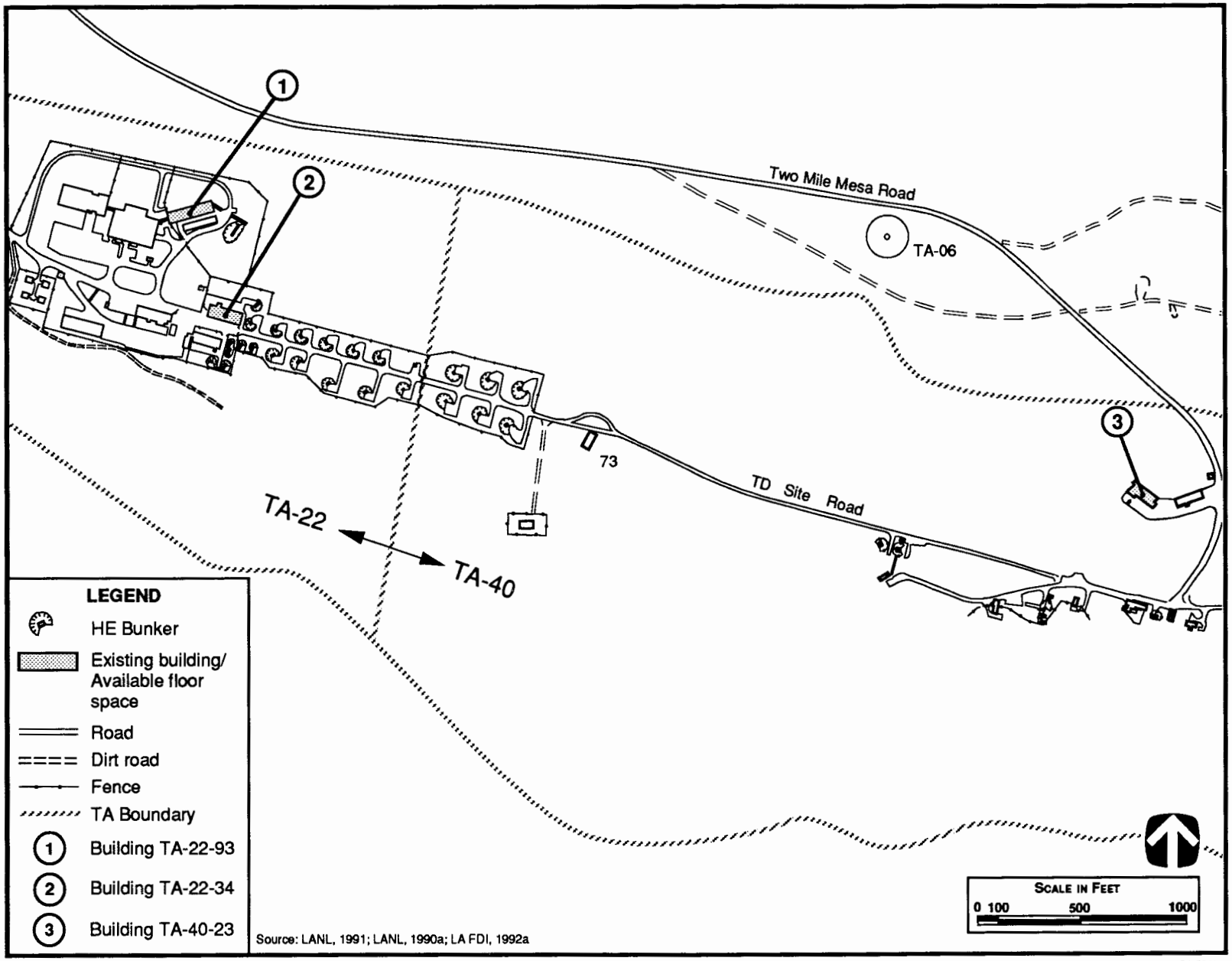

FIGURE 3.3.3-1a—*Proposed Location of High Power Detonator Functions at Los Alamos National Laboratory, TA-22 and TA-40.*

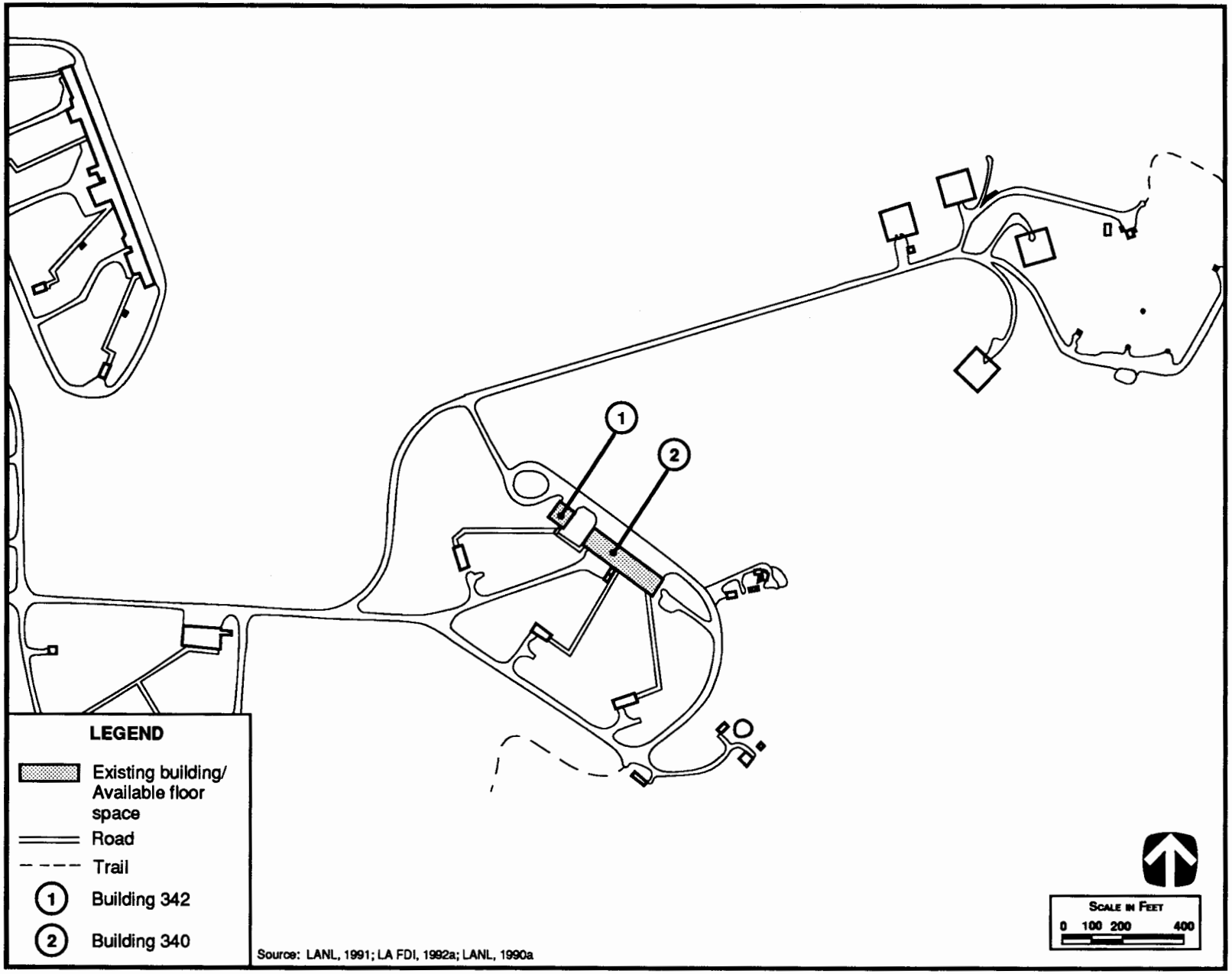

FIGURE 3.3.3-1b—***Proposed Location of High Power Detonator Functions at Los Alamos National Laboratory, TA-16 Northeast.***

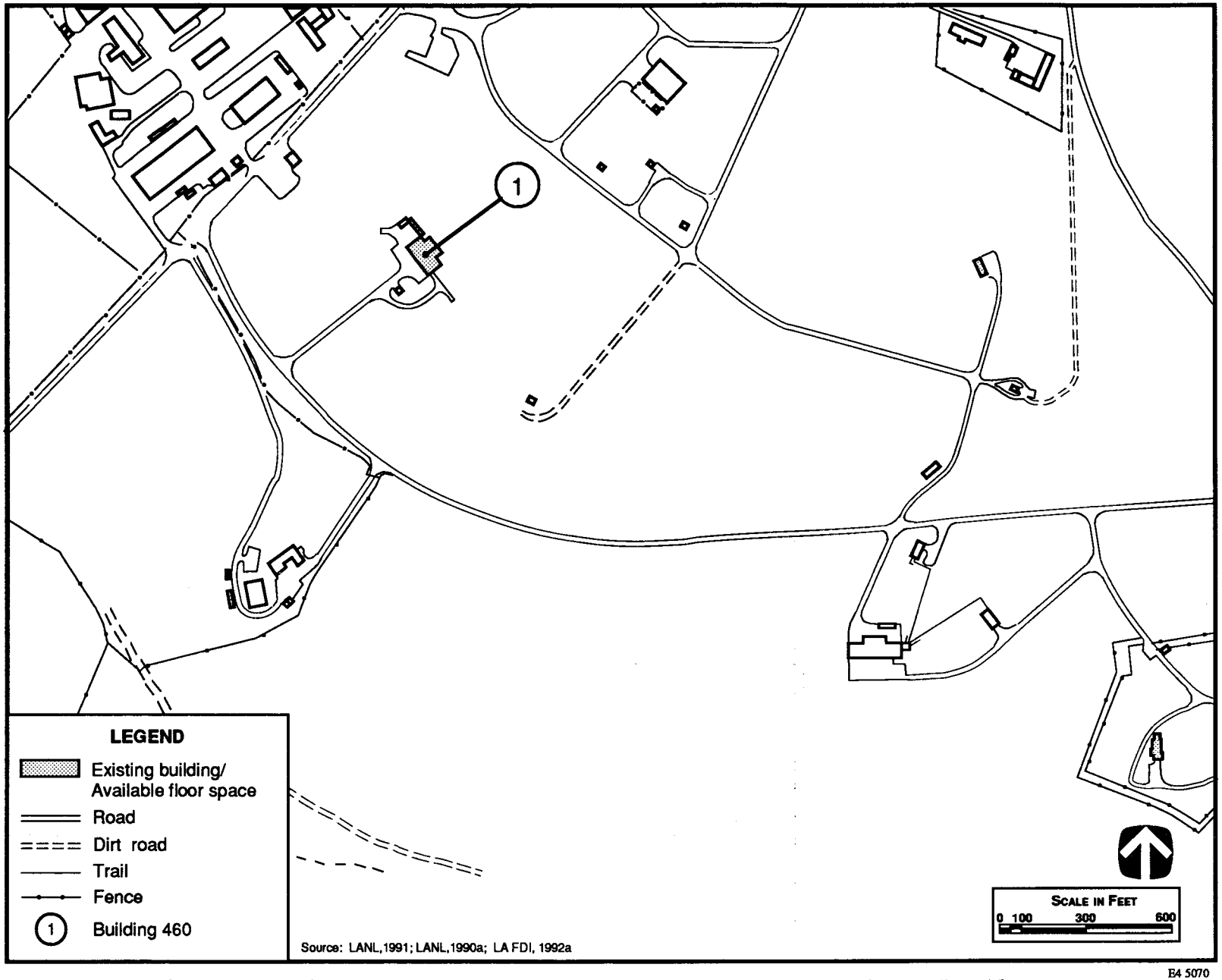

FIGURE 3.3.3-1c—*Proposed Location of High Power Detonator Functions at Los Alamos National Laboratory, TA-16 Southwest.*

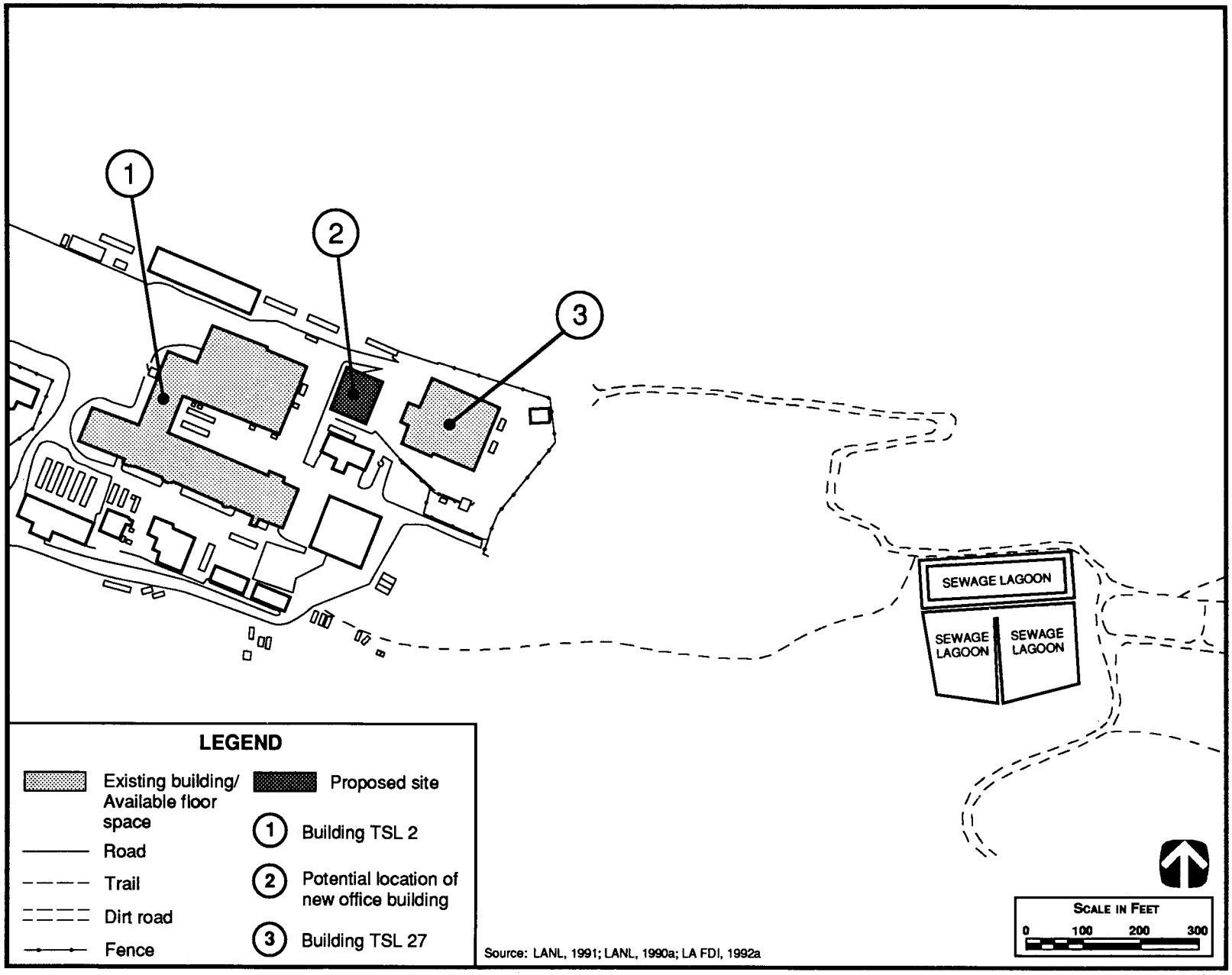

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FIGURE 3.3.3-1d—*Proposed Location of Calorimeter Operations at Los Alamos National Laboratory, TA-35 East.*

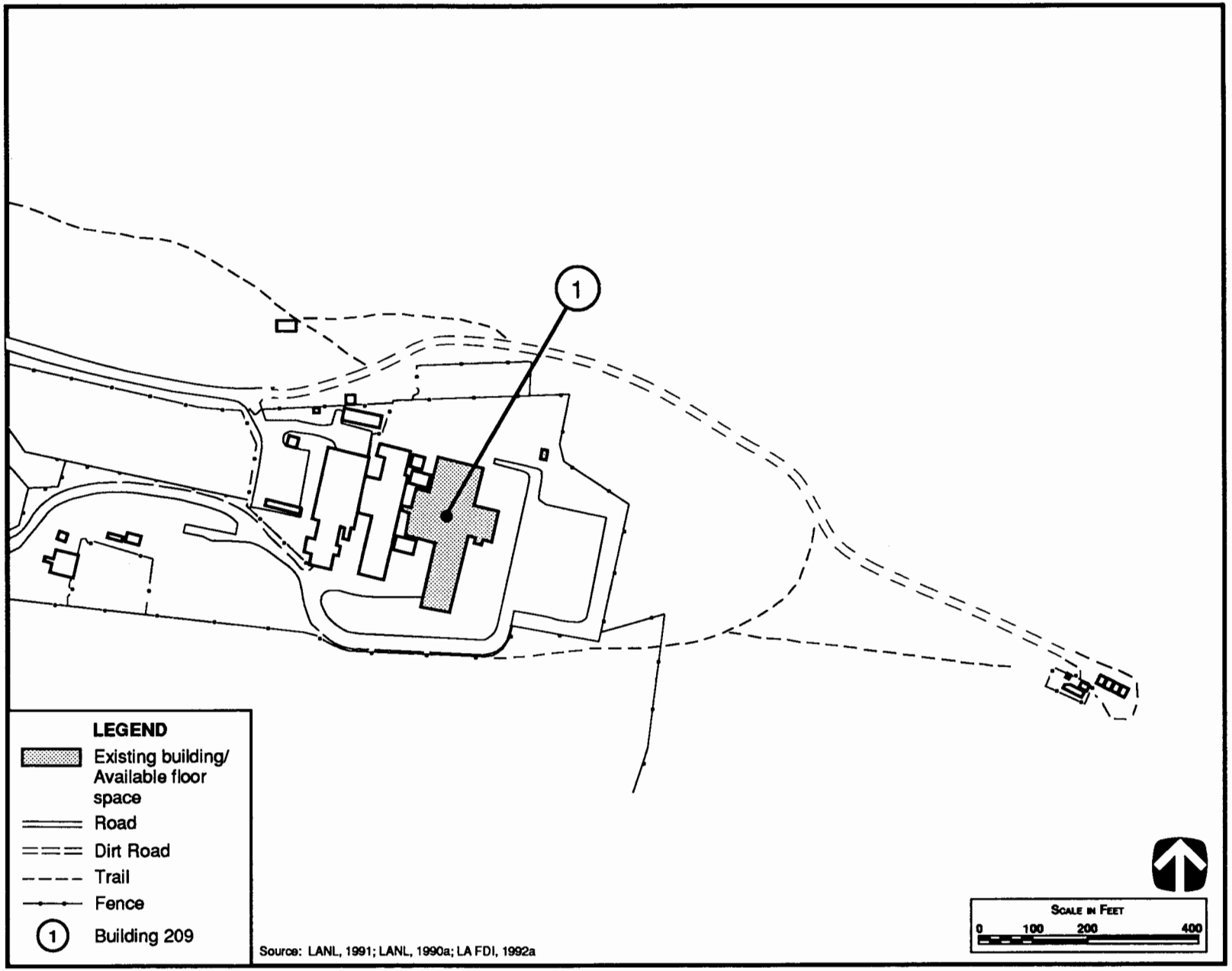

FIGURE 3.3.3-1e—*Proposed Location of Neutron Tube Target Loading Operations at Los Alamos National Laboratory, TA-21 East.*

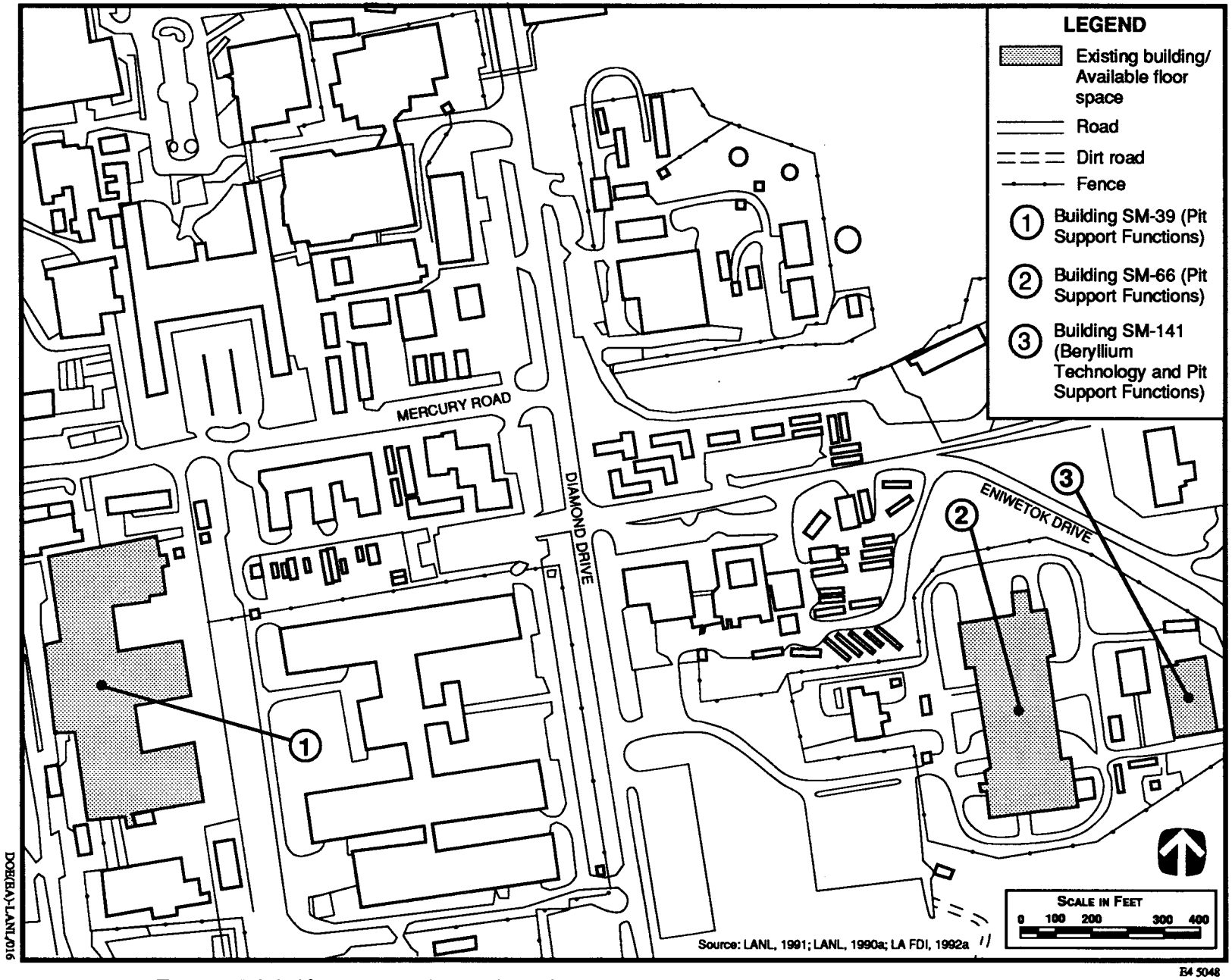

FIGURE 3.3.3-1f—***Proposed Location of Beryllium Technology and Pit Support Functions at Los Alamos National Laboratory, TA-3 Southeast.***

TABLE 3.3.3–2.—*Los Alamos National Laboratory: Interior Construction/ Modification Requirements—Proposed Action*

Relocated Activity	Construction/Modification & Demolition	Remedial Measures	Mechanical & Electrical
High Power Detonators This activity would be moved into Buildings 34 and 93 in TA 22, and Buildings 340, 342 and 460 in TA 16. Existing occupants of Building 34 would be relocated to Building 23 in TA 40. Building 23 would require remodeling to accommodate the new occupants. No major modifications to Buildings 93, 340, 342 and 460.	Extensive interior modifications of Building 34. Demolition of steps, landing, walls, HVAC, floors, plumbing, utilities and electrical systems, windows and roofing. Construct seismic upgrades, concrete ramps, steps and dock areas, walls and floors. Install new doors, interior walls, plumbing and utility systems. Extensive interior modifications of Building 23. Demolition of masonry walls, stairs, floor, windows, doors, HVAC, plumbing, utility, and electrical systems and existing roofing. Construct and install seismic upgrades, floors, walls, plumbing, and utilities.	Asbestos abatement	Extensive electrical and mechanical modifications for both Buildings 34 and 23; install additional power and lighting, fire protection and HVAC systems.
Calorimeters This activity would be moved into Buildings 2 and 27 in TA 35, and a 3,055 ft^2 prefabricated office facility.	No major interior modifications/ construction required. Pour concrete pad for prefabricated office facility.	None	Install connections for additional utilities (water, gas, electricity) for prefabricated office facility. Install sprinkler and five alarm systems.
Neutron Tube Target Loading This activity would be located in Building 209 in TA 21.	Demolition of interior block masonry wall, metal partitions, and doors. Construction of new walls, partitions and doors.	Asbestos abatement and removal of tritium contaminated equipment.	Modification of HVAC, plumbing, utility and electrical systems.
Beryllium Technology This activity would be moved into Building 141 in TA 3.	Expand existing space; interior modifications include demolition of masonry walls, doors, windows, HVAC, electrical systems, stairway, stack and roofing; construct and install seismic upgrades, walls, doors, roof and utilities; install new HVAC equipment room; rearrange existing equipment; construct liquid waste holding tank.	Asbestos abatement	Modify existing HVAC and utilities; install new additional HVAC system; install additional power and lighting.
Pit Support Functions This activity would be moved into Buildings 39, 66 and 141 in TA 3. No modifications to Buildings 39 and 141 are necessary for this activity.	Expand existing space; some interior modifications; rearrange existing equipment; construct new drywall and framing.	None	None

E4 3932

Source: LA FDI, 1992a and b.

TABLE 3.3.3–1.—*Los Alamos National Laboratory: Proposed Action*

Activity	Space Req. (ft^2)	Location	Donor Site
High Power Detonators	9,500	Bldgs. 34, 93 in TA 22 and Bldgs. 340, 342, & 460 in TA 16	Mound
Calorimeters	3,000	Bldgs. 2 & 27 in TA 35	Mound
Neutron Tube Target Loading	3,000	Bldg. 209 in TA 21	Pinellas
Beryllium Technology	2,700	Bldg. 141 in TA 3	RFP
Pit Support Functions	2,000	Bldgs. 39, 66 & 141 in TA 3	RFP
Total	20,200		

E4 3931

Source: LANL 1992a, c, d and e, LA FDI, 1992b.

TABLE 3.3.3-3.—*Los Alamos National Laboratory: Estimated Construction Material/ Resource Requirements—Proposed Action*

Materials/Resources	Requirement
Utilities:	
Electricity	2,750 kWh
Water	5,500 GPD
Solids:	
Concrete	360 yd^3
Steel (structural, rebar, ductwork, and piping)	48 tons
Liquid Fuels	25,000 gal
Gases	52,000 ft^3

E4 3766

Source: LA FDI, 1992b.

TABLE 3.3.3-4.—*Los Alamos National Laboratory: Estimated Additional Annual Waste Generation—Proposed Action*

Waste Type	Quantity
Hazardous/Toxic	
Liquid	7,508 gal
Solid	3,300 ft^3
Nonhazardous	
Liquid	442,000 gal
Solid	28,680 ft^3
LLW	
Liquid	30 gal
Solid	200 ft^3
Mixed	
Liquid	None
Solid	20 ft^3

E4 3933

Source: LA FDI, 1992b.

TABLE 3.3.3-5.—*Los Alamos National Laboratory: Estimated Additional Operations Resource Requirements—Proposed Action*

Utility Resources	Average Daily Consumption	Peak Demand
Electricity	4,700 kWh	3,045 kW
Natural Gas	685 ft^3	175 ft^3/hr
Water	1,840 gal	65 GPM

Chemical Resources	Annual Consumption
Nitrogen	1,600 gal
Argon	40,500 ft^3
Helium	1,000 ft^3
Hydrogen	400 ft^3

E4 3768

Source: LA FDI, 1992b.

3.3.4 Y-12 Plant

The beryllium technology and pit support functions to be collocated at Y-12 as an option to the Proposed Action would be situated within existing buildings on the ORR as shown in figure 3.3.4-1. Table 3.3.4-1 provides estimated space requirements and specifies location for the relocated beryllium technology and pit support activities.

Interior construction/modification requirements at Y-12 are addressed in table 3.3.4-2. Anticipated construction material/resource requirements are presented in table 3.3.4-3.

Beryllium and pit support waste streams are discussed in section 3.3.3. Table 3.3.4-4 presents a summary of waste streams at Y-12 from relocated products. A detailed description of the waste streams and waste management and disposal of the wastes is provided in appendix B.4. A discussion of effluents is also in appendix B.4 while air emissions are covered in appendix D.

As a result of this consolidation, certain hazardous chemicals of particular concern because of their possible release during potential accidents (discussed in detail in appendix F and included in table F5.1) would be used in activities transferred to Y-12. These chemicals are beryllium compounds (beryllium oxide and beryllium sulfate) used in coating graphite crucibles and molds to prevent exothermic reaction of molten beryllium with graphite in the vacuum induction melting and gas atomization melting processes. The maximum increase in beryllium compounds as a result of consolidation would be less than 1 percent of the quantity presently handled and stored at Y-12.

The impacts of chemicals associated with normal operations are discussed in section 4.1.4.9.

No onsite utility (water, electricity, etc.) upgrade requirements are anticipated. Existing support facilities would be utilized to provide specialized services (such as testing, coating, industrial hygiene, maintenance, etc.) for the relocated activities.

Anticipated resource requirements resulting from the relocation of beryllium technology and pit support activities to ORR's Y-12 facility are presented in table 3.3.4-5.

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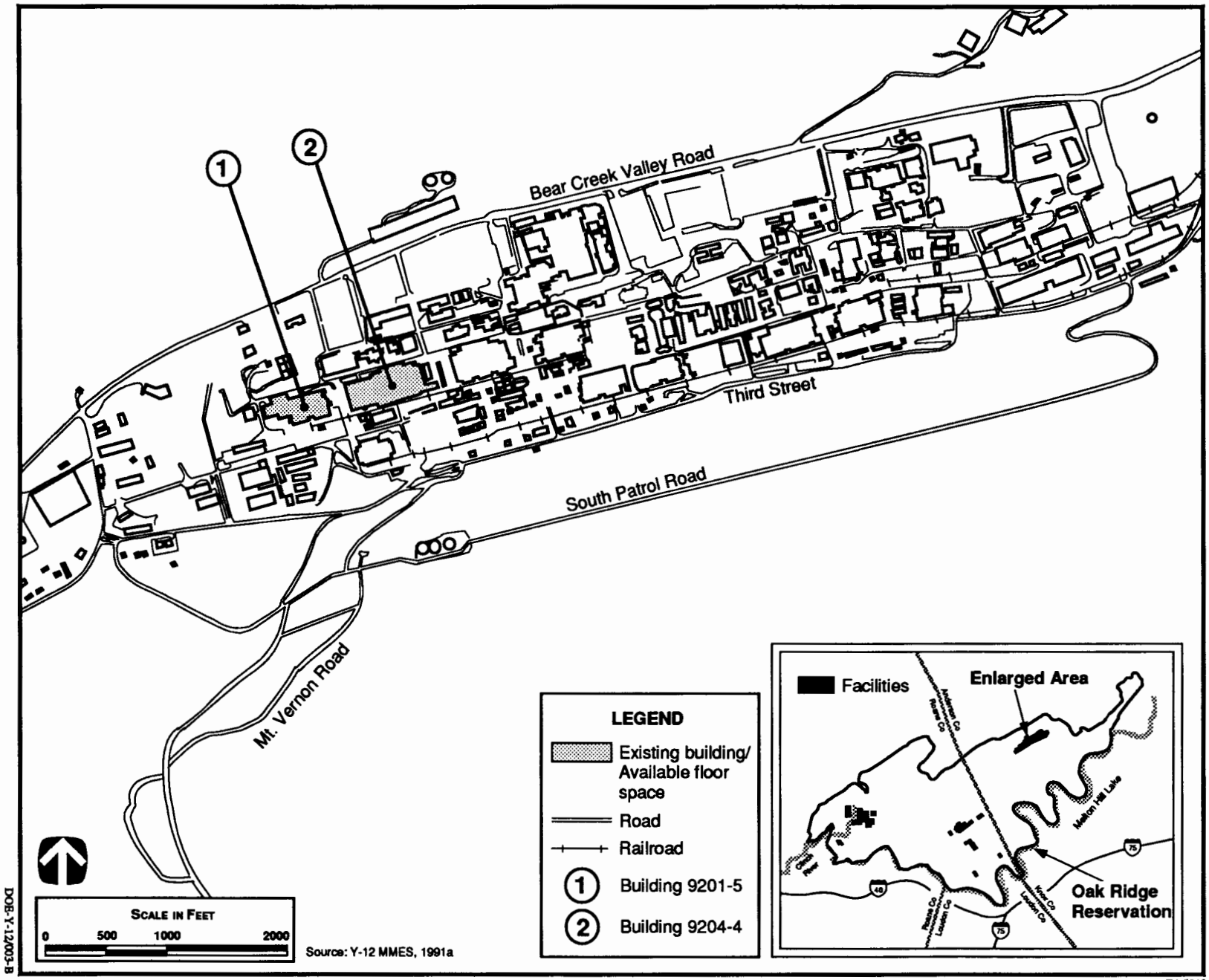

FIGURE 3.3.4-1—*Proposed Location of New Operations at the Oak Ridge Reservation Y-12 Plant.*

TABLE 3.3.4–1.—*Oak Ridge Reservation Y-12 Plant—Proposed Action*

Activity	Space Req (ft^2)	Location	Donor Site
Beryllium Technology	8,890	Bldg. 9201-5	Rocky Flats
Pit Support Functions	730	Bldg. 9204-4	Rocky Flats
Total	9,620		

E4 3256

Source: Y–12 MMES, 1992c.

TABLE 3.3.4-2.—*Oak Ridge Reservation Y-12 Plant: Interior Construction/Modification Requirements—Proposed Action*

Relocated Activity	Construction/Modification & Demolition	Remedial Measures	Mechanical & Electrical
Beryllium Technology This activity would be located in Building 9201-5 which would require modifications necessary to accommodate the equipment that would be moved from RFP.	Remove and replace existing equipment, platforms, stairs, support structures, platforms, relocate equipment from current location in preparation for vacuum furnace relocation; install walls and wall partitions; air lock entrances, gloveport windows; construct supports and platforms; construct new room to house gas atomization equipment; extend ceiling above roof for extended head room; construct walls, doors, ceilings, windows. Construct new enclosure for ultrasonic cleaner to shield remaining work area from noise. Relocate vacuum furnace from within Y-12. Construct small enclosed room for cleaning beryllium contaminated items.	None	Remove and replace space heating, sump pump, utility piping and ductwork; modify existing large inert gas atmospheric glovebox to provide an enclosed wash station with breakout chambers; install new HEPA filter system; install/modify sprinkler systems in atomization chamber, HIP area, measuring machine area, and machining tools area; rearrange existing electrical services; modify existing vacuum chamber electricity services; install gasketed lighting fixtures for enclosed decontamination room; install additional power and lighting.
Pit Support Functions This activity would be located in Building 9204-4, which would require modifications necessary to accommodate the equipment that would be moved from RFP.	Remove existing equipment and piping; modify existing floor to allow for vibration isolation for forming machine; install new vacuum brazing furnace.	None	Relocate and install auto spin machine, power supply cabinets, hydraulic unit, and control equipment; install piping for natural gas and tower water, instrument air and plant air; install new vacuum brazing furnace. Remove and replace piping, raceway, conduit and wiring associated with equipment, power distribution system and route to forming machine equipment; install additional power and lighting.

E4 3797

Source: Y–12 MMES, 1992c.

TABLE 3.3.4-3.—*Oak Ridge Reservation Y-12 Plant: Estimated Construction Material/ Resource Requirements—Proposed Action*

Materials/Resources	Requirement
Utilities:	
Electricity	1,752,000 kWh
Water	200 GPD
Solids:	
Concrete	NA
Steel (structural, rebar, ductwork, and piping)	16.8 tons
Liquid Fuels	0 gal
Gases	0 ft^3

E4 3478

Source: Y–12 MMES, 1992b.

TABLE 3.3.4-4.—*Oak Ridge Reservation Y-12 Plant: Estimated Additional Annual Waste Generation—Proposed Action*

Waste Type	Quantity
Hazardous/Toxic	
Liquid	4,310 gal
Solid	930 ft^3[a]
Nonhazardous	
Liquid (treated H_2O)	3,579 gal
Solid	Negligible
LLW	
Liquid	NA
Solid	22.2 ft^3
Mixed	
Liquid	NA
Solid	NA

E4 3798

[a] Assumes 15 percent sludge generated from water during treatment at Y-12 Central Pollution Control Facility and West End Treatment Facility.

Source: Y–12 MMES, 1992b.

TABLE 3.3.4-5.—*Oak Ridge Reservation Y-12 Plant: Estimated Additional Operations Resource Requirements—Proposed Action*

Utility Resources	Average Daily Consumption	Peak Demand
Electricity	3,960 kWh	500 kWh
Natural Gas	0 ft^3	0 ft^3/hr
Water	1,000 gal	40 GPM

Chemical Resources	Annual Consumption
Nitrogen	0 gal
Argon	10,000 ft^3
Helium	2,160 ft^3
Hydrogen	0 ft^3
Deionized Water	1,000 gal

E4 3480

Source: Y-12 MMES, 1992a.

3.3.5 Sandia National Laboratories, Albuquerque

Neutron generator, thermal batteries, and cap assemblies at Pinellas (discussed in section 3.2.3) and the milliwatt heat source surveillance function at Mound (discussed in section 3.2.2) would be relocated. These functions would be situated within existing buildings at SNL as shown in figure 3.3.5-1. The estimated space requirements and planned location of the relocated products are provided in table 3.3.5-1.

Relocated neutron generator manufacturing activities except tritium loading of the neutron tube targets would be performed at SNL. Tritium loading operations would be performed at LANL, as already discussed in section 3.3.3. Building 870 at SNL would be modified to support the neutron generator by extensive modifications to include the addition of a second story on the northern (oldest) part of the building.

Shelf-life-storage neutron generator units and other tritium inventory items would be stored in Building 6730 in Tech Area III where adequate stand-off is available for the storage of larger tritium quantities than allowable in Building 870.

Approximately 3,050 ft^2 of Building 841 would be modified to accommodate various processes used in cap assemblies. Machining operations would be performed in Building 840, while flame spraying and related operations would be done in Building 842. There would be some other minor accommodations made in existing work spaces and building for cap assemblies.

The capability for backup manufacture of thermal batteries at SNL would be established by renovating portions of Building 894 and relocating necessary equipment. Approximately 400 ft^2 in Building 894 would be used for milliwatt heat source surveillance operations.

Construction/modification requirements at SNL are summarized in table 3.3.5-2. Anticipated construction material/resource requirements are in table 3.3.5-3.

As a result of this consolidation, certain hazardous chemicals of particular concern because of their possible releases during potential accidents (discussed in detail in appendix F and included in table F5.1) would be used in activities transferred to SNL. These chemicals are methylene chloride and trichloroethylene. In 1991, SNL used 119 lb of methylene chloride and 531 lb of trichloroethylene as cleaning solvents. Processes that would be transferred as a result of this consolidation would add 11 lb of methylene chloride and 61 lb of trichloroethylene per year. Both chemicals would be used as cleaning solvents.

The impacts of chemicals associated with normal operations are discussed in section 4.1.5.9.

Table 3.3.5-4 presents the anticipated additional waste generation volume at SNL. A partial list of waste items from the relocated functions is discussed below. Waste management and effluents are discussed in greater detail in appendix B.5. Air emissions are covered in appendix D.

- *Neutron Generators*—Manufacture of neutron generators would generate additional waste streams, consisting principally of laboratory wastes and flammable liquids. Tritiated wastewater and solid LLW would be generated, as shown in table 3.3.5-4, the bulk of these additional waste streams would contain hazardous and nonhazardous materials. Wherever possible, use of hazardous solvents would be kept to a minimum.

- *Thermal Batteries*—The manufacture of thermal batteries would result in a minor addition to SNL waste streams. Solid hazardous waste would be generated in small quantities and stored in local accumulation areas before transfer to the hazardous waste storage area.

- *Cap Assemblies*—Cap assemblies would also result in a minor addition to the SNL mixed, nonhazardous, and hazardous waste.

- *Milliwatt Heat Source Surveillance*—These operations would only generate very small amounts (less than 55 ft^3 per year) of hazardous and nonhazardous waste.

Besides modifying utilities in existing buildings, no new utility services or support facilities are required. Anticipated resource requirements for the relocation of the new functions to SNL are provided in table 3.3.5–5.

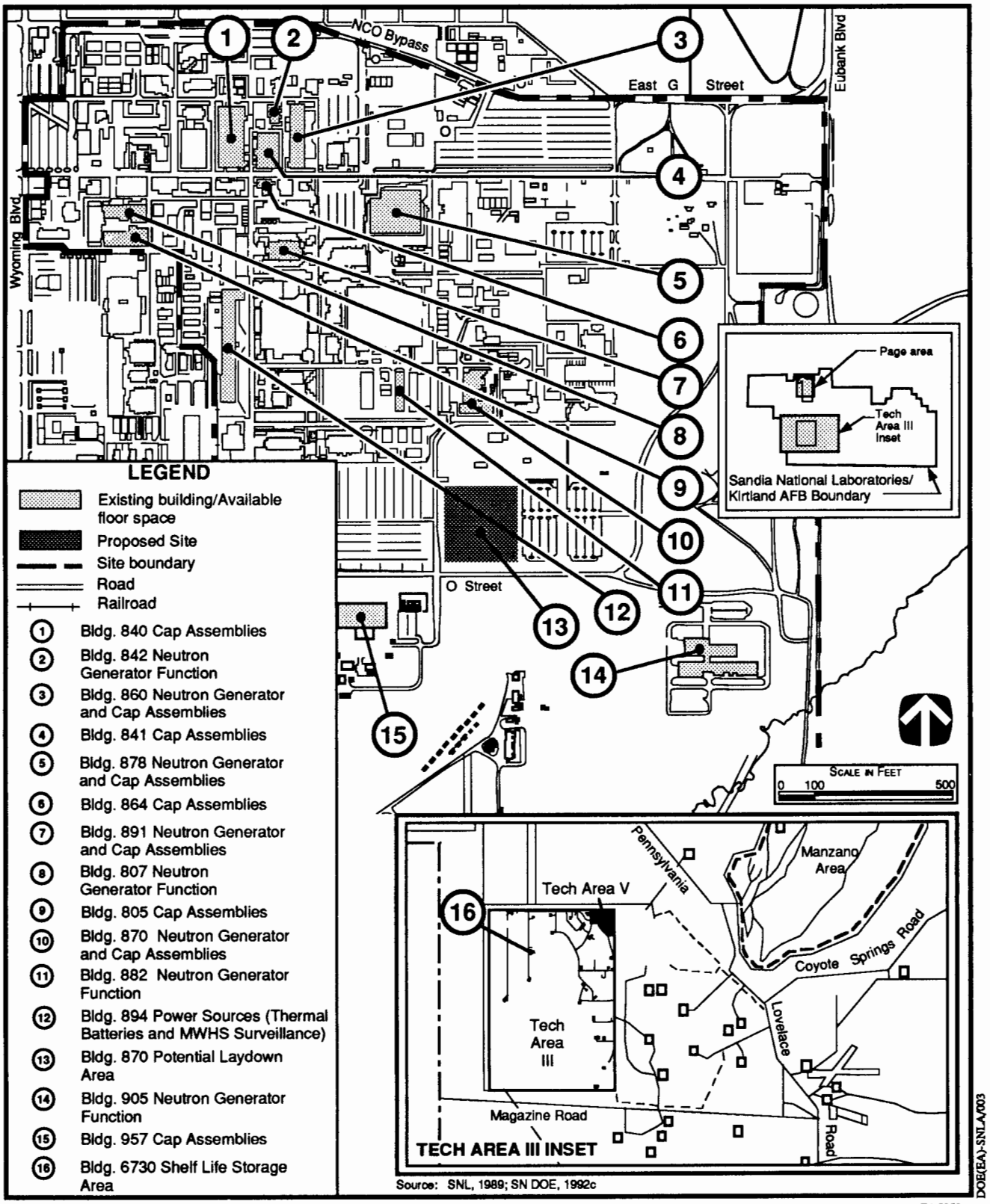

FIGURE 3.3.5-1—***Proposed Location of New Operations at Sandia National Laboratories, Albuquerque.***

TABLE 3.3.5-2.—*Sandia National Laboratories, Albuquerque: Interior Construction/Modification Requirements—Proposed Action*

Relocated Activity	Construction/Modification & Demolition	Remedial Measures	Mechanical & Electrical
Neutron Generators This activity would be located in Buildings 807, 842, 860, 870, 878, 891, 905, 957, and 6730. Building 882 would be modified to support equipment staging for new and tranferred equipment during renovations to Building 870.	Remove existing liquid hydrogen and oxygen tanks; demolish north wing, foundations, floor slabs, superstructure, and exterior walls and reconstruct north wing and second story and install new walkways at Building 870; modify Buildings 842, 860, 878; selective demolition, new partitions, repair floor and ceiling materials in Building 891; and relocate existing bridgecrane, force and pressure test frame, and 3 pressure chambers to another building and install a 30,000-gallon tank for potentially contaminated firewater runoff for Building 6730. No modifications to existing space in Buildings 807, 905, and 957.	Remove asbsestos-contaminated concrete.	Install new liquid nitrogen, argon storage tanks at Building 870; install new piping and gas manifolds to connect to hydrogen gas cylinders; install new HVAC, electrical & plumbing utility systems; new power in lighting in all buildings except 891.
Cap Assemblies This activity would be moved into Buildings, 805, 840, 841 (mostly vacant), 860, 864, 870, 878, 891, and 957.	Install new fire resistant walls and ceiling and strengthen floor foundation in Building 840; install Class 1,000 clean room in Building 841; minor facility modifications such as installation of wall partitions and 1-hour-rated walls in Buildings 860 and 864. No modifications to existing space in Buildings 805, 870, 878, 891 and 957.	Remove asbsestos-contaminated concrete.	Install additional or replacement equipment in Building 840. Install hydrogen gas storage manifold or gas pipeline at Buildings 841 and 864. No upgrades to onsite utilities would be required in Buildings 805, 830, 878, 891 and 957.
Thermal Batteries and Milliwatt Heat Source Surveillance These activities would be moved into Building 894. Building 882 would be modified to support staging for new and transferred equipment during renovations to Building 894.	Demolish interior partitions, ceilings, mechanical and electrical equipment. Remove argon and nitrogen tanks and concrete pads. Install new wall partitions, ceilings, concrete loading dock, stairs, ramp and hazardous materials storage room.	Remove asbsestos-contaminated concrete.	Modify HVAC systems; install new exhaust ductwork and roof-mounted exhaust fans; install new domestic water and sewage lines and gas piping system, install new fire protection systems.

E4 3800

Source: SNL, 1992a; SN FDI, 1992.

TABLE 3.3.5-1.—*Sandia National Laboratories, Albuquerque—Proposed Action*

Activity	Space Req (ft^2)	Location	Donor Site
Neutron Generators	84,210	Bldgs. 807, 842, 860, 870, 878, 882, 891, 905, 957, 6730	Pinellas
Cap Assemblies	12,020	Bldgs. 805, 840, 841, 860, 864, 870, 878, 891 and 957	Pinellas
Thermal Batteries and Milliwatt Heat Source Surveillance	9,200	Bldg. 894	Pinellas and Mound
Total	105,430		

E4 3799

Source: SNL, 1992g.

TABLE 3.3.5-3.—*Sandia National Laboratories, Albuquerque: Estimated Construction Material/ Resource Requirements—Proposed Action*

Materials/Resources	Requirement
Utilities:	
Electricity	480 kWh
Water	3,928 GPD
Solids:	
Concrete	2,820 yd^3
Steel (structural, rebar, ductwork, and piping)	702 tons
Liquid Fuels	54,000 gal
Gases	155,000 ft^3

E4 3481

Source: SNL, 1992a; SN FDI, 1992.

TABLE 3.3.5-4.—*Sandia National Laboratories, Albuquerque: Estimated Additional Annual Waste Generation—Proposed Action*

Waste Type	Quantity
Hazardous/Toxic	
Liquid	1,252 gal
Solid	209 ft^3
Nonhazardous	
Liquid	3,216,000 gal
Solid	9,340 ft^3
LLW	
Liquid	100 gal
Solid	294 ft^3
Mixed	
Liquid	None
Solid	0.005 ft^3

E4 3803

Source: SNL, 1992a and f.

TABLE 3.3.5-5.—*Sandia National Laboratories, Albuquerque: Estimated Additional Operations Resource Requirements—Proposed Action*

Utility Resources	Average Daily Consumption	Peak Demand
Electricity	32,000 kWh	5,000 kW
Natural Gas	30,000 ft^3	4,000 ft^3/hr
Water	25,000 gal	150 GPM

Chemical Resources	Annual Consumption
Nitrogen	167,500 gal
Argon	65,000 gal
Helium	5,000 ft^3
Hydrogen	2,118,000 ft^3
Oxygen	299,000 gal

E4 3483

Source: SNL, 1992a; SN FDI, 1992.

3.4 OTHER ALTERNATIVES

This section describes the alternative consolidation sites, Mound, Pinellas, and RFP. Table 3.4-1 shows the anticipated workforce requirements for these actions.

3.4.1 Mound Plant Alternative

The Mound alternative is similar to the Proposed Action in that neutron tube target loading from Pinellas and beryllium technology and pit support functions from RFP would be relocated to LANL (section 3.3.3); and neutron generators, cap assemblies, and thermal batteries from Pinellas would be relocated to SNL (section 3.3.5).

This alternative differs from the Proposed Action in that milliwatt heat source surveillance, high power detonators, and tritium handling functions from Mound would not be transferred to SNL, LANL, and SRS, respectively, and the remaining electrical/ mechanical and special product functions would be consolidated at Mound rather than at KCP.

With Mound as the consolidated site for nonnuclear manufacturing, the KCP, Pinellas, and RFP nonnuclear manufacturing functions would be terminated and the associated facilities turned over to DOE's EM for disposition. Figure 3.4.1-1 illustrates the consolidation alternative of transferring the electrical and mechanical nonnuclear manufacturing activities to Mound.

Electrical/mechanical functions that would be consolidated at Mound under this alternative would be situated within existing, as well as newly constructed buildings. The construction consists of five new buildings, one office expansion, new parking areas, and one new storage pad. The proposed locations of new facilities at Mound are shown in figure 3.4.1-2.

Under this alternative, all current operations at Mound, including electrical/mechanical functions, tritium functions, and detonator functions, would continue at Mound. In addition, electrical/ mechanical functions would be transferred from KCP, Pinellas, and RFP to Mound. KCP, Pinellas, and nonnuclear manufacturing operations at RFP would be phased out under this alternative. The functions to be transferred to Mound are listed in table 3.4.1-1. Descriptions of the activities to be consolidated under the Mound alternative are provided in sections 3.2.1, 3.2.3, and 3.2.4; which represent current operations at KCP, Pinellas and RFP, respectively.

This alternative would require approximately 1,659,804 ft^2 additional space at Mound to house operations related to the consolidation of electrical/

TABLE 3.4-1.—*Estimated Peak Construction/Operations Workforce Requirements—Proposed Alternatives*

	Mound Alternative		Pinellas Alternative		RFP Alternative	
Site	**Const.**	**Ops.**	**Const.**	**Ops.**	**Const.**	**Ops.**
Mound Plant	804	3,508				
Pinellas Plant			1,021	3,414		
Rocky Flats Plant					538	3,163
Savannah River Site			45	85	45	85
LANL	10	5	41	31	51	36
Y-12 Plant	162	8	162	8		
SNL	92	346	1	4	93	350
Total	1,068	3,867	1,270	3,542	727	3,634

E4 3873

Source: DOE, 1991f, 1992e; FDI, 1992a.

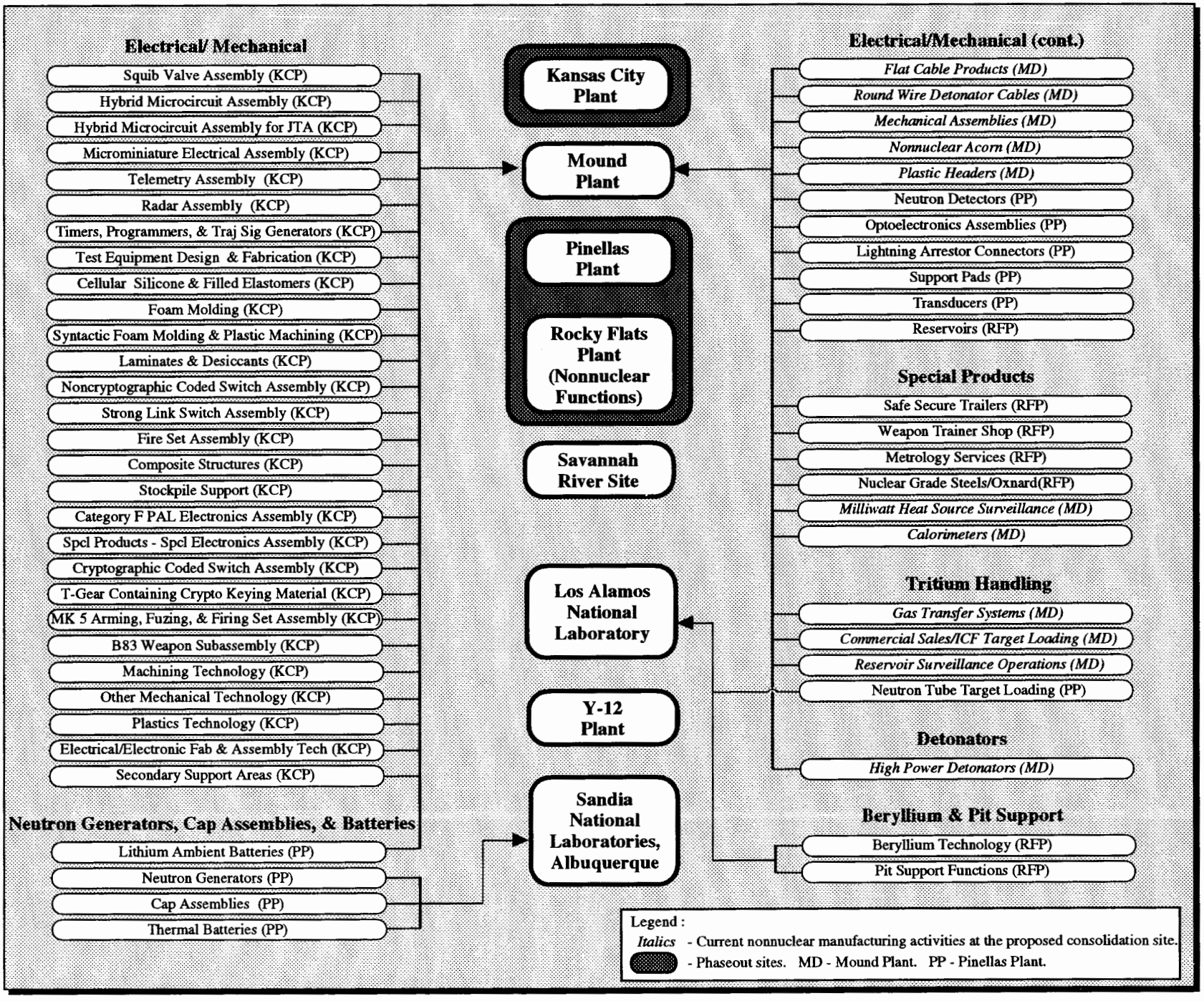

FIGURE 3.4.1-1.—*Consolidation of Electrical/Mechanical Products at Mound.*

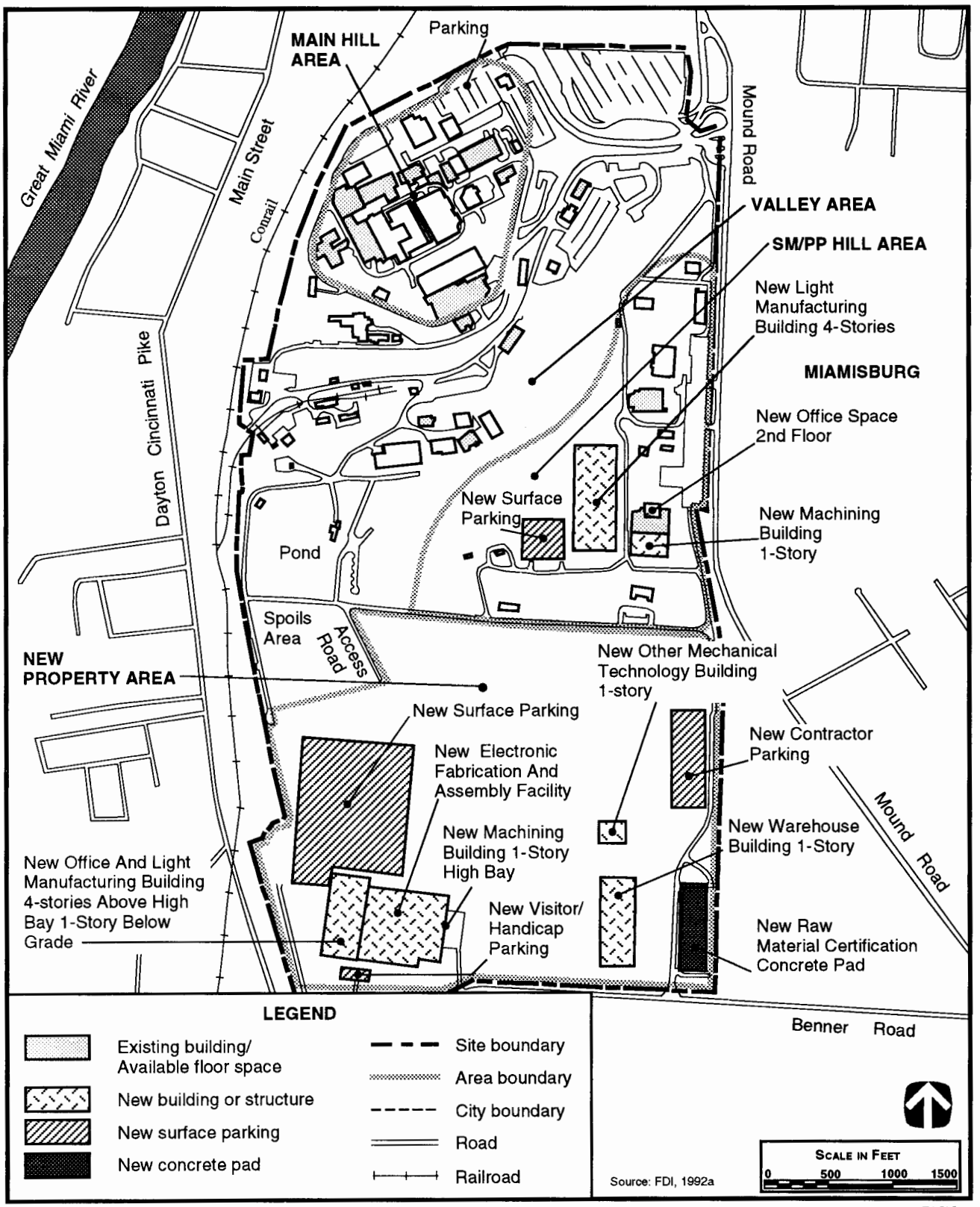

FIGURE 3.4.1-2—*Proposed Location of New Facilities at the Mound Plant.*

TABLE 3.4.1-1.—*Mound Plant Alternative: Relocated Activities to Mound*

Product	Space Req. (ft^2)	Donor Site
Squib Valve Assembly	4,600	KCP
Hybrid Microcircuit Assembly	25,400	KCP
Hybrid Microcircuit Assembly for Joint Test Assemblies	3,500	KCP
Microminiature Electrical Assembly	36,600	KCP
Telemetry Assembly	19,800	KCP
Radar Assembly	14,500	KCP
Timers, Programmers & Trajectory Sensing Signal Generators	44,000	KCP
Test Equipment Design and Fabrication	26,300	KCP
Cellular Silicone & Filled Elastomers	27,700	KCP
Foam Molding	19,700	KCP
Syntactic Foam Molding & Plastic Machining	35,000	KCP
Laminates & Desiccants	19,300	KCP
Noncryptographic Coded Switch Assembly	1,800	KCP
Strong Link Switch Assembly	32,100	KCP
Fire Set Assembly	50,100	KCP
Composite Structures	23,800	KCP
Stockpile Support	14,200	KCP
Category F PAL Electronics Assembly	9,400	KCP
Special Products - Special Electronics Assembly	14,000	KCP
Cryptographic Coded Switch Assembly	2,700	KCP
T-Gear Containing Cryptographic Keying Material	4,100	KCP
MK 5 Arming, Fuzing, and Firing Systems Assembly	12,400	KCP
B83 Weapon Subassembly	4,000	KCP
Machining Technology	144,300	KCP
Other Mechanical Technology	143,700	KCP
Plastics Technology	48,700	KCP
Electrical/Electronic Fabrication & Assembly Technology	76,300	KCP
Secondary Support Areas	52,700	KCP
Lithium Ambient Batteries	7,400	Pinellas
Neutron Detectors	11,200	Pinellas
Optoelectronics Assemblies	9,900	Pinellas
Lightning Arrestor Connectors	3,750	Pinellas
Support Pads	460	Pinellas
Transducers	500	Pinellas
Reservoirs	20,000	RFP
Safe Secure Trailers	29,400	RFP
Weapon Trainer Shop	6,800	RFP
Metrology Services	0	RFP
Nuclear Grade Steels/Oxnard	8,800	RFP
Product Procurement	278,000	All Sites
Production Support	206,600	All Sites
Indirect Function Support Facilities	166,294	All Sites
Total	1,659,804	

E4 3297

Source: FDI, 1992e.

mechanical functions. Mound currently has only 300,000 ft^2 of space available for these activities. Therefore, approximately 1,359,804 ft^2 of additional facility space would have to be constructed at Mound under this alternative. Table 3.4.1-1 describes square footage requirements for activities from all involved sites should Mound be selected as the consolidation site. Additional land area requirements for the consolidation of nonnuclear manufacturing activities at Mound, including construction laydown area and additional parking, are listed in table 3.4.1-2. Anticipated construction materials/resource requirements are listed in table 3.4.1-3.

Primary products to be transferred from KCP to Mound include: (1) electrical and electronics items such as radars, firing systems, timers, telemetry, unique signal generators, cables, printed wiring boards, field test equipment, microelectronics, large scale integrated circuits, arming and fuzing systems and depth sensors; (2) mechanical devices such as coded switches, squib valves, case parts, fins, strong link switches, inertial sensing devices, battery actuators, structural supports, handling equipment, locking tapes, command disable devices, and assembly hardware; and (3) plastics items such as compression pads, membranes, cushions, foam supports, composite structures, metal-filled polymers, insulators, radomes, shock mitigators, molded rigid plastics, desiccants, and hydrogen getters.

Products to be transferred to Mound from Pinellas include optoelectronics assemblies, neutron detectors, support pads, lightning arrestor connectors, and transducers.

TABLE 3.4.1-3.—*Mound Plant Alternative: Estimated Construction Materials/Resource Requirements at Mound*

Materials/Resources	Requirement
Utilities:	
Electricity	2,200 kWh
Water	13,000 GPD
Solids:	
Concrete	48,050 yd^3
Steel (structural, rebar, ductwork, and piping)	12,692 tons
Other (paving)	13,745 tons
Liquid Fuels	737,300 gal
Gases	2,119,000 ft^3

E4 3493

Source: FDI, 1992a.

Missions to be transferred from RFP to Mound include reservoirs, nuclear grade steels/Oxnard, safe secure trailers, weapons trainer shop, and metrology services (FDI, 1992a).

The transfer of all activities from KCP to Mound would involve the generation of additional hazardous wastes and nonhazardous wastes. The additional hazardous waste volume of Mound due to consolidation could require revision of existing hazardous waste permits, because new facilities must be added to handle the additional volume. Table 3.4.1-4 provides a summary of anticipated additional annual waste generation. A discussion of the wastes,

TABLE 3.4.1-2.—*Mound Plant Alternative: Additional Land Area Requirements at Mound*

Land Use	Total Area	
	Square Feet	Acres
Building(s) footprint(s)	493,375	11
Additional parking	656,125	15
Construction laydown area	1,089,000	25
Construction parking	174,240	4
Total	2,412,740	55

E4 3862

Source: FDI, 1992a and c.

effluents, and emissions and discussions related to their treatment/management can be found in appendix C.1.

Additional support facilities would provide for the balance of plant functions, which include at a minimum administration, cafeteria service, medical services, fire protection, security, all maintenance functions, environmental monitoring, utility services, Emergency Operations Center, and parts warehousing and storage.

TABLE 3.4.1-4.—*Mound Plant Alternative: Estimated Additional Annual Waste Generation at Mound*

Waste Type	Quantity
Hazardous/Toxic	
Liquid	47,600 gal
Solid	12,300 ft^3
Nonhazardous	
Liquid	291 million gal
Solid	600,000 ft^3
LLW	
Liquid	None
Solid	15 ft^3
Mixed	
Liquid	None
Solid	9 ft^3

E4 3494

Source: FDI, 1992e.

Additional utility upgrade requirements for consolidation at Mound include raw water, power consumption, natural gas, and steam. Water and steam are produced on the plant site; natural gas and electricity are provided by local utility companies.

The anticipated additional resource requirements for nonnuclear manufacturing electrical/mechanical consolidation at Mound are shown in table 3.4.1-5.

3.4.2 Pinellas Plant Alternative

The Pinellas alternative is similar to the Proposed Action in that tritium handling functions from Mound would be relocated to SRS (section 3.3.2); calorimeters and high power detonators from Mound and beryllium technology and pit support functions from RFP would be relocated to LANL (section 3.3.3); and milliwatt heat source surveillance functions from Mound would be transferred to SNL (section 3.3.5).

This alternative differs from the Proposed Action in that neutron tube target loading from Pinellas would not be transferred to LANL; neutron generators, cap assemblies, and thermal batteries from Pinellas would not be transferred to SNL; and the remaining

TABLE 3.4.1-5.—*Mound Plant Alternative: Estimated Additional Operations Resource Requirements at Mound*

Utility Resources	Average Daily Consumption	Peak Demand
Electricity	272,000 kWh	28,000 kW
Natural Gas	917,000 ft^3	123,000 ft^3/hr
Water	944,000 gal	1,200 GPM

Chemical Resources	Annual Consumption
Nitrogen	2,431,000 gal
Argon	2,812,000 gal
Helium	760,000 ft^3
Hydrogen	8,000 ft^3
Carbon Dioxide	5,912,000 gal

E4 3495

Table assumes Mound operates 365 days per year.

Source: FDI, 1992e.

electrical/mechanical and special product functions would be consolidated at Pinellas rather than at KCP.

With Pinellas as the consolidated site for nonnuclear manufacturing, the KCP, Mound, and RFP nonnuclear manufacturing functions would be terminated. Figure 3.4.2-1 illustrates the consolidation alternative of transferring the electrical and mechanical nonnuclear manufacturing activities to Pinellas.

Consolidation of electrical/mechanical functions at Pinellas would require the construction of three new buildings, a large three-story office/production facility, a one-level mechanical/technical facility to store hazardous materials, and a five-level parking garage. The proposed locations of new facilities at Pinellas are shown in figure 3.4.2-2.

All current electrical/mechanical functions at Mound, RFP, and KCP would be transferred to Pinellas. The activities to be consolidated at Pinellas are listed in table 3.4.2-1. Descriptions of the activities are provided in sections 3.2.1, 3.2.2, and 3.2.4 which represent current operations at KCP, Mound, and RFP, respectively.

With Pinellas as the consolidation site for electrical/mechanical functions, a total of 1,673,685 ft^2 of new construction would be required to accommodate the consolidated activities. Pinellas currently has no space available for these activities. The total square footage increases for new construction in the production area and the indirect support areas are 1,506,000 and 167,685 ft^2, respectively. A new three-story office/manufacturing building would be constructed at the north end of the site, a five-level parking structure would be built in the east central portion of the site, and a new one-story mechanical/technical facility would be constructed to store hazardous chemicals. Renovations are also required for production and support facilities. Table 3.4.2-1 lists additional space requirements for each of the transferred activities. Additional land area requirements for the consolidation of nonnuclear manufacturing activities at Pinellas, including construction laydown area and additional parking, are listed in table 3.4.2-2.

Construction of new facilities and renovation of existing facilities would require the consumption of concrete, fuel, steel, and gases as estimated in table 3.4.2-3. A laydown area estimated at 30 acres would be needed, as well as an estimated 5 acres for construction parking.

Primary products to be transferred from KCP to Pinellas include : (1) electrical and electronics items such as radars, firing systems, timers, telemetry, unique signal generators, cables, printed wiring boards, field test equipment, microelectronics, large scale integrated circuits, arming and fuzing systems, and depth sensors: (2) mechanical devices such as coded switches, squib valves, case parts, fins, strong link switches, inertial sensing devices, battery actuators, structural supports, handling equipment, locking tapes, command disable devices, and assembly hardware; and (3) plastic items such as compression pads, membranes, cushions, foam supports, composite structures, metal-filled polymers, insulators, radomes, shock mitigators, molded rigid plastics, desiccants, and hydrogen getters.

Products to be transferred from Mound to Pinellas include electrical/mechanical products such as flat cable products, mechanical assemblies and detonator safing strong link, round wire detonator cables, nonnuclear Acorn, and plastic headers.

Missions to be transferred from RFP to Pinellas include reservoirs, nuclear grade steels/Oxnard, safe secure trailers, weapons trainer shop, and metrology services (FDI, 1992a).

The consolidation of functions at Pinellas would require the transfer of the following processes from KCP, Mound, and RFP: soldering, welding, bonding, lasers, robotics, cleaning, wire/sleeving, preparation, encapsulation, wafer fabrication, semiconductor packing, machining, plating and surface finishing, painting and special coatings,

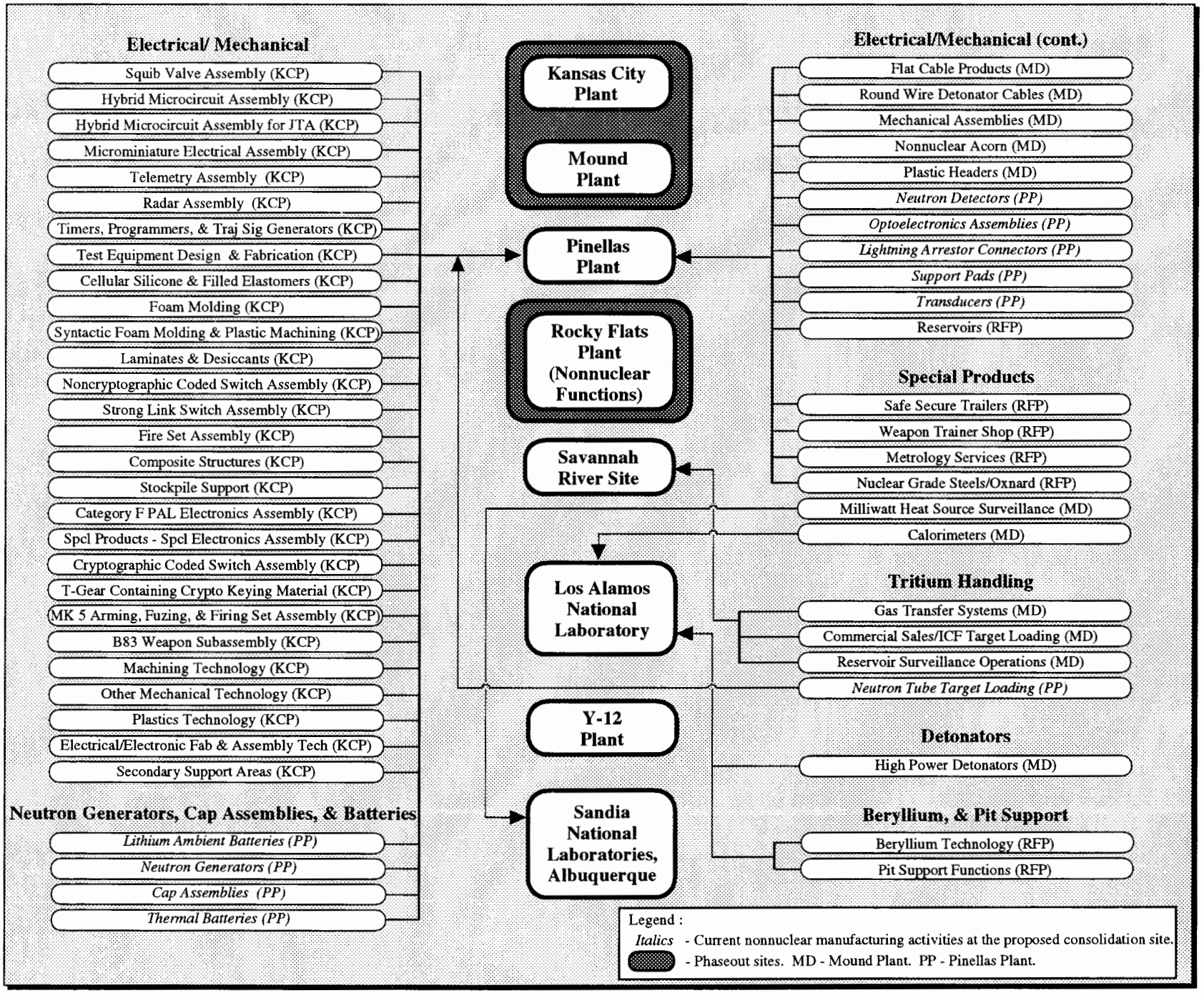

FIGURE 3.4.2-1.—*Consolidation of Electrical/Mechanical Products at Pinellas.*

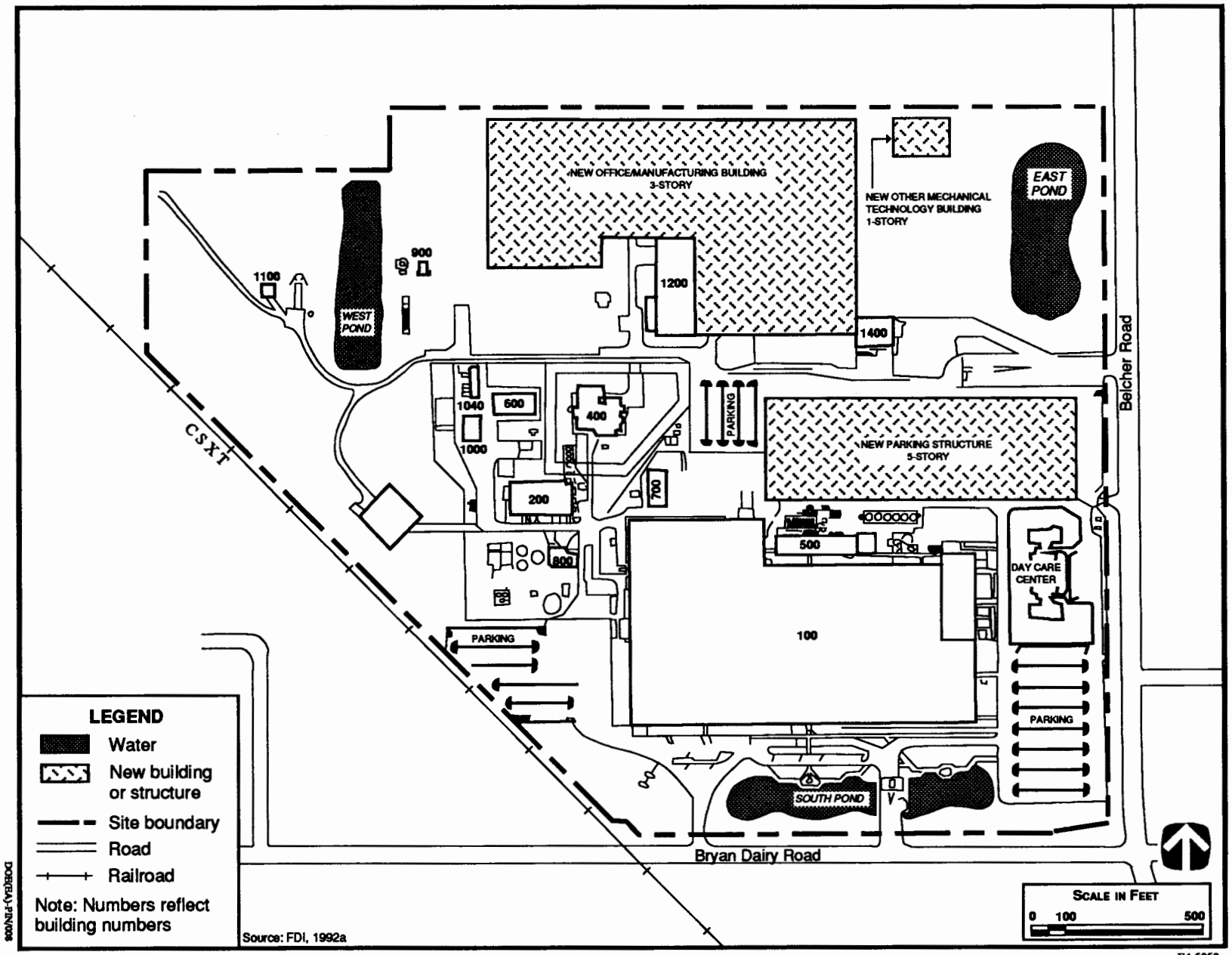

FIGURE 3.4.2-2—*Proposed Location of New Facilities at the Pinellas Plant.*

TABLE 3.4.2-1.—*Pinellas Plant Alternative: Relocated Activities to Pinellas*

Product	Space Req. (ft^2)	Donor Site
Squib Valve Assembly	4,600	KCP
Hybrid Microcircuit Assembly	25,400	KCP
Hybrid Microcircuit Assembly for Joint Test Assemblies	3,500	KCP
Microminiature Electrical Assembly	36,600	KCP
Telemetry Assembly	19,800	KCP
Radar Assembly	14,500	KCP
Timers, Programmers & Trajectory Sensing Signal Generators	44,000	KCP
Test Equipment Design and Fabrication	26,300	KCP
Cellular Silicone & Filled Elastomers	27,700	KCP
Foam Molding	19,700	KCP
Syntactic Foam Molding & Plastic Machining	35,000	KCP
Laminates & Desiccants	19,300	KCP
Noncryptographic Coded Switch Assembly	1,800	KCP
Strong Link Switch Assembly	32,100	KCP
Fire Set Assembly	50,100	KCP
Composite Structures	23,800	KCP
Stockpile Support	14,200	KCP
Category F PAL Electronics Assembly	9,400	KCP
Special Products - Special Electronics Assembly	14,000	KCP
Cryptographic Coded Switch Assembly	2,700	KCP
T-Gear Containing Cryptographic Keying Material	4,100	KCP
MK 5 Arming, Fuzing, and Firing Systems Assembly	12,400	KCP
B83 Weapon Subassembly	4,000	KCP
Machining Technology	144,300	KCP
Other Mechanical Technology	143,700	KCP
Plastics Technology	48,700	KCP
Electrical/Electronic Fabrication & Assembly Technology	76,300	KCP
Secondary Support Areas (Plating, Painting, HT and Welding)	52,700	KCP
Flat Cable Products	16,500	Mound
Round Wire Detonator Cables/Plastic Headers	1,000	Mound
Mechanical Assemblies	5,600	Mound
Reservoirs and Nonnuclear Acorn	31,600	Mound & RFP
Safe Secure Trailers	29,400	RFP
Weapon Trainer Shop	6,800	RFP
Metrology Services	0	RFP
Nuclear Grade Steels/Oxnard	8,800	RFP
Product Procurement	289,000	All Sites
Production Support	206,600	All Sites
Indirect Function Support Facilities	167,685	All Sites
Total	1,673,685	

B4 3303

Source: FDI, 1992e.

TABLE 3.4.2-2.—*Pinellas Plant Alternative: Additional Land Area Requirements at Pinellas*

Land Use	Total Area	
	Square Feet	Acres
Building(s) footprint(s)	564,833	13
Additional parking	283,840	6.5
Construction laydown area	1,306,800	30
Construction parking	217,800	5
Total	2,373,273	54.5

E4 3863

Source: FDI, 1992a and c.

molding, manufacture of special chemicals, and assembly.

The transfer of all activities from KCP to Pinellas would involve the generation of additional hazardous and nonhazardous wastes. The additional hazardous waste volume of Pinellas due to consolidation could require revision of existing hazardous waste permits, because new facilities would be added to handle the additional volume. Table 3.4.2-4 presents a summary of anticipated additional annual waste generation. A discussion of the wastes, effluents, emissions and information related to their treatment/ management can be found in appendix C2.

TABLE 3.4.2-3.—*Pinellas Plant Alternative: Estimated Construction Material/Resource Requirements at Pinellas*

Materials/Resources	Requirement
Utilities:	
Electricity	2,700 kWh
Water	13,000 GPD
Solids:	
Concrete	106,600 yd^3
Steel (structural, rebar, ductwork, and piping)	15,850 tons
Other	
Liquid Fuels	909,000 gal
Gases	2,611,000 ft^3

E4 3496

Source: FDI, 1992a.

Consolidation of the electrical/mechanical functions at Pinellas would also require the construction of a mechanical technology facility to store hazardous materials. No other support facilities would be required to support the consolidation activities.

Onsite utility upgrades required for consolidation at Pinellas include raw water, power consumption, natural gas, and steam. Water and steam are produced on the plant site. Natural gas and electricity are provided by the local utility companies. Table 3.4.2-5 describes the anticipated additional resource requirements for consolidation at Pinellas.

Under the Pinellas alternative, additional bulk chemical inventory would be required. However,

TABLE 3.4.2-4.—*Pinellas Plant Alternative: Estimated Additional Annual Waste Generation at Pinellas*

Waste Type	Quantity
Hazardous/Toxic	
Liquid	51,500 gal
Solid	12,300 ft^3
Nonhazardous	
Liquid	292 million gal
Solid	610,000 ft^3
LLW	
Liquid	None
Solid	15 ft^3
Mixed	
Liquid	None
Solid	9 ft^3

E4 3762

Source: FDI, 1992e.

no centralized storage and distribution systems are planned for these materials due to the limited number of facilities supplied. All of these materials are assumed to be brought to the site by tank truck. Facilities for receiving, unloading, and distributing these liquids are included at the plant buildings where the materials are consumed. See table 3.4.2-5 for a list of bulk chemical resource requirements identified for this consolidation activity.

3.4.3 Rocky Flats Plant Alternative

The RFP alternative is similar to the Proposed Action in that tritium handling functions from Mound would be relocated to SRS (section 3.3.2); calorimeters and high power detonators from Mound and neutron tube target loading from Pinellas would be relocated to LANL (section 3.3.3); and neutron generators, cap assemblies, and thermal batteries from Pinellas, and milliwatt heat source surveillance from Mound, would be transferred to SNL (section 3.3.5).

This alternative differs from the Proposed Action in that beryllium technology and pit support functions from RFP would not be relocated to LANL and the remaining electrical/mechanical and special product functions would be consolidated at RFP rather than at KCP.

With RFP as the consolidated site for nonnuclear manufacturing, the KCP, Mound, and Pinellas nonnuclear manufacturing functions would be terminated. Figure 3.4.3-1 illustrates this consolidation alternative.

Electrical/mechanical functions that would be consolidated at RFP under this alternative would be situated within existing as well as newly constructed buildings. The new construction would consist of a three-story office/manufacturing building, a two-level parking garage and a new one-story mechanical technology facility. The proposed locations of new facilities at the RFP are shown in figure 3.4.3-2.

Under the RFP alternative, all current operations and missions, including electrical/mechanical functions and beryllium technology functions, would continue at RFP. In addition, electrical/mechanical functions would be transferred from Mound, KCP, and Pinellas to RFP. KCP, Mound, and Pinellas Plant would be phased out.

The RFP alternative would require approximately 1,432,701 ft^2 additional space at RFP to house new operations. RFP currently has 430,600 ft^2 available for these activities. Therefore, approximately 1,002,101 ft^2 of additional facility space would have to be constructed at RFP under this alternative. Table

TABLE 3.4.2-5.—*Pinellas Plant Alternative: Estimated Additional Operations Resource Requirements at Pinellas*

Utility Resources	Average Daily Consumption	Peak Demand
Electricity	273,000 kWh	29,000 kW
Natural Gas	835,000 ft^3	112,000 ft^3/hr
Water	945,000 gal	1,200 GPM

Chemical Resources	Annual Consumption
Nitrogen	2,423,000 gal
Argon	2,728,000 gal
Helium	760,000 ft^3
Hydrogen	2,600 gal
Carbon Dioxide	5,912,000 gal

E4 3498

Table assumes Pinellas operates 365 days per year.

Source: FDI, 1992e

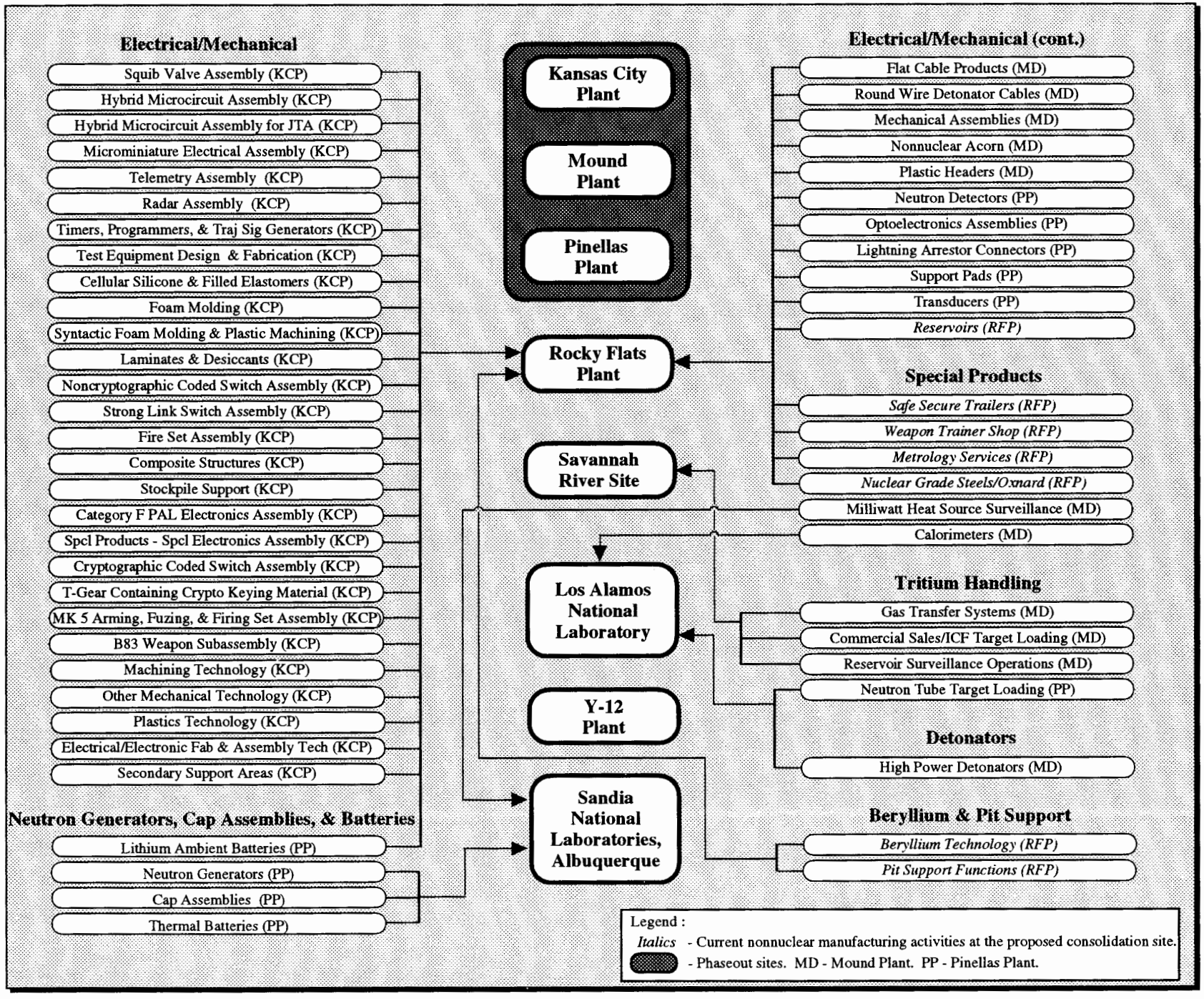

FIGURE 3.4.3-1.—*Consolidation of Electrical/Mechanical Products at Rocky Flats.*

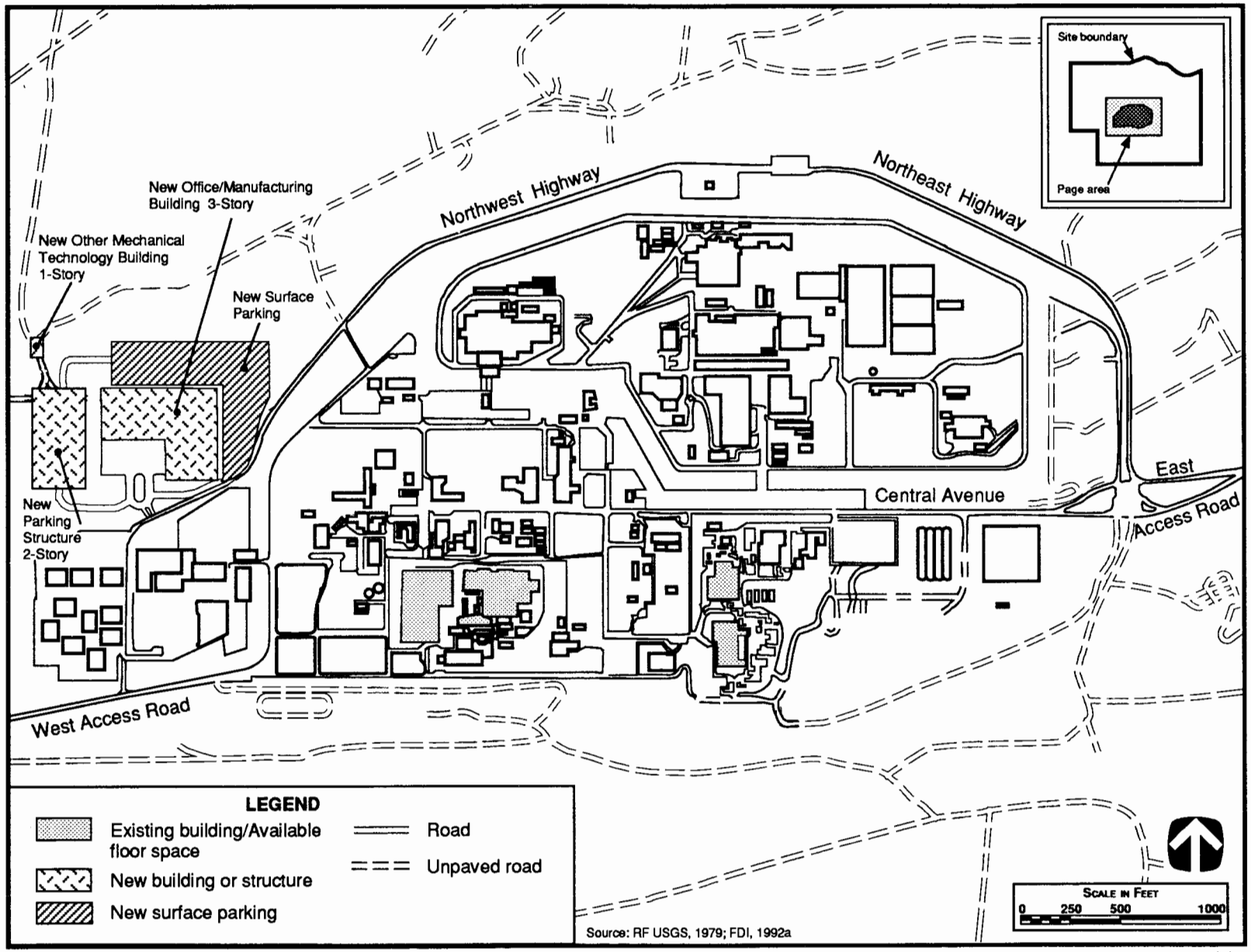

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FIGURE 3.4.3-2—*Proposed Location of New Facilities at the Rocky Flats Plant.*

3.4.3-1 lists square footage requirements for all involved activities should RFP be selected as the consolidation site. Additional land area requirements for the consolidation of nonnuclear manufacturing activities at RFP, including construction laydown area and additional parking, are listed in table 3.4.3-2. Material/resources requirements during construction of the consolidated RFP can be found in table 3.4.3-3 (FDI, 1992a).

Primary products to be transferred from KCP to RFP include: (1) electrical and electronics items such as radars, firing systems, timers, telemetry, unique signal generators, cables, printed wiring boards, field test equipment, microelectronics, large scale integrated circuits, arming and fuzing systems, and depth sensors; (2) mechanical devices such as coded switches, squib valves, case parts, fins, strong link switches, inertial sensing devices, battery actuators, structural supports, handling equipment, locking tapes, command disable devices, and assembly hardware; and (3) plastic items such as compression pads, membranes, cushions, foam supports, composite structures, metal filled polymers, insulators, radomes, shock mitigators, molded rigid plastics, desiccants, and hydrogen getters. Descriptions of the nonnuclear electrical/mechanical functions to be transferred from KCP to RFP can be found in section 3.2.1.

Missions to be transferred to RFP from Mound include flat cable products and mechanical assemblies, detonator safing strong links, round wire detonator cables, nonnuclear Acorn, and plastic headers (FDI 1992a). Descriptions of the nonnuclear electrical/mechanical functions to be transferred from Mound to RFP can be found in section 3.2.2.

Products to be transferred to RFP from Pinellas would include optoelectronics assembly, neutron detectors, support pads, lightning arrestor connectors, and transducers. Descriptions of the nonnuclear electrical/mechanical functions to be transferred from Pinellas to RFP can be found in section 3.2.3.

The transfer of all of the activities from KCP to RFP would involve the generation of additional hazardous wastes and nonhazardous wastes. The additional hazardous waste volume at RFP due to consolidation could require revision of existing hazardous waste storage permits, because new facilities would have to be added to handle the additional volume. Table 3.4.3-4 presents a summary of the anticipated additional annual waste generation at RFP.

RFP is restricted by Federal regulations and operating permits regarding both the amounts of different types of waste that may be stored and the capacity constraints. In addition, RFP must maintain compliance with storage regulations in all of its storage facilities. Activities necessary to address the generation of additional hazardous wastes would include improvements and/or expansion of storage facilities and certification of wastes to meet disposal criteria at offsite disposal facilities.

RFP must operate all waste packaging, treatment, and storage facilities in compliance with applicable regulations. The requirements of the Colorado Department of Health/DOE Agreement in Principle and the Federal Facility Compliance Agreement for land-disposal restricted waste must be considered for the additional wastes associated with this alternative.

A summary of the wastes, effluents, and emissions and discussions related to their treatment/management can be found in appendix C.3.

Existing RFP support facilities would provide for the balance of plant functions to support consolidation, which includes at a minimum administration, cafeteria service, medical services, fire protection, security, all maintenance functions, environmental monitoring, utility services, Emergency Operations Center, and parts warehousing and storage.

Utility upgrade requirements for consolidation at RFP include raw water, power consumption, natural gas, and steam. Water and steam are produced on

TABLE 3.4.3-1.—*Rocky Flats Plant Alternative: Relocated Activities to Rocky Flats*

Product	Space Req. (ft^2)	Donor Site
Squib Valve Assembly	4,600	KCP
Hybrid Microcircuit Assembly	25,400	KCP
Hybrid Microcircuit Assembly for Joint Test Assemblies	3,500	KCP
Microminiature Electrical Assembly	36,600	KCP
Telemetry Assembly	19,800	KCP
Radar Assembly	14,500	KCP
Timers, Programmers & Trajectory Sensing Signal Generators	44,000	KCP
Test Equipment Design and Fabrication	26,300	KCP
Cellular Silicone & Filled Elastomers	27,700	KCP
Foam Molding	19,700	KCP
Syntactic Foam Molding & Plastic Machining	35,000	KCP
Laminates & Desiccants	19,300	KCP
Noncryptographic Coded Switch Assembly	1,800	KCP
Strong Link Switch Assembly	32,100	KCP
Fire Set Assembly	50,100	KCP
Composite Structures	23,800	KCP
Stockpile Support	14,200	KCP
Category F PAL Electronics Assembly	9,400	KCP
Special Products - Special Electronics Assembly	14,000	KCP
Cryptographic Coded Switch Assembly	2,700	KCP
T-Gear Containing Cryptographic Keying Material	4,100	KCP
MK 5 Arming, Fuzing, and Firing Systems Assembly	12,400	KCP
B83 Weapon Subassembly	4,000	KCP
Machining Technology	144,300	KCP
Other Mechanical Technology	143,700	KCP
Plastics Technology	48,700	KCP
Electrical/Electronic Fabrication & Assembly Technology	76,300	KCP
Secondary Support Areas	52,700	KCP
Flat Cable Product Mechanical	16,500	Mound
Round Wire Detonator Cables/Plastic Headers	1,000	Mound
Mechanical Assemblies	5,600	Mound
Nonnuclear Acorn	1,900	Mound
Lithium Ambient Batteries	7,400	Pinellas
Neutron Detectors	11,200	Pinellas
Optoelectronics Assemblies	9,900	Pinellas
Lightning Arrestor Connectors	3,600	Pinellas
Support Pads	460	Pinellas
Transducers	1,300	Pinellas
Product Procurement	121,000	All Sites
Production Support	198,600	All Sites
Indirect Function Support Facilities	143,541	All Sites
Total	1,432,701	

E4 3303-1

Source: FDI, 1992e.

TABLE 3.4.3-2.—*Rocky Flats Plant Alternative: Additional Land Requirements at Rocky Flats*

Land Use	Total Area	
	Square Feet	Acres
Building(s) footprint(s)	340,735	8
Additional parking	731,500	17
Construction lay down area	653,400	15
Construction parking	130,680	3
Total	1,856,315	43

E4 3864

Source: FDI, 1992a and c.

the plant site; natural gas and electricity are provided by local utility companies.

The anticipated additional resource requirements for nonnuclear manufacturing electrical/mechanical consolidation at RFP can be found in table 3.4.3-5.

TABLE 3.4.3-3.—*Rocky Flats Plant Alternative: Estimated Construction Material/Resource Requirements at Rocky Flats*

Materials/Resources	Requirement
Utilities:	
Electricity	1,700 kWh
Water	13,000 GPD
Solids:	
Concrete	67,350 yd^3
Steel (structural, rebar, ductwork, and piping)	10,210 tons
Other (paving)	8,060 tons
Liquid Fuels	479,000 gal
Gases	1,375,000 ft^3

E4 3499

Source: FDI, 1992a.

TABLE 3.4.3-4.—*Rocky Flats Plant Alternative: Estimated Additional Annual Waste Generation at Rocky Flats*

Waste Type	Quantity
Hazardous/Toxic	
Liquid	43,300 gal
Solid	12,300 ft^3
Nonhazardous	
Liquid	284 million gal
Solid	530,000 ft^3
LLW	
Liquid	None
Solid	15 ft^3
Mixed	
Liquid	None
Solid	9 ft^3

E4 3491

Source: FDI, 1992e

TABLE 3.4.3-5.—*Rocky Flats Plant: Estimated Additional Operations Resource Requirements at Rocky Flats*

Utility Resources	Average Daily Consumption	Peak Demand
Electricity	260,000 kWh	24,000 kW
Natural Gas	921,000 ft^3	123,000 ft^3/hr
Water	924,000 gal	1,150 GPM

Chemical Resources	Annual Consumption
Nitrogen	2,425,000 gal
Argon	1,198,000 ft^3
Helium	8,000 ft^3
Hydrogen	11,000 ft^3
Carbon Dioxide	5,912,000 gal

E4 3492

Table assumes that Rocky Flats operates 365 days per year.

Source: FDI, 1992e.

CHAPTER 4

CHAPTER 4: AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

Chapter Four describes the affected environment and environmental consequences associated with nonnuclear consolidation. The chapter begins with a brief introduction that includes an overview of environmental assessment methodologies, followed by a discussion of the affected environment and environmental consequences of the Proposed Action. Discussions are provided for each potentially affected site: the principal consolidation site (Kansas City Plant), other consolidation sites, and phaseout sites. The affected environment discussions include the effects of continued operation at each site, i.e., the impacts of the No Action alternative. The chapter also includes discussions of the affected environment and environmental consequences of each of the three consolidation alternatives (Mound, Pinellas, and Rocky Flats Plants). The chapter concludes with a summary and comparison of the environmental consequences of the Proposed Action and alternatives, and discussions of decontamination and decommissioning and intersite transportation issues.

The affected environment consists of the existing conditions at each of the eight sites that are affected by the Proposed Action and any reasonably foreseeable changes independent of the Proposed Action that may occur throughout the expected operating lifetime of the facilities. Environmental consequences are the potential adverse impacts of the project as well as its beneficial effects. Environmental consequences have been assessed for the No Action alternative, the Proposed Action, and alternatives. Where applicable and depending on the resource or issue involved, cumulative impacts at sites receiving relocated functions are discussed as the additional or incremental effects of the Proposed Action over the baseline or No Action. Each alternative involves seven or eight sites: a principal consolidation site, three or four other receiver sites, and three phaseout sites. For each site, a description of each environmental resource that may be affected by the project is presented: land resources, air quality and acoustics, water resources, geology and soils, biotic resources, cultural resources, and socioeconomics. In addition, waste management and human health effects are discussed.

The environmental consequences of No Action are equivalent to the existing environmental conditions, plus reasonably foreseeable changes to the existing situation that would occur with or without consolidation, such as reduced plant workloads. Reasonably foreseeable future baseline changes, including population forecasts, have been projected for socioeconomic conditions. For resource issues such as air quality, water resources, and waste management that are subject to regulatory standards, the future baseline assumes the facilities would be in compliance with those standards. Facilities currently out of compliance, or that may find themselves out of compliance in the future due to regulatory changes, would submit and implement plans and corrective measures to meet applicable compliance standards. For land resources, geology and soils, biotic resources, cultural resources, and human health, it is assumed that current conditions adequately represent the future baseline. The best available data have been used to represent existing conditions. In some cases, information that is several years old represents the best available data regarding design or upper-bound operating conditions of

facilities that are now functioning at reduced capacities due to lower workloads.

At each site, the study area evaluated for each resource is consistent with the requirements of the resource. In all cases, the area is large enough to include possible direct and indirect impacts of consolidation activities. For each environmental resource, the study area depends on the nature of the resource and the manner in which it may be affected by the project.

The period for building modification and relocation of functions for the nonnuclear consolidation would be approximately from 1993 to 1995. Depending on the relocated function, operations would be phased in beginning in late 1997 and continue until the middle of the 21st century.

Overview of Environmental Assessment Methodologies. Brief descriptions of the approaches used in the analyses of land resources, air quality and acoustics, water resources, geology and soils, biotic resources, cultural resources, socioeconomics, waste management, and human health are provided below. More detailed discussions of methodologies and analyses of air quality and acoustics, socioeconomics, and human health are presented in appendixes D, E, and F, respectively.

Land Resources. Land resource analyses included assessments of land use, recreation, and visual resources. The land use analysis was based on assessment of potential impacts to land ownership patterns, potential disturbance of prime farmlands, and future compatibility with local land use plans and policies. The land use analysis included assessments of direct impacts which could result from future project-related activities during the implementation and operation phases, and indirect impacts which could result from land use changes caused by project-induced population growth or decline.

Local-level impacts on urban land use were evaluated for those communities where project in-migrants would reside as determined by the socioeconomic analysis. The construction of new housing on vacant developable land in the urban areas would be the predominant land use impact. Any increased business, commerce, industrial, or other related activities generated as a result of the proposed program are anticipated to be absorbed through the utilization of existing office, store, and building space together with land already platted to accommodate new construction. The analytical methods utilized to evaluate program-induced impacts are similar to those used to determine projected conditions. The amount of land needed to accommodate the project-induced in-migrant population was projected to determine whether project-related impacts can be absorbed under the existing zoning ordinances and be consistent with the adopted city-county comprehensive plans. The land use analysis was predicated on the premise that local decision-makers would enforce existing plans, policies, and ordinances; therefore, future development would be compatible with existing plans, policies, and ordinances.

Land required for future residential offsite use was estimated using the following methods: The acreage requirements (gross) of residential housing needed for the project-related in-migration was determined by combining and averaging density factors of residential types found in the *Residential Development Handbook* by the Urban Land Institute (1978). This resulted in a single factor (6.9 dwelling units per acre) used with the projected in-migration estimates.

For example, 100 in-migrating employees / 6.9 dwelling units per acre = 14.49 acres of space estimated to accommodate these in-migrating employees in offsite housing. The number of in-migrating employees was based on housing projections for each phase of the project developed by the socioeconomic analysis.

Evaluations of impacts on recreational facilities were based on qualitative assessments of potential changes in the use of available local, state, and Federal recreation sites. Visual resource assessments were based on the Bureau of Land Management Visual Resource Management (VRM) methodology (BLM, 1980). The existing landscape at each site was given a VRM classification ranging from 1 (applied to wilderness areas, wild and scenic rivers, and other similar situations) to 5 (applied to areas where the natural character of the landscape has been destroyed). Land form, vegetation, water features, color, adjacent scenery, scarcity, and cultural modifications were key factors used to determine VRM classification. Visual impact assessments were based on the potential of the project to alter or conflict with this classification.

The significance of visual impacts was determined by assessing the degree of visual contrast that the proposed activities and/or facilities would create with the existing landscape character as seen from viewpoints accessible to the public, such as public roadways, parks, and residential areas. If the contrast would demand attention, and if the degree of contrast would conflict with the VRM classification by exceeding accepted standards, the contrast would be considered significant. Sensitivity levels of representative key viewpoints, based on the number and concerns of observers and the distance from viewpoints to the affected area, were also taken into consideration. The impact of the proposed activity or facility would be considered significant if the contrasts and sensitivity levels were unacceptably high.

Air Quality and Acoustics. The assumptions used in the modeling analysis were selected to ensure that the overall assessment was conservative. Assessments of environmental consequences for air quality were based upon comparison of project effects with applicable standards and guidelines. The assessment consisted of determining the potential of additions to ambient levels of criteria, hazardous, and toxic air pollutants (HAP) and comparing the total quantities to Federal and state ambient air quality standards and guidelines. The criteria pollutants are the pollutants for which National Ambient Air Quality Standards (NAAQS) exist, as defined in 40 CFR 50. These pollutants are sulfur dioxide (SO_2), nitrogen dioxide (NO_2) or oxides of nitrogen (NO_x), carbon monoxide (CO), lead (Pb), ozone (O_3), and particulate matter less than 10 microns in diameter (PM_{10}). The 189 HAPs listed under Title III of the 1990 *Clean Air Act* (CAA), as amended through May 1992, are regulated by the National Emissions Standards for Hazardous Air Pollutants (NESHAP). In addition, many states have adopted standards for other toxic air pollutants not regulated by NESHAP.

Available ambient air monitoring data were used to determine maximum background concentrations of pollutants for each site. Results from modeling site emission rates for criteria pollutants, HAPs, and toxic air pollutants were used to estimate the No Action air quality. The sum of the maximum background concentration and the No Action concentration for a given pollutant and averaging time is the baseline concentration. The baseline concentration was compared to applicable Federal and state criteria pollutant, HAP, and toxic pollutant guidelines and regulations to provide an estimate of the effects of the No Action alternative on air quality. Since the maximum background concentration may already include a portion of the pollutant emissions from the site, summation of the maximum background concentration and the No Action concentration may overpredict pollutant concentrations.

The methodology used in the modeling of the site-specific emissions met the guidelines of the Environmental Protection Agency's (EPA) *Guideline on Air Quality Models* (EPA, 1986b). The EPA-recommended Industrial Source Complex Short Term Model (ISCST) (EPA, 1987) was chosen as the most appropriate model to perform the air dispersion modeling analysis because it allows for the estimation of dispersion from a combination of point, area, and volume sources. Required input data for the model were provided by each of the sites. The input parameters include emissions inventories (release rates) and source characteristics

(stack height, stack diameter, and effluent velocity), meteorological data, source locations, and distances to the site boundary and critical receptors. Modeling was performed for all sources that had projected emission rates greater than 100 lb/yr. Emissions less than this quantity would have negligible effects on air quality. However, modeling was performed if a standard or guideline was at a level such that an impact may have occurred.

EPA guidelines were conservatively applied while performing the air quality assessment. The "highest-high" concentration was selected for comparison to applicable standards and guidelines, instead of the "highest second-high" concentration as recommended by EPA. This concentration was the maximum occurring at or beyond the site boundary. It was also assumed that the HAP emissions for each site originated from a single point source. This assumption generally results in higher concentrations than would actually occur, since emission sources are commonly geographically separated from one another.

Terrain data for the modeling assessment were input for the sites considered to be other than "flat." These sites are: Kansas City Plant (KCP), Mound, Oak Ridge Reservation Y-12 Plant (Y-12), Los Alamos National Laboratory (LANL), and Rocky Flats Plant (RFP). The use of site terrain data in the ISCST model provides more representative results for those sites located in areas not considered "flat."

The emission rates for each pollutant were those provided by each site or the Architect/Engineer which furnished the design information. For most sources, data were provided on an annual emission rate basis in units of tons per year or pounds per year. The model requires units in pounds per hour, assuming that the source was operated for the entire year, or 8,760 hours (the number of hours in a year). Data were generally not available to determine actual operating hours.

The assessment of impacts of the Proposed Action and alternatives involved the addition of baseline concentrations of pollutants to concentrations determined through modeling which represent emissions during the implementation and operation phases of the project. The sum of baseline concentrations and concentrations attributed to the Proposed Action or alternatives were then compared with state and/or Federal standards and guidelines to determine compliance and the potential significance of impacts.

Acoustic assessments involved evaluating noise emissions from traffic on major routes leading to the sites. The assessment of noise impacts of the Proposed Action and alternatives during the implementation and operation phases is based upon changes in traffic volumes as a function of changes in employees required during these phases. The EPA guidelines recommend a day-night sound level (DNL) of 55 decibels, A-weighted (dBA), which is sufficient to protect the public from the effect of broadband environmental noise in typically quiet outdoor and residential areas (EPA, 1974). For protection against hearing loss in the general population from nonimpulsive noise, the EPA guideline recommends an equivalent sound level (L_{eq}) of 70 dBA or less over a 40-year period. The *Noise Control Act* of 1972 (P. L. 92-574), with its subsequent amendments (P. L. 95-609), allows states to regulate environmental noise and directs government agencies to comply with local community noise statutes and regulations. The No Action baseline includes results from site sound-level measurements, if available, and/or ranges of typical DNL for each location. These sound levels were then compared to local community noise statutes, regulations, and guidelines to determine the significance of acoustic impacts.

Workers at each site are exposed to varying levels of equipment noise. Department of Energy (DOE) Order 5480.4 requires compliance with Department of Labor Occupational Noise Exposure Standard (29 CFR 1910.95) for DOE and contractor employees. This standard requires that an effective hearing protection program be administered whenever employee noise exposures equal or exceed an 8-hr

time weighted average (TWA) sound level of 85 dBA, where noise levels exceed an exposure to an 8-hr level of 90 dBA or other levels and durations as specified by the regulations. Protection against noise would be provided in the form of administrative or engineering control, where feasible, or as personal hearing protection equipment. As a minimum, these requirements are met at each site.

Water Resources. Environmental consequences for surface water and groundwater resources were determined for both the Proposed Action and the alternatives. The impacts were assessed by determining the potential degree of change in the baseline conditions by the implementation and operation of the Proposed Action or alternatives.

The baseline characterization reflects conditions at the sites as they currently exist and is referred to as the affected environment. Conditions at the sites for the No Action Alternative were considered to be the same as the baseline conditions. The affected environment sections include a brief overview of the key hydrological features: water availability, usage, rights, and allocations; floodplains and drainage basins; and water quality with regard to compliance with regulatory authority requirements.

Surface Water. For the baseline environment, surface water flow, water rights, and water quality were studied. An assessment of water availability was made in light of the potential change in demand caused by reconfiguration activities. The change in the average annual flow of surface water resulting from proposed withdrawals and discharges was determined. The change in stream flow was compared with the average annual flow to determine the impact. Impacts from consolidation activities were predicted if the change in water demand or use exceeded the available water supply, exceeded water allocations, or would be in violation of current water rights agreements. Furthermore, a decrease in stream flow was determined to have a significant impact if the diminished flow resulted in the alteration of the physical and chemical characteristics of the stream such that the assimilative capacity of the stream were substantially reduced. A reduced assimilative stream capacity could potentially result in the need to revise the *Clean Water Act*'s National Pollutant Discharge Elimination System (NPDES) permit, in addition to changing the characteristics of the stream. An increase in stream flow could have an impact if it overflowed stream banks or eroded stream channels.

In accordance with Executive Order 11988 Floodplain Management, the effects of proposed actions on floodplains are to be considered. The Order requires Federal agencies to avoid to the extent possible adverse impacts associated with the occupancy and modification of floodplains and to avoid direct or indirect support of floodplain development whenever there is a practicable alternative. The agency must be determined whether a floodplain is present which may be affected by an action, assess the impacts and consider alternatives to the action. The locations for the Proposed Action or alternatives were compared to known floodplain areas. Floodplains exist in low-lying areas adjoining inland or coastal waters and are measured as having either a 0.2 percent chance (500-year floodplain) or a 1.0 percent chance (100-year floodplain) of being inundated by a flood in any given year. Activities for which even a slight chance of flooding would be intolerable are determined to be "critical actions" and cannot be located within a 500-year floodplain. Reconfigured activities constituting "critical actions" that would be relocated to an area within a 500-year floodplain or any actions modifying areas within the 100-year floodplain would require a floodplains assessment.

The potential impact of reconfigured activities on water quality was evaluated. Baseline water quality was assessed by reviewing the monitoring data for surface water supplies and identifying any individual parameters that exceeded water quality criteria. The water quality criteria are presented to provide an understanding of an undesirable concentration and are not enforceable limits. Although water quality criteria do not directly affect plant activities or discharges, they can be translated into end-of-pipe

effluent limitations through the permitting process. As such, any concentrations exceeding water quality criteria were noted and the NPDES permit reviewed to determine whether monitoring for those parameters was required. Relationships between the surface water and groundwater quality were also described, as needed.

Monitoring results for discharges permitted under the NPDES program were examined to ascertain whether any permit limits were exceeded and if permit requirements were satisfied. NPDES permits set discharge limits and monitoring requirements for discharges into receiving waters. The performance of the site in complying with the NPDES permit requirements was presented. Any actions taken by the site to identify and/or rectify the cause of the noncompliance was noted. At some sites, the NPDES permit requires the plant to notify the regulatory authority if discharge monitoring identified unpermitted parameters at concentrations above a predetermined level. Although notifications were required, the discharges were not considered violations of the permit. The notification process serves to guide the regulatory authority in the renewal and reissuing of permits. NPDES permits are issued for a maximum period of five years. At sites where a notification requirement is in effect, the compliance activities are noted.

Consequences of the site operating at conditions not in compliance with NPDES permit requirements or discharging to a receiving water with poor water quality could be more comprehensive or stringent discharge limitations, monitoring, or pretreatment requirements when the NPDES is reissued. Parameters for which a change in future permit requirements may be a possibility are presented. Particular significance was attached to those parameters identified at concentrations exceeding water quality criteria and not complying with NPDES permit limitations. Future NPDES permits will take into consideration the existing water quality, the sites' NPDES monitoring record, and current site activities including the transferred technologies.

Groundwater. The analysis considers effects of groundwater usage on aquifers and groundwater quality within the regions-of-influence (ROI) for groundwater resources. Groundwater resources are defined as the aquifers underlying the site and their extensions down the hydraulic gradients to, and including, discharge points and/or the first major users. As part of the affected environment discussion, local aquifers were described in terms of the extent, thicknesses, and quality of the groundwater.

Current facility groundwater usage was described. Cases in which projected groundwater use would exceed locally developed sources of groundwater supply were identified. Existing water rights for the major water users, as well as contractual agreements for water supply to the sites from support communities, were summarized. Impacts associated with construction and operation withdrawals were estimated if available data indicated that serious drawdown problems would occur.

Current groundwater quality conditions were described. The results were compared to Federal and state groundwater quality criteria and drinking water standards in order to assess current conditions. Impacts of groundwater withdrawals on existing contamination plumes were assessed to determine the potential for changes in their rates of migration. Impacts were assessed by the degree to which drawdown of groundwater levels, groundwater availability, and groundwater quality would be affected by the Proposed Action or alternatives.

Geology and Soils. Analyses of environmental consequences on geology and soils were based upon the location and extent (new construction and/or building renovation) of proposed project activities and the local geologic and soils setting. In general, impacts to the geological environment may include destruction of or damage to unique geological features, landslides or shifting caused by loading or removal of supporting rock or soil, and removal of or covering of mineral resources. The descriptions of the individual settings emphasize, as appropriate,

the aspects of the local geology that could affect or be affected by project alternatives including geomorphology, faults and seismicity, and general foundation conditions. The degree to which any of the above factors would be affected by the project was an indication of geologic impacts.

Assessments of soil impact, including soil erosion and contamination, were based upon evaluations of implementation and operation activities associated with the Proposed Action and alternatives. Soil impacts during the implementation phase were assessed according to the type of renovation and/or construction activities and the amount of disturbed area. Erosion prevention and control measures are described as necessary and their effectiveness is considered. Soil contamination potential was assessed by determining current and future waste management and material handling practices due to expected operation activities. Spill prevention and control measures are described as appropriate and their effectiveness is considered.

Biotic Resources. Potential impacts to biotic resources were evaluated in the following categories: terrestrial resources, aquatic resources, wetlands, and threatened and endangered species. In general, potential impacts were based on the degree to which various habitats of species would be affected by the project. Where appropriate, impacts were evaluated with respect to Federal and state protection regulations and standards.

Potential impacts to wetlands, aquatic and terrestrial resources, and threatened and endangered species include loss and disturbance of wildlife and wildlife habitats as well as exposure of flora and fauna to air and water emissions, including radioactive materials. While contaminant releases would be limited by various Federal and state regulations, there may still be impacts on biotic resources. Impact analyses involved determining the level of exposure of wetlands and important organisms to the contaminants of concern and whether that level meets limits such as EPA Aquatic Life Criteria or, in the case of radioactive substances, those established in DOE Orders or state regulations.

Cultural Resources. Cultural resources impact analyses included three major elements: prehistoric, historic, and Native American resources. The affected environment sections include a brief overview by element type; the number and type of resources in the project areas, if known; their status on both the National Register of Historic Places (NRHP) and appropriate state registers; and the importance of traditional resources to Native American groups with historical ties to the project areas.

Assessments for prehistoric and historic resources focus mainly on those properties likely to be eligible for the NRHP. In addition to identifying the numbers and kinds of prehistoric and historic resources to be affected, the following issues were also considered: evaluation of the relative importance of a resource type in the regional context, the depositional integrity of a given resource, and the relative degree of protection afforded similar resources in nonproject areas in the region. The individual resource type, the proximity of impact areas to the resources, and the likely duration of impacts were considered in the analysis of Native American resources. Impacts to prehistoric and historic resources were predicted if the proposed project could substantially add to existing disturbance of resources in the project areas; or if the project could adversely affect NRHP-eligible resources; or cause loss or destruction of important scientific, cultural, or historic resources. Impacts to Native American resources were predicted if the project had the potential to affect sites important for their position in the Native American physical universe or belief system, or to reduce access to traditional use areas or sacred sites.

Socioeconomics. A detailed description of the assumptions, data, methodologies, and models used for the assessment of environmental consequences is provided in appendix E. Environmental consequences for socioeconomics and community services were assessed for an ROI surrounding each

site. The ROIs were determined to be those areas in which approximately 90 percent of the current DOE and contractor employees reside. Growth projections were developed for each site to establish a No Action baseline for population from which baseline estimates for employment, housing, and community services were projected. This No Action baseline was used as a comparison against the effects that the Proposed Action and alternatives might have on the conditions in the ROI.

The assessment of impacts associated with the Proposed Action and alternatives was based upon the additional employees the project would require during the construction and operation periods. These directly created jobs would also lead to other new jobs created indirectly by the project. A labor analysis was performed to ascertain the amount of appropriate labor available in the region to fulfill the employment requirements created by the project and the number of workers that would be expected to in-migrate with their families. This project-related population increase was compared to the No Action population growth baseline to determine additional housing and community services that would be needed to accommodate the new growth.

Projected housing needs were based upon current housing unit and population data and were developed by estimating the household size from current population and housing unit ratios. These ratios were applied to the estimated future population trends to obtain the number of housing units needed to accommodate the projected No Action baseline population and the population created by the project.

The major water supply and wastewater treatment systems providing service in each ROI were identified and information was collected on their current capacities and average daily demands. The effects of any future population on the average daily demands and capacities of these systems were then evaluated.

Statistics on public school enrollments, school capacities, and the number of teachers were collected for all school districts in each ROI. The percentage of school-age children in the population was applied to future population trends to project the number of enrollments under the No Action future baseline and the number of future students as a result of the project. Estimates of the number of teachers needed in the future were based upon current pupil-to-teacher ratios and were developed by applying future enrollment trends to these ratios.

Projected population data were applied to current hospital occupancy rates and capacities to determine the number of additional hospital beds in excess of capacity, if any, that would be needed to accommodate future population under the No Action baseline or as a result of the project. Current levels of service ratios for physicians were applied to projected population trends to estimate the number of physicians needed in the future.

Statistics on current levels of service for police and fire protection were applied to future population trends to estimate the number of additional personnel, if any, that would be needed under the No Action baseline or as a result of the project.

Local transportation impacts were assessed in terms of the changes to roadway traffic volumes and service levels associated with consolidation activity employment changes and commercial trucking requirements. Projected vehicle accident and fatality levels were also assessed relative to baseline conditions.

Waste Management. Waste management assessments were based upon projected waste types and waste volumes due to the implementation and operation of the Proposed Action and alternatives; the waste storage, treatment, and disposal facilities required to manage these wastes; the current waste types and waste volumes generated; and the existing and planned storage, treatment, and disposal facilities. Data for projected wastes were derived from conceptual design reports, other environmental reports, or site contacts. Existing annual waste generation data and existing onsite storage,

treatment, and disposal capacities were obtained directly from each of the facilities that comprise the No Action baseline.

The impact assessment for the Proposed Action and alternatives considered the additional waste types and waste volumes to be generated due to the Proposed Action and alternatives, compared to the No Action baseline at each of the affected sites. The impacts to the existing storage, treatment, and disposal facilities due to the changes in waste type volumes could consist of incremental or substantial increases (or decreases) to onsite waste volumes that could cause current design capacities to be exceeded (or underutilized). The result could (1) produce minor or no impacts on the operational waste management functions, or (2) identify the need to either upgrade or construct new waste management facilities to handle the additional waste types or waste volumes.

Human Health. Human health effects were assessed for normal operations and potential accidents. Information contained in the site environmental reports and other information received directly from the sites were used to evaluate No Action conditions as well as the Proposed Action and alternatives. The air and water concentrations of hazardous and radioactive material were compared to applicable permit, regulatory, and DOE operational limits. These concentrations were also compared to cancer potency factors for carcinogenic compounds and no-observable-adverse-effect-level for noncarcinogenic compounds. Additionally, each operation was examined for the use of hazardous and radioactive materials in the manufacturing process. When available, monitoring data were compared to DOE, Occupational Safety and Health Administration (OSHA), and National Institute for Occupational Safety and Health limits for worker exposure. The results of these comparisons were used to assess the human health effects.

The hazardous and radioactive materials associated with each of the activities proposed for transfer were also assessed for their potential to impact human health in the event of an accident. An inventory of hazardous/toxic chemicals was conducted to generate a list of toxicants and the processes with which they are associated. In addition, quantitative hazard assessments that had been previously performed and documented, were reviewed to determine the accidents that had been assessed or analyzed. Accidents at donor and receiver sites that involved hazardous or radioactive materials and processes similar to the functions that may be relocated to the receiver sites were assessed to make qualitative comparisons. Due to lower workloads, the time period of the review (1986-1990) was chosen as being more representative of the future activity levels at the various sites since the activity levels for the last 2 years have been uncharacteristically low.

Baseline Conditions Common to All Sites. Current operations at each Complex site result in the emission of pollutants to the atmosphere, discharge of pollutants in wastewater, and the generation of wastes. DOE Orders require that site operations be conducted in accordance with all regulatory standards and provide for protection of the public and the environment. Monitoring is conducted at each site to determine compliance with these standards. Where monitoring indicates non-compliance, DOE Orders require that appropriate corrective action(s) and follow-up be performed. Monitoring activities conducted at DOE sites are reported in accordance with permit, regulatory, and DOE operational requirements. Additionally, monitoring results and analyses are included in the sites' annual environmental reports, which are available to the public as required by DOE Order 5400.1, *General Environmental Protection Program.*

At all sites, applicable waste management regulatory requirements and guidelines for hazardous/toxic wastes are the Resource Conservation and Recovery Act (RCRA) Interim Status Permit, RCRA Subtitle C Standards and *Toxic Substance Control Act* (TSCA) regulations. Nonhazardous (sanitary) solid wastes are governed by RCRA Subtitle D Standards.

All radioactive and mixed waste management activities conducted at the sites are driven primarily by DOE Order 5400.3, *Hazardous and Radioactive Mixed Waste Program*; and DOE Order 5820.2A, Chapter III, which defines the requirements for handling, storage, and shipment of low-level and mixed waste. All mixed waste storage areas must meet RCRA containment system requirements of 40 CFR.175. The recent *Federal Facilities Compliance Act* (October 6, 1992) requires DOE to submit site-specific plans to EPA and the states containing schedules for providing treatment capacity for mixed waste streams at DOE sites. DOE is proposing to develop the site-specific plans based on decisions made in the National Compliance Plan for DOE Mixed Wastes and the EM PEIS. Due to the small quantities of mixed wastes associated with the relocated nonnuclear activities, the Proposed Actions will not affect the Department's ability to comply with the *Federal Faciltiies Compliance Act.*

In accordance with RCRA as amended, the Pollution Prevention Act of 1990, and DOE Order 5400.1, all sites have an active pollution prevention and waste minimization program to reduce the volume and toxicity of waste generated to the extent that is economically practical. The site programs are an organized and continual effort to systematically reduce waste generation. The overall focus of these programs is aimed at pollution prevention which involves the elimination/minimization of pollutant releases to all environmental media from all aspects of site operations. This includes air emissions and water discharges to sewer systems as well as the offsite disposal of solid waste.

Operations at each site also present the potential for exposures of workers to hazardous constituents. DOE Orders require that site operations provide for protection of workers, including having programs in place to protect workers. DOE Orders 5480.11, *Radiation Protection for Occupational Workers,* and 5483.1A, *Occupational Safety and Health Program for DOE Contractor Employees at Government-Owned Contractor-Operated Facilities,* dictate protection of workers against radiological and hazardous materials, respectively. Should an exposure occur, the incident would be reported in accordance with DOE Order 5000.3A, *Occurrence Reporting and Processing of Operations Information,* which would include appropriate corrective action(s) and follow-up.

As with any facility, operations at each site have the potential for accidents. DOE Orders require the review of all planned and existing construction and operations for potentials for accidents and the assessment of the associated human health and environmental consequences, should an accident occur. The results of these reviews are used as the basis for determining the need for controls or other mitigative actions to eliminate or greatly reduce the potential for, and consequences of, an accident. These reviews are required before authorization of construction or start of operations. The orders that require review include, but are not limited to, the following: DOE Order 5440.1E, *National Environmental Policy Act* (NEPA); DOE Order 6430.1A, *General Design Criteria*; DOE Order 5481.1B, *Safety Analysis and Review System*; DOE Order 5480.23, *Nuclear Safety Analysis Reports* (which canceled 5481.1B on 4/30/92); and DOE Order 5480.1B, *Environment, Safety, and Health Program for Department of Energy Operations.* The reviews involve the identification of hazards and an analysis of normal, abnormal, and accident conditions. This includes consideration of natural and man-made external events including fires, floods, tornadoes, earthquakes, other severe weather events, human errors, and explosions. The sites affected by the Proposed Action have complied with applicable DOE Orders. Currently, KCP and the Savannah River Site (SRS) are reviewing the need for, and update of, Safety Analysis Reports (SAR).

In accordance with DOE Order 5500.1B, *Emergency Management System,* emergency response planning and training are provided to mitigate the consequences of potential accidents. Additionally, should an accident occur, the incident would be reported in accordance with DOE orders 5000.3A, *Occurrence Reporting and Processing of Operations Infor-*

mation, and 5400.4, *Comprehensive Environmental Response, Compensation, and Liability Act,* which would also include appropriate corrective action(s) and follow-up.

Consequences of the Proposed Action Common to All Sites. Consolidating or relocating nonnuclear functions to a site could result in increases in the emissions of pollutants to the atmosphere, discharges of pollutants in wastewater, and the generation of wastes. Members of the public can be exposed to pollutants that are released to the environment. Additionally, these functions, as with all industrial processes, would have the potential for exposing workers to hazardous constituents.

The monitoring currently conducted at each Proposed Action site will be reviewed to ensure that monitoring activities being performed are still adequate to assess whether new operations and site conditions are adversely affecting members of the public, workers, or the environment. At each site, modifications to monitoring activities would be made, as appropriate. Any modifications, as well as the bases for the modifications, would be documented in the sites' Environmental Monitoring Reports as required by DOE Order 5400.1, *General Environmental Protection Program.* The results of these monitoring activities and the potentials for exposures of members of the public and workers would be reviewed, processed, and reported as discussed earlier.

In many cases, the nonnuclear functions that are proposed for relocation are similar to or the same as activities currently being performed at the receiver site. In addition, the processes and materials associated with relocated functions are similar to or the same as those currently performed and used at the receiver sites. These processes and materials have been previously reviewed and analyzed in accordance with applicable regulatory and DOE Order requirements and documented in various forms, including memoranda, safety assessments, and various NEPA documents. In all cases, current activities at these sites have received the appropriate authorization to operate.

The human health impacts of relocating a nonnuclear function to a receiver site were assessed in the following manner for each site: from an operational perspective, the additional impacts associated with that activity and the cumulative impacts after relocation were determined and presented; from an accident perspective, the processes to be transferred have been assessed for the potential hazards they present and all potential accidents. This assessment included the review of NEPA documents, SARs, and other applicable documents.

Additionally, it should be noted that all proposed nonnuclear functions to be consolidated or relocated to new sites are currently being performed at existing DOE sites and do not constitute new activities within the Complex.

4.1 Affected Environment and Environmental Consequences of the Proposed Action

This section discusses the affected environment and environmental consequences of the Proposed Action. Sites discussed include existing nonnuclear facilities of the DOE Complex and potential Complex sites not currently performing nonnuclear functions, but which are candidates for such functions under the Proposed Action and alternatives.

The affected environment includes the consequences of continued operation at each of the sites that may be affected by the Proposed Action: the principal consolidation site–KCP; other consolidation sites–SRS, LANL, Y-12, Sandia National Laboratories, Albuquerque (SNL); and sites that would be phased out–Mound, Pinellas, and the nonnuclear functions at RFP. Since the affected environment discussions include the consequences of continued operations at each site, they represent the impacts of the No Action alternative. The discussions of the affected

environment reflect each site's expected reduced workload projections. For Mound, Pinellas, and RFP, this means that they would continue to have the same manufacturing missions; however, the anticipated lower workloads would require some facilities to be placed in a standby mode.

The environmental consequences of the Proposed Action at each site include the effects of all nonnuclear functions proposed for relocation (see figure 3.3-1). The discussion of environmental consequences addresses consolidation of electrical/mechanical functions at KCP; most tritium handling functions at SRS; detonators, calorimeters, neutron tube target loading, and beryllium and pit support functions at LANL; beryllium and pit support functions as an option at Y-12; and neutron generator, cap assemblies, thermal batteries, and milliwatt heat source surveillance functions at SNL.

Impacts associated with implementation and operation activities are described for each resource at each site that would receive new missions. Following these discussions, the impacts associated with transition activities and decontamination and decommissioning (D&D) due to phasing out Mound, Pinellas, and RFP nonnuclear functions are described for each resource.

A limited capability currently exists at the Lawrence Livermore National Laboratory (LLNL) to perform beryllium and other metal machining work now performed at RFP. If needed, LLNL could provide the small amount of beryllium technology support in lieu of RFP. This would not require analysis of impacts of this type of work at LLNL, nor inclusion of LLNL as a site analyzed in this EA, since existing capabilities are already in place.

4.1.1 Kansas City Plant

Detailed discussion of the Kansas City Plant's current missions, facility/process description, and waste treatment and management activities are provided in section 3.2.1. The functions and processes associated with the Proposed Action to be consolidated at KCP and the proposed facility modifications required to support each relocated function are discussed in section 3.3.1. Discussions of the assumptions used in the EA for determining the affected environment and environmental consequences at KCP and the environmental assessment methodologies for each resource or issue discussed below is presented in the introduction to this chapter. Additional information on baseline conditions and environmental consequences of the Proposed Action that supports the following discussion on KCP is also provided in the chapter 4 introduction and section 4.1.

4.1.1.1 *Land Resources*

Affected Environment. The Bannister Federal Complex is located approximately 12 miles south of the downtown area of Kansas City, MO (figure 3.2.1-1). KCP is 136 acres and is located within the boundaries of the 300-acre Bannister Federal Complex. Generalized land uses at the Bannister Federal Complex and vicinity (including KCP) are shown in figure 4.1.1.1-1. KCP currently contains approximately 3.2 million ft^2 of floorspace, with approximately 82 percent located within the large Federal office/industrial building which dominates the site. KCP, as well as the remainder of the Bannister Federal Complex, is compactly developed with little remaining open space onsite. Residential distribution of KCP employees is discussed in section 4.1.1.7.

No residential structures are within the Bannister Federal Complex. The General Services Administration operates a child care center onsite with a capacity of 160 children, 400 feet north of the main DOE building and west of the DOE-controlled parking area. The center currently has approximately 150 children enrolled and a staff of 25 (KC ASAC, 1991d). Kansas City has zoned the Bannister Federal Complex, including KCP, heavy industrial. It is city policy to plan for space for existing and new

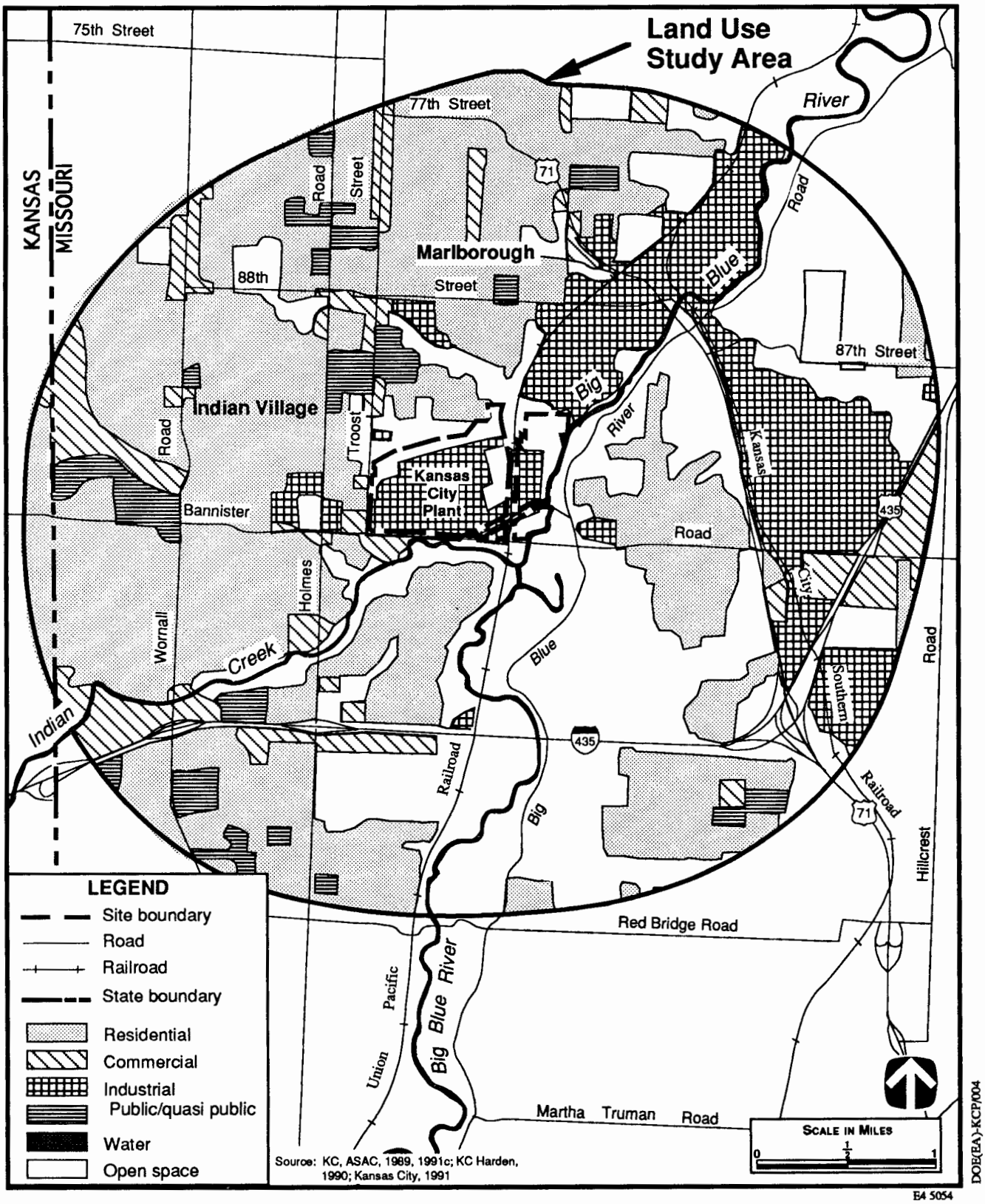

FIGURE 4.1.1.1-1—***Generalized Land Use at the Kansas City Plant and Vicinity.***

industries by expansion rather than relocation (Kansas City, 1990).

Land use within a 2-mile radius of the Bannister Federal Complex is urban, consisting of 41 percent residential (containing 15,164 dwelling units), 42 percent open space (25 percent consists of city-owned recreational lands; the remainder is vacant property), 6 percent commercial, 6 percent publicly owned (Federal, state, and local government), and 5 percent industrial (Kansas City, 1992). The closest residence to the Bannister Federal Complex is 20 feet away, at its northernmost boundary; however, this residence is 540 feet northwest of the closest DOE-controlled property. A multi-family development west of the Bannister Federal Complex is 409 feet away from the nearest DOE-controlled property (KC Harden, 1990).

The city proposes to expand the Indian Creek Greenway through future acquisition of vacant private property, which would increase the amount of permanent open space around the Bannister Federal Complex (Kansas City Board, 1983). There are no prime farmlands on the Bannister Federal Complex.

The Bannister Federal Complex does not contain any public recreation facilities. A U.S. Marine Corps baseball diamond and the General Services Administration child care center playground are located at the northwest corner.

Human modifications to the natural landscape of the Bannister Federal Complex and vicinity are consistent with that of the Kansas City urban area. The Bannister Federal Complex presents a view of a typical industrial facility with most of the structures lower than 35 feet. The landscape of the Federal property, consisting of office/industrial uses, is applicable to VRM Class 5.

Environmental Consequences. The relocated functions would be incorporated into existing buildings at KCP through the rearrangement of existing activities and the use of vacant space. No building additions or major disturbances of land are proposed. The relocated functions would be compatible with existing KCP missions. The Proposed Action would maintain employment at KCP close to current levels (see section 4.1.1.7). Due to project-related in-migration, offsite land requirements for residential land development would be approximately 4 acres during implementation and 47 acres during operation. There are extensive public and private recreational facilities in the region that could easily absorb the anticipated demand. Since relocated facilities would be located in existing structures, the impacts upon visual resources would be negligible and would not affect VRM classifications.

4.1.1.2 *Air Quality and Acoustics*

Affected Environment. The climate at the Bannister Federal Complex and in the surrounding region is characterized as humid, continental, with warm summers, moderately cold winters, and moderate annual precipitation evenly distributed throughout the year (Trewartha, 1954). The annual average temperature in the area, as measured at the Kansas City National Weather Service station, is 54.1 °F; temperatures vary from an average daily minimum of 17.2 °F in January to an average daily maximum of 88.5 °F in July (NOAA, 1991a). Annual average precipitation is 35 inches with most occurring between April and October. About 20 inches of snowfall are typically recorded per year (NOAA, 1991a). Maximum monthly precipitation measured at the Kansas City National Weather Service station ranged from 2.66 inches in January to 11.34 inches in September.

Ambient Air Quality. The Bannister Federal Complex is located in the Metropolitan Kansas City Intrastate Air Quality Control Region (AQCR). This AQCR is designated as attainment by the EPA for all criteria pollutants (40 CFR 81.326). The NAAQS and Missouri state ambient air quality standards are listed in table D2.1.1-1. The Missouri ambient air

TABLE 4.1.1.2-1.—*KCP Ambient and No Action Concentrations Comparison with Applicable Regulations and Guidelines* [Page 1 of 2]

Pollutant	Averaging Time	Most Stringent Regulation or Guideline Level ($\mu g/m^3$)	Maximum Background Concentration ($\mu g/m^3$)[d]	No Action Concentration ($\mu g/m^3$)	Baseline Concentration ($\mu g/m^3$)[e]
Carbon Monoxide (CO)	8-hour	10,000[a]	5.2[b]	73.8	78.9
	1-hour	40,000[a]	81.3[b]	148.8	230.1
Lead (Pb)	Calendar Quarter	1.5[a]	j	c	h
Nitrogen Dioxide (NO_2)	Annual	100[a]	24.9[b]	43.5	68.4
Ozone (O_3)	1-hour	235[a]	263.1	c	263.1
Particulate Matter (PM_{10})	Annual	50[a]	27.8[b]	6.9	34.7
	24-hour	150[a]	54.7[b]	73.6	128.3
Sulfur Dioxide (SO_2)	Annual	80[a]	3.8[b]	24.7	28.5
	24-hour	365[a]	18.8[b]	286.3	305.1
	3-hour	1,300[a]	63.7[b]	949.8	1,013.5
Hazardous Air Pollutants[e] and Other Toxic Compounds[f]					
1,1,1-Trichloroethane	24-hour	1,040[g]	h	0.2	≥0.2
1,4-Dioxane	24-hour	24.5[g]	h	0.6	≥0.6
Acetic Acid	8-hour	i	h	c	h
Acetone	24-hour	161[g]	h	6.3	≥6.3
Acids	8-hour	i	h	18.02	≥18.02
Alcohols	8-hour	i	h	22.34	≥22.34
D-Limonene	8-hour	i	h	1.8	≥1.8
Dichlorodifluoremethane	8-hour	i	h	0.4	≥0.4
Dimethyl Formamide	24-hour	8.13[g]	h	0.2	≥0.2
Ethyl Benzene	24-hour	118[g]	h	0.4	≥0.4
Glycol Ethers	8-hour	i	h	37.8	≥37.8
Hexane	8-hour	2,400[g]	h	1.1	≥1.1
Hydrogen Chloride	24-hour	2.03[g]	h	c	h
Hydrogen Fluoride	24-hour	0.68[g]	h	c	h
Isopropyl Alcohol	8-hour	13,100[g]	h	c	h
Methyl Alcohol	24-hour	7.13[g]	h	c	h
Methyl Ethyl Ketone	24-hour	32.1[g]	h	0.6	≥0.6
Methyl Isobutyl Ketone	24-hour	55.7[g]	h	1.2	≥1.2
Methylene Chloride	8-hour	i	h	0.4	≥0.4

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Footnotes at end of table.

quality standards for criteria pollutants are the same as the NAAQS.

Missouri has standards for the hazardous air pollutants (HAPs) regulated by the NESHAP. The Missouri Department of Natural Resources has guidelines for acceptable ambient air levels of the 189 HAPs specified in the CAA, as amended. The HAPs/toxics described in this section are those currently used at KCP or those anticipated to be used under the Proposed Action.

Ambient air quality within and near the Bannister Federal Complex is monitored at three perimeter locations for each of the criteria pollutants. The data from each of these monitoring stations for 1990 are

TABLE 4.1.1.2-1.—*KCP Ambient and No Action Concentrations Comparison with Applicable Regulations and Guidelines*—Continued [Page 2 of 2]

Pollutant	Averaging Time	Most Stringent Regulation or Guideline Level (μg/m³)	Maximum Background Concentration (μg/m³)[d]	No Action Concentration (μg/m³)	Baseline Concentration (μg/m³)[e]
Hazardous Air Pollutants[e] and Other Toxic Compounds[f]					
Miscellaneous Solvents	8-hour	i	h	12.25	≥12.25
Naphtha/Mineral Spirits	8-hour	i	h	5.4	≥5.4
Nitric Acid	8-hour	66.7[g]	h		
Sulfuric Acid	24-hour	2.72[g]	h	c	h
Tetrachloroethylene	24-hour	922[g]	h	0.4	≥0.4
Toluene	24-hour	10.2[g]	h	3.3	≥3.3
Trichloroethylene	24-hour	36.5[g]	h	3.7	≥3.7
Trichlorotrifluoroethane	8-hour	101,333[g]	h	0.4	≥0.4
Xylene	8-hour	5,800[g]	h	4.0	≥4.0

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a Federal Standard (40 CFR 50).
b Ambient air quality monitoring data for 1990 (KC ASAC 1991a; Roth, 1992).
c Not estimated because the potential release is less than 100 lb/yr (0.01 lb/hr).
d The maximum of the concentrations as measured from the Bannister Federal Complex ambient air monitoring stations.
e The Baseline Concentrations represents a conservative assessment of potential impacts since the concentration contributions from individual sources do not necesarily occur at the same location.
f The compounds listed are the major pollutants of concern (Le, 1992 and KC ASAC, 1992d).
g State guideline (MO Resources, 1992).
h Data unavailable.
i No standard or guideline.
j Concentration is too low to be detected.

presented in table D2.1.1-2. To achieve a conservative estimate, the maximum background concentrations, as measured from the monitoring stations, were used in this analysis. With the exception of the ozone (1-hour) standard, the ambient air quality in the Bannister Federal Complex area does not exceed applicable guidelines or regulations. The ozone standard is exceeded primarily due to chemical reactions that involve vehicle emissions.

The principal sources of criteria air pollutants are the four boilers serving the Bannister Federal Complex. Table D2.1.1-3 presents an emissions inventory of these sources. Volatile organic compounds (VOC) emission sources include fugitive emissions and fuel storage tanks (KC BFEC, 1987). Hazardous/toxic air pollutants are emitted from various process sources at the Bannister Federal Complex. Analytical data from a stack monitoring project (KC ASAC, 1992h) detail quantities of hazardous/toxic air pollutants released (table D2.1.1-5). Since radioactive materials are not processed at KCP, operations do not result in the emission of any radioactive materials at KCP.

Table 4.1.1.2-1 shows the air quality under ambient and no action conditions at KCP. Ambient air quality monitoring data are listed as "maximum background concentration," and the air dispersion modeling results for existing operations are listed as "No Action concentration." The sum of the maximum background concentration and the No Action concentration for a given pollutant and the averaging

time is the baseline concentration. The baseline concentration was compared to applicable Federal and state pollutant limits to provide a conservative estimate of effects of the No Action alternative on air quality. With the exception of the ozone (1-hr) standard, baseline air quality concentrations in the Bannister Federal Complex area do not exceed, and are not expected to exceed, applicable guidelines or regulations. The maximum measured ozone background concentration is approximately 110 percent of the 1-hr standard. The contribution from the site was not modeled since the emission rate for ozone was less than 100 lb/yr. The majority of the ozone concentrations measured at the monitoring stations are attributed to chemical reactions involving vehicular traffic.

The EPA-recommended Industrial Source Complex Short Term (ISCST) model was used to perform the air dispersion modeling analysis (EPA, 1987). A description of the modeling methodology is included in appendix D.

Acoustic Conditions. The major noise sources within the Bannister Federal Complex include various facilities, equipment, and machines (e.g., cooling towers, transformers, engines, pumps, boilers, steam vents, paging systems, construction and materials-handling equipment, and vehicles). Sound-level measurements were made around the steam plant and at the western site boundary of the Bannister Federal Complex. The maximum measured sound level at the western site boundary along Troost Avenue was 69 dBA (KC Tab F, 1992). The contribution from the plant to noise levels at the other site boundaries is minimal. Traffic is the primary source of noise (other than the steam plant) at the site boundaries. The acoustic environment in residential areas near the Bannister Federal Complex away from major roads is assumed to be that of a typical suburban or urban location, with DNL in the range of 53 to 62 dBA (EPA, 1974). The Kansas City community regulations limit noise levels in residential areas to an L_{eq} of 60 dBA during the daytime to 55 dBA at night, and in commercial and light industrial areas to 80 dBA (Kansas City, 24). Sound levels at the Bannister Federal Complex boundaries are within applicable city and Federal guidelines and limits, except at the western boundary due to the Bannister Federal Complex west boilerhouse and local traffic. A noise-dampening enclosure has been proposed and would be installed to reduce noise levels from the west boilerhouse cooling tower condenser pumps. This enclosure should reduce noise levels in the affected residential areas.

Environmental Consequences.

Air Quality. The consolidation of the electrical/mechanical operations at KCP would be accomplished by renovating and upgrading space in existing buildings (section 3.3.1). Renovation of these facilities would create a temporary increase in emissions of particulate matter such as dust and dirt and vehicle emissions. This increase is minor when compared to overall site emissions and would not be expected to significantly contribute to existing air quality concentrations.

Air emissions from the consolidation of the non-nuclear activities would total approximately 4 tons per year of several hazardous/toxic air pollutants (KC ASAC, 1992a). The potential emission rates are listed in table D3.1.1-1. Table 4.1.1.2-2 shows the Proposed Action's contribution to ambient air quality. Except for ozone, pollutant concentrations are within applicable standards or guidelines. As stated in the Affected Environment section, the exceedance for ozone is due to vehicular traffic in the Kansas City metropolitan area and not from site activities. Consolidation of the nonnuclear activities at the KCP would not result in the emission of radioactive materials from normal operations.

Acoustic Conditions. The Proposed Action's effects on noise levels during construction and operation have been evaluated for the major traffic routes around the Bannister Federal Complex. The changes in traffic volumes are expected to result in an increase of 2 dB in peak-hour sound levels along Bannister Road and Troost Avenue. Changes in sound levels

TABLE 4.1.1.2-2.—*Contribution to Air Quality from Proposed Action and Total Concentrations at KCP with Comparison to Applicable Regulations and Guidelines*

Pollutant	Averaging Time	Most Stringent Regulation or Guideline (μg/m³)	Baseline Concentration (μg/m³)[d]	Proposed Action Concentration (μg/m³)	Total Concentration (μg/m³)
Carbon Monoxide (CO)	8-hour	10,000[a]	78.9	f	78.9
	1-hour	40,000[a]	230.1	f	230.1
Lead (Pb)	Calendar Quarter	1.5[a]	e	f	e
Nitrogen Dioxide (NO_2)	Annual	100[a]	68.4	f	68.4
Ozone (O_3)	1-hour	235[a]	263.1	f	263.1
Particulate Matter (PM_{10})	Annual	50[a]	34.7	f	34.7
	24-hour	150[a]	128.3	f	128.3
Sulfur Dioxide (SO_2)	Annual	80[a]	28.5	f	28.5
	24-hour	365[a]	305.1	f	305.1
	3-hour	1300[a]	1,013.5	f	1,013.5
Hazardous Air Pollutants and Other Toxic Compounds[g]					
1,1,1-Trichloroethane	24-hour	1,040[b]	≥0.2	1.71	≥1.91
1,4-Dioxane	24-hour	24.5[b]	≥0.6	f	≥0.6
Acetic Acid	8-hour	c	e	0.75	≥0.75
Acetone	24-hour	161[b]	≥6.3	0.38	≥6.68
Acids	8-hour	c	≥18.02	f	≥18.02
Alcohols	8-hour	c	≥22.3	3.19	≥25.53
D-Limonene	8-hour	c	≥1.8	1.15	≥2.95
Dichlorodifluoremethane	8-hour	c	≥0.4	f	≥0.4
Dimethyl Formamide	24-hour	8.13[b]	≥0.2	f	≥0.2
Ethyl Benzene	24-hour	118[b]	≥0.4	f	≥0.4
Glycol Ethers	8-hour	c	≥37.8	f	≥37.8
Hexane	8-hour	2,400[b]	≥1.1	f	≥1.1
Hydrogen Chloride	24-hour	2.03[b]	e	0.27	≥0.27
Hydrogen Fluoride	24-hour	0.68[b]	e	0.40	≥0.40
Isopropyl Alcohol	8-hour	13,100[b]	e	5.11	≥5.11
Methyl Alcohol	24-hour	7.13[b]	e	0.71	≥0.71
Methyl Ethyl Ketone	24-hour	32.1[b]	≥0.6	f	≥0.6
Methyl Isobutyl Ketone	24-hour	55.7[b]	≥1.2	f	≥1.2
Methylene Chloride	8-hour	c	≥0.4	0.76	≥1.16
Miscellaneous Solvents	8-hour	c	≥12.25	f	≥12.25
Naphtha/Mineral Spirits	8-hour	c	≥5.4	f	≥5.4
Nitric Acid	8-hour	66.7[b]	e	0.49	≥0.49
Sulfuric Acid	24-hour	2.72[b]	e	0.28	≥0.28
Tetrachloroethylene	24-hour	922[b]	≥0.4	f	≥0.4
Toluene	24-hour	10.2[b]	≥3.3	f	≥3.3
Trichloroethylene	24-hour	36.5[b]	≥3.7	2.32	≥6.02
Trichlorotrifluoroethane	8-hour	101,333[b]	≥0.4	3.26	≥3.66
Xylene	8-hour	5,800[b]	≥4.0	f	≥4.0

E4 3778

a Federal Standard (40 CFR 50).
b State guideline (MO Resources, 1992).
c No state standard or guideline.
d Baseline Concentration values are from table 4.1.1.2-1.
e Data unavailable.
f Design report indicates that emissions for this pollutant would be less than 100 lb/yr (0.01 lb/hr) (KC ASAC, 1992d).
g Compounds listed are the major pollutants of concern (Le, 1992 and KC ASAC, 1992d).

along other routes are expected to be less than 1 dB. The predicted rise in noise levels along the major access routes is expected to cause little or no increase in annoyance to the surrounding communities or individuals.

Noise emissions from construction activities and onsite operation activities are not expected to result in any increase in offsite noise levels. Construction activities are limited primarily to interior renovation of existing buildings, resulting in few outdoor noise sources. Noise emissions from renovation work and from operational facilities, equipment, and machines are not expected to cause ambient noise levels at the site boundary to exceed the EPA guidelines.

Although no significant increase in noise is expected offsite from construction and operations, measures would be implemented onsite to protect workers' hearing. These measures include the use of standard silencing packages on construction equipment and providing workers in noisy environments with appropriate earmuffs or earplugs approved by the OSHA. As required, noise levels would be measured in worker areas, and a hearing protection program would be conducted.

4.1.1.3 *Water Resources*

Affected Environment. This section describes the surface water and groundwater resources at KCP.

Surface Water. KCP is located near the confluence of the Big Blue River and Indian Creek. Individual drainage basins exist for each, but both the Big Blue River and Indian Creek are included in the Big Blue River basin. KCP lies on the divide between the two drainage basins, both of which receive surface runoff and cooling water discharge from the plant (KC DOE, 1988). The Big Blue River drains 188 square miles upstream of KCP (KC DOE, 1989b), with a mean annual flow of 159 cubic feet per second (ft^3/s) past the plant's eastern perimeter (KC DOE, 1988). Flow during the summer months is primarily provided by effluent from the sewage treatment plant located on Indian Creek upstream of KCP (KC DOE, 1989b). Indian Creek has a mean annual flow of 23 ft^3/s (KC ABA, 1986). Surface water channels near KCP are depicted in figures 3.2.1-1 and 3.2.1-2.

There are no onsite surface water withdrawals (KC DOE, 1989b). The Kansas City, MO, municipal water supply system provides all drinking and process water for KCP. The water usage at KCP averages approximately 1.4 million gallons per day (MGD) (table 3.2.1-3).

There are four NPDES outfalls at KCP, numbered 001 through 004. These discharge a combination of stormwater and one-pass cooling water. Outfall 001 discharges to the Big Blue River while outfalls 002, 003, and 004 discharge into Indian Creek. There are six unpermitted stormwater outfalls at KCP. Two discharge to the Big Blue River and four discharge to Indian Creek.

Industrial wastes and wastewater are pretreated onsite at the 1.3 MGD-capacity industrial wastewater pretreatment facility. The site currently discharges approximately 0.4 MGD to the industrial wastewater pretreatment facility. Following pretreatment, effluents are monitored and discharged in combination with sanitary wastewater to the Kansas City Municipal Wastewater Treatment Plant. Wastewater generation from KCP is estimated at 310 million gallons per year (MGY) (table 3.2.1-2).

The quality of the effluent discharged from KCP to the Kansas City Municipal Wastewater Treatment Plant is regulated by city and Federal standards (KC ASAC, 1991a). In 1990, two exceedances of chlorinated solvents, one exceedance of boron, and one exceedance of total toxic organics occurred (KC ASAC, 1991a). As required, the Kansas City Water and Pollution Control Department was notified in each case, source investigations were initiated and follow-up sampling was conducted. Because continued or excessive noncompliance with these discharge standards disrupts operation of the Kansas City Municipal Wastewater Treatment Plant, design work progressed during 1990 on a Contaminated

Flow Collection and Treatment System. This system would consist of new piping to route all chlorinated solvent and total toxic organics-contaminated wastewater at the KCP to a treatment facility where it would be treated prior to discharge to the Kansas City Municipal Wastewater Treatment Plant (KC ASAC, 1991a). This system is expected to be operational approximately 18 months after compliance with NEPA requirements, currently underway (KC ASAC, 1992k). The Contaminated Flow Collection and Treatment System does not have NEPA approval and construction is not yet underway (Roth, 1992).

KCP lies within the floodplain of the Big Blue River and Indian Creek (KC DOE, 1989a). A flood exceeding the protective capacity of the existing levee system, designed for a once-every-70-years flood (KC DOE, 1989a), poses a threat to the facilities (KC COE, 1990). Additional flood control works, providing protection against a 500-year flood, are scheduled for completion in December 1993. An environmental review of the levee construction project found no significant environmental impacts, and a Finding of No Significant Impact (FONSI) was prepared by DOE (KC COE, 1990).

Surface Water Quality. Water quality in Indian Creek and Big Blue River is affected by effluent introduced upstream of KCP from the Leawood, Kansas, Sewage Treatment Plant on Indian Creek, and runoff from the urbanized Big Blue River watershed (KC ASAC, 1991a). Water quality in the Big Blue River is monitored monthly at three locations and quarterly at three additional locations for parameters monitored at the NPDES-permitted outfalls (KC ASAC, 1991a). Table 4.1.1.3-1 summarizes water quality monitoring results for the Big Blue River in 1990. The monitoring results reflect the water quality of the river near the KCP. Water quality would be taken into consideration in future NPDES permitting of all upstream and downstream dischargers, including KCP.

Table 4.1.1.3-1 shows an average concentration of silver downstream of all KCP outfalls that exceeds the Missouri chronic water quality standards. Identical results were found upstream of KCP on the Big Blue River, indicating that the source of contamination is upstream. Similarly, the average concentration of aluminum, nitrate, thallium, and total dissolved solids exceeded Federal Drinking Water Regulations. However, these parameters were measured at similar levels upstream of KCP, again indicating the source of contamination to be upstream. Although the average concentration of iron was within Missouri water quality standards, the maximum concentrations exceeded these standards. Although upstream concentrations exceed maximum standards, the difference between the concentration upstream of KCP and downstream of KCP also exceeds standards.

Monthly monitoring of Indian Creek at three locations downstream of KCP indicates that average silver and lead concentrations exceeded applicable Missouri water quality standards in 1990. Similar concentrations observed upstream of KCP and low concentrations in KCP outfalls indicate that the source of these constituents is upstream of the plant.

NPDES permitted outfall 001, one of the three outfalls discharging to the Big Blue River, has a flow of approximately 0.7 MGD (KC ASAC, 1991d). 1,2-dichloroethylene (DCE) from contaminated groundwater infiltrating into the storm sewer system has been found in Outfall 001 effluent (KC ASAC, 1991a). Sewer rehabilitation projects have reduced DCE levels at Outfall 001 to an average of 5 to 7 micrograms per liter (μg/L), and efforts to further reduce the discharges are continuing (KC ASAC, 1991a). This parameter is not monitored in the Big Blue River. The two other outfalls emptying to the Big Blue River discharge only stormwater from non-industrial areas of the Bannister Federal Complex.

Seven outfalls empty into Indian Creek from the Bannister Federal Complex. Three of these (002, 003, and 004), which discharge a total of approximately 0.8 MGD of stormwater and 1-pass cooling water, are covered by an NPDES permit (KC ASAC, 1991d). The remaining four outfalls discharge only

TABLE 4.1.1.3-1.—*Summary of Surface Water Quality Monitoring, Kansas City Plant*

Receiving Water: Big Blue River—1990				
Parameter	Unit of Measure	Water Quality Criteria	Existing Water Body Concentration[a]	
			Average	Maximum
Aluminum[f]	mg/L	0.05-0.2[d]	0.87	3.11
Ammonia[e]	mg/L	0.9[b]	0.53	3.97
Arsenic	mg/L	0.02[b]	< 0.001	0.003
Barium	mg/L	1[c]	0.093	0.138
Beryllium	mg/L	0.004[b]	< 0.001	0.001
Biochemical Oxygen Demand	mg/L	NA	8	21
Boron	mg/L	NA	0.115	0.2460
Cadmium[e]	mg/L	0.013[b]	0.004	0.019
Chemical Oxygen Demand	mg/L	NA	21	40
Chloride	mg/L	250[d]	82	201
Chromium, total	mg/L	0.042[b]	0.007	0.032
Copper[f]	mg/L	0.029[b]	0.009	0.039
Cyanide[e]	mg/L	0.005[b]	0.001	0.021
Iron[f]	mg/L	1[b]	0.858	3.33
Lead[e]	mg/L	0.02[b]	0.018	0.032
Nickel	mg/L	0.1[b]	0.004	0.029
Nitrate[f]	mg/L	10[c]	20.68	154
Oil & Grease	mg/L	NA	1.1	8.2
pH	pH units	6.5–8.5[d]	8.1	
Phenol	mg/L	0.1[b]	0.007	0.018
Phosphorus	mg/L	NA	2.17	9.2
Silver[f]	mg/L	0.00012[b]	0.002	0.003
Sulfate	mg/L	250[d]	102	183
Strontium	mg/L	NA	0.291	0.388
Tantalum	mg/L	NA	0.012	0.067
Temperature	Fahrenheit	NA	59	
Thallium[f]	mg/L	0.002[c]	0.015	0.075
Titanium	mg/L	NA	0.003	0.015
Total Dissolved Solids[f]	mg/L	500[d]	531	787
Total Suspended Solids	mg/L	NA	38	133
Tungsten	mg/L	NA	0.013	0.107
Zinc	mg/L	0.345[b]	0.019	0.053

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[a] Average values are taken from the monitoring station downstream on the Big Blue River, below all KCP outfalls. Maximum value used is the highest value from all monitoring stations downstream of the confluence of the Big Blue River and Indian Creek. More parameters than are listed were sampled for; less than symbol (<) indicates concentration below the analysis detection limit. However, only those parameters having average or maximum concentrations greater than the instrument detection level are presented.

[b] Specific state standards for Indian Creek and Big Blue River. If both chronic and acute standards apply, chronic is listed.

[c] Maximum Contaminant Level (MCL), EPA National Primary Drinking Water Regulations, 40 CFR 141.

[d] Secondary Maximum Contaminant Level (SMCL), EPA National Secondary Drinking Water Regulations, 40 CFR 143.

[e] Although chronic standards are listed for comparison with average concentrations, the State of Missouri has acute standards which apply to maximum concentrations. The maximum concentration for the following parameters did not exceed the acute listed standards: ammonia, 4.4 mg/L; cadmium, 0.052 mg/L; copper, 0.045 mg/L; cyanide, 0.022 mg/L; lead, 0.13 mg/L.

[f] Average concentration exceeded water quality criteria; however, these criteria are listed for comparison only. Water quality standards do not affect plant activities until they are translated into end-of-pipe effluent limitations imposed on discharges through the NPDES permitting process. Similarly, drinking water standards are listed to provide an understanding of an undesirable concentration for those parameters not covered by water quality standards–they do not constitute an enforceable limit.

NA None Applicable

Source: KC ASAC, 1991b.

stormwater from non-industrial areas of the Bannister Federal Complex.

All average effluent concentrations were within NPDES limits in 1990 (KC ASAC, 1991a). Past violations for polychlorinated biphenyls (PCB) led to the reconstruction of Outfall 002, resulting in compliance in 1989 and 1990 (KC ASAC, 1991a). Zinc concentrations exceeded notification levels nine times in 1990, although concentrations in the receiving water bodies remained within applicable standards (table 4.1.1.3-1). The source of the zinc is under investigation (KC ASAC, 1991a).

Groundwater. KCP lies on alluvium consisting of a complex of continuous and discontinuous units of clayey silt, sand, and gravel. Two separate water-bearing units are present within the alluvium. The basal gravel unit is less than 1 foot to 6 feet thick (Roth, 1992), continuous throughout the site, and lies at a depth of 37 to 45 feet below the ground surface. The upper sand-clay-silt unit has a thickness of approximately 10 feet and lies at a depth of 10 to 15 feet below the ground surface. The two are separated in some areas by a layer of silty clay. The alluvial aquifer is not considered a Class I aquifer.

Groundwater Quality. Groundwater quality in the alluvial aquifer is generally good. However, four separate contaminated groundwater sites have been identified within the KCP boundaries. These are related to past activities and include the Trichloroethylene (TCE) Still Area, the Underground Tank Farm, the Northeast Area, and the South Lagoon (figure 4.1.1.3-1). In addition, an abandoned landfill south of the Internal Revenue Service (IRS) parking lot is a contributing source of contamination to the groundwater.

The primary contaminant at these sites is TCE and its degradation products: DCE, chloroethane, and vinyl chloride. Other organic solvents and VOCs are also present. The contamination exists solely in the upper portion of the alluvial aquifer. Table 4.1.1.3-2 shows the groundwater quality for the Tank Farm Area, Northeast Area, and TCE Still RFI (RCRA Facility Investigation) and TCE Still Area plumes. Remediation activities include treating an average of approximately 40,000 gallons of solvent-contaminated groundwater per day (Roth, 1992).

The main contamination plume from the former underground Tank Farm Area lies beneath Building 73, an outlying storage building. This plume is moving to the south/southeast.

The Northeast Area plume and the IRS plume are not located near buildings that house DOE Defense Program activities. The source of the contamination is unknown.

The TCE Still was used for the recovery of used solvent. A portion of the contamination plume from the TCE Still RFI Area lies beneath the Main Manufacturing Building, the Manufacturing Support Building and eastern edge of the Main Manufacturing Building and is moving to the southeast and the southwest.

Groundwater Use. No groundwater is withdrawn for water supply usage at KCP. Water is supplied to KCP from the city of Kansas City, MO, potable water distribution system. This water is obtained from the Missouri River and wells in the Missouri River alluvium located 15 miles north of the plant (KC DOE, 1991a). Water usage at KCP averages about 1.4 MGD (table 3.2.1-3). The Kansas City, MO, potable water distribution system currently supplies its users with approximately 115 MGD. The capacity of this system is 11.5 billion gallons per year (BGY).

Groundwater Rights. KCP is able to purchase unlimited amounts of water from Kansas City, MO. KCP does not have water allotments or groundwater rights.

Environmental Consequences. The consolidation activities would not result in the construction of any new buildings at KCP. Some modification would take place within existing facilities. A description of the functions to be transferred to KCP and the

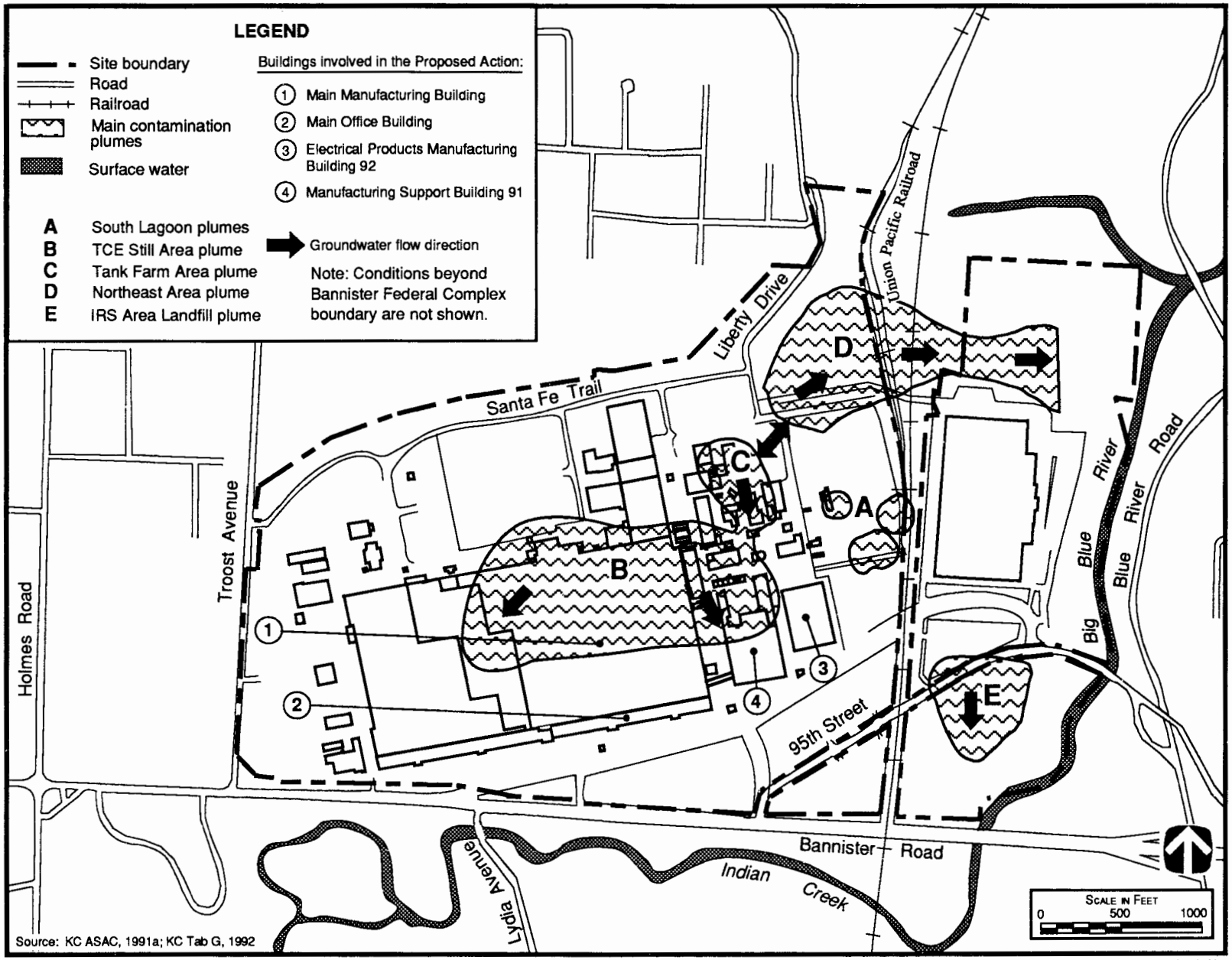

FIGURE 4.1.1.3-1—*Groundwater Contamination at the Bannister Federal Complex.*

TABLE 4.1.1.3-2.—*Summary of Groundwater Quality Monitoring, Kansas City Plant*

Parameter	Unit of Measure	Water Quality Criteria	1991—Existing Conditions			
			TCE Still Area[c]	Northeast Area[d]	Tank Farm Area[e]	TCE Still RFI Area[f]
Vinyl Chloride	mg/L	0.002[a]	0.049	0.39	0.10	0.052
1,1-Dichloroethylene	mg/L	0.007[a]	0.061	0.029	0.016	g
1,1-Dichloroethane	mg/L	h	0.012	0.080	0.011	g
1,2-Dichloroethylene (total)	mg/L	0.007[b]	11	2	2.1	0.016
Trichloroethylene	mg/L	0.005[a]	g	g	0.64	g
Tetrachloroethylene	mg/L	0.005[a]	g	g	0.065	g

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[a] National Primary Drinking Water Regulations, Maximum Contaminant Level (MCL), 40 CFR 141.
[b] Missouri Division 60-Public Drinking Water Program.
[c] Well KC-87-G9L.
[d] Well KC-84-18L.
[e] Well KC-89-97L.
[f] Well KC-89-125U.
[g] Below detection level.
[h] No specified limit.

Source: KC DOE, 1991a.

facility locations selected to house these activities is presented in section 3.3.1.

Surface Water. Process and sanitary wastewater from transferred operations would be discharged to the Kansas City Wastewater Treatment Plant. The additional sanitary wastewater generated by the transferred processes would be approximately 1.7 MGY (table 3.3.1-4). This represents a less than 1 percent increase over the current sanitary wastewater generation rate of 310 MGY (table 3.2.1–2). All industrial wastewater would be pretreated to meet all applicable regulatory standards before discharge to the Kansas City Wastewater Treatment Plant. There would be no increase in cooling water discharge to the Big Blue River and Indian Creek from the transferred operations.

With improved flood control works scheduled for completion before the initiation of nonnuclear consolidation, the transferred operations would be protected from flooding events up to and including a flood with a 500-year recurrence interval.

Surface Water Quality. The site was selected to receive these activities based on the compatibility between current operations and those that would be relocated. As such, the reconfiguration activities would not require a new NPDES permit (KC ASAC, 1992d). However, future NPDES permits would be written after review of the current water quality and how it is affected by discharges from KCP, including those transferred technologies. Zinc, iron, lead, silver, aluminum, nitrate, thallium, and total dissolved solids have been identified as potential water quality concerns. These concerns do not effect activities at KCP until they are translated into end-of-pipe NPDES permit limits. As stated above, there would be no increase in cooling water discharge to the Big Blue River and Indian Creek from the transferred operations.

Groundwater. Water supply for construction comes from the Kansas City municipal system. The amount of water usage for the construction phase at KCP would be supplied from the existing plant distribution system (table 3.3.1-3) and does not represent a significant increase in the current water usage of 1.4 MGD.

The water requirements for operation of the relocated activities would be approximately 1,600 gallons per day (GPD) (table 3.3.1-5). This would be less than 1 percent of the current usage of 1.4 MGD. This is not significant compared to the 115 MGD currently supplied to users by the city, and would not affect groundwater levels or water supply in the area.

Groundwater Quality. Plumes of organic solvents and VOCs are present beneath the buildings proposed for consolidation. However, because no groundwater beneath KCP would be used and no discharge of waste materials to groundwater is planned, no additional impacts to groundwater quality are expected to result from activities of the Proposed Action.

4.1.1.4 *Geology and Soils*

Affected Environment. KCP is located on the Central Stable Interior Platform of the Great Plains Province and rests on the southeastern flank of the Forest City Basin as it rises toward the Ozark Uplift. The plant lies on approximately 45 feet of alluvium of the Big Blue River floodplain, which is bordered by outcrops of Pennsylvanian limestones and shales (KC USDA, 1984).

No capable faults are present within or near KCP. A capable fault is one that has had movement at, or near, the ground surface at least once within the past 35,000 years or movement of a recurring nature within the past 500,000 years (10 CFR 100, appendix A).

The Kansas City area is seismically quiet. It is located on the boundary between Seismic Zone 2-A and Zone 1 (UBC, 1991). Since 1867, Kansas has experienced 27 earthquakes of magnitude 3 or greater (KC DuBois, 1978).

Several large earthquakes greater than magnitude 8 occurred in the years 1811 and 1812 along the New Madrid Fault Zone 350 miles southeast of Kansas City. The Kansas City area was affected by Modified Mercalli Intensity (MMI) values estimated to have been V or less during these events (Nuttli, 1990). An earthquake with a MMI of V is felt by most people but causes little or no damage to structures.

There are no geological hazards known to be present in the immediate area of KCP. The plant does not lie within 80 miles of any known capable faults, nor does it lie in areas of subsidence, landsliding, active volcanism, rapid erosion, or sedimentation.

KCP is underlain by Urban bottomland and Udifluvents. Urban bottomland consists of areas where more than 85 percent of the surface is covered by concrete, asphalt, buildings, or other impervious material. Udifluvents consist of nearly level fill areas and are located adjacent to the Big Blue River. These soils present no erosion hazard or shrink-swell problems (KC USDA, 1984). No agricultural or prime farmland soils are present.

Environmental Consequences. The Proposed Action would cause no significant alteration of geologic features, such as slopes, rock outcrops, or drainages.

Renovation and facility modifications to accommodate the relocated functions would be done according to seismic design building code requirements appropriate to the facility and the regional seismicity; therefore, the hazard due to earthquake activity would not increase.

The Proposed Action would have no adverse impact on KCP soils since the entire area has been disturbed to accommodate existing facilities and operations.

4.1.1.5 *Biotic Resources*

Affected Environment. Tracts within and surrounding DOE-controlled areas in the Bannister Federal Complex are of limited value to terrestrial wildlife due to intensive human activity and the lack of large areas of natural habitat. A 1.2-acre remnant

of riparian woodland occurs near the southern boundary of the Bannister Federal Complex where a bend of Indian Creek was cut off from the rerouted channel by construction of Bannister Road. The Bannister Federal Complex is bordered on the north by a bluff supporting a relatively undisturbed oak-hickory woodland designated as Legacy Park. Riparian forests, dominated by cottonwoods (*Populus deltoides*) and willow (*Salix nigra*), and disturbed by human activities, border the Big Blue River and Indian Creek to the east and south of the Bannister Federal Complex (KC DOE, 1989a). Flora and fauna of various natural habitats in and around the Bannister Federal Complex are described in a recent Environmental Assessment (EA) prepared by the COE (KC COE, 1990).

No wetlands occur within DOE-controlled areas in the Bannister Federal Complex. The Corps of Engineers has determined that the 1.2-acre remnant of riparian forest near the southern boundary does not contain wetlands under jurisdiction of the CWA (KC DOE, 1989a). Present plans call for this area to be excavated, capped, and grassed in 1993 as part of a hazardous waste remediation effort. An area of potential wetlands supporting a cover of narrow-leafed cattail (*Typha angustifolia*) and a mixture of bulrushes (*Scirpus* sp.) and sedges (*Carex* sp.) is located in a low area north of the IRS Building near the northeastern corner of the Bannister Federal Complex (KC COE, 1990).

No aquatic habitats occur within the Bannister Federal Complex. Beyond the KCP boundary, aquatic habitats associated with the Big Blue River and Indian Creek receive discharges of stormwater and 1-pass cooling water generated on the Bannister Federal Complex. Four fish kills have occurred in the Big Blue River in the five years preceding 1992; however, the Missouri Department of Conservation has not attributed any of those kills to activities conducted at KCP (KC Tab I, 1992).

The U.S. Fish and Wildlife Service (FWS) has indicated that the bald eagle (*Haliaeetus leucocephalus*) (a Federally-listed endangered species) is the only Federally-protected, threatened, or endangered species present in the vicinity of the Bannister Federal Complex (KC COE, 1990). Because of the nearly complete development of the Bannister Federal Complex, suitable habitat for the bald eagle does not likely occur. The Missouri Department of Conservation's records do not show that any sensitive species or communities exist within the Bannister Federal Complex or the surrounding area (KC DOE, 1989a).

Environmental Consequences. Temporary land disturbance from renovating KCP facilities would be limited to laydown areas on lawns and paved areas within the already intensively developed KCP. Because these areas have been previously developed, they have minimal value as habitat for terrestrial wildlife. No undeveloped land would be disturbed by the Proposed Action.

No wetlands occur on the DOE-controlled areas of the Bannister Federal Complex, and any renovation activities would be limited to previously developed areas in KCP. As such, no impacts to wetlands would result from the proposed action.

The Proposed Action would not affect aquatic biota or aquatic habitats in the vicinity of KCP. Renovation for, and operation of, the consolidation facilities would not involve water withdrawal from aquatic habitats. As described in the water resources section, effects of discharges into surface waters would not be significant; therefore, aquatic habitats would not be affected.

No terrestrial or aquatic areas potentially providing habitat to Federally- or Missouri-listed threatened or endangered species would be affected by the Proposed Action. DOE has initiated consultations with the FWS and the Missouri Department of Conservation to ensure that renovation or operation of the facilities would not result in impacts to any listed or special status species in the vicinity.

4.1.1.6 *Cultural Resources*

Affected Environment. The prehistoric chronology of the KCP area consists of five broad time periods (KC Chapman, 1975, 1980; KC Weston, 1987): Paleoindian (12,000-8000 B.C.), Dalton (8000-7000 B.C.), Archaic (7000-1000 B.C.), Woodland (1000 B.C.-A.D. 900), and Mississippian (A.D. 900-1700). Site types that may occur in the area include villages, campsites, limited-activity sites, and burial mounds. Two prehistoric sites and a multi-component site have been previously recorded along the terraces of the Big Blue River (KC Ziegler, 1990b). All of the KCP area has been either developed or disturbed, mostly as a result of flood protection construction. No surveys have been conducted for KCP. However, one cultural resource survey was conducted for areas adjacent to KCP; no prehistoric resources were identified (KC Ziegler, 1990a and b).

The history of the KCP region has been previously documented (KC Brown, 1963; KC Zeigler, 1990a and b). The main building was built in 1942 for the manufacture of Pratt & Whitney aircraft engines for the U.S. Navy. After World War II, production ceased, and the plant was declared excess. The Atomic Energy Commission (AEC) began production at the plant in 1949. The facilities at KCP lack architectural integrity, are not representative of a particular style, and are not considered contributing features to the broad themes of World War II defense production, the Manhattan Project, or initial nuclear production. Consequently, the facilities are not likely to be considered eligible for the NRHP.

Three Native American groups occupied or traversed the KCP area: the Osage, the Missouri, and the Kansas (KC Henning, 1970; KC Unrau, 1971; KC Chapman, 1983). The Great and Little Osage Indians occupied the region when French explorers and trappers arrived in the early 1700's. The Missouri Indians occupied the area along the Missouri River between the Grand and Chariton rivers in central Missouri. The Kansas moved along the Missouri River from St. Louis toward St. Joseph, MO from the late 1600's to around 1800. By 1827, they were living along the Kansas River in northern Kansas. Native American resources in the area of KCP may include villages, trails, and sacred areas such as springs, vision quest sites, and burial sites. However, most of the historic Indian villages were not located in the KCP area, but south on the Osage River or north and east along the Missouri River.

Environmental Consequences. All electrical/mechanical functions at KCP would be accommodated within existing structures without new construction. The existing facilities are not likely to be considered NRHP-eligible. Therefore, no NRHP-eligible prehistoric or historic resources or important Native American resources would be affected by either renovation or operation activities.

Federal, state, and Native American consultations have been initiated for KCP to determine if the Proposed Action would have an adverse effect on important Native American resources or NRHP-eligible historic resources. If the resources identified as potential locations for transferred functions and other facilities at KCP are not considered NRHP-eligible or traditionally important after consultation, then no adverse effects on cultural resources are expected.

Mitigation measures to avoid any potential adverse effect to NRHP-eligible or traditionally important resources could include, but not be limited to, siting project activities to avoid such resources, data recovery such as archival research and photo-documentation of historic resources, and restricting access to important Native American resources.

4.1.1.7 *Socioeconomics and Community Services*

Affected Environment. The discussion of socioeconomics and community services at KCP is based on the ROI where 93 percent of the KCP employees lived in 1991. The ROI includes Cass (14 percent) and Jackson (60 percent) counties in

Missouri and Johnson (17 percent) and Wyandotte (3 percent) counties in Kansas. Within these ROI counties, the following key cities have been included in the Affected Environment and Environmental Consequences discussions: Belton, MO (4 percent); Harrisonville, MO (3 percent); Kansas City, MO (28 percent); Lee's Summit, MO (11 percent); and Overland Park, KS (7 percent). (See figure 3.2.1-1).

Assumptions, methodologies, and supporting data for the assessment of environmental consequences are presented in appendix E. Tables E3.1-1 through E3.1-5 give ROI resource information on the following: residential distribution of plant employees; regional economic and population growth indicators, housing characteristics, primary municipal water and wastewater systems, education characteristics, and local transportation.

Employment and Local Economy. The civilian labor force in the ROI grew 42 percent, increasing from 471,743 persons in 1970 to 670,954 persons in 1990. Total employment increased from 455,781 to 637,550 persons between 1970 and 1990, an annual growth rate of 2 percent. The unemployment rates for 1970 and 1990 were 3.4 percent and 5.0 percent, respectively. For the same years, personal income increased from approximately $4.8 billion to $23.2 billion (an annual average of 8 percent), and per capita income increased from $4,319 to $19,076.

Between 1970 and 1990, employment at KCP decreased from 7,546 to 6,320 persons, representing less than 1 percent of the ROI employment in 1990 (KC Tab J, 1992). As of September 30, 1992, employment at KCP had decreased to 4,473 persons. Under the No Action alternative, future site employment would be expected to decrease to approximately 4,275 persons by the year 2000 (DOE, 1992e). Under the No Action baseline, the total payroll is projected to be approximately $151 million by the year 2000.

The civilian labor force is projected to grow at less than 1 percent annually, reaching an estimated 752,000 persons by 2000 and 768,000 persons by 2020. The unemployment rates for 2000 and 2020 are both projected to be 6 percent. For the same years, personal income is projected to increase from approximately $32.1 billion to $40.4 billion, an annual average increase of 1 percent. Per capita income is projected to increase from an estimated $24,000 in 2000 to $27,000 in 2020.

Population. Between 1970 and 1990, the population in the ROI increased 11 percent to 1,214,087 persons. During the same period, the Missouri population increased 9 percent, and the Kansas population increased 10 percent. The population in the 4-county ROI is projected to increase from an estimated 1,335,000 persons in 2000 to 1,473,000 persons by 2020 at an annual rate of less than 1 percent.

The largest county population increase (63 percent) occurred in Johnson County between 1970 and 1990, while during the same years, populations in Wyandotte and Jackson counties declined 13 percent and 3 percent, respectively. Population in Johnson County is estimated to increase 6 percent between 1990 and 2000 and 10 percent between 2000 and 2020, an annual growth rate of less than 1 percent. The Wyandotte County population is projected to increase approximately 16 percent between 1990 and 2000 and 10 percent between 2000 and 2020, an annual growth rate of less than 1 percent. The population in Jackson County is expected to increase approximately 11 percent by 2000 and an additional 10 percent by 2020, an annual growth rate of less than 1 percent.

Between 1970 and 1990, Kansas City, MO, had the greatest decrease in city population (33 percent) in the ROI. For the same years, the Belton, Harrisonville, Lee's Summit, and Overland Park populations increased 86 percent, 52 percent, 183 percent, and 42 percent, respectively.

Housing. Between 1970 and 1990, the number of housing units in the ROI increased 34 percent from 386,007 to 518,323 units. Concurrent with population growth in the ROI, housing units are

expected to increase approximately 10 percent by the year 2000 and an additional 10 percent by 2020, an annual increase of less than 1 percent.

Between 1970 and 1990, the largest increase in housing units (114 percent) occurred in Johnson County, while the smallest increase (9 percent) occurred in Wyandotte County. Housing units in Johnson County are expected to increase approximately 12 percent by 2000 and an additional 10 percent by 2020, an annual increase of less than 1 percent. Housing units in Wyandotte County are expected to increase about 16 percent by 2000 and an additional 10 percent by 2020, an annual increase of less than 1 percent.

In 1990, the homeowner vacancy rates averaged 2 percent in the ROI and ranged from approximately 2 percent in Cass County to 3 percent in Wyandotte County. The vacancy rates for rental units averaged 12 percent and ranged from about 9 percent in Johnson County to 16 percent in Wyandotte County.

Community Infrastructure and Services. The water supply systems operated by Johnson County; Kansas City, KS; Kansas City, MO; and Independence maintain about 97 percent of the total capacity of the 6 major public systems in the ROI. Most of these systems utilize surface water as their primary source of raw water, although Kansas City, MO, utilizes some groundwater and Independence utilizes only groundwater supplies.

Kansas City, MO (240 MGD capacity), and Independence, MO (36 MGD capacity), operate systems in Jackson County and had 1991 average daily demands equal to 48 percent and 64 percent of capacity, respectively. The Johnson County Water Supply District #1 (105 MGD capacity) experienced 1991 average daily demands equal to 42 percent of capacity. The Kansas City, KS, system (60 MGD capacity) in Wyandotte County had 1991 average daily demands equal to 50 percent of capacity.

Independence and Johnson County plan to increase their system capacities to 42 MGD and 130 MGD, respectively, by 1995. In 1995, these systems are projected to have average daily demands of less than 61 percent of capacity. By 2000, these systems are projected to experience average daily demands of less than 66 percent of capacity.

Johnson County; Kansas City, KS; Kansas City, MO; Independence; and the Little Blue Valley Sewer District in Missouri operate wastewater treatment systems that maintain about 96 percent of the capacity of the 7 major public systems in the ROI. Kansas City, MO, (about 132 MGD capacity); the Little Blue Valley Sewer District (40 MGD capacity); and Independence (10 MGD capacity) all operate systems in Jackson County and had 1991 average daily demands equal to 77 percent, 68 percent, and 80 percent of capacity, respectively. The Johnson County Unified Wastewater District (about 33 MGD capacity) experienced 1991 average daily demands equal to 96 percent of capacity. The Kansas City, KS, system (42 MGD capacity) in Wyandotte County had 1991 average daily demands equal to 48 percent of capacity.

Johnson County plans to expand its system capacity to about 37 MGD by 1995 and is projected to have average daily demands equal to 87 percent of capacity in 1995 and 90 percent of capacity in 2000. The Independence system is projected to have average daily demands equal to 83 percent of capacity in 1995 and 86 percent of capacity in 2000. The other 2 systems are projected to have average daily demands of less than 80 percent of capacity in 1995 and less than 82 percent of capacity in 2000.

Thirty-two school districts provide public education services and facilities in the ROI. In 1990, these school districts ranged in enrollment size from 110 students in the Strasburg School District to 34,640 students in the Kansas City, MO, School District #33. School districts with enrollments of over 1,000 students were operating between 60 percent and 107 percent of capacity, but the majority of school districts were operating between 85 percent and 100

percent of capacity. Those school districts operating over 100 percent of capacity were Independence (107 percent) and Piper-Kansas City (101 percent). School districts in Jackson, Cass, and Wyandotte counties were operating, on average, at 87 percent of capacity. However, current capacities are projected to be exceeded by the years 1995 and 2000 under the No Action future baseline. The largest increases are expected to occur in the Jackson County school districts where enrollments are projected to exceed current capacities by 17 percent in 1995, increasing to 24 percent in 2000. Smaller increases are expected to occur in the Wyandotte County school districts where enrollments are projected to exceed the current capacities by 3 percent in 1995 and 11 percent in 2000. The average pupil-to-teacher ratio for the ROI was 15:1, and expenditures averaged $4,558 per pupil. The Missouri average pupil-to-teacher ratio was 21:1, and expenditures averaged $4,142 per pupil. The Kansas average pupil-to-teacher ratio was 16:1, and expenditures averaged $4,760 per pupil (MO Education, 1990b; KS Education, 1990).

Thirty-five hospitals serve the four-county ROI, with the majority operating well below capacity (AHA, 1990). In 1990, a total of 3,538 physicians served the ROI. The physician-to-population ratio for the ROI was 2.9:1,000 and ranged from 0.4:1,000 in Cass County to 3.5:1,000 in Johnson County. The national physician-to-population ratio for urban areas was 2.6:1,000 (AMA, 1990; DOC, 1991b).

Sixteen city, county, and state law enforcement agencies provide police protection in the ROI. In 1990, the largest law enforcement agency in the 4-county ROI was in Kansas City, MO, with 1,178 sworn officers, or 2.7 sworn officers per 1,000 persons. Other large agencies are in Kansas City, KS, with 297 sworn officers (2.0 sworn officers per 1,000 persons) and Johnson County with 230 sworn officers (0.6 sworn officers per 1,000 persons). The average number of sworn officers in the ROI was 2.1 per 1,000 persons (FBI, 1991).

Thirty-three fire departments and 2,615 regular and volunteer firefighters provided fire protection services in 1990. The principal municipal departments include both professional and volunteer staff. In 1990, the greatest staffing strengths were found in the fire departments in Kansas City, MO (733 firefighters; 1.7 firefighters per 1,000 persons), and in Kansas City, KS (435 firefighters; 2.9 firefighters per 1,000 persons). The average number of firefighters in the ROI was 2.2 per 1,000 persons (Kapalczynski, 1988).

Local Transportation. Vehicular access to KCP is provided by Troost Avenue, a city-maintained arterial; Bannister Road, a four-lane divided highway; and 95th Street.

Projected 1995 and 2000 baseline traffic for segments providing access to KCP was estimated using average daily traffic (ADT), peak-hour volume (PHV), and level of service (LOS). ADT estimates represent the average vehicular traffic volume experienced on a specific route segment each day, with PHV representing the maximum volume of vehicles during a given hour of that day. These volume estimates were assessed relative to the design capacity of the route in order to determine the associated LOS, which is a qualitative measure of traffic flow conditions. These levels are further defined in appendix E.

Estimated baseline traffic along segments providing access to KCP is projected to contribute to differing service level conditions in accordance with baseline population growth. Bannister Road would generally support congestion-free traffic flow. Troost Avenue, however, and to a lesser extent 95th Street, would typically experience traffic congestion, with volumes approaching or exceeding the design capacity of each roadway. Along these roadways, a motorist's speed and ability to maneuver would be restricted, and potential disruptions to the traffic flow could be caused by accidents or maintenance activities, resulting in considerable congestion. In addition, estimated baseline truck traffic into KCP for delivery of commercial supplies and removal of commercial

wastes would typically average 77 trips per day. However, the additional traffic volumes associated with continued operation of KCP are relatively minor and would not substantially affect local transportation baseline conditions.

No major improvements are scheduled for those segments providing immediate access to KCP (KS DOT, 1991b; MO HTD, 1990).

KCP has a fleet of 29 government-owned and 5 subcontractor-owned vehicles on the property. Other modes of transportation within the ROI include public transportation systems, railways, and waterways. Public transport in the ROI is provided by the Area Transportation Authority, serving metropolitan counties in both Missouri and Kansas. Major railroads in the ROI include the Atchison, Topeka, and Santa Fe Railroad; Burlington Northern Railroad; Chicago and Northwestern Railroad; Norfolk Southern Corporation; the SOO Line; and the Union Pacific Railroad. KCP is provided rail access via single-track rail line operated by the Union Pacific Railroad. Waterborne transportation to the ROI is via the Missouri River and the Port of Kansas City, MO (COE, 1991).

Kansas City International Airport, the largest airport in the ROI, receives passenger and cargo service from both national and local carriers. Numerous smaller private airports are located in the ROI (DOT, 1991).

Environmental Consequences. The employment figures for construction and operations for the Proposed Action are given in table 3.3-1 in section 3.3. The construction, modification, and installation of facilities and equipment for the Proposed Action at KCP would require 80 additional employees during peak construction (KC ASAC, 1992e). Operations employment would begin in 1997 and grow to a full complement of 575 jobs in 2000 (DOE, 1992e). In addition to these jobs created directly by the project, another 190 jobs would be created indirectly during peak construction and 907 additional jobs during operations. The creation of direct and indirect employment would lead to in-migration of 58 persons during peak construction and 755 persons during operations. The in-migrating population is primarily related to the in-migrating professional employees who are scientists, engineers, etc. (and their families), and who are not available in the regional unemployed labor force.

Under the No Action alternative, the current KCP employment of 4,473 persons would be projected to be 4,275 persons by the year 2000, a decrease of 198 persons. The addition of 575 direct jobs to KCP would represent a net increase of 363 jobs as a result of the reduction in the projected baseline levels of the current workforce.

Table 4.1.1.7-1 summarizes the projected economic and population changes that would result from the Proposed Action. In the year 2000, this project-related population growth from in-migration would represent a negligible increase of less than 1 percent over the projected ROI baseline population of 1,335,000 persons, and no cities or counties in the ROI would experience a population growth beyond 1 percent.

The less than 1 percent change in population during the time of peak construction would create the need for only an estimated 20 additional housing units, which is not a significant addition to this large urban area. For operations in the year 2000, the less than 1 percent change in population would not create a need for additional housing units beyond a 1 percent increase. In past years, housing units have been built at an annual rate of 2 percent. Therefore, the additional housing needed to accommodate the in-migrating population could be built without any adverse effect on the cities and counties in the ROI.

The estimated additional population during peak construction and operations would not affect any community infrastructure and services in the ROI. Existing water and wastewater capacities more than exceed the projected demand. Many existing public education facilities are currently approaching 100 percent of capacity. Under current conditions,

TABLE 4.1.1.7–1.—*Kansas City Plant Proposed Action Economic and Population Characteristics*

Economics	1995 Peak Construction	Percent Over Baseline	2000 Peak Operation	Percent Over Baseline
Baseline Civilian Labor Force	710,129	NA	751,591	NA
Baseline Unemployment Rate	5.5%	NA	6.0%	NA
Baseline Personal Income (Thousands $)	$27,257,974	NA	$32,080,918	NA
Baseline Per Capita Income ($/Person)	$21,412	NA	$24,034	NA
Baseline Employment	671,291	NA	706,818	NA
Direct Jobs	80	0.01	575	0.08
Indirect Jobs	190	0.03	907	0.13
In-Migrating Workforce	26	0.00	298	0.04
Total In-Migration	58	0.00	755	0.06
Population Increase				
Cass County	9	0.01	113	0.17
Belton	3	0.01	35	0.19
Harrisonville	2	0.02	23	0.28
Jackson County	37	0.01	485	0.07
Kansas City	17	0.00	223	0.06
Lee's Summit	7	0.01	91	0.18
Johnson County	10	0.00	137	0.04
Overland Park	4	0.00	56	0.05
Wyandotte County	2	0.00	20	0.01
ROI (County Total)	58	0.00	755	0.06

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Source: Estimated from Census, 1977, 1983, 1990a; DOC, 1991a; KS HR, 1991; MO Employment, 1991; KC ASAC, 1992e; DOE, 1992e.

enrollments will exceed capacities by the years 1995 and 2000 given the No Action future baseline. However, these school capacities will not be affected beyond what would naturally occur under the No Action baseline growth because the Proposed Action would not add more than 1 percent to enrollments during construction or operations. Existing health care resources are more than adequate to accommodate the projected population increases during peak construction and operations. Current staffing levels for police and fire services in the ROI are adequate to support the projected population increases, while maintaining current service standards, because none of the cities or counties would grow by more than 1 percent over the No Action baseline. Additional commercial truck traffic into KCP would be negligible relative to historic levels, and this truck traffic would occur during non-peak hours. Impacts to the local transportation network serving KCP would be negligible, as well.

4.1.1.8 *Waste Management*

Affected Environment. Discussion of the KCP waste management baseline is provided in section 3.2.1.3 and appendix A.1. Because there are no transuranic (TRU) wastes associated with any of the proposed activities that would be consolidated, no further discussion of TRU waste generation or management is presented.

Generation of all waste types at KCP is expected to decrease with time, as production operations are expected to be reduced. Additionally, KCP's Pollution Prevention Program would systematically reduce waste generation through specific waste minimization projects and the use of process waste assessments. The following discussion represents no significant changes in waste stream types or handling other than possibly reduced quantities due to the smaller workload.

KCP generates small quantities of LLW; through process changes KCP no longer generates low-level mixed waste (section 3.2.1.3). Lower amounts of LLW are also expected in the future due to a projected decrease in production operations. All radioactive and mixed waste management activities conducted at KCP, including requirements for handling, storage, and shipping of LLW and mixed waste, are covered by many DOE Orders, and Federal and state statutes and regulations, such as RCRA (see tables 5-1 and 5-2). KCP mixed wastes are currently subject to all applicable RCRA requirements. LLW and mixed waste are accumulated onsite and stored in DOE-approved containers in one controlled-access facility. LLW is stored onsite on an interim basis until sufficient quantities accumulate to warrant shipment to an approved DOE disposal facility. The mixed waste is stored onsite on an interim basis until the Nevada Test Site (NTS) receives permit approval for receipt of this type of material. At this time, mixed waste would be packaged according to regulatory requirements and transported to NTS or other treatment and disposal facilities which may be developed in the future for ultimate disposal.

Hazardous/toxic wastes are stored onsite in existing areas and facilities that meet RCRA and TSCA facility standards; no new waste storage facilities are anticipated to manage current operation waste streams. KCP currently operates under RCRA interim status while it is undergoing the RCRA permitting process. All waste stream residue generated at KCP that is not reclaimed by solvent reclamation/distillation or recycled onsite is manifested and shipped under contract with RCRA-permitted transporters to RCRA-permitted offsite treatment and disposal facilities.

The onsite industrial waste processing facility uses a precipitation process to treat dilute metal-finishing rinsewaters, concentrated acids and caustics, and cyanide waste, to acceptable indirect discharge, pretreatment effluent standards. This is done prior to discharge to the Kansas City, MO, wastewater treatment plant.

KCP operates under discharge permits required by the *Clean Water Act* (CWA), the Missouri Department of Natural Resources, and the City of Kansas City, MO. Compliance with respect to the permitted discharge limits were described or referenced in section 4.1.1.3.

Nonhazardous solid waste streams including paper, cardboard, glass, wood, plastics, scrap, and metal containers are segregated and recycled whenever possible. Other trash is disposed of in the local sanitary landfill by a commercial contractor. Nonhazardous liquid wastes are discharged to the industrial wastewater processing facility or to the sanitary sewer system.

Due to a projected decrease in KCP production operations, certain existing KCP equipment may be categorized as surplus, thereby subject to decontamination protocols. The decontamination of existing equipment could result in the generation of wastes; the volume of waste would depend on the degree of decontamination required.

Environmental Consequences. No radioactive or mixed waste streams are anticipated as a result of the relocated nonnuclear functions. Consequently, there are no impacts on KCP's radioactive waste management operations. Any equipment to be transferred to KCP from another site due to the Proposed Action would be decontaminated prior to shipment. Construction debris and scrap metals from demolition of existing interior utilities and partitions would be disposed of as sanitary waste or sold/recycled as scrap. Although the quantities cannot be accurately assessed at this time, minimal environmental impacts are expected.

Construction/modification activities involving decontamination are part of routine facilities operations at KCP. Decontamination activities include the removal of asbestos piping insulation, floor and ceiling tiles, and asbestos- or PCB-contaminated concrete flooring. Such decontamination activities, if identified to be necessary, would be performed in accordance with TSCA

requirements for handling and disposal of asbestos and PCB wastes. The amount of construction waste materials is expected to be minimal.

Should any soil excavation occur as a result of piping modification or replacement of sanitary and industrial drains, the soils would be analyzed for possible contamination before disposal. Uncontaminated soils would be used as fill or disposed of in a local sanitary landfill if considered unsuitable for backfill. If soils are found to be contaminated, the location would be referred to the KCP Environmental Restoration Program for subsequent management. Management activities would involve an area inspection and characterization, then an evaluation of cleanup alternatives (if necessary). Cleanup action and compliance follow-up would be conducted as necessary to remove and dispose of contaminated soils. Remediation of contaminated areas would be conducted according to accepted guidelines and procedures applicable to the type and extent of contamination. Although remediation activities would have additional project cost implications, no adverse environmental impacts are expected.

No new hazardous waste streams would be generated at KCP as a result of consolidation operations. Wastes generated from the consolidation of operations are outlined in appendix B.1 and would be disposed of through KCP's existing Waste Management Department. The 8,130 gallons/year of additional liquid hazardous wastes represent a less than 5 percent annual addition to the current KCP waste streams. The 109 ft^3 of additional solid hazardous waste is a less than 1 percent increase. KCP has 11 RCRA-permitted waste storage areas for containerized waste and 6 RCRA bulk waste storage tanks. The storage container areas and the tanks have storage capacities of 44,000 gallons for liquid hazardous wastes and 83,000 ft^3 for solid hazardous wastes. In 1990, 41,870 ft^3 of hazardous liquid and solid wastes were shipped offsite for disposal in 123 shipments. Consequently, at any given time, existing storage areas would have sufficient capacity to handle the additional liquid and solid hazardous wastes.

The additional 1.7 MGY of nonhazardous sanitary effluents generated by the relocated reservoirs and nonnuclear Acorn product and the support pads operation can easily be handled by the KCP industrial wastewater processing facility, which has a design capacity of 1 MGD.

In summary, the magnitude of additional quantities of waste generated as a result of the increased nonnuclear manufacturing activities at KCP are well within the storage, treatment, and disposal capability of existing waste management facilities.

4.1.1.9 *Human Health: Facility Operations and Accidents*

General discussions of impacts to the public and the environment, worker exposures, and accidents are presented in section 4.1. Information specific to KCP is presented below.

Affected Environment. As discussed in the Air and Water Resources sections for KCP (4.1.1.2 and 4.1.1.3, respectively), all exposures to members of the public associated with the release of chemical pollutants (as a result of KCP operations) meet applicable permit, regulatory, and DOE operational requirements. There are no radiological releases associated with KCP activities.

A review of the recent KCP annual environmental and accident reports indicates that there have been no significant adverse impacts upon workers, members of the public, or the environment. This review was performed to provide an indication of the site's accident history. The level of operations during the time period of the review (1986-1990) was higher than either the past year's operations or those expected in the future.

Environmental Consequences. The Air and Water Resources sections discuss the releases associated with relocating the electrical/mechanical and special products functions identified in section 3.3.1 to KCP.

Water from processes containing hazardous chemicals is not discharged directly into surface or groundwater that serves as potable water. Process water that may contain hazardous chemicals is treated to remove the toxicants before discharge. Furthermore, all releases of the pollutants are below NPDES limits and water quality would not be adversely affected. Thus, the primary pathway considered for possible worker or public exposure is the air pathway.

For normal operations at KCP, all possible hazardous air pollutants were examined and from their assessment, the following chemicals were identified for further analysis based on their toxicity, concentration, and frequency of use: acetone, chromium trioxide, dimethylformamide, 1,4-dioxane, Freon-113, isopropyl alcohol, methylene chloride, toluene, trichloroethylene, and nitric acid. The Hazard Index (EPA, 1983), a summation of the Hazard Quotients for all chemicals, was calculated for the No Action alternative and the chemicals proposed to be added (increment) at the site to yield cumulative levels for the site. A Hazard Index value of 1.0 or less means that no adverse human health effects are expected to occur. The cumulative Hazard Indexes for KCP (see table F5-12a in appendix F) were 0.251 for onsite (worker effects) and 0.214 at the site boundary (effect on the public) on an annual basis and the incremental change Hazard Indexes were 0.0005 for onsite and 0.0002 at the site boundary. Therefore, the Proposed Action would add hazardous chemicals to KCP, but these additions contribute only 0.2 percent to the cumulative Hazard Index onsite and 0.09 percent at the site boundary.

Two of the chemicals identified (1,4-dioxane and methylene chloride) are considered to be carcinogens and the cancer risk to individuals for each was calculated. The combined risk for the carcinogens was calculated as 7×10^{-7} onsite (worker) and 3×10^{-7} at the site boundary (public) (see table F5-12b in appendix F) whereas the incremental change due to the Proposed Action contributed a risk of 5×10^{-8} onsite and 0 at the site boundary. Risks less than 10^{-6} are considered acceptable by EPA since this incidence of cancers cannot be distinguished from the normal cancer risk to an individual member of the general population.

Consolidation of the nonnuclear activities at KCP would not result in the normal emission of radioactive materials from normal operations.

In summary, these analyses show that no adverse health effects or excess cancer risk can be expected from the normal release of hazardous chemicals/ chemical pollutants at KCP attributable to the Proposed Action.

The accident assessment for KCP draws upon the information presented in chapter 3, section 3.3.1. In the consideration of potential accidents it is seen there that the processes and chemicals of concern associated with the functions to be relocated to KCP from the donor sites are the same as those performed and used presently at KCP. There is an increased annual usage of 3 lbs of methylene dianiline and 12 lbs of toluene diisocyanate. These amounts represent only 2.1 percent and 0.2 percent, respectively, of the present annual usages at KCP.

KCP site activities have been reviewed in accordance with the requirements of the canceled DOE Order 5481.1B and the determination made that the preparation of SARs is not required because KCP is a low hazard facility. KCP is currently in the process of performing a site Safety Assessment, which is required by DOE Order 5480.23, the successor to DOE Order 5481.1B. The Safety Assessment reviews site processes to identify potential hazards. The results of the Safety Assessment would be used as a basis for determining the need for additional reviews. The site Safety Assessment expected to be completed in 1992, is anticipated to confirm that KCP is a low-hazard facility. The existing site accident profile is strictly chemical in nature. As indicated in section 3.3.1, the functions to be relocated to KCP are common industrial processes that are the same as or similar to those currently being performed at KCP and would require no

additional bulk chemical storage or chemical resources. Based on the above discussions, the current accident profile at KCP would not change as a result of relocating these functions to KCP.

4.1.2 Savannah River Site

Detailed discussion of the Savannah River Site's current missions, facility/process description, and waste treatment and management activities are provided in section 3.2.5. The functions and processes associated with the Proposed Action to be consolidated at SRS and the proposed facility modifications required to support each relocated function are discussed in section 3.3.2. Discussions of the assumptions used in the EA for determining the affected environment and environmental consequences at SRS and the environmental assessment methodologies for each resource or issue discussed below is presented in the introduction to this chapter. Additional information on baseline conditions and environmental consequences of the Proposed Action which supports the following discussion on SRS is also provided in the Chapter 4 introduction and section 4.1.

4.1.2.1 *Land Resources*

Affected Environment. SRS occupies a 300 square mile area and is located approximately 16 miles southeast of Augusta, GA (figure 3.2.5-1). Generalized land use at the SRS and in the vicinity are shown in figure 4.1.2.1-1. The residential distribution of SRS employees is discussed in section 4.1.2.7.

SRS land use can be grouped into three major categories: forest/undeveloped, water, and developed facility locations. Ninety-six percent of SRS's area, about 191,000 acres, is undeveloped. Approximately 89 percent of this area is forested (SR DOE, 1991b). A forest management program has been in effect at SRS since 1952 when it was formed through an interagency agreement between DOE (then the AEC) and the U.S. Forest Service (SR DOE, 1990a). In 1972, DOE designated SRS as a National Environmental Research Park (NERP). Currently, 12,000 acres (6 percent) are designated as NERP. These areas are specifically protected for environmental research activities that are coordinated through either the Forest Service or DOE's Savannah River Research Center (SR DOE, 1990b). There are no prime farmlands on SRS.

Land use bordering SRS is primarily forest and agricultural. There is also a significant amount of open water and non-forested wetland along the Savannah River Valley. Incorporated and industrial areas are the only other significant use of land in the vicinity (figure 4.1.2.1-1). SRS land is not zoned by any of the three counties in which it is located. The only adjacent area that has any zoning is the town of New Ellenton. It has two zoning categories that bound SRS, urban development and residential development. The closest residences to the SRS boundary include several located to the west, north, and northeast that are within 200 feet of the perimeter.

SRS does not contain any public recreation facilities; however, controlled deer and boar hunts occur on SRS each fall from early November through mid-December. The purpose of the hunts is to control the resident deer and boar populations and reduce animal-vehicle accidents on SRS. The Operations Recreation Association owns and operates a 210-acre recreation complex located approximately 5 miles northwest of SRS.

The viewshed consists mainly of agricultural land use, with some limited residential and industrial areas. DOE facilities are scattered throughout SRS and are brightly lit at night. Viewpoints affected by DOE facilities are primarily associated with the public access roadways, including U.S. 278, State Highway 125, and SRS Road 1. Because of the rolling terrain, normally hazy atmospheric conditions, and heavy vegetation, the DOE facilities are not generally visible from offsite. The few areas that do have views of some of the facilities are quite distant (5 miles or more) and have low visual sensitivity levels.

The developed areas of SRS are consistent with a Class 5 VRM designation. The remainder of SRS generally ranges from VRM Class 3 to Class 4.

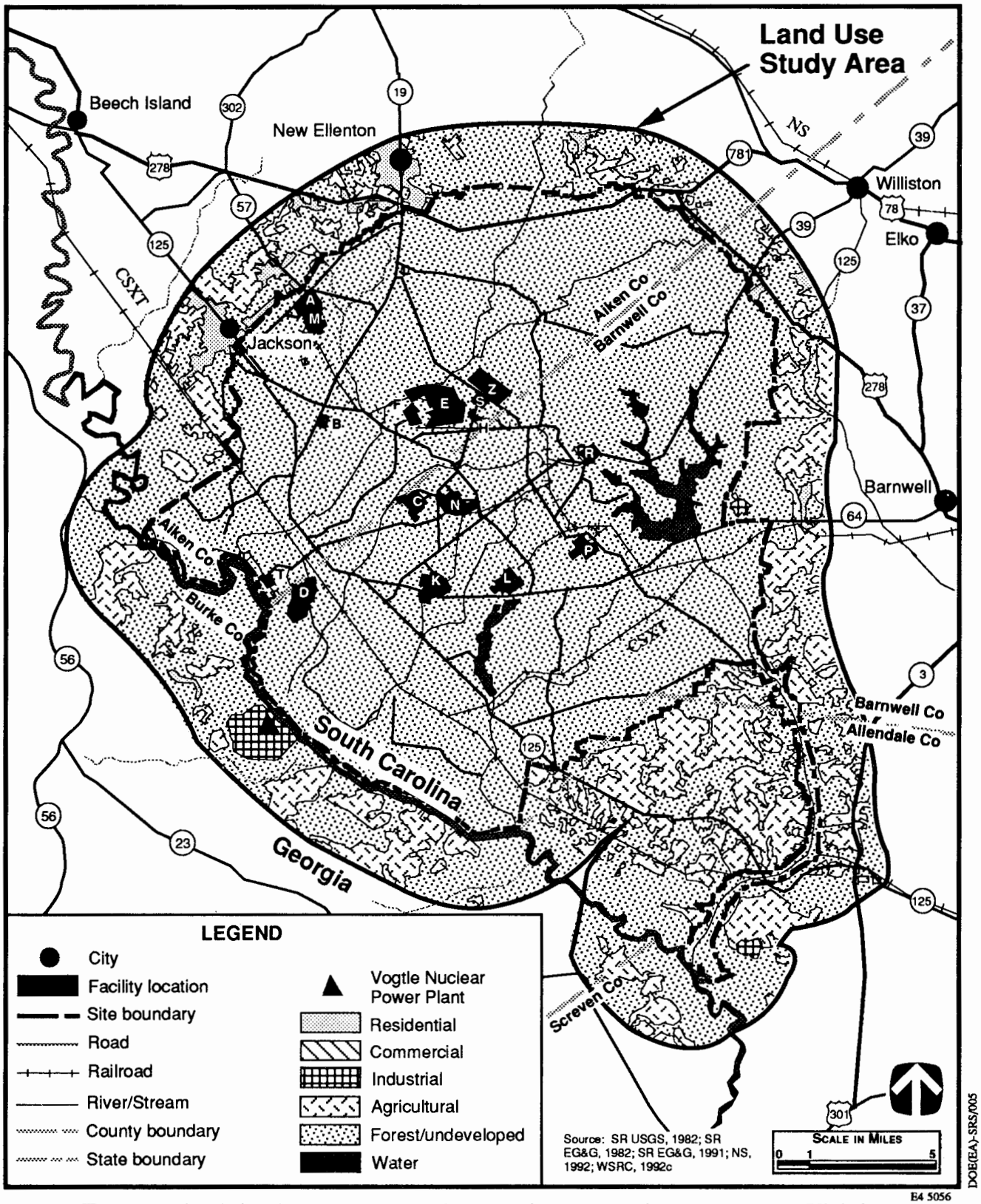

FIGURE 4.1.2.1-1—*Generalized Land Use at the Savannah River Site and Vicinity.*

Environmental Consequences. Nonnuclear functions would be located within existing facilities (see section 3.3.2) and be compatible with existing SRS operations.

The small number of in-migrating employees (see section 4.1.2.7) would have minimal impact on land resources. Project-related offsite land requirements for residential land uses associated with operations would be approximately 7 acres, and construction land requirements would be approximately 2 acres; these constitute small percentages of the total land available. There are extensive public and private recreational facilities in the region that could easily absorb the resulting increased demand. Impacts to recreational resources would be minor. Impacts to visual resources would be negligible and not affect VRM classifications because relocated tritium functions would be located within existing structures.

4.1.2.2 *Air Quality and Acoustics*

Affected Environment. The SRS region has a temperate climate with short, mild winters and long, humid summers. The region is frequently affected by warm and moist maritime air masses (Trewartha, 1954). The annual average temperature at SRS is 66 °F; temperatures vary from an average daily minimum of 37.9 °F in January to an average daily maximum of 90.8 °F in July. The average annual precipitation at SRS is 49.7 inches (NOAA, 1991b).

Ambient Air Quality. SRS is located within the Augusta-Aiken Interstate AQCR. None of the areas within SRS and its surrounding counties is designated as a nonattainment area by the EPA with respect to any of the NAAQS (40 CFR 81.341). The NAAQS and the ambient air quality standards for South Carolina and Georgia are listed in table D2.1.1-1. The South Carolina and Georgia state standards are identical to the NAAQS, except for the annual average TSP standard, for which a NAAQS no longer exists. The South Carolina Department of Health and Environmental Control also has ambient standards for gaseous fluorides (SCDHEC, 1989).

The South Carolina Department of Health and Environmental Control has standards for over 250 HAPs/toxics (SCDHEC, 1991). These provide maximum 24-hr concentrations not to be exceeded at the site boundary. They are divided into three groups depending upon toxicity level. The HAPs/toxics described in this section are those currently used at SRS or those anticipated to be used under the Proposed Action.

Ambient air quality at SRS is monitored at five onsite locations. The data presented in table D2.1.5-1 and used in the analysis are considered representative of the background concentrations at SRS.

The principal sources of criteria air pollutants at SRS are the 13 coal-burning boilers for producing steam and electricity (A-, D-, H-, K-, and P-Areas); fuel and target fabrication (M-Area) and processing facilities (F- and H-Areas); and continuously operating diesel generators (F-, H-, K-, L-, and P-Areas). Other emissions include fugitive particulate emissions from coal piles and coal processing facilities, vehicular emissions, and temporary emissions from various construction-related activities. The emission inventories are included in table D2.1.5-2.

HAP/toxic emissions from various SRS operations include Freon-113, 1,1,1-trichloroethane, and nitric acid. Table D2.1.5-3 presents the SRS emission inventory for HAPs/toxics.

Table 4.1.2.2-1 shows the under ambient and no action conditions at SRS. Ambient air quality monitoring data are listed as "maximum background concentration" and the air dispersion modeling results for existing operations are listed as "No Action concentration." The sum of the maximum background concentration and the No Action concentration for a given pollutant and averaging time is the baseline concentration. The baseline concentration was compared to applicable Federal

TABLE 4.1.2.2–1.—*SRS Ambient and No Action Concentrations Comparison with Applicable Regulations and Guidelines*

Pollutant	Averaging Time	Most Stringent Regulation or Guideline (μg/m³)	Maximum Background Concentration (μg/m³)	No Action Concentration (μg/m³)	Baseline Concentration (μg/m³)[f]
Carbon Monoxide (CO)	8-hour	10,000[a]	h	38	≥ 38
	1-hour	40,000[a]	h	195	≥ 195
Hydrogen Fluoride (HF)	30-day	0.8[b]	h	e	h
	7-day	1.6[b]	h	e	h
	24-hour	2.9[b]	h	e	h
	12-hour	3.7[b]	h	e	h
Lead (Pb)	Calendar Quarter	1.5[a]	h	e	h
Nitrogen Dioxide (NO_2)	Annual	100[a]	6[c]	16	22
Ozone (O_3)	1-hour	235[a]	223.8[d]	e	223.8
Particulate Matter (PM_{10})	Annual	50[a]	27[c]	1	28
	24-hour	150[a]	47[c]	17	64
Sulfur Dioxide (SO_2)	Annual	80[a]	5[c]	11	16
	24-hour	365[a]	34[c]	232	266
	3-hour	1,300[a]	48[c]	1,074.2	1,122.2
Total Suspended Particulates (TSP)	Annual	75[b]	27	1	28
Hazardous Air Pollutants and other Toxic Compounds[g]					
1,1,1–Trichloroethane	24-hour	9,550[b]	h	1.3[d]	≥1.3
Nitric Acid	24-hour	125[b]	h	1.1[d]	≥1.1
Trichlorotrifluoroethane	24-hour	no standard	h	23.3[d]	≥23.3

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[a] Federal Standard (40 CFR 50).
[b] State standard (SCDHEC, 1991).
[c] Ambient air quality monitoring data (DOE, 1991c).
[d] Ambient air quality monitoring data for calendar year 1989 and 1990 (WSRC, 1990 and 1991a).
[e] Not estimated because the potential release is negligible.
[f] The total concentration represents a conservative assessment of potential impacts since the concentration contributions from individual sources do not necessarily occur at the same location.
[g] The compounds listed are the major pollutants of concern (SR Tab F, 1992).
[h] Data unavailable.

and state pollutant limits to provide a conservative estimate of effects of the No Action alternative on air quality. Baseline air quality concentrations from the SRS do not exceed, and would not be expected to exceed any applicable guidelines or regulations.

The EPA-recommended Industrial Source Complex Short Term (ISCST) model was used to perform the air dispersion modeling analysis (EPA, 1987). A description of the modeling methodology is included in Appendix D.

Normal operations result in the emission of radioactive materials at SRS. These emissions include 253,000 curies (Ci) of tritium annually. Radiological releases result in a total maximum individual annual dose of 0.163 millirem (mrem) effective dose equivalent, which is below the NESHAPs 10 mrem effective dose equivalent standard. Tritium is the only radionuclide that may be affected by the activities that are the subject of this EA.

Acoustic Conditions. Major noise sources at SRS are primarily located in developed areas, including

various facilities, equipment, and machines (e.g., cooling towers, transformers, engines, pumps, boilers, steam vents, paging systems, construction and materials-handling equipment, and vehicles). Noise from these sources would be barely distinguishable from background noise levels at the SRS boundary, which is a considerable distance from the facilities. Major noise sources outside these areas consist primarily of vehicles and rail operations. These are also the major sources of offsite noise attributed to SRS activities and would have an effect on noise levels along the highways through the nearby towns of New Ellenton, Jackson, and Aiken.

A sound-level survey was conducted at SRS in July 1989 and January 1990 to determine background noise levels for major transportation routes near SRS and for a limited number of onsite locations (SR NUS, 1990b). In both surveys, the sound-level data were collected at seven offsite locations and three onsite locations during daytime and nighttime periods for weekdays and weekends. DNL derived from the summer survey data L_{eq}(1-hr) ranged from 62 to 72 dBA for offsite locations and from 54 to 62 dBA for onsite locations. Winter survey data generally showed noise levels slightly lower than those for the summer survey data. The levels observed were higher than those suggested by EPA as representative of rural, small-town, or quiet suburban areas, except in a few cases where insect, traffic, and industrial-facility noise contributions were all minor. Estimated L_{eq}(24-hr) values at all measurement locations were below the EPA guideline level of 70 dBA for protection of the public from hearing loss. Further, the levels described are based on data collected at locations adjacent to roads (50 feet); therefore, these levels are greater than those that would be expected for general background.

The States of Georgia and South Carolina and the counties in which SRS is located have not established any noise regulations that specify acceptable community noise levels with the exception of a provision of the Aiken County Nuisance Ordinance which limits daytime and nighttime noise by frequency band as described in appendix D (section D.2.2). Noise levels at residences near SRS may exceed the EPA guideline level for residential areas as a result of natural sources, such as insects, and are expected to exceed the guideline level for residential areas at residences along major roads where traffic is a major noise source.

Environmental Consequences.

Air Quality. Relocating nonnuclear functions would require renovation of existing facilities and some modification of the Replacement Tritium Facility (RTF) (section 3.3.2). Modification and renovation of these facilities would create a temporary increase in emissions of particulate matter such as dust and dirt, vehicle emissions, and various other types of construction-related air releases. The increase is minor when compared to overall site emissions (WSRC, 1992b and c), and when added to existing levels, it would not be expected to exceed applicable air quality standards.

The nonnuclear functions associated with neutron tube target loading would be located in the existing Building 232-H (WSRC, 1992b). Gaseous waste streams would be connected to a dedicated accumulator and trapping system and connected to the existing diffuser system. The accumulator system would protect the high purity neutron generator system from any contaminants in the 232-H system (WSRC, 1992b).

The nonnuclear functions associated with the reservoir surveillance operations would be located in the RTF (WSRC, 1992c). All gaseous waste streams leaving the reservoir surveillance operations would pass through the RTF stripper system prior to discharge to the RTF stack system. In addition, the reservoir surveillance operations area heating, ventilation, and air conditioning (HVAC) room exhaust would go to the RTF stack which is provided with monitoring systems (WSRC, 1992c).

Table 4.1.2.2-2 shows that there is no increase to background concentrations from the Proposed Action.

Consolidation of the nonnuclear activities at SRS would result in an increase in the emission of tritium. An additional 1,823 Ci of tritium would be released annually (MD DOE, 1991a). This would result in a cumulative total maximum individual annual dose of 0.164 mrem effective dose equivalent, which is still below the NESHAP standard of 10 mrem effective dose equivalent. The activities which are the subject of this EA would only affect the emission of tritium.

Acoustic Conditions. Proposed Action effects on noise levels during renovation and operation have been evaluated for the major traffic routes around SRS. The changes in traffic volumes are expected to result in an increase of less than 1 dB in peak-hour sound levels along South Carolina Routes 19 and 125. Changes in sound levels along other routes are expected to be less than 1 dB. The slight increase in noise levels along the major access routes is expected to cause little or no increase in annoyance to surrounding communities or individuals.

TABLE 4.1.2.2–2.—*Contribution to Air Quality from Proposed Action and Total Concentrations at SRS with Comparison to Applicable Standards and Regulations and Guidelines*

Pollutant	Averaging Time	Most Stringent Regulation or Guideline ($\mu g/m^3$)	Baseline Concentration ($\mu g/m^3$)[d]	Proposed Action Concentration ($\mu g/m^3$)	Total Concentration ($\mu g/m^3$)
Carbon Monoxide (CO)	8-hour	10,000[b]	≥ 38[e]	g	≥ 38
	1-hour	40,000[b]	≥ 195[e]	g	≥ 195
Hydrogen Fluoride (HF)	30-day	0.8[c]	f	g	f
	7-day	1.6[c]	f	g	f
	24-hour	2.9[c]	f	g	f
	12-hour	3.7[c]	f	g	f
Lead (Pb)	Calendar Quarter	1.5[b]	f	g	f
Nitrogen Dioxide (NO_2)	Annual	100[b]	22	g	22
Ozone (O_3)	1-hour	235[b]	223.8	g	223.8
Particulate Matter (PM_{10})	Annual	50[b]	28	g	28
	24-hour	150[b]	64	g	64
Sulfur Dioxide (SO_2)	Annual	80[b]	16	g	16
	24-hour	365[b]	266	g	266
	3-hour	1300[b]	1,122	g	1,122
Total Suspended Particulates (TSP)	Annual	75[c]	28	g	28
Hazardous Air Pollutants and Other Toxic Compounds[a]					
1,1,1-Trichloroethane	24-hour	9,550[c]	≥1.3	g	≥1.3
Nitric Acid	24-hour	125[c]	≥1.1	g	≥1.1
Trichlorotrifluoroethane	24-hour	no standard	≥23.3	g	≥23.3

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[a] Compounds listed are the major pollutants of concern SR Tab F, 1992.
[b] Federal Standard (40 CFR 50).
[c] State standard (SCDHEC, 1991).
[d] Baseline Concentrations values are from table 4.1.2.2-1.
[e] Maximum Concentration value unavailable.
[f] Data unavailable.
[g] Design report indicates that emissions of this pollutant would be less than 100 lb/yr (0.01 lb/hr) (WSRC, 1992b and c).

Noise emissions from construction and onsite operation activities are not expected to result in any increase in offsite noise levels. Construction activities are limited to renovation of existing buildings in H- and F-Areas, which are isolated from offsite areas. As required, noise emissions from construction equipment and machines and from operational facilities, equipment, and machines, would not cause ambient noise levels at the site boundary to exceed the EPA guidelines.

Although no increase in annoyance is expected offsite from construction and operation, measures would be implemented onsite to protect workers' hearing. These measures include the use of standard silencing packages on construction equipment and providing workers in noisy environments during construction and operation with appropriate ear-muffs or earplugs approved by OSHA. As required, noise levels would be measured in worker areas and a hearing protection program would be conducted.

4.1.2.3 *Water Resources*

Affected Environment. This section describes the surface water and groundwater resources at SRS.

Surface Water. Surface water bodies at SRS include the Savannah River, Savannah River Swamp, Upper Three Runs Creek (including its tributaries, Tims Branch and Tinker Creek), Beaver Dam Creek, Four Mile Creek, Pen Branch (including its tributary, Indian Grave Branch), Steel Creek (including its tributary, Meyers Branch), and Lower Three Runs Creek (figure 4.1.2.3-1). All these surface water bodies drain into the Savannah River. With the exception of Tinker Creek, these surface water bodies receive effluent from site operations.

There are over 190 Carolina Bays scattered throughout the site. Carolina Bays are naturally occurring closed depressions that often hold water. There are no direct discharges to Carolina Bays; however, some do receive stormwater runoff. One bay in the 3700-Area receives approximately 43,200 GPD of clean overflow water from a fire protection water holding tank (WSRC, 1992h).

Two onsite man-made surface water bodies, Par Pond and L-Lake, have served as cooling water reservoirs. Par Pond has a surface area of 2,640 acres and was formed by impounding waters of Lower Three Runs Creek. L-Lake has a surface area of 1,000 acres and was formed by impounding waters of Steel Creek (SR DOE, 1987).

The Savannah River is the principal surface water body near the site, flowing along a 35-mile stretch of the SRS southwestern boundary. The Savannah River basin is one of the major river systems in the southeast, draining an area of approximately 10,600 square miles. Stream flow is regulated by 5 large reservoirs located upriver of SRS, the nearest being the Thurmond Reservoir 65 miles upstream (figure 3.2.5.1-1). The Thurmond Reservoir Dam operates at a water-release level of no less than 3,600 ft^3/s to meet downstream requirements of SRS. The average flow rate of the river for the 81-year period of record is approximately 10,000 ft^3/s. The peak historic (1929) flow rate is 350,000 ft^3/s, and the lowest average annual flow rate is approximately 6,500 ft^3/s recorded during the 1985 to 1988 drought (SR DOE, 1987). Activities transferred under the Proposed Action, as well as under the alternatives, would be relocated to areas well outside the 100-year floodplain (SR DOE, 1990b)

The Savannah River Swamp lies along the river for a distance of 10 miles and averages 1.5 miles in width (approximately 15 square miles). The swamp is separated from the river by a 10-foot high natural levee. Four Mile Creek, Pen Branch, Steel Creek, and Beaver Dam Creek empty into the swamp (SR DOE, 1987).

Surface water rights in the Savannah River watershed are set by the Doctrine of Riparian Rights; users must not adversely affect downstream quantity or quality (DOE, 1991c). SRS discharges waste-water into the Savannah River and onsite tributaries under a sitewide NPDES permit. Through October

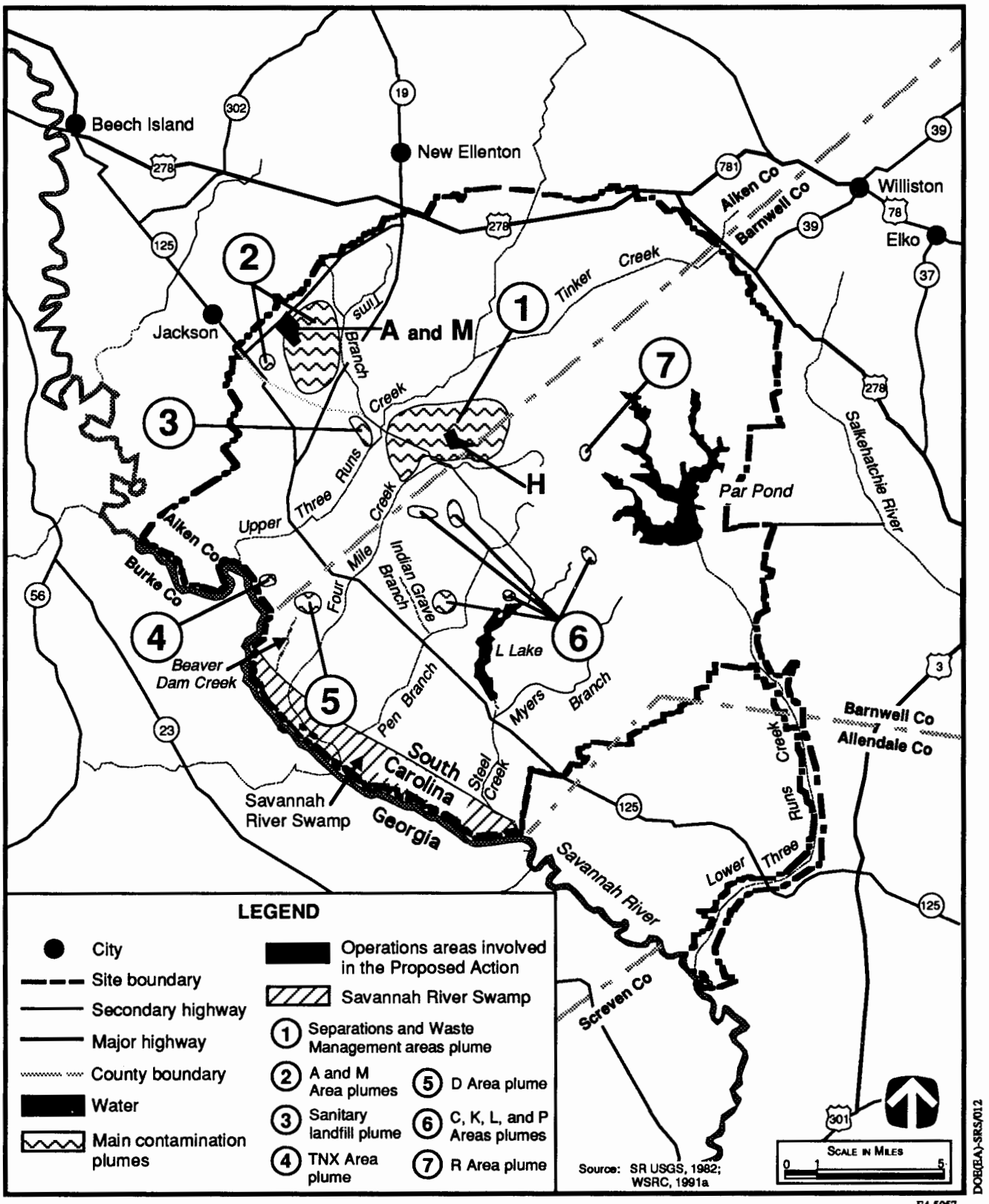

FIGURE 4.1.2.3-1—*Groundwater Contamination at the Savannah River Site.*

1990, the SRS NPDES permit regulated 76 active NPDES outfalls at locations on the 6 onsite streams and at 6 locations on the Savannah River (SR DOE, 1989). In November 1990, another NPDES permit was issued for 5 additional outfalls, bringing the total number of permitted outfalls to 81 (WSRC, 1991a). These discharges are primarily thermal effluents but also include sanitary and industrial wastes that contain radioactive and nonradioactive constituents.

All SRS streams and their associated wetlands, except Tinkers Branch and Upper Three Runs Creek, have been influenced by SRS reactor cooling water discharges. These discharges, 10 to 20 times the natural stream flows, caused the streams to overflow their original banks and to scour and erode the stream channels. Deposition of eroded material has resulted in the creation of large deltas where the streams enter the Savannah River swamp (SR DOE, 1987).

When it is operating, K-Reactor discharges cooling water to Indian Grave Branch and Pen Branch. Other discharges to Pen Branch and Indian Grave Branch include nonprocess cooling water, ash basin effluent, powerhouse wastewater, waste treatment plant overflow, reactor process wastewater, and sanitary wastewater, all of which are associated with K-Area operation. In the past, Steel Creek received cooling water effluents from L-Reactor, and Par Pond received cooling water effluent from P- and R-Reactors.

Upper Three Runs Creek receives tritiated wastewater from the F- and H-Area Effluent Treatment Facility (SR DOE, 1987). The mean flow rate of Four Mile Branch is 16.5 ft^3/s. Discharges from the SRS Wastewater Treatment facilities average approximately 185 MGY (table 3.2.5-1).

When K-, L-, and P-Reactors, and the D-Area Powerhouse were all operational, the maximum SRS withdrawal rate from the Savannah River was about approximately 650 MGD. This was primarily used as cooling water in the production reactors and coal-fired steam plants. Approximately 87 percent of this water was returned to the Savannah River via SRS streams. Consumptive water use for these operations was approximately 83 MGD (SR DOE, 1987).

Construction of the K-Reactor cooling tower is complete and testing will begin in early 1993. Preliminary estimates indicate that when it is operational, K-Reactor will withdraw between 29 and 43 MGD from the Savannah River and discharge approximately 85 percent of that back into Indian Grave Branch and Pen Branch. This 85 percent consists of both blowdown and bypass water. The percentage of each will be influenced by factors such as weather and season, and thus will fluctuate frequently, perhaps daily. The DHEC permit for operation of the K-Reactor cooling tower has been issued. The current start up date for the tower is April 1993. Full heat load and more specific withdrawl and discharge information will be available in the summer of 1993.

Surface Water Quality. Much of the contaminated groundwater emerges onsite at streams. Migration from the source of contamination to a surface water body may take from 5 to 30 years. The quantity of tritium migrating from all seepage basins represented 84 percent of the total amount of tritium released to site streams in 1990 (WSRC, 1991a). Liquid releases of tritium through spills and seepage basin migration generally account for more than 99 percent of the total radioactivity introduced into the Savannah River from SRS activities (WSRC, 1991a).

In the vicinity of SRS, the Savannah River and onsite streams are Class B streams under the South Carolina Department of Health and Environmental Control Regulations. These regulations define Class B waters as suitable for secondary-contact recreation and as a source of drinking water after conventional treatment (WSRC, 1991a). Water from the Savannah River is not used as a source of drinking water within 50 miles downstream of SRS (SR DOE, 1989).

In 1990, Savannah River water quality and sediment analyses upriver and down river from SRS showed no significant differences except for fecal coliform, which were higher upriver than down river. All

pesticides and herbicides were found at less than minimum detectable concentrations in the river water and in sediments (WSRC, 1991a). The 1990 surface water quality monitoring results for the Savannah River are presented in table 4.1.2.3-1. Aluminum, iron, and manganese had maximum concentrations exceeding listed water quality criteria. However, these maximum concentrations were less than or equal to maximum concentrations monitored upstream from SRS, indicating that the primary source of contamination is upstream. Analytical results for both chemicals and metals were generally within the ranges observed in previous years (WSRC, 1991a). Water quality would be taken into consideration in future NPDES permitting of all upstream and downstream dischargers, including SRS.

The majority of the proposed activities would be located at existing facilities within H-Area. The primary receiving stream in H-Area is Four Mile Creek. The 1990 water quality monitoring results for Four Mile Creek were compared to water quality criteria. The comparison indicated that the maximum concentration of iron (0.042 milligram per liter (mg/L)) was the only parameter of the sampling program that exceeded water quality criteria. The average concentration was below the criteria value of 0.3 mg/L (WSRC, 1991a).

Permitted discharges to the Savannah River and the onsite streams are monitored pursuant to NPDES and South Carolina Department of Health and Environmental Control permits. In 1990, SRS had a 99.8 percent NPDES compliance rate with just 16 noncompliances out of 6,810 analyses performed (WSRC, 1991a). Of the 16 noncompliances, 4 were for total suspended solids, 3 were for oil and grease, 3 were for pH, 2 were for trichloroethylene, 2 were for mercury, 1 was for biochemical oxygen demand, and 1 was for fecal coliform. Two pH noncompliances occurred at the same outfall and both trichloroethylene noncompliances occurred at the same outfall. All other noncompliances were one-time, one outfall events (WSRC, 1991a).

Each noncompliance was reported to the South Carolina Department of Health and Environmental Control in the monthly Discharge Monitoring Report. The monitoring report includes the following information: parameter in noncompliance, location, possible cause, and any corrective action taken (WSRC, 1991a).

Groundwater. SRS is located in an area of sedimentary rocks that dip southeastward and generally thicken toward the southeast. A number of geologic units contain large amounts of groundwater, and the site relies on this groundwater to supply most of its sanitary and process water needs.

Bledsoe and others (SR Bledsoe, 1990) have divided the coastal plain sequence into a series of aquifers and aquitards; from bottom to top, Confining System I, Aquifer System I, Confining System I-II, and Aquifer System II. In the northwest corner of the site, Aquifer Systems I and II coalesce, forming a single system, Aquifer System I/II. These systems are not considered Class I aquifers.

The water table in H-Area is approximately 20 to 25 feet below the ground surface. The depth of incision of the creeks that allow discharge of water to the surface determines the horizontal direction of ground water. The vertical direction of groundwater movement is governed by the permeability of the aquitards (confining layers) and the relative difference in hydraulic head between the water-bearing units (WSRC, 1990).

Groundwater Quality. The SRS groundwater monitoring program includes analyses for several hundred radioactive and nonradioactive constituents from over 1,100 wells at more than 85 locations.

The radioactive constituents include gross alpha, nonvolatile beta, strontium-89, strontium-90, and tritium. The nonradioactive constituents include volatile organics, herbicides, pesticides, metals, and major ions. Figure 4.1.2.3-1 shows areas of the SRS that are contaminated by radioactive and nonradioactive constituents. The contaminant

TABLE 4.1.2.3-1.—*Summary of Surface Water Quality, Savannah River Site*

Receiving Water: Savannah River—1990				
Parameter	Unit of Measure	Water Quality Criteria	Existing Water Body Concentration[a]	
			Average	Maximum
Aluminum[g]	mg/L	0.05-0.2[d]	NC	1.1
Ammonia	mg/L	NA	0.1	0.2
Cadmium	mg/L	0.005[c]	NC	<0.01
Calcium	mg/L	NA	NC	4.4
Cesium-137	pCi/L	120[e]	0.028	0.037
Chemical Oxygen Demand	mg/L	NA	9.8	14
Chloride	mg/L	250[d]	8	10
Chromium	mg/L	0.1[b]	NC	<0.02
Copper	mg/L	1.0[b]	NC	<0.01
Dissolved Oxygen	mg/L	NA	7.7	9.5
Fecal Coliform	Colonies Per 100/ml	1,000[c]	54	197
Gross Alpha	pCi/L	15[c]	0.08	1.48
Iron[g]	mg/L	0.3[d]	NC	1.5
Lead	mg/L	0.015[c]	NC	0.01
Magnesium	mg/L	NA	NC	1.3
Manganese[g]	mg/L	0.05[d]	NC	0.1
Mercury	mg/L	0.002[b]	NC	<0.0002
Nickel	mg/L	0.1[c]	NC	<0.05
Nitrite/Nitrate	mg/L	10[c]	0.28	0.43
Non Volatile Beta (dissolved)	pCi/L	50[c]	2.1	5.1
pH	pH Units	6.5-8.5[d]	(not reported)	8.2
Phosphate	mg/L	NA	0.1	0.16
Plutonium-238	pCi/L	1.6[e]	0.0006	0.0029
Plutonium-239	pCi/L	1.2[e]	0.0014	0.0079
Sodium	mg/L	NA	NC	11
Strontium-89	pCi/L	800[e]	0.25	0.98
Strontium-90	pCi/L	8[c]	0.13	0.30
Sulfate	mg/L	250[d]	8.5	12
Suspended Solids	mg/L	NA	12	19
Temperature	Celsius	32.2[f]	18.0	27
Total Dissolved Solids	mg/L	500[d]	63	71
Tritium	pCi/L	20,000[c]	900	6,810
Zinc	mg/L	5[d]	NC	0.02

E4 3346

[a] Average concentration of all samples taken at the downstream monitoring station. Maximum taken as the highest sampled concentration along the reach of the river potentially affected by site activities. Less than symbol (<) indicates concentration below the analysis detection limit.

[b] Maximum Contaminant Level (MCL), South Carolina State Water Quality Standards.

[c] Maximum Contaminant Level (MCL), EPA National Primary Drinking Water Regulations, 40 CFR 141.

[d] Secondary Maximum Contaminant Level (SMCL), EPA National Secondary Drinking Water Regulations, 40 CFR 143.

[e] U.S. Department of Energy Derived Concentration Guides (DCGs) for Water (DOE Order 5400.5). DCG values are based on a committed effective does of 100 millirem per year; however, because the drinking water MCL is based on 4 millirem per year, the number listed is 4 percent of the DCG.

[f] Shall not exceed weekly average of 32.2 degrees Celsius after mixing nor rise more than 2.8 degrees Celsius in one week unless appropriate temperature criterion mixing zone has been established.

[g] Concentration exceeded water quality criteria; however, these criteria are listed for comparison only. Water quality standards do not affect plant activities until they are translated into end-of-pipe effluent limitations imposed on discharges through the NPDES permitting process. Similarly, drinking and DOE DCGs are listed to provide an understanding of an undesirable concentration for those parameters not covered by water quality standards—they do not constitute an enforceable limit.

NA None Applicable.

NC Not calculated due to insufficient number of samples.

Source: WSRC, 1991a.

plumes near A- and H-Areas contain chlorinated volatile organics, radionuclides, nitrate, and heavy metals. The plume near H-Area also contains tritium and sulfate (WSRC, 1991a).

Groundwater quality at SRS ranges from good to extremely poor. There is no evidence that Aquifer Unit IA has been degraded by SRS operations. Water quality in parts of Aquifers IIA and IIB has deteriorated because of infiltration of radioactive and hazardous contaminants (WSRC, 1990). Radionuclide concentrations in SRS groundwater range from below detection limits to 7 billion picocuries per liter (pCi/L), 140,000 pCi/L, and 2,400 pCi/L for tritium, strontium-89 and -90, and chromium-51, respectively. Table 4.1.2.3-2 shows typical groundwater quality. Wells RAC-3 and RDB-2D are downgradient from the former acid/caustic basin. Measured values for pH reflect an influence from acid waters disposed of in this basin.

Groundwater Use. SRS is one of 56 major municipal, industrial, and agricultural ground water users identified within a 20 mile radius. The total pumpage for these 56 users averages about 12.9 BGY (SR DOE, 1990b). Groundwater use at SRS totals approximately 4 BGY which represents about 31 percent of the total groundwater used in the area. To meet future development plans and regulatory requirements, a new production well is planned in the B-Area.

The entire water supply for H-Area is from groundwater. The H-Area tritium handling operations currently use an average of 576,000 GPD (table 3.2.5-2).

Groundwater Rights. Groundwater rights in South Carolina are traditionally associated with property ownership. The South Carolina Water Resources Commission requires groundwater users pumping more than 1.162 gallons per second (37 MGY) to report their withdrawal rates. SRS groundwater use of approximately 4 BGY exceeds this amount and, consequently, SRS reports its withdrawal rates to the Commission.

Environmental Consequences. The relocation of tritium functions would not result in the construction of any new buildings at SRS. Some modification would take place within existing facilities. Processes associated with tritium functions would not result in any new waste streams (WSRC, 1992a, b, and c). A description of the functions to be transferred to SRS and the facility locations selected to house these activities is presented in section 3.3.2.

Surface Water. If an outside construction laydown area is used, surface water runoff would be collected by a stormwater collection system. No impacts to surface water levels are anticipated during the facility modification phase.

The additional sanitary wastewater generated by the transferred processes is approximately 0.3 MGY (table 3.3.2-4). This additional wastewater would represent a less than 1 percent increase over the current SRS wastewater generation rate of approximately 185 MGY (table 3.2.5-1). This is not a significant increase in the wastewater generation rate. Wastewater would be treated onsite initially in existing treatment facilities, and later in new facilities that are already planned (WSRC, 1992e).

If the entire additional 0.3 MGY (0.001 ft^3/s) of wastewater generated were discharged to Four Mile Branch, it would result in a less than one percent increase to the mean flow rate of the stream of 16.5 ft^3/s (WSRC, 1991a). The mean flow rate of Upper Three Runs Creek is an order of magnitude greater than that of Four Mile Branch, and hence the additional flow in Upper Three Runs Creek would be a much less than 1 percent increase.

Surface Water Quality. The site was selected to receive these activities based on the compatibility between current operations and those that would be relocated. Future NPDES permits would be issued after review of the current water quality and how it is affected by discharges from SRS, including the transferred technologies. Aluminum, iron, and manganese have been identified as potential water quality concerns in the Savannah River. These

TABLE 4.1.2.3-2.—*Summary of Groundwater Quality Monitoring, Savannah River Site*

Parameter	Unit of Measure	Water Quality Criteria	1990—Existing Conditions		
			Well No. RAC 3	Well No. RDB-2D	Well No. YSC 2D
1,1,1-Trichloroethane	mg/L	0.2[b]	<0.001	a	a
Barium	mg/L	1[b]	0.045	0.021-0.036	0.011-0.016
Carbon Tetrachloride	mg/L	0.005[b]	<0.001	a	a
Chloride	mg/L	250[d]	2.2	1.3-1.8	1.2
Chloroform	mg/L	0.10[b]	<0.001	a	a
Copper	mg/L	1[d]	0.012	a	a
Gross alpha	pCi/L	15[b]	3	2-3	3.80-11.3
Iron	mg/L	0.3[d]	0.025-0.055	0.84-2.78	0.006-0.014
Lead	mg/L	0.015[b]	0.01-0.018	<0.003-0.011	<0.002-0.005
Manganese	mg/L	0.05[d]	0.021-0.03	0.062-0.146	0.012-0.032
Nitrate	mg/L	10[b]	1.07	0.05-0.09	1.18-1.44
Nonvolatile beta	pCi/L	50[b]	<2	4-10.7	2.70-3.2
Organic Halogens (total)	mg/L	c	<0.005-0.011	0.005	<0.005
pH	pH units	6.5-8.5[d]	4.4-4.9	6.2-6.6	6.1-7.6
Phenols	mg/L	c	<0.005	<0.005	<0.005
Phosphates (total)	mg/L	c	<0.05	0.05-0.49	0.23-1
Radium (total)	pCi/L	5[b]	94	<1-5.4	1-21[d]
Sulfate	mg/L	250[d]	5	3.7-13.1	<1
Tetrachloroethylene	mg/L	0.005[b]	<0.001	a	a
Total Dissolved Solids	mg/L	500[d]	a	59-154	43-81
Trichloroethylene	mg/L	0.005[b]	<0.001	a	a
Tritium	pCi/L	20,000[b]	a	57,900-119,000	5,800-6,100

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Notes: Data comes from wells located in the area of the relocated facilities. Less than symbol (<) indicates concentration below analysis detection limit.

[a] Did not analyze for this constituent.
[b] National Primary Drinking Water Regulations, Maximum Contaminant Level (MCL). 40 CFR 141.
[c] No limit specified.
[d] National Secondary Drinking Water Regulations, Secondary Maximum Contaminant Level (SMCL), 40 CFR 143.

Source: WSRC, 1990.

concerns do not effect activities at SRS until they are translated into end-of-pipe NPDES permit limits.

Groundwater. H-Area draws its water supply from onsite wells. The amount of water usage for building modification would be approximately 600 GPD (table 3.3.2-3). The amount is less than 1 percent of the current groundwater usage in H-Area of 576,000 GPD. Therefore, it would not be a significant increase in groundwater usage.

During operations, there would be 144,000 GPD of water required for the consolidation activities (table 3.3.2-5). This amount is approximately 25 percent of the current groundwater usage by the H-Area tritium handling operations, approximately 5 percent of the H-Area system capacity, and approximately 1 percent of the total SRS groundwater usage.

Groundwater Quality. No discharge of waste materials to groundwater is planned. Wastewater amounts would be minor and transported to sewer systems in existing facilities. All wastewater discharges would comply with NPDES permit requirements.

4.1.2.4 *Geology and Soils*

Affected Environment. SRS is located in the Upper Atlantic Coastal Plain province of the Aiken Plateau.

SRS lies within Seismic Zone 2A (UBC, 1991). There are no known capable faults in the immediate region of SRS. Evidence from subsurface mapping and seismic surveys suggests the presence of a fault, the Pen Branch, which underlies SRS (WSRC, 1991b). However, there is no evidence of recent movement along this fault.

There are few geologic concerns associated with SRS. SRS does not lie within 80 miles of any known capable faults, nor does it lie in areas of subsidence, landslides, active volcanism, rapid erosion, or sedimentation. SRS is therefore considered a low geologic hazard area.

SRS lies on bottom land and upland soils of seven soil associations (SR USDA, 1990). Most of the soils are well to excessively drained. The well-drained soils have a sandy surface layer underlain by a loamy subsoil. The somewhat excessively-drained soils have a thick, sandy surface layer that extends to a depth of 80 inches or more. Several soil units which cover nearly 17 percent of the plant property (SR USDA, 1990) have been designated as prime farmland. All soils have low shrink-swell potentials. Many soils are subject to flooding, ponding, and cutbank caving. Upland soils are subject to moderate water erosion and slight to moderate wind erosion because of their slope. All other soils have a slight water and wind erosion hazard.

Environmental Consequences. SRS lies in an area characterized by geological and soil stability. Consolidation of the tritium functions at SRS would be accomplished within existing buildings, or within the RTF, which is currently under construction. There would be no significant alteration of topographic features such as geological landmarks, slopes, rock outcrops, or drainages.

Renovation to accommodate relocated functions would be done according to seismic building code requirements appropriate to the facility and regional seismicity; therefore, the hazard from earthquake activity would not increase.

Because there would be no new construction, relocation of the tritium functions to SRS would have no impact on the soils of the site, including no impact to prime farmland.

4.1.2.5 *Biotic Resources*

Affected Environment. Areas within SRS that would be modified by activities under the Proposed Action (H-Area and 700-Area) are already developed and do not support natural vegetation or terrestrial wildlife habitat. Adjoining undeveloped lands support primarily upland hardwood pine forest with narrow zones of bottom land hardwood forest in swales and stream valleys (SR Dupont, 1982). Much of the upland hardwood pine forest consists of loblolly pine (*Pinus taeda*), longleaf pine (*Pinus palustris*), and slash pine (*Pinus elliottii*) that has been planted and managed by the U.S. Forest Service. Several areas within SRS have been designated as a NERP (section 4.1.2.1) and support a variety of short-term and long-term ecological research activities.

Approximately 43,000 acres of wetlands occur on SRS (DOE, 1991c). These include the roughly 9,400 acre Savannah River Swamp bordering the channel of the Savannah River, an estimated 190 Carolina Bays of various size scattered throughout SRS, and numerous large and small areas of wetland within lowland areas associated with the many streams on SRS. Wetlands do not occur within the pavement and graveled lands in the H-Area or 700-Area, but several areas of wetlands occur adjacent to or in close proximity to each of these areas.

Operation of DOE facilities on SRS, including the present tritium functions, involves surface and groundwater withdrawal and discharge to aquatic

ecosystems within and adjacent to the site. Numerous species of fish, macroinvertebrates, and other aquatic biota are present in these aquatic ecosystems (DOE, 1991c; SR Dukes, 1984; SR Bennett, 1983). No aquatic habitats occur within the H-Area or 700-Area, but several streams flow through undeveloped lands immediately adjoining these areas.

Several Federally-listed threatened and endangered species are known to occur, or potentially occur, at SRS (DOE, 1991c). A biological assessment prepared in 1984 addressed several Federally-listed species, including the American alligator (*Alligator mississippiensis*) (a Federally-listed threatened species most commonly found in Par Pond, swamps, and marshes), red-cockaded woodpecker (*Picoides borealis*) (a Federally-listed endangered species that nests in medium- to old-age living pines), and American wood stork (*Mycteria americana*) (a Federally-listed endangered species most commonly found in the Savannah River Swamp) (SR Mackey, 1984). Several other Federally-listed endangered species occur on SRS, including the bald eagle (*Haliaeetus leucocephalus*) (observed near Par Pond and L Lake, nested below Par Pond and on Pen Branch), the peregrine falcon (*Falco peregrinus*) (rare winter migrant), and the short nose sturgeon (*Ancipenser brevirostrum*) (spawns in the Savannah River upstream from SRS) (DOE, 1991c). None of these species would be expected to inhabit the H-Area, 700-Area, or other such highly developed area; although undeveloped lands in the vicinity of each area could potentially provide suitable habitat for threatened and endangered species.

Environmental Consequences. Temporary minor land disturbance could result from renovating SRS facilities with the Proposed Action. The disturbance would be limited to laydown areas on lawns and paved areas in two existing intensively developed areas within the SRS (the H-Area, and 700-Area). All have minimal value as terrestrial wildlife habitat. No undeveloped land would be disturbed by the Proposed Action, and these activities would not affect current forestry operations, public hunting, or research activities conducted at the NERP. Renovation and operation activities would be limited to previously developed areas, and therefore, would not result in impacts to wetlands. Standard erosion control procedures would be implemented before renovation to protect wetlands adjoining the H-Area and 700-Area from potential sedimentation.

The Proposed Action would not significantly affect aquatic biota. Minor increases in water withdrawal from the Savannah River and water discharged to its tributaries resulting from the consolidation facilities (section 4.1.2.3) would not significantly affect aquatic habitats associated with those water bodies. Additional wastewater would be discharged in compliance with the NPDES permit issued by the South Carolina Department of Health and Environmental Control.

Terrestrial or aquatic habitats potentially providing habitat to Federally-listed or South Carolina-listed threatened or endangered species would not be affected by the Proposed Action. DOE has initiated consultations with the FWS and the South Carolina Natural Heritage Program to ensure that renovation and operation activities would not result in impacts to any listed or special status species in the vicinity.

4.1.2.6 *Cultural Resources*

Affected Environment. The prehistoric chronology of the SRS area is separated into five broad time periods (SRARP, 1990a): Paleoindian (9550-7950 B.C.), Archaic (7950-1050 B.C.), Woodland (1050 B.C.-A.D. 1150), Mississippian (A.D. 1150-1450), and Protohistoric (A.D. 1450-1540). Prehistoric types in the region include villages, base camps, limited activity sites, quarries, and workshops. Over 60 percent of SRS has received some level of cultural resources evaluation (SR Brooks, 1988; SR Brooks, 1987; SR Hanson, 1978a; SR Hanson, 1978b; SRARP, 1990a; SRARP, 1989a). Over 800 prehistoric sites have been identified at SRS; however, less than 8 percent have been evaluated for NRHP eligibility. Only 10 prehistoric sites have

been determined eligible, with concurrence from State Historic Preservation Office (SHPO).

The history of the region has been previously documented (SR Brooks, 1986; SR DePratter, 1987; SR Brooks, 1991). About 400 historic sites have been identified at SRS; approximately 10 percent have been evaluated for NRHP eligibility (SRARP, 1989b, 1990a and b, 1991). Only 10 historic sites have been determined eligible, with concurrence from the South Carolina SHPO.

The AEC selected South Carolina Site No. 5 in 1950. Construction began at SRS in 1951 and the plant was operational in 1953 (History Associates, 1987). Most of the previously existing historic structures were demolished during the initial establishment of SRS in 1951. The existing nuclear production facilities are not likely to be considered NRHP-eligible because they may lack architectural integrity, may not represent a particular style, and may not be contributing features to the broad historic theme of the Manhattan Project and initial nuclear production.

Native American groups with traditional ties to the area include the Westo, Shawnee, Yuchi, Apalachee, Chickasaw, Creek, and Cherokee (SR DOE, 1991a). Native American resources in the region include villages or townsites, ceremonial lodges, burial sites, cemeteries, and areas containing traditional plants used for certain rituals. The Yuchi Tribal Organization, the National Council of the Muskogee Creek, the Indian People's Muskogee Tribal Town Confederacy, the Pee Dee Indian Association, the Ma Chis Lower Alabama Creek Indian Tribe, and the United Keetoowah Band of the Cherokees have expressed concerns about sensitive Native American resources at the Savannah River Site. Villages or townsites may contain a variety of sensitive features associated with different ceremonies and rituals; therefore, Pee Dee, Creek, and Yuchi townsites are considered sensitive (SR DOE, 1991a). The Yuchi and the Muskogee Creek expressed concern that the area contains several plants traditionally used in ceremonies (SR DOE, 1991a).

Environmental Consequences. All tritium functions relocated to SRS would be accommodated within existing structures without new construction. The existing facilities are not likely to be considered NRHP-eligible. Therefore, no NRHP-eligible prehistoric or historic resources or important Native American resources would be affected by either renovation or operation activities.

4.1.2.7 *Socioeconomics and Community Services*

Affected Environment. The discussion of socioeconomics and community services at SRS is based on the ROI where 93 percent of the SRS employees lived in 1991. The ROI includes Aiken (52 percent), Allendale (1 percent), Bamberg (2 percent), Barnwell (7 percent), Edgefield (1 percent), and Orangeburg (2 percent) counties in South Carolina; and Columbia (11 percent) and Richmond (17 percent) counties in Georgia. Within these ROI counties, the following key cities have been included in the Affected Environment and Environmental Consequences discussions: Aiken, SC (26 percent); North Augusta, SC (14 percent); and Augusta, GA (15 percent). (See figure 3.2.5.1-1.)

Assumptions, methodologies, and supporting data for the assessment of environmental consequences are presented in appendix E. Tables E3.2-1 through E3.2-5 give ROI resource information on the following: residential distribution of plant employees, regional economic and population growth indicators, housing characteristics, primary municipal water and wastewater systems, education characteristics, and local transportation.

Employment and Local Economy. The civilian labor force in the ROI grew 75 percent, increasing from 146,087 persons in 1970 to 256,074 persons in 1990. Total employment increased from 138,668 to 243,301 persons between 1970 and 1990, an annual growth rate of 3 percent. The unemployment rates for 1970 and 1990 were 5.1 percent and 5.0 percent, respectively. For the same years, personal income

increased from approximately $1.2 billion to $7.6 billion (an annual average of 10 percent), and per capita income increased from $2,959 to $14,446.

In 1990, employment at SRS was 20,230 persons, representing 8 percent of the ROI employment (SR DOE, 1992e). As of September 30,1992 employment at SRS had increased to 21,478 persons. Under the No Action alternative, future site employment would be expected to increase to approximately 21,963 persons by the year 2000 (DOE, 1992e). In 1990, the total SRS payroll was estimated to be $725.8 million (SR DOE, 1992e). Under the No Action baseline, the total payroll would be projected to be approximately $788 million by the year 2000.

The civilian labor force is projected to grow at less than 1 percent annually, reaching an estimated 289,000 persons by 2000 and 300,000 persons by 2020. The unemployment rates for 2000 and 2020 are projected to be 6.3 percent and 6.2 percent, respectively. For the same years, personal income is projected to increase from approximately $10.6 billion to $13.7 billion, an annual average of 1 percent. Per capita income is projected to increase from an estimated $18,000 in 2000 to $21,500 in 2020.

Population. Between 1970 and 1990, the population in the ROI increased 31 percent to 528,785 persons. During the same period, the South Carolina population increased 35 percent and the Georgia population increased 41 percent. The population in the 8-county ROI is projected to increase from an estimated 583,000 persons in 2000 to 636,000 persons by 2020 at an annual rate of less than 1 percent.

The largest county population increase (196 percent) occurred in Columbia County between 1970 and 1990, while during the same years, populations in Bamberg and Aiken counties increased 6 percent and 33 percent, respectively. Population in Columbia County is estimated to increase 5 percent between 1990 and 2000 and 10 percent between 2000 and 2020, an annual growth rate of less than 1 percent. The Bamberg County population is projected to increase approximately 13 percent between 1990 and 2000 and 9 percent between 2000 and 2020, an annual growth rate of less than 1 percent. The population in Aiken County is expected to increase approximately 10 percent by 2000 and an additional 9 percent by 2020, an annual growth rate of less than 1 percent.

Between 1970 and 1990, Aiken had the greatest increase in city population (48 percent) in the ROI. For the same years, the North Augusta population increased 19 percent, and the Augusta population decreased 25 percent.

Housing. Between 1970 and 1990, the number of housing units in the ROI increased 70 percent from 122,558 to 208,433 units. Concurrent with population growth in the ROI, housing units are expected to increase approximately 10 percent by the year 2000 and an additional 9 percent by 2020, an annual increase of less than 1 percent.

Between 1970 and 1990, the largest increase in housing units (252 percent) occurred in Columbia County, while the smallest increase (32 percent) occurred in Bamberg County. Housing units in Columbia County are expected to increase approximately 15 percent by 2000 and an additional 11 percent by 2020, an annual increase of less than 1 percent. Housing units in Bamberg County are expected to increase about 18 percent by 2000 and an additional 9 percent by 2020, an annual increase of less than 1 percent.

In 1990, the homeowner vacancy rates averaged 2 percent in the ROI and ranged from approximately 1 percent in Barnwell County to 2 percent in Columbia County. The vacancy rates for rental units averaged 10 percent and ranged from about 7 percent in Allendale County to 11 percent in Aiken County.

Community Infrastructure and Services. The water supply systems operated by the counties of Aiken, Allendale, Bamberg, Edgefield, Orangeburg, Columbia, and Richmond and the Cities of Aiken,

Augusta, North Augusta, and Barnwell maintain about 97 percent of the total capacity of the 14 major public systems in the ROI. The majority of these systems draw their raw water supplies from groundwater; but the systems serving Aiken, North Augusta, Columbia County, and Richmond County also draw a portion of their water supplies from surface water. Edgefield County, Orangeburg County, and Augusta utilize only surface water.

The Aiken County system (about 16.1 MGD capacity), Aiken (10.3 MGD capacity), and North Augusta (8 MGD capacity) in Aiken County had 1989 average daily demands equal to 55 percent, 84 percent, and 31 percent of capacity, respectively. The systems operated by Allendale County (about 6.8 MGD capacity), Bamberg County (about 3.1 MGD capacity), and the city of Barnwell (about 4.8 MGD capacity) had 1989 average daily demands equal to 13 percent, 51 percent, and 15 percent of capacity, respectively. The water supply systems operated by Edgefield County (4.4 MGD capacity) and Orangeburg County (11 MGD capacity) experienced 1991 average daily demands equal to 57 percent and 54 percent of capacity, respectively. The systems operated by Columbia County (about 16.7 MGD capacity), Richmond County (22 MGD capacity), and the city of Augusta (60 MGD capacity) had 1989 average daily demands equal to 40 percent, 55 percent, and 47 percent of capacity, respectively.

Aiken is projected to have average daily demands equal to 86 percent of capacity in 1995 and 88 percent of capacity in 2000. All of these other systems are projected to have average daily demands of less than 63 percent of capacity in 1995 and less than 71 percent of capacity in 2000.

The counties of Aiken, Bamberg, Orangeburg, and Columbia and the city of Augusta operate wastewater treatment systems that maintain about 93 percent of the capacity of the 10 major public systems in the ROI. The Aiken County system (20 MGD capacity), which also serves the Aiken and North Augusta, had 1989 average daily demands equal to 45 percent of capacity. The system operated by Bamberg County (4 MGD capacity) had 1989 average daily demands equal to 13 percent of capacity. The Orangeburg County system (9 MGD capacity) experienced 1991 average daily demands equal to 41 percent of capacity. The systems operated by Columbia County (about 5.4 MGD capacity) and the city of Augusta (46.1 MGD capacity) had 1989 average daily demands equal to 61 percent and 63 percent of capacity, respectively. All of these systems are projected to have average daily demands of less than 66 percent of capacity in 1995 and less than 69 percent of capacity in 2000.

Eighteen school districts provide public education services and facilities in the ROI. In 1990, these school districts ranged in enrollment size from 640 students in the Orangeburg School District #8 to 31,669 students in the Richmond County School District. School districts with enrollments of over 1,000 students were operating between 83 percent and 105 percent of capacity, but the majority of school districts were operating between 80 percent and 100 percent of capacity. Those school districts operating over 100 percent of capacity were Aiken County (103 percent), Allendale County (103 percent), Orangeburg District #3 (101 percent), and Orangeburg District #7 (103 percent). School districts in Aiken, Allendale, and Columbia counties were operating between 100 percent and 103 percent of capacity. Under the No Action future baseline, the current capacity of the Aiken County School District is projected to be further exceeded by the years 1995 and 2000, while the current capacity of the Columbia County School District is projected to be further exceeded by the year 2000. The largest increase is expected to occur in the Aiken County School District where enrollments are projected to exceed the existing capacity by 4 percent in 1995 and 9 percent in 2000. A smaller increase is expected to occur in the Columbia County School District where enrollments are projected to exceed the current capacity by less than 1 percent in 2000. The average pupil-to-teacher ratio for the ROI was 18:1, and expenditures averaged $3,378 per pupil. The Georgia average pupil-to-teacher ratio was 16:1, and

expenditures averaged $3,731 per pupil. The South Carolina average pupil-to-teacher ratio was 19:1, and expenditures averaged $3,788 per pupil (SC Education, 1991; GA Education, 1991).

Fifteen hospitals serve the 8-county ROI. In 1991, Barnwell County Hospital was operating close to capacity, while the other hospitals were operating well below capacity (AHA, 1990). In 1990, a total of 1,477 physicians served the ROI. The physician-to-population ratio for the ROI was 2.8:1,000 and ranged from 0.3:1,000 in Allendale County to 5.6:1,000 in Richmond County. The statewide physician-to-population ratio was 1.8:1,000 in South Carolina and 1.9:1,000 in Georgia (AMA, 1990).

Thirteen city, county, and state law enforcement agencies provide police protection in the ROI. In 1990, the largest law enforcement agency in the 8-county ROI was in Richmond County with 310 sworn officers, or 1.6 sworn officers per 1,000 persons. Other large agencies are in the city of Augusta with 157 sworn officers (3.5 sworn officers per 1,000 persons) and in Columbia County with 88 sworn officers (1.3 sworn officers per 1,000 persons). The average number of sworn officers in the ROI was 1.6 per 1,000 persons (FBI, 1991).

Eleven fire departments and 1,104 regular and volunteer firefighters provided fire protection services in 1990. The principal municipal departments include both professional and volunteer staff. In 1990, the greatest staffing strengths were found in the fire departments in Aiken County (221 firefighters; 1.8 firefighters per 1,000 persons) and in Richmond County (166 firefighters; 0.9 firefighters per 1,000 persons). The average number of firefighters in the ROI was 2.1 per 1,000 persons (Kapalczynski, 1988; SC FA, 1990).

Local Transportation. Vehicular access to the Savannah River Site is via South Carolina State Route 125 to the west and south, South Carolina State Route 19 to the north, South Carolina State Route 39 to the northeast, and South Carolina State Route 64 to the east. US Route 278, South Carolina State Route 125, and SRS Road 1 are public roads that traverse SRS. Interstates and highways near SRS are shown in figure 4.1.2.7-1.

Estimated baseline traffic along segments providing access to SRS is projected to contribute to differing service level conditions in accordance with baseline population growth. South Carolina State Routes 64 and 125 and US 278 would generally support congestion-free traffic flow. South Carolina State Route 19, however, would typically experience traffic congestion, with volumes approaching or exceeding the design capacity of the roadway. Along this roadway, a motorist's speed and ability to maneuver would be restricted, and potential disruptions to the traffic flow could be caused by accidents or maintenance activities, resulting in considerable congestion. In addition, estimated baseline truck traffic into SRS for delivery of commercial supplies and removal of commercial wastes would typically average 196 trips per day. However, the additional traffic volumes associated with continued operation of SRS are relatively minor and would not substantially affect local transportation baseline conditions.

No major improvements are scheduled for those segments providing immediate access to SRS (SR Griffin, 1991; SC HC, 1991).

Rail service in the ROI is provided by the Norfolk Southern Corporation and CSX Transportation. SRS is provided rail access via Robbins Station on the CSX Transportation line. In addition, SRS maintains 50 miles of onsite track for internal uses (SR DOE, 1989).

Waterborne transportation is available via the Savannah River. The river was last dredged in 1979 and the COE has no future dredging plans. At present, the Savannah River is used primarily for recreation (SR DOE, 1989).

Columbia Metropolitan Airport in Columbia and Bush Field in Augusta receive jet air passenger and cargo service from both national and local carriers

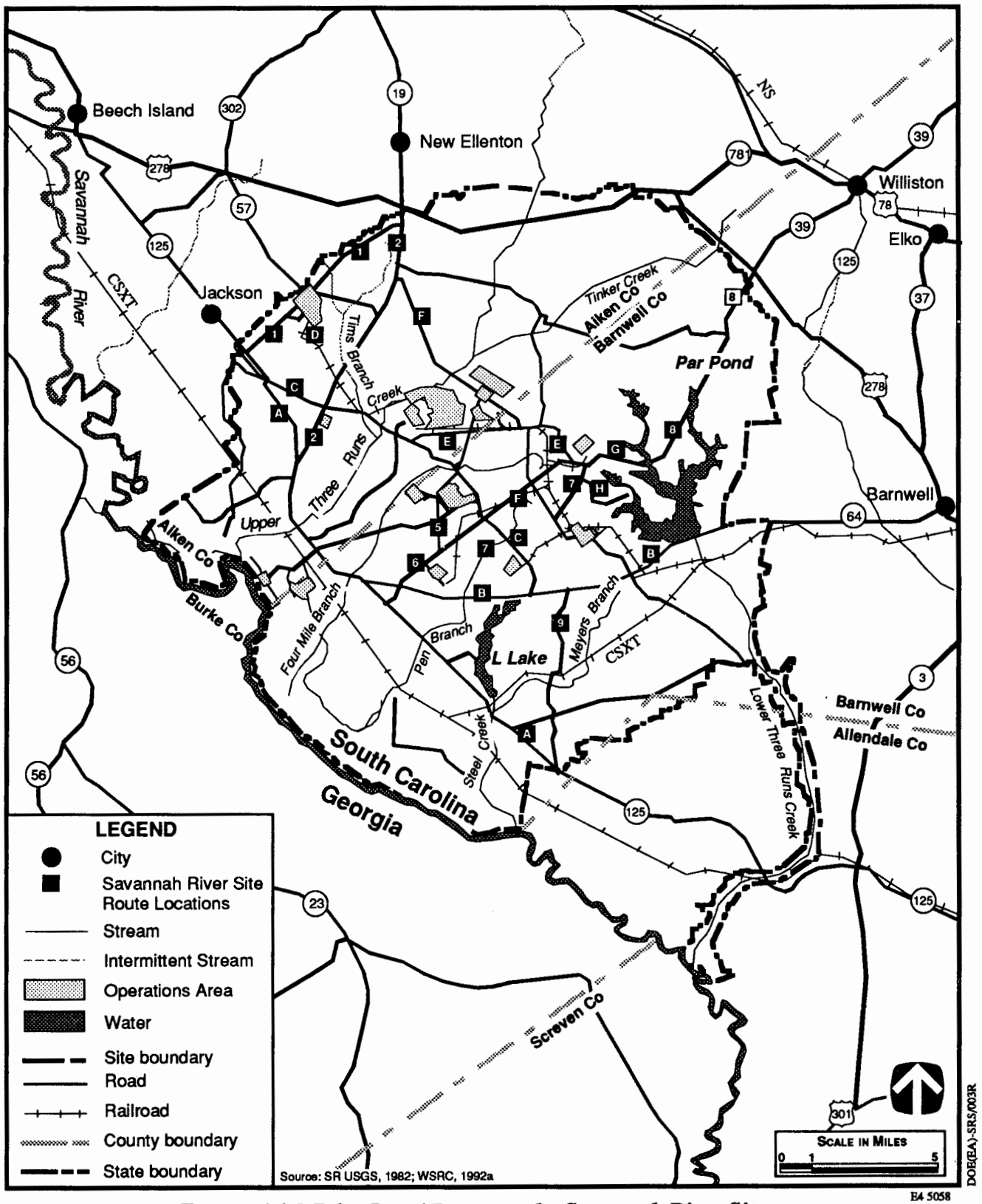

FIGURE 4.1.2.7-1—*Local Routes at the Savannah River Site.*

(SR DOE, 1989; DOT, 1991). Numerous smaller private airports are located in the ROI.

Environmental Consequences. The employment figures for construction and operations for the Proposed Action are given in table 3.3-1 in section 3.3. The construction, modification, and installation of facilities and equipment for the Proposed Action at SRS would require 52 additional employees during peak construction (SR DOE, 1992d). Operations employment would begin in 1997 and grow to a full complement of 85 jobs in 2000 (DOE, 1992e). In addition to these jobs created directly by the project, another 113 jobs would be created indirectly during peak construction and 109 additional jobs during operations. The creation of direct and indirect employment would lead to in-migration of 39 persons during peak construction and 113 persons during operations. The in-migrating population is primarily related to the in-migrating professional employees who are scientists, engineers, etc. (and their families), and who are not available in the regional unemployed labor force.

Under the No Action alternative, the current SRS employment of 21,478 persons would be projected to be 21,963 persons by the year 2000, an increase of 495 persons. The addition of 85 direct jobs to SRS would represent a net increase of 580 jobs over current levels.

Table 4.1.2.7-1 summarizes the projected economic and population changes that would result from the Proposed Action. In the year 2000, this project-related population growth from in-migration would represent a negligible increase of less than 1 percent over the projected ROI baseline population of 583,000 persons, and no cities or counties in the ROI would experience a population growth beyond 1 percent.

The less than 1 percent change in population during the time of peak construction would create the need for only an estimated 15 additional housing units, which is not a significant addition. For operations in the year 2000, the less than 1 percent change in population would create the need for only an estimated 40 additional housing units, with no adverse effect on the cities and counties in the ROI.

The estimated additional population during peak construction and operations would not affect any community infrastructure and services in the ROI. Existing water and wastewater capacities more than exceed the projected demand. Many existing public education facilities are currently approaching 100 percent of capacity. Under current conditions, enrollments will not exceed most school capacities by the years 1995 and 2000 given the No Action future baseline. School districts in Aiken, Allendale, and Orangeburg counties currently exceed their capacities and the Columbia County School District will exceed its capacity by 2000. However, these school capacities will not be affected beyond what would naturally occur under the No Action baseline growth because the Proposed Action would not add more than 1 percent to enrollments during construction or operations. Existing health care resources are more than adequate to accommodate the projected population increases during peak construction and operations. Current staffing levels for police and fire services in the ROI are adequate to support the projected population increases, while maintaining current service standards, because none of the cities or counties would grow by more than 1 percent over the No Action baseline. Additional commercial truck traffic into SRS is estimated to be negligible relative to historic levels, and this truck traffic would occur during non-peak hours. Impacts to the local transportation network serving SRS would be negligible, as well.

4.1.2.8 *Waste Management*

Affected Environment. Discussion of the SRS waste management baseline is provided in section 3.2.5.3. Because there are no high-level or TRU wastes associated with any of the proposed activities that would be consolidated, no further discussion of high-level or TRU waste generation or management is presented.

TABLE 4.1.2.7-1.—*Savannah River Site Proposed Action Economic and Population Characteristics*

Economics	1995 Peak Construction	Percent Over Baseline	2000 Peak Operation	Percent Over Baseline
Baseline Civilian Labor Force	271,832	NA	288,560	NA
Baseline Unemployment Rate	5.6%	NA	6.3%	NA
Baseline Personal Income (Thousands $)	$9,011,037	NA	$10,629,518	NA
Baseline Per Capita Income ($/Person)	$ 16,236	NA	$18,246	NA
Baseline Employment	256,495	NA	270,405	NA
Direct Jobs	52	0.02	85	0.03
Indirect Jobs	113	0.04	109	0.04
In-Migrating Workforce	17	0.01	45	0.02
Total In-Migration	39	0.01	113	0.02
Population Increase				
Aiken County	22	0.02	63	0.05
Aiken	11	0.05	31	0.14
North Augusta	6	0.04	17	0.10
Allendale County	0	0.00	1	0.01
Bamberg County	1	0.00	2	0.01
Barnwell County	3	0.01	9	0.04
Edgefield County	1	0.00	2	0.01
Orangeburg County	1	0.00	2	0.00
Columbia County	4	0.01	13	0.02
Richmond County	7	0.00	21	0.01
Augusta	6	0.01	18	0.04
ROI (County Total)	39	0.01	113	0.02

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Source: Estimated from Census, 1977, 1983, 1990a; DOC, 1990a; GA Labor, 1991; SC Employment, 1991; Huber, 1992; DOE, 1992e.

The waste management objective at SRS is to contain waste handling, treatment, storage, and disposal within the SRS. Exceptions to onsite final disposal are PCBs, which must go to EPA-approved disposal facilities; some types of nonradioactive hazardous waste, which are sent offsite for incineration and disposal until onsite facilities are available; and chlorinated hydrocarbons, lead batteries, and scrap metal, which are sold to commercial recyclers.

LLW is buried at a 100-acre site in the north portion of E-Area, with storage capacity projected to meet SRS solid LLW storage/disposal requirements for the next 20 years.

The SRS facilities designed to treat and dispose of mixed waste includes an interim storage complex called the Mixed Waste Storage Facility, the Waste Solidification and Disposal Facility (planned for 1995), the Consolidated Incineration Facility (planned for 1993), and the new Hazardous Waste/ Mixed Waste Disposal Facility (planned for 1992).

The Waste Solidification and Disposal Facility located in the Y-Area treats low-level mixed waste concentrate from the M-Area effluent treatment facility and slurry from off-gas treatment. This waste is grouted and placed in the underground Saltstone Disposal Vaults at this facility.

The Consolidated Incineration Facility would be designed to treat combustible solid and liquid mixed waste and hazardous waste and would become operational for mixed waste under a Compliance Agreement signed by SRS and the state of South

Carolina in April 1992, which requires an RCRA Part B permit to be filed for this facility by a certain date.

All hazardous waste treatment, storage, and disposal facilities at the SRS are either fully permitted, have interim status, or are operating pursuant to enforceable agreements with the regulations while other waste management facilities are being developed.

Hazardous wastes are manifested and shipped offsite by RCRA-permitted transporters to RCRA-permitted disposal facilities. Sanitary waste is disposed of in the onsite sanitary waste landfill; the northern expansion section would be utilized from 1992 until 1997 if current generation rates continue. The northern expansion would cease operation when the new onsite sanitary landfill, with a 20-year capacity and a projected availability in 1996, becomes operational. Garbage/paper is recycled where possible; the incinerable portion of the waste stream is sent to an incineration facility and the ash is then sent to the sanitary landfill, while the nonincinerable portion of the waste stream is compacted and then sent to the sanitary landfill. Asbestos and rubble are sent to the sanitary landfill. Powerhouse ash is sent to the ash basin and to land reclamation, while domestic sewage is sent to the onsite sanitary treatment plant. After sanitary treatment, the sludge is then sent to land reclamation, and the treated effluent discharged to a NPDES-permitted outfall.

Environmental Consequences. Any equipment to be moved to SRS from another site due to the Proposed Action would be decontaminated prior to shipment.

Construction/modification activities involving decontamination are part of routine facilities operations at SRS. Decontamination activities include the removal of asbestos piping insulation, floor and ceiling tiles, and asbestos or PCB contaminated concrete flooring. Such decontamination activities, if identified to be necessary, would be performed in accordance with TSCA requirements for handling and disposal of asbestos and PCB wastes. The amount of construction waste materials is expected to be minimal.

Any soil excavated for subsurface investigations, or as a result of piping modification or replacement of sanitary and industrial drains, would be analyzed for possible contamination before disposal. Uncontaminated soils would be used as fill or disposed of in a local sanitary landfill if considered unsuitable for backfill. Soils found to be contaminated would be referred to the SRS Environmental Restoration Program for subsequent management.

Management of potentially contaminated soil would involve an area inspection, characterization, and evaluation of cleanup activities (if necessary). Cleanup action and compliance follow-up would be conducted as necessary to remove and dispose of contaminated soils. Remediation of contaminated areas would be conducted according to accepted guidelines and procedures applicable to the type and extent of contamination. Although remediation activities may have additional project cost implications, no significant environmental impacts are expected.

No new waste streams would be generated as a result of the nonnuclear consolidation. Estimated additional wastes associated with the relocated functions are shown in appendix B.2. Consolidation of tritium functions at SRS would generate approximately 500 ft^3 of LLW. This amount is insignificant in relation to existing LLW at SRS. A small portion of the LLW is expected to be classified radioactive waste. The LLW would include low-level compactible and noncompactible wastes generated from glove boxes, and from decontamination of tritium-contaminated components. These wastes would be repackaged, if necessary, and stored temporarily in 96 ft^3 boxes to minimize radiation exposure and contamination. The wastes would be sent to the E-Area Burial Ground for disposal per DOE Order 5480.2A. The Burial Ground, in combination with the concrete vaults, has adequate capacity to receive the

additional LLW generated by proposed nonnuclear consolidation activities.

Small quantities of acid wastewater generated from laboratory operations would be collected in bottles or other suitable containers, and treated in another facility which meets the requirements for sampling, monitoring, and neutralizing these wastes.

The disposal of nonhazardous waste would be made onsite at the sanitary landfills in accordance with SRS waste management policies. The additional nonhazardous wastes would have a minor impact on accelerating the anticipated operational life of the existing SRS sanitary landfills.

The volume of liquid effluents from the relocated functions are quite small and well within the capacity of the SRS wastewater treatment facility and process sewers. Consequently, there would be minimal impact on the SRS wastewater treatment system and the resulting NPDES-permitted discharges.

In summary, the magnitude of additional waste streams generated as a result of the increased nonnuclear manufacturing activities at the SRS are well within the storage, treatment, and disposal capability of existing waste management facilities.

4.1.2.9 *Human Health: Facility Operations and Accidents*

General discussions of impacts to the public and the environment, worker exposures, and accidents are presented in section 4.1. Information specific to SRS is presented below.

Affected Environment. As discussed in the Air and Water Resources sections for SRS (4.1.2.2 and 4.1.2.3, respectively), exposures to members of the public associated with the release of chemical pollutants as a result of SRS operations meet all applicable permit, regulatory, and DOE operational requirements. Exposures to members of the public associated with the release of radiological releases are also well below applicable permit, regulatory, and DOE operational requirements (WSRC, 1991a).

A review of the recent SRS annual environmental and accident reports indicates that there have been no significant adverse impacts to workers, members of the public, or the environment. This review was performed to provide an indication of the site's accident history. The time period of the review (1986-1990) was a period during which plant operations were much higher than in the past year and higher than anticipated in the future.

Historical releases of tritium from SRS facilities due to normal operations and accidents are well documented and their effects have been thoroughly studied. Total SRS annual offsite doses from accidental and routine releases for 1984 to 1988 ranged from 0.28 to 0.52 mrem effective dose equivalent (a risk of less than 5×10^{-7} fatal cancers from 1 year of operations) to the maximum individual at the site boundary and from 15 to 27 person-rem environmental dose commitment (less than 3×10^{-2} fatal cancers from 1 year of operations) to the population of more than 500,000 individuals living within 80 kilometers of the site, resulting in a frequency of 6×10^{-8}. The Separations Area in which the new tritium functions would be located accounted for 73 percent of the total releases (WSRC, 1991c).

Most of the Mound tritium functions would be located in the existing tritium extraction and purification facility (Building 232-H) and in the new RTF (Building 233-H). The RTF replaces the tritium processing and loading functions that have been performed in an existing tritium loading facility (Building 234-H) that has contributed to historical tritium releases. When the RTF replaces the loading operations in Building 234-H, routine operation of the RTF would substantially reduce atmospheric tritium releases from SRS tritium loading operations to less than 5 percent of the levels experienced from Building 234-H. Analysis of the most severe credible accident (earthquake) for the RTF indicates a maximum individual dose at the site boundary of

408 mrem effective dose equivalent (a risk of less than $4x10^{-4}$ fatal cancers) (SR DOE, 1992f). This is about 25 percent of the dose that would be received if Building 234-H experienced an equal magnitude earthquake.

Environmental Consequences. The Air and Water Resources sections discuss the chemical releases associated with relocating tritium handling functions identified in section 3.3.2 to SRS. As shown, the cumulative impacts resulting from existing releases and the releases of chemicals and radioactive materials associated with relocating these functions at SRS are below applicable permit, regulatory, and DOE operational requirements.

Water from processes containing hazardous chemicals is not discharged directly into surface or groundwater that serves as potable water. Process water which may contain hazardous chemicals is treated before discharge to remove the toxicants. Furthermore, all releases of the pollutants are below NPDES limits and water quality would not be adversely affected. Thus, the primary pathway considered for possible worker or public exposure is the air pathway. For SRS, all possible hazardous air pollutants were examined and from their assessment only Freon-113 was identified for further analysis based on its toxicity, concentration, and frequency of use. The Hazard Index, a summation of the Hazard Quotients for all chemicals, was calculated for the No Action alternative and the chemicals proposed to be added (increment) at the site to yield cumulative levels for the site. A Hazard Index value of 1.0 or less means that no adverse human health effects are expected to occur. The cumulative Hazard Index for the SRS (see table F5-16 in appendix F) were $6.7x10^{-5}$ for onsite (worker effects) and 9.5×10^{-7} at the site boundary (effect on the public) on an annual basis and the incremental change Hazard Index were 0 for both onsite and at the site boundary. Therefore, the Proposed Action would not contribute to the cumulative Hazard Index at SRS.

Normal releases of radioactive materials from SRS result in a total maximum individual annual dose of 0.163 mrem effective dose equivalent (WSRC, 1991a). The resulting risks of potential fatal cancers associated with 1 year of operation would be $7.3x10^{-8}$. The dose increment associated with the increase in tritium emissions would be less than 0.001 mrem effective dose equivalent and result in an increased risk of less than $4.5x10^{-10}$ fatal cancers from one year of operation. A cancer risk of 10^{-6} or less is considered to be acceptable by the EPA since this incidence of cancers cannot be distinguished from the normal cancer risk to an individual member of the general population.

In summary, these analyses show that no adverse health effects can be expected from the release of hazardous chemicals/chemical pollutants or radioactive materials at the SRS attributable to the Proposed Action.

All tritium handling functions to be relocated to SRS would be performed in an SRS facility with an equal or greater hazard level designation. The risks to workers and the general public from potential accidents at SRS tritium facilities have been thoroughly studied and documented in safety analysis reports (SAR) and are routinely updated in accordance with DOE Orders 5480.21 (DOE, 1991i), 5480.22(DOE, 1992j), and 54809.23 (DOE, 1992h) to assure operations are within an acceptable safety baseline. For tritium functions being relocated to SRS from Mound, the risks due to potential accidents have been analyzed. Conservative worst case estimates of offsite doses were made assuming: (1) an accidental release occurs (probability equal to one), (2) all of the tritium would be released in an oxide form (the oxide form of tritium is 25,000 times more hazardous than the elemental form), and (3) the release would be unmitigated (no credit taken for the tritium stripper systems, secondary containment and favorable dispersion effects of the facilities exhaust stack). Under these assumptions, the estimated offsite dose to the maximum individual at the site boundary ranged from 30 mrem effective dose equivalent for the commercial sales function

to 900 mrem effective dose equivalent for the gas transfer systems function (a risk of less than $8x10^{-4}$ fatal cancers). Under more realistic assumptions, the estimated consequences would be less due to the source term reduction afforded by the tritium stripper systems and the reservoir secondary containers, due to the dispersion effects of the facility's exhaust stack and because a portion of the released tritium could be in the less hazardous elemental form (SR Moore, 1992).

Postulated accidents for the new tritium functions are the same as those identified and analyzed in SARs for tritium facilities existing at SRS; no new accident scenarios were identified. They include accidents associated with an earthquake, tornado, explosion, or fire that have sufficient energy to cause a tritium release. The risk (mathematical product of the accident frequency of occurrence and estimated dose) of an individual receiving the estimated offsite dose from exposure to tritium is reduced by the extent that the accident probability is smaller than one. Under assumptions that take credit for mitigating factors, the probabilities and consequences of these accidents at existing SRS tritium facilities are in the range of $2x10^{-4}$ events/yr and 4,000 mrem dose to the maximum offsite individual (equates to a risk of $7x10^{-7}$ fatal cancers/yr) for a design basis earthquake accident to 8.8 events/yr and $3x10^{-5}$ mrem dose to the maximum offsite individual (equates to a risk of $3x10^{-10}$ fatal cancers/yr) for a tritium leak accident in the product evacuation system (WSRC, 1992d; SR DuPont, 1987b). For comparison purposes, the same maximum individual living on the site boundary received an estimated annual dose of 300 mrem from natural sources with a probability of 1 per year which equates to a risk of 300 mrem/yr ($1x10^{-4}$ fatal cancers/yr) (WSRC, 1991c).

A summary of the accident impacts discussed above is presented in table 4.1.2.9-1. Included in the table are the impacts from natural sources of radiation.

The reduction in requirements for nuclear weapons has reduced the tritium operations and inventories at SRS. The quantity of tritium in operations and inventories associated with relocating Mound functions to SRS would be below those that currently exist at SRS. The tritium handling functions to be relocated are the same as or similar to those currently

TABLE 4.1.2.9-1.—*SRS Comparison of Consequences and Risks of SRS Tritium Accidents with Radiation from Natural Sources*

Event	Maximum Offsite Individual Dose Consequences (Rem)	Event Frequency Events/yr	Risk (Rem/yr) (Fatal Cancers/yr) (Note 3)
Severe accident-gas transfer function	9×10^{-1}	Note 1	Note 1
Design Basis Earthquake (Note 2)	4	$2x10^{-4}$	8×10^{-4} 7×10^{-7}
Tritium leak in Product Evacuation System (Note 2)	3×10^{-8}	8.8	3×10^{-7} 3×10^{-10}
Radiation from natural sources	3×10^{-1}	1	3×10^{-1} 1×10^{-4}

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Note 1 A release of the total tritium inventory is postulated for only the tritium inventory in the Gas Transfer System without consideration for a release mechanism or frequency of occurrence and without credit for mitigating factors such as secondary containment and the tritium stripper system.

Note 2 The dose and fatal cancer consequences shown are as postulated for existing tritium facilities without the new tritium functions.

Note 3 A factor of 8.85×10^{4} fatal cancers/rem is assumed for accidents and one-half that value for exposure to natural sources of radiation.

being performed at SRS. The operations would be conducted in an SRS facility designed for tritium handling with an equal or greater hazard level designation (i.e., high hazard facility), and the current accident profile at SRS would not change as a result of relocating these functions. The current chemical accident profile is not affected by the Proposed Action.

4.1.3 Los Alamos National Laboratory

Detailed discussion of the Los Alamos National Laboratory's current mission, facility/process description, and waste treatment and management activities are provided in section 3.2.6. The functions and processes associated with the Proposed Action to be consolidated at LANL and the proposed facility modifications required to support each relocated function are discussed in section 3.3.3. Discussions of the assumptions used in the EA for determining the affected environment and environmental consequences at LANL and the environmental assessment methodologies for each resource or issue discussed below is presented in the introduction to this chapter. Additional information on baseline conditions and environmental consequences of the Proposed Action that supports the following discussion on LANL is also provided in the chapter 4 introduction and section 4.1.

4.1.3.1 *Land Resources*

Affected Environment. LANL is located approximately 58 miles north-northeast of Albuquerque, NM (figure 3.2.6-1). Generalized land uses at LANL and in the vicinity are shown in figure 4.1.3.1-1. The County of Los Alamos has zoned the entire area of the lab FL (Federal Land) (LA County, 1990 and 1991). LANL has developed nine land use classifications for their operations (LANL, 1990a). The affected environment for this project at LANL consists of six Technical Areas (TA) situated in the western half of LANL, designated TA-3, -16, -21, -22, -35, and -40 (figure 3.2.6-2). There are no prime farmlands on LANL. The residential distribution of LANL employees is discussed in section 4.1.3.7.

TA-3, called the Central Business District in the Administrative and Technical Services land classification areas, contains the highest density of development and the highest working population at LANL. TA-3 is physically separated from the Los Alamos townsite by the steep-walled Los Alamos Canyon. Multifamily housing is located on the north rim of the canyon, set back approximately 10 feet from the Federal Reservation boundary fence.

TA-16, called Weapons Engineering in the High Explosives Research and Development and Testing (RD&T) land classification area, is a remote site located in the southwest corner of LANL. The mission requirements of TA-16 necessitate large blast buffer zones contained within DOE-controlled land and radiation site evaluation circles that extend offsite (LANL, 1990a).

TA-21, called the DP site in the Experimental Science land classification area, contains both plant processing and laboratory functions surrounded by radiation site evaluation circles that partially extend offsite into the Los Alamos townsite (LANL, 1990a).

TA-22, also in the High Explosives RD&T area, is located approximately 1 mile southwest of TA-3. The remote site is used for detonator RD&T for HE. Surrounding open space has been designated for blast buffer zones that do not extend beyond the site boundary (LANL, 1990a).

TA-35, in an Experimental Science land classification area, is also located in a remote area southeast of TA-3. The mission at TA-35 is related to experimental science, special nuclear materials, and laser research. Development is clustered in a dense pattern surrounded by undeveloped open space (LANL, 1990a).

TA-40 abuts the east side of TA-22 and is also in the High Explosives RD&T area. The mission of TA-40 is explosives testing and characterization. The site is remote and surrounded by undeveloped open space with blast buffer zones contained within LANL boundaries (LANL, 1990a).

LANL does not contain any public recreation facilities; however, there are several recreation facilities for LANL personnel.

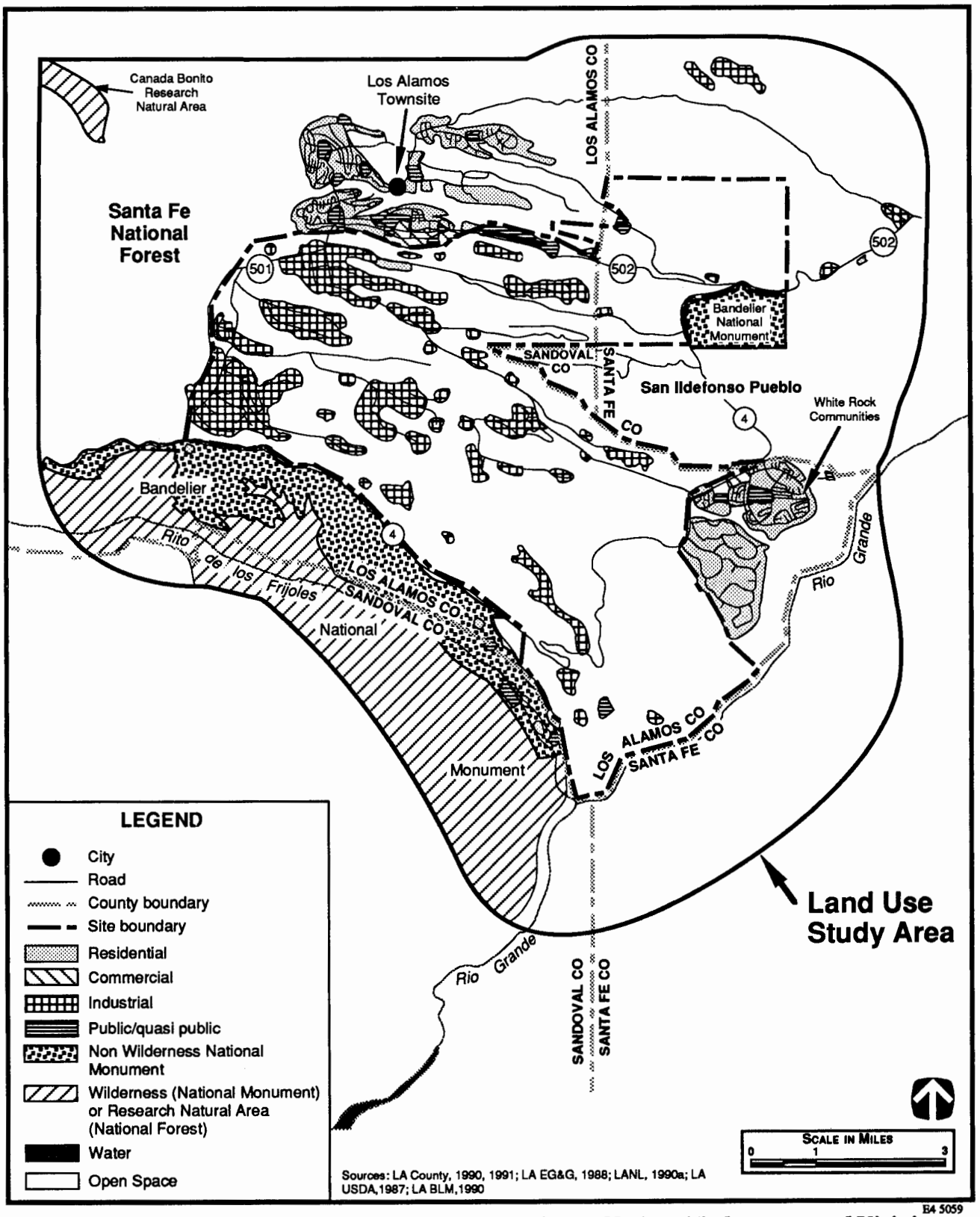

FIGURE 4.1.3.1-1—***Generalized Land Use at Los Alamos National Laboratory and Vicinity.***

Development and operation of DOE facilities has disturbed the character of the landscape in their respective areas. The DOE facilities are generally brightly lit at night and highly visible from nearby viewpoints, and are visible from as far away as southeast Santa Fe (approximately 30 miles). The developed areas of LANL are consistent with a Class 5 VRM area designation. The remainder of LANL ranges from a Class 3 to Class 4.

Offsite viewpoints affected by DOE facilities are primarily associated with the Los Alamos townsite and New Mexico State Highways 4, 501, and 502. On a clear day, views can exceed 50 miles. Topographic relief and heavy vegetation provide significant visual screening of LANL facilities, especially from mid- and long-distance viewpoints.

Environmental Consequences. High power detonators, calorimeter functions, and neutron tube target loading functions would be situated within existing buildings at LANL (see section 3.3.3 and figures 3.3.3-1 through 3.3.3-1f). The high power detonators function is to be sited within TA-22 and is compatible and consistent with the designated land use classification at LANL (LANL, 1990a). Both the proposed calorimeter functions sited at TA-35 and neutron tube target loading functions in TA-21 are located within an area designated as Experimental Science and are compatible and consistent with this land use classification (LANL, 1990a). A small pre-fabricated office building to support calorimeter operations in TA-35 would also be consistent with the current land use classification. The pre-fabricated structure would be sited on an existing parking area and require no new construction. There would be no direct impacts to land use because the new facilities are all being sited within compatible land use classifications for existing operations at LANL.

The small number of in-migrating employees (see section 4.1.3.7) would have a minimal impact on land resources. Offsite land requirements for residential use would be approximately 4 acres during implementation and 10 acres during operations, and would result in no significant indirect impacts to land use resources. The small in-migration would have no impact on the extensive recreational facilities in the region.

The Proposed Action would place relocated functions in existing buildings and one small office building to be located in an existing developed area. Approximately one-half acre would be required to accommodate temporary construction laydown and parking. The impacts to visual resources would be negligible.

4.1.3.2 *Air Quality and Acoustics*

Affected Environment. The climate at LANL and in the surrounding region is characterized as a semiarid tropical and subtropical steppe (Trewartha, 1954). Mountain barriers deplete a large portion of the moisture from the maritime air masses from the Pacific Ocean, a condition that contributes to the semiaridness. The annual average temperature in the area is 56.2 °F (NOAA, 1991c); average daily temperatures range from 22.3 °F in January to 92.8 °F in July. The average annual precipitation in the area is 8.1 inches (NOAA, 1991c). The average monthly precipitation ranges from 0.38 inch in November to 1.51 inches in August.

Ambient Air Quality. LANL is located in the New Mexico Intrastate AQCR. Areas in LANL and its surrounding counties are designated as attainment with respect to the NAAQS (40 CFR 50). The applicable NAAQS and New Mexico state ambient air quality standards are presented in table D.2.1.1-1.

Ambient concentration limits for HAPs/toxics have been promulgated by the New Mexico Environmental Improvement Board. The emission rates of HAPs/toxics from existing LANL facilities during 1989 are listed in table D.2.1.6-3. The HAPs/toxics described in this section are those currently used at LANL or those anticipated to be used under the proposed action.

Ambient air quality within and near the LANL site boundary is currently monitored only for TSP (LANL, 1990a). Data for the period 1985 through 1989 indicate that the 24-hr New Mexico TSP standard was exceeded. In addition, a short term monitoring program for O_3 was conducted during the period January to June, 1986 at a station in the Bandelier National Monument, near the southern site boundary of LANL. Measurements indicated that the New Mexico O_3 standard was exceeded. The ambient air quality data are summarized in table D.2.1.6-1.

The principal sources of criteria air pollutants at LANL (LANL, 1990a) are: (1) the steam plants and power plant; (2) operations associated with beryllium including machining in shop 4 at area TA-3-39, in shop 13 at area TA-3-102, beryllium shop at area TA-35-213, and beryllium processing facility at area TA-3-141; (3) asphalt plant; (4) burning of HE wastes at the area TA-16 burnground and experimental detonation of conventional explosives; and (5) the lead-pouring facility for casting lead at area TA-3-38. Other emissions include fugitive particulate emissions from waste-burial activities and coal piles, other process emissions, vehicular emissions, and temporary emissions from various construction activities. Emission estimates for these sources are presented in table D.2.1.6-2.

Normal operations result in the emission of radioactive materials at LANL. These emissions include 14,400 curies of tritium (LANL, 1990b). Operations at LANL are conducted to ensure that releases of radioactive materials result in a total maximum individual annual dose of less than the NESHAP standard of 10 mrem effective dose equivalent. Tritium is the only radionuclide which may be affected by the activities which are the subject of this EA.

Table 4.1.3.2-1 shows the air quality under ambient and No Action conditions at LANL. Ambient air quality monitoring data are listed as "maximum background concentrations" and the air dispersion modeling results for existing operations are listed as "No Action concentrations." The sum of the maximum background concentration and the No Action concentration for a given pollutant and averaging time is the baseline concentration. The baseline concentration was compared to applicable Federal and state pollutant limits to provide a conservative estimate of effects of the No Action alternative on air quality. With the exception of the ozone (1-hr) standard and the 24-hr average concentration of particulate matter, baseline air quality impacts from LANL are well below any applicable guidelines or regulations. The ozone exceedance is typical of metropolitan areas. The exceedance of the 24-hr PM_{10} and TSP standards would only occur occasionally, during periods with relatively high winds. The exceedance is typical of semiarid and arid regions with large areas of exposed earth.

The EPA-recommended Industrial Source Complex Short Term (ISCST) model was used to perform the air dispersion modeling analysis (EPA, 1987). A description of the modeling methodology is included in appendix D.

Acoustic Conditions. The major noise sources at LANL include various facilities, equipment, and machines (e.g., cooling towers, transformers, engines, pumps, boilers, steam vents, paging systems, construction and materials-handling equipment, vehicles, pistol and rifle firing range, and explosives detonation). No LANL environmental noise survey data are available. At the LANL boundary, away from most of the industrial facilities, noise from most of these sources is barely distinguishable from background noise levels.

Impulsive noise from explosives testing can be heard occasionally in Los Alamos Townsite, White Rock Communities, or Bandelier National Monument. The acoustic environment along the LANL boundary away from traffic noise, although not measured, is expected to be that of a rural location with typical day/night sound levels in the range of 35 to 50 dBA (EPA, 1974). Traffic is the primary

TABLE 4.1.3.2-1—*LANL Ambient and No Action Concentrations Comparison with Applicable Regulations and Guidelines* [Page 1 of 2]

Pollutant	Averaging Time	Most Stringent Regulation or Guideline (μg/m³)	Maximum Background (μg/m³)	No Action Concentration (μg/m³)	Baseline Concentration (μg/m³)
Carbon Monoxide (CO)	8-hour	10,000[b]	d	1,792.0	≥1,792.0
	1-hour	15,000[b]	d	9,402.0	≥9,402.0
Hydrogen Sulfide (H_2S)	1-hour	14[b]	d	f	d
Lead (Pb)	Calendar Quarter	1.5[c]	d	f	d
Nitrogen Dioxide (NO_2)	Annual	94[b]	d	8.1	≥8.1
	24-hour	188[b]	d	169.0	≥169.0
Ozone (O_3)	1-hour	118[b]	149.0	f	149.0
Particulate Matter (PM_{10})	Annual	50[c]	29.7[e]	0.4[e]	30.1
	24-hour	150[c]	150.8[e]	7.5[e]	158.3
Sulfur Dioxide (SO_2)	Annual	52[b]	d	0.118	≥0.118
	24-hour	262[b]	d	2.67	≥2.67
	3-hour	1,300[c]	d	9.33	≥9.33
Total Reduced Sulfur	1-hour	4[b]	d	f	d
Total Suspended Particulates (TSP)	Annual	60[b]	29.7	0.4	30.1
	30-day	90[b]	d	0.9	≥0.9
	7-day	110[b]	d	g	d
	24-hour	150[b]	150.8	7.5	158.3
Hazardous Air Pollutants and Other Toxic Compounds[a]					
2-Butoxyethanol	8-hour	1,200[b]	d	2.5	≥2.5
Acetic Acid	8-hour	250[b]	d	0.23	≥0.23
Acetone	8-hour	5,900[b]	d	26.3	≥26.3
Acetonitrile	8-hour	340[b]	d	0.54	≥0.54
Ammonia	8-hour	180[b]	d	9.2	≥9.2
Dioxane	8-hour	36[b]	d	0.29	≥0.29
Fluoride Compounds	8-hour	25[b]	d	0.29	≥0.29
Hexane (N-hexane)	8-hour	1,800[b]	d	1.05	≥1.05
Hydrogen Chloride	8-hour	70[b]	d	4.4	≥4.4
Isopropyl Alcohol	8-hour	9,800[b]	d	2.0	≥2.0
Methyl Acetate	8-hour	6,100[b]	d	3.6	≥3.6
Methyl Alcohol	8-hour	2,600[b]	d	10.7	≥10.7
Methyl Ethyl Ketone	8-hour	5,900[b]	d	7.7	≥7.7
Methylene Chloride	8-hour	2,610[b]	d	1.7	≥1.7
N-butyl Acetate	8-hour	7,100[b]	d	0.24	≥0.24
Nitric Acid	8-hour	50[b]	d	4.1	≥4.1
Nitric Oxide	8-hour	300[b]	d	2.5	≥2.5
Nitrogen Oxide	8-hour	300[b]	d	2.5	≥2.5
Nitrous Oxide	8-hour	449[b]	d	1.09	≥1.09
sec-Butyl Alcohol	8-hour	3,050[b]	d	0.26	≥0.26
Stoddard Solvent	8-hour	5,250[b]	d	2.3	≥2.3
Sulfuric Acid	8-hour	10[b]	d	0.29	≥0.29

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Footnotes at end of table.

source of noise at the site boundary and at residences near roads. The acoustic environment in the town of Los Alamos is similarly expected to be that of a suburban location with typical DNL in the range of 53 to 62 dBA (EPA, 1974).

The State of New Mexico has not established specific numerical environmental noise standards applicable to LANL. Los Alamos County has adopted a noise ordinance which specifies maximum sound levels in residential areas. This ordinance is discussed in appendix D. Although the maximum

TABLE 4.1.3.2-1—*LANL Ambient and No Action Concentrations Comparison with Applicable Regulations and Guidelines*—Continued [Page 2 of 2]

Pollutant	Averaging Time	Most Stringent Regulation or Guideline (μg/m³)	Maximum Background (μg/m³)	No Action Concentration (μg/m³)	Baseline Concentration (μg/m³)
Hazardous Air Pollutants and Other Toxic Compounds[a]					
Tetrahydrofuran	8-hour	5,900[b]	d	0.47	≥0.47
Toluene	8-hour	3,750[b]	d	0.65	≥0.65
Trichloroethylene	8-hour	250[b]	d	3.0	≥3.0
Trichloromethane	8-hour	97.5[b]	d	1.07	≥1.07
Turpentine	8-hour	5,600[b]	d	1.4	≥1.4
VM&P Naphtha	8-hour	13,500[b]	d	5.2	≥5.2
Xylene	8-hour	4,350[b]	d	3.3	≥3.3

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[a] Compounds listed are the major pollutants of concern (LANL, 1990b).
[b] State standard (NMEIB, 1991, 1991b).
[c] Federal Standard (40 CFR 50).
[d] Data unavailable.
[e] It is assumed that all PM_{10} concentrations are TSP concentrations.
[f] No sources indicated or negligible emissions.
[g] Not calculated, concentration values between the 24-hour and 30-day values.

levels specified by the ordinance and the EPA guideline may be exceeded occasionally at the LANL boundary, this is expected to be attributable to traffic noise and not to sources at LANL; the ordinance does not apply to traffic noise.

Environmental Consequences.

Air Quality. The relocated functions would require modification of some facilities (section 3.3.3). The modification activity would create a temporary increase in emissions of particulate matter such as dust and dirt and vehicle emissions. The increase, when added to existing levels, is expected to be below applicable standards, and would cause no adverse impacts to ambient air quality.

No additional emissions of criteria pollutants are expected at LANL. Therefore, the ambient concentration of criteria pollutants as shown in table 4.1.3.2-2 is not expected to change.

Hazardous/toxic air pollutant emissions are expected to be minimal. Table D3.1.1-2 presents the potential emission rates. Consequently, impacts to ambient air quality are predicted to be very low compared to applicable standards and guidelines (table 4.1.3.2-2).

Consolidation of the nonnuclear activities at the LANL would result in an increase in the emission of tritium. An additional 122 curies of tritium would be released annually (PI DOE, 1991b). Operations at LANL would be conducted to ensure that releases of radioactive materials result in a total maximum individual annual dose below the NESHAP standard of 10 mrem effective dose equivalent. The activities which are the subject of this EA would only affect the emission of tritium.

Acoustic Conditions. The Proposed Action's effects on noise levels during construction and operation have been evaluated for major traffic routes around LANL. The changes in traffic volumes are expected to result in an increase of less than 2 dB in peak-hour sound levels along Route 4 at White Rock and along Route 502 in Los Alamos. Changes in sound levels along other routes are expected to be minor. The increase in noise levels along the major access routes is expected to cause little or no increase in annoyance to communities or individuals.

Noise emissions from renovation of existing buildings, placement of transportable offices, and onsite operation activities are not expected to result in any increase in offsite noise levels.

TABLE 4.1.3.2-2.—*Contribution to Air Quality from Proposed Action and Total Concentrations at LANL with Comparison to Applicable Regulations and Guidelines* [Page 1 of 2]

Pollutant	Averaging Time	Most Stringent Regulation or Guideline ($\mu g/m^3$)	Baseline Concentration ($\mu g/m^3$)[g]	Proposed Action Concentration ($\mu g/m^3$)	Total Concentration ($\mu g/m^3$)
Carbon Monoxide (CO)	8-hour	10,000[b]	≥ 1,792.0[h]	f	≥ 1,792.0
	1-hour	15,000[b]	≥ 9,402.0[h]	f	≥ 9,402.0
Hydrogen Sulfide (H_2S)	1-hour	14[b]	d	f	d
Lead (Pb)	Calendar Quarter	1.5[c]	d	f	d
Nitrogen Dioxide (NO_2)	Annual	94[b]	≥ 8.1[h]	f	≥ 8.1
	24-hour	188[b]	≥ 169.0[h]	f	≥ 169.0
Ozone (O_3)	1-hour	118[b]	149.0	f	149.0
Particulate Matter (PM_{10})	Annual	50[c]	30.1[e]	f	30.1
	24-hour	150[c]	158.3[e]	f	158.3
Sulfur Dioxide (SO_2)	Annual	52[b]	≥ 0.118[h]	f	≥ 0.118
	24-hour	262[b]	≥ 2.67[h]	f	≥ 2.67
	3-hour	1,300[c]	≥ 9.33[h]	f	≥ 9.33
Total Reduced Sulfur	1-hour	4[b]	d	f	d
Total Suspended Particulates (TSP)	Annual	60[b]	30.1	f	30.1
	30-day	90[b]	≥ 0.9[h]	f	≥ 0.9
	7-day	110[b]	d	f	d
	24-hour	150[b]	158.3	f	158.3
Hazardous Air Pollutants and Other Toxic Compounds[a]					
2-Butoxyethanol	8-hour	1,200[b]	≥2.5[h]	f	≥2.5
Acetic Acid	8-hour	250[b]	≥0.23[h]	f	≥0.23
Acetone	8-hour	5,900[b]	≥26.3[h]	f	≥26.3
Acetonitrile	8-hour	340[b]	≥0.54[h]	f	≥0.54
Ammonia	8-hour	180[b]	≥9.2[h]	f	≥9.2
Dioxane	8-hour	36[b]	≥0.29[h]	f	≥0.29
Fluoride Compounds	8-hour	25[b]	≥0.29[h]	f	≥0.29
Hexane (N-hexane)	8-hour	1,800[b]	≥1.05[h]	f	≥1.05
Hydrogen Chloride	8-hour	70[b]	≥4.4[h]	f	≥4.4
Isopropyl Alcohol	8-hour	9,800[b]	≥2.0[h]	f	≥2.0
Methyl Acetate	8-hour	6,100[b]	≥3.6[h]	f	≥3.6
Methyl Alcohol	8-hour	2,600[b]	≥10.7[h]	f	≥10.7
Methyl Ethyl Ketone	8-hour	5,900[b]	≥7.7[h]	f	≥7.7
Methylene Chloride	8-hour	2,610[b]	≥1.7[h]	f	≥1.7
N-butyl Acetate	8-hour	7,100[b]	≥0.24[h]	f	≥0.24
Nitric Acid	8-hour	50[b]	≥4.1[h]	f	≥4.1
Nitric Oxide	8-hour	300[b]	≥2.5[h]	f	≥2.5
Nitrogen Oxide	8-hour	300[b]	≥2.5[h]	f	≥2.5
Nitrous Oxide	8-hour	449[b]	≥1.09[h]	f	≥1.09
sec-Butyl Alcohol	8-hour	3,050[b]	≥0.26[h]	f	≥0.26
Stoddard Solvent	8-hour	5,250[b]	≥2.3[h]	f	≥2.3
Sulfuric Acid	8-hour	10[b]	≥0.29[h]	f	≥0.29

E4 3776-1

Footnotes at end of table

Noise emissions from construction equipment and machines and from operational facilities, equipment, and machines, is not expected to cause ambient noise levels to exceed the EPA guidelines.

Construction workers and personnel working at any of the reconfigured facilities at LANL would be exposed to varying levels of equipment noise. The requirements for worker hearing protection, as

TABLE 4.1.3.2-2.—*Contribution to Air Quality from Proposed Action and Total Concentrations at LANL with Comparison to Applicable Regulations and Guidelines—Continued* [Page 2 of 2]

Pollutant	Averaging Time	Most Stringent Regulation or Guideline ($\mu g/m^3$)	Maximum Background ($\mu g/m^3$)	No Action Concentration ($\mu g/m^3$)	Baseline Concentration ($\mu g/m^3$)
Hazardous Air Pollutants and Other Toxic Compounds[a]					
Tetrahydrofuran	8-hour	5,900[b]	≥0.47[h]	f	≥0.47
Toluene	8-hour	3,750[b]	≥0.65[h]	f	≥0.65
Trichloroethylene	8-hour	250[b]	≥3.0[h]	f	≥3.0
Trichloromethane	8-hour	97.5[b]	≥1.07[h]	f	≥1.07
Turpentine	8-hour	5,600[b]	≥1.4[h]	f	≥1.4
VM&P Naphtha	8-hour	13,500[b]	≥5.2[h]	f	≥5.2
Xylene	8-hour	4,350[b]	≥3.3[h]	f	≥3.3

E4 3776-2

[a] Compounds listed are the major pollutants of concern (LANL, 1990b).
[b] State standard (NMEIB, 1991, 1991b).
[c] Federal Standard (40 CFR 50).
[d] Data unavailable.
[e] It is assumed that all PM_{10} concentrations are TSP concentrations.
[f] Design report indicates that emissions of this pollutant would be less than 100 lb/yr (0.01 lb/hr) (LA DOE, 1992a).
[g] Baseline Concentration values are from table 4.1.3.2-1.
[h] No Action concentration value; background concentration value unavailable.

described previously for current facilities, would continue to be met at LANL.

Although no increase in annoyance is expected offsite from construction and operation, measures would be initiated onsite to protect workers' hearing. These measures include the use of standard silencing packages on construction equipment and providing workers in noisy environments during construction and operation with appropriate earmuffs or earplugs approved by OSHA. As required, noise levels would be measured in worker areas and an effective hearing protection program conducted.

4.1.3.3 *Water Resources*

Affected Environment. This section describes the surface water and groundwater resources at LANL.

Surface Water. The major surface water body in the immediate vicinity of LANL is the Rio Grande to the east of the site (figure 3.2.6-2).

The primary surface water features near LANL are intermittent streams. Sixteen drainage areas pass through or start in the LANL site. Most LANL facilities are located well above the streambeds (DOE, 1988). Only those TAs located within canyons would be within the 500-year floodplain. Because reconfiguration activities will take place in TAs atop mesas, they would not be affected by a 500-year flood.

No surface water is withdrawn at LANL for either drinking water or facility operations. The water supply system for LANL is based on a series of groundwater supply wells and springs (LA DOE, 1988).

Existing wastewater generation is approximately 183 MGY (table 3.2.6-1). Los Alamos, Sandia, and Mortandad canyons currently receive treated industrial or sanitary effluent. This effluent emerges from 10 sanitary outfalls and 102 industrial outfalls and is covered under one NPDES permit. Industrial effluent includes power plant discharges (1 outfall), boiler blowdown (2 outfalls), treated cooling wastewater (36 outfalls), noncontact cooling wastewater (19 outfalls), radioactive wastewater (2 outfalls), high explosives production facilities wastewater (19 outfalls), photographic laboratory

rinse wastewater (13 outfalls), and printed circuit board process wastewater (1 outfall) (LANL, 1990b).

In addition to NPDES monitoring, regional, perimeter, and onsite stations are monitored to provide routine surveillance of the effect of operations on surface water quality. This includes monitoring of the canyons that receive NPDES-permitted discharges, as well as the Acid-Pueblo Canyon, which previously received both treated and untreated industrial effluent (LANL, 1990b). It is possible that effluent found in these canyons could reach the Rio Grande during spring snowmelt or thunderstorms. Table 4.1.3.3-1 lists the substances monitored in the Rio Grande.

Surface Water Quality. In 1989, there were six instances where sanitary discharges were in noncompliance with NPDES permit limits. Four noncompliances occurred at the same outfall; two for total suspended solids, one for biochemical oxygen demand, and one for fecal coliform bacteria.

TABLE 4.1.3.3–1.—*Summary of Surface Water Quality Monitoring, Los Alamos National Laboratory*

Receiving Water: Rio Grande—1989			
Parameter	**Unit of Measure**	**Water Quality Criteria**	**Existing Water Body Concentration[a]**
Bicarbonate	mg/L	NA	92
Calcium	mg/L	NA	31
Carbonate	mg/L	NA	<1
Cesium–137	pCi/L	120[e]	16
Chlorine	mg/L	NA	5
Fluorine	mg/L	NA	0.3
Magnesium	mg/L	NA	6.3
Nitrate	mg/L	10.0[b]	0.2
pH	pH units	6.5-8.5[d]	8.1
Phosphorus	mg/L	NA	<0.1
Plutonium–238	pCi/L	1.6[e]	0.008
Plutonium–239, 240	pCi/L	1.2[e]	0.013
Potassium	mg/L	NA	2.7
Sodium	mg/L	NA	19
Sulfate	mg/L	250[d]	51
Total Dissolved Solids	mg/L	500[d]	192
Total Hardness	mg/L	NA	107
Tritium	pCi/L	20,000[c]	100
Turbidity[f]	NTU	1[c]	19
Uranium, total	mg/L	NA	4

E4 3955

[a] Monitored values represent a one-time sampling event in March 1989. Less than symbol (<) indicates concentration below the analysis detection limit.

[b] Maximum Contaminant Level (MCL), New Mexico state water quality standards.

[c] Maximum Contaminant Level (MCL), National Primary Drinking Water Regulations, 40 CFR 141.

[d] Secondary Maximum Contaminant Level (SMCL), National Secondary Drinking Water Regulations, 40 CFR 143.

[e] U.S. Department of Energy Derived Concentration Guides (DCGs) for Water (DOE order 5400.5). DCG values are based on a committed effective dose of 100 millirem per year; however, because the drinking water MCL is based on 4 millirem per year, the number listed is 4 percent of the DCG.

[f] Concentration exceeded water quality criteria; however, these criteria are listed for comparison only. Water quality standards do not affect plant activities until they are translated into end-of-pipe effluent limitations imposed on discharges through the NPDES permitting process. Similarly, drinking water standards and DOE DCGs are listed to provide an understanding of an undesirable concentration for those parameters not covered by water quality standards—they do not constitute an enforceable limit.

NA None applicable.

Source: LANL, 1990b. (Radiological data from table G-18 and nonradiological data from table G-19.)

Total suspended solids and biochemical oxygen demand were also in noncompliance at other outfalls. There were four noncompliances for industrial outfalls. Two were for total suspended solids at boiler blowdown outfalls, one was for total suspended solids at a high explosive production facility outfall, and one was for chlorine at a treated cooling wastewater outfall. EPA was notified of these and any other deviations from permit limits in the monthly NPDES sampling results report (LANL, 1990b).

The surface water quality monitoring results are presented in table 4.1.3.3-1. The monitoring results indicate that only turbidity exceeded listed water quality criteria (LANL, 1990b).

Groundwater. The main aquifer consists mainly of sediments of the Santa Fe Group. Nearly all groundwater at LANL is obtained from deep wells that produce water from this aquifer. The Bandelier Tuff, a volcanic unit that lies above the Santa Fe Group, contains fractures that yield small amounts of water to springs. A minor amount of groundwater at LANL is obtained from springs.

The water in the main aquifer moves slowly from the major recharge area in the west to discharge springs in White Rock Canyon along the Rio Grande. The depth to the aquifer ranges from about 1,200 feet on the west to about 600 feet on the east. The total saturated thicknesses penetrated by production wells ranges up to at least 1,700 feet (LANL, 1984).

Groundwater Quality. Most wells yield fresh water (total dissolved solids less than 500 mg/L) although some wells east of the site have a higher total dissolved solids content (1,000 mg/L or more). The primary, secondary, and radiochemical groundwater quality, as measured at six distribution stations, was in compliance with all Federal and state regulations (LANL, 1989a). No contamination from organic compounds has been detected in the main aquifer (table 4.1.3.3-2).

TABLE 4.1.3.3–2.—*Summary of Groundwater Quality Monitoring, Los Alamos National Laboratory*

Parameter	Unit of Measure	Water Quality Criteria	1989—Existing Conditions[a]		
			Test Well #3	Test Well #DT-5A	Test Well #8
Cesium–137	pCi/L	120[c]	-62	40	30
Chloride	mg/L	250[e]	3	2	1
Fluoride	mg/L	4[b]	0.4	0.3	0.3
Gross Gamma	counts/mm/l	e	70	60	60
Nitrate	mg/L	10[b]	0.6	0.4	0.3
pH	pH units	6.5–8.5[e]	8.2	8.0	8.0
Plutonium–238	pCi/L	1.6[c]	0.004	-0.008	0.019
Plutonium–239, 240	pCi/L	1.2[c]	-0.009	0.008	0.028
Sulfate	mg/L	250[e]	3	2	2
Tritium	pCi/L	20,000[b]	<600	<200	100
Uranium (total) (mg/L)	mg/L	d	2.7	2.0	2.0
Total Dissolved Solids	mg/L	500[e]	179	132	132

E4 4007

[a] All data comes from groundwater from onsite stations. Samples were collected March-April 1989. Less than symbol (<) indicates concentration below the analysis detection limit.
[b] National Primary Drinking Water Regulations, Maximum Contaminant Level (MCL), 40 CFR 141.
[c] U.S. DOE, 4 percent of Derived Concentration Guides (DCGs) for water (DOE Order 5400.5).
[d] No specified limit.
[e] National Secondary Drinking Water Regulations, Secondary Maximum Contaminant Level (SMCL), 40 CFR 143.

Source: LANL, 1990b.

Groundwater Use. LANL, the adjacent communities of Los Alamos and White Rock, and Bandelier National Monument are entirely dependent on groundwater for their water supply. The water supply is primarily obtained from well fields. About 4.1 MGD are used annually in the LANL area (table 3.2.6-2).

Groundwater Rights. LANL does not have Federal reserved rights. Existing water rights held by LANL include 5,541.3 acre-feet per year (1.8 BGY). An additional 1,200 acre-feet per year (391 MGY) are purchased from the San Juan-Chama Transmountain Diversion Project of the Bureau of Reclamation. This amount is currently in reservoir storage and would be available (minus an adjustment for evaporation) by way of the Rio Grande. No infrastructure currently exists to allow water to be withdrawn from the Rio Grande for use at LANL.

During the next 50 years, increases in water use will require one or all of the following: use of the 1,200 acre-feet of San Juan-Chama water, pumping in excess of the 5,514 acre-foot allotment in exchange for release of San Juan-Chama water, or establishment of credit for return flow (LANL, 1989a).

Although water usage by the laboratory has decreased by about 1.7 million gallons per year since 1979, water usage by the city/county has been increasing by about 13 million gallons per year (LANL, 1988c). Thus, there has been a net growth in overall usage of about 0.8 percent per year. Based on this growth rate, the present allotment would be fully used by about the year 2000. If San Juan-Chama water is added, the limit to the total available supply would be reached by about the year 2020 (LANL, 1988c). Recent water usage has followed the trend of the 1988 projection, and in 1990 was at 91.5 percent of the allotment.

The preferred course of action is to use the San Juan-Chama water (LANL, 1988c). Ownership of this water has already been established, and this water constitutes an established source. Establishment of return flow credits is secondarily preferred. Return flow is potentially of low cost. The increased water supply to be obtained from return flow credit, however, would necessarily come from groundwater. There are potential problems in receiving approval for increased withdrawals, particularly in view of the fact that groundwater from the main aquifer discharges to the Rio Grande and any further groundwater withdrawal has the potential to impact downstream users of Rio Grande water.

Environmental Consequences. A description of the functions to be transferred to LANL and the facility locations selected to house these activities is presented in section 3.3.3.

Surface Water. No surface water would be withdrawn for relocated activities. Impacts to surface water resources associated with runoff and wastewater discharged during the modification phase would be negligible.

The additional sanitary wastewater generated by the transferred processes would be approximately 0.44 MGY (table 3.3.3-4). The increase represents less than 1 percent over the current sanitary wastewater generation rate of 183 MGY. (LANL, 1988b).

Surface Water Quality. The site was selected to receive these activities based on the compatibility between current operations and those that would be relocated. Future NPDES permits would be written after review of the current water quality and how it is affected by discharges from LANL, including those transferred technologies. In order to prevent further degradation of the water quality of the Rio Grande, future NPDES permits may carry more stringent limits or more extensive pretreatment measures on the release of total suspended solids, biochemical oxygen demand, fecal coliform, or chlorine. Silicon dioxide, which contributes to turbidity, may also be included in future NPDES permits as a result of elevated turbidity levels in the Rio Grande.

Groundwater. Water requirements for both the modification and operation phases of new functions would be supplied from local groundwater sources. It is projected that 5,500 GPD of water would be needed during the 3-year modification period (table 3.3.3-3). This amount is less than 1 percent of the current groundwater usage of 4.1 MGD, and would not be a significant increase.

During operations, an additional 1,840 GPD of water would be required (table 3.3.3-5), which is less than 1 percent of the present groundwater usage of 4.1 MGD. The amounts of projected water requirements for modification and operations would not be significant increases in the total amount of groundwater currently withdrawn by LANL and would not affect water supply in the area. This additional amount would still be below the LANL maximum allotment of 1.8 BGY, and would be approximately 0.2 percent of the remaining available allotment of 0.3 BGY.

Groundwater Quality. No process wastes would be discharged directly to the groundwater and all wastewater discharges would be required to comply with NPDES permit requirements. Given normal safeguards and precautions, no adverse impacts to groundwater quality are expected to result from the Proposed Action.

4.1.3.4 *Geology and Soils*

Affected Environment. LANL is located on the Pajarito Plateau. The surface of the plateau is dissected by deep, southeast-trending canyons separated by long narrow mesas.

LANL lies within Seismic Zone 2B (UBC, 1991). The strongest earthquake in the last 100 years within a 50-mile radius was estimated to have a 5.5 to 6 Richter magnitude and a MMI of VII. Studies suggest that several faults have produced seismic events with a 6.5 to 7.8 Richter magnitude in the last 500,000 years (LA Gardner, 1987). LANL operates a seismic hazards program which monitors seismic patterns through a seismic network and conducts studies in paleoseismology. These studies have determined the presence of three faults in the area that are considered active as defined by 10 CFR 100 App A. These form the Pajarito fault system, which includes the Pajarito, Water Canyon, and Guaje Mountain faults. The Guaje Mountain fault had movement on it between 4,000 and 6,000 years ago. There is no evidence of movement along the Pajarito fault system during historical times (LA DOE, 1979). The 100-year earthquake at Los Alamos is regarded as having a magnitude of 5, with an event of Magnitude-7 being the maximum credible earthquake. These values are currently used in design considerations at Los Alamos.

Geological concerns associated with the LANL area include potential downslope movements in association with regional seismic activity. Although isolated rockfalls commonly occur from the canyon rims, landslides are an unlikely hazard.

LANL is underlain by soil types varying in texture from clay and clay loam to gravel. Over 95 percent of the soils are developed on acidic volcanic rocks (LA USDA, 1978). Because of the topographic relief of the Pajarito Plateau, rock outcrops occur on greater than 50 percent of the site area.

Water and wind erosion of these soils varies from slight to severe depending on slope, soil grain size, amount of disturbance, and degree of protection. Shrinkswell potential ranges from low to high, correlating with the amount of swelling clays present (LA USDA, 1978). No soils in Los Alamos County have been designated prime farmland or Soil of Statewide Importance for New Mexico.

Environmental Consequences. All new functions would be accommodated within existing structures. All laydown areas would be either inside existing buildings or in existing paved areas; therefore, no impacts to geologic features would occur.

During implementation and operations of the new functions, seismic activity in the area poses a

potential hazard to the facilities and personnel at LANL. Secondary effects from seismic activities, such as soil liquefaction or landslides, are not expected because of the depth of groundwater and relatively level topography. Modifications of site facilities to accommodate the new functions would meet standards for Seismic Risk Zone 2B in the Uniform Building Code (UBC, 1991). Hazards resulting from the return of volcanism during implementation and operations are unlikely.

Because there would be no new construction, relocation of functions to LANL would have no impact on the soils of the site.

4.1.3.5 *Biotic Resources*

Affected Environment. Terrestrial habitats within undeveloped areas of LANL support six major vegetative communities: juniper–grassland, pinyon pine–juniper, ponderosa pine, mixed conifer, spruce–fir, and subalpine grassland (LA DOE, 1979). Undeveloped areas within LANL provide habitat for a diversity of terrestrial wildlife, described in detail in an environmental impact statement (EIS) prepared for the continued operation of LANL in 1979 (LA DOE, 1979). LANL was designated a NERP in 1976.

National Wetland Inventory (NWI) maps (LA FWS, 1990a-d) indicate that wetlands within LANL are restricted to several canyons containing the Rio Grande or its tributaries. Most of the wetlands shown on the NWI maps have been designated as temporary or seasonal.

Aquatic habitats on LANL are limited to the Rio Grande and several springs and intermittent streams in the canyons. These habitats currently receive NPDES–permitted wastewater discharges (LA DOE, 1988). Fourteen species of fish are known to inhabit the roughly 6-mile reach of the Rio Grande between LANL and Cochiti Lake (LA Montoya, 1992). The springs and streams on the site support limited, if any, aquatic life.

Seventeen Federally-listed or New Mexico-listed threatened, endangered, or candidate species potentially occur in the vicinity of LANL (NMDGF, 1990). Four of these species have been observed on LANL, including the bald eagle (*Haliaeetus leucocephalus*) (a Federally-listed endangered species that roosts along the Rio Grande); the peregrine falcon (*Falco peregrinus*) (a Federally-listed endangered species that historically nests in the northeast corner of LANL); the northern goshawk (*Accipiter gentilis*) (a Federal candidate Category 2 species that forages in the northwest corner of LANL), and the giant helleborine orchid (*Epipactis gigantea*) (a state-listed endangered species that occurs near springs in White Rock Canyon). Five other species occur in close proximity to LANL and are likely to exist onsite (LANL, 1992g and h).

Environmental Consequences. Minor permanent and temporary land disturbance would result from relocation activities associated with the Proposed Action. Disturbance would be limited to land within several of the fenced technical areas. Because of the high degree of land development, these areas are not significant habitat for terrestrial wildlife. No undeveloped areas would be disturbed by the Proposed Action. Relocation activities would not affect research activities conducted at the LANL NERP.

No areas potentially containing wetlands or other aquatic habitats would be affected by renovation or operation of the facilities. Operation of the consolidation facilities would not require water withdrawals from aquatic habitats, and minor increases in wastewater reaching the LANL canyons (section 4.1.3.4) would not significantly affect aquatic habitats within those canyons.

No terrestrial or aquatic habitats potentially providing habitat to Federally-listed or New Mexico-listed threatened or endangered species would be disturbed by the Proposed Action. DOE has initiated consultations with the FWS and the New Mexico Department of Game and Fish to ensure that

renovation and operation of the facilities would not result in impacts to any listed or special status species in the vicinity.

4.1.3.6 *Cultural Resources*

Affected Environment. The prehistoric chronology for the LANL area consists of six broad time periods: Paleoindian (10,000-4000 B.C.), Archaic (5500 B.C.-A.D. 600), Early Developmental (A.D. 600-900), Late Developmental (A.D. 900-1100), Coalition (A.D. 110-1325), and Classic (A.D. 1325-1600) (LA Cordell, 1979). Prehistoric site types identified in the vicinity of LANL include large multi-room pueblos, pithouse villages, field houses, talus houses, cave kivas, shrines, towers, rock-shelters, animal traps, hunting blinds, water control features, agricultural fields and terraces, quarries, rock art, trails, campsites, windbreaks, rock rings, and limited activity sites (LA USDA, 1987). Approximately 75 percent of LANL has been inventoried for cultural resources (LANL, 1990a). Coverage for some inventories has been less than 100 percent; however, about 60 percent of LANL has received 100 percent coverage. Over 975 prehistoric sites have been recorded; about 95 percent of these sites are considered eligible or potentially eligible for the NRHP.

The history of the region has been documented (Los Alamos, 1978). Approximately 75 percent of LANL has been inventoried for cultural resources (LANL, 1990a). Over 50 historic resources have been recorded at LANL; more than 95 percent are considered eligible or potentially eligible for the NRHP. The existing LANL facilities have been extensively modified and refurbished since 1942 (LA Kunetka, 1979). The existing facilities are not likely to be considered NRHP-eligible because they may lack architectural integrity and may not be representative of a particular architectural style. However, some of the facilities may be NRHP-eligible based on their association with the broad historic theme of the Manhattan Project and initial nuclear production.

Native Americans with concerns in this area include the San Ildefonso, San Juan, Santa Clara, Nambe, Tesuque, and Pojoaque Pueblos east of Los Alamos (LA Arnon, 1979; LA Edelman, 1979a; LA Edelman, 1979b; LA Lambert, 1979; LA Ortiz, 1979; LA Spiers, 1979). Native American resources on LANL may consist of prehistoric sites with ceremonial features such as kivas, village shrines, petroglyphs, or burials; all of these site types or features would be of concern to local groups. Consultation with the San Ildefonso, San Juan, Santa Clara, Tesuque, Nambe, and Pojoaque Pueblos has been initiated by DOE for this project. Important Native American resources may be identified through consultation.

Environmental Consequences. Several buildings may be renovated and/or modified; however, they may be considered potentially eligible based on their association with the broad historical theme of the Manhattan Project and initial nuclear production. NRHP-eligible prehistoric sites or Native American resources will be affected by ground disturbing activities during renovation.

Federal, state, and Native American consultations have been initiated for LANL to determine if the Proposed Action would have an adverse effect on important Native American resources or NRHP-eligible prehistoric or historic resources. If the resources identified as potential locations for transferred functions and other facilities at LANL are not considered NRHP-eligible or traditionally important after consultation, then no adverse effects to cultural resources are expected.

Mitigation measures to avoid any potential adverse effect to NRHP-eligible or traditionally important resources could include, but not be limited to, siting project activities to avoid such resources, data recovery such as excavation of prehistoric sites or archival research and photodocumentation of historic resources, and restricting access to important Native American resources.

4.1.3.7 *Socioeconomics and Community Services*

Affected Environment. The discussion of socioeconomics and community services at LANL is based on the ROI where 88 percent of LANL employees lived in 1991. The ROI includes Los Alamos (48 percent), Rio Arriba (21 percent), and Santa Fe (19 percent) counties in New Mexico. Within these ROI counties, the following key cities have been included in the Affected Environment and Environmental Consequences discussions: Española (10 percent) and Santa Fe (16 percent). (See figure 3.2.5.2-1.)

Assumptions, methodologies, and supporting data for the assessment of environmental consequences are presented in appendix E. Tables E3.3-1 through E3.3-5 give ROI resource information on the following: residential distribution of plant employees, regional economic and population growth indicators, housing characteristics, primary municipal water and wastewater systems, education characteristics, and local transportation.

Employment and Local Economy. The civilian labor force in the ROI grew 144 percent, increasing from 34,467 persons in 1970 to 84,107 persons in 1990. Total employment increased from 31,155 to 79,846 persons between 1970 and 1990, an annual growth rate of 5 percent. The unemployment rates for 1970 and 1990 were 9.6 percent and 5.1 percent, respectively. For the same years, personal income increased from approximately $324.7 million to $2.3 billion (an annual average of 10 percent), and per capita income increased from $3,396 to $15,348.

Between 1975 and 1990, employment at LANL increased from 5,094 to 7,622 persons, representing 10 percent of the ROI employment in 1990 (LA Tab J, 1992). As of September 30, 1992, employment at LANL had increased to 7,450 persons. Under the No Action alternative, future site employment would be expected to increase to 7,600 persons by the year 2000 (DOE, 1992e). In 1991, the total LANL payroll was estimated to be more than $392 million (LA Tab J, 1992). Under the No Action baseline, the total payroll would be projected to be approximately $391 million by the year 2000.

The civilian labor force is projected to grow at less than 1 percent annually, reaching an estimated 99,000 persons by 2000 and 106,000 persons by 2020. The unemployment rates for 2000 and 2020 are projected to be 6.0 percent and 5.8 percent, respectively. For the same years, personal income is projected to increase from approximately $3.1 billion to $4.2 billion, an annual average of about 2 percent. Per capita income is projected to increase from an estimated $19,000 in 2000 to $22,000 in 2020.

Population. In 1991, more than half of the LANL workforce resided in the unincorporated communities of Los Alamos and White Rock in Los Alamos County. Between 1970 and 1990, the population in the ROI increased 61 percent to 151,408 persons. During the same period, the New Mexico population increased 49 percent. The population in the 3-county ROI is projected to increase from an estimated 169,000 persons in 2000 to 191,000 persons by 2020 at an annual rate of less than 1 percent.

The largest county population increase (84 percent) occurred in Santa Fe County between 1970 and 1990, while during the same years, population in Los Alamos County increased 19 percent. Population in Santa Fe County is estimated to increase 11 percent between 1990 and 2000 and 14 percent between 2000 and 2020, an annual growth rate of less than 1 percent. The Los Alamos County population is projected to increase approximately 23 percent between 1990 and 2000 and an additional 14 percent between 2000 and 2020, an annual growth rate of 1 percent.

The unincorporated communities of Los Alamos and White Rock in Los Alamos County are included in the county population analysis. Between 1970 and 1990, the population in Española increased

85 percent. For the same years, the Santa Fe population increased 36 percent.

Housing. Between 1970 and 1990, the number of housing units in the ROI increased 124 percent from 28,344 to 63,386 units. Concurrent with population growth in the ROI, housing units are expected to increase approximately 11 percent by the year 2000 and an additional 13 percent by 2020, an annual increase of less than 1 percent.

Between 1970 and 1990, the largest increase in housing units (157 percent) occurred in Santa Fe County, while the smallest increase (61 percent) occurred in Los Alamos County. Housing units in Santa Fe County are expected to increase approximately 12 percent by 2000 and an additional 14 percent by 2020, an annual increase of less than 1 percent. Housing units in Los Alamos County are expected to increase about 9 percent by 2000 and an additional 12 percent by 2020, an annual increase of less than 1 percent.

In 1990, the homeowner vacancy rates averaged 1 percent in the ROI and ranged from less than 1 percent in Los Alamos County to 1 percent in Rio Arriba and Santa Fe counties. The vacancy rates for rental units averaged 8 percent and ranged from about 5 percent in Los Alamos County to 13 percent in Rio Arriba County.

Community Infrastructure and Services. The DOE at LANL and the cities of Santa Fe and Española operate water supply systems in the ROI. LANL and Española draw all of their raw water supplies from groundwater, while Santa Fe utilizes both groundwater and surface water.

LANL's system is the primary supplier in Los Alamos County and had 1988 average daily demands equal to about 83 percent of its current groundwater allotment of 4.92 MGD. Santa Fe's system (18 MGD capacity) in Santa Fe County had 1991 average daily demands equal to 49 percent of capacity. Española's system in Rio Arriba County had 1991 average daily demands equal to 67 percent of its 1.5 MGD capacity.

Under current conditions, LANL's system is projected to experience average daily demands equal to 92 percent of its current allotment in 1995 and 101 percent of its current allotment in 2000. The average daily demands on Santa Fe's system are projected to be about 53 percent of capacity in 1995 and 56 percent of capacity in 2000. Española's system is projected to have average daily demands equal to about 70 percent and 74 percent of capacity in 1995 and 2000, respectively.

Los Alamos County Utilities, Santa Fe, and Española all operate wastewater systems in the ROI. Los Alamos County Utilities had 1991 average daily demands equal to 42 percent of its 3.1 MGD capacity. The 1991 average daily demands on Santa Fe's system were equal to 92 percent of its 6.5 MGD capacity, while Española experienced 1991 average daily demands equal to 99 percent of its capacity of about 1 MGD.

Española plans to increase its system capacity to 1.6 MGD by 1993 and is projected to have average daily demands equal to about 64 percent of capacity in 1995 and 66 percent of capacity in 2000. Los Alamos County Utilities has two modifications planned, a decrease in capacity by 1993 and an increase in capacity by 1996, which would result in a net decrease in capacity to about 2.8 MGD by 1996. Los Alamos County Utilities is projected to experience average daily demands equal to 67 percent of capacity in 1995 and 63 percent of capacity in 2000. The average daily demands on Santa Fe's systems are projected to equal about 97 percent and 102 percent of current capacity in 1995 and 2000, respectively.

Seven school districts provide public education services and facilities in the ROI. In 1990, these school districts ranged in enrollment size from 493 students in the Jemez Mountain School District to 12,556 students in the Santa Fe School District. School districts in Los Alamos, Rio Arriba, and

Santa Fe counties with enrollments of over 1,000 students were operating between 89 percent and 100 percent of capacity. However, current capacities in Los Alamos and Santa Fe counties are projected to be exceeded by the years 1995 and 2000 under the No Action future baseline. The largest increases are expected to occur in the Santa Fe County school districts where enrollments are projected to exceed current capacities by 38 percent in 1995 and 45 percent in 2000. Smaller increases are expected to occur in the Los Alamos County School District where enrollments are projected to exceed the current capacity by 21 percent in 1995 and 35 percent in 2000. The average pupil-to-teacher ratio for the ROI was 18:1, and expenditures averaged $3,323 per pupil. The statewide average pupil-to-teacher ratio was 18:1, and expenditures averaged $3,137 per pupil (NM Education, 1990).

Five hospitals serve the 3-county ROI, with the majority operating well below capacity (AHA, 1990). In 1990, a total of 366 physicians served the ROI. The physician-to-population ratio for the ROI was 2.4:1,000 and ranged from 0.9:1,000 in Rio Arriba County to 2.9:1,000 in Santa Fe County. The statewide physician-to-population ratio was 2.1:1,000 (AMA, 1990).

Six city, county, and state law enforcement agencies provide police protection in the ROI. In 1990, the largest law enforcement agency in the 3-county ROI was in Santa Fe with 126 sworn officers, or 2.3 sworn officers per 1,000 persons. Other large agencies are in Santa Fe County with 60 sworn officers (0.6 sworn officers per 1,000 persons) and Los Alamos County with 33.5 sworn officers (1.8 sworn officers per 1,000 persons). The average number of sworn officers in the ROI was 1.5 per 1,000 persons (FBI, 1991).

Three fire departments and 258 regular and volunteer firefighters provided fire protection services in 1990. The principal municipal departments include both professional and volunteer staff. In 1990, the greatest staffing strengths were found in the fire departments in Los Alamos County (130 firefighters; 7.2 firefighters per 1,000 persons) and in the city of Santa Fe (102 firefighters; 1.0 firefighters per 1,000 persons). The average number of firefighters in the ROI was 1.7 per 1,000 persons (Kapalczynski, 1988).

Local Transportation. Vehicular access to LANL is provided by Pajarito Road; East Jemez Road; US Route 84; and New Mexico State Routes 4, 501, and 502.

Estimated baseline traffic along segments providing access to LANL is projected to contribute to differing service level conditions in accordance with baseline population growth. New Mexico State Route 4 would generally support congestion-free traffic flow. New Mexico State Routes 501 and 502 would support stable flow. Along these roadways, a motorist's speed and ability to maneuver would be restricted, and potential disruptions to the traffic flow could be caused by accidents or maintenance activities, resulting in some congestion. In addition, estimated baseline truck traffic into LANL for delivery of commercial supplies and removal of commercial wastes would typically average 159 trips per day. However, the additional traffic volumes associated with continued operation of LANL are relatively minor and would not substantially affect local transportation baseline conditions.

No major improvements are scheduled for those segments providing immediate access to LANL (LANL, 1990a).

Other modes of transportation within the ROI include public transportation systems and railways. Although no public bus service exists in Los Alamos County, a non-profit bus system provides regular scheduled service between White Rock, the Laboratory, and the Los Alamos townsite (LANL, 1990a). The nearest railroad is the Atchison, Topeka, and Santa Fe Railroad (LA DOE, 1979; NM HTD, 1991c). No navigable waterways within the ROI are capable of accommodating waterborne transportation of material shipments to LANL.

The ROI receives jet air passenger and cargo service from both national and local carriers at Albuquerque International Airport (DOT, 1991). The Santa Fe Municipal Airport and Los Alamos Airport serve local air traffic.

Environmental Consequences. The employment figures for construction and operations for the Proposed Action are given in table 3.3-1 in section 3.3. The construction, modification, and installation of facilities and equipment for the Proposed Action at LANL would require 81 additional employees during peak construction (LA DOE, 1992c and d). Operations employment would begin in 1997 and grow to a full complement of 60 jobs in the year 2000 (DOE, 1992e). In addition to these jobs created directly by the project, another 194 jobs would be created indirectly during peak construction and 93 additional jobs during operations. The creation of direct and indirect employment would lead to in-migration of 61 persons during peak construction and 81 persons during operations. The in-migrating population is primarily related to the in-migrating professional employees who are scientists, engineers, etc. (and their families), and who are not available in the regional unemployed labor force.

Under the No Action alternative, the current LANL employment of 7,450 persons would be projected to be 7,600 persons by the year 2000, an increase of 150 persons. The addition of 60 direct jobs to LANL would represent a net increase of 210 jobs over current levels.

Table 4.1.3.7-1 summarizes the projected economic and population changes that would result from the Proposed Action. In the year 2000, this project-related population growth from in-migration would represent a negligible increase of less than 1 percent over the projected ROI baseline population of 169,000 persons, and no cities or counties in the ROI would experience a population growth beyond 1 percent.

The less than 1 percent change in population during the time of peak construction would create the need for only an estimated 20 additional housing units, which is not a significant addition. For operations

TABLE 4.1.3.7–1.—*Los Alamos National Laboratory Proposed Action Economic and Population Characteristics*

Economics	1995 Peak Construction	Percent Over Baseline	2000 Peak Operation	Percent Over Baseline
Baseline Civilian Labor Force	91,191	NA	98,872	NA
Baseline Unemployment Rate	5.5%	NA	6.0%	NA
Baseline Personal Income (Thousands $)	$2,698,386	NA	$3,133,307	NA
Baseline Per Capita Income ($/Person)	$16,886	NA	$18,578	NA
Baseline Employment	86,139	NA	92,928	NA
Direct Jobs	81	0.09	60	0.06
Indirect Jobs	194	0.23	93	0.10
In-Migrating Workforce	27	0.03	32	0.03
Total In-Migration	61	0.04	81	0.05
Population Increase				
Los Alamos County	33	0.17	44	0.20
Rio Arriba County	14	0.04	19	0.05
Espanola	7	0.10	9	0.13
Santa Fe County	13	0.01	17	0.02
Santa Fe	11	0.02	15	0.02
ROI (County Total)	61	0.04	81	0.05

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Source: Estimated from Census, 1977, 1983, 1990a; DOC, 1990a and b, 1991a; NM Employment, 1991; Booth, 1992; Huff, 1992; DOE, 1992e.

in the year 2000, the less than 1 percent change in population would not create a need for additional housing units beyond a 1 percent increase. In past years, housing units have been built at an annual rate of 4 percent. Therefore, the additional housing needed to accommodate the in-migrating population could be built without any adverse effect on the cities and counties in the ROI.

Under the No Action future baseline, Santa Fe's wastewater system would exceed current capacity by 1995 and the LANL current water system allotment would be exceeded by the year 2000. However, the less than 1 percent estimated additional population during peak construction and operations would not affect any community infrastructure and services in the ROI beyond what would naturally occur under the No Action baseline. Some existing public education facilities are currently approaching 100 percent of capacity. Under current conditions, enrollments will exceed capacities by the years 1995 and 2000 given the No Action future baseline. However, these school capacities will not be affected beyond what would naturally occur under the No Action baseline growth because the Proposed Action would not add more than 1 percent to enrollments during construction or operations. Existing health care resources are more than adequate to accommodate the projected population increases during peak construction and operations. Current staffing levels for police and fire services in the ROI are adequate to support the projected population increases, while maintaining current service standards, because none of the cities or counties would grow by more than 1 percent over the No Action baseline. Additional commercial truck traffic into LANL would be negligible relative to historic levels, and this truck traffic would occur during non-peak hours. Impacts to the local transportation network serving LANL would be negligible, as well.

4.1.3.8 *Waste Management*

Affected Environment. Discussion of the LANL waste management baseline is provided in section 3.2.6.3. Because there are no TRU wastes associated with any of the proposed activities that would be consolidated, no further discussion of TRU waste generation or management is presented.

Current LLW management activities at LANL requires development of a 60- to 70-acre LLW landfill to replace the existing landfill at LANL. A portion of the expansion area for the existing landfill has been contaminated by a chemical plume from the hazardous chemical disposal site that restricts further development. The new landfill is required to ensure continued operation of laboratory activities that generate LLW and to provide safe isolation of the wastes. Construction completion is anticipated in March 1996.

A new HE wastewater treatment facility at LANL must also be constructed in order to comply with RCRA and NPDES regulations. The planned project would eliminate approximately 20 HE sumps and outfall lines which do not comply with Federal regulations and permits. If these existing sumps are not upgraded, HE operations at LANL could be curtailed under No Action. Construction completion is anticipated in late 1995.

LANL is providing for the construction of a sanitary wastewater treatment plant and collection system to replace 8 existing treatment facilities and 30 existing septic tanks to centralize and consolidate sanitary wastewater treatment at LANL. The plant and collection system will meet the requirements of the Laboratory's Federal Facilities Compliance Agreement, and would meet all current and expected future standards and regulations required by the EPA. Construction completion is anticipated in 1993.

Environmental Consequences. Any equipment moved to LANL from another site due to the Proposed Action would be decontaminated prior to shipment. Construction debris and scrap metals from demolition of existing interior utilities and partitions would be disposed of as sanitary waste or sold/recycled as scrap.

Construction/modification activities involving decontamination are part of routine facilities operations at the LANL. Decontamination activities include the removal of asbestos piping insulation, floor and ceiling tiles, and asbestos- or PCB-contaminated concrete flooring. Such decontamination activities, if identified to be necessary, would be performed in accordance with TSCA requirements for handling and disposal of asbestos and PCB wastes. The amount of construction waste materials is expected to be minimal.

Should any soil excavation occur as a result of piping modification or replacement of sanitary and industrial drains, the soils would be analyzed for possible contamination before disposal. Uncontaminated soils would be used as fill or disposed of in a local sanitary landfill if considered unsuitable for backfill. If soils are found to be contaminated, the location would be referred to the LANL Basewide Environmental Restoration Program for subsequent management. Management of potentially contaminated soil would involve an area inspection, characterization, and evaluation of cleanup alternatives (if necessary). Cleanup action and compliance follow-up would be conducted as necessary to remove and dispose of contaminated soils. Remediation of contaminated areas would be conducted according to accepted guidelines and procedures applicable to the type and extent of contamination. Although remediation activities may have additional project cost implications, no significant environmental impacts are expected.

Wastes generated from the consolidation of operations are outlined in appendix B.3 and would be disposed of through LANL's existing Environmental Management Division. The activities under the Proposed Action would increase Los Alamos's solid LLW and liquid LLW streams by an insignificant amount (less than 1 percent). There are no liquid or solid mixed wastes being generated as part of the Proposed Action. With the addition of the planned 60- to 70-acre LLW landfill and the construction of the LLW/mixed waste incinerator, the additional LLW due to the Proposed Action to be treated or disposed of at LANL would be accommodated.

Under the Proposed Action, LANL would increase its hazardous waste streams by 21 percent. LANL has 31 hazardous waste management units located at 7 different sites operating under state and Federal regulations promulgated in accordance with RCRA. At any given time, existing storage areas would have sufficient excess capacity to handle the additional hazardous waste streams. All HE hazardous waste and potentially contaminated HE waste is delivered by LANL to the incinerator or flash pad (TA-16) where it is burned. Ash residue is drummed and buried by LANL at the TA-54 burial ground according to RCRA rules. Other liquid and solid hazardous wastes are packaged, manifested, and shipped by a RCRA-approved transporter to RCRA-approved commercial facilities. Consequently, the impacts on the LANL hazardous management storage and handling capacities and current operating permits would be minimal.

An increase of less than 1 percent in liquid nonhazardous waste streams would result from the Proposed Action. The additional nonhazardous liquid waste can be handled with the existing and planned upgraded sanitary wastewater treatment plant and collection system. The additional solid nonhazardous waste due to the Proposed Action is less than 1 percent of current disposal volume.

4.1.3.9 *Human Health: Facility Operations and Accidents*

General discussions of impacts to the public and the environment, worker exposures, and accidents are presented in section 4.1. Information specific to LANL is presented below.

Affected Environment. As discussed in the Air and Water Resources sections for LANL (4.1.3.2 and 4.1.3.3, respectively), exposures to members of the public associated with the release of chemical

pollutants as a result of LANL operations meet all applicable permit, regulatory, and DOE operational requirements. Exposures to members of the public associated with the release of radiological pollutants are also below applicable permit, regulatory, and DOE operational requirements (LANL, 1990b).

A review of the recent LANL annual environmental and accident reports indicates that there have been no significant adverse impacts to workers, members of the public, or the environment. This review was performed to provide an indication of the site's accident history. The time period of the review (1986-1990) was a period during which site operations were much higher than in the past year and higher than anticipated in the future.

Environmental Consequences. The Air and Water Resources sections discuss the chemical releases associated with relocating the tritium handling, special products, high explosives, and beryllium and pit support functions identified in section 3.3.3 to LANL. As shown, the cumulative impacts resulting from existing releases and the releases of chemicals and radioactive materials associated with relocating these functions at LANL are below applicable permit, regulatory, and DOE operational requirements.

Water from processes containing hazardous chemicals is not discharged directly into surface or ground waters that serve as potable water. Process water that may contain hazardous chemicals is treated before discharge to remove the toxicants. Furthermore, all releases of the pollutants are below NPDES limits and water quality is not adversely affected. Thus, the primary pathway considered for possible worker or public exposure is the air pathway.

For normal operations at LANL, all possible hazardous air pollutants were examined and from their assessment, the following chemicals were identified for further analysis based on their toxicity, concentration, and frequency of use: acetone, ammonia, chromium trioxide, dimethylformamide, 1,4 dioxane, formaldehyde, isopropyl alcohol, methylene chloride, trichloroethylene, methyl ethyl ketone, and nitric acid. The Hazard Index, a summation of the Hazard Quotients for all chemicals, was calculated for the No Action alternative and the chemicals proposed to be added (increment) at the site to yield cumulative levels for the site. A Hazard Index value of 1.0 or less means that no adverse human health affects are expected to occur. The cumulative Hazard Indexes for LANL (see table F5-13a in appendix F) were 0.0465 for the onsite (worker effects) and 0.0044 at the site boundary (effect on the public) on an annual basis and the incremental change-Hazard Indexes were both 0 for onsite and at the site boundary. Therefore, the Proposed Action would not contribute to the cumulative Hazard Indexes at the LANL site.

Four of the chemicals identified, 1,4 dioxane, formaldehyde, methylene chloride, and trichloroethylene, are considered to be carcinogens and the cancer risk to individuals for each was calculated. The combined risk for the carcinogens was calculated as 1.5×10^{-6} onsite (worker) and 1.2×10^{-7} at the site boundary (public) (see table F5-13b in appendix F). The increment change due to the Proposed Action contributed no additional risk either onsite or at the site boundary.

Operations are conducted to ensure that normal releases of radioactive materials from the LANL result in a total maximum individual dose of less than 10 mrem effective dose equivalent (LANL, 1990b). The resulting risks of potential fatal cancers associated with 1 year of operations would be less than 4.5×10^{-6} to that individual. The annual dose increment associated with the increase in tritium emissions would be less than 0.1 mrem effective dose equivalent and result in an increased risk of less than 4.5×10^{-8} potential fatal cancers from 1 year of operations. Mitigation measures, underway, would reduce the dose from Los Alamos Meson Physics Facility by a factor of 6. The new resulting cumulative dose would result in a risk of less than 7.9×10^{-7} potential fatal cancers from 1 year of operations. Risks less than 10^{-6} are acceptable by EPA since this incidence of cancers cannot be

distinguished from the normal cancer risk to an individual member of the general population. When risks are greater than 10^{-6}, appropriate measures are required to reduce the risk to less than 10^{-6}.

The cancer risk of 1.5×10^{-6} for the onsite worker is primarily the result of the use of TCE in the current operations (No Action); the Proposed Action would not increase the risk to workers.

Tritium handling, explosive, and activities similar to the beryllium and pit support functions have been analyzed previously for accidents at LANL in the site EIS (LA DOE, 1979). The accidents analyzed included explosions and the release of tritium, beryllium, and plutonium. Both natural and man-made external initiating events were considered (e.g., human errors, fires, explosions, and aircraft crashes).

The neutron tube target loading function would be located in the Tritium Salt Laboratory in TA-21, Building 209. The Tritium Salt Laboratory is an operating tritium facility that has an inventory of approximately 100 grams of tritium. The tritium inventory requirements for the neutron tube target loading activities are about 2 grams and therefore represent an insignificant addition to the amount of tritium in the Tritium Salt Laboratory.

Radioactive materials are routinely stored, handled, processed, and tested at LANL. Additionally, explosives are also routinely stored, handled, processed, manufactured, and tested at LANL. Safety procedures and requirements have been developed and implemented for storing, handling, processing, manufacturing, and testing radioactive and explosive materials, as appropriate. These procedures and requirements limit the amount of materials that can be used or stored in one location, as well as material proximity to site boundaries or other materials.

Currently, beryllium inventories at LANL include 1,852 lb, 80 lb in powder form and 2 lb of beryllium oxide. Transferring the beryllium function to LANL would result in a cumulative inventory of 10,200 lb of which only 200 lb would be powder. The powder material is the only form capable of producing adverse health effects. However, there have been significant improvements in the safety procedures for handling beryllium, and the crystal structure of beryllium powder now used in industry has a much lower toxicity (Rossman, 1991) than that used during the early days (1940-1950) of the industry. Employee exposure limits will be maintained below applicable standards and acceptable concentrations established by OSHA.

Projected workloads of the tritium handling, explosive, and plutonium operations and inventories at LANL would be reduced. Therefore, including the operations and inventories that would be moved from the other DOE sites to LANL, operations and inventories would be below those that currently exist at LANL. As discussed in section 3.3.3, the tritium handling, explosive, and the beryllium and pit support functions involve operations and chemicals that are the same as those that are currently being performed and used at LANL.

Based on the above discussions, the current accident profile at LANL would not change as a result of the Proposed Action.

4.1.4 Y-12 Plant

Detailed discussion of the Y-12 Plant's current missions, facility/process description, and waste treatment and management activities are provided in section 3.2.7. The functions and processes associated with the Proposed Action to be consolidated at Y-12 and the proposed facility modifications required to support each relocated function are discussed in section 3.3.4. Discussions of the assumptions used in the EA for determining the affected environment and environmental consequences at Y-12 and the environmental assessment methodologies for each resource or issue discussed below are presented in the introduction to this chapter. Additional information on baseline conditions and environmental consequences of the Proposed Action which supports the following discussion on Y-12 is also provided in the chapter 4 introduction and section 4.1.

4.1.4.1 *Land Resources*

Affected Environment. The Oak Ridge Reservation (ORR) and Y-12 are located approximately 20 miles west of Knoxville, TN (figure 3.2.7-1). Generalized land uses at ORR and in the vicinity are shown in figure 4.1.4.1-1.

Land uses within ORR generally fall under one of four major land use classifications: industrial, forest/undeveloped, public/quasi-public, and water. ORR contains three major operations areas: Y-12, the Oak Ridge National Laboratory (ORNL or X-10), and K-25 site. These areas account for approximately 11,665 acres or about 33.1 percent of the total site acreage. There are numerous other support facilities scattered throughout ORR. An additional 1,200 acres (3.5 percent) are used for security buffer zones around the various facilities. About 790 acres (2.2 percent) of ORR's land are classified as public and consist mainly of the Clark Center Recreational Park, numerous small public cemeteries, and onsite public roads (Y-12 MMES, 1989b). The remaining area, about 21,577 acres (61.2 percent), consists of forested undeveloped land. There are no prime farmlands on ORR.

Approximately 13,590 acres of ORR undeveloped land are designated as a NERP. This is one of five DOE NERPs primarily used for environmental research to study the impact of human activities on the environment (DOE, 1990 and Y-12 DOE, 1980a).

Except for the city of Oak Ridge on the northeast, land use bordering ORR is predominately rural and used largely for residences, small farms, forest land, and pasture land. Several residences are adjacent to the ORR boundary approximately 1,300 feet north of Y-12; the closest house is within 100 feet of the boundary. The residential distribution of ORR employees is discussed in section 4.1.4.7.

ORR contains one recreation facility, Clark Center Recreational Park, which is open to the public. Clark Center Recreational Park is located on 90 acres along an embayment of Melton Hill Lake, about 2 miles south of Y-12. Facilities include a boat ramp and two softball fields. Deer hunting is permitted on ORR to control the resident deer population and reduce animal-vehicle accidents.

Development of the three major sites at ORR has disturbed the character of the landscape within their respective areas. The onsite DOE facilities are brightly lit at night, with lighting at the three major sites especially visible. Views affected by DOE facilities are primarily associated with the public access roadways and the bluffs on the opposite side of the Clinch River. Some partial views of the water treatment plant facilities can be seen from the urban areas of the city of Oak Ridge. Views are limited by the hilly terrain, heavy vegetation, and generally hazy atmospheric conditions.

The three major ORR sites are consistent with a Class 5 VRM designation. The remainder of the ORR ranges from a Class 3 to Class 4.

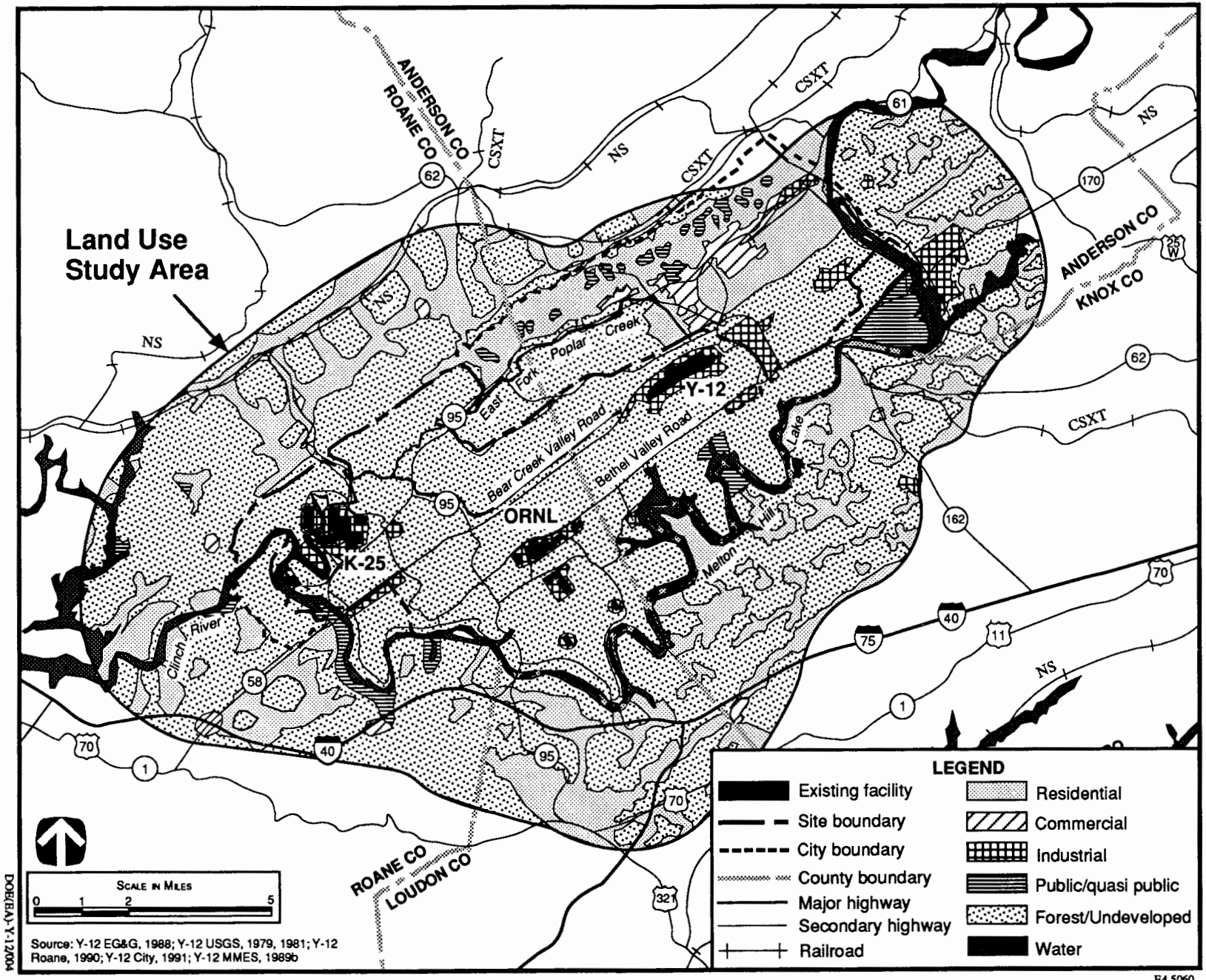

FIGURE 4.1.4.1-1—*Generalized Land Use at the Oak Ridge Reservation and Vicinity.*

Environmental Consequences. Figure 3.3.4-1 shows the locations of the beryllium technology and pit support functions. The relocated functions would be compatible with existing operations.

The number of in-migrating employees (see section 4.1.4.7) would have a minimal impact on land resources for residential use. Offsite land requirements would be 8 acres during implementation and 1 acre during operations. This acreage represents only a small percentage of the total developable land available for residential uses. Because the Proposed Action would result in a slight population increase (section 4.1.4.7), impacts on recreational resources would not be expected, nor would VRM classification be affected. Since all relocated beryllium functions would be placed within existing structures, the impact to visual resources would be negligible.

4.1.4.2 *Air Quality and Acoustics*

Affected Environment. The climate at ORR and in the surrounding region is characterized as humid, subtropical, with warm summers (Trewartha, 1954) and generally mild winters. Moderate annual precipitation is evenly distributed throughout the year. The annual average temperature at ORR is 57.5 °F; temperatures vary from an average daily minimum of 27.7 °F in January to an average daily maximum of 87.2 °F in July. The average annual precipitation measured at ORR is 54.8 inches (NOAA, 1991c).

Ambient Air Quality. ORR is located within the Eastern Tennessee-Southwestern Virginia Interstate AQCR. This AQCR is designated as attainment by the EPA with respect to the NAAQS (40 CFR 81.343) for PM_{10}, CO, and SO_2, and designated as nonattainment for NO_2. The NAAQS and Tennessee state ambient air quality standards are listed in table D2.1.1-1.

The Tennessee Department of Environment and Conservation provides guidance for the evaluation of HAPs/toxics (TDHE, 1991). The list of HAPs/toxics is identical to those promulgated by Title III of the CAA. The acceptable ambient concentration is defined as 10 percent of the Threshold Limit Value (TLV) or Permissible Exposure Limit (PEL), whichever is the most restrictive. For those "high-risk pollutants," the acceptable ambient air concentration is defined as 1 percent of the TLV or PEL, whichever is the most restrictive. The HAPs/toxics described in this section are those currently used at Y-12 or those anticipated to be used under the Proposed Action.

Ambient air quality within Y-12 is monitored at two locations. The data from these monitoring stations for 1989 and 1990 are presented in table D2.1.7-1. To achieve a conservative estimate the maximum background concentrations were used in the analysis. Note that the ozone, PM_{10}, and SO_2 standards were exceeded.

The principal source of criteria air pollutants at Y-12 is the steam plant. Other sources include fugitive particulate emissions from coal piles, other process emissions, vehicular emissions, and temporary emissions from various construction processes (Y-12 MMES, 1987). HAP emissions occur from various laboratories and manufacturing facilities. The emission inventories are included in tables D2.1.7-2 and D2.1.7-3.

The air emissions also include trace amounts of the hazardous air pollutant beryllium. Compliance testing was performed in 1990 in accordance with applicable Tennessee Department of Environment and Conservation regulations. Testing showed that emissions from Y-12 were less than 3.5 grams per 24-hr period. A less-than number was reported because the results of the individual stack tests were below the detection limits of the laboratory analysis. The regulation states that emissions to the atmosphere shall not exceed 10 grams of beryllium during a 24-hr period.

Normal operations result in the emission of radioactive materials at Y-12. These emissions

would not be affected by the activities that are the subject of this EA.

Table 4.1.4.2-1 shows the air quality under ambient and No Action conditions at Y-12. Ambient air quality monitoring data are listed as "maximum background concentration" and the air dispersion modeling results for existing operations are listed as "No Action concentration." The sum of the maximum background concentration and the No Action concentration for a given pollutant and averaging time is the baseline concentration. The baseline concentration was compared to applicable Federal and state pollutant limits to provide a conservative estimate of effects of the No Action alternative on air quality. Baseline air quality concentrations at ORR exceed applicable guidelines or regulations for O_3, PM_{10}, and SO_2.

The EPA-recommended Industrial Source Complex Short Term (ISCST) model was used to perform the air dispersion modeling analysis (EPA, 1987). A description of the modeling methodology is included in appendix D.

Acoustic Conditions. The major noise sources within ORR include various facilities, equipment, and machines (e.g., cooling towers, transformers, engines, pumps, paging systems, construction and materials-handling equipment, and vehicles). At the site boundary, away from most of these industrial facilities, noise from these sources would be barely distinguishable from background noise levels. Sound-level measurements have been made around ORR in the process of testing sirens and in preparing support documentation for the Atomic Vapor Laser Isotope Separation site (Y-12 Cleaves, 1991). The acoustic environment along the ORR site boundary in rural areas and at nearby residences away from traffic noise is typical of a rural location with the DNL in the range of 35 to 50 dBA. Areas near the site within Oak Ridge are typical of a suburban area with the DNL in the range 53 to 62 dBA (EPA, 1974). The primary source of noise at the site boundary and at residences near roads is traffic. During peak hours, plant traffic is a major contributor to traffic noise levels in the area.

The State of Tennessee has not established specific numerical environmental noise standards applicable to ORR. The city of Oak Ridge has specified allowable noise levels at property lines as described in appendix D (section D2.2.). Noise levels at the residences adjacent to the ORR boundary are not expected to exceed the EPA guideline level for residential areas as a result of any noise sources at ORR. Noise levels can be expected to exceed the EPA guideline along major roads as a result of traffic noise and may exceed the limits set for streets.

Environmental Consequences.

Air Quality. The transfer of the beryllium function from RFP to Y-12 would involve modifying existing buildings and facilities within Y-12 (section 3.3.4). Renovation of these facilities would create a temporary increase in emissions of particulate matter such as dust and dirt, and vehicle emissions. This increase, although relatively minor when compared to overall site emissions and when added to existing levels, is not expected to exceed applicable air quality standards. Appropriate mitigative actions such as increased watering would be implemented to minimize emissions.

The combined beryllium operations include beryllium machining, assembly, testing, and inspection. The exhaust from all beryllium operations is ducted into a special filter system. The air emissions of criteria pollutants from beryllium operations total only about 0.2 ton per year, including primarily VOC and NO_X (Y-12 MMES, 1992c). Consequently, resulting impacts to the ambient air quality are predicted to be low compared to applicable standards and guidelines. Concentrations of criteria pollutants would be the same as shown in table 4.1.4.2-2.

Consolidation of the nonnuclear activities at Y-12 would not result in an increase in the emission of any radionuclides.

TABLE 4.1.4.2-1.—*ORR Ambient and No Action Concentrations Comparison with Applicable Regulations and Guidelines*

Pollutant	Averaging Time	Most Stringent Regulation or Guideline ($\mu g/m^3$)	Maximum Background Concentration ($\mu g/m^3$)[c]	No Action Concentration ($\mu g/m^3$)	Baseline Concentration ($\mu g/m^3$)[d]
Carbon Monoxide (CO)	8-hour	10,000[a]	f	7.5	≥7.5
	1-hour	40,000[a]	f	15.4	≥15.4
Hydrogen Fluoride (HF)	30-day	1.2[b]	0.16	e	0.16
	7-day	1.6[b]	0.28	e	0.28
	24-hour	2.9[b]	f	e	f
	12-hour	3.7[b]	f	e	f
	8-hour	250[b]	f	9.5	≥9.5
Lead (Pb)	Calendar Quarter	1.5[a]	f	e	f
Nitrogen Dioxide (NO_2)	Annual	100[a]	f	9.0	≥9.0
Ozone (O_3)	1-hour	235[a]	265.0[c]	e	265.0
Particulate Matter (PM_{10})	Annual	50[a]	76.0	1.2	77.2
	24-hour	150[a]	385.6	17.0	402.6
Sulfur Dioxide (SO_2)	Annual	80[a]	35.1	27.8	62.9
	24-hour	365[a]	165.6	399.6	565.2
	3-hour	1,300[a]	322.0	1,269.6	1,591.6
Hazardous Air Pollutants and Other Toxic Compounds[g]					
1,1,1-Trichloroethane	8-hour	19,000[b]	f	92.6	≥92.6
Acetic Acid	8-hour	2,500[b]	f	0.2	≥0.2
Acetonitrile	8-hour	6,700[b]	f	7.9	≥7.9
Chlorine	8-hour	150[b]	f	2.1	≥2.1
Hydrogen Chloride	8-hour	700[b]	f	62.6	≥62.6
Methyl Alcohol	8-hour	26,000[b]	f	266.8	≥266.8
Nitric Acid	8-hour	500[b]	f	175.8	≥175.8
Sulfuric Acid	8-hour	100[b]	f	0.1	≥0.1
Tetrachloroethylene	8-hour	17,000[b]	f	49.9	≥49.9
Trichlorotrifluoroethane	8-hour	562,000[b]	f	174.9	≥174.9

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a Federal Standard (40 CFR 50).
b State standard (TDHE, 1991).
c Ambient air quality data (Y-12 MMES, 1990, 1991b).
d The Baseline Concentration represents a conservative assessment of potential impacts since the concentration contributions from individual sources do not necessarily occur at the same location.
e Not estimated because the potential release is negligible.
f Data unavailable.
g The compounds listed are the major pollutants of concern (Y-12, MMES, 1990, 1991b).

Acoustic Conditions. Changes in noise levels during renovation and operation have been estimated for the major traffic routes around Y-12. The estimates are based on existing traffic volumes and projected changes in volumes as a result of the Proposed Action changes in employment at ORR. These changes in traffic volumes are predicted to result in an increase of less than 1 dB in peak-hour sound levels along Route 62 through Oak Ridge and Route 95. Changes in sound levels along other routes are

TABLE 4.1.4.2-2.—*Contribution to Air Quality from Proposed Action and Total Concentrations at Y-12 with Comparison to Applicable Regulations and Guidelines*

Pollutant	Averaging Time	Most Stringent Regulation or Guideline (μg/m³)	Baseline Concentration (μg/m³)[d]	Proposed Action Concentration (μg/m³)	Total Concentration (μg/m³)
Carbon Monoxide (CO)	8-hour	10,000[b]	≥ 7.5[e]	g	≥ 7.5
	1-hour	40,000[b]	≥ 15.4[e]	g	≥ 15.4
Hydrogen Fluoride (HF)	30-day	1.2[c]	0.16	g	0.16
	7-day	1.6[c]	0.28	g	0.28
	24-hour	2.9[c]	f	g	f
	12-hour	3.7[c]	f	g	f
	8-hour	250[c]	≥ 9.5[e]	g	≥ 9.5
Lead (Pb)	Calendar Quarter	1.5[b]	f	g	f
Nitrogen Dioxide (NO_2)	Annual	100[b]	≥ 9.0[e]	g	≥ 9.0
Ozone (O_3)	1-hour	235[b]	265.0	g	265.0
Particulate Matter (PM_{10})	Annual	50[b]	77.2	g	77.2
	24-hour	150[b]	402.6	g	402.6
Sulfur Dioxide (SO_2)	Annual	80[b]	62.9	g	62.9
	24-hour	365[b]	565.2	g	565.2
	3-hour	1,300[b]	1,591.6	g	1,591.6
Hazardous Air Pollutants and Other Toxic Compounds[a]					
1,1,1-Trichloroethane	8-hour	19,000[c]	≥ 92.6[e]	g	≥ 92.6
Acetic Acid	8-hour	2,500[c]	≥ 0.2[e]	g	≥ 0.2
Acetonitrile	8-hour	6,700[c]	≥ 7.9[e]	g	≥ 7.9
Chlorine	8-hour	150[c]	≥ 2.1[e]	g	≥ 2.1
Hydrogen Chloride	8-hour	700[c]	≥ 62.6[e]	g	≥ 62.6
Methyl Alcohol	8-hour	26,000[c]	≥ 266.8[e]	g	≥ 266.8
Nitric Acid	8-hour	500[c]	≥ 175.8[e]	g	≥ 175.8
Sulfuric Acid	8-hour	100[c]	≥ 0.1[e]	g	≥ 0.1
Tetrachloroethylene	8-hour	17,000[c]	≥ 49.9[e]	g	≥ 49.9
Trichlorotrifluorethane	8-hour	562,000[c]	≥ 174.9[e]	g	≥ 174.9

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[a] Compounds listed are the major pollutants of concern (Y-12 MMES, 1991b).
[b] Federal Standard (40 CFR 50).
[c] State standard (TDHE, 1991).
[d] Baseline Concentration values are from table 4.1.4.2-1.
[e] No Action concentration only; maximum background concentration unavailable.
[f] Data unavailable.
[g] Design report indicates that emissions of this pollutant would be less than 100 lb/yr (0.01 lb/hr) (Y–12 MMES, 1992c).

also estimated to be less than 1 dB. The increased noise levels along the major access routes are expected to cause little or no increase in annoyance to surrounding communities or individuals.

Noise emissions from renovation of existing buildings and operation activities are not expected to result in any increase in offsite noise levels. Noise emissions due to renovation work and from operational facilities, equipment, and machines would not cause ambient noise levels at the site boundary to exceed the EPA guidelines, which are set to protect the public and workers from the effects

of broad band environmental noise and to prevent against hearing loss.

Although no increase in annoyance is expected offsite from construction and operation, measures would be implemented onsite to protect workers' hearing. These measures include the use of standard silencing packages on construction equipment and providing workers in noisy environments during construction and operation with appropriate earmuffs or earplugs approved by OSHA. As required, noise levels would be measured in worker areas and a hearing protection program would be conducted.

4.1.4.3 *Water Resources*

Affected Environment. This section describes the surface water and groundwater resources at ORR in the vicinity of Y-12.

Surface Water. There are four major sub-drainage basins on ORR which flow into the Clinch River: Poplar Creek, East Fork Poplar Creek, Bear Creek, and White Oak Creek (Y-12 DOE, 1990b). Each drainage basin takes the name of the major stream flowing through the area.

Discharges from Y-12 affect water quality and flow in Kerr Hollow Quarry, McCoy Branch, East Fork Poplar Creek and Bear Creek (Y-12 MMES, 1991b). Y-12 is located at the headwaters of Bear Creek and East Fork Poplar Creek. Bear Creek, East Fork Poplar Creek, and the Clinch River are shown in figure 3.2.7-2.

Water levels in the Clinch River in the vicinity of ORR are regulated by a system of dams operated by the Tennessee Valley Authority; fluctuations of the river affect the lower reaches of some of the tributary streams at ORR (Y-12 DOE, 1986). The system of dams also control flooding in the Clinch and Tennessee rivers near ORR (Y-12 DOE, 1987). Norris Dam, constructed in 1936, is approximately 31 miles upstream of ORR. Melton Hill Dam, completed in 1963, controls the flow of the Clinch River near ORR. Watts Bar Dam is on the Tennessee River near the lower end of the Clinch River (Y-12 DOE, 1986).

TVA has performed flood studies along the Clinch River, Bear Creek, and East Fork Poplar Creek (Y-12 TVA, 1991). Although portions of Y-12 are subject to flooding, buildings selected to house reconfiguration activities are located above both the 100-yr and 500-yr floodplains (Williams, 1992).

Water is taken from the Clinch River at a pump station at river mile 41.7 (Melton Hill Lake). This pump station provides the water supply for the DOE water treatment system that serves Y-12, ORNL, the Scarboro facility, and the city of Oak Ridge (Y-12 DOE, 1982). Total withdrawals from the Clinch River by Y-12 operations are approximately 7 MGD (see table 3.2.7-2).

Effluents from the facilities include surface water runoff, cooling water discharges, and treatment plant effluents. The current Y-12 NPDES permit includes 240 discharges that require compliance monitoring. The existing Y-12 NPDES permit expired in May 1990; the application for renewal was submitted in November of 1989 (Y-12 MMES, 1991b). It is expected that the draft permit will be available in early 1993 (Y-12 DOE, 1992b). The Federal Facilities Agreement between DOE and EPA addresses selection of corrective measures and schedules for implementation of activities to reduce the impacts from current and historical operations on the receiving streams at ORR (Y-12 DOE, 1990a). The current Y-12 annual wastewater generation rate is approximately 2.1 MGY table 3.2.7-1.

Surface Water Quality. The streams and creeks of the ORR are classified for usage purposes by the Tennessee Department of Conservation (Y-12 DOE, 1987). Most of the streams on ORR are classified for fish and aquatic life, irrigation and livestock watering, and wildlife (TDC, 1991).

Water quality in ORR streams is affected by treated sanitary wastewater, discharges, cooling water blowdown, stormwater, and surface runoff and groundwater transport of contaminants from land disposal of wastes (Y-12 MMES, 1991c). The surface water bodies monitored by the three installations include White Oak, Bear, East Fork Poplar, and Poplar Creeks, which are all tributaries of the Clinch River (Y-12 MMES, 1991b). Water samples are collected and analyzed for radiological and nonradiological parameters in accordance with the NPDES permit requirements (Y-12 MMES, 1991b). Routine surface water monitoring not required by the NPDES permit is also performed (Y-12 MMES, 1991b). The 1990 radiological monitoring results for the Clinch River (downstream of all ORR outfalls) are presented in table 4.1.4.3-1.

As noted in the table, the maximum concentration of plutonium-239/240 exceeded 4 percent of the DOE Derived Concentration Guides. The DOE guide is expressed at 4 percent to correlate to EPA's drinking water standards that are set at concentrations that yield no more than 4 mrem/yr dose equivalent; this is not an enforceable limit.

The average and maximum iron concentrations and the maximum manganese and pH concentrations exceeded water quality criteria. However, monitoring at Melton Hill dam indicated that the maximum concentrations of iron, manganese and pH also exceeded water quality criteria upstream from ORR.

In 1990, Y-12 was 98 percent in compliance with NPDES permit limits with 97 noncompliances (Y-12 MMES, 1991b). The three major areas of noncompliance with the plant NPDES permit were treatment facilities (29 percent), creek outfalls (27 percent), and administrative errors (22 percent). Y-12 was well within limits for all radiological parameters (Y-12 MMES, 1991b).

No nonradiological parameters were detected in exceedance of permit limitations at NPDES monitoring locations for Kerr Hollow Quarry. Exceedances for oil and grease were noted for the Bear Creek and McCoy Branch NPDES discharges. At McCoy Branch, pH also exceeded the permit limitations. In East Fork Poplar Creek, noncompliances were noted for oil and grease, pH, total suspended solids, cyanide, nickel, iron, and temperature (Y-12 MMES, 1991b).

Corrective actions relating to the NPDES program include identifying candidate facilities for the installation of wastewater treatment technologies and the removal of sources of nonpoint source pollution. The water quality of the streams at ORR is expected to improve as remediation of nonpoint sources of contamination such as inactive waste sites and waste storage areas, are completed. These projects include the rehabilitation of sanitary sewer lines to prevent infiltration of contaminated groundwater, the removal and/or treatment of effluents to storm drains to remove residual chlorine, and the remediation of sites that may be contributing to surface water contamination. Regulation and monitoring of discharges that are not currently regulated are also expected to occur under a new NPDES permit (Y-12 MMES, 1991b).

Groundwater. ORR is located in an area of sedimentary rocks of widely varying hydrological character. Shallow groundwater is in close hydraulic communication with surface waters, and solution features are common in the carbonate hydrostratigraphic units. With respect to the shallow aquifer system, groundwater basins in the region are restricted to small areas because of the topography and geologic structure characteristic of the Valley and Ridge Province.

Aquifers at ORR include surficial and bedrock aquifers. The surficial aquifer consists of man-made fill, alluvium, and residuum from weathered bedrock. Bedrock aquifers occur in carbonates and low-yield sandstones, siltstones, and shales.

Carbonate rocks are the most important aquifers in terms of water production and storage capacity. Water in the carbonate rock units is produced

TABLE 4.1.4.3-1.—*Summary of Surface Water Quality Monitoring Near Y-12*

Receiving Water: Clinch River—1990				
Parameter	Unit of Measure	Water Quality Criteria	Existing Water Body Concentration[f]	
			Average	Maximum
Barium	mg/L	1[b]	0.033	0.33
Bicarbonate	mg/L	NA	99	99
Bis(2-Ethylhexyl)phthalate	mg/L	NA	<0.04	0.37
Boron	mg/L	NA	0.023	0.023
Calcium	mg/L	NA	29	29
Cesium-137	pCi/L	120[d]	0.827	8.01
Chemical Oxygen Demand	mg/L	NA	5.17	7
Chloride	mg/L	250[c]	3.7	3.7
Chromium	mg/L	0.05[a]	0.010	0.014
Copper	mg/L	1[c]	0.004	0.014
Cyanide	mg/L	0.2[b]	<0.091	0.1
Dissolved Solids	mg/L	500[c]	143.67	158
Fluoride	mg/L	4[b]	0.1	0.1
Magnesium	mg/L	NA	8.2	8.2
Iron[e]	mg/L	0.3[c]	0.66	0.66
Manganese[e]	mg/L	0.05[c]	0.035	0.066
Neptunium-237	pCi/L	1.2[d]	0.0153	0.36
Nickel	mg/L	0.1[b]	0.02	0.05
Nitrate	mg/L	10[b]	0.458	0.7
pH[e]	pH units	6.5-8.5[c]	NA	8.8
Plutonium-238	pCi/L	1.6[d]	-0.16	0.45
Plutonium-239	pCi/L	1.2[d]	0.0843	0.57
Plutonium-239, 240[e]	pCi/L	1.2[d]	0.306	1.67
Potassium	mg/L	NA	1.7	1.7
Sodium	mg/L	NA	4.18	5.2
Sulfate	mg/L	250[c]	20.83	23
Suspended solids	mg/L	NA	8.33	18
Technetium-99	pCi/L	4,000[d]	-11.2	399
Temperature	Celsius	NA	16.88	22.1
Titanium	mg/L	NA	0.011	0.011
Zinc	mg/L	5[c]	0.008	0.02

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[a] Tennessee state water quality standards.

[b] Maximum Contaminant Levels (MCL), EPA National Primary Drinking Water Regulations, 40 CFR 141.

[c] Secondary Maximum Contaminant Level (SMCL), EPA National Secondary Drinking Water Standards, 40 CFR 143.

[d] U.S. Department of Energy Derived Concentration Guides (DCGs) for Water (DOE Order 5400.5). DCG values are based on a committed effective dose of 100 millirem per year; however, because the drinking water MCL is based on 4 millirem per year, the number listed is 4 percent of the DCG. All concentrations of radionuclides are determined by subtracting the instrument background environmental level from the monitored concentration. A negative or zero incremental concentration means that the concentration at the sampling location is equivalent to the environmental level and that there is no significant impact from the facility.

[e] Concentration exceeded water quality criteria; however, these criteria are listed for the comparison only. Water quality standards do not affect plant activities until they are translated into end-of pipe effluent limitations imposed on discharges through the NPDES permitting process. Similarly, drinking water standards and DOE DCGs are listed to provide an understanding of an undesirable concentration for those parameters not covered by water quality standards–they do not constitute an enforceable limit.

[f] Samples were analyzed for 120 parameters including radionuclides, volatile and semivolatile organic compounds, metals, and standard water quality characteristics. Only those parameters having average mazimum concentrations greater than the instrument detection level are presented. Less than symbol (<) indicates concentration below the analysis detection limit.

NA None applicable.

Source: Y-12 MMES, 1991b.

primarily from the zone of solution, which is in the upper 350 feet of the units. The noncarbonate sandstones and shales, although fractured, are not as productive hydrologically as the carbonate rocks and decrease greatly in their ability to transmit water at depths greater than 100 feet. The Copper Ridge Dolomite and the Maynardville Limestone form the major aquifer system in Bear Creek Valley.

Depth to groundwater varies because of steep dips of beds and variations in topography. Depths to water at most places are from a few feet to about 200 feet.

Recharge occurs over most of the area but is most effective where overburdened soils are thin or permeable. In the area near Y-12, recharge into the carbonate rocks is mainly along Chestnut Ridge.

Groundwater Quality. Background groundwater quality at ORR is generally good in the surficial aquifer zones and poor (because of high total dissolved solids) in the bedrock aquifer at depths over 1,000 ft. Water in the surficial aquifer is typically a nearly neutral to moderately alkaline calcium bicarbonate type (Y-12 Moore, 1988).

Groundwater in Bear Creek Valley near Y-12 contains contamination. Contamination at Y-12 includes hazardous chemicals and radio-nuclides (mostly uranium), used primarily in the weapons production process. The contaminated sites in need of environmental restoration include past-practice waste disposal sites, waste storage tanks, spill sites, and contaminated inactive facilities (Y-12 Tab G, 1992). Table 4.1.4.3-2 summarizes the groundwater quality in the surficial aquifer at ORR. A map showing the extent of groundwater contamination at Y-12 is not available.

Groundwater Use. Because of the abundance of surface water and its proximity to the points of use, almost no groundwater is used at ORR. Only one supply well exists on the reservation; it provides a supplemental supply during extended drought to an aquatics laboratory. There are no sole-source, Federally protected, or EPA Class I aquifers beneath

TABLE 4.1.4.3-2.—*Summary of Groundwater Quality Monitoring, Y-12*

Parameter	Unit of Measure	Water Quality Criteria	1989—Existing Conditions[a]	
			Well No. 136	Well No. 470
Alkalinity	mg/L	c	700-760	650-730
Calcium	mg/L	c	1.0-2.6	2.3-104
Carbon–14	pCi/L	2,800[e]	<50-120	<50-130
Chloride	mg/L	250[d]	1-2.6	24-64
Gross Alpha	pCi/L	15[b]	<5-10	<2-21
Gross Beta	pCi/L	50[b]	<7-12	<24-79
Magnesium	mg/L	c	0.3-1.5	1.3-47.5
Nitrate	mg/L	10[b]	0	0
Potassium	mg/L	c	2.5-4.0	11.0-39.0
pH	pH units	6.5-8.5[d]	9.64-10.24	10.06-11.80
Sodium	mg/L	c	251-350	160-370
Sulfate	mg/L	250[d]	33-38	20-82
Tritium	pCi/L	20,000[b]	<190	<190

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[a] All data are from wells near the Y-12 site. Less than symbol (<) indicates concentration below analysis detection limit.
[b] National Primary Drinking Water Regulations, Maximum Contaminant Level (MCL), 40 CFR 141.
[c] No specified limit.
[d] National Secondary Drinking Water Regulations, Secondary Maximum Contaminant Level (SMCL), 40 CFR 143.
[e] U.S. DOE, 4 percent of Derived Concentration Guidelines (DCGs) for water (DOE Order 5400.5).

Source: Y-12 Golder, 1989.

the ORR. All aquifers at ORR are considered to be Class II.

Groundwater Rights. The State of Tennessee does not issue permits or allotments or otherwise regulate groundwater use.

Environmental Consequences. The consolidation of nonnuclear activities would be within existing buildings. A description of the functions to be transferred to Y-12 and the facility locations selected to house these activities is presented in section 3.3.4.

Surface Water. Relocating beryllium and pit support functions to Y-12 would utilize a portion of the current plant that is above the 100-year floodplain. However, certain buildings are located within the 500-year floodplain. This is significant if the relocated technologies are considered to be "critical actions" as defined by Executive Order 11988 and 10 CFR 1022. It has yet to be determined if these are "critical actions."

Since consolidation of activities at Y-12 would be within existing buildings, no adverse impacts are expected to surface waters from runoff during the modification phase (Y-12 Tab G, 1992).

Modification activities would require an additional 200 GPD of water (table 3.3.4-3), which is less than a 1 percent increase in the current water demand at Y-12 of 7 MGD. Operations for the beryllium and pit support functions would require an additional 1,000 GPD of water (table 3.3.4-5). This would result in an increase of less than 1 percent in the current demand.

The additional sanitary wastewater discharged by the transferred processes would be approximately 3,600 gallons per year (GPY) (table 3.3.4-4). This wastewater increase would represent less than 1 percent over the current sanitary wastewater generation rate of 2.1 MGY. The wastewater generated from the transferred operations would be conveyed to the Y-12 Central Pollution Control Facility or the Y-12 West End Treatment Facility for processing (Y-12 Tab G, 1992). The approximately 3,600 GPY of additional treated wastewater would be discharged to the waters of East Fork Poplar Creek. If the entire estimated annual discharge were released in a single day to the waters of East Fork Poplar Creek, there would be an increase of less than 1 ft^3/s of the average flow of 51.4 ft^3/s. If the total amount were released to Bear Creek in 1 day, it would result in a similar negligible change in stream flow. No adverse impacts to the flow of receiving waters are expected.

Surface Water Quality. The site was selected to receive these activities based on the compatibility between current operations and those that will be relocated. Future NPDES permits would be written after review of the current water quality and how it is affected by discharges from Y-12, including those transferred technologies. In order to prevent further degradation of the water quality of the Clinch River, future NPDES permits may carry more stringent limits or more extensive pretreatment measures on the release of cyanide, iron, nickel, oil and grease, pH, temperature, and total suspended solids. Manganese may also be included in future NPDES permits as a result of elevated levels in the Clinch River. Discharges from the treatment plants are required to meet all permit limits; therefore, no impacts to water quality are expected.

Groundwater. No groundwater would be used at Y-12 given the plentiful surface water supplies; therefore, no impact to groundwater levels would be expected.

Groundwater Quality. Because there would be no direct discharge of process waste to the groundwater and wastewater would be treated at either the Y-12 Central Pollution Control Facility or at the Y-12 West End Treatment Facility before being released to surface waters, no impacts to groundwater quality are expected.

4.1.4.4 *Geology and Soils*

Affected Environment. ORR lies in the Valley and Ridge Province of east-central Tennessee. The topography consists of alternating valleys and ridges that have a northeast-southwest trend, with most of the reservation facilities occupying the valleys. The area is drained by the Clinch River, which bounds the reservation on the northeast, southeast, and southwest. Y-12 lies in Bear Creek Valley.

All faults in the vicinity of ORR have been inactive since the late Paleozoic period. There is no evidence of capable faults in the ORR area.

The Oak Ridge area lies at the boundary between Seismic Zones 1 and 2A (UBC, 1991). Since the New Madrid earthquakes of 1811 to 1812, 26 other earthquakes (MMI III to VI) have been felt in the Oak Ridge area. The Charleston earthquake of 1886 had an MMI of VI at Oak Ridge. An earthquake centered in Giles County, Virginia, in 1886 produced an MMI of IV to V at Oak Ridge. The closest seismic event occurred in 1930, 5 miles to the east and had an MMI of V at the site (Y-12 Staub, 1991).

Y-12 lies on soils of the Armuchee-Montevallo-Hamblen, Fullerton-Claiborne-Bodine, and Lewhew-Armuchee-Muskinghum associations. Soil erosion due to past land use has ranged from slight to severe. Wind erosion is slight and shrink-swell potential is low to moderate. Finer-textured soils of the Armuchee-Montevallo-Hamblen Association, when drained, have been designated prime farmland (Y-12 USDA, 1942, 1981).

Environmental Consequences. All new functions would be accommodated in existing structures; therefore, no impact to geologic features is expected.

Major seismic activity and associated mass movement and subsidence are unlikely to occur during the renovation or operation phases, because although ground shaking has occured due to earthquakes in other parts of the country, faults in the area have not been active since the late Paleozoic. Renovation and remodeling of plant facilities to accommodate the functions to be transferred would be done according to the appropriate seismic design requirements; therefore, the hazard due to earthquake activity would not increase.

Because there would be no construction, relocation of functions to Y-12 would have no impact on the soils of the site.

4.1.4.5 *Biotic Resources*

Affected Environment. No natural terrestrial habitat occurs within the intensively developed Y-12 area, but the undeveloped ORR lands surrounding the area provide habitat for terrestrial wildlife typical of eastern Tennessee (Y-12 Parr, 1991). ORR, including undeveloped areas surrounding Y-12, has been designated as a Wildlife Management Area and public deer hunts are conducted. Several areas within ORR have also been designated as a NERP (section 4.1.4.1) and support a variety of short-term and long-term ecological research activities.

NWI maps identify several wetlands in the undeveloped lands surrounding Y-12. Artificial ponds near the east and west borders of Y-12 are open-water wetlands. The Bear Creek channel southwest of Y-12 is an intermittent streambed wetland bordered by a wide swath of forested wetlands (Y-12 FWS, 1981). A more detailed wetlands inventory performed for ORR confirms the existence of these wetlands and also shows several small or narrow areas of wetlands within and surrounding the Y-12 area (Y-12 ORNL, 1991).

Lands within and surrounding Y-12 drain to the Clinch River, which forms the eastern and southern boundary of ORR. Bear Creek, a tributary to the Clinch River, originates immediately southwest of the Y-12 area as an intermittent stream (Y-12 FWS, 1981). East Fork Poplar Creek originates immediately to the northeast of Y-12. After leaving the Y-12 area, it flows first northwest and then southwest before entering Poplar Creek. Due to

headwater contamination, aquatic diversity is reduced in the upper reaches of Bear Creek (Y-12 Loan, 1985). Minnows, suckers, and bluegills are the predominant types of fish found in both Bear Creek and East Fork Poplar Creek; however, overall the diversity and number of species present is greater in the latter stream (Y-12 Ryan, 1988).

Several Federally-listed threatened and endangered species are thought to occur in natural habitats on ORR (Y-12 Kroodsma, 1987). No bald eagles (*Haliaeetus leucocephalus*) (a Federally-listed endangered species) are known to nest on ORR, despite the presence of large lakes that would appear to provide suitable habitat. The peregrine falcon (*Falco peregrinus*) (a Federally-listed endangered species) has not been recorded on ORR, but may occur there as a rare migrant or winter visitor. Two Federally-listed endangered bat species, the Indiana Bat (*Myotis sodalis*) and the gray bat (*Myotis grisescens*), are potential residents at ORR.

Aquatic habitats on ORR and in the adjoining reach of the Clinch River are unsuitable for several Federally-listed endangered or threatened mollusk and fish species known to occur in Anderson and Roane Counties (Y-12 Kroodsma, 1987). DOE has initiated consultations with the State of Tennessee concerning the potential occurrence of state-listed threatened and endangered species.

Environmental Consequences. Temporary land disturbance could result from renovation of the Y-12 facilities. This disturbance would be limited to laydown areas on lawns and paved areas within Y-12 that, due to the high degree of land development, are of no significant value as habitat for terrestrial wildlife. No natural vegetation or terrestrial wildlife habitats surrounding Y-12 would be lost or modified. The relocated beryllium functions would be consistent with the existing industrial mission of Y-12 and would not result in an increased human presence in natural habitats in the surrounding areas of ORR.

Renovation activities would be limited to previously developed areas and therefore, would not result in impacts to wetlands.

No aquatic habitat within or in the vicinity of Y-12 would be affected by the relocated beryllium functions. Minor increases in water withdrawal from the Clinch River and water discharged to its tributaries resulting from the consolidation facilities (section 4.1.4.3) would not significantly affect aquatic habitats associated with those water bodies. Any additional wastewater would be discharged in compliance with NPDES permit limits.

No terrestrial or aquatic areas potentially providing habitat to Federally-listed or Tennessee-listed threatened or endangered species would be affected by the Proposed Action. DOE has initiated consultations with the FWS and Tennessee Department of Environment and Conservation to determine whether the relocated beryllium functions would pose any impacts to threatened or endangered species at ORR or surrounding areas.

4.1.4.6 *Cultural Resources*

Affected Environment. The prehistoric chronology of the Oak Ridge area has been divided into five time periods (Y-12 Chapman, 1985): Paleoindian (10,000-8000 B.C.), Archaic (8000-900 B.C.), Woodland (900 B.C.-A.D. 900), Mississippian (A.D. 900-1450), and Protohistoric (A.D. 1450-1673). More than 20 cultural resources surveys have been conducted on the Oak Ridge Reservation (Y-12 ORNL, 1984). About 90 percent of the reservation has received at least reconnaissance-level studies; less than 5 percent has been intensively surveyed. Most studies have occurred along the Clinch River and adjacent tributaries. Prehistoric sites recorded include villages, burial mounds, camps, quarries, chipping stations, limited activity locations, and shell scatters (Y-12 Chapman, 1985). Over 65 prehistoric sites have been recorded at Oak Ridge (Y-12 Fielder, 1974; Y-12 Schroedl, 1990). About 10 prehistoric

sites may be considered potentially eligible for the NRHP; most sites have not yet been evaluated.

The history of the region has been previously documented (Y-12 Robinson, 1950; Y-12 Creekmore, 1967; Y-12 MMES, 1989a). In 1942, 866 tracts of land and the communities of Scarboro and Wheat were acquired for the Manhattan Project (Y-12 Fielder, 1977). Construction of the Clinton Engineer Works began in 1943. The Y-12 Electromagnetic Plant, the X-10 area containing the experimental air-cooled plutonium pile and separation facilities, and the K-25 gaseous diffusion plant were completed by 1945 (Y-12 DOE, 1990a). The town of Oak Ridge was a planned community, designed in three phases (Y-12 Johnson, 1981; Y-12 Robinson, 1950). By 1945, the town had a population of 75,000 which greatly exceeded the original planned community estimate of 13,000 (Y-12 Johnson, 1981; Y-12 Robinson, 1950). Several historic resources surveys have been conducted at Oak Ridge (Y-12 ORNL, 1984; Y-12 Fielder, 1977). Historic resources include archaeological remains and standing structures. Documented structures include cabins, barns, churches, gravehouses, springhouses, storage sheds, smokehouses, log cribs, privies, henhouses, and garages. Archaeological remains consist primarily of foundations, roads, and trash scatters. Sixty-five pre-1942 cemeteries also occur at Oak Ridge (Y-12 Robinson, 1950). Over 240 historic resources have been recorded at Oak Ridge and about 20 of those sites may be considered potentially NRHP-eligible (Y-12 Fielder, 1977; Y-12 Schroedl, 1990). The X-10 Graphite Reactor, Freels' cabin, and two church structures are considered eligible for, or listed on, the NRHP. Several buildings and facilities at Oak Ridge were associated with the Manhattan Project and may be potentially eligible for the NRHP.

The Overhill Cherokee occupied portions of the Tennessee, Hiwassee, Clinch, and Little Tennessee river valleys by the 1700's (Y-12 Chapman, 1985). Conflicts with the British, and later the Americans, resulted in the loss of Cherokee villages and eventual treaties and land concessions. By 1838, most of the remaining Cherokee were forcibly moved to the Oklahoma territory (Y-12 Chapman, 1985). By 1866, Colonel William Thomas established the Qualla Cherokee Reservation in North Carolina (Y-12 Creekmore, 1967). Resources which may be important to Native American groups include prehistoric and historic villages, ceremonial lodges, cemeteries, burials, and traditional plant gathering areas.

Environmental Consequences. All beryllium and pit support functions relocated to Y-12 would be accommodated within three existing structures without new construction. Therefore, no NRHP-eligible prehistoric or historic resources, or important Native American resources would be affected by renovation or operation activities.

4.1.4.7 *Socioeconomics and Community Services*

Affected Environment. The discussion of socioeconomics and community services at Y-12 located at ORR is based on the ROI where 94 percent of Y-12 employees lived in 1991. The ROI includes Anderson (33 percent), Blount (2 percent), Knox (36 percent), Loudon (6 percent), and Roane (17 percent) counties in Tennessee. Within these ROI counties, the following key cities have been included in the Affected Environment and Environmental Consequences discussions: Clinton (7 percent), Knoxville (32 percent), and Oak Ridge (21 percent). (See figure 3.2.5.3-1.)

Assumptions, methodologies, and supporting data for the assessment of environmental consequences are presented in appendix E. Tables E3.4-1 through E3.4-5 give ROI resource information on the following: residential distribution of plant employees, regional economic and population growth indicators, housing characteristics, primary municipal water and wastewater systems, education characteristics, and local transportation.

Employment and Local Economy. The civilian labor force in the ROI grew 42 percent, increasing from 195,220 persons in 1970 to 277,630 persons in 1990. Total employment increased from 196,657 to 326,059 persons between 1970 and 1990, an annual growth rate of 3 percent. The unemployment rates for 1970 and 1990 were 3.3 percent and 4.6 percent, respectively. For the same years, personal income increased from approximately $1.5 billion to $9 billion (an annual average of 9 percent), and per capita income increased from $3,228 to $15,892.

Although employment at ORR has grown since 1970 and is projected to increase further, employment at the Y-12 Plant has decreased. Between 1970 and 1990, employment at the Y-12 Plant decreased from 6,776 to 6,599 persons (Y-12 Tab J, 1992). As of September 30, 1992, employment at Y-12 had decreased to 5,384 persons. Under the No Action alternative, future site employment would be expected to decrease to approximately 5,172 persons by the year 2000 (DOE, 1992e). In 1990, the total Y-12 payroll was estimated to be more than $225.8 million (Y-12 Tab J, 1992). Under the No Action baseline, the total payroll would be projected to decrease to $177 million by the year 2000.

The civilian labor force is projected to grow at less than 1 percent annually, reaching an estimated 319,000 persons by 2000 and 330,000 persons by 2020. The unemployment rates for 2000 and 2020 are projected to be 7.0 percent and 7.1 percent, respectively. For the same years, personal income is projected to increase from approximately $12.9 billion to $16.5 billion, an annual average of 1 percent. Per capita income is projected to increase from an estimated $21,000 in 2000 to $24,000 in 2020.

Population. Between 1970 and 1990, the population in the ROI increased 23 percent to 568,450 persons. During the same period, the Tennessee population increased 24 percent. The population in the 5-county ROI is projected to increase from an estimated 626,000 persons in 2000 to 694,000 persons by 2020 at an annual rate of less than 1 percent.

The largest county population increase (35 percent) occurred in Blount County between 1970 and 1990, while during the same years, populations in Anderson and Knox counties increased 13 percent and 22 percent, respectively. Population in Blount County is estimated to increase 9 percent between 1990 and 2000 and 11 percent between 2000 and 2020, an annual growth rate of less than 1 percent. The Anderson County population is projected to increase 15 percent between 1990 and 2000 and 11 percent between 2000 and 2020, an annual growth rate of less than 1 percent. The population in Knox County is expected to increase approximately 9 percent by 2000 and an additional 11 percent by 2020, an annual growth rate of less than 1 percent.

Between 1970 and 1990, Clinton had the greatest increase in city population (87 percent) in the ROI. For the same years, the Oak Ridge and Knoxville populations decreased 15 percent and 5 percent, respectively.

Housing. Between 1970 and 1990, the number of housing units in the ROI increased 49 percent from 156,925 to 233,181 units. Concurrent with population growth in the ROI, housing units are expected to increase approximately 10 percent by the year 2000 and an additional 11 percent by 2020, an annual increase of less than 1 percent.

Between 1970 and 1990, the largest increase in housing units (54 percent) occurred in Knox County, while the smallest increase (23 percent) occurred in Blount County. Housing units in Knox County are expected to increase approximately 5 percent by 2000 and an additional 11 percent by 2020, an annual increase of less than 1 percent. Housing units in Blount County are expected to increase about 43 percent by 2000 and an additional 11 percent by 2020, an annual increase of 2 percent.

In 1990, the homeowner vacancy rates averaged 2 percent in the ROI and ranged from approximately 1 percent in Anderson County to 2 percent in Blount County. The vacancy rates for rental units averaged

8 percent and ranged from about 7 percent in Loudon County to 10 percent in Roane County.

Community Infrastructure and Services. The water supply systems operated by ORR, Clinton, Alcoa, Maryville, Knoxville, the First Utility District of Knox County, the West Knox Utility District, the Hallsdale-Powell Utility District, the Loudon Utilities Board, the Tellico Area Service System, the Lenoir City Utilities Board, Rockwood, Harriman, and Kingston maintain about 96 percent of the capacity of the 17 major public systems in the ROI. All of these systems utilize surface water for their raw water supplies.

In Anderson County, ORR's system (32.1 MGD capacity) experienced 1991 average daily demands equal to 57 percent of capacity. Clinton's system (about 2.3 MGD capacity), also in Anderson County, had 1988 average daily demands equal to 65 percent of capacity. In Blount County, the systems operated by Alcoa (24 MGD capacity) and Maryville (6 MGD capacity) had 1991 average daily demands equal to 31 percent and 50 percent of capacity, respectively. In Knox County, the systems operated by Knoxville (63.6 MGD capacity), the First Utility District of Knox County (14 MGD capacity), the West Knox Utility District (8.5 MGD capacity), and the Hallsdale-Powell Utility District (about 6.3 MGD capacity) had 1991 average daily demands equal to 52 percent, 42 percent, 47 percent, and 64 percent of capacity, respectively. Loudon Utilities Board's system (8.7 MGD capacity) and the Tellico Area Service System (3.5 MGD capacity), both in Loudon County, had 1991 average daily demands equal to 56 percent and 37 percent of capacity, respectively. The Lenoir City Utilities Board's system (3 MGD capacity), also in Loudon County, had 1988 average daily demands equal to 32 percent of capacity. In Roane County, the systems operated by Rockwood (6 MGD capacity) and Kingston (2 MGD capacity) had 1991 average daily demands equal to 28 percent and 20 percent of capacity, respectively. Harriman's system (3 MGD capacity), also in Roane County, had 1988 average daily demands equal to 55 percent of capacity. All of these systems are projected to have average daily demands of less than 68 percent of capacity in 1995 and less than 70 percent of capacity in 2000.

Oak Ridge, Clinton, Maryville, Knoxville, the Hallsdale-Powell Utility District, the First Utility District of Knox County, the West Knox Utility District, the Loudon Utilities Board, the Lenoir City Utilities Board, Rockwood, Harriman, and Kingston operate wastewater treatment systems in the ROI. In Anderson County, the systems operated by Oak Ridge (about 5.9 MGD capacity) and Clinton (about 2.1 MGD capacity) experienced 1991 average daily demands equal to 85 percent and 34 percent of capacity, respectively. In Blount County, the Maryville system (10 MGD capacity) had 1991 average daily demands equal to 62 percent of capacity. In Knox County, the systems operated by Knoxville (about 62.9 MGD capacity), the First Utility District of Knox County (5 MGD capacity), the West Knox Utility District (4 MGD capacity), and the Hallsdale-Powell Utility District (about 5.6 MGD capacity) had 1991 average daily demands equal to 70 percent, 94 percent, 62 percent, and 70 percent of capacity, respectively. The Loudon Utilities Board's system (7.6 MGD capacity) and Lenoir City Utilities Board's system (2 MGD capacity) in Loudon County had 1991 average daily demands equal to 67 percent and 56 percent of capacity, respectively. In Roane County, the systems operated by Rockwood (1.5 MGD capacity) in 1991 and Harriman (1.5 MGD capacity) in 1988 had average daily demands equal to 100 percent of capacity. Kingston's system (1 MGD capacity), also in Roane County, had 1991 average daily demands equal to 8 percent of capacity.

The Oak Ridge system is projected to have average daily demands equal to 88 percent of capacity in 1995 and 91 percent of capacity in 2000. The First Utility District of Knox County plans to expand its system capacity to 10 MGD and is projected to have average daily demands of less than 55 percent of capacity in 1995 and in 2000. The Harriman and Rockwood systems are currently operating at capacity and are both projected to have average daily

demands equal to about 103 percent and 107 percent of capacity in 1995 and 2000, respectively. All of the other systems are projected to have average daily demands of less than 74 percent of capacity in 1995 and less than 80 percent of capacity in 2000.

Eleven school districts provide public education services and facilities in the ROI. In 1990, these school districts ranged in enrollment size from 1,122 students in the Clinton City Elementary School District to 54,943 students in the Knox County School District. In 1990, 7 out of the 11 school districts operated between 105 percent and 127 percent of capacity. Among these 7 districts were: Roane County (127 percent), Anderson County (116 percent), and Knox County (109 percent). The remaining 4 districts operated from 91 percent to 99 percent of capacity. On average, school districts in all counties were operating above capacity, and the ROI average was 110 percent of capacity. Current capacities are expected to be further exceeded by the years 1995 and 2000 under the No Action future baseline. The largest increases are expected to occur in the school districts located in Roane County where enrollments are projected to exceed current capacities by 37 percent in 1995 and 47 percent in 2000. The average pupil-to-teacher ratio for the ROI was 19:1, and expenditures averaged $3,031 per pupil. The statewide average pupil-to-teacher ratio was 19:1, and expenditures averaged $3,518 per pupil (TN Education, 1990).

Fifteen hospitals serve the five-county ROI, with the majority operating well below capacity (AHA, 1990). In 1990, a total of 1,332 physicians served the ROI. The physician-to-population ratio for the ROI was 2.3:1,000 and ranged from 0.6:1,000 in Roane County to 2.9:1,000 in Knox County. The statewide physician-to-population ratio was 2.1:1,000 (AMA, 1990).

Twelve city, county, and state law enforcement agencies provide police protection in the ROI. In 1990, the largest law enforcement agencies in the 5-county ROI were in the city of Knoxville with 296 sworn officers, or 1.8 sworn officers per 1,000 persons; and in Knox County with 165 sworn officers, or 0.5 sworn officers per 1,000 persons. The average number of sworn officers in the ROI was 1.3 per 1,000 persons (FBI, 1991).

Thirty fire departments and 1,342 regular and volunteer firefighters provided fire protection services in 1990. The principal municipal departments include both professional and volunteer staff. In 1990, the greatest staffing strengths were found in the fire departments in the city of Knoxville (363 firefighters; 2.2 firefighters per 1,000 persons) and in Knox County Rural Metro (292 firefighters; 0.9 firefighters per 1,000 persons). The average number of firefighters in the ROI was 2.4 per 1,000 persons (Kapalczynski, 1988).

Local Transportation. Vehicular access to the Y-12 Plant is via Bear Creek Valley Road. Tennessee State Routes 58, 62, 95, and 162 pass through ORR and are open to the general public.

Estimated baseline traffic along segments providing access to Y-12 is projected to contribute to differing service level conditions in accordance with baseline population growth. Tennessee State Route 95, however, and to a lesser extent Tennessee State Routes 61, 170, and Bear Creek Valley Road, would typically experience traffic congestion, with volumes approaching the design capacity of each roadway. Along these roadways, a motorist's speed and ability to maneuver would be restricted, and potential disruptions to the traffic flow could be caused by accidents or maintenance activities, resulting in moderate to serious congestion. In addition, estimated baseline truck traffic into Y-12 for delivery of commercial supplies and removal of commercial wastes would typically average 121 trips per day. However, the additional traffic volumes associated with continued operation of Y-12 are relatively minor and would not substantially affect local transportation baseline conditions.

Road reconstruction, widening, modification of interchanges, and new interchange construction projects are planned for segments of Bear Creek

Valley Road; Scarboro Road; and Tennessee State Routes 58, 62, and 95 (TN DOT, 1992a and b; Y-12 MMES, 1989b).

No public transportation service exists in the city of Oak Ridge. Other modes of transportation within the ROI include railways and waterways. Railroad service in the ROI is provided by CSX Transportation and the Norfolk Southern Corporation. Two mainline branch lines serve the ORR. Waterborne transport in the ROI is via the Clinch River, which provides an alternative mode of transportation to the Oak Ridge area. The Clinch River waterway has rarely been used for DOE business and no designated port facilities exist for such purpose.

The McGhee Tyson Airport in Knoxville, 40 miles from ORR, receives jet air passenger and cargo services from both national and international carriers. The closest air transportation facility to Oak Ridge is Atomic Airport in Oliver Springs. Numerous other private airports are located throughout the ROI (DOT, 1991).

Environmental Consequences. The employment figures for construction and operations for the Proposed Action are given in table 3.3-1 in section 3.3. The construction, modification, and installation of facilities and equipment for the Proposed Action at the Y-12 Plant would require 162 additional employees during peak construction (Y-12 Tab D, 1992). Operations employment would begin in 1997 and grow to a full complement of eight jobs in the year 2000 (DOE, 1992e). In addition to these jobs created directly by the project, another 338 jobs would be created indirectly during peak construction and 10 additional jobs during operations. The creation of direct and indirect employment would lead to in-migration of 119 persons during peak construction and 11 persons during operations. The in-migrating population is primarily related to the in-migrating professional employees who are scientists, engineers, etc. (and their families), and who are not available in the regional unemployed labor force.

Under the No Action alternative, the current Y-12 employment of 5,384 persons would be projected to be 5,172 persons by the year 2000, a decrease of 212 persons. The addition of 8 direct jobs to Y-12 would represent a net decrease of 204 jobs over current levels.

Table 4.1.4.7-1 summarizes the projected economic and population changes that would result from the Proposed Action. In the year 2000, this project-related population growth from in-migration would represent a negligible increase of less than 1 percent over the projected ROI baseline population of 626,000 persons, and no cities or counties in the ROI would experience a population growth beyond 1 percent.

The less than 1 percent change in population during the time of peak construction would create the need for only an estimated 50 additional housing units, which is not a significant addition. For operations in the year 2000, the less than 1 percent change in population would not create a need for additional housing units beyond a 1 percent increase. In past years, housing units have been built at an annual rate of 2 percent. Therefore, the additional housing needed to accommodate the in-migrating population could be built without any adverse effect on the cities and counties in the ROI.

Under the No Action future baseline, two small wastewater systems (Harriman and Rockwood) would exceed their current capacities by 1995. However, the estimated additional population during peak construction and operations would not affect any community infrastructure and services in the ROI. Existing water and wastewater capacities more than exceed the projected demand. School districts in all counties are currently operating above capacity. However, these school capacities will not be affected beyond what would naturally occur under the No Action baseline growth because the Proposed Action would not add more than 1 percent to school enrollments during construction or operations. Existing health care resources are more than adequate to accommodate the projected population

TABLE 4.1.4.7-1—*Y-12 Plant Proposed Action Economic and Population Characteristics*

Economics	1995 Peak Construction	Percent Over Baseline	2000 Peak Operation	Percent Over Baseline
Baseline Civilian Labor Force	297,792	NA	319,419	NA
Baseline Unemployment Rate	5.8%	NA	7.0%	NA
Baseline Personal Income (Thousands $)	$10,779,496	NA	$12,862,302	NA
Baseline Per Capita Income ($/Person)	$18,070	NA	$20,547	NA
Baseline Employment	280,496	NA	297,032	NA
Direct Jobs	162	0.06	8	0.00
Indirect Jobs	338	0.12	10	0.00
In-Migrating Workforce	54	0.02	4	0.00
Total In-Migration	119	0.02	11	0.00
Population Increase				
Anderson County	42	0.06	4	0.00
Clinton	9	0.10	1	0.01
Oak Ridge	26	0.10	2	0.01
Blount County	3	0.00	0	0.00
Knox County	46	0.01	4	0.00
Knoxville	40	0.02	4	0.00
Loudon County	7	0.02	1	0.00
Roane County	21	0.04	2	0.00
ROI (County Total)	119	0.02	11	0.00

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Source: Estimated from Census, 1977, 1983, 1990a; DOC, 1990a and b, 1991a; TN Employment, 1991; Martin Marietta, 1992; DOE, 1992e.

increases during peak construction and operations. Current staffing levels for police and fire services in the ROI are adequate to support the projected population increases, while maintaining current service standards, because none of the cities or counties would grow by more than 1 percent over the No Action baseline. Additional commercial truck traffic into Y-12 would be negligible relative to historic levels, and this truck traffic would occur during non-peak hours. Impacts to the local transportation network serving Y-12 would be negligible, as well.

4.1.4.8 *Waste Management*

Affected Environment. Discussion of the Y-12 waste management baseline is provided in section 3.2.7.3. Because there are no TRU wastes associated with any of the proposed activities that would be consolidated due to the Proposed Action, no further discussion of TRU waste generation or management is presented.

Waste management activities at Y-12 include the operation of seven processing facilities: packaging, certification and staging, industrial waste compaction, classified waste treatment, oil/solvent treatment, sludge and soil processing, Class III LLW treatment, and decontamination. To obtain compliance with RCRA, Y-12 has submitted applications to environmental regulators for each hazardous waste treatment, storage, or disposal facility. As of 1990, 20 Part B permit applications and six postclosure applications have been filed for Y-12 facilities. After the issuance of final RCRA permits by the State of Tennessee, Y-12 facilities would be fully permitted under RCRA and subject to stringent guidelines specified in 40 CFR Part 264. The facilities are inspected regularly by EPA, the State of Tennessee, DOE, and/or internal auditors

to ensure RCRA compliance. Y-12 is currently operating under RCRA interim status.

Environmental Consequences. The Beryllium Technology and Pit Support functions would generate various types of waste due to construction related building modifications and equipment installation. No mixed waste would be generated as a result of relocated nonnuclear functions. Approximately 807 ft^3 of LLW metallic, LLW nonmetallic, classified, and nonhazardous nonmetallic wastes would be generated as a result of the modification and installation of facilities and equipment for the Proposed Action at Y-12.

All radiologically contaminated metallic waste above 5,000 disintegrations per minute/100 cm^2 would be transferred to the Y-12 Salvage Yard. Where possible, the metallic waste would be placed into 8x8x20-ft boxes for storage at the salvage yard.

Site preparation and demolition work would generate approximately 575 ft^3 of classified wastes, which may include LLW and hazardous materials, both metallic and nonmetallic. These wastes would be bagged if hazardous and placed in six 4x6x4-ft metal boxes for classified storage.

Floor and wall penetrations, roof demolition, and construction scraps in radioactive areas would generate approximately 192 ft^3 of nonmetallic LLW. The nonmetallic, non-RCRA, non-TSCA LLW would be sent to a local commercial compaction/ incineration facility for processing to greatly reduce the volume of material to be stored. After processing, the nonmetallic LLW would placed in 4x6x4-ft metal boxes. The boxes would be maintained outdoors in the old salvage yard and would eventually be transferred to the above grade storage pads.

The building modifications would result in various beryllium-contaminated metallic wastes (duct work, conduit, etc.) and construction debris, which would be stored in 4x6x4-ft metal boxes in a special facility at the Y-12 Site. Some of the piping removed as a result of the modifications may be contaminated with asbestos. These would be treated the same as beryllium-contaminated wastes. The various pieces of equipment currently located in the area designated to become the beryllium technology facility are contaminated. This equipment would be cleaned externally to less than 5 $\mu g/cm^2$, and where necessary some equipment would be disassembled and placed in 4x6x4-ft metal boxes for permanent storage in a special facility.

It is anticipated that in the near future, metallic LLW wastes can also be sent offsite for volume reduction through compaction or smelting operations which would greatly reduce storage space required. Noncompactible metallic wastes may also be decontaminated through chemical leaching processes or surface cleaning methods. Some small amount of LLW with a very low radioactivity content may meet the waste acceptance criteria for onsite disposal. The majority of the waste would require eventual disposal in an LLW landfill off of the Y-12 Plant site. Waste containing dusts or other friable material would be stabilized in grout before storage. Some low-level contaminated metallic materials may even be used in special applications such as the proposed shielding materials for the supercollider.

Construction and new equipment installation debris from non-radioactive areas would generate 40 ft^3 of noncontaminated nonmetallics such as concrete and wood. These wastes would be disposed of onsite in the Y-12 Sanitary Landfill #2.

As outlined in appendix B.4, the transfer of the beryllium and pit support work from RFP to Y-12 would generate some liquid and solid wastes. Approximately 4,210 gallons of the additional beryllium-contaminated liquid hazardous waste are aqueous wastes which can be treated onsite. Aqueous wastes would be generated by machining operations, ultrasonic cleaning, and powder handling operations. This aqueous waste would be shipped to the Y-12 Central Pollution Control Facility for beryllium removal. The batch operation nature of

the Central Pollution Control Facility and the anticipated volume of beryllium operations generated process water is such that the Central Pollution Control Facility would have adequate capacity to treat the additional waste stream without any resulting environmental impacts.

Can dissolution operations would generate less than 500 GPY of beryllium-contaminated nitric acid solutions. Machining operations would generate 100 GPY of liquid LLW machine coolant. These aqueous wastes would be sent to the Y-12 West End Treatment Facility for treatment. The West End Treatment Facility has 3 million gallons of tank treatment capacity and 1.5 million gallons of sludge storage tank capacity, which is adequate to treat the additional waste stream without any resulting environmental impacts.

Quantities of excess beryllium recyclable scrap would be consolidated into ingot form and stored onsite in the short-term or sold to commercial buyers. No adverse environmental impacts are expected.

Beryllium-contaminated solid wastes cannot currently be placed in the Y-12 landfill since it is only permitted for beryllium oxide. Therefore, either the wastes must be treated and converted to beryllium oxide prior to burial or the landfill permit must be modified by the State of Tennessee to include the addition of beryllium. If Y-12 is not successful in amending its permits, this waste would be processed at a local commercial facility, via compaction or incineration, to significantly reduce the volume of wastes to be stored.

Small quantities of beryllium-contaminated organic liquid and solid wastes would be stored long-term onsite. This would require the need for continuous management of the waste. An alternative would be to process the liquid organics in the K-25 Plant TSCA incinerator and ship solids offsite to a "secure" (RCRA-type) hazardous landfill permitted to handle such waste. The ability to ship either waste form offsite is predicated on being able to declare a "no-radiation added" status for the waste streams. A rigorous readiness review of the waste generating facilities, processes, and equipment and their origins is required to obtain the desired status. While dedicated, uranium-free areas would be set up to handle the operations generating the waste streams identified, certain processing equipment would be moved from RFP and/or other areas of Y-12. Whether these economically desirable equipment moves would impact the ability to declare a "no-radiation added" status is unknown at this time. However, if "no-radiation added" status cannot be declared, then the wastes would be processed as low-level radioactive contaminated wastes.

Pit support function components would be manufactured in radiological areas and on uranium-contaminated equipment; thus, the liquid (water based machining coolants) and solid (scrap metals) wastes would be processed as LLW. The relocated pit support function would increase the quantity of LLW generated at Y-12, but the amount is expected to be small (less than 1 percent).

While clean scrap metal was sold to the public in 1990, Y-12 is now restricted from sending any scrap metals offsite. Scrap metal sorting continues however, in anticipation of future provisions for clean scrap metal consolidation/recycling/resale.

In summary, the magnitude of additional waste streams generated as a result of the increases in nonnuclear manufacturing activities at Y-12 are well within the storage, treatment, and disposal capability of existing waste management facilities.

4.1.4.9 *Human Health: Facility Operations and Accidents*

General discussions of impacts to the public and the environment, worker exposures, and accidents are presented in section 4.1. Information specific to Y-12 is presented below.

Affected Environment. As discussed in the Air and Water Resources sections for Y-12 (4.1.4.2 and

4.1.4.3, respectively), exposures to members of the public associated with the release of chemical pollutants as a result of Y-12 operations meet all applicable permit, regulatory, and DOE operational requirements. Exposures to members of the public associated with the release of radiological pollutants are well below applicable permit, regulatory, and DOE operational requirements (Y-12 MMES, 1991b).

A review of the recent Y-12 annual environmental and accident reports indicates that there have been no significant adverse impacts to workers, members of the public, or the environment. This review was performed to provide an indication of the site's accident history. The time of the review (1986-1990) was a period during which plant operations were much higher than in the past year and higher than anticipated in the future.

Environmental Consequences. The Air and Water Resources sections discuss the chemical releases associated with relocating the beryllium and pit support functions identified in section 3.3.4 to Y-12. As shown, the cumulative impacts resulting from existing releases and the releases of chemicals associated with relocating the beryllium and pit support function at Y-12 are below applicable permit, regulatory, and DOE operational requirements.

Water from processes containing hazardous chemicals is not discharged directly into surface or ground water that serve as potable water. Process water that may contain hazardous chemicals is treated before discharge to remove toxicants. Furthermore, all releases of the pollutants are below NPDES limits and water quality is not adversely affected. Thus, the primary pathway considered for possible worker or public exposure is the air pathway.

For normal operations at Y-12, all possible hazardous air pollutants were examined and from their assessment, the following chemicals were identified for further analysis based on their toxicity, concentration, and frequency of use: chlorine and Freon-113. The Hazard Index, a summation of the Hazard Quotient for all chemicals, was calculated for the No Action alternative and the chemicals proposed to be added (increment) at the site yield cumulative levels for the site. A Hazard Index value of 1.0 or less means that no adverse human health effects are expected to occur. The cumulative Hazard Indexes for Y-12 (see table F5-17 in appendix F) were 0.0186 for onsite (worker effects) and 0.0005 at the site boundary (effect on the public) on an annual basis. The incremental change Hazard Indexes were both 0 for onsite and at the site boundary. Therefore, the Proposed Action would not contribute to the cumulative Hazard Indexes at the Y-12 site.

Consolidation of the nonnuclear activities at Y-12 would not result in an increase in the emission of any radionuclides.

In summary, these analyses show that no adverse health effects can be expected from the release of hazardous chemicals/chemical pollutants at Y-12 attributable to the Proposed Action.

Beryllium compounds are currently stored at Y-12. The transfer of the beryllium function to Y-12 would result in a maximum increase of less than 2 percent in the total beryllium inventory. Additionally, there have been significant improvements in the safety procedures for handling beryllium, and the crystal structure of beryllium now used in industry results in a much lower toxicity (Rossman, 1991) than the form of beryllium used during the period between 1940-1950. Employee exposure limits will be maintained below applicable standards and acceptable concentrations established by OSHA.

As discussed in section 3.3.4, the beryllium and pit support functions involves activities and chemicals that are the same or similar to those that are currently being performed in Y-12 facilities designed for these activities. Therefore, the current accident profile at Y-12 would not change as a result of relocating these functions to Y-12.

4.1.5 Sandia National Laboratories, Albuquerque

Detailed discussion of the Sandia National Laboratories, Albuquerque, current missions, facility/process description, and waste treatment and management activities are provided in section 3.2.8. The functions and processes associated with the Proposed Action to be consolidated at SNL and the proposed facility modifications required to support each relocated function are discussed in section 3.3.5. Discussions of the assumptions used in the EA for determining the affected environment and environmental consequences at SNL and the environmental assessment methodologies for each resource or issue discussed below is presented in the introduction to this chapter. Additional information on baseline conditions and environmental consequences of the Proposed Action which supports the following discussion on SNL is also provided in the chapter 4 introduction and in section 4.1.

4.1.5.1 *Land Resources*

Affected Environment. SNL is located approximately 7 miles southeast of downtown Albuquerque, NM (figure 3.2.8.1). Generalized land uses at SNL and in the vicinity are shown in figure 4.1.5.1-1. There are no prime farmlands on SNL. The residential distribution of SNL employees is discussed in section 4.1.5.7.

SNL has developed 13 functional zones for operations at this site (SNL, 1989). The affected environment at SNL consists of 3 TAs, situated in the western end of SNL, and designated TA-1, TA-2, and TA-3 (figure 3.2.8-2). These TAs are within the following functional zones: Administration, Component Development, Defense Programs, Energy Programs, Exploratory Systems, Micro-Electronics, Parking, Pedestrian Corridors, Pulsed Power Sciences, Research, Site Support, Technical Support, and Testing (SNL, 1989).

TA-1 is the most intensively developed of the SNL TAs, containing administrative and support facilities; project engineering, research, component activities; and special laboratories and shops (SNL, 1992e). TA-2, located south of TA-1, is a remote site containing various facilities which conduct intermediate-hazard testing of explosive components. TA-2 contains a safety buffer around its facilities; the buffer extends into the open space of TA-1.

The Kirtland Air Force Base (KAFB) cantonment, the most heavily developed area on base, is adjacent to TA-1. U.S. Air Force (USAF) accompanied base housing is located west and north of TA-1. Various KAFB facilities and operations, including flight operations, are located west of TA-1 and -2. USAF flight operations are collocated with the civilian commercial aircraft operations of Albuquerque International Airport. The runway and taxi runways are owned and managed by the city of Albuquerque (SN USAF, 1990). The airport Accident Potential Zone- (APZ) 1 extends east beyond the runway clear zone to the edge of the TA-1 boundary, with the APZ-2 extending across both TA-1 and 2 (SNL, 1992e). Flight operations of the airport are regulated by the Federal Aviation Administration, which does not use APZs (SN Greiner, 1989).

The USAF granted an exemption for the development of an all-new Air Installation Compatible Use Zone study at KAFB. The base, however, is directed to monitor all development in its vicinity to ensure compatibility with base flying missions (SN USAF, 1978, 1987a and 1987b). The USAF Air Installation Compatibility Use Zone Land Use Guidelines reflect land use recommendations. The basic criteria for APZ-1 and APZ-2 Land Use Guidelines exclude uses that have a high labor intensity and involve explosive, fire, toxic, corrosive, or other hazardous characteristics, and high-density office use (SN USAF, 1985).

The land north of SNL, except for vacant land on both sides of Tijeras Canyon east of TA-1 and some

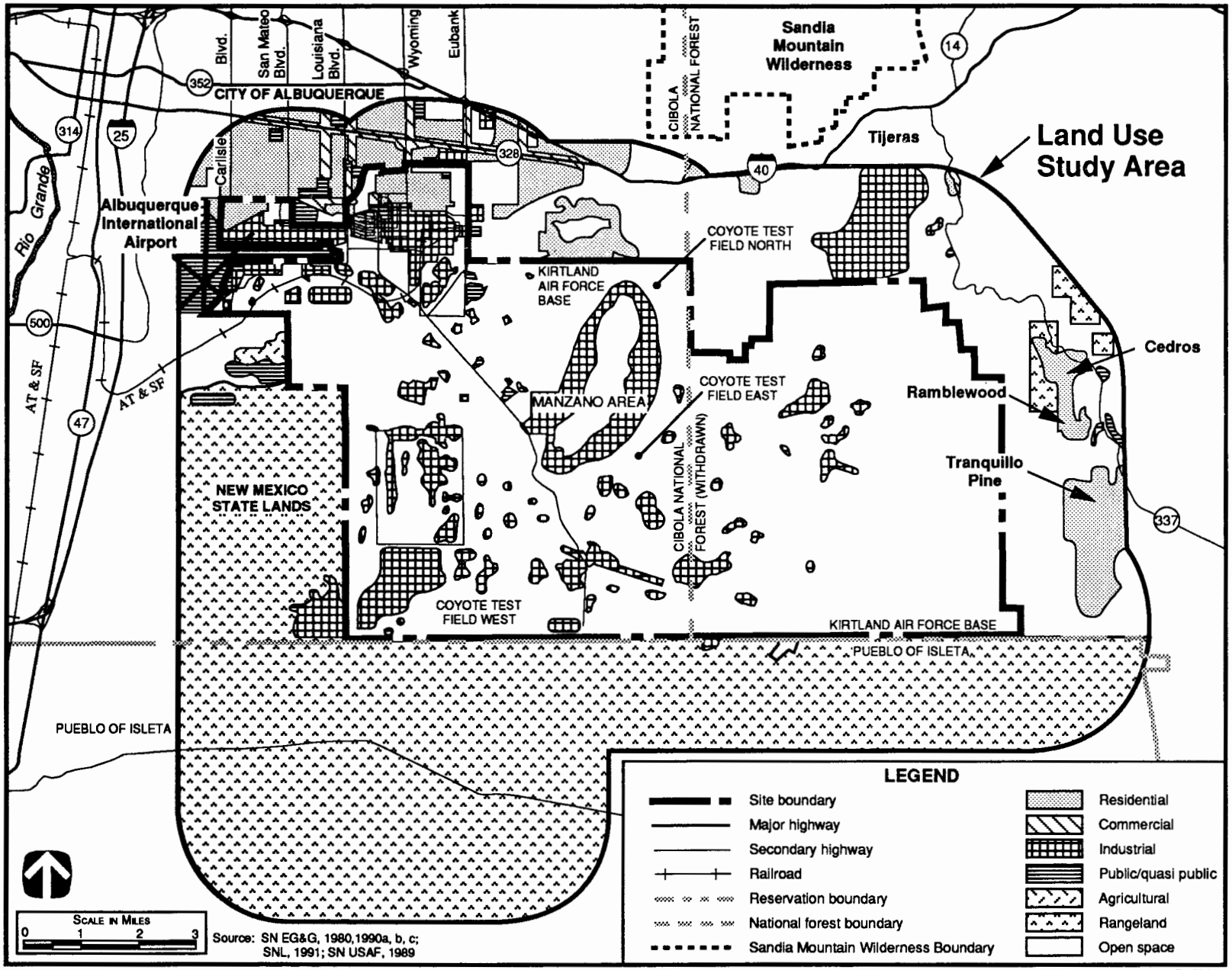

FIGURE 4.1.5.1-1—*Generalized Land Use at Sandia National Laboratories, Albuquerque, and Vicinity.*

unmanned utility facilities, is part of the urbanized city of Albuquerque. The urban land use consists of a mixture of residential, commercial, industrial, institutional, and various supporting public uses. The closest residence to the KAFB boundary is 20 feet to the north. An industrial park is currently being developed immediately east of the KAFB Eubank Gate and TA-1. Commercial uses are primarily concentrated along Central Avenue and Gibson Boulevard, north of the site (SN USAF, 1990, and SN EG&G, 1980). SNL does not contain any public recreation facilities.

The viewshed is mainly comprised of the south side of Albuquerque, Cibola National Forest, and rural rangeland. Development of the SNL and KAFB facilities has heavily disturbed the character of the landscape within their respective areas. The facilities are brightly lit at night and highly visible from various viewpoints. Viewpoints impacted by DOE facilities are primarily associated with the residential areas in southeast Albuquerque and short sections of northbound I-25 and westbound I-40. Visual impacts to the following areas are lessened because of distance: 2 to 3 miles from the residential area to the northeast, 3 to 5 miles from the I-25 viewpoint, and 2 to 3 miles from I-40. The impact from I-40 is also lessened by intervening urban development.

The developed SNL and KAFB facilities are consistent with a Class 5 VRM area designation. The remainder of SNL ranges from a Class 3 to Class 4 VRM designation, except for the DOE-leased U.S. Forest Service land. The Forest Service has identified the DOE withdrawal area as ranging from management Class R (Retention) to Class PR (Partial Retention) (SN USDA, 1978). These classes are equivalent to VRM Class 1, Class 2, and Class 3.

Environmental Consequences. Neutron generator, cap assemblies, thermal batteries, and milliwatt heat source surveillance functions would be situated within existing buildings at SNL (see section 3.3.5 and figure 3.3.5-1). The introduced facilities would be consistent with the SNL Site Development Plan and compatible with other ongoing operations within their respective technical areas. An existing laydown area of approximately 2 acres would be used for renovation activities in TA-1 and TA-2 (figure 3.3.5-1). The laydown area, existing Building 957, and Building 905 are sited within the USAF APZ-2. A recently approved environmental assessment and FONSI for Building 905 determined there were no known land use conflicts (SN DOE, 1992a) and, consequently, no land use impacts are anticipated for these facilities. The proposed Shelf Life Storage Facility would be situated within Building 6730 at a remote site in TA-3 (figure 3.3.5-1). The siting and proposed use of this building are consistent with Federal plans, policies, or controls (SNL, 1989 and SNL 1992f). There would be no direct impacts to land use because the new introduced facilities are all sited within compatible land use categories.

The number of in-migrating employees described in section 4.1.5.7 are small enough that existing accommodations of the host community of Albuquerque should be able to absorb the increase without significant land development for residential use. Offsite land requirements would be approximately 4 acres during the modification phase and 13 acres during the operation phase.

There are extensive public and private recreational facilities in the region that could easily absorb the increased demand resulting from this in-migration. Impacts to regional recreational facilities would be negligible. Since relocated facilities would be located in existing buildings, the impacts to visual resources would be negligible.

4.1.5.2 *Air Quality and Acoustics*

Affected Environment. The climate at SNL and in the surrounding region is characteristically that of a semiarid tropical and subtropical steppe (Trewartha, 1954). The annual average temperature in the area is 56.2 °F (NOAA, 1991b); temperatures vary from an average daily minimum of 22.3 °F in January to an average daily maximum of 92.8 °F in

July. The average annual precipitation is 8.1 inches (NOAA, 1991b).

Ambient Air Quality. SNL is located within the Albuquerque-Mid Rio Grande New Mexico Intrastate AQCR. Portions of the AQCR are designated as nonattainment by the EPA for TSP (40 CFR 81.332). The AQCR is designated attainment for the other criteria pollutants. The NAAQS and New Mexico State ambient air quality standards are given in table D2.1.1-1.

Ambient concentration limits for HAPs/toxics have been promulgated by the New Mexico Environmental Improvement Board. The emission rates of HAPs/toxics from existing SNL facilities during 1991 are listed in table D2.1.8-3. The HAPs/toxics described in this section are currently used at SNL or those anticipated to be used under the Proposed Action.

Ambient air quality near SNL is monitored for PM_{10}, CO, and NO_2. The data from the monitoring stations are presented in table D2.1.8-1. To achieve a conservative estimate, the maximum background concentrations as measured at these stations were used in the analysis. Note that the New Mexico ozone standard is exceeded. This is common in urban areas.

The principal sources of criteria air pollutants at SNL (SNL, 1988) are the steam plant at Area I; paint shops, toxic machine shop, process development laboratory, emergency diesel generator plant, and the solvent spray booth, all located at Area I; and the explosive testing at Area II. Other emissions include fugitive particulate emissions from waste-burial activities, other process emissions, vehicular emissions, and temporary emissions from various construction activities. HAP/toxics emissions at SNL occur from laboratories and miscellaneous operations and consist primarily of 1,1,1-trichlorethane, toluene, and xylene. The emission inventories are included in tables D2.1.8-2 and D2.1.8-3.

Normal operations result in the emission of radioactive materials at SNL. These emissions include 160 microcuries of tritium annually (SNL, 1991). Radiological releases result in a total maximum individual annual dose of 0.002 mrem effective dose equivalent, which is below the NESHAP 10 mrem effective dose equivalent standard. Tritium is the only radionuclide which may be affected by the activities which are the subject of this EA.

Table 4.1.5.2.-1 shows the air quality under ambient and No Action conditions at SNL. Ambient air quality monitoring data are listed as "maximum background concentration" and the air dispersion modeling results for existing operations are listed as "No Action concentration." The sum of the maximum background concentration and the No Action concentration for a given pollutant and averaging time is the baseline concentration. The baseline concentration was compared to applicable Federal and state pollutant limits to provide a conservative estimate of effects of the No Action alternative on air quality. With the exception of ozone, baseline air quality concentrations at SNL do not exceed, and would not be expected to exceed, any applicable guidelines or regulations. It is expected that the contribution to ozone concentrations from SNL is negligible.

The EPA-recommended Industrial Source Complex Short Term (ISCST) model was used to perform the air dispersion modeling analysis (EPA, 1987). A description of the modeling methodology is included in appendix D.

Acoustic Conditions. The major noise sources within SNL include various facilities, equipment, and machines (e.g., cooling towers, transformers, engines, pumps, boilers, steam vents, paging systems, construction and materials-handling equipment, vehicles, and explosives detonation). Explosives testing is conducted at TA-3 which is well isolated from residential areas. Sound-level measurements have not been made at SNL for explosives testing. Sound levels from aircraft

TABLE 4.1.5.2-1.—*SNL Ambient and No Action Concentrations Comparison with Applicable Regulations and Guidelines*

Pollutant	Averaging Time	Most Stringent Regulation or Guideline ($\mu g/m^3$)	Maximum Background Concentration ($\mu g/m^3$)[g]	No Action Concentration ($\mu g/m^3$)	Baseline Concentration ($\mu g/m^3$)[h]
Carbon Monoxide (CO)	8-hour	10,000[b]	7,557[c]	5.8	7,762.8
	1-hour	15,000[b]	13,740[c]	12.2	13,752.2
Hydrogen Sulfide (H_2S)	1-hour	14[b]	j	f	j
Lead (Pb)	Calendar Quarter	1.5[a]	j	f	j
Nitrogen Dioxide (NO_2)	Annual	94[b]	k	1.8	≥1.8
	24-hour	188[b]	j	20.3	≥ 20.3
Ozone (O_3)	1-hour	118[b]	192.3[c]	f	192.3
Particulate Matter (PM_{10})[d]	Annual	50[a]	35.8[c]	0.03	35.8
	24-hour	150[a]	104[c]	0.33	104.3
Sulfur Dioxide (SO_2)	Annual	52[b]	j	0.004	≥ 0.004
	24-hour	262[b]	j	0.04	≥ 0.04
	3-hour	1,300[a]	j	0.14	≥ 0.14
Total Reduced Sulfur	1-hour	4[b]	j	f	j
Total Suspended Particulates (TSP)	Annual	60[b]	j	f	j
	30-day	90[b]	j	f	j
	7-day	110[b]	j	f	j
	24-hour	150[b]	j	f	j
Hazardous Air Pollutants and Other Toxic Compounds[i]					
1,1,1-Trichloroethane	8-hour	1	j	0.73	≥ 0.73
Acetone	8-hour	5,900[e]	j	0.27	≥ 0.27
Amyl Acetate	8-hour	5,300[e]	j	f	j
Hydrogen Chloride	8-hour	70[e]	j	0.04	≥ 0.04
Isopropyl Acetate	8-hour	9,500[e]	j	f	j
Isopropyl Alcohol	8-hour	9,800[e]	j	0.12	≥ 0.12
Methyl Alcohol	8-hour	2,600[e]	j	0.12	≥ 0.12
Methylene Chloride	8-hour	2,610[e]	j	0.04	≥ 0.04
Toluene	8-hour	3,750[e]	j	0.57	≥ 0.57
Trichloroethylene	8-hour	250[e]	j	0.11	≥ 0.11
Triclorofluoroethane	8-hour	1	j	0.09	≥ 0.09
Xylene	8-hour	4,350[e]	j	0.61	≥ 0.61

E4 3401

a Federal Standard (40 CFR 50).
b State standard (NMEIB, 1981).
c Ambient air quality monitoring data for 1991 (SNL, 1991).
d Particulate matter less than 10 microns in diameter.
e State standard (NMEIB, 1991a).
f Not estimated because the potential release is negligible.
g The maximum of the concentrations as provided from the ambient air quality network.
h The Baseline Concentration represents a conservative assessment of potential impacts since the concentration contributions from individual sources do not necessarily occur at the same location.
i The compounds listed are the major pollutants of concern (SN Tab F, 1992).
j Data unavailable.
k Data not representative.
l No state standard.

operations at Albuquerque Airport/KAFB have been analyzed (SN USAF, 1990; SN Greiner, 1989). At the site boundary adjoining the urban areas of Albuquerque, noise from sources at SNL would be barely distinguishable from background noise levels. The acoustic environment along the SNL site boundary adjoining urban areas of Albuquerque and in the nearby residential areas is assumed to be that of an urban location with typical DNL in the range of 58 to 72 dBA (EPA, 1974), except where levels are higher due to aircraft operations. The primary sources of noise in these areas are traffic and aircraft operations. The acoustic environment in the rural areas adjoining SNL is assumed to be that of a rural location with typical DNL in the range of 35 to 50 dBA (EPA, 1974), except where higher due to aircraft operations.

The State of New Mexico has not established specific numerical environmental noise standards applicable to the SNL. The city of Albuquerque has adopted a noise ordinance which specifies a maximum sound level in residential areas as described in appendix D section D2.2.8. Noise levels at residences near SNL, especially those along major roads, may exceed the EPA guideline level for residential areas due to traffic and aircraft noise.

Environmental Consequences.

Air Quality. Renovation and modification activities (section 3.3.5) would create a temporary increase in emissions of particulate matter such as dust and dirt and vehicle emissions. This increase, although relatively small when compared to overall site emissions and when added to existing levels, would not be expected to exceed applicable air quality standards.

Air emissions from the manufacture of neutron generators would result from production operations. Available information indicates that there are no additional emissions of criteria pollutants associated with the transfer of these activities (FDI, 1992a). Hazardous/toxic air pollutant emissions from the manufacture of neutron generators are about 22 tons per year (FDI, 1992a). The potential emission rates are listed in table D3.1.1-3. Table 4.1.5.2.-2 shows the ambient air quality impacts of these emissions, none of which exceeds the applicable standards or guidelines.

Relocation of the thermal battery manufacturing facility would not require any major new construction (FDI, 1992a). Therefore, there would not be any construction-related air quality impacts associated with their function.

Air emissions from operation of the thermal battery backup production functions would be negligible. Small-volume batch cleaning operations would be performed using aqueous terpine-based cleaners (e.g., Citracline or D-liminene) (SN FDI, 1992). Cleaning operation releases would cause negligible air impacts.

Consolidation of the nonnuclear activities at SNL would result in an increase in the emission of tritium. An additional 5 Ci of tritium would be released annually (PI DOE, 1991b). This would result in a cumulative total maximum individual annual dose of 1 mrem effective dose equivalent, which is still below the NESHAP standards of 10 mrem effective dose equivalent. The activities which are the subject of this EA would only affect the emission of the radionuclide tritium.

Acoustic Conditions. The Proposed Action's effect on noise levels during construction and operation has been evaluated for the major traffic routes around SNL. These changes in traffic volumes are expected to result in an increase of less than 1 dB in peak-hour sound levels along Eubank Boulevard, Gibson Avenue, and Louisiana Boulevard. Changes in sound levels along other routes are expected to be minor. The increase in noise levels along the major access routes would be expected to cause little or no increase in annoyance to surrounding communities or individuals.

Noise emissions from renovation of existing building and onsite operation activities are not expected to

TABLE 4.1.5.2-2.—*Contribution to Air Quality from Proposed Action and Total Concentrations at SNL with Comparison to Applicable Regulations or Guidelines*

Pollutant	Averaging Time	Most Stringent Regulation or Guideline ($\mu g/m^3$)	Baseline Concentration ($\mu g/m^3$)[e]	Proposed Action Concentration ($\mu g/m^3$)	Total Concentration ($\mu g/m^3$)
Carbon Monoxide (CO)	8-hour	10,000[c]	7,762.8	h	7,762.8
	1-hour	15,000[c]	13,722.2	h	13,522.2
Hydrogen Sulfide (H_2S)	1-hour	14[c]	g	h	g
Lead (Pb)	Calendar Quarter	1.5[b]	g	h	g
Nitrogen Dioxide (NO_2)	Annual	94[c]	≥1.8[f]	h	≥1.8
	24-hour	188[c]	≥20.3[f]	h	≥20.3
Ozone (O_3)	1-hour	118[c]	192.3	h	192.3
Particulate Matter (PM_{10})	Annual	50[b]	35.8	h	35.8
	24-hour	150[b]	104.3	h	104.3
Sulfur Dioxide (SO_2)	Annual	52[b]	≥0.004[f]	h	≥0.004
	24-hour	262[b]	≥0.04[f]	h	≥0.04
	3-hour	1300[c]	≥0.14[f]	h	≥0.14
Total Reduced Sulfur	1-hour	4[c]	g	h	g
Total Suspended Particulates (TSP)	Annual	60[c]	g	h	g
	30-day	90[c]	g	h	g
	7-day	110[c]	g	h	g
	24-hour	150[c]	g	h	g
Hazardous Air Pollutants and Other Toxic Compounds[a]					
1,1,1-Trichloroethane	8-hour	d	≥0.73[f]	0.50	≥1.23
Acetone	8-hour	5,900[c]	≥0.27[f]	0.43	≥0.70
Amyl Acetate	8-hour	5,300[c]	g	0.43	≥0.43
Freon-113					
Hydrogen Chloride	8-hour	70[c]	≥0.04[f]	h	≥0.04
Isopropyl Acetate	8-hour	9,500[c]	g	0.22	≥0.22
Isopropyl Alcohol	8-hour	9,800[c]	≥0.12[f]	h	≥0.12
Methyl Alcohol	8-hour	2,600[c]	≥0.12[f]	h	≥0.12
Methylene Chloride	8-hour	2,610[c]	≥0.04[f]	0.99	≥1.03
Toluene	8-hour	3,750[c]	≥0.57[f]	0.56	≥1.13
Trichloroethylene	8-hour	250[c]	≥0.11[f]	0.54	≥0.65
Trichlorotrifluoroethane	8-hour	d	≥0.09[f]	0.59	≥0.68
Xylene	8-hour	4,350[c]	≥0.61[f]	h	≥0.61

E4 3808

[a] Compounds listed are the major pollutants of concern (SN Tab F, 1992).
[b] Federal Standard (40 CFR 50).
[c] State standard (NMEIB, 1981; NMEIB, 1991a).
[d] No state standard.
[e] Baseline Concentrations are from table 4.1.5.2-1.
[f] No Action concentration only, maximum background concentrations unavailable.
[g] Data unavailable.
[h] Design report indicates that the additional emission of this pollutant will be less than 100 lbs/yr (0.01 lbs/hr) (SN FDI, 1992a).

result in any increase in offsite noise levels. Noise emissions from renovation work and from operational facilities, equipment, and machines would not be expected to cause ambient noise levels at the site boundary to exceed the EPA guidelines set to protect the public from the effect of broadband environmental noise and against hearing loss.

Construction workers and personnel working at any of the reconfigured facilities at SNL would be exposed to varying levels of equipment noise. The requirements for worker hearing protection, as described previously for current facilities, would continue to be met at SNL.

Although no increase in annoyance is expected to occur offsite from construction and operation, measures would be implemented onsite to protect workers' hearing. These measures include the use of standard silencing packages on construction equipment and providing workers in noisy environments during construction and operation with appropriate earmuffs or earplugs approved by OSHA. As required, noise levels would be measured in worker areas and a hearing protection program conducted.

4.1.5.3 *Water Resources*

Affected Environment. This section describes the surface water and groundwater resources at SNL.

Surface Water. SNL is located within KAFB on the Albuquerque East Mesa. The mesa slopes gently southwesterly to the Rio Grande, the primary drainage channel for the area. The average flow of the Rio Grande is 1,008 ft^3/s (SN DOE, 1988). There are no perennial streams that flow through the SNL area. The two primary surface channels at SNL are Tijeras Arroyo and the smaller Arroyo del Coyote (figure 3.2.8-2). The Arroyo del Coyote joins the Tijeras Arroyo to discharge into the Rio Grande approximately 5 miles from the western edge of KAFB. Both arroyos flow intermittently during spring snowmelt or following thunderstorms (SN DOE, 1988). Springs in the eastern mountains provide a perennial flow in the upper reaches of Tijeras Arroyo. Most of this flow evaporates or percolates into the soil before reaching the KAFB.

The primary component of the natural drainage system, Tijeras Arroyo, separates TA-1, -2, and -4 from TA-3, -5, and the Coyote Test Field. Stormwater runoff is drained from the SNL Technical Areas by a combination of overland flow, natural channels, open drainage ditches, culverts, and storm sewers.

High peak flows of short duration characterize floods in the area. High-intensity summer thunderstorms produce the greatest flows, but flooding is not considered a high probability at KAFB. The southeast corner of TA-4 and the east side of TA-2 could lie within the 500-year floodplain of Tijeras Arroyo; however, because all relocation activities would take place in TA-1 and -3, they would not be affected by the 500-year floodplain (SNL, 1989).

SNL is responsible for the sanitary wastewater collection system in its Technical Areas and in the Coyote Test Field, while KAFB is responsible for the system base wide. Total flow from SNL is estimated at 200 MGY (table 3.2.8-1). Some of this is sent to the city of Albuquerque's sewer system with the remainder going to the KAFB sewer system and then discharged into two sewage lagoons. None of the sanitary or industrial wastewaters discharge directly into surface water channels.

Surface Water Quality. SNL has eight active permits including seven wastewater discharge permits from the city of Albuquerque for discharges to the city wastewater treatment plant and one surface impoundment discharge permit from the New Mexico Environmental Improvement Division for discharges to two lagoons in TA-4. The wastewater discharges are monitored for radiological and nonradiological parameters. In 1990, SNL did not comply with permit limits on 16 different occasions. Nine noncompliances occurred when pH levels exceeded permits for more than one hour. Seven

noncompliances occurred when fluoride levels exceeded permit limits for a full day. Since then, modifications and upgrades to the pretreatment system have been installed at Building 858, where these discharges initiated.

As a part of the annual surface water monitoring program, samples are obtained from stations upstream and downstream of SNL in the Rio Grande and from Coyote Springs. The Rio Grande upstream station is at Corrales Bridge, and the downstream station is at the Isleta Indian Reservation considerably downstream of the influent point of Tijeras Arroyo (SNL, 1991). Stormwater flowing into Tijeras Arroyo is the only significant surface water input into the Rio Grande from the site; however, no stormwater monitoring is conducted at SNL. Rio Grande water samples are analyzed for gross alpha, gross beta, total uranium, cesium-137, and tritium. Results from the 1990 annual monitoring are presented in table 4.1.5.3-1. Concentrations of radionuclides in surface waters do not exceed applicable standards. No nonradiological monitoring is conducted in Tijeras Arroyo or in the Rio Grande.

Groundwater. SNL lies within the north-south trending Albuquerque basin. The principal aquifer of the Albuquerque basin is the Valley Fill Aquifer. The valley fill consists of unconsolidated and semiconsolidated sands, gravels, silts, and clays that vary in thickness from a few feet adjacent to the mountain ranges to over 21,000 feet at a point 5 miles southwest of the KAFB airfield (SN Engineering, 1981).

The regional water table is separated by a fault complex that divides the area into a deep region west of the complex and a shallower region on the east side. The depth to groundwater ranges from 50 to 100 feet on the eastern side of the fault complex and from 380 to 500 feet on the western side (SN DOE, 1992b). Based on available data, the apparent direction of groundwater flow west of the fault complex is generally to the north and northwest (SNL, 1991). The direction of groundwater flow east of the fault complex typically is westward toward the fault system (SNL, 1991).

TABLE 4.1.5.3-1.—*Summary of Surface Water Quality Monitoring at SNL*

Receiving Water: Rio Grande—1990			
Parameter	**Unit of Measure**	**Water Quality Criteria**	**Average Existing Water Body Concentration[a]**
Cesium-137	pCi/L	120[c]	<10.0
Gross alpha	pCi/L	15[b]	12.8
Gross beta	pCi/L	50[b]	10.0
Tritium	pCi/L	20,000[b]	<450.0
Uranium, total	mg/L	NA	0.00000389

E4 3348

[a] Only yearly average radionuclide concentrations were provided for all monitoring locations. Less than symbol (<) indicates concentration below analysis detection limit.
[b] EPA National Primary Drinking Water Regulations, Maximum Contaminant Level (MCL), 40 CFR 141.
[c] U.S. Department of Energy Derived Concentration Guides (DCGs) for Water (DOE Order 5400.5). DCG values are based on a committed effective dose of 100 millirem per year; however, because the drinking water MCL is based on 4 millirem per year, the number listed is 4 percent of the DCG.

Note: Drinking water standards and DOE DCGs are listed to provide an understanding of an undesirable concentration for those parameters not covered by water quality standards-they do not constitute an enforceable limit.

NA None applicable.

Source: SNL, 1991.

Sources of recharge to the aquifer include precipitation, snowmelt along the margins of the basin, underflow from adjacent areas such as the Hagen Basin, and seepage from streams, canal drains, surface reservoirs, and applied crop irrigation water.

Groundwater Quality. The groundwater monitoring program at SNL has been in operation since 1985. The east side wells are characterized by low pH, high alkalinity, and high calcium. West side wells are characterized by higher pH, lower alkalinity, and high calcium. Overall, the groundwater in this region has been classified as a calcium bicarbonate chemical type with a pH ranging from 6.08 to 8.84 and an alkalinity range of 49 to 0.40 mg/L. Currently, there are no monitoring wells in the proposed project area. The closest well is located approximately 0.25 miles southeast of the area and has an August 1990 depth-to-water reading of 498 feet.

The Chemical Waste Landfill and the Mixed Waste Landfill at SNL have been identified as sources of groundwater contamination. A monitoring well network was established at the Chemical Waste Landfill in the summer of 1985. A monitoring well network was established at the Mixed Waste Landfill beginning in 1988, but sampling did not begin until late 1990. These contamination areas are not located near buildings that house DOE DP activities. Concentrations of TCE and metals were found above the water quality criteria established by the New Mexico Water Quality Regulations at the Chemical Waste Landfill. Concentrations of TOC and phenolics were found above the water quality criteria at the Mixed Waste Landfill (SN DOE, 1992b). Since these areas are not located near buildings that house DOE DP activities, a map of the areas of groundwater contamination was not provided. Table 4.1.5.3-2 summarizes groundwater quality near the proposed locations. All data are less than water quality criteria.

Groundwater Usage and Rights. No groundwater rights have been established through the Office of the State Engineer. SNL uses approximately 1 MGD of water (see table 3.2.8-2). Thirty percent of the water used at SNL is purchased from the city of Albuquerque and the rest is pumped from KAFB wells. KAFB pumped a total of over 1.6 billion gallons of water from its production wells in 1990 (SN DOE, 1992b), of which 0.7 MGD or 256 MGY was used by SNL.

Environmental Consequences. A description of the functions to be transferred to SNL and the facility locations selected to house these activities is presented in section 3.3.5.

TABLE 4.1.5.3-2.—*Summary of Groundwater Quality Monitoring, Sandia National Laboratories, Albuquerque*

Parameter	Unit of Measure	Water Quality Criteria	1990—Existing Conditions[c]		
			Base Well No.1	Base Well No. 7	Base Well No. 11
Cesium-137	pCi/L	120[b]	<10	<13	<10
Gross Alpha	pCi/L	15[a]	5.13	<2.8	<5.6
Gross Beta	pCi/L	50[a]	3.26	3.58	5.25
Tritium	pCi/L	20,000[a]	<0.45	<0.45	<0.45

E4 4023

[a] National Primary Drinking Water Regulations, Maximum Contaminant Level (MCL), 40 CFR 141.

[b] U.S. DOE, four percent of DOE Derived Concentraion Guidelines (DCGs) for Water, DOE Order 5400.5.

[c] Less than symbol (<) indicates concentration below analysis detection limit.

Source: SNL 1991.

Surface Water. The additional wastewater generated by the transferred processes is approximately 3.2 MGY (table 3.3.5-4). This wastewater increase would represent less than 2 percent over the current sanitary wastewater generation rate of 200 MGY. Impacts to surface water flow would be negligible since all wastewater would be collected and discharged to KAFB and the city of Albuquerque's sewer systems. Treated wastewater would meet or exceed standards of the city of Albuquerque, Wastewater Utility Division, Sewer Use and Wastewater Control Ordinance (SN FDI, 1992).

No relocated functions would be located within the 500-year floodplain.

Surface Water Quality. Impacts to surface water quality would be negligible since all wastewater would be discharged to KAFB and the city of Albuquerque's sewer systems.

The site was selected to receive these activities based on the compatibility between current operations and those that would be relocated. Future NPDES permits would be issued after review of the current water quality and how it is affected by discharges from SNL, including the transferred technologies.

Groundwater. Water requirements for both the modification and operation phases of relocated functions would be supplied from local groundwater sources at KAFB. During the modification phase, approximately 3,900 GPD of water would be required (table 3.3.5-3). This amount is less than 1 percent of the present groundwater withdrawal (1 MGD) from the KAFB wells. It is projected that an additional 25,000 GPD of water would be required to operate the facilities (table 3.3.5-5). This amount is less than 3 percent of the present groundwater withdrawal from the KAFB wells.

Groundwater Quality. There are no plans for direct discharge of process wastes to groundwater. Given normal safeguards and precautions, there would be no impacts to groundwater quality.

4.1.5.4 *Geology and Soils*

Affected Environment. SNL lies on a sequence of sedimentary, igneous, and Precambrian basement rocks. The northern and western sections of SNL rest on Miocene to Quaternary gravels, sands, silts, and clays deposited in the basin formed by uplift of the mountains to the east. The eastern portion of SNL is primarily underlain by Precambrian rocks (SN SAIC, 1985).

The eastern portion of SNL is cut by the Tijeras, Hubble Springs, Sandia, and Manzano faults. Both the Tijeras and Sandia faults, which intersect on the site, are considered capable faults (SN Engineering, 1981).

SNL is located in Seismic Zone 2B (UBC, 1991). The facility is situated in a region of high seismic activity but low magnitude and intensity. Available records indicate that more than 1,100 earthquakes have occurred during the past 127 years. However, during the past century, only three have caused damage at Albuquerque. Intensities have been as high as an MMI (Modified Mercalli Intensity) of VII, which can cause damage.

Possible geological concerns include potential ground shaking and rupturing associated with regional seismic activity and the two capable faults intersecting on the site. Statistical studies indicate that a nondamaging earthquake (MMI less than III) may be expected every 2 years, with a damaging event every 100 years.

SNL is located on soils of the Bluepoint-Kokan, Madurez-Wink, Tijeras-Embudo, Kolob-Rock outcrop, and the Seis-Orthids associations (SN USDA, 1977). The Bluepoint-Kokan soils are excessively drained, sandy, and gravelly soils. The Madurez-Wink soils are well-drained, loamy soils. The Tijeras-Embudo soils are well-drained, loamy, and gravelly soils. The Kolob-Rock outcrop association in the eastern portion of SNL includes deep, moderately to very steep, well-drained, loamy,

and stony soils and basalt, sandstone, and limestone rock outcrops. The Seis-Orthids association includes shallow to moderately deep soils on level to very steep slopes that are well-drained, very cobbly, stony, and very stony loamy.

The hazard of blowing soils on the terraces and pediments is severe. Future water erosion hazards are moderate on the alluvial fans, foothills, and highlands (SN USDA, 1977). Although no soils are classed prime farmland, finer grained soils of the Bluepoint-Kokan Soil Association along Tijeras Arroyo are classed Farmland of Statewide Importance (Irrigated) by the State of New Mexico.

Environmental Consequences. All new functions would be accommodated in existing structures, with no new construction of buildings, parking lots, or roads. During implementation, approximately two and one-half acres would be required temporarily for a laydown area. The extent of disturbance is not considered significant and no impacts to geologic features would occur.

There are no geological hazards or soil conditions that would adversely affect modification of the buildings or operations of new functions at SNL. Major seismic activity and associated mass movement and subsidence are unlikely to occur during the implementation or operational phases, as seismic activity in the region is generally of low frequency and magnitude. Renovation of plant facilities to accommodate the new functions would meet standards for Seismic Risk Zone 2B in the Uniform Building Code (UBC, 1991).

Because there would be no new construction, relocation of functions to SNL would have negligible impact on the soils of the site.

4.1.5.5 *Biotic Resources*

Affected Environment. Most undeveloped lands within TA-1 and -3 of SNL support grassland vegetation (SNL, 1992c). Terrestrial wildlife using grassland habitats on SNL are typical of similar habitats in Central New Mexico. The size and diversity of wildlife populations is thought to be limited by the poor availability of water (SNL, 1992c). An inventory of wildlife species on KAFB (including SNL) has been recently updated (SN Fischer, 1990).

No wetland inventories have been performed for SNL and no NWI maps have been published. Several springs exist on SNL including Sol se Mete Spring, Coyote Springs, and G Spring (SNL, 1992c). These are associated with canyons and arroyos and not the grasslands found on TA-1 and -3.

Potential aquatic habitat within SNL are limited to arroyos and canyons and the few springs associated with them. The nearest major perennial aquatic habitat is the Rio Grande, located approximately 5 miles to the west.

No Federally-listed threatened or endangered species are known to occur within SNL. The peregrine falcon (*Falco peregrinus*) (a Federally-listed endangered species) could potentially occur in the mountainous areas of KAFB surrounding SNL but the likelihood is low because of the poor habitat quality for this species. The grama grass cactus (*Pediocactus papyracanthus*) (a Federally-listed Candidate species, Category 2) is known to occur in grasslands on KAFB similar to those occuring on SNL. The spotted bat (*Euderma maculatum*) (a Federally-listed Candidate species, Category 2) has a low probability of occurrence on SNL. SNL lies within the breeding range of several Federal Candidate bird species (SNL, 1992c). DOE has initiated consultation with the State of New Mexico concerning the potential occurrence of state-listed threatened and endangered species.

Environmental Consequences. Temporary land disturbance could result from renovation of SNL facilities under the Proposed Action. The disturbances would be limited to laydown areas on lawns and paved areas within existing developed areas that are of minimal value as habitat for terrestrial wildlife.

No undeveloped areas within SNL would be disturbed by the Proposed Action.

Very small releases of tritium to the atmosphere could occur during operations (SN FDI, 1992). However, as discussed in section 4.1.5.9, these releases would not significantly affect human health. Because studies have indicated that no other organisms are more sensitive than man to radiation (SN NRC, 1979), the radionuclide releases would not significantly affect terrestrial organisms.

No areas potentially containing wetlands or other aquatic habitats would be affected by renovation or operation of the new facilities. Water demands for manufacture of neutron generators would be met through groundwater withdrawal and not from surface water withdrawal within or surrounding SNL. Process wastewater would be discharged to the local municipal system rather than to the natural surface waters containing aquatic habitats (SN FDI, 1992).

No terrestrial or aquatic areas potentially providing habitat for Federally- or New Mexico-listed threatened or endangered species would be affected by the Proposed Action. DOE has initiated consultations with the FWS and the New Mexico Department of Game and Fish to ensure that renovation or operation of the facilities would not result in impacts to any listed or special status species in the vicinity.

4.1.5.6 *Cultural Resources*

Affected Environment. The prehistoric chronology for the SNL area consists of three broad time periods (SN Mariah, 1988; SN Hoagland, 1992): Paleo-indian (10,000-5500 B.C.), Archaic (5500 B.C.-A.D. 1), and Anasazi (A.D. 1-1600). Prehistoric site types include pueblos, pithouse villages, rockshelters, hunting blinds, agricultural terraces, quarries, lithic and ceramic scatters, lithic scatters, and hearths. About 22 percent of SNL/DOE-controlled lands have been intensively inventoried for cultural resources (SN Hoagland, 1992); another 28 percent received less intensive surveys. Because techniques and procedures varied greatly between projects in these areas, most surveys are not considered adequate (SN Hoagland, 1992; SN Mariah, 1988). All five DOE TAs have been intensively surveyed; no prehistoric sites were recorded. Sixty-four prehistoric sites have been recorded in DOE-owned or -controlled lands beyond the five TAs. About 88 percent of these sites are considered eligible or potentially eligible for the NRHP.

The history of the region has been previously documented (SN Mariah, 1988; SN Furman, 1990; SN Hoagland, 1992). Historic resources identified in the vicinity of SNL are associated with early mining, ranching and sheepherding activities, commercial ventures, or transportation routes (SN Mariah, 1988). All five DOE TAs have received intensive cultural resources inventory; two historic sites were recorded. These sites were small historic trash scatters and are not eligible for the NRHP. Twenty-three historic resources have been recorded in DOE-owned or -controlled lands outside of the five TAs; about 65 percent are considered eligible or potentially eligible for the NRHP.

SNL was established in 1945 as the Z Division of the Los Alamos Scientific Laboratory (SN Furman, 1990; SN Hoagland, 1992). TA-1 originally consisted of temporary WWII structures and wooden framed buildings; more permanent buildings were constructed in 1948 (SN Furman, 1990). Construction in TA-2 was initiated in 1948, including two buildings (Buildings 904 and 907) used to assemble the first hydrogen bomb. Test facilities were developed in TA-3 from 1954 through 1960 (SN Furman, 1990; SN Hoagland, 1992). Numerous buildings and structures in TAs -1, -2, and -3 were built between 1945 and 1960; most are associated with the AEC and as such may be considered NRHP-eligible. Buildings in TAs -3, -4, and -5 may also qualify for eligibility to the NRHP when they are 50 years old. The New Mexico SHPO has requested that buildings in these areas be evaluated at that time (SN Hoagland, 1992). Buildings 904 and 907 may

be considered potentially NRHP-eligible because of their association with the assembly of the first hydrogen bomb (SN Hoagland, 1992).

Native Americans with concerns in this area include the Sandia Pueblo, north of Albuquerque, and the Isleta Pueblo, south of KAFB (SN Brandt, 1979; SN Ellis, 1979; SN Hoagland, 1992). Native American resources on SNL/DOE-controlled lands may consist of prehistoric sites with ceremonial features such as kivas, village shrines, petroglyphs, or burials; all of these site types or features would be of concern to local groups. Consultation with the Isleta and Sandia Pueblos has been initiated by DOE for this project and is an ongoing process (SN Hoagland, 1992). Important Native American resources may be identified through consultation.

Environmental Consequences. Nonnuclear functions relocated to SNL would be accommodated within the existing structures without new construction. However, at least seven of these buildings were built between 1949 and 1960 and may be considered NRHP-eligible. No NRHP-eligible prehistoric resources or important Native American resources are likely to be affected during construction activities. Federal, state, and Native American consultations have been initiated for SNL to determine if the Proposed Action would have an adverse effect on NRHP-eligible historic resources. If the resources identified as potential locations for transferred functions and other facilities at SNL are not considered NRHP-eligible after consultation, then no adverse effects to cultural resources are expected.

Mitigation measures to avoid any potential adverse effect to NRHP-eligible resources could include, but not be limited to, siting project activities to avoid such resources, archival research, photo-documentation, and adaptive reuse of historic architectural resources.

Because no NRHP-eligible prehistoric or historic resources or important Native American resources would be affected during operations, impacts during that period would be negligible.

4.1.5.7 *Socioeconomics and Community Services*

Affected Environment. The discussion of socioeconomics and community services at SNL is based on the ROI where 96 percent of the SNL employees lived in 1991. The ROI includes Bernalillo (91 percent), Valencia (3 percent), and Sandoval (2 percent) counties in New Mexico. Within the ROI, the key city of Albuquerque (86 percent) has also been included in the Affected Environment and Environmental Consequences discussions. (See figure 3.2.5.4-1.)

Assumptions, methodologies, and supporting data for the assessment of environmental consequences are presented in appendix E. Tables E3.5-1 through E3.5-5 give ROI resource information on the following: residential distribution of plant employees, regional economic and population growth indicators, housing characteristics, primary municipal water and wastewater systems, education characteristics, and local transportation.

Employment and Local Economy. The civilian labor force in the ROI grew 132 percent, increasing from 133,798 persons in 1970 to 310,252 persons in 1990. Total employment increased from 124,605 to 293,905 persons between 1970 and 1990, an annual growth rate of 4 percent. The unemployment rates for 1970 and 1990 were 6.9 percent and 5.3 percent, respectively. For the same years, personal income increased from approximately $1.3 billion to $9.4 billion (an annual average of 10 percent), and per capita income increased from $3,438 to $15,992.

Between 1970 and 1990, employment at SNL increased from 6,440 to 7,536 persons, representing 3 percent of the ROI employment in 1990 (SN Tab J, 1992). As of September 30, 1992, employment at SNL had increased to 8,473 persons. Under the

No Action alternative, future site employment would be expected to decrease to 8,400 persons by the year 2000 (DOE, 1992e). In 1991, the total SNL payroll was estimated to be approximately $355 million (SN Tab J, 1992). Under the No Action baseline, the total payroll would be projected to be approximately $395 million by the year 2000.

The civilian labor force is projected to grow at less than 1 percent annually, reaching an estimated 380,000 persons by 2000 and 408,000 persons by 2020. The unemployment rates for 2000 and 2020 are projected to be 6.0 percent and 5.9 percent, respectively. For the same years, personal income is projected to increase from approximately $14.1 billion to $19.0 billion, an annual average of less than 2 percent. Per capita income is projected to increase from an estimated $21,000 in 2000 to $25,000 in 2020.

Population. Between 1970 and 1990, the population in the ROI increased 58 percent to 589,131 persons. During the same period, the New Mexico population increased 49 percent. The population in the 3-county ROI is projected to increase from an estimated 682,000 persons in 2000 to 771,000 persons by 2020 at an annual rate of less than 1 percent.

The largest county population increase (262 percent) occurred in Sandoval County between 1970 and 1990, while during the same years, populations in Valencia and Bernalillo counties increased 12 percent and 52 percent, respectively. Also in the same period, the population in the city of Albuquerque increased 58 percent. Population in Sandoval County is estimated to increase 8 percent between 1990 and 2000 and 12 percent between 2000 and 2020, an annual growth rate of less than 1 percent. The Valencia County population is projected to increase 1 percent between 1990 and 2000 and 12 percent between 2000 and 2020, an annual growth rate of less than 1 percent. Population in Bernalillo County is projected to increase approximately 18 percent by 2000 and an additional 13 percent by 2020, an annual growth rate of about 1 percent.

Housing. Between 1970 and 1990, the number of housing units in the ROI increased 110 percent from 114,977 to 241,683 units. Concurrent with population growth in the ROI, housing units are expected to increase approximately 16 percent by the year 2000 and an additional 13 percent by 2020, an annual increase of less than 1 percent.

Between 1970 and 1990, the largest increase (395 percent) in housing units occurred in Sandoval County, while the smallest increase (45 percent) occurred in Valencia County. Housing units in Sandoval County are expected to increase approximately 19 percent by 2000 and an additional 12 percent by 2020, an annual increase of less than 1 percent. Housing units in Valencia County are expected to increase about 12 percent by 2000 and an additional 12 percent by 2020, an annual increase of less than 1 percent.

In 1990, homeowner vacancy rates averaged 2 percent in the ROI and ranged from 2 percent in Bernalillo County to 3 percent in Valencia County. The vacancy rates for rental units averaged 10 percent and ranged from about 8 percent in Sandoval County to 15 percent in Valencia County.

Community Infrastructure and Services. The water supply system operated by Albuquerque maintains about 92 percent of the total capacity of the 5 systems identified in the ROI. Albuquerque draws all of its raw water supplies from groundwater and had 1991 average daily demands equal to 42 percent of its 280 MGD capacity. Albuquerque is projected to experience average daily demands equal to 44 percent of capacity in 1995 and 47 percent of capacity in 2000.

Albuquerque's wastewater treatment system has a current capacity of 61 MGD, equal to about 90 percent of the combined capacity of the 5 systems identified in the ROI. The 1991 average daily demands on Albuquerque's system were equal to 87 percent of capacity. Albuquerque plans to increase its system capacity to 72 MGD by 1993 and is projected to have average daily demands equal

to 78 percent of capacity in 1995 and 83 percent of capacity in 2000.

Six school districts provide public education services and facilities in the ROI. In 1990, these school districts ranged in enrollment size from 514 students in the Jemez School District to 86,653 students in the Albuquerque School District. School districts with enrollments of over 1,000 students were operating between 80 percent and 100 percent of capacity. School districts in Bernalillo and Sandoval counties were operating, on average, at 74 percent and 100 percent of capacity, respectively. However, current capacities are projected to be exceeded by 1995 and 2000 under the No Action future baseline. The largest increases are expected to occur in the school districts in Sandoval County where enrollments are projected to exceed current capacities by 159 percent in 1995 and 169 percent in 2000. Smaller increases are expected to occur in the Albuquerque School District in Bernalillo County where enrollments are projected to exceed the current capacity by 28 percent in 1995 and 39 percent in 2000. The average pupil-to-teacher ratio for the ROI was 18:1, and expenditures averaged $3,192 per pupil. The statewide average pupil-to-teacher ratio was 18:1, and expenditures averaged $3,137 per pupil (NM Education, 1990).

Twenty hospitals serve the 3-county ROI. In 1990, Valencia County hospitals were operating close to capacity, while Bernalillo and Sandoval counties were operating well below capacity (AHA, 1990). In 1990, a total of 1,724 physicians served the ROI. The physician-to-population ratio for the ROI was 2.9:1,000 and ranged from 0.6:1,000 in Valencia County to 3.4:1,000 in Bernalillo County. The national physician-to-population ratio for urban areas was 2.6:1,000 (AMA, 1990, DOC, 1991b).

Five city, county, and state law enforcement agencies provide police protection in the ROI. In 1990, the largest law enforcement agency in the 3-county region was in the city of Albuquerque with 793 sworn officers, or 2.1 sworn officers per 1,000 persons. Other large agencies are in Bernalillo County with 209 sworn officers (0.4 sworn officers per 1,000 persons) and Sandoval County with 26 sworn officers (0.4 sworn officers per 1,000 persons). The average number of sworn officers in the ROI was 1.8 per 1,000 persons (FBI, 1991).

Four fire departments and 1,152 regular and volunteer firefighters provided fire protection services in 1990. The principal municipal departments include both professional and volunteer staff. In 1990, the greatest staffing strengths were found in the fire departments in the city of Albuquerque (450 firefighters; 1.2 firefighters per 1,000 persons) and in Bernalillo County (390 firefighters; 0.8 firefighters per 1,000 persons). The average number of firefighters in the ROI was 2.0 per 1,000 persons (Kapalczynski, 1988).

Local Transportation. Vehicular access to SNL is provided by Louisiana Blvd., Wyoming Blvd., Eubank Blvd., Gibson Blvd., and South Valley Rd. via Broadway Blvd.

Estimated baseline traffic along segments providing access to SNL is projected to contribute to differing service level conditions in accordance with baseline population growth. Eubank, Gibson, Louisiana, Wyoming, and to a lesser extent Broadway, Boulevards would typically experience traffic congestion, with volumes approaching or exceeding the design capacity of each roadway. Along these roadways, a motorist's speed and ability to maneuver would be restricted and potential disruptions to the traffic flow could be caused by accidents or maintenance activities, resulting in considerable congestion. In addition, estimated baseline truck traffic into SNL for delivery of commercial supplies and removal of commercial wastes would typically average 120 trips per day. However, the additional traffic volumes associated with continued operation of SNL are relatively minor and would not substantially affect local transportation baseline conditions.

No major improvements are scheduled for those segments providing immediate access to SNL (NM HTD, 1991a and b).

Other modes of transportation within the ROI include public transportation systems and railways. Public transport to SNL is provided by Sun Tran (SN AED, 1989). Rail service to SNL and KAFB is provided via a spur from the Atchison, Topeka, and Santa Fe Railroad (NM HTD, 1991c). No navigable waterways exist within the ROI.

The Albuquerque Aviation Department owns and operates the Albuquerque International Airport, located on KAFB. Albuquerque International Airport receives jet air service from both national and local carriers. Numerous smaller private airports are also located throughout the ROI as well (DOT, 1991).

Environmental Consequences. The employment figures for construction and operations for the Proposed Action are given in table 3.3-1 in section 3.3. The construction, modification, and installation of facilities and equipment for the Proposed Action at SNL would require 93 additional employees during peak construction (FDI, 1992a). Operations employment would begin in 1997 and grow to a full complement of 350 jobs in 2000 (DOE, 1992e). In addition to these jobs created directly by the project, another 214 jobs would be created indirectly during peak construction and 504 additional jobs during operations. The creation of direct and indirect employment would lead to in-migration of 69 persons during peak construction and 468 persons during operations. The in-migrating population is primarily related to the in-migrating professional employees who are scientists, engineers, etc. (and their families), and who are not available in the regional unemployed labor force.

Under the No Action alternative, the current SNL employment of 8,473 persons would be projected to be 8,400 persons by the year 2000, a decrease of 73 persons. The addition of 350 direct jobs to SNL would represent a net increase of 277 jobs over current levels.

TABLE 4.1.5.7-1.—*Sandia National Laboratories, Albuquerque Proposed Action Economic And Population Characteristics*

Economics	1995 Peak Construction	Percent Over Baseline	2000 Peak Operation	Percent Over Baseline
Baseline Civilian Labor Force	343,299	NA	379,866	NA
Baseline Unemployment Rate	5.6%	NA	6.0%	NA
Baseline Personal Income (Thousands $)	$11,517,012	NA	$14,078,925	NA
Baseline Per Capita Income ($/Person)	$18,168	NA	$20,640	NA
Baseline Employment	323,981	NA	357,135	NA
Direct Jobs	93	0.03	350	0.10
Indirect Jobs	214	0.07	504	0.14
In-Migrating Workforce	31	0.01	185	0.05
Total In-Migration	69	0.01	468	0.07
Population Increase				
Bernalillo County	66	0.01	446	0.08
Albuquerque	62	0.01	421	0.09
Sandoval County	1	0.00	9	0.01
Valencia County	2	0.00	12	0.03
ROI (County Total)	69	0.01	468	0.07

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Source: Estimated from Census, 1977, 1983, 1990a; DOC, 1990a and b, 1991a; NM Employment, 1991; FDI, 1992a; DOE, 1992e.

Table 4.1.5.7-1 summarizes the projected economic and population changes that would result from the Proposed Action. In the year 2000, this project-related population growth from in-migration would represent a negligible increase of less than 1 percent over the projected ROI baseline population of 683,000 persons, and no cities or counties in the ROI would experience a population growth beyond 1 percent.

The less than 1 percent change in population during the time of peak construction would create the need for only an estimated 30 additional housing units, which is not a significant addition to this large urban area. For operations in the year 2000, the less than 1 percent change in population would not create a need for additional housing units beyond a 1 percent increase. In past years, housing units have been built at an annual rate of 4 percent. Therefore, the additional housing needed to accommodate the in-migrating population could be built without any adverse effect on the cities and counties in the ROI.

The estimated additional population during peak construction and operations would not affect any community infrastructure and services in the ROI. Existing water and wastewater capacities more than exceed the projected demand. Some existing public education facilities are currently approaching 100 percent of capacity. Under current conditions, enrollments will exceed capacities by the years 1995 and 2000 given the No Action future baseline. However, these school capacities will not be affected beyond what would naturally occur under the No Action baseline growth because the Proposed Action would not add more than 1 percent to enrollments during construction or operations. Existing health care resources are more than adequate to accommodate the projected population increases during peak construction and operations. Current staffing levels for police and fire services in the ROI are adequate to support the projected population increases, while maintaining current service standards, because none of the cities or counties would grow by more than 1 percent over the No Action baseline. Additional commercial truck traffic into SNL would be negligible relative to historic levels, and this truck traffic would occur during non-peak hours. Impacts to the local transportation network serving SNL would be negligible, as well.

4.1.5.8 *Waste Management*

Affected Environment. Discussion of the SNL waste management baseline is provided in section 3.2.8.3. Because there are no TRU wastes associated with any of the proposed activities that would be consolidated, no further discussion of TRU waste generation and management is presented.

LLW at SNL is generated in both technical and remote test areas as the result of research and development activities. Most of the LLW consists of contaminated equipment and combustible decontamination materials and cleanup debris. All generated LLW is being temporarily stored at generator sites or above ground in transportation containers at the inactive Technical Area III disposal site. All LLW packages are currently onsite pending approval to be transported by commercial carriers to the Nevada Test Site for burial.

Mixed wastes include radioactively contaminated oils and solvents, and radioactively contaminated or activated lead or other heavy metals. Other mixed wastes may be generated as a result of weapons tests. The 6,000 ft^2 Radioactive Mixed Waste Management Facility has waste acceptance criteria, and serves as a centralized packaging and storage facility for LLW and mixed waste. Wastes are stored at this facility until suitable treatment and disposal facilities are available for the disposal of these wastes in accordance with the provisions of RCRA. SNL is currently developing a compliance agreement to be negotiated with the State of New Mexico to stipulate the provisions of the storage of these wastes pursuant to the terms of the Land Disposal Restrictions of RCRA.

Hazardous/toxic chemical wastes are generated at SNL by the numerous research and development

activities conducted throughout the facilities. The Hazardous Waste Management Facility can store 70,000 gallons of liquid and solid hazardous wastes at any one time. There are no active onsite disposal facilities for hazardous/toxic wastes at SNL. All RCRA-regulated wastes are packaged, manifested, shipped offsite by RCRA-permitted transporters for disposal at RCRA-permitted treatment and disposal facilities.

SNL contains over 15 miles of sewer lines interconnected with those of Kirtland Air Force Base. Pretreated industrial wastewater effluent and sanitary sewage is discharged to the city of Albuquerque sewer system in compliance with NPDES permit discharge limits. Solid sanitary waste is collected and taken to the KAFB sanitary landfill on a regular basis.

Environmental Consequences. Any equipment to be moved to SNL from another site due to the Proposed Action would be decontaminated prior to shipment.

Construction debris and scrap metals would result from demolition of existing interior utilities and partitions, and would be disposed of as sanitary waste, or sold/recycled as scrap. Building 870 may contain as much as 10 yds of concrete and 50 tons of steel contaminated by previous operations. These materials would be managed and disposed of as hazardous waste, packaged, and manifested in accordance with all applicable regulatory requirements, and shipped by an RCRA-permitted transporter to an offsite RCRA-permitted disposal facility. Building 870 may also generate 120 yds of asbestos. Buildings 841, 860, 878, and 894 may generate 10, 10, 5, and 2 yds of asbestos, respectively. Asbestos waste would consist primarily of floor tile, pipe insulation, and ceiling tile, and would be disposed of in an approved asbestos landfill in accordance with the provisions of TSCA.

Wastes projected to be generated as a result of the relocated functions are outlined in appendix B.5. Operation wastes from the manufacture of neutron generators may be in the form of liquids, gases, or solids. Effluent wastewaters in the form of liquid sanitary sewage, process and industrial wastewater, and radioactive wastewater (tritiated water) would result from the manufacture of the neutron generators. From the operation of the thermal battery facility, no increase in sanitary sewage is expected since no additional increase in personnel is required. Existing sanitary tie-ins and the chemical drain system would be utilized, as no increase in chemical wastewater volume is expected from the battery facility.

Sanitary sewage would be sent directly to KAFB sanitary sewer system and then to the city of Albuquerque sanitary sewer to be treated at the municipal wastewater treatment facility. The estimated sanitary sewage flow attributed to the Proposed Action is 35,000 GPD (12.25 MGY based on 350 days per year). The city of Albuquerque sanitary sewer and municipal wastewater treatment plant have adequate capacity to handle the estimated (less than 1 percent increase) sanitary sewage flow.

A chemical drain system in Building 870 serves all nonradioactive chemical and industrial wastewater streams in the building. The chemical drain system would utilize gravity drainage through double-walled pipe in accessible concrete trenches or utilize the gravity system to lined collection sumps from which it would be pumped through an above ground piping system. The chemical drain system would provide transport of process and industrial wastewater to the chemical wastewater collection/neutralization facility located outside the building. This facility neutralizes the acidic or basic wastewater to standards meeting or exceeding the city of Albuquerque's Wastewater Utility Division, Sewer Use and Wastewater Control Ordinance. Chemical wastewater volume due to the Proposed Action is estimated at 70,000 GPD (24.5 MGY based on 350 days per year).

There are no low-level or mixed wastes generated from thermal battery production or milliwatt heat source surveillance. Approximately 1,252 gal/yr of

additional liquid hazardous waste (less than 1 percent) and 209 ft^3/yr of additional solid hazardous wastes (less than 5 percent) from the consolidation functions would be generated at SNL. Waste would be accumulated in local accumulation areas and then transferred to the existing onsite permitted hazardous waste storage area. The hazardous wastes from the Thermal Battery Facility would require the Chemical and Waste Storage Building to manage an additional four to five 55-gallon drums per month. The Chemical and Waste Storage Building has a maximum capacity of 1,090 drums. Since hazardous wastes are periodically shipped offsite, the consolidation would not have an adverse impact on SNL hazardous waste management operations.

It is estimated that less than 100 gallons per year of wastewater, potentially contaminated with tritium, would be generated by neutron generator operations at SNL. These wastes would be collected at the source in drums. This water would be treated by solidification or an approved alternate technology and disposed of at an approved site. The 294 ft^3 of additional solid LLW is less than a 13 percent increase.

The cap assemblies operation proposed for transfer to SNL may result in the generation of a small quantity of solid mixed waste, although it is yet to be determined whether this is LLW or mixed waste. No liquid waste is expected to be generated. Scrap from the machining process may not meet the definition of mixed waste. The quantity of this scrap is expected to be generated is approximately 18 grams per year. The scrap contains minute quantities of radioactive and hazardous substances. In an 18 gram quantity of this solid waste, the radioactive component, which has a relatively low specific activity, has an estimated weight of 100 mg and the hazardous component, which is a compound of arsenic, has an estimated weight of 18 mg. It is unlikely that this waste material exhibits the characteristic of toxicity, as described in 40 CFR 261.24 (which is necessary for it to be classified as a mixed waste), because the arsenic compound is found in the scrap material in an insoluble form (the radioactive constituent is also bound). However, the toxicity characteristic leaching procedure (TCLP) must be performed in accordance with Appendix II of 40 CFR 261 to make this determination. If the solid material is determined to be a mixed waste, treatment of this waste, if necessary to eliminate the characteristic of toxicity, would have to be identified prior to generation or it would have to be included in a Federal Facility Compliance Agreement, consistent with the Federal Facility Compliance Act.

The additional waste streams generated as a result of the increases in nonnuclear manufacturing activities at SNL would be well within the storage, treatment, and disposal capability of existing waste management facilities.

4.1.5.9 *Human Health: Facility Operations and Accidents*

General discussions of impacts to the public and the environment, worker exposures, and accidents are presented in section 4.1. Information specific to SNL is presented below.

Affected Environment. As discussed in the Air and Water Resources sections for SNL (4.1.5.2 and 4.1.5.3, respectively), exposures to members of the public associated with the release of chemical pollutants as a result of SNL operations meet all applicable permit, regulatory, and DOE operational requirements. Exposures to members of the public associated with radiological releases are also well below applicable permit, regulatory, and DOE operational requirements (SNL, 1991).

A review of the recent SNL annual environmental and accident reports indicates that there have been no significant adverse impacts to workers, members of the public, or the environment. This review was performed to provide an indication of the site's accident history. The time period of the review (1986-1990) was a period during which plant

operations were much higher than in the past year and higher than anticipated in the future.

Environmental Consequences. The Air and Water Resources sections discuss the chemical releases associated with relocating the neutron generators, cap assemblies, thermal batteries, and special products functions identified in section 3.3.5 to SNL. As shown, the cumulative impacts resulting from existing releases and the release of chemicals associated with relocating these functions at SNL are below applicable permit, regulatory, and DOE operational requirements.

Water from processes containing hazardous chemicals is not discharged directly into surface or groundwater that serves as potable water. Process water that may contain hazardous chemicals is treated before discharge to remove the toxicants. Furthermore, all releases of the pollutants are below NPDES limits and water quality is not adversely affected. Thus, the primary pathway considered for possible worker or public exposure is the air pathway.

For normal operations at SNL, all possible hazardous air pollutants were examined and from their assessment, the following chemicals were identified for further analysis based on their toxicity, concentration, and frequency of use: acetone, chromium trioxide, methylene chloride, nickel chloride, toluene, 1,1,1-trichloroethane, and trichloroethylene. The Hazard Index, a summation of the Hazard Quotients for all chemicals, was calculated for the No Action alternative and the chemicals proposed to be added (increment) at the site to yield cumulative levels for the site. A Hazard Index value of 1.0 or less means that no adverse human health effects are expected to occur. The cumulative Hazard Indexes for SNL (see table F5-18a in appendix F) were 0.0479 for onsite (worker effects) and 0.0024 at the site boundary (effect on the public) on an annual basis and the incremental change Hazard Indexes were 0.046 for onsite and 0.0023 at the site boundary. Therefore, the proposed action would add hazardous chemicals to SNL, but the cumulative Hazard Indexes at the site are well below a value of 1.0.

Two of the chemicals identified, methylene chloride and trichloroethylene, are considered to be carcinogens and the cancer risk to individuals for each was calculated. The combined risk for the carcinogens was calculated as 6.0×10^{-6} onsite (worker) and 3.0×10^{-7} at the site boundary (public) (see table F5-18b in appendix F) where the increment change due to the Proposed Action contributed the entire risk; however, the concentrations of methylene chloride and trichloroethylene did not consider controls on the emissions and a single source term was used. Therefore, the excess cancer risk to workers is a conservative estimate.

Releases of radioactive materials from SNL result in a total maximum individual annual dose of 0.002 mrem effective dose equivalent (SNL, 1991). The resulting risk of potential fatal cancers associated with 1 year of operations would be 8.9×10^{-10} to that individual. The dose increment associated with the increase in tritium emissions would be less than 1 mrem effective dose equivalent and result in an increased risk of less than 4.5×10^{-7} potential fatal cancers from 1 year of operation. Risks less than 10^{-6} are considered acceptable by EPA since this incidence of cancers cannot be distinguished from the normal cancer risk to an individual member of the general population. When risks are greater than 10^{-6}, appropriate measures are required to reduce the risks to less than 10^{-6}.

In summary, these analyses show that a small excess cancer risk to workers is possible from the normal release of hazardous chemicals/chemical pollutants at SNL as a result of the Proposed Action unless mitigative actions are implemented.

Accidents associated with the neutron generators and activities similar to the cap assemblies, thermal batteries, and special products functions at SNL have been analyzed previously and are documented in an EA (SN DOE, 1992a). The accidents analyzed included the release of tritium. Both natural and

man-made external initiating events were considered (e.g., human errors, fires, explosions, and airplane crashes). Safety procedures and requirements have been developed and implemented for these activities at SNL. These procedures and requirements establish the safety conditions under which operations must be performed. Additionally, due to the projected reduction in workloads, neutron generators, cap assemblies, thermal batteries, and special products functions, operations and inventories at SNL would be reduced. Therefore, even including the operations and inventories that would be moved from the other DOE sites to SNL, operations and inventories would be below those that currently exist at SNL.

Currently, SNL operations consume 760,000 ft^3 of hydrogen per year. SNL's current storage capacity for hydrogen is 76,000 ft^3. Therefore, storage is recharged approximately 10 times per year to meet the current demand for hydrogen. The functions which are proposed to be relocated to SNL would result in the consumption of an additional 2,118,000 ft^3 of hydrogen per year. No new storage capacity for hydrogen would be constructed as a result of the Proposed Action. While the increased demand for hydrogen would result in a higher recharge rate, the storage and distribution systems and practices would not change as a result of the Proposed Action.

As discussed in section 3.3.5, the neutron generators, cap assemblies, thermal batteries, and special products functions involve operations and use of chemicals that are the same as or similar to those currently being performed and used at SNL. Even if there were no projected reduction in workloads, the annual usage of chemicals that are of concern because of their hazardous nature, methylene chloride and trichloroethylene, would increase by only 9 and 10 percent, respectively. Therefore, the current accident profile at SNL would not change as a result of relocating these functions to SNL.

4.1.6 Phasing Out Mound

Detailed discussions of Mound's current missions, facility/process description, and waste treatment and management activities are provided in section 3.2.2. Discussions of the assumptions used in the EA for determining the affected environment and environmental consequences at Mound and the environmental assessment methodologies for each resource or issue discussed below is presented in the introduction to this chapter. Additional information on baseline conditions and environmental consequences of the Proposed Action which supports the following discussion on the phaseout of Mound is also provided in the chapter 4 introduction and in section 4.1.

4.1.6.1 *Land Resources*

Affected Environment. Mound is located in Miamisburg, OH, approximately 10 miles south-southwest of Dayton (figure 3.2.2-1). Generalized land uses at Mound and in the vicinity are shown in figure 4.1.6.1-1. Residential distribution of Mound employees is discussed in section 4.1.6.7. Mound is subdivided into a 183-acre northern half and a 123-acre southern half. The northern half consists of a heavily industrialized area with a high density of 120 buildings, an internal road network and parking lots, a government-owned railroad spur, a spoils area, and a small testing ground and surrounding buffer zone (MD EG&G, 1990). The Main Hill Area, SM/PP Hill Area, and the Valley Area are located in the northern half (figure 3.4.1-2). The southern half, called the "New Property Area," is a former farm, which currently consists of wooded areas, old fields, and a parking lot.

Mound is located within the center of the urban service area defined by the *Comprehensive Development Plan for Montgomery County*. County policies encourage development inside the urban service area boundaries, but discourage development outside them; the intent is to preserve prime farmland (Montgomery County, 1988). There are no prime farmlands on Mound. Mound, which is zoned industrial, is located on the southwest corner of developed Miamisburg. (Miamisburg, 1990).

Residential use adjacent to the Mound site is generally low density. The closest residence is 46 feet east of the Mound boundary. Much of the adjacent land use is composed of the Mound Golf Course and Mound Park (both municipal facilities). Mound does not contain any public recreation facilities.

Construction and operation of the DOE facilities has heavily disturbed the landscape character of the site. Development on the site has mainly occurred on the northern portion. Most of the buildings are one to two stories; the tallest is approximately five stories. The most visually dominant features on the site include six stacks and two water tanks. The facilities, including the stacks and water tanks, are brightly lit at night and are highly visible. The majority of the development at Mound is on one of the highest points (940+ feet elevation) along this reach of the Great Miami River. Substantial portions of Mound are visible from 3 to 4 miles away, especially from the north and east. Views from the south are much more limited. Views from the west are limited by the high ridgeline that forms the west side of the river valley, generally 1 to 1.5 miles from the plant. Viewpoints impacted by DOE facilities include portions of downtown Miamisburg, Central Avenue, Miamisburg Road, Lower Miamisburg Road, Riverview Avenue, Miamisburg Mound State Memorial (immediately adjacent to the east boundary), Mound Golf Course, Hill Grove Cemetery, and various residential areas. The developed portion of the site is consistent with a Class 5 VRM designation.

Environmental Consequences. Land use within the Mound site would not change during the phaseout DP nonnuclear mission period; therefore, no onsite land use impacts are expected. Future use of the Mound facilities would be evaluated in the transition process.

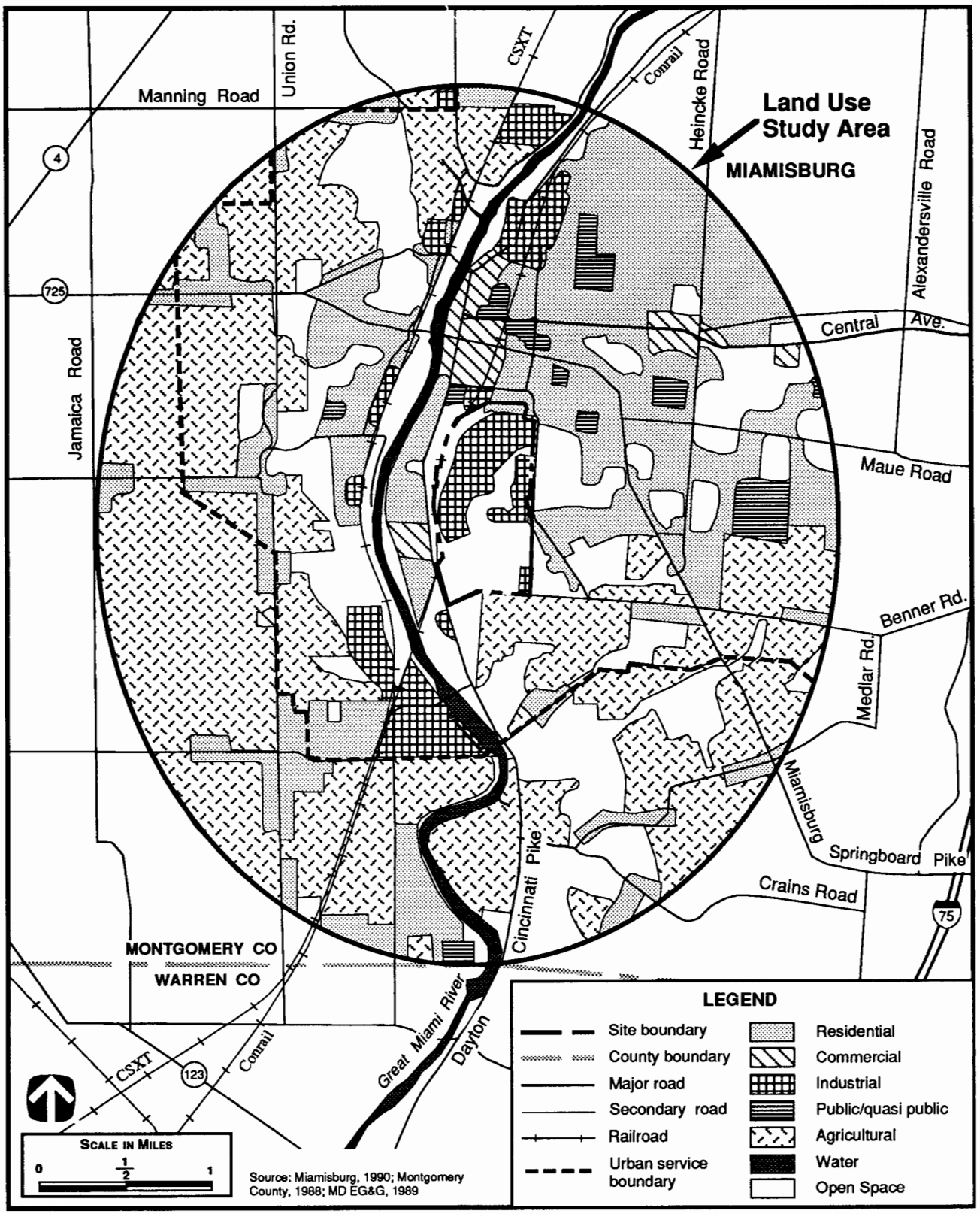

FIGURE 4.1.6.1-1—***Generalized Land Use at the Mound Plant and Vicinity.***

Phasing out DP nonnuclear missions at Mound would not adversely impact the comprehensive planning and zoning of the city of Miamisburg, Montgomery County, and surrounding jurisdictions. A review of socioeconomic data in section 4.1.6.7 indicates no adverse impacts to regional recreational resources due to changes in employment at the plant. No construction or demolition activities are planned as part of the DP nonnuclear mission phaseout; therefore, phaseout of Mound would not affect visual resources or VRM classifications.

4.1.6.2 *Air Quality and Acoustics*

Affected Environment. The climate at Mound and in the surrounding region is characterized as being humid, continental, with warm summers, moderately cold winters, and with moderate annual precipitation evenly distributed throughout the year (Trewartha, 1954). The annual average temperature in the area as measured at the Dayton National Weather Service station is 51.9 °F; temperatures vary from an average daily minimum of 18.8 °F in January to an average daily maximum of 84.9 °F in July (NOAA, 1991a). Annual average precipitation is 34 inches. About 20 inches of snowfall are typically recorded per year (MD EG&G, 1988). Maximum monthly precipitation measured at the Dayton National Weather Service station ranged from 5.69 inches in September to 10.89 inches in June.

Ambient Air Quality. Mound is located within the Metropolitan Dayton Intrastate AQCR. The region is under the authority of the Regional Air Pollution Control Agency (RAPCA), which conducts a program to monitor ambient levels of criteria pollutants. This AQCR is designated as attainment by the EPA with respect to SO_2, NO_2, and CO (40 CFR 81.336). However, several counties within the AQCR, have been classified as nonattainment for TSP and O_3. The NAAQS and Ohio state ambient air quality standards are listed in table D2.1.1-1. The Ohio ambient air quality standards for criteria pollutants are the same as the NAAQS. The Ohio EPA has standards for the existing pollutants regulated by the NESHAP. As of July 1991, the Ohio EPA has not promulgated standards for the additional 189 HAPs specified in the CAA. However, Ohio EPA uses the American Conference of Governmental Industrial Hygienists list of pollutant TLV. The HAPs/toxics described in this section are those currently used at Mound or those anticipated to be used under the Mound consolidation alternative.

Ambient air quality near Mound is monitored by RAPCA monitoring program and that of the Southwestern Ohio Air Pollution Control Agency (MD RAPCA, 1987-1991). Table D2.1.2-1 presents the data for each of the years 1987 through 1991.

The principal sources of criteria air pollutants at Mound are the two boilers associated with the steam plant and the Keystone heat exchanger. Other sources include fugitive particulates from process emissions, emissions from laboratory operations, and vehicular emissions. Predominant HAP/toxic emissions from Mound include acetone and TCA. The emission inventories for Mound are presented in tables D2.1.2-2 and D2.1.2-3.

Normal operations result in the emission of radioactive materials at Mound. These emissions include 1,823 Ci of tritium. Radiological releases result in a total maximum individual annual dose or 0.16 mrem effective dose equivalent, which is below the NESHAP 10 mrem effective dose equivalent standard. Tritium is the only radionuclide that may be affected by the activities that are the subject of this EA.

Table 4.1.6.2-1 shows the air quality under ambient and No Action conditions at Mound. Ambient air quality monitoring data are listed as "maximum background concentration" and the air dispersion modeling results for existing operations are listed as "No Action concentration." The sum of the maximum background concentration and the No Action concentration for a given pollutant and averaging time is the baseline concentration. The

TABLE 4.1.6.2-1.—*Mound: Ambient and No Action Concentrations Comparison with Applicable Regulations and Guidelines*

Pollutant	Averaging Time	Most Stringent Regulation or Guideline (μg/m³)	Maximum Background Concentration (μg/m³)[f]	No Action Concentration (μg/m³)	Baseline Concentration (μg/m³)[g]
Carbon Monoxide (CO)	8-hour	10,000[a]	4,466[c]	0.97	4,467
	1-hour	40,000[a]	13,971[c]	2.04	13,973
Lead (Pb)	Calendar Quarter	1.5[a]	h	e	h
Nitrogen Dioxide (NO_2)	Annual	100[a]	h	0.39	≥ 0.39
Ozone (O_3)	1-hour	235[a]	h	e	h
Particulate Matter (PM_{10})[d]	Annual	50[a]	29[c]	0.55	29.6
	24-hour	150[a]	93[c]	5.50	98.5
Sulfur Dioxide (SO_2)	Annual	80[a]	15.7[c]	0.002	15.7
	24-hour	365[a]	70.7[c]	0.01	70.7
	3-hour	1,300[a]	120.4[c]	0.02	120.4
Hazardous Air Pollutants and Other Toxic Compounds[i]					
1,1,1-Trichloroethane	1-hour	1,310[b]	h	42.5	≥ 42.5
Acetone	1-hour	42,380[b]	h	56.6	≥ 56.6
Ammonia	1-hour	405[b]	h	25.9	≥25.9
Hydrogen Chloride	1-hour	179[b]	h	16.5	≥16.5
Isopropyl Alcohol	1-hour	23,405[b]	h	20.9	>20.9
Trichlorotrifluoroethane	1-hour	182,619[b]	h	17.5	≥17.5

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[a] Federal Standard (40 CFR 50).
[b] State Standard (Ohio EPA, 1991).
[c] Ambient air quality monitoring data for calendar year 1990 (MD RAPCA, 1991).
[d] Particulate matter less than 10 microns in diameter.
[e] Not estimated because the potential release is negligible.
[f] The maximum of the concentrations as measured from the area ambient monitoring stations.
[g] The Baseline Concentration represents a conservative assessment of potential impacts since the concentration contributions from individual sources do not necessarily occur at the same location.
[h] Data unavailable.
[i] The compounds listed are the major pollutants of concern.

baseline concentration was compared to applicable Federal and state pollutant limits to provide a conservative estimate of effects of the No Action alternative on air quality. Baseline air quality concentrations from Mound do not exceed, and would not be expected to exceed, any applicable guidelines or regulations.

The EPA-recommended Industrial Source Complex Short Term (ISCST) model was used to perform the air dispersion modeling analysis (EPA, 1987). A description of the modeling methodology is included in appendix D.

Acoustic Conditions. The major noise sources within Mound include various facilities, equipment and machines (e.g., cooling towers, transformers, engines, pumps, boilers, steam vents, paging systems, construction and materials-handling equipment, vehicles, and explosive detonation). No sound-level measurements have been made around Mound. At the site boundary, away from most of these industrial facilities, noise from these sources

would be barely distinguishable from background noise levels. The acoustic environment along the Mound site boundary is assumed to be that of a suburban or urban location with typical DNL in the range of 53 to 62 dBA (EPA, 1974). Sound levels in the more rural areas to the south of the plant may be more typical of a rural area with typical DNL in the range of 35 to 50 dBA. Some noise from explosives detonation can occasionally be heard at the site boundary to the west. The primary source of noise at the site boundary and in nearby residential areas is traffic. During peak traffic periods, vehicles traveling to and from Mound are a major contributor to traffic noise in the residential areas near the plant.

The State of Ohio has not established specific numerical environmental noise standards applicable to Mound. The city of Miamisburg has set maximum sound-level limits for residential, commercial, and industrial property boundaries as described in appendix D (section D2.2.2). Maximum sound levels at a residential property boundary are limited to 60 dBA during the hours of 7 a.m. to 9 p.m. and 50 dBA during the hours of 9 p.m. to 7 a.m.

Although sound levels at nearby residences may exceed the city of Miamisburg noise limits and the EPA guideline level for residential areas, they result primarily from traffic noise and not noise from Mound facilities.

Environmental Consequences.

Air Quality. Phasing out the DP missions at Mound would reduce emissions of criteria, hazardous and toxic air pollutants. The air quality in the vicinity of Mound would likely improve with the reduction of pollutant sources (table 4.1.6.2-1). Phasing out the DP missions at Mound would eliminate emissions of tritium.

Acoustic Conditions. Phasing out the DP missions at Mound would reduce staff levels and, therefore, traffic volumes on nearby streets in Miamisburg. Some minor reduction in traffic noise levels would also be expected. A minor reduction in sound levels in the community is expected to result from elimination of noise sources on the site.

4.1.6.3 *Water Resources*

Affected Environment. This section describes the surface water and groundwater resources at Mound.

Surface Water. The Great Miami River borders Mound to the west and is the predominant hydrological feature in the region (figure 3.2.2-1 and 3.2.2-2). The river is classified for uses of recreation, agriculture, and water supply. There are no natural surface water bodies onsite (MD DOE, 1979), although there is a drainage basin in a valley between the two highest areas of the facility. The basin is small with relatively steep slopes, so runoff is rapid and poses no threat to structures (MD DOE, 1987a). The Great Miami River has an average flow of 2,436 ft^3/s for the 45 years of record (MD DOE, 1987a). In 1990, the flow in the Great Miami River averaged 3,369 ft^3/s, with a minimum of 489 ft^3/s and a maximum of 23,385 ft^3/s (MD DOE, 1991a).

As part of the flood mitigation program, a flood control system was constructed along the Great Miami River and its tributaries. This system, managed by the Miami Conservancy District, includes five dams (four are located above Miamisburg). All existing facilities are located 710 feet above mean sea level and the 500-year floodplain is estimated at 703.1 feet above mean sea level. Levees constructed along the banks of the Great Miami River near the Mound Facility have crest elevations ranging from 705 to 706.5 feet above mean sea level (DOE, 1988).

The site has three principal wastewater collection systems: sanitary wastewater, stormwater (which receives significant amounts of noncontact cooling water), and radioactive wastewater (MD DOE, 1987a). Each system leads to a treatment unit before ultimately discharging to the Great Miami River (MD DOE, 1987a). The units are the sanitary wastewater treatment plant, the stormwater retention

pond, and the radioactive waste treatment plant (MD DOE, 1987a). Existing sanitary wastewater generation is estimated at approximately 44 MGY (table 3.2.2-2). Effluent streams are monitored to ensure no undetected discharges occur (MD DOE, 1987a).

The effluents from the sanitary wastewater treatment plant and the radioactive waste treatment plant are combined into one pipeline just outside Mound and discharge to the Great Miami River (MD DOE, 1987a). Stormwater discharges through a culvert into the abandoned Miami-Erie Canal. It then empties into a drainage ditch and enters the river 1 mile south of where the wastewater pipeline discharges. No municipal system in the Great Miami River basin uses surface water for a public water supply below the Mound discharges, although surface waters are used by manufacturing and power companies along the basin for processing and heat exchange (MD DOE, 1979).

Surface Water Quality. Routine surface water monitoring, in accordance with EPA guidelines and the requirements of the NPDES permit, consists of sample collection at various discharge points (outfalls) within the facility and along the Great Miami River. The effluent locations have been sampled for total toxic organics, NPDES-required nonradiological parameters, and radionuclides. The surface waters have been analyzed for radiological parameters only (MD DOE, 1991a).

In 1990, 813 effluent samples were collected for analysis. Four occasions of noncompliance with permit limits were detected, all involving the biochemical oxygen demand of the wastewater treatment plant effluent. The exceedances occurred in January and February of 1990 and had no measurable impact on the water quality of the Great Miami River (MD DOE, 1991a). There were no parameters that exceeded water quality criteria.

River water sampling locations for radionuclides in 1990 were selected to be representative of water after mixing with the Mound effluents (MD DOE, 1991a). Water samples were analyzed regularly for tritium, plutonium-238, uranium-233/234, and uranium-238 (MD DOE, 1991a). The 1990 surface water monitoring results for downstream locations on the Great Miami River are presented in table 4.1.6.3-1

TABLE 4.1.6.3–1.—*Summary of Surface Water Quality Monitoring, Mound Plant*

Receiving Water: Great Miami River—1990				
Parameter	Unit of Measure	Water Quality Criteria	Existing Water Body Concentration	
			Average	Maximum
Plutonium-238	pCi/L	1.6[b]	0.00081	0.00563
Tritium	pCi/L	20,000[a]	40	220
Uranium-233, 234	pCi/L	20[b]	-0.07	0.22
Uranium-238	pCi/L	24[b]	-0.09	0.18

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[a] EPA National Primary Drinking Water Regulations, Maximum Contaminant Level (MCL), 40 CFR, 141.

[b] U.S. Department of Energy Derived Concentration Guides (DCGs) for Water, (DOE Order 5400.5). DCG values are based on a committed effective dose of 100 millirem per year; however, because the drinking water MCL is based on 4 millirem per year, the number listed is 4 percent of the DCG. All concentrations of radionuclides are determined by subtracting the instrument background and reference or background environmental level from the monitored concentration. A negative or zero incremental concentration means that the concentration at the sampling location is equivalent to the environmental level and that there is no significant impact from the facility.

Note: Drinking water standards and DOE DCGs are listed to provide an understanding of an undesirable concentration for those parameters not covered by water quality standards—they do not constitute an enforceable limit.

Source: MD DOE, 1991a.

(MD DOE, 1991a). There were no parameters that exceeded water quality criteria.

Groundwater. There are three aquifer units in the area, including outwash, till, and limestone. The most important is the outwash aquifer unit, which lies at a depth of 5 to 15 feet below the ground. It consists of 200 feet of fine sand, coarse sand, gravel, and cobbles that were deposited by streams. The glacial till aquifer unit lies at a depth of 20 to 40 feet below the ground surface. It consists of 30 feet of poorly sorted silt, sand, and gravel in a clay matrix. The number of till zones and their lateral extents vary, and the thickness of the zones range from 10 to 50 feet. The bedrock aquifer unit lies at a depth greater than 50 feet below the ground surface. It consists of 50 feet of interbedded limestone and shale. These rocks are exposed east of Mound.

Groundwater flow is toward the Mound boundary from both the east and west, then southward parallel to the boundary. The general hydraulic gradient in the buried aquifer under the valley floor is to the southwest at 5 to 10 feet per mile. The groundwater level varies seasonally and yearly and ranges from 681 to 696 feet. The groundwater table has declined under conditions of heavy use and drought but recovers when conditions reverse. The water supply for Mound is taken from three onsite wells (MD DOE, 1987b).

Groundwater Quality. The water quality of the aquifers near Mound and in the region as a whole is good. Scattered areas may contain objectionable concentrations of iron and manganese.

Water samples are periodically collected from community supplies in the surrounding area, private wells, and Mound's onsite wells and are analyzed for plutonium-238, uranium-233/234,-238, and tritium (table 4.1.6.3-2). Analyses show that plutonium concentration levels in all cases are well below DOE and EPA limits. Samples from some locations have been analyzed for uranium; concentrations and isotopic ratios are typical of naturally occurring background levels in the shales and other rocks of the area. Tritium levels are within DOE limits, as well as EPA maximum contaminant levels. Nonradioactive pollutant levels are also within water quantity criteria.

Groundwater Use. The region of the lower Great Miami River Valley is an important user of groundwater. The many supply wells in the general region furnish approximately 97 percent of the regional water supply. They range in yield from a few to 3,000 gallons per minute. The most important production is from the thicker, cleaner portions of the buried valley aquifer; nearly all municipal supplies are from this source. The upland till areas supply water to small domestic and farm units.

TABLE 4.1.6.3–2.—*Summary of Groundwater Quality Monitoring, Mound Plant*

Parameter	Unit of Measure	Water Quality Criteria	1990—Existing Conditions[a]	
			Average	Maximum
Plutonium–238	pCi/L	1.6[c]	0.0044	0.044
Tritium	pCi/L	20,000[b]	3,300	4,600
Uranium–233/234	pCi/L	20[c]	0.19	0.27
Uranium–238	pCi/L	24[c]	0.17	0.23

E4 4021

[a] Samples were taken throughout the Mound Plant area.
[b] EPA National Primary Drinking Water Regulations, Maximum Contaminant Level (MCL), 40 CFR 141.
[c] U.S. DOE, 4 percent of Derived Concentration Guides (DCGs) for Water (DOE Order 5400.5).

Source: MD DOE, 1991a.

The major regional use of groundwater is municipal; other uses include industrial and noncommunity domestic; there is no agricultural use. Mound has three production wells onsite that supply mainly drinking and process water from the glacial till aquifer. Current groundwater use is approximately 0.48 MGD (table 3.2.2-3).

Groundwater Rights. Groundwater rights in Ohio are held by the landowner. Mound has the right to develop its own wells and withdraw water in quantities sufficient to meet its needs.

Environmental Consequences. Phaseout activities (section 4.4) for Mound would require no new construction and all current DP operations would cease.

Surface Water. Since no surface water is used at Mound and wastewater discharges would be reduced, no adverse impacts would be anticipated to water flow rates in the Great Miami River.

Surface Water Quality. Since surface water discharges would be reduced, there would be no adverse impacts for water quality from phaseout activities.

Groundwater. By eliminating DP functions at Mound, a reduction of demand of local water supply would occur.

Groundwater Quality. Spill protection systems and plans exist to contain and minimize effects of releases of hazardous substances during phaseout activities. Given normal safeguards and precautions, no adverse impacts to groundwater quality are expected to result from transition activities associated with phaseout of Mound.

4.1.6.4 *Geology and Soils*

Affected Environment. Mound is located in the central stable interior. There are no capable faults at or in the vicinity of Mound. The closest capable fault is over 50 miles away and has not been active for over 60 years. The Mound area is in Seismic Zone 1 (UBC, 1991). Historic earthquakes, including the New Madrid shocks of the 19th Century, have resulted in a MMI of V or less in the Miamisburg area (Nuttli, 1990). There are no geologic concerns that would affect operation at Mound. Slopes are stable and seismic hazards pose little or no threat to Mound.

Soils that underlie Mound belong to the Milton-Ritchey-Millsdale association and are typically silt and clay loams formed on glacial till over limestone (MD USDA, 1976). Many of these soils rest on slopes of 2 to 6 percent, and some soils lie on slopes exceeding 25 percent. Miamian silt loams (2 to 6 percent slopes) and Milton silt loams (2 to 6 percent slopes) are designated prime farmland.

Most soils at Mound are moderately to severely eroded and are unsuitable for cultivation or have severe limitations because of the risk of erosion.

Environmental Consequences. The proposed phaseout of the DP missions at Mound would not result in adverse impacts on the geologic features of the area, nor would the geology have any impacts on phaseout activities at the plant.

However, the proposed phaseout could result in minor beneficial impacts on the soils of the area. Hazardous, radioactive, and mixed waste sources would be eliminated from the plant, thus decreasing future soil contamination potential.

4.1.6.5 *Biotic Resources*

Affected Environment. Terrestrial habitats at Mound are generally limited to the southwestern portion of the plant and to several slopes separating developed areas. The western half of the site supports a matrix of mowed grass, deciduous forest, and scrub-shrub communities in various stages of succession. Land surrounding the site is urbanized, or under cultivation (section 4.1.6.1).

Wetlands at the Mound site are likely limited to a small area of seeps, narrow intermittent stream channels, some drainage ditches, and man-made ponds (MD DOE, 1991a). Although wetland boundaries have not been delineated previously, consultations with Corps of Engineers has been initiated by DOE to determine the extent of jurisdictional wetlands on the site.

No perennial streams occur within the site. Aquatic species found in the Great Miami River, located approximately one-half mile from the site, are listed in an EIS prepared earlier by the DOE (MD DOE, 1979). Recreational fishing is common in the river. Wastewater and stormwater are treated prior to discharge to the Great Miami River. Aquatic habitats in the vicinity of Mound are not significantly affected by Mound operations (MD DOE, 1987a).

The only Federally–listed threatened or endangered species potentially occurring in the vicinity of Mound is the Indiana Bat (*Myotis sodalis*) (a Federally–listed endangered species). Although no bats have been officially recorded on the site, the Indiana Bat is known to occur in the surrounding area (MD FWS, 1991). Suitable habitat is thought to include riparian areas and nearby woodlots, especially those with dead trees or trees with peeling bark such as the shagbark hickory (*Carya illinoisensis*) (MD DOE, 1991c). DOE has initiated consultation with the FWS and the Ohio Division of Natural Areas and Preservation concerning the potential occurrence of Federal- and/or Ohio-listed threatened or endangered species.

Environmental Consequences. Phasing out of the DP nonnuclear missions at Mound under the Proposed Action would not adversely affect biotic resources. Phaseout of these missions would result in a reduction of existing operational impacts to natural habitats on and surrounding the site.

4.1.6.6 *Cultural Resources*

Affected Environment. The prehistoric chronology in western Ohio consists of five time periods (MD Riordan, 1987; MD Willey, 1966): Paleoindian (10,000-8000 B.C.), Archaic (8000-1000 B.C.), Woodland (1000 B.C.-A.D. 700), Mississippian (A.D. 700-1600), and Protohistoric (A.D. 1600-1795). Site types identified in the area of Mound include burial mounds, villages, campsites, and limited activity sites. The Miamisburg Mound, an Adena burial mound, is located 400 feet east-southeast of Mound in the Miamisburg Mound State Memorial Park (MD Riordan, 1987). This mound, a symmetrical conical earthwork, is one of the two largest Adena mounds recorded and is listed on the NRHP. About 62 percent of the Mound area has been developed or disturbed. In 1987, all undeveloped sections in the plant area were surveyed for cultural resources or assessed for the probability of containing sites (MD Riordan, 1987). Only one isolated artifact was recorded during the study.

The history of the region has been previously documented (MD Anson, 1970; MD Riordan, 1987; MD Kneeper, 1989). Archaeological remains of a 1865-1914 homestead were recorded on Mound property during the 1987 cultural resources survey (MD Riordan, 1987). The site lacked physical integrity and was recommended as not eligible for the NRHP; the Ohio SHPO concurred.

Prior to World War II, the Mound area was primarily used for agriculture. In 1943, the Manhattan Project developed the Dayton Project at three locations in Dayton, Ohio (History Associates, 1987). Expansion of this project soon required the construction of facilities at Mound in 1946; the plant became operational in 1949 (History Associates, 1987). The buildings and facilities at Mound are not regarded as exhibiting architectural integrity, nor are they representative of a particular style. It is unlikely that their documentation would contribute to the broad historical context of nuclear production. Therefore, the existing facilities are not likely to be considered eligible for the NRHP.

Native American groups who occupied or traversed the area include the Mosopelea, Shawnee, Miami, and Huron or Wyandot (MD Anson, 1970; MD Howard, 1981; MD Riordan, 1987). Site types which may be of concern to Native American groups include villages, burials, and cemeteries. Consultation with the Miami and Shawnee has not yet been initiated by DOE. Important Native American resources may be identified through consultation.

Environmental Consequences. The phasing out of the DP missions at Mound does not include ground disturbance or building modifications and, therefore, would not affect cultural resources.

4.1.6.7 *Socioeconomics and Community Services*

Affected Environment. The discussion of socioeconomics and community services at Mound is based on the ROI where 88 percent of Mound employees lived in 1991. The ROI includes Butler (9 percent), Montgomery (65 percent), and Warren (14 percent) counties in Ohio. Within these ROI counties, the following key cities have been included in the Affected Environment and Environmental Consequences discussions: Carlisle (2 percent), Centerville (10 percent), Dayton (18 percent), Germantown (2 percent), Miamisburg (15 percent), and Middletown (6 percent). (See figure 3.2.2-1.)

Assumptions, methodologies, and supporting data for the assessment of environmental consequences are presented in appendix E. Tables E3.6-1 through E3.6-5 give ROI resource information on the following: residential distribution of plant employees, regional economic and population growth indicators, housing characteristics, primary municipal water and wastewater systems, education characteristics, and local transportation.

Employment and Local Economy. The civilian labor force in the ROI grew 27 percent, increasing from 380,253 persons in 1970 to 481,700 persons in 1990. Total employment increased from 360,836 to 456,100 persons between 1970 and 1990, an annual growth rate of about 1 percent. The unemployment rates for 1970 and 1990 were 5.1 percent and 5.3 percent, respectively. For the same years, personal income increased from approximately $3.8 billion to $16.6 billion (an annual average of 8 percent), and per capita income increased from $4,132 to $16,947.

Between 1970 and 1990, employment at Mound increased from 1,875 to 2,138 persons, representing less than 1 percent of the ROI employment in 1990 (MD Tab J, 1992). As of September 30, 1992, employment at Mound had decreased to 1,719 persons. Under the No Action alternative, future site employment would be expected to decrease to 1,692 persons by the year 2000, but none of this employment would be DP-related (DOE, 1992e). In 1991, the total Mound payroll was estimated to be more than $60.2 million (MD Tab J, 1992). Under the No Action baseline, the total payroll would be projected to be approximately $48 million by the year 2000.

The civilian labor force is projected to grow at less than 1 percent annually, reaching an estimated 521,680 persons by 2000 and 523,780 persons by 2020. The unemployment rates for 2000 and 2020 are both projected to be 5.6 percent. For the same years, personal income is projected to increase from approximately $22.3 billion to $27.9 billion, an annual average of 1 percent. Per capita income is projected to increase from an estimated $22,000 in 2000 to $26,000 in 2020.

Population. Between 1970 and 1990, the population in the ROI increased 7 percent to 979,197 persons. During the same period, the Ohio population increased 2 percent. The population in the 3-county ROI is projected to increase from an estimated 1,009,000 persons in 2000 to 1,084,000 persons by 2020 at an annual rate of less than 1 percent.

The largest county population increase (34 percent) occurred in Warren County between 1970 and 1990, while during the same years, population in

Montgomery County declined 5 percent. Population in Warren County is estimated to increase 2 percent between 1990 and 2000 and 8 percent between 2000 and 2020, an annual growth rate of less than 1 percent. The Montgomery County population is projected to increase approximately 4 percent between 1990 and 2000 and an additional 7 percent between 2000 and 2020, an annual growth rate of less than 1 percent.

Between 1970 and 1990, Centerville had the greatest increase in city population (104 percent) in the ROI. For the same years, the Carlisle, Miamisburg, and Germantown populations increased 28 percent, 21 percent, and 20 percent, respectively, while the Dayton and Middletown populations decreased 25 percent and 6 percent, respectively.

Housing. Between 1970 and 1990, the number of housing units in the ROI increased 35 percent from 290,740 to 391,809 units. Concurrent with population growth in the ROI, housing units are expected to increase approximately 3 percent by the year 2000 and an additional 7 percent by 2020, an annual increase of less than 1 percent.

Between 1970 and 1990, the largest increase in housing units (69 percent) occurred in Warren County, while the smallest increase (22 percent) occurred in Montgomery County. Housing units in Warren County are expected to increase approximately 14 percent by 2000 and an additional 8 percent by 2020, an annual increase of less than 1 percent. The demand for housing units in Montgomery County is expected to decrease by 1 percent by 2000 and increase about 7 percent by 2020, an annual increase of less than 1 percent.

In 1990, the homeowner vacancy rates averaged 1 percent in the ROI and ranged from approximately 1 percent in Warren County to 2 percent in Butler County. The vacancy rates for rental units averaged 8 percent and ranged from 6 percent in Warren County to 8 percent in Butler and Montgomery counties.

Community Infrastructure and Services. The water supply systems operated by Dayton, Miamisburg, West Carrollton, Germantown, Hamilton, Middletown, Franklin, and Warren County maintain about 96 percent of the total capacity of the 10 systems identified in the ROI. All of these systems draw their raw water supplies from groundwater.

Dayton (192 MGD capacity), Miamisburg (4.3 MGD capacity), West Carrollton (3.6 MGD capacity), and Germantown (1.3 MGD capacity) all operate systems in Montgomery County and had 1991 average daily demands equal to 45 percent, 49 percent, 38 percent, and 32 percent of capacity, respectively. The Franklin (4.7 MGD capacity) and Warren County (4.5 MGD capacity) systems in Warren County experienced 1991 average daily demands equal to 11 percent and 62 percent of capacity, respectively. Hamilton (25 MGD capacity) and Middletown (20 MGD capacity) operate systems in Butler County and had 1991 average daily demands equal to 70 percent and 55 percent of capacity, respectively.

Hamilton plans to increase its system capacity to 42 MGD by 1997, and the average daily demands on this system are projected to equal about 72 percent of capacity in 1995 and 44 percent of capacity in 2000. Warren County's system is projected to have average daily demands equal to about 64 percent of capacity in 1995 and 65 percent of capacity in 2000. The other systems are all projected to have average daily demands of less than 56 percent of capacity in 1995 and less than 57 percent of capacity in 2000.

Dayton, Montgomery County, the Miami Conservancy District North Regional, the Miami Conservancy District Franklin Regional, Miamisburg, West Carrollton, Warren County, Hamilton, Middletown, Butler County, and Fairfield operate wastewater treatment systems in the ROI. In Montgomery County, Dayton (72 MGD capacity), Montgomery County (33 MGD capacity), the Miami Conservancy District North Regional (about 11 MGD capacity), West Carrollton (about

4.3 MGD capacity), and Miamisburg (3 MGD capacity) had 1991 average daily demands equal to 76 percent, 61 percent, 58 percent, 35 percent, and 67 percent of capacity, respectively. In Warren County, the Miami Conservancy District Franklin Regional (4.5 MGD capacity) and the Warren County system (about 3.6 MGD capacity) experienced 1991 average daily demands equal to 67 percent and 66 percent of capacity, respectively. Hamilton (32 MGD capacity), Middletown (26 MGD capacity), Butler County (10 MGD capacity), and Fairfield (10 MGD capacity), all in Butler County, had 1991 average daily demands equal to 69 percent, 81 percent, 81 percent, and 49 percent of capacity, respectively.

Butler County plans to increase its system capacity to 14 MGD by 1995 and is projected to have average daily demands equal to about 63 percent of capacity in 1995 and 2000. The other systems are projected to have average daily demands of less than 82 percent of capacity in both 1995 and 2000.

Thirty-three school districts provide public education services and facilities in the ROI. In 1990, these school districts ranged in enrollment size from 1,073 students each in the New Miami and Wayne school districts to 27,662 students in the Dayton School District. The school districts operated between 62 percent and 103 percent of capacity. Those school districts operating over 100 percent of capacity were Mason (103 percent), Edgewood City (101 percent), and Huber Heights (101 percent). The average pupil-to-teacher ratio for the ROI was 18:1, and expenditures averaged $3,956 per pupil. The statewide average pupil-to-teacher ratio was 17:1, and expenditures averaged $4,349 per pupil (OH Education, 1990a, b, and c).

Fourteen hospitals serve the 3-county ROI, with the majority operating well below capacity (AHA, 1990). In 1990, a total of 1,841 physicians served the ROI. The physician-to-population ratio for the ROI was 1.9:1,000 and ranged from 0.7:1,000 in Warren County to 2.5:1,000 in Montgomery County. The national physician-to-population ratio for urban areas was 2.6:1,000 (AMA, 1990; DOC, 1991b).

Thirteen city, county, and state law enforcement agencies provide police protection in the ROI. In 1990, the largest law enforcement agency in the 3-county ROI was in the city of Dayton with 594 sworn officers, or 3.3 sworn officers per 1,000 persons. Other large agencies are in Montgomery County with 183 sworn officers (0.3 sworn officers per 1,000 persons) and Butler County with 89 sworn officers (0.3 sworn officers per 1,000 persons). The average number of sworn officers in the ROI was 1.1 per 1,000 persons (FBI, 1991).

Forty fire departments and 2,286 regular and volunteer firefighters provided fire protection services in 1990. The principal municipal departments include both professional and volunteer staff. In 1990, the greatest staffing strengths were found in the fire departments in Montgomery County (912 firefighters; 1.6 firefighters per 1,000 persons) and in the city of Dayton (424 firefighters; 2.3 firefighters per 1,000 persons). The average number of firefighters in the ROI was 2.3 per 1,000 persons (Kapalczynski, 1988).

Local Transportation. Vehicular access to Mound is provided by Mound and Benner roads. All onsite roads, except for Mound Avenue, are DOE-owned and -controlled, with access restricted to employees and official visitors.

Estimated baseline traffic along segments providing access to Mound is projected to contribute to differing service level conditions in accordance with baseline population growth. Benner and Mound roads, as well as 6th Street, would generally support congestion-free traffic flow. Main Street, however, would typically experience some congestion. Along this roadway, a motorist's speed and ability to maneuver would be restricted, and potential disruptions to the traffic flow could be caused by accidents or maintenance activities, resulting in some congestion. In addition, estimated baseline truck

traffic into Mound for delivery of commercial supplies and removal of commercial wastes would typically average 25 trips per day. However, the additional traffic volumes associated with continued operation of Mound are relatively minor and would not substantially affect local transportation baseline conditions.

No major improvements are scheduled for those segments providing immediate access to Mound (OH DOT, 1992).

Other modes of transportation within the ROI include public transportation systems, railways, and waterways. Public transport to Mound is provided by the Dayton Regional Transit Authority. A plant bus system provides transportation between facilities on the site. Major railroads in the ROI include Consolidated Rail Corporation (Conrail), CSX Transportation, and the Norfolk Southern Corporation. A Conrail spur line accesses the site from the west via Miamisburg. The Great Miami River is located on the west side of Mound but is not considered a navigable waterway.

Dayton International Airport (29 miles north of the site) and the Greater Cincinnati International Airport (69 miles south of the site) serve the ROI. Both provide passenger and cargo service via national and international carriers. Numerous smaller airports are located in the ROI (DOT, 1991).

Environmental Consequences. The employment figures for the Proposed Action are given in table 3.3-1 in section 3.3. The Proposed Action would result in minor decreases in economic activity and employment in the ROI. Based on the employment requirements for the transferred functions from Mound, employment would decrease in the ROI by an estimated 3,200 jobs (1,200 direct and 2,000 indirect). This reduction in jobs would not increase the unemployment rate in the year 2000 beyond the projected baseline level of 5.6 percent. Earnings in the ROI would be reduced by about $104.4 million,

TABLE 4.1.6.7-1.—*Mound Plant Proposed Action Economic and Population Characteristics*

Economics	2000 Peak Operation	Percent Under Baseline
Baseline Civilian Labor Force	521,680	NA
Baseline Unemployment Rate	5.6 %	NA
Baseline Personal Income (Thousands $)	$22,344,200	NA
Baseline Per Capita Income ($/Person)	$22,146	NA
Baseline Employment	492,213	NA
Direct Jobs Lost	1,200	0.24
Indirect Jobs Lost	1,991	0.40
Out-Migrating Workforce	628	0.13
Total Out-Migration	1,594	0.16
Population Decrease		
Butler County	167	0.06
Middletown	105	0.22
Montgomery County	1,178	0.20
Centerville	182	0.83
Dayton	317	0.17
Germantown	83	1.62
Miamisburg	276	1.49
Warren County	249	0.21
Carlisle	104	2.10
ROI (County Total)	1,594	0.16

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Source: Estimated from Census, 1977, 1983, 1990a; DOC, 1990a and b, 1991a; OH Employment, 1991; DOE, 1992e.

with a related decrease in the total personal income of $133.8 million.

Table 4.1.6.7-1 summarizes the projected economic and population changes that would result from the Proposed Action. This project-related change would represent a slight population decrease of less than 1 percent from the projected ROI baseline of 1,009,000 persons. The Cities of Germantown, Miamisburg, and Carlisle would be the most affected. Germantown and Miamisburg would each lose about 2 percent of their projected populations, and Carlisle would lose slightly more than 2 percent of its projected population.

The less than 1 percent change in population after phasing out the nonnuclear functions would create an estimated 600 additional vacant housing units, which is less than 1 percent increase. The smaller Cities of Miamisburg, Germantown, and Carlisle would be the most affected, but with no more than a 2 percent increase in the number of vacant housing units.

The less than 1 percent estimated population loss would not adversely affect any community infrastructure and services in the ROI but would, instead, reduce the burden on the capacity of the existing systems. Existing public education and health care capacity burdens would also improve by reducing utilization. Current staffing levels for police and fire services in the ROI counties and cities would not be affected, and local traffic conditions would improve slightly.

4.1.6.8 *Waste Management*

Affected Environment. Discussion of the Mound waste management baseline is provided in section 3.2.2.3 and appendix A.2. Because there are no TRU wastes associated with any of the nonnuclear DP activities at Mound that would be phased out due to the Proposed Action, no further discussion of TRU waste management or generation is presented.

Generation of all waste types at Mound is expected to decrease with time, as production operations are expected to be reduced. Additionally, Mound's Pollution Prevention Program would systematically reduce waste generation through specific waste minimization projects and the use of process waste assessments.

All radioactive and mixed waste management activities conducted at Mound, including requirements for handling, storage, and shipping of LLW and mixed waste are covered by many DOE Orders, Federal and state statutes, and regulations such as RCRA (see chapter 5). All solid LLW is stored onsite in LLW management facilities, and transported by commercial carriers in closed vans to NTS for burial. Mixed waste is containerized and stored in Building 23 at Mound pending completion of waste characterization and identification of an acceptable waste treatment/ disposal option by DOE. It is anticipated that Mound's Glass Melter thermal treatment unit would be available for treatment of much of this waste in 1994.

The addition of a new facility, which incorporates 7,800 ft^2 of storage space, when combined with the existing 2,400 ft^2 of Building 72, would result in 10,200 ft^2 of available hazardous waste storage area inside the 23, 994 ft^2 facility. The storage area would meet RCRA and TSCA facility standards. All waste stream residue generated at Mound that is not reclaimed or recycled onsite is manifested and shipped under contract with RCRA- and TSCA-permitted transporters to RCRA-permitted offsite treatment and disposal facilities.

Environmental Consequences. Phaseout of the DP mission at Mound would reduce annual onsite hazardous waste management by 50,900 lbs for DP operations. Over 99 percent of the reduction would be due to decreased generation and landfilling of industrial wastewater pretreatment sludge. The remaining less than one percent of the hazardous waste reduction is due to generation and disposal by incineration of bulk acid liquids.

Phaseout of Mound would also initiate closure of existing onsite RCRA hazardous waste storage facilities. Closure would comply with a detailed closure plan and schedule approved by the Ohio Environmental Protection Agency. Hazardous wastes in storage would be manifested and shipped under contract with RCRA-permitted transporters to RCRA-permitted treatment and disposal facilities. Equipment, structures, and soils (if contaminated) must also be decontaminated and disposed of in accordance with all applicable environmental regulatory requirements.

Existing inventories of TRU waste, LLW, mixed waste, and classified waste would be shipped offsite to DOE disposal facilities certified to accept such wastes.

Due to the phaseout of DP nonnuclear functions, Mound would no longer treat alpha wastewater and discharge pretreated process wastewater and sanitary wastewater effluents into the Great Miami River.

The Burn Area at Mound would no longer treat explosive/reactive wastes. Nonhazardous solid waste streams such as paper, cardboard, glass, wood, scrap, and metal containers would no longer continue to be generated. Trash that would have been disposed of in the local sanitary landfill by a commercial contractor would cease, extending the operating life of the landfill.

4.1.6.9 *Human Health: Facility Operations and Accidents*

Affected Environment. As discussed in the Air and Water Resources sections for Mound (4.1.6.2 and 4.1.6.3, respectively), exposures to members of the public from the release of chemical pollutants as a result of Mound operations meet all applicable permit, regulatory, and DOE operational requirements. Exposures to members of the public from radiological releases are also well below applicable permit, regulatory, and DOE operational requirements (MD DOE, 1991a).

A review of the recent Mound annual environmental reports and accident reports indicates that there have been no significant adverse impacts to workers, members of the public, or the environment. This review was performed to provide an indication of the site's accident history. The time period of the review (1986-1990) was a period during which plant operations were much higher than in the past year and higher than anticipated in the future.

Water from processes containing hazardous chemicals is not discharged directly into surface or groundwater that serve as potable water. Process water that may contain hazardous chemicals is treated before discharge to remove toxicants. Furthermore, all releases of the pollutants are below NPDES limits and water quality is not adversely affected. Thus, the primary pathway considered for possible worker or public exposure is the air pathway.

All possible hazardous air pollutants from Mound were examined and the following chemicals were identified for further analysis based on their toxicity, concentration, and frequency of use: acetone; ammonia; Freon-113; isopropyl alcohol; and 1,1,1-trichloroethane. The Hazard Index, a summation of the Hazard Quotients for all chemicals, was calculated for the No Action alternative and the chemicals proposed to be added (increment) at the site to yield cumulative levels for the site. A Hazard Index value of 1.0 or less means that no adverse human health effects are expected to occur. The existing Hazard Indexes for Mound (see table F5-15 in appendix F) were 0.0411 for onsite (worker effects) and 0.0006 at the site boundary (effect on the public) on an annual basis. No chemicals posing a potential cancer risk were identified.

Releases of radioactive materials from Mound result in a total maximum individual annual dose of 0.16 mrem effective dose equivalent (MD DOE, 1991b). The resulting risk of potential fatal cancers associated with 1 year of operations would be 7.1×10^{-8}. Risks less than 10^{-6} are considered acceptable by the EPA

since this incidence of cancers cannot be distinguished from the normal cancer risk to an individual member of the general population.

Environmental Consequences. Phasing out Mound DP operations would result in no additions of hazardous material to, but rather the transfer of DP operations from, Mound to other DOE sites. Consequently, phasing out Mound would result in a decrease in adverse effects at Mound. The impacts at the DOE facilities that would receive the relocated DP functions from Mound are discussed in their respective sections.

4.1.7 Phasing Out Pinellas

Detailed discussion of the current missions at Pinellas, facility/process description, and waste treatment and management activities are provided in section 3.2.3. Discussions of the assumptions used in the EA for determining the affected environment and environmental consequences at Pinellas and the environmental assessment methodologies for each resource or issue discussed below is presented in the introduction to this chapter. Additional information on baseline conditions and environmental consequences of the Proposed Action which supports the following discussion on the phaseout of Pinellas is also provided in the chapter 4 introduction and section 4.1.

4.1.7.1 *Land Resources*

Affected Environment. Pinellas is located in the unincorporated Greater Seminole Area of Pinellas County, adjacent to the northwestern city limits of Pinellas Park. The city limits bound portions of the plant on the north, east, and south (Pinellas, 1989). Pinellas County is the most highly urbanized county in the State of Florida. Figure 4.1.7.1-1. illustrates the urban land use which surrounds the plant. The residential distribution of Pinellas employees is discussed in section 4.1.7.7. There are no prime farmlands on Pinellas.

Pinellas is a heavily industrialized facility. There is one principal building (Building 100) surrounded by other accessory structures and parking lots which occupy approximately 55 acres, while another 42 acres are essentially open space. The remaining 3 acres are occupied by the Pinellas Childcare Development Center/Partnership School with a maximum enrollment of 240 children and a staff of 25 to 30. The school is located approximately 150 feet east of Building 100 (PI DOE, 1990a and b).

The comprehensive plans of Pinellas County and the city of Pinellas Park have policies encouraging industrial development inside the boundaries of their defined industrial areas. Pinellas County has zoned the Pinellas site as "Light Manufacturing and Industrial District (M-1)." Approximately 57 acres of additional M-1 zoned land abuts the site on the north; of the 57 acres, 43 are vacant. The city portion of the industrial area is zoned both M-1 and "Industrial Planned Use Development." An additional 39 acres of an inactive landfill zoned "Public" (owned by the Pinellas County School Board) is also located north of the plant. The County School Board has also acquired 40 acres of a former industrial plant, zoned M-1, east of the plant.

The closest residences to the plant site perimeter are two caretaker facilities located approximately 550 feet and 610 feet north. A 270-unit apartment complex is located approximately 910 feet north. The nearest single-family residential subdivisions are located approximately 1,015 feet northeast and northwest of the plant perimeter. Other than the playground of the school, there are no recreation areas present at Pinellas.

The natural landscape of the plant and vicinity has been altered to that of a highly developed area. Viewpoints of the plant site are limited to roads and adjoining property that present clear unobstructed views of the plant facility. The Lake Allen area, an expanding residential area north of the plant, has views of the facilities. The facilities, however, are mostly screened by a strip of woodland with only higher structures such as outdoor security lighting, antennas, towers, and some tanks and roofs visible from the residential subdivisions. The Pinellas landscape is consistent with a Class 5 VRM designation.

Environmental Consequences. Land use within the Pinellas site would not change during the DP nonnuclear mission phaseout period; therefore, no onsite land use impacts are expected. Future use of Pinellas facilities would be evaluated in the transition process.

Phasing out DP nonnuclear missions at Pinellas would not adversely impact the comprehensive

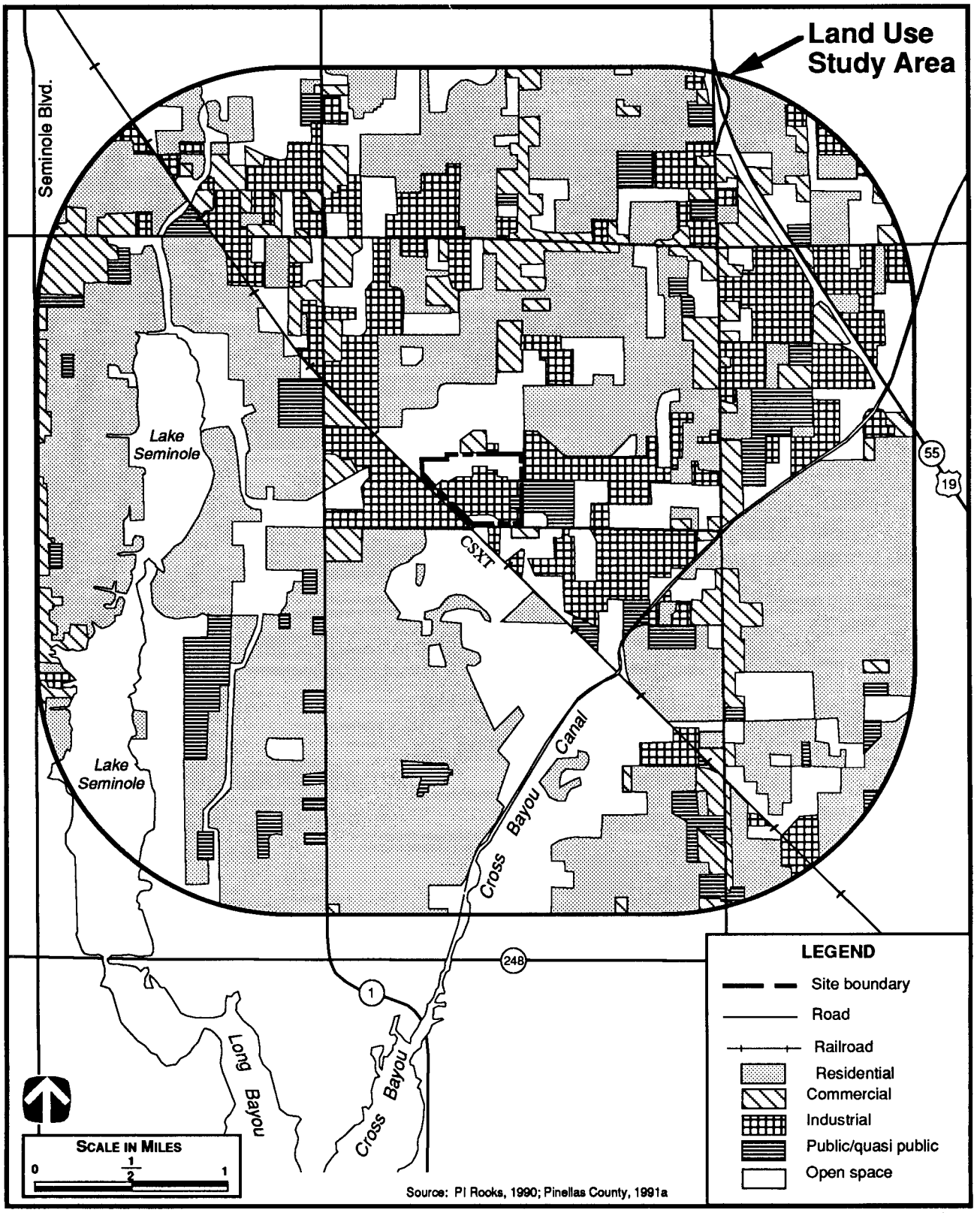

FIGURE 4.1.7.1-1—***Generalized Land Use at the Pinellas Plant and Vicinity.***

planning and zoning of Pinellas County, the city of Pinellas Park, and surrounding jurisdictions. A review of socioeconomic data in section 4.1.7.7 indicates no adverse impacts to regional recreation resources due to changes in employment at the plant. No construction or demolition activities are planned as part of the DP nonnuclear mission phaseout; therefore, phaseout of Pinellas would not affect visual resources or VRM classifications.

4.1.7.2 *Air Quality and Acoustics*

Affected Environment. The climate at Pinellas and in the surrounding region is subtropical marine which is characterized by long, humid summers and mild winters (Trewartha, 1954). The annual average temperature in the area as measured at the Tampa National Weather Service (NWS) station is 72 °F; temperatures vary from an average daily minimum of 49.5 °F in January to an average daily maximum of 90.3 °F in August (NOAA, 1991b). Annual average precipitation is 47 inches with most occurring between June and September.

Ambient Air Quality. Pinellas is located within the West Central Florida Intrastate AQCR. This AQCR is designated as attainment by EPA for all criteria pollutants with the exception of O_3 (40 CFR 81.310). The NAAQS and Florida State Ambient Air Quality Standards (which are the same as the NAAQS) are listed in table D2.1.1-1. Pinellas does not conduct any onsite or offsite ambient monitoring for criteria pollutants or HAPs (PI DOE, 1989).

The Florida Department of Environmental Regulation has standards for the existing HAPs regulated by the NESHAPs. In addition, the Florida Department of Environmental Regulation maintains a working list of toxics that is used as a tool in regulatory and air permitting analyses. This list, published in January 1992, is Revision 3 of the *Draft Florida Air Toxics Permitting Strategy Guidelines*, (FL DER, 1992) and covers 751 compounds including all 189 HAPs listed under Title III of the CAA. The HAPs/toxics described in this section are those currently used at Pinellas or those anticipated to be used under Pinellas consolidation alternative.

Ambient air quality within and near Pinellas is monitored by the state for each of the criteria pollutants. The ambient air quality data for SO_2, O_3, and CO collected at these stations during 1990 are presented in table D2.1.3-2. The ozone standard is exceeded primarily due to vehicular emissions. This is typical of most urban areas.

The principal sources of criteria air pollutants at Pinellas are the boilers and diesel generators in Building 500. Buildings 100, 700, and 1040 are sources of particulate and solvent emissions (Kirby, 1992). Other sources include vehicular emissions (PI DOE, 1989). The emission inventories for criteria poll-utants at Pinellas are included in table D2.1.3-3.

HAPs/toxics emitted to the atmosphere from the plant include methylene chloride, diethanolamine, and trichloroethylene as well as cadmium, lead, and mercury (Kirby, 1992). HAP/toxic sources include laboratories, coating and plating operations, production and test facilities, and various manufacturing operations. Pinellas emissions inventory for these HAPs/toxics is listed in table D2.1.3-3.

Normal operations result in the emission of radioactive materials at Pinellas. These emissions include approximately 100 Ci of tritium annually. Radiological releases result in a total maximum individual annual dose of 0.1 mrem effective dose equivalent, which is below the NESHAP 10 mrem effective dose equivalent standard. EPA has granted the Pinellas Plant minor source status because of these low annual emissions (Kirby, 1992). Tritium is the only radionuclide that may be affected by the activities that are the subject of this EA.

Table 4.1.7.2-1 shows the air quality under ambient and no action conditions at Pinellas. The concentrations listed in the table are based on

TABLE 4.1.7.2-1.—*Pinellas Plant Ambient and No Action Concentrations Comparison with Applicable Regulations and Guidelines*

Pollutant	Averaging Time	Most Stringent Regulation or Guideline (μg/m³)	Maximum Background Concentration (μg/m³)[f]	No Action Concentration (μg/m³)	Baseline Concentration (μg/m³)[g]
Carbon Monoxide (CO)	8-hour	10,000[b]	8,016[c]	e	8,016
	1-hour	40,000[b]	13,742[c]	e	13,742
Lead (Pb)	Calendar Quarter	1.5[b]	i	e	i
Nitrogen Dioxide (NO_2)	Annual	100[b]	i	e	i
Ozone (O_3)	1-hour	235[b]	243.4[c]	e	243.4
Particulate Matter (PM_{10})[d]	Annual	50[b]	i	e	i
	24-hour	150[b]	i	e	i
Sulfur Dioxide (SO_2)	Annual	60[a]	23[c]	e	23
	24-hour	260[a]	118[c]	15.02	133
	3-hour	1,300[b]	526[c]	e	526
Total Suspended Particulates	Annual	50	i	e	i
	24-hour	150	i	e	i
Hazardous Air Pollutants and Other Toxic Compounds[h]					
1,1,1-Trichloroethane	Annual	10[a]	i	2.0	≥2.0
	24-hour	9,168[a]	i	26	≥26
	8-hour	38,200[a]	i	55	≥55
Lead Compound	Annual	0.09[a]	i	0.022	≥0.022
	24-hour	0.36[a]	i	0.13	≥0.13
	8-hour	1.5[a]	i	0.23	≥0.23
Methylene Chloride	Annual	0.24[a]	i	1.2	≥1.2
	24-hour	417.6[a]	i	33.4	≥33.4
	8-hour	1,740[a]	i	75	≥75
Nickel Chloride	Annual	0.0042[a]	i	0.0126	≥0.0126
	24-hour	0.24[a]	i	0.126	≥0.126
	8-hour	1[a]	i	0.25	≥0.25
Trichloroethylene	Annual	0.59[a]	i	1.18	≥1.18
	24-hour	645.6[a]	i	8	≥8
	8-hour	2,690[a]	i	14	≥14

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[a] State standard (FL DER, 1992).
[b] Federal Standard (40 CFR 50).
[c] Ambient air quality monitoring data for year 1990 (PI Tab F, 1992).
[d] Particulate matter less than 10 microns in diameter.
[e] Not estimated because the potential release is negligible.
[f] The maximum of the concentrations as measured from the area ambient monitoring stations.
[g] The Baseline Concentration represents a conservative assessment of potential impacts since the concentration contributions from individual sources do not necessarily occur at the same location.
[h] The compounds listed are the major pollutants of concern (PI DOE, 1992a).
[i] Data unavailable.

information received from DOE, Pinellas (PI Tab F, 1992). Ambient air quality monitoring data are listed as maximum "background concentration" and the air dispersion modeling results for existing operations are listed as "No Action concentration." The sum of the maximum background concentration and the No Action concentration for a given pollutant and averaging time is the baseline concentration. The baseline concentration was compared to applicable Federal and state pollutant limits to provide a conservative estimate of effects of the No Action alternative on air quality. With the exception of the ozone standard and the annual "no threat limit" (FL DER, 1992) for nickel chloride, trichloroethylene, and methylene chloride, baseline air quality concentrations from Pinellas do not exceed, and would not be expected to exceed, any applicable guideline or regulation. (See section 4.1.7.9 for discussion of the human health effects of these constituents.)

The EPA-recommended Industrial Source Complex Short Term (ISCST) model was used to perform the air dispersion modeling analysis (EPA, 1987). A description of the modeling methodolgy is included in appendix D.

Acoustic Conditions. The major noise sources within Pinellas include various facilities, equipment, and machines (e.g., cooling towers, transformers, engines, pumps, paging systems, construction and materials-handling equipment, and vehicles). No sound-level measurements have been made around Pinellas. At the site boundary, away from most of these industrial facilities, noise from these sources would be barely distinguishable from background noise levels. Thus, the acoustic environment along the Pinellas boundary and in the nearby residential areas away from traffic noise is assumed to be that of a suburban or urban location with typical DNL in the range of 53 to 62 dBA (EPA, 1974). The primary source of noise at the site boundary and in nearby residential areas is traffic. The contribution of plant traffic to traffic noise levels in the area is minor.

The State of Florida has not established specific numerical environmental noise standards applicable to Pinellas. Pinellas County has specified limits on environmental noise at the property line of an industrial source as described in appendix D (section D2.2.3). Although the maximum noise levels specified by the ordinance and the EPA guideline level for residential areas may be exceeded at the Pinellas site boundary, these noise levels are attributable to traffic noise and not to sources at the plant.

Environmental Consequences.

Air Quality. Phasing out Pinellas would reduce emissions of criteria, hazardous, and toxic air pollutants. The air quality in the vicinity of the plant would likely improve with the elimination of pollutant sources (table 4.1.7.2-1).

Phasing out the DP missions at Pinellas would eliminate the emissions of tritium.

Acoustic Conditions. Phasing out Pinellas would result in reduced staff levels. The reduction in traffic volumes on nearby streets, primarily during the peak hours would result in only a minor reduction in noise levels along these routes. Community noise levels are expected to experience only a minor reduction due to elimination of noise sources on the site.

4.1.7.3 *Water Resources*

Affected Environment. This section describes the surface water and groundwater resources at Pinellas.

Surface Water. Pinellas lies on the divide between the Cross Bayou and Starkey Road drainage basins. The dividing line between the basins crosses the site in a northeast/southwest direction (PI DOE, 1991a). All wastewater discharges from the plant, with the exception of stormwater, are sent to the Pinellas County Sewer System (PI DOE, 1991a). There are three stormwater retention and one stormwater

detention ponds and no natural surface water bodies at Pinellas (figure 3.2.3-2) (PI GE, 1988).

Pinellas is located above the 100-year tidal floodplain. The land elevation at the plant is 17 to 18 feet above MSL, which is higher than the 100-year floodplain mark of 11 feet above MSL (PI DOE, 1991a).

Extraordinary wave action off the Gulf Coast could potentially inundate the plant site during a 500-year flood event (DOE, 1988). However, due to the distance and number of naturally occurring and man-made barriers which exist between Pinellas and the open waters of the Gulf of Mexico and Tampa Bay, there appears to be no credible scenario in which storm-generated wave activity could impact Pinellas (PI MMSC, 1992b). In addition, the 500-year floodplain is only significant with regard to "critical actions" as defined by Executive Order 11988 and 10 CFR 1022. It has yet to be determined if relocated technologies are considered "critical actions."

Pinellas discharges approximately 66 MGY in industrial and sanitary wastewater to the Pinellas County wastewater treatment plant (table 3.2.3-2). The Pinellas County wastewater treatment plant receives approximately 7.3 to 8.8 BGY (20 to 24 MGD) of wastewater and has a capacity of 10.4 BGY (28.5 MGD) (PI DOE, 1987). Effluent discharge is covered under a Pinellas County Sewer Ordinance permit and monitored daily for tritium. Nonradiological samples are also collected weekly for metals, monthly for cyanide, mercury, biochemical oxygen demand, total suspended solids, and semi-annually for toxic organics and pH (PI GE, 1991). Since the permit was issued on August 28, 1989, four instances of noncompliance for pH and one for zinc have occurred (PI DOE, 1991a).

The East and South retention ponds receive all surface runoff from paved areas of the plant. The East retention pond is included in the Northeast Site solid waste management unit, currently under investigation for corrective measures as part of the Hazardous and Solid Waste Amendments Permit issued by the EPA Region IV (FL 6890090008) (PI GE, 1991). Sediments from the East retention pond contain no pollutants above regulatory action levels (Kirby, 1992). Storm water from the South retention pond would flow to the Cross Bayou Canal; however, no discharge from the pond has occurred since its construction. An NPDES industrial stormwater permit application for the South and East retention ponds has been submitted to EPA for processing (Kirby, 1992).

The West detention pond received pH-neutralized industrial effluent from 1972 to 1982 and has been identified as a solid waste management unit to be investigated for possible corrective measures (PI DOE, 1991a). No stormwater is piped to the West retention pond, nor does it discharge to offsite surface waters.

Surface Water Quality. Water quality in the two stormwater retention ponds and the west pond is monitored weekly for tritium and periodically for nonradiological constituents (PI DOE, 1991a). Results from 1990 indicate the highest tritium levels were 3,600 times less than the DOE Derived Concentration Guide for drinking water (PI DOE, 1991a). Monitoring results for nonradiological parameters in the East and South Retention Ponds are presented in table 4.1.7.3-1. Monitoring from 1990 indicates that only vinyl chloride concentrations in the South retention pond exceed listed water quality criteria (PI DOE, 1991a). However, since the South retention pond has not discharged since its construction, no impacts to offsite surface waters have resulted. Quarterly, offsite surface water monitoring indicates tritium concentrations to be well below DOE and EPA water quality criteria (PI DOE, 1991a).

Groundwater. Aquifers associated with Pinellas include a near-surface unit (5 to 35 feet below ground) and the deeper Floridan Aquifer (100 feet below ground), separated by a shale of low hydraulic conductivity.

TABLE 4.1.7.3-1.—*Summary of Surface Water Quality Monitoring, Pinellas Plant*

Receiving Water: Cross Bayou Canal—1991			
Parameter	**Unit of Measure**	**Water Quality Criteria**	**Average Existing Water Body Concentration**
East Retention Pond			
1,2-Dichloroethylene	mg/L	0.07[b]	BDL
Arsenic	mg/L	0.05[a]	BDL
Beryllium	mg/L	0.011[a]	BDL
Iron	mg/L	1[a]	0.18
Lead	mg/L	0.03[a]	0.004
Manganese	mg/L	0.05[c]	0.02
Methylene Chloride	mg/L	1.58[a]	BDL
pH	pH units	6.0-8.5[a]	7.2
Trichloroethylene	mg/L	0.005[b]	BDL
Vinyl Chloride	mg/L	0.002[b]	BDL
South Retention Pond			
1,2-Dichloroethylene	mg/L	0.07[b]	0.015
Arsenic	mg/L	0.05[a]	0.002
Beryllium	mg/L	0.011[a]	0.001
Iron	mg/L	1[a]	0.2
Lead	mg/L	0.03[a]	BDL
Manganese	mg/L	0.05[c]	0.01
Methylene Chloride	mg/L	1.58[a]	0.13
pH	pH units	6.0-8.5[a]	7.8
Trichloroethylene	mg/L	0.005[b]	0.003
Vinyl Chloride[d]	mg/L	0.002[b]	0.006

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[a] Florida state water quality standards, specific for Cross Bayou Canal.
[b] EPA National Primary Drinking Water Regulations, Maximum Contaminant Level (MCL), 40 CFR 141.
[c] EPA National Secondary Drinking Water Regulations, Secondary Maximum Contaminant Level (SMCL), 40 Cb FR 143.
[d] Average concentration exceeded water quality criteria; however, these criteria are listed for comparison only. Water quality standards do not affect plant activities until they are translated into end-of-pipe effluent limitations imposed on discharges through the NPDES permitting process. Similarly, drinking water standards are listed to provide an understanding of an undesirable concentration for those parameters not covered by water quality standards—they do not constitute an enforceable limit.

BDL Below detection level.

Source: PI GE, 1991.

The water table of the near-surface aquifer is found a few feet below the ground surface. The water table fluctuates 1 to 5 feet seasonally (Kirby, 1992). A groundwater divide crosses the site in a northeast to southwest direction. Groundwater flow in the surficial aquifer is from the divide toward discharge points along three surface water channels.

The Floridan Aquifer is an extensive water-bearing carbonate unit found throughout west-central Florida. It contains upper and lower units, which are separated by an evaporite bed. The lower unit generally contains saltwater, while the upper unit serves as the primary potable and agricultural water supply for the area. In Pinellas and Hillsborough counties, the thickness of the Upper Floridan Aquifer is approximately 1,200 feet.

In much of west-central Florida, the Upper Floridan Aquifer is separated from the Surficial Aquifer by the Hawthorn Formation. This unit, because of its flow-restricting properties, acts as a confining layer for the Upper Floridan Aquifer. As a result, the potentiometric surface associated with the Upper Floridan is generally only 5 to 10 feet below that of

the groundwater table associated with the Surficial Aquifer.

Groundwater Quality. Table 4.1.7.3-2 shows that groundwater quality in the uncontaminated portions of the Surficial Aquifer beneath the plant is generally good, exceptions being a pH less than water quality criteria and a naturally occurring iron content that is higher than criteria. The results of water quality analyses from wells in the monitoring network indicate that concentrations of major constituents are within the reported range for background water quality. Concentrations of trace metals in the groundwater are less than detection limits or are within criteria limits of the EPA. Concentrations of herbicides, insecticides, organic priority pollutants, and total organic carbon in groundwater are also less than detection limits.

Contamination of groundwater in the Surficial Aquifer has been identified within and adjacent to Pinellas boundary (figure 4.1.7.3-1). The areas of concern are the 15 solid waste management unit sites within the plant boundary and the 4.5 acre site, which is adjacent to the plant boundary but has been attributed to previous Pinellas activities. Remediation activities for the 4.5 acre site have successfully recovered and treated approximately 4.1 million gallons of VOC contaminated groundwater (PI GE, 1991).

The water quality of the Floridan Aquifer directly beneath Pinellas has been measured and has not been adversely impacted by Pinellas Plant operations (Kirby, 1992).

Groundwater Supply. The Floridan Aquifer is the primary source of water supply in the Pinellas County area. Well fields are located in Pasco and Hillsborough counties that supply the various communities with domestic and industrial water. Only limited agricultural usage of water occurs in the vicinity of Pinellas. The plant has no production wells, and the water supply is obtained from the Pinellas County Water System (PI DOE, 1991a).

TABLE 4.1.7.3-2.—*Summary of Groundwater Quality Monitoring, Pinellas Plant*

Parameter	Unit of Measure	Water Quality Criteria	1990—Existing Conditions[f]	
			DOE 1[b]	DOE 2[c]
1,2-Dichloroethylene (total)	mg/L	e	<0.003	<0.003
Arsenic	mg/L	0.05[a]	0.001	0.001
Chloroform	mg/L	0.10[d]	<0.003	<0.001
Iron	mg/L	1,000[a]	4,600	3,900
Lead	mg/L	0.01[a]	100	100
Maganese	mg/L	0.05[a]	0.01	0.05
Methylene Chloride	mg/L	0.005[d]	<0.003	<0.003
Pesticides & Herbicides	mg/L	0.01-0.003[a]	<0.01	<0.01
pH	pH units	6.0-8.5[a]	6.6	6.8
Sodium	mg/L	160[a]	230	86
Total Organic Carbons	mg/L	e	130	56
Trichloreothylene	mg/L	0.005[d]	<0.003	<0.003

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[a] Florida state water quality criteria.
[b] Well located in the area of the proposed Mechanical Technology Building.
[c] Well located in the area of the proposed Office/Manufacturing Building.
[d] National Primary Drinking Water Regulations, Maximum Contaminant Level (MCL), (40 CFR 141).
[e] No specified limit.
[f] Less than symbol (<) indicates concentration below analysis detection limit.

Source: PI DOE, 1991a.

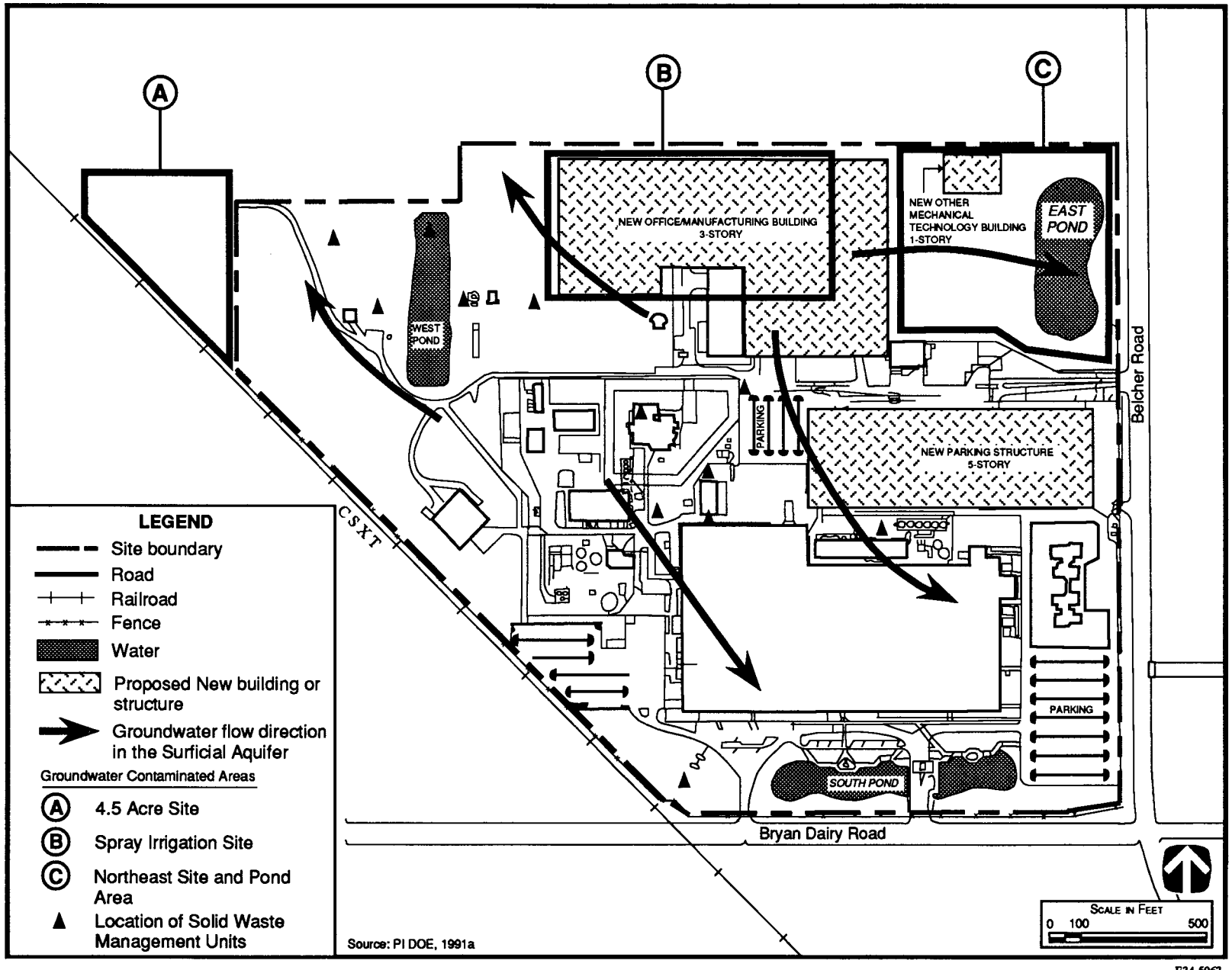

FIGURE 4.1.7.3-1—*Groundwater Contamination at the Pinellas Plant.*

Pinellas uses approximately 0.14 MGD of potable water (table 3.2.3-3). Periodic restrictions on water use at the plant has resulted due to a dramatic rise in regional water demand (PI GE, 1988). Although there have been failures in some of the supply piping of the Pinellas County Water supply system, faulty sections of the system are scheduled for replacement and backup supplies from the St. Petersburg Water supply system are available to ensure that there is no interruption in service. All current water restrictions are due to drought conditions. There is no permit or contract agreement with Pinellas County for water supply.

Environmental Consequences. Phaseout activities (section 4.4) at Pinellas would involve no new construction and all current defense programs operations would cease.

Surface Water. Because there would be no surface water withdrawals, and no routine releases to offsite surface waters, no adverse impacts would be anticipated to flow rates in local surface water bodies.

Surface Water Quality. Because there would be no routine releases to offsite surface waters, there would be no adverse impacts to water quality.

Groundwater. By eliminating DP functions at Pinellas, a reduction in the demand for groundwater from local water suppliers would occur.

Groundwater Quality. Spill protection systems and plans exist to contain and minimize effects of releases of hazardous substances during phaseout activities. Given normal safeguards and precautions, no adverse impacts to groundwater quality are expected to result from transition activities associated with phaseout of Pinellas.

4.1.7.4 *Geology and Soils*

Affected Environment. Pinellas lies on the Floridan Plateau of the Florida Peninsula. The site lies on a low relief surface north of St. Petersburg. There are no capable faults in Pinellas County. This region of Florida lies in Seismic Zone 0 (UBC, 1991). Earthquakes are not common in Florida. The most severe earthquake within a 200-mile radius occurred near St. Augustine in 1879, 160 miles northeast of the plant, and had a Richter magnitude of 4. There is no reason to expect damaging earthquakes at Pinellas (PI DOE, 1991b).

Sinkholes are not uncommon in Florida in areas where limestone layers are near the surface. Inactive sinkholes have been observed at Pinellas from aerial photographs, but no historic active sinkhole development has taken place in the plant area. Because of the depth of the limestone layers below the water table, sinkhole collapse is unlikely at Pinellas under present environmental conditions (PI DOE, 1983).

Pinellas is underlain by Made land and soils of the Myakka and Wabasso soil series (PI USDA, 1972). Made land consists of mixed sand, clay, hard rock, shells, and shell fragments that have been transported, reworked, leveled by earth-moving equipment, and used as foundation material. The Myakka and Wabasso consist of nearly level, poorly drained, fine sandy soils formed, respectively, in thick beds of acid marine sands and beds of sandy and loamy sediments. Because of the low relief and relatively high water saturation of these soils, they are not subject to water or wind erosion.

There are no prime or unique farmland soils located within the Pinellas site. All the soils within the site boundary are characterized as unsuitable for cultivation (PI USDA, 1972).

The Pinellas radiological monitoring program analyzes soil from two onsite and four offsite locations for plutonium. Results of the analyses for 1990 were below detectable levels (PI DOE, 1991b).

Environmental Consequences. The proposed phaseout of the DP missions at Pinellas would not result in impacts on the geologic features of the area,

nor would the geology have any impact on phaseout activities at the plant.

Hazardous, radioactive, and mixed waste sources would be eliminated from the plant, thus decreasing future soil contamination potential.

4.1.7.5 *Biotic Resources*

Affected Environment. Habitat in the southern part of Pinellas generally consists of lawns, ponds, and ornamental vegetation surrounding buildings and parking lots. Because of the lack of natural vegetation to provide cover, few animals are likely to use these areas to breed. Much of the northern part of the site is a grassy field with clusters of scattered trees. Lands surrounding the site have experienced extensive urban development, although areas to the immediate northwest are bounded by remnant pine forests and other natural plant communities typical of Pinellas County. These plant communities and the wildlife typically found in them are described in an EA prepared for the site by DOE (PI DOE, 1983).

Two man-made ponds, the East Pond near the northeastern corner of the site and the West Pond near the northwestern corner of the site (figure 3.2.3-2), are designated as wetlands on NWI maps (PI FWS, 1982; PI DOE, 1983). These wetlands are classified on the maps as Palustrine Open Water. These ponds were once used to store wastewater generated by Pinellas (PI DOE, 1983) but now serve only as stormwater retention ponds. To function for stormwater retention, the ponds require periodic cleaning and maintenance involving disruption of any vegetation that establishes within them. A third stormwater retention pond, South Pond, was constructed since development of the NWI maps. The sides of this pond are lined with steel pilings; it contains no vegetative growth. Consultation with the Corps of Engineers has been initiated to determine whether any jurisdictional wetlands occur within the site.

Although there is no natural surface water on the site, some aquatic flora and fauna, including frogs and insects, may have become established in the East and West Ponds, and could be providing a source of food for migrating birds. However, habitats within both ponds are less than choice for migrating birds.

The FWS has indicated that the site lies within the range of the Florida golden aster (*Chrysopsis floridana*) (a Federally-listed endangered species) and recommends that any pine scrub remnants within the plant boundary be inspected (PI FWS, 1991). Federally-protected species that may occur within the site according to the FWS include the wood stork (*Mycteria americana*) (a Federally-listed endangered species) and the Eastern indigo snake (*Drymarchon corais couperi*) (a Federally-listed threatened species). The American alligator (*Alligator mississippiensis*) (a Federally-listed threatened species) has not been observed on the site for over 15 years. A survey for Federally-listed and Florida-listed threatened and endangered species is scheduled (PI Tab I, 1992), and if any individuals are found, appropriate actions will be taken to protect them.

Environmental Consequences. Phasing out of nonnuclear functions at Pinellas under the Proposed Action would not adversely affect biotic resources. Phaseout would result in a reduction of existing operational impacts to natural habitats on and surrounding the site.

4.1.7.6 *Cultural Resources*

Affected Environment. The prehistoric chronology of the Pinellas area consists of five broad time periods (PI Milanich, 1980; PI Austin, 1991): Paleoindian (12,000-6500 B.C.), Archaic (6500-1000 B.C.), Transitional (1000-500 B.C.), Manasota (500 B.C.-A.D. 800), and Mississippian (A.D. 800-1625). Prehistoric site types in the vicinity include temple and burial mounds, shell and dirt middens, artifact scatters, villages, and cemeteries (PI Austin, 1991). About 65 percent of the facility has been

developed, and the remaining area has been disturbed by plowing and clearing activities. No cultural resource inventories have been conducted for Pinellas, and no sites have been recorded. As a result of the previous development and disturbance, the Florida SHPO has concurred with the finding that NRHP-eligible cultural resources are not likely to occur at the plant (FL SHPO, 1991).

The history of the region has been previously documented (PI Tebeau, 1971; PI Austin, 1991). Pinellas was constructed in 1955 on land that was originally pasture for dairy cattle (History Associates, 1987). As a result of the previous development and disturbance at the plant, no historic resources have been identified and no surveys have been conducted. The Florida SHPO has concurred with the finding that NRHP-eligible cultural resources are not likely to occur at Pinellas (FL SHPO, 1991). The Pinellas facilities are constructed of cinder block and have been modified numerous times. The facilities are not considered to exhibit architectural integrity, nor are they representative of a particular style. They are not considered contributing features to the broad historical theme of the Manhattan Project and initial nuclear production. The facilities are not likely to be considered eligible for the NRHP.

The Safety Harbor archaeological manifestation (late Mississippian period) is assumed to represent the Tocobaga Indian group who occupied the area at the time of Spanish contact. They were decimated in the early 1700's by European diseases, and the area was relatively unoccupied (PI Austin, 1991; PI Bullen, 1978). Northern Creek groups moved into the Tampa Bay area after the Creek War and were labeled Seminoles by the British (PI Tebeau, 1971). An Upper Creek or Red Stick settlement may have been located on the lower Pinellas peninsula, but an exact location has not been documented (PI Austin, 1991). Site types that may be of concern to Native American groups include villages, temple mounds, charnel house locations, burial sites, and cemeteries. Consultation with a local Seminole group regarding this project has not yet been initiated by DOE. Important Native American resources may be identified through consultation.

Environmental Consequences. The phasing out of the DP missions at Pinellas does not include ground disturbance or building modifications and therefore would not effect cultural resources.

4.1.7.7 *Socioeconomics and Community Services*

Affected Environment. The discussion of socioeconomics and community services at Pinellas is based on the ROI where 99 percent of the plant employees lived in 1991. The ROI includes Hillsborough (4 percent), Pasco (4 percent), and Pinellas (91 percent) counties in Florida. Within these ROI counties, the following key cities have been included in the Affected Environment and Environmental Consequences discussions: Clearwater (23 percent), Largo (18 percent), Pinellas Park (10 percent), Seminole (11 percent), and St. Petersburg (30 percent). (See figure 3.2.3-1.)

Assumptions, methodologies, and supporting data for the assessment of environmental consequences are presented in appendix E. Tables E3.7-1 through E3.7-5 give ROI resource information on the following: residential distribution of plant employees, regional economic and population growth indicators, housing characteristics, primary municipal water and wastewater systems, education characteristics, and local transportation.

Employment and Local Economy. The civilian labor force in the ROI grew 159 percent, increasing from 378,426 persons in 1970 to 979,201 persons in 1990. Total employment increased from 364,562 to 929,724 persons between 1970 and 1990, an annual growth rate of 5 percent. The unemployment rates for 1970 and 1990 were 3.7 percent and 5.1 percent, respectively. For the same years, personal income increased from approximately $4.1 billion to $35.5 billion (an annual average of 11 percent), and per capita income increased from $3,749 to $18,051.

Between 1970 and 1990, employment at Pinellas increased from 1,274 to 1,667 persons, representing less than 1 percent of the ROI employment in 1990 (PI Tab J, 1992). As of September 30, 1992, employment at Pinellas had decreased to 1,025 persons. Under the No Action alternative, future site employment would be expected to increase to 1,210 persons by the year 2000 (DOE, 1992e). In 1991, the total Pinellas payroll was estimated to be about $77.9 million (PI Tab J, 1992). Under the No Action baseline, the total payroll would be projected to be approximately $57 million by the year 2000.

The civilian labor force is projected to grow at less than 1 percent annually, reaching an estimated 1,188,000 persons by 2000 and 1,300,000 persons by 2020. The unemployment rates for the years 2000 and 2020 are both projected to be 5.4 percent. For the same years, personal income is projected to increase from approximately $51.5 billion to $70.4 billion, an annual average of 1 percent. Per capita income is projected to increase from an estimated $23,000 in 2000 to $26,000 in 2020.

Population. Between 1970 and 1990, the population in the ROI increased 81 percent to 1,966,844 persons. During the same period, the Florida population increased 91 percent. The population in the 3-county ROI is projected to increase from an estimated 2,255,000 persons in 2000 to 2,689,000 persons by 2020 at an annual rate of 1 percent.

The largest county population increase (270 percent) occurred in Pasco County between 1970 and 1990, while during the same years, population in Pinellas County increased 63 percent. Population in Pasco County is estimated to increase 12 percent between 1990 and 2000 and 19 percent between 2000 and 2020, an annual growth rate of less than 1 percent. The Pinellas County population is projected to increase approximately 14 percent between 1990 and 2000 and an additional 19 percent between 2000 and 2020, an annual growth rate of less than 1 percent.

Between 1970 and 1990, Seminole had the greatest increase in city population (825 percent) in the ROI. For the same years, the Clearwater, Largo, and Pinellas Park populations increased 90 percent, 198 percent, and 95 percent, respectively, while St. Petersburg had the smallest population growth (10 percent).

Housing. Between 1970 and 1990, the number of housing units in the ROI increased 126 percent from 432,142 to 975,046 units. Concurrent with population growth in the ROI, housing units are expected to increase approximately 15 percent by the year 2000 and an additional 19 percent by 2020, an annual increase of about 1 percent.

Between 1970 and 1990, the largest increase in housing units (328 percent) occurred in Pasco County, while the smallest increase (100 percent) occurred in Pinellas County. Housing units in Pasco County are expected to increase approximately 12 percent by 2000 and an additional 19 percent by 2020, an annual increase of less than 1 percent. Housing units in Pinellas County are expected to increase about 14 percent by 2000 and an additional 19 percent by 2020, an annual increase of about 1 percent.

In 1990, the homeowner vacancy rates averaged about 4 percent in the ROI, with averages of approximately 4 percent for both Hillsborough and Pasco counties. The vacancy rate for rental units averaged 14 percent and ranged from about 14 percent in Hillsborough County to 15 percent in Pasco County.

Community Infrastructure and Services. The water supply systems operated by Pinellas, Hillsborough, and Pasco counties and the city of St. Petersburg and Tampa maintain about 95 percent of the capacity of the 9 systems identified in the ROI. All of these systems draw their raw water supplies from groundwater, except Tampa which draws about 60 percent of its supplies from surface water.

The systems operated by Pinellas County (about 102 MGD capacity) and St. Petersburg (68 MGD capacity) had 1988 average daily demands equal to 75 percent and 63 percent of capacity, respectively. The water supply systems of Tampa (130 MGD capacity), Hillsborough County Northwest Service Area (about 9 MGD capacity), and Hillsborough County South-Central Service Area (about 24 MGD capacity) all operate in Hillsborough County. In 1988, the average daily demands on Tampa's system were equal to 53 percent of capacity. Hillsborough County's South-Central and Northwest Service Area systems operated near or at capacity, with average daily demands equal to 91 percent and 100 percent of capacity, but both are supplemented by Tampa and other regional systems. Pasco County Utilities (35 MGD capacity) had 1991 average daily demands equal to 32 percent of capacity.

The average daily demands on the Pinellas County and St. Petersburg systems are projected to be equal to 83 percent and 68 percent of capacity in 1995 and 92 percent and 73 percent of capacity in 2000, respectively. The average daily demands on Tampa's system are projected to equal 64 percent of capacity in 1995 and 75 percent in 2000. Pasco County Utilities is projected to have average daily demands equal to about 35 percent of capacity in 1995 and 38 percent of capacity in 2000.

Pinellas, Hillsborough, and Pasco Counties and the cities of St. Petersburg, Clearwater, Largo, and Tampa operate wastewater treatment systems that maintain about 96 percent of the capacity of the 12 systems identified in the ROI. The Pinellas County system (about 45 MGD capacity), St. Petersburg (about 68 MGD capacity), Clearwater (about 23 MGD capacity), and Largo (15 MGD capacity) all operate systems in Pinellas County. The Pinellas County system had 1990 average daily demands equal to 64 percent of capacity, while the St. Petersburg, Clearwater, and Largo systems had 1988 average daily demands equal to 74 percent, 65 percent, and 68 percent of capacity, respectively. Hillsborough County (about 25 MGD capacity) and Tampa (about 212 MGD capacity) had 1988 average daily demands equal to 67 percent and 29 percent of capacity, respectively. Pasco County's system (15 MGD capacity) experienced 1991 average daily demands equal to 80 percent of capacity.

All of the systems discussed above in Pinellas and Hillsborough counties are projected to have average daily demands of less than 78 percent of capacity in 1995 and less than 80 percent of capacity in 2000. The average daily demands on Pasco County's system are projected to equal about 83 percent of capacity in 1995 and 87 percent of capacity in 2000.

Three school districts provide public education services and facilities in the ROI. In 1990, these school districts ranged in enrollment size from 32,626 students in the Pasco School District to 120,364 students in the Hillsborough County School District. The school districts operated between 79 percent and 94 percent of capacity. The average pupil-to-teacher ratio for the ROI was 22:1, and expenditures averaged $4,261 per pupil. The statewide average pupil-to-teacher ratio was 23:1, and expenditures averaged $4,638 per pupil (FL Education, 1990).

Forty-six hospitals serve the three-county ROI, with the majority operating well below capacity (AHA, 1990). In 1990, a total of 4,483 physicians served the ROI. The physician-to-population ratio for the ROI was 2.3:1,000 and ranged from 1.2:1,000 in Pasco County to 2.5:1,000 in Hillsborough County. The national physician-to-population ratio for urban areas was 2.6:1,000 (AMA, 1990; DOC, 1991b).

Nine city, county, and state law enforcement agencies provide police protection in the ROI. In 1990, the largest law enforcement agency in the 3-county ROI was in Hillsborough County with 845 sworn officers, or 1.0 sworn officers per 1,000 persons. Other large agencies are in Pinellas County with 680 sworn officers (0.8 sworn officers per 1,000 persons) and in the city of St. Petersburg with 483 sworn officers (2.0 sworn officers per 1,000 persons). The average number of sworn officers in the ROI was 1.4 per 1,000 persons (FBI, 1991).

Seventeen fire departments and 2,064 regular and volunteer firefighters provided fire protection services in 1990. The principal municipal departments include both professional and volunteer staff. In 1990, the greatest staffing strengths were found in the fire departments in Hillsborough County (507 firefighters; 0.6 firefighters per 1,000 persons) and in Pinellas County (384 firefighters; 0.5 firefighters per 1,000 persons). The average number of firefighters in the ROI was 1.0 per 1,000 persons (Kapalczynski, 1988).

Local Transportation. Vehicular access to Pinellas is via Belcher Road (Pinellas County Road 501) to the east and Bryan Dairy Road (Pinellas County Road 296) to the south.

Estimated baseline traffic along segments providing access to Pinellas is projected to contribute to differing service level conditions in accordance with baseline population growth. All roadways that access the site would typically experience traffic congestion, with volumes exceeding the design capacity of each roadway. Along these roadways, a motorist's speed and ability to maneuver would be greatly restricted, and potential disruptions to the traffic flow could be caused by accidents or maintenance activities, resulting in considerable congestion. In addition, estimated baseline truck traffic into Pinellas for delivery of commercial supplies and removal of commercial wastes would typically average 30 trips per day. However, the additional traffic volumes associated with continued operation of Pinellas are relatively minor and would not substantially affect local transportation baseline conditions.

No major improvements are scheduled for those segments providing immediate access to Pinellas (FL DOT, 1991).

Other modes of transportation within the ROI include public transportation systems, railways, and waterways. Public transportation in Pinellas County is provided by the Pinellas Sun Coast Transit Authority. Railroad service in the ROI is provided by CSX Transportation. A single-track CSX Transportation line parallels the western border of Pinellas but does not access the site. Waterborne transport in the ROI is from the Gulf of Mexico through Tampa Bay. Two port facilities are located at St. Petersburg Harbor and Tampa Harbor (COE, 1991).

Tampa International and St. Petersburg-Clearwater International airports receive jet air passenger and cargo service from both national and local carriers. Numerous smaller private airports are located in the study area (DOT, 1991).

Environmental Consequences. The employment figures for construction and operations for the Proposed Action are given in table 3.3-1 in section 3.3. The Proposed Action would result in minor decreases in economic activity and employment in the ROI. Based on the employment requirements for the transferred functions from Pinellas, employment would decrease in the ROI by an estimated 4,200 jobs (1,450 direct and 2,750 indirect). This reduction in jobs would not increase the unemployment rate in the year 2000 beyond a projected baseline level of 5.4 percent. Earnings in the ROI would be reduced by about $142.4 million, with a related decrease in the total personal income of $204.6 million.

Table 4.1.7.7-1 summarizes the projected economic and population changes that would result from the Proposed Action. This project-related change would represent a slight population decrease of less than 1 percent from the projected ROI baseline of 2,255,000 persons. The city of Seminole would be the most affected with an estimated 2 percent loss in its projected population.

The less than 1 percent change in population after phasing out the nonnuclear functions would create an estimated 700 additional vacant housing units, which is less than 1 percent increase. The city of Seminole would be the most affected, but with a less than 2 percent increase in the number of vacant housing units.

TABLE 4.1.7.7-1.—*Pinellas Plant Proposed Action Economic and Population Characteristics*

Economics	2000 Peak Operation	Percent Under Baseline
Baseline Civilian Labor Force	1,188,649	NA
Baseline Unemployment Rate	5.4%	NA
Baseline Personal Income (Thousands $)	$51,496,890	NA
Baseline Per Capita Income ($/Person)	$22,837	NA
Baseline Employment	1,124,772	NA
Direct Jobs Lost	1,450	0.13
Indirect Jobs Lost	2,745	0.24
Out-Migrating Workforce	753	0.07
Total Out-Migration	1,910	0.08
Population Decrease		
Hillsborough County	86	0.01
Pasco County	69	0.02
Pinellas County	1,755	0.18
Clearwater	439	0.39
Largo	340	0.45
Pinellas Park	201	0.40
Seminole	201	1.90
St. Petersburg	573	0.21
ROI (County Total)	1,910	0.08

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Source: Estimated from Census, 1977, 1983, 1990a; DOC, 1990a and b, 1991a; FL Labor, 1991; DOE, 1992e.

The less than 1 percent estimated population loss would not adversely affect any community infrastructure and services in the ROI but would, instead, reduce the burden on the capacity of the existing systems. Existing public education and health care capacity burdens would also improve by reducing utilization. Current staffing levels for police and fire services in the ROI counties and cities would not be affected, and local traffic conditions would improve slightly.

4.1.7.8 *Waste Management*

Affected Environment. Discussion of the Pinellas waste management baseline is provided in section 3.2.3.3 and appendix A.3. Because there are no TRU wastes associated with any of the DP activities at Pinellas that would be phased out due to the Proposed Action, no further discussion of TRU waste generation or management is presented.

Generation of LLW, hazardous/toxic waste, and nonhazardous wastes at Pinellas is expected to decrease with time, as production operations are expected to be reduced. Additionally, Pinellas' Pollution Prevention Program would systematically reduce waste generation through specific waste projects and the use of process waste assessments.

Solid LLW generated in small quantities at Pinellas is temporarily stored onsite and shipped to the SRS burial site for final disposal.

Hazardous waste operations at Pinellas consist of storage and treatment units which meet RCRA and TSCA facility standards. All waste stream residue generated at Pinellas that is not reclaimed or recycled onsite is manifested and shipped under contract with RCRA-permitted transporters to RCRA-permitted offsite treatment and disposal facilities. There are no RCRA-permitted commercial facilities available to treat Pinellas' explosive wastes; therefore, open burn thermal treatment activities occur onsite for

reactive and Class C explosive materials. Pinellas is currently evaluating alternative treatment options for explosive wastes which are currently treated onsite.

Nonhazardous wastes are segregated and recycled whenever possible. Trash is taken to the local sanitary landfill. Pretreated industrial process wastewater and sanitary wastewater are discharged to the Pinellas County wastewater treatment facility in compliance with NPDES permit discharge limits.

Environmental Consequences. Phaseout of the DP mission at Pinellas would reduce annual onsite hazardous annual waste management by 2,400 lbs for DP operations. Over 50 percent of the reduction would be due to decreased generation, treatment, and disposal of wastewater sludge.

Phaseout of Pinellas would initiate closure of existing onsite RCRA hazardous waste storage facilities. Closure would comply with a detailed closure plan and schedule approved by the Florida Department of Environmental Regulations. Hazardous wastes in storage would be manifested and shipped under contract with RCRA-permitted transporters to RCRA-permitted treatment and disposal facilities. Equipment, structures, and soils (if contaminated) would also be decontaminated and disposed of in accordance with all applicable environmental regulatory requirements.

Existing inventories of LLW, mixed waste, and classified waste would be shipped offsite to DOE disposal facilities certified to accept such wastes.

Due to the phaseout of DP nonnuclear functions, Pinellas would no longer discharge pretreated industrial process wastewater effluents and sanitary wastewaters to the Pinellas County Sewer System.

Nonhazardous solid waste streams such as paper, cardboard, glass, wood, plastics, scrap, and metal containers would no longer continue to be generated. Trash that would have been disposed of in the local sanitary landfill by a commercial contractor would cease, extending the operating life of the local landfill.

4.1.7.9 *Human Health: Facility Operations and Accidents*

Affected Environment. Releases of chemical pollutants as a result of Pinellas operations are discussed in the Air and Water Resources sections (4.1.7.2 and 4.1.7.3, respectively). Exposures to members of the public associated with radiological releases are well below applicable permit, regulatory, and DOE operational requirements (PI DOE, 1991d).

A review of the recent annual environmental and accident reports for Pinellas indicates that there have been no significant adverse impacts to workers, members of the public, or the environment. This review was performed to provide an indication of the site's accident history. The time of the review (1986-1990) was a period during which plant operations were much higher than in the past year and higher than anticipated in the future.

Water from processes containing hazardous chemicals is not discharged directly into surface or groundwater that serve as potable water. Process water which may contain hazardous chemicals is treated before discharge to remove toxicants. Furthermore, all releases of the pollutants are below NPDES limits and water quality is not adversely affected. Thus, the primary pathway considered for possible worker or public exposure is the air pathway.

For Pinellas, all possible hazardous air pollutants were examined and the following chemicals were identified for further analysis based on their toxicity, concentration, and frequency of use: methylene chloride, 1,1,1-trichloroethane, trichloroethylene, and isopropyl alcohol. The Hazard Index, a summation of the Hazard Quotients for all chemicals, was calculated for the No Action alternative and the chemicals proposed to be added

(increment) at the site to yield cumulative levels for the site. A Hazard Index value of 1.0 or less means that no adverse human health effects are expected to occur. The existing Hazard Indexes for Pinellas (see table F5-19a in appendix F) were 0.225 for onsite (worker effects) and 0.224 at the site boundary (effect on the public) on an annual basis.

Two of the chemicals identified, methylene chloride and trichloroethylene, are considered to be carcinogens and the cancer risk for each was calculated. The combined risk to individuals for the carcinogens was calculated as 3.9 x 10-5 onsite and 3.7×10^{-5} at the site boundary (public) (see table F5-19b in appendix F).

Releases of radioactive materials from Pinellas result in a total maximum individual annual dose of 0.098 mrem effective dose equivalent (PI DOE, 1991b). The resulting risk of potential fatal cancers associated with 1 year of operations would be 4.4×10^{-8}.

Risks less than 10^{-6} are considered acceptable by EPA since this incidence of cancers cannot be distinguished from the normal cancer risk to an individual member of the general public. When risks are greater than 10^{-6}, appropriate measures are required to reduce the risks to less than 10^{-6}.

In summary, these analyses show that excess cancer risks to workers and members of the public can be expected from the normal releases of hazardous chemicals/chemical pollutants at Pinellas as a result of continued operations (No Action) unless mitigative actions such as substituting less toxic solvents or modifying production processes are implemented.

Environmental Consequences. Phasing out Pinellas operations would result in no additions of hazardous material to, but rather the transfer of operations from, Pinellas to other DOE sites. Consequently, phasing out would result in a decrease in adverse effects at Pinellas. The impacts at the DOE facilities that would receive the relocated functions from Pinellas are discussed in their respective sections. Phasing out DP functions at Pinellas would reduce or eliminate the mitigated cancer risks, which are expected to be below 10^{-6}.

4.1.8 Phasing Out Rocky Flats Plant

Detailed discussion of the Rocky Flats Plant's current missions, facility/process description, and waste treatment and management activities are provided in section 3.2.4. Discussions of the assumptions used in the EA for determining the affected environment and environmental consequences at RFP and the environmental assessment methodologies for each resource or issue discussed below is presented in the introduction to this chapter. Additional information on baseline conditions and environmental consequences of the Proposed Action, which supports the following discussion on the phaseout of RFP, is also provided in the chapter 4 introduction and section 4.1.

4.1.8.1 *Land Resources*

Affected Environment. RFP is located approximately 16 miles northwest of downtown Denver, Colorado (figure 3.2.4-1). Generalized land uses within RFP and in the immediate vicinity are shown in figure 4.1.8.1-1. Residential distribution of RFP employees is discussed in section 4.1.8.7. RFP contains two main types of land use: industrial and undeveloped. Production facilities, which occupy only 304 acres (about 6 percent of the site), are centrally located on the site in a fenced security area (RF Tab E-2, 1991). The primary function of the remaining 6,166 acres is that of a security buffer zone. Most of this area is open space; however, there are several other uses including 20 acres of production support facilities, 111 acres (55 acres developed, 56 acres future) of sanitary waste disposal, and 523 acres of aggregate and clay mining. Twenty-nine acres are presently being mined, 194 acres are expected to be mined over the next 20 years, and the remainder is on a 50-year lease. In addition to RFP facilities, the DOE Wind Energy Research Institute has facilities located in the extreme northwest corner of the site. There is no prime farmland within or in the vicinity of the RFP boundary. RFP does not contain any public recreation facilities.

Construction and operation of the DOE facilities has heavily disturbed the character of the landscape. The most dominant features on the site include two large stacks and a water tank. The facilities are brightly lit at night and highly visible from many areas within a 3- to 5-mile radius of the site. The area within the central security area is consistent with a Class 5 VRM designation. The remainder of RFP ranges from a Class 3 to Class 4.

Environmental Consequences. With implementation of the Proposed Action for nonnuclear consolidation RFP facilities would change from a DP mission to an environmental cleanup (see section 4.4). Land use within the RFP site would not change during the phaseout period; therefore, no onsite land use impacts are expected. Future use of RFP facilities would be determined as part of transition activities.

Phasing out DP nonnuclear missions at RFP would not adversely impact the comprehensive planning and zoning of Boulder and Jefferson Counties. A review of socioeconomic data in section 4.1.8.7 indicates no adverse impacts to regional recreational resources due to changes in employment at the plant. No construction or demolition activities are planned as part of phaseout; therefore, phaseout of RFP would not affect visual resources or VRM classifications.

4.1.8.2 *Air Quality and Acoustics*

Affected Environment. The climate at RFP and in the surrounding region is characterized as a dry climate, middle-latitude steppe (Trewartha, 1954), indicating mild, sunny, semiarid conditions with few temperature extremes. The annual average temperature at RFP is 50.3 °F; temperatures vary from an average daily minimum of 15.9 °F in January to an average daily maximum of 88.0 °F in July. The average annual precipitation at the RFP is approximately 15 inches (NOAA, 1991c).

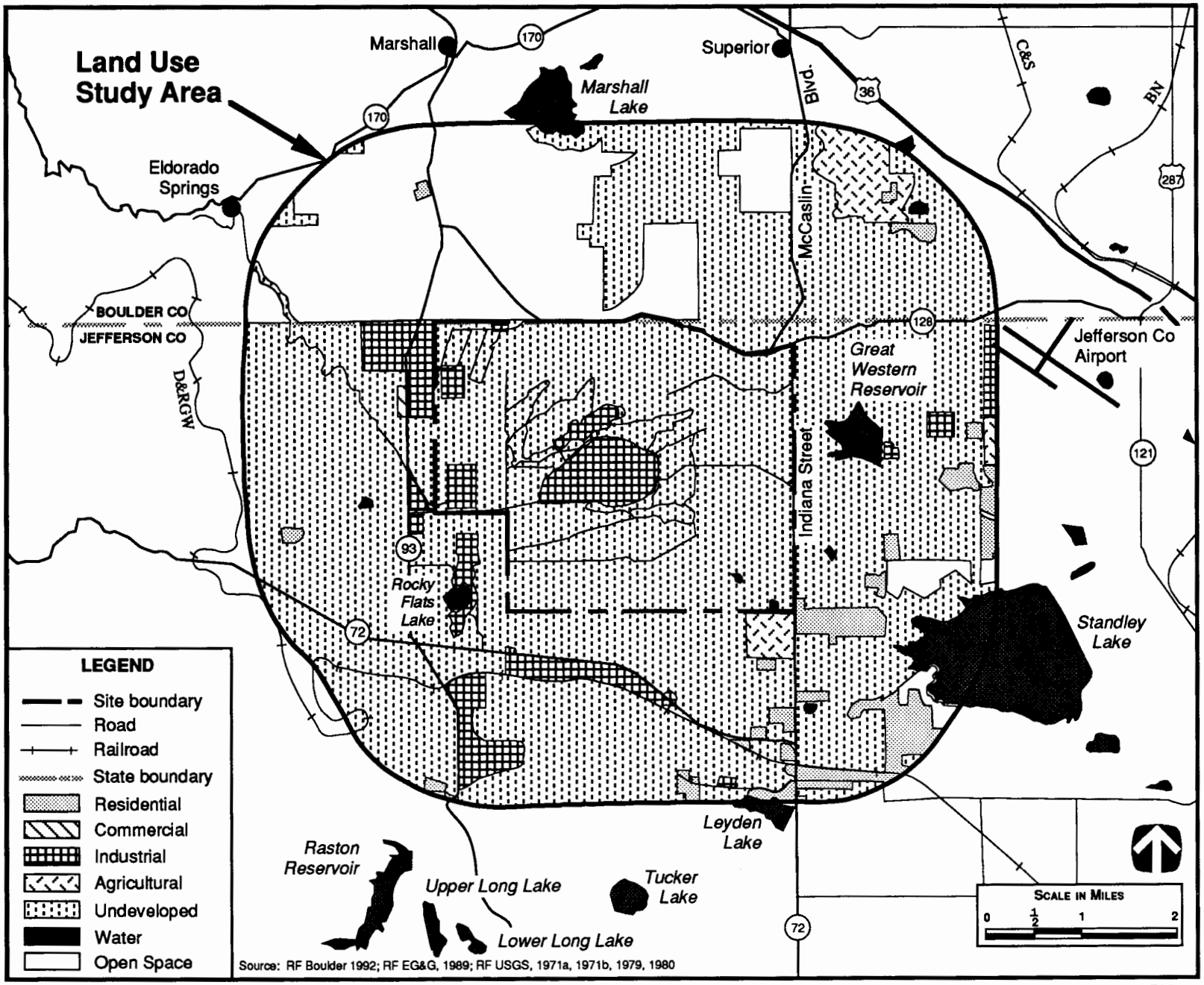

FIGURE 4.1.8.1-1—*Generalized Land Use at the Rocky Flats Plant and Vicinity.*

Ambient Air Quality. RFP is located within the Metropolitan Denver Intrastate AQCR. This AQCR is designated nonattainment with respect to the NAAQS for PM_{10}, O_3, and CO, and listed as attainment for SO_2 and NO_2 (40 CFR 81.306). The PM_{10} standard is exceeded primarily due to fugitive dust. The O_3 and CO standards are exceeded primarily due to vehicular traffic; this is typical of an urban area. The NAAQS and Colorado state ambient air quality standards are listed in table D2.1.1-1.

The Colorado Department of Health has standards for seven hazardous/toxic air pollutants. Five of these (asbestos, beryllium, mercury, benzene, and vinyl chloride) are regulated by NESHAP. The other two (lead and hydrogen sulfide) are not regulated under NESHAP. The Colorado Department of Health has not promulgated HAPs regulations for new sources. The HAPs/toxics described in this section are those currently used at RFP or those anticipated to be used under the RFP consolidation alternative.

RFP operates an ambient air quality monitoring station located near the east entrance of the plant (RF Rockwell, 1989). The data from this monitoring station are presented in table D2.1.4-1. To achieve a conservative estimate, the maximum background concentrations as measured from this station were used in the analysis. Note that the Colorado ozone standard was exceeded.

The principal sources of criteria pollutants at RFP are the steam plant boilers. Minor combustion sources include various small boilers and diesel generators. Other sources of criteria pollutants include coating operations and particulate matter from various manufacturing operations. The emission inventories for RFP are included in the table D2.1.4-2.

HAPs/toxics from various laboratories and manufacturing facilities include carbon tetrachloride, 1,1,1-trichloroethane, trichlorotrifluoroethane, ammonia, and trace quantities of other chemicals. Table D2.1.4-3 presents the RFP emissions inventory of HAPs/toxics.

Normal operations result in the emission of radioactive materials at RFP. These emissions would not be affected by the activities that are the subject of this EA.

Table 4.1.8.2-1 shows the air quality under ambient and No Action conditions at RFP. Ambient air quality monitoring data are listed as "maximum background concentration" and the air dispersion modeling results for existing operations are listed as "No Action concentration." The sum of the maximum background concentration and the No Action concentration for a given pollutant and averaging time is the baseline concentration. The baseline concentration was compared to applicable Federal and state pollutant limits to provide a conservative estimate of effects of the No Action alternative on air quality. With the exception of predicted concentrations of ozone and carbon tetrachloride, baseline concentrations from RFP do not exceed, and would not be expected to exceed, any applicable guidelines or regulations. (See section 4.1.8.9 for a discussion of the human health effects of carbon tetrachloride.)

The EPA-recommended Industrial Source Complex Short Term (ISCST) model was used to perform the air dispersion modeling analysis (EPA, 1987). A description of the modeling methodology is included in appendix D.

Acoustic Conditions. The major noise sources within RFP include various facilities, equipment, and machines (e.g., cooling towers, transformers, engines, pumps, boilers, steam vents, paging systems, construction and materials-handling equipment, and vehicles). No sound-level measurements have been made around RFP. At the site boundary, away from most of these industrial facilities, noise from these sources would be barely distinguishable from background noise levels. Thus, the acoustic environment along the RFP boundary and in the nearby residential areas away from traffic

TABLE 4.1.8.2-1.—*RFP Ambient and No Action Concentrations Comparison with Applicable Regulations and Guidelines*

Pollutant	Averaging Time	Most Stringent Regulation or Guideline ($\mu g/m^3$)	Maximum Background Concentration ($\mu g/m^3$)	No Action Concentration ($\mu g/m^3$)	Baseline Concentration ($\mu g/m^3$)
Carbon Monoxide (CO)	8-hour	10,000[b]	4,437	7.1	4,444
	1-hour	40,000[b]	11,108	13.8	11,122
Hydrogen Sulfide (H_2S)	1-hour	142	d	18.8	≥ 18.8
Lead (Pb)	Calendar Quarter	1.5[b]	0.12	e	0.12
	30-day	1.5[c]	d	e	d
Nitrogen Dioxide (NO_2)	Annual	100[b]	20.7	0.3	21
Ozone (O_3)	1-hour	160[c]	561.5	e	561.5
Particulate Matter (PM_{10})	Annual	50[b]	21.2	0.7[g]	21.9
	24-hour	150[b]	43.4	40.4[g]	83.8
Sulfur Dioxide (SO_2)	Annual	80[b]	13.1	0.2	13.3
	24-hour	365[b]	86.4	7.8	94.2
	3-hour	700[c]	120.4	13.5	133.9
Hazardous Air Pollutants and Other Toxic Compounds[a]					
1,1,1-Trichloroethane	30-day	h	d	0.42[f]	≥0.42
Acetone	Annual	h	d	0.003	≥0.003
Ammonia	Annual	h	d	0.2	≥0.2
Carbon Tetrachloride	Annual	h	d	0.76	≥0.76
Cyclohexane	Annual	h	d	0.002	≥0.002
Dioctyl Phthalate	Annual	h	d	0.004	≥0.004
Ethyl Alcohol	Annual	h	d	0.003	≥0.003
Ethylene Glycol	Annual	h	d	0.005	≥0.005
Hydrogen Chloride	Annual	h	d	0.04	≥0.04
Hydrogen Fluoride	Annual	h	d	0.12	≥0.12
Isopropyl Alcohol	Annual	h	d	0.003	≥0.003
Lead	Annual	h	d	0.004	≥0.004
Methylene Chloride	Annual	h	d	0.07	≥0.07
Nitric Acid	Annual	h	d	0.05	≥0.05
Trichlorotrifluoro-ethane	30-day	h	d	0.43[f]	≥0.43

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[a] Compounds listed are the major pollutants of concern (RF Tab F, 1992).
[b] Federal Standard (40 CFR 50).
[c] State standard (CO Health, 1989).
[d] Data unavailable.
[e] Not estimated because the potential release is negligible.
[f] Annual average concentration.
[g] It is assumed that all PM_{10} concentrations are TSP concentrations.
[h] No state standards.

noise is assumed to be that of a rural location with typical DNL in the range of 35 to 50 dBA (EPA, 1974). The primary source of noise at the site boundary and at nearby residences is traffic. Except for the prohibition of nuisance noise, neither the State of Colorado nor its local governments have established environmental noise standards applicable to RFP.

Noise levels at some residences along roads near RFP may exceed the EPA guidelines level for residential areas. The contribution to noise levels at nearby residences from sources at RFP is minor and not expected to contribute to any exceedance of the guideline levels.

Environmental Consequences.

Air Quality. Phasing out DP nonnuclear manufacturing operations at RFP would reduce emissions of criteria, hazardous, and toxic air pollutants. The air quality in the vicinity of RFP would likely improve with the elimination of pollutant sources.

Phasing out the DP nonnuclear missions at RFP would not reduce or eliminate emissions of radioactive materials. These emissions would not be affected by the activities that are the subject of this EA.

Acoustic Conditions. Phaseout would reduce staff levels and traffic volumes on nearby roads. A minor reduction in traffic noise levels would also result. However, some of this reduction is expected to be offset by traffic resulting from increases in other transition activities at RFP.

4.1.8.3 *Water Resources*

Affected Environment. This section describes the surface water and groundwater resources at RFP.

Surface Water. The primary streams in the plant area are Walnut Creek, North Walnut Creek, South Walnut Creek, and Woman Creek. The major hydrological features at RFP are depicted in figure 4.1.8.3-1. Rock Creek and Big Dry Creek tributary basins are not directly affected by RFP activities. Rock Creek has been maintained in an undisturbed condition since 1952 (RF EG&G, 1991d).

RFP lies on the divide between the two drainage basins of Walnut Creek and Woman Creek. North Walnut Creek and South Walnut Creek drain the central and northern areas of RFP, and Woman Creek drains the southern areas. The confluence of South and North Walnut Creeks forms Walnut Creek. Walnut Creek flows downstream from RFP and empties into the Broomfield Diversion Ditch. The Broomfield Diversion Ditch routes water around the Great Western Reservoir which is a public water supply. Woman Creek flows easterly across the southern portion of RFP into Standley Lake, which provides irrigation storage and municipal water for surrounding communities (RF EG&G, 1990a). All natural surface water flow on RFP occurs in ephemeral channels that flow only as a result of precipitation, discharge of site effluents, surface seeps, or release of water from storage areas west of the site to supplement water supplies in the Great Western Reservoir or Standley Lake (RF DOE, 1987). On North Walnut Creek, South Walnut Creek, and Woman Creek, a series of ponds serve to impound waters from the site. Along North Walnut Creek, the ponds are numbered A-1 through A-4; on South Walnut Creek, the ponds are numbered B-1 through B-5; and on Woman Creek, the ponds are numbered C-1 through C-2.

Wastewater from industrial processes is treated at a treatment plant which is isolated from other sources and does not discharge. Existing sanitary wastewater generation is estimated at approximately 71 MGY (table 3.2.4-2). Sanitary wastewater is treated and discharged to Pond B-3. Stormwater runoff from the plant is conveyed in storm sewers which discharge to creeks on the undeveloped portion of the site (RF EG&G, 1992a). Discharges from Ponds A-3, A-4, B-3, B-5, and C-2 are monitored under the NPDES permit program.

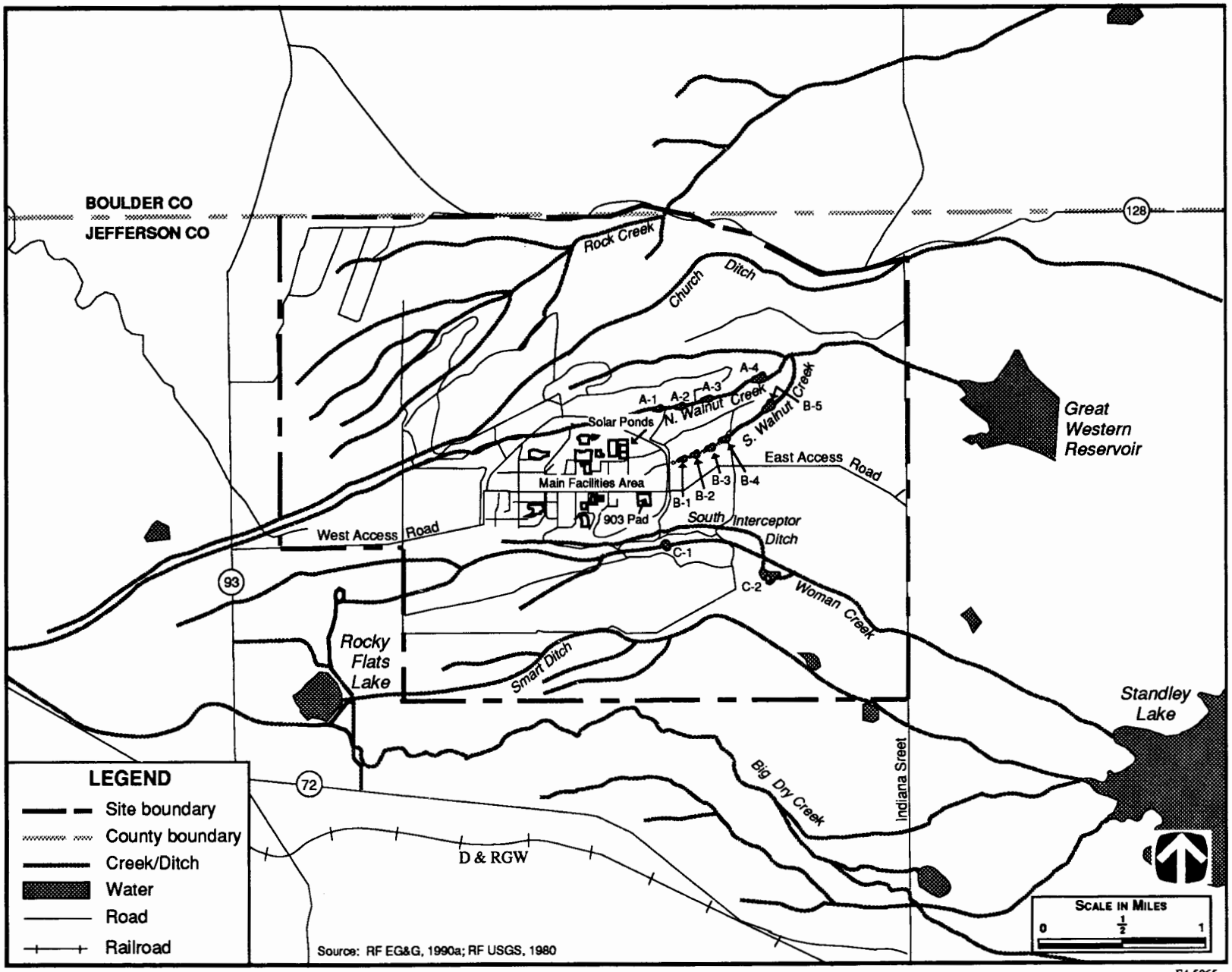

FIGURE 4.1.8.3-1—*Surface Water Features at the Rocky Flats Plant.*

Terminal Ponds (A-4, B-5, and C-2) are designed to capture the flow from a 100-year storm if maintained at less than 10 percent of capacity. However, RFP has been unable to maintain the 10 percent capacity limit due to the treatment of large quantities of water and delays in receiving approval for certain discharges (RF EG&G, 1991a).

The primary source of flood potential at RFP is from flash flooding in seasonal streams. Of these, Woman Creek and North and South Walnut Creek drain the part of the site occupied by plant facilities (DOE, 1988). South Walnut Creek drains a small part of the eastern side of the plant towards the confluence with North Walnut Creek. The site would not be affected by the 500-year floodplain of Woman Creek; however, some portions of RFP may lie within the 500-year floodplain of Walnut Creek. A 1988 study identified Walnut Creek as the principal stream for flooding; this study, however, determined that the probability of danger to RFP from flooding was low (DOE, 1988).

RFP does not withdraw any water from streams on or near the site. All water for the plant is obtained from surface waters from the city of Denver via the South Boulder Diversion Canal and Ralston Reservoir. The water supply contract with the City and County of Denver through the Denver Water Board is for an unguaranteed supply of up to 1.5 MGD (RF DOE, 1991c). This allocation is subject to change if a conflict occurs with the future water supply needs of Denver (RF EG&G, 1991d). The current average water consumption is approximately 0.32 MGD (table 3.2.4-3). Raw water is stored in a 1.5 million gallon storage pond located west of the plant (RF DOE, 1987).

Surface Water Quality. Revised surface water classifications and standards for RFP streams were adopted by the Colorado Water Quality Control Commission in January 1990 (RF DOE, 1991c). These standards were enacted in response to concerns raised after the 1989 FBI/EPA investigation of environmental violations and a chromic acid spill (RF EG&G, 1991d). The new water quality stream standards are not yet reflected in the RFP NPDES permit (RF EG&G, 1991a).

The surface water from Woman Creek, North Walnut Creek, and South Walnut Creek flows into ponds that restrict offsite discharges and allow water testing and, if necessary, treatment to meet water quality standards (RF EG&G, 1991e). Treatment consists of filtration and carbon absorption to reduce potential radionuclides and organic chemical contaminants. Treatment facilities exist at each of the primary release ponds, Ponds A-4, B-5, and C-2 (RF EG&G, 1990a). Water is released from Ponds A-4 and B-5 to Walnut Creek and from Pond C-2 water is transferred to the Broomfield Diversion Ditch located east of the plant boundary, or in an emergency, to Ponds A-4 or B-5, with concurrence from the Colorado Department of Health.

Discharges from Ponds A-4 and B-5 enter Walnut Creek and are diverted around the Great Western Reservoir by the Broomfield diversion ditch. Water is discharged untreated from Pond C-2 through an 8,000-foot pipeline into the Broomfield diversion ditch and around the Great Western Reservoir (RF EG&G, 1990a). The release of untreated discharge from C-2 has been approved by EPA because sampling indicates that the discharge meets all Woman Creek standards except for gross beta. The gross beta standards for Walnut Creek, the eventual destination of the piped discharge, are higher, and no standard is violated (RF EG&G, 1991e).

A surface water control pond exists immediately downstream and downgradient of the landfill and current waste disposal operations at the eastern end of the landfill. The landfill is considered a hazardous waste management landfill due to disposal in the past of some materials that may now qualify as regulated hazardous wastes (RF EG&G, 1991e). The landfill pond routinely exceeds the RFP standard for strontium and has exceeded standards for copper, iron, lithium, manganese, mercury, nickel, plutonium, and zinc (RF EG&G, 1991a). The landfill pond does not discharge to natural surface waters.

In 1990, RFP did not comply with NPDES permit limits for biochemical oxygen demand in May, June, and September and for fecal coliform in August. All noncompliances were communicated to DOE as soon as the data became available. DOE notified EPA by telephone and followed up with written details. No Notices of Violation were issued by EPA in 1990 for these noncompliances (RF EG&G, 1991e). Also, the 1989 Environmental Audit states that the leach fields are inadequate and sewage emerges on the surface and has flowed to nearby streams (RF DOE, 1989).

Water quality monitoring results for Walnut Creek and Woman Creek are presented in table 4.1.8.3-1. These results indicate that concentrations were less than the water quality criteria listed, except in the case of beryllium, which exceeds Federal drinking water regulations.

Groundwater. Two hydraulically connected groundwater systems are present at RFP. The upper unit exists as an unconfined aquifer and the lower unit exists as a confined aquifer.

The unconfined aquifer at RFP is primarily unconsolidated alluvial material. The depth to the water table becomes shallower from 50 to 70 feet toward the east as the alluvial material thins. Seeps are common along stream drainages. Groundwater flow direction is generally toward the east (RF EG&G, 1991f).

Recharge to the unconfined aquifer occurs from infiltration of precipitation and as seepage from ditches, creeks, and ponds. In addition, retention ponds along South Walnut and Woman Creeks probably recharge this unit.

In the confined aquifer, groundwater is in the sandstone lenses below most of the plant. Flow within the sandstones is assumed to be from west to east (RF Hydro-Search, 1985). In some places, the sandstones are in contact with the alluvium so that the unit is part of the unconfined system at those places. Recharge to the sandstones occurs where they are in direct contact with the alluvium and valley fill of the upper aquifer or by leakage through claystones in contact with alluvium. The sandstone units discharge along the South Platte River, about 18 miles east of RFP.

Groundwater Quality. Groundwater monitoring has been conducted at RFP since 1960. Currently, 371 wells characterize the hydrogeology and groundwater quality of RFP. Groundwater quality in uncontaminated portions in surficial materials (alluvium, colluvium, valley fill, and weathered bedrock) is relatively good and can be classified as calcium bicarbonate water. The unweathered bedrock groundwater system can be distinguished from the surficial system by relatively higher sodium and sulfate content (DOE, 1989). Table 4.1.8.3-2 shows groundwater quality of the aquifer beneath the proposed area.

The unconfined aquifer contains both radiological and nonradiological contaminants. To date, no contaminants have been found in the confined aquifer.

There are five known contaminant plumes located at RFP (figure 4.1.8.3-2). The first plume is associated with the solar evaporation ponds which were used to store radioactive/hazardous waste. The main contamination from this plume lies beneath Buildings 207A and 207B. Groundwater quality data from 1991 indicate that the solar ponds contributed nitrate/nitrite, sodium, total dissolved solids, sulfate, radionuclides, and VOCs to the groundwater in surficial material and weathered bedrock immediately north, east, and southeast of the ponds. The radionuclides include tritium, radium, strontium-89 and -90, and uranium-233, -234, -235, and -238.

The second plume is associated with the West Spray Area with primary contamination occurring in the western portion of the RFP buffer zone. This plume does not lie beneath buildings that house DOE DP nonnuclear activities.

TABLE 4.1.8.3–1.—*Summary of Surface Water Quality Monitoring at Rocky Flats Plant*

Parameter	Unit of Measure	Water Quality Criteria	Existing Water Body Concentration[f]	
			Average	Maximum
Receiving Water: Walnut Creek—1989/90				
Americium–241	pCi/L	0.05[a]	0.0015	0.003
Beryllium[e]	mg/L	0.004[b]	0.005	0.005
Copper	mg/L	1[c]	0.019	0.025
Gross Alpha	pCi/L	11[a]	4.1	5.3
Gross Beta	pCi/L	19[a]	6.4	9.2
Lead	mg/L	0.015[b]	0.005	0.005
Plutonium–239	pCi/L	1.2[d]	0.005	0.01
Tritium	pCi/L	500[a]	30	50
Uranium–233, 234	pCi/L	10[a]	1.89	3.4
Uranium–235	pCi/L	10[a]	0.15	0.3
Uranium–238	pCi/L	10[a]	2.02	2.86
Total Dissolved Solids	mg/L	500[c]	270	270
Receiving Water: Woman Creek—1989/90				
Americium–241	pCi/L	0.05[a]	0.0	0.0
Beryllium[e]	mg/L	0.004[b]	0.0046	0.005
Copper	mg/L	1[c]	0.0266	0.0363
Gross Alpha	pCi/L	7[a]	<1	<1
Gross Beta	pCi/L	5[a]	4	4
Lead[e]	mg/L	0.015[b]	0.007	0.025
Plutonium–239	pCi/L	1.2[d]	0.0	0.0
Tritium	pCi/L	500[a]	<20	<20
Uranium–233, 234	pCi/L	5[a]	1.1	1.1
Uranium–235	pCi/L	5[a]	0.0	0.0
Uranium–238	pCi/L	5[a]	0.6	0.6
Total Dissolved Solids	mg/L	500[c]	287	300

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[a] Colorado state water quality standards, specific for Walnut and Woman Creeks.
[b] Maximum Contaminant Level (MCL), EPA National Primary Drinking Water Regulations, 40 CFR 141.
[c] Secondary Maximum Contaminant Level (SMCL), EPA National Secondary Drinking Water Regulations, 40 CFR 143.
[d] U.S. Department of Energy Derived Concentration Guides (DCGs) for Water (DOE Order 5400.5) DCG values are based on a committed effective dose of 100 millirem per year; however, because the drinking water MCL is based on 4 millirem per year, the number listed is 4 percent of the DCG.
[e] Concentration exceeded water quality criteria; however, these criteria are listed for comparison only. Water quality standards do not affect plant activities until they are translated into end-of-pipe effluent limitations imposed on discharges through the NPDES permitting process. Similarly, drinking water standards and DOE DCGs are listed to provide an understanding of an undesirable concentration for those parameters not covered by water quality standards—they do not constitute an enforceable limit.
[f] Less than symbol (<) indicates concentration below analysis detection limit.

Source: RF EG&G, 1990a. (Radiological data from table 9-1; nonradiological data from table 9-18.)

TABLE 4.1.8.3–2.—*Summary of Groundwater Quality Monitoring, Rocky Flats Plant*

Parameter	Unit of Measure	Water Quality Criteria	1991—Existing Conditions[c]		
			Well No. 4986	Well No. 110889	Well No. 110989
1,1,1-Trichloroethane	mg/L	0.2[a]	NA	0.0050	0.0050
1,1,2-Trichloroethane	mg/L	0.005[a]	NA	0.0050	0.0050
1,2-Dichloroethane	mg/L	0.005[a]	NA	0.0050	0.0050
Beryllium	mg/L	0.004[a]	0.002-0.005	0.001	NA
Cadmium	mg/L	0.005[a]	0.002-0.005	0.005	NA
Copper	mg/L	1.0[d]	0.0056-0.02	0.0172	NA
Gross Alpha	pCi/L	15[a]	-0.05-7.4	-0.5-2.1	0.3-1.06
Gross Beta	pCi/L	50[a]	-0.19-8.3	0.5-2.9	1.7-3.3
Lead	mg/L	0.015[a]	0.0006-0.0007	0.0021	NA
Radium–229	pCi/L	e	0.067	NA	NA
Strontium–89, 90	pCi/L	e	0.08-0.26	0.2-0.38	0.46-0.56
Total Dissolved Solids	mg/L	500[d]	10-430	170	160-190
Trichloroethylene	mg/L	0.005[a]	NA	0.0050	0.0050
Tritium	pCi/L	20,000[a]	-15-231	8-788	-116-271
Uranium–233, 234	pCi/L	20[b]	0.075-2.0	0-4.6	0.11-0.38
Uranium–235	pCi/L	24[b]	0-1.6	0-0.12	-0.01-0.03
Uranium–238	pCi/L	24[b]	NA	0.03-0.48	0.07-0.25
Vinyl Chloride	mg/L	0.002[a]	NA	0.0100	0.0100

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[a] National Primary Drinking Water Regulations, Maximum Contaminant Level (MCL), 40 CFR 141.
[b] U.S., 4 percent of DOE Derived Concentration Guides (DCGs) for Water (DOE Order 5400.5).
[c] Wells are located in the area of the proposed Mechanical Technology Building, Office Manufacturing Building, and surface parking sites.
[d] National Secondary Drinking Water Regulations, Secondary Maximum Contaminant Level (SMCL), 40 CFR 143.
[e] No specified limit.

NA Not available.

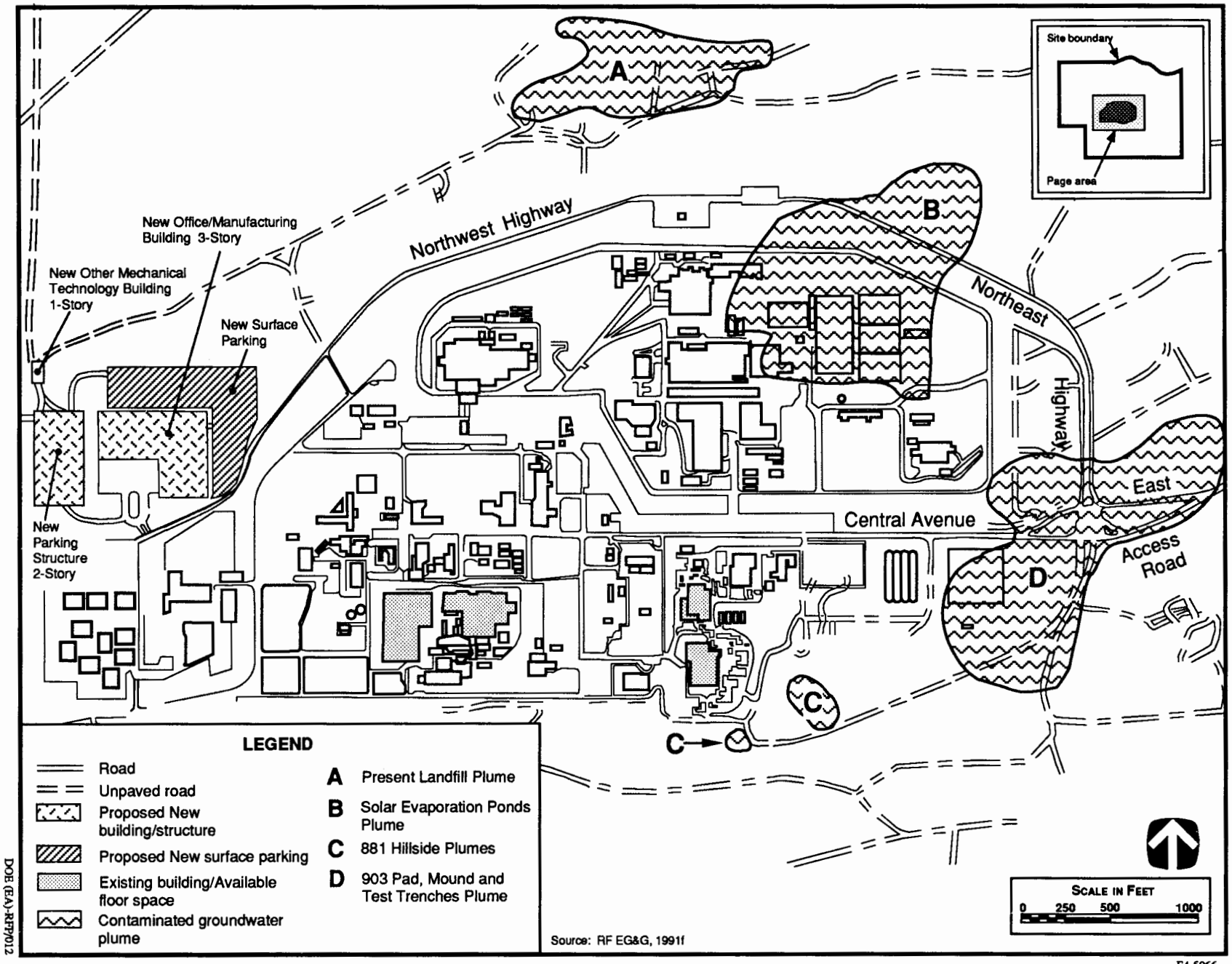
Source: RF EG&G, 1991e.

The third plume is associated with the present landfill and is located at the western end of North Walnut Creek. The plume does not lie beneath buildings that house DOE DP nonnuclear activities. However, the contaminants in this area have reached the North Walnut Creek drainage. The plume contains inorganic analytes, dissolved metals, dissolved radionuclides, VOCs, and nitrate/nitrite above standard levels.

The fourth plume is the 881 Hillside plume, located in the south-central portion of the RFP in the shallow groundwater system. This plume does not lie beneath any buildings housing DOE DP nonnuclear activities.

The fifth plume, the 903 Pad, Mound, and Trench plume, is located in the southeast central portion of RFP. The 903 Pad and the Mound areas were historically used for storage and burial respectively, of radioactively contaminated wastes. The plume does not lie beneath buildings that house DOE DP nonnuclear activities. Remediation of all plumes is being addressed as part of the RFP environmental restoration program.

Groundwater Use. At the present time, no groundwater is used by the facility. However, the plant is attempting to have one water supply well permitted for research use.



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E4 5066

FIGURE 4.1.8.3-2—*Groundwater Contamination at the Rocky Flats Plant.*

Groundwater Rights and Permits. In general, the rights to groundwater resources in Colorado are unrelated to ownership of the land under which those groundwater resources are located. However, for the Denver Basin Aquifers, which include the lower aquifers at the RFP, the right to groundwater resources derives from land ownership as long as the water is not tributary to any surface water supplies.

Environmental Consequences. Phaseout activities at RFP would not involve any new construction, instead, all current nonnuclear manufacturing operations would cease.

Surface Water. The transfer would result in an incremental decrease in the total wastewater stream volume handled by the plant. With reduced wastewater discharges, the RFP Terminal Ponds may be able to operate at design capacity to capture the flow from a 100-year storm. No impact to flow and water quality of Walnut and Woman Creeks would result.

Surface Water Quality. Since surface water discharges would be reduced there would be no adverse impact to water quality from phaseout activities.

Groundwater. Since RFP does not withdraw groundwater, there would be no impact on the availability of this resource.

Groundwater Quality. A minor beneficial impact on groundwater resources would occur due to less potential for degradation of water quality from DP nonnuclear activities. However, all other nuclear functions would continue as presently planned.

Spill protection systems and plans exist to contain and minimize effects of releases of hazardous substances during phaseout activities. Given normal safeguards and procedures, no adverse impact to groundwater quality is expected to result from transition activities associated with the phaseout of RFP nonnuclear functions.

4.1.8.4 *Geology and Soils*

Affected Environment. RFP lies on the west flank of the Denver Basin, (RF EG&G, 1991b). The plant is located on the gently eastward-sloping plain east of the foothills of the Front Range of the Rocky Mountains. The site is on rock layers that dip east at a low angle. A short distance to the west, the stratigraphic sequence turns sharply upwards, forming a series of rock outcrops along the mountain front (RF EG&G, 1991b).

RFP is in an area of low seismicity and lies in Seismic Zone 1 (UBC, 1991). No capable faults are present in the immediate vicinity of the plant. The main faulting in the area is along the Front Range. Occasional earthquakes with maximum intensities of V to VI occur in Colorado, with the larger ones restricted to the west end of the state. Seismic activity poses little or no threat.

Small landslides and other mass movements are present where slopes exist; however, slopes are not steep and mass movements are limited in scale.

RFP is underlain by soils of the Denver-Kutch and Flatirons-Veldcamp soil associations (RF USDA, 1980). Erosion potential of the Denver-Kutch soils is low to moderate and the shrink-swell potential is moderate to high. The Flatirons-Veldcamp soils do not pose an erosion hazard, and their shrink-swell potential is low to moderate. Some soils in the Denver-Kutch association located on RFP could be considered prime farmland if irrigated (RF USDA, 1980). However, they are not irrigated and, therefore, are not designated as prime farmland.

Air-distributed plutonium-239 has settled over the land surface at RFP due to past operation activities, contaminating the surface layer of soils to depths of up to about 12 inches. Soil sampling is conducted to detect and monitor contamination with radioactive material on and from RFP, and permanent soil-sampling sites have been set up around the perimeter of the plant. Because radiation levels above those occurring naturally have been found to the east and

southeast of the main RFP complex, DOE has carried out and currently supports remediation actions to remove or decrease soil contamination (RF DOE, 1992b).

Environmental Consequences. The proposed phaseout of DP nonnuclear missions at RFP would result in no impact on geologic features of the area, nor would the geology have any impact on phaseout activities at the plant.

Hazardous, radioactive, and mixed waste sources would be eliminated from portions of the plant, thus decreasing future soil contamination potential. The proposed phaseout of DP nonnuclear functions at RFP would result in no impact on the soils of the area.

4.1.8.5 *Biotic Resources*

Affected Environment. Other than the central developed area of approximately 400 acres, most of RFP is managed as an undeveloped security buffer zone (section 4.1.8.1) supporting natural vegetation that is excluded from human activity. Vegetation in the undeveloped buffer areas is representative of tall grass prairie, short grass plains, lower montane, and foothill ravine regions (RF DOE, 1980 and 1991a). The undeveloped buffer areas are closed to the grazing that is prevalent on grasslands in the vicinity of the RFP site. Many areas that formerly supported annual weed communities (due to grazing prior to DOE acquisition) now support perennial grassland (RF DOE, 1991a). Wildlife in the undeveloped buffer areas is typical of similar grassland habitats in the surrounding region (RF DOE 1991a).

Wetlands within the RFP site have been mapped and verified by the COE. Wetlands include an open lake, ponds, intermittent stream channels, ditches, and hillside seeps (RF EG&G, 1990b; RF FWS, 1975). These wetlands are classified in the lacustrine, riverine, and palustrine systems by the FWS (RF FWS, 1975).

Four intermittent streams that provide habitat for aquatic biota occur within the boundaries of RFP: Rock Creek, Woman Creek, and North and South Walnut Creeks (figure 4.1.8.3-1) (RF DOE, 1980; RF Rockwell, 1986a). Woman Creek supports an aquatic biota typical of small, high-prairie streams receiving minimal agricultural runoff and domestic and industrial wastes (RF DOE, 1980).

A comprehensive survey for threatened and endangered species has been recently completed for RFP (RF EG&G, 1991c). Suitable habitat for the diluvium lady's-tresses orchid (*Spiranthes diluvialis*) (a Federally-listed threatened species) occurs on RFP. The bald eagle (*Haliaeetus leucocephalus*) (a Federally-listed endangered species) is known to winter on large water bodies in the vicinity of RFP, and the peregrine falcon (*Falco peregrinus*) (a Federally-listed endangered species) has been sighted on RFP. The ferruginous hawk (*Buteo regalis*) and the Preble's meadow jumping mouse (*Zapus hudsonius preble*) (both Federally-listed Candidate 2 species) have also been observed on RFP and may breed there. Portions of a prairie dog colony extend across RFP's northern boundary and could provide suitable habitat for the black-footed ferret (*Mustele nigripes*) (a Federally-listed endangered species). However, the occurrence of the black-footed ferret is not likely (RF EG&G, 1991c). DOE has initiated consultations with the Colorado Department of Natural Resources concerning the potential occurrence of state-listed threatened and endangered species.

Environmental Consequences. Phasing out DP nonnuclear functions at RFP under the Proposed Action would not adversely affect biotic resources. Phaseout of these missions would result in a reduction of existing operational impacts to natural habitats on and around the site.

4.1.8.6 *Cultural Resources*

Affected Environment. The prehistoric chronology of the Rocky Flats area consists of four broad time

periods (RF Cassells, 1983; RF EG&G, 1991d): Paleoindian (10,000-5500 B.C.), Archaic (5500 B.C.-A.D. 1), Ceramic (A.D. 1-1550), and Protohistoric (A.D. 1550-1800). Prehistoric site types that occur in the area include teepee ring sites, camps, quarries, hunting stations, plant processing sites, and buffalo kill and butchering sites. Three surveys have been conducted at RFP covering all of the undisturbed portions of the facility (RF Burney, 1989; RF Cassells, 1983; RF EG&G, 1991d). No prehistoric sites were identified; however, two sites with rock alignments and four isolated cairns were recorded and are most likely prehistoric (RF Burney, 1989; RF Tab E-2, 1991). The two sites have not been evaluated to determine their NRHP eligibility; therefore, these sites are considered potentially NRHP-eligible pending additional work. The four isolated cairns are not considered NRHP-eligible (RF Burney, 1989; RF EG&G, 1991d).

The history of the region has been previously documented (RF Burney, 1989; RF EG&G, 1991d). Most of the historic resources in the area are archaeological sites or standing structures associated with ranching or transportation routes. Historic site types in the vicinity include trails, railroad grades, homesteads, cattle camps, line shacks, ranch complexes, irrigation ditches, stock ponds, and windmills. All undisturbed portions of RFP have been intensively surveyed; 35 historic sites and 4 isolated rock features have been recorded (RF Burney, 1989; RF EG&G, 1991d). The historic sites include a railroad grade, stock ponds and tanks, irrigation ditches, corrals, a fence, a dump, a spring house, and homesteads. None of the historic sites or features has been recommended as eligible for the NRHP (RF Burney, 1989; RF EG&G, 1991d).

The Santa Fe Office of the AEC selected the Denver area in 1951 for a new fabrication facility, and operations at Rocky Flats were initiated in 1953 (RF EG&G, 1991d). Most of the RFP facilities were constructed in the early 1950's and have since been modified and refurbished. The existing facilities are not likely to be considered NRHP-eligible because they lack architectural integrity, are not representative of a particular style, and are not contributing features to the broad theme of the Manhattan Project and initial nuclear production.

Several Native American groups, including Plains Apache, Comanche, Ute, Arapaho, and Cheyenne, historically occupied or traversed the foothills area around RFP. Important sites, such as burials or vision quest locations, may be of concern to Native American groups. Several unidentified rock features and alignments have been recorded on RFP and may also be of concern to Native American groups. Consultation with the Comanche, Cheyenne, Arapaho, Southern Ute, Ute, Mountain Ute, and Apache tribes has been initiated by DOE. Important Native American resources may be identified through consultation.

Environmental Consequences. The phasing out of nonnuclear functions at RFP does not include ground disturbance or building modifications and, therefore, would not affect cultural resources.

4.1.8.7 *Socioeconomics and Community Services*

Affected Environment. The discussion of socioeconomics and community services at RFP is based on the ROI where 93 percent of the RFP employees lived in 1991. The ROI includes Adams (18 percent), Arapahoe (5 percent), Boulder (24 percent), Denver (8 percent), and Jefferson (38 percent) counties in Colorado. Within these ROI counties, the following key cities have been included in the Affected Environment and Environmental Consequences discussions: Arvada (16 percent), Boulder (6 percent), Broomfield (8 percent), Golden (5 percent), and Westminster (8 percent). (See figure 3.2.4-1.)

Assumptions, methodologies, and supporting data for the assessment of environmental consequences are presented in appendix E. Tables E3.8-1 through E3.8-5 give ROI resource information on the following: residential distribution of plant

employees, regional economic and population growth indicators, housing characteristics, primary municipal water and wastewater systems, education characteristics, and local transportation.

Employment and Local Economy. The civilian labor force in the ROI grew 97 percent, increasing from 511,935 persons in 1970 to 1,009,650 persons in 1990. Total employment increased from 492,961 to 964,447 persons between 1970 and 1990, an annual growth rate of 3 percent. The unemployment rates for 1970 and 1990 were 3.7 percent and 4.5 percent, respectively. For the same years, personal income increased from approximately $5.6 billion to $35.8 billion (an annual average of 10 percent), and per capita income increased from $4,503 to $20,006.

Between 1970 and 1990, employment at RFP increased from 3,805 to 6,780 persons, representing less than 1 percent of the ROI employment in 1990 (RF Tab J, 1992). As of September 30, 1992, employment at RFP had increased to 7,299 persons (DOE, 1992e). Under the No Action alternative, future site employment would be expected to increase to approximately 7,455 persons by the year 2000 (DOE, 1992e). In 1990, the total RFP payroll was estimated to be about $273.1 million (RF DOE, 1992g). Under the No Action baseline, the total payroll would be projected to be approximately $300 million by the year 2000.

The civilian labor force is projected to grow at less than 1 percent annually, reaching an estimated 1,205,000 persons by 2000 and 1,283,000 persons by 2020. The unemployment rates for 2000 and 2020 are both projected to be 5.6 percent. For the same years, personal income is projected to increase from approximately $51.8 billion to $67.7 billion, an annual average of 1 percent. Per capita income is projected to increase from an estimated $25,000 in 2000 to $28,000 in 2020.

Population. Between 1970 and 1990, the population in the ROI increased 45 percent to 1,787,928 persons. During the same period, the Colorado population increased 49 percent. The population in the 5-county ROI is projected to increase from an estimated 2,100,000 persons in 2000 to 2,390,000 persons by 2020, an annual rate of 1 percent.

The largest county population increase (137 percent) occurred in Arapahoe County between 1970 and 1990, while the population in Denver County declined 9 percent. During the same period, population in Jefferson County increased 88 percent. Population in Arapahoe County is estimated to increase 16 percent between 1990 and 2000 and 14 percent between 2000 and 2020, an annual growth rate of less than 1 percent. The Denver County population is projected to increase approximately 22 percent between 1990 and 2000 and 14 percent between 2000 and 2020, an annual growth rate of 1 percent. The population in Jefferson County is expected to increase approximately 14 percent by 2000 and an additional 14 percent by 2020, an annual growth rate of less than 1 percent.

Between 1970 and 1990, Westminster had the greatest increase in city population (284 percent) in the ROI. For the same years, the populations in Arvada, Boulder, Broomfield, and Golden increased 86 percent, 25 percent, 239 percent, and 34 percent, respectively.

Housing. Between 1970 and 1990, the number of housing units in the ROI increased 92 percent from 410,529 to 788,480 units. Concurrent with population growth in the ROI, housing units are expected to increase approximately 18 percent by the year 2000 and an additional 14 percent by 2020, an annual increase of about 1 percent.

Between 1970 and 1990, the largest increase in housing units (245 percent) occurred in Arapahoe County, while the smallest increase (24 percent) occurred in Denver County. Housing units in Arapahoe County are expected to increase approximately 19 percent by 2000 and an additional 14 percent by 2020, an annual increase of 1 percent. Housing units in Denver County are expected to increase about 5 percent by 2000 and an additional

14 percent by 2020, an annual increase of less than 1 percent.

In 1990, the homeowner vacancy rates averaged 3 percent in the ROI and ranged from approximately 2 percent in Boulder County to 4 percent in Denver County. The vacancy rates for rental units averaged 11 percent and ranged from about 5 percent in Boulder County to 14 percent in Adams County.

Community Infrastructure and Services. Thornton, Westminster, Northglenn, Brighton, South Adams County Water and Sewer District, Aurora, Englewood, Boulder, Longmont, Broomfield, Lafayette, Denver, Arvada, and Golden all operate water supply systems in the ROI. All of these systems draw their raw water supplies from surface water, except Brighton and the South Adams County Water and Sewer District which utilize groundwater supplies.

In Adams County, the systems operated by Thornton (50 MGD capacity), Northglenn (15 MGD capacity), Brighton (12 MGD capacity), and South Adams County Water and Sewer District (15.5 MGD capacity) had 1989 average daily demands of less than 29 percent of capacity. Westminster's system (36 MGD capacity), also in Adams County, had 1989 average daily demands equal to 64 percent of capacity. The Aurora (130 MGD capacity) and Englewood (34 MGD capacity) systems in Arapahoe County experienced 1989 average daily demands equal to 31 percent and 24 percent of capacity, respectively. Water supply systems in the cities of Boulder (55 MGD capacity), Longmont (50 MGD capacity), Broomfield (8 MGD capacity), and Lafayette (8 MGD capacity) in Boulder County all had 1989 average daily demands of less than 38 percent of capacity. The Denver Water Board system (715 MGD capacity) had 1989 average daily demands equal to 30 percent of capacity. The systems operated by Arvada (52 MGD capacity) and Golden (15 MGD capacity) in Jefferson County had 1989 average daily demands equal to 30 percent and 23 percent of capacity, respectively.

Westminster's system is projected to have average daily demands equal to 67 percent of capacity in 1995 and 70 percent of capacity in the year 2000. All of the other systems are projected to experience average daily demands of less than 41 percent of capacity in 1995 and less than 46 percent of capacity in 2000.

Westminster, Northglenn, Brighton, South Adams County Water and Sewer District, Aurora, Englewood, Boulder, Broomfield, Lafayette, Longmont, and Denver operate wastewater treatment systems in the ROI. Westminster (5.5 MGD capacity), Northglenn (6.5 MGD capacity), Brighton (about 2.6 MGD capacity), and South Adams County Water and Sewer District (4 MGD capacity) in Adams County experienced 1989 average daily demands equal to 76 percent, 48 percent, 67 percent, and 65 percent of capacity, respectively. Englewood's system (35 MGD capacity) in Arapahoe County experienced 1989 average daily demands equal to 66 percent of capacity. Aurora (2.5 MGD capacity), also in Arapahoe County, operates its system near capacity (92 percent in 1989) but utilizes Denver's system to treat approximately 90 percent of its wastewater. The cities of Boulder (16 MGD capacity), Longmont (about 11.6 MGD capacity), Broomfield (5.4 MGD capacity), and Lafayette (1.8 MGD capacity) all operate systems in Boulder County. Longmont, Broomfield, and Lafayette had 1989 average daily demands equal to 61 percent, 47 percent, and 67 percent of capacity, respectively, while Boulder's system experienced average daily demands equal to 100 percent of capacity. The Denver Metro Wastewater Reclamation District (185 MGD capacity), the largest system in the region, serves both Denver County and Arvada and Lakewood in Jefferson County and had 1989 average daily demands equal to 76 percent of capacity.

The system operated by Westminster is projected to have average daily demands equal to 85 percent of capacity in 1995 and 95 percent of capacity in 2000. Boulder's system, currently operating at capacity, is projected to have average daily demands

equal to 103 percent and 106 percent of capacity in 1995 and 2000, respectively. All of the other systems are projected to have average daily demands of less than 80 percent of capacity in 1995 and less than 84 percent of capacity in 2000.

Eighteen school districts provide public education services and facilities in the ROI. In 1990, these school districts ranged in enrollment size from 181 students in the Deer Trail School District to 75,164 students in the Jefferson County School District. School districts with enrollments of over 1,000 students were operating between 46 percent and 135 percent of capacity. Those school districts operating over 100 percent of capacity were Strasburg (135 percent) and Westminster (104 percent). The average pupil-to-teacher ratio for the ROI was 19:1, and expenditures averaged $5,253 per pupil. The statewide average pupil-to-teacher ratio was 18:1, and expenditures averaged $5,374 per pupil (CO Education, 1990).

Thirty-one hospitals serve the five-county ROI, with the majority operating well below capacity (AHA, 1990). In 1990, a total of 5,199 physicians served the ROI. The physician-to-population ratio for the ROI was 2.9:1,000 and ranged from 1.3:1,000 in Jefferson County to 6.6:1,000 in Denver County. The national physician-to-population ratio for urban areas was 2.6:1,000 (AMA, 1990; DOC, 1991b).

Fourteen city, county, and state law enforcement agencies provide police protection in the ROI. In 1990, the largest law enforcement agencies in the 5-county ROI were in Denver with 1,362 sworn officers, or 2.9 sworn officers per 1,000 persons; and in Jefferson County with 360 sworn officers, or 0.8 sworn officers per 1,000 persons. The average number of sworn officers in the ROI was 1.8 per 1,000 persons (FBI, 1991).

Thirty-three fire departments and 3,694 regular and volunteer firefighters provided fire protection services in 1990. The principal municipal departments include both professional and volunteer staff. In 1990, the greatest staffing strengths were found in the fire departments in Denver County (877 firefighters; 1.9 firefighters per 1,000 persons) and in Boulder County (754 firefighters; 3.3 firefighters per 1,000 persons). The average number of firefighters in the ROI was 2.1 per 1,000 persons (Kapalczynski, 1988).

Local Transportation. Vehicular access to RFP is provided by Colorado State Route 93 to the west and Jefferson County Road 17 (Indiana Street) to the east.

Estimated baseline traffic along segments providing access to RFP is projected to contribute to differing service level conditions in accordance with baseline population growth. Colorado State Routes 93 and 128 as well as Indiana Street would typically experience traffic congestion, with volumes approaching or exceeding the design capacity of each roadway. Along these roadways, a motorist's speed and ability to maneuver would be restricted, and potential disruptions to the traffic flow could be caused by accidents or maintenance activities, resulting in some congestion. In addition, estimated baseline truck traffic into RFP for delivery of commercial supplies and removal of commercial wastes would typically average 24 trips per day. However, the additional traffic volumes associated with continued operation of RFP are relatively minor and would not substantially affect local transportation baseline conditions.

No major improvements are scheduled for those segments providing immediate access to RFP (CO Highway, 1991a).

Major railroads in the ROI include the Denver and Rio Grande Western Railroad; the Burlington Northern Railroad; the Atchison, Topeka, and Santa Fe Railroad; and the Union Pacific Railroad. A single-track spur from the Denver and Rio Grande Western Railroad mainline accesses the RFP from the west (RF DOE, 1980). No navigable waterways within the ROI are capable of accommodating waterborne transportation of material shipments to RFP.

Stapleton International Airport provides passenger and cargo service in the ROI on national and international carriers (DOT, 1991). A new Denver Airport is scheduled for completion in October 1993, at which time Stapleton International Airport is scheduled to close (RF Adams County, 1990).

Environmental Consequences. The employment figures for construction and operations for the Proposed Action are given in table 3.3-1 in section 3.3. The Proposed Action would result in minor decreases in economic activity and employment in the ROI. Based on the employment requirements for the transferred functions from Rocky Flats, employment would decrease in the ROI by an estimated 9,500 jobs (3,700 direct and 5,800 indirect). This reduction in jobs would not increase the unemployment rate in the year 2000 beyond the projected baseline level of 5.6 percent. Earnings in the ROI would be reduced by about $340.9 million, with a related decrease in the total personal income of $409 million.

Table 4.1.8.7-1 summarizes the projected economic and population changes that would result from the Proposed Action. This project-related change would represent a slight population decrease of less than 1 percent from the projected ROI baseline of 2,100,000 persons. The Cities of Broomfield and Golden would be the most affected. Broomfield would lose about 1 percent of its projected population, and Golden would lose about 2 percent of its projected population.

The less than 1 percent change in population after phasing out the nonnuclear functions would create an estimated 2,000 additional vacant housing units, which is less than 1 percent increase. The city of Golden would be the most affected, but with a less than 2 percent increase in the number of vacant housing units.

The less than 1 percent estimated population loss would not adversely affect any community infrastructure and services in the ROI but would, instead, reduce the burden on the capacity of the existing systems. Existing public education and health care capacity burdens would also improve by reducing utilization. Current staffing levels for police and fire services in the ROI counties and cities would not be affected, and local traffic conditions would improve slightly.

4.1.8.8 *Waste Management*

Affected Environment. Discussion of the RFP waste management baseline is provided in section 3.2.4.3 and appendix A.4. Because there are no TRU wastes associated with any of the nonnuclear DP activities at RFP that would be phased out due to the Proposed Action, no further discussion of TRU waste generation or management is presented.

Generation of LLW, mixed, hazardous/toxic waste, and nonhazardous wastes at RFP is expected to decrease with time, as production operations are expected to be reduced.

LLW is packaged and stored onsite pending approval for offsite disposal at NTS. Rocky Flats Plant's RCRA permit specifies storage locations and volume limits for low-level waste storage onsite. A new 25,000 ft^2 centralized waste storage facility, which would consolidate LLW, low-level mixed, and hazardous wastes, is scheduled to be completed in June 1993, allowing RFP to extend permitted capacity well beyond 1993.

Hazardous waste operations consist of storage and treatment units which meet RCRA and TSCA facility standards. All waste stream residue generated at RFP that is not reclaimed or recycled onsite is manifested and shipped under contract with RCRA-permitted transporters to RCRA- and TSCA-permitted offsite treatment and disposal facilities.

Nonhazardous wastes are segregated and recycled whenever possible. Trash is disposed of at RFP in a landfill approved by Jefferson County with concurrence from the State of Colorado. Wastewater effluents from RFP processing activities are treated

TABLE 4.1.8.7–1.—*Rocky Flats Plant Proposed Action Economic and Population Characteristics*

Economics	2000 Peak Operation	Percent Under Baseline
Baseline Civilian Labor Force	1,205,374	NA
Baseline Unemployment Rate	5.6%	NA
Baseline Personal Income (Thousands $)	$51,753,781	NA
Baseline Per Capita Income ($/Person)	$24,644	NA
Baseline Employment	1,137,688	NA
Direct Jobs Lost	3,732	0.33
Indirect Jobs Lost	5,806	0.51
Out-Migrating Workforce	2,197	0.19
Total Out-Migration	5,572	0.27
Population Decrease		
Adams County	1,071	0.33
Arapahoe County	306	0.07
Boulder County	1,428	0.57
Boulder	368	0.40
Broomfield	284	1.03
Denver County	508	0.09
Jefferson County	2,259	0.45
Arvada	936	0.95
Golden	318	2.12
Westminster	496	0.58
ROI (County Total)	5,572	0.27

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Source: Estimated from Census, 1977, 1983, 1990a; DOC, 1990a and b, 1991a; CO Labor, 1991; DOE, 1992e.

and used for process make-up water and do not discharge offsite.

Environmental Consequences. Phaseout of DP nonnuclear functions at RFP would reduce onsite, hazardous annual waste management by 378,600 lb for DP operations. Over 65 percent of the reduction would be due to decreased generation and incineration of bulk oil; 32 percent to decreased generation and landfilling of industrial wastewater pretreatment sludge; and less than 2 percent to decreased generation and incineration of bulk acid liquid. Nonhazardous waste would also be reduced as a result of the phaseout.

Phaseout of RFP would initiate closure of existing onsite RCRA hazardous waste storage facilities. Closure would comply with a detailed closure plan and schedule approved by the Colorado Department of Health. Hazardous wastes in storage would be manifested and shipped under contract with RCRA-permitted transporters to RCRA- and TSCA-permitted treatment and disposal facilities. Equipment, structures, and soils (if contaminated) would also be decontaminated and disposed of in accordance with all applicable environmental regulatory requirements.

Existing inventories of LLW, mixed waste, and classified waste would be shipped offsite to DOE disposal facilities certified to accept such wastes.

Due to the phaseout of nonnuclear functions, RFP would reduce discharges of treated sanitary wastewater to Walnut Creek.

Nonhazardous solid waste streams such as paper, cardboard, glass, wood, plastics, scrap, and metal containers would no longer continue to be generated. Trash that would have been disposed of in the onsite sanitary landfill would cease, extending the operating life of the landfill.

4.1.8.9 *Human Health: Facility Operations and Accidents*

Affected Environment. As discussed in the Air and Water Resources sections for RFP (4.1.8.2 and 4.1.8.3, respectively), exposures to members of the public from the release of chemical pollutants as a result of RFP operations, meet applicable permit, regulatory, and DOE operational requirements. Exposures to members of the public from radiological releases from RFP are well below applicable permit, regulatory, and DOE operational requirements (RF EG&G, 1991e).

A review of the recent RFP annual environmental and accident reports indicates that there have been no releases that resulted in adverse impacts to workers, members of the public, or the environment. This review was performed to provide a baseline for estimating impacts from recent site operations. The time of the review (1986-1990) was a period during which plant operations were much higher than in the past year and higher than expected in the future.

Water from processes containing hazardous chemicals is treated before discharge to remove toxicants and all releases of the pollutants are below NPDES limits; water quality is not adversely affected. Thus, the primary pathway considered for possible worker or public exposure is the air pathway.

For RFP, hazardous air pollutants were examined and from this assessment, the following chemicals were identified for further analysis based on their toxicity, concentration, and frequency of use: ammonia, carbon tetrachloride (CCl_4), Freon-113, methylene chloride, and 1,1,1-trichloroethane. The Hazard Index, a summation of the Hazard Quotients for all chemicals, was calculated for the No Action alternative and the chemicals proposed to be added (increment) at the site to yield cumulative levels for the site. A Hazard Index value of 1.0 or less means that no adverse human health effects are expected to occur. The existing Hazard Indexes for RFP (see table F5-14a in appendix F) were 14.1 for onsite (worker effects) and 0.322 at the site boundary (effect on the public) on an annual basis.

The exceedance of the Hazard Index threshold onsite is due primarily to CCl_4 emissions (14.0); elimination of this chemical would bring the Hazard Index to a level below 1.0 where no adverse health effects would be expected. In the future, CCl_4 use would be reduced. Replacement non-carcinogenic solvents like 1,1,1-trichloroethane (TCA) would be used as a substitute for CCl_4. Furthermore, RFP operations that use CCl_4 are not activities that are proposed to be transferred as part of the action of this EA.

Two of the chemicals identified, carbon tetrachloride and methylene chloride, are considered to be carcinogens and the cancer risk to individuals was calculated. The risk for the carcinogen was calculated as 5.3×10^{-4} onsite (worker) and 1.2×10^{-5} at the site boundary (public) (see table F5-14b in appendix F).

Releases of radioactive materials from RFP resulted in a total maximum individual annual dose of 0.23 mrem effective dose equivalent (RF EG&G, 1990a). The resulting risk of potential fatal cancers associated with 1 year of operations would be 1.0×10^{-7}. Cancer risks of 10^{-6} or less are considered acceptable since this incidence of cancers cannot be distinguished from the normal risk to an individual member of the public. When risks are greater than 10^{-6}, appropriate measures are required to reduce the risks to less than 10^{-6}.

In summary, these analyses show that excess cancer risks to workers and members of the public can be expected from normal releases of hazardous

chemicals/chemical pollutants at RFP as a result of continued operations unless mitigative actions are implemented.

Environmental Consequences. Phasing out RFP nonnuclear operations would result in no addition of hazardous material to, but rather the transfer of, nonnuclear operations from RFP to other DOE sites. Consequently, phasing out the DP nonnuclear operations at RFP would result in a decrease in adverse affects. The impacts at the DOE facilities that would receive the relocated nonnuclear functions from RFP are discussed in their respective sections.

Phasing out DP functions at RFP would reduce or eliminate the cancer risks.

4.2 OTHER CONSOLIDATION ALTERNATIVES

This section discusses the environmental consequences of the Mound, Pinellas, and RFP alternatives to the Proposed Action (KCP Consolidation). Since many of the elements of the alternatives are also common to the Proposed Action and No Action, the discussion of impacts for each is presented and discussed in a comparative manner to the Proposed Action (section 4.1) and as appropriate, No Action (section 4.1.1 to 4.1.8).

4.2.1 Mound Plant

Impacts of this alternative are similar to the Proposed Action because the neutron generator, cap assemblies, and thermal battery functions from Pinellas would be relocated to SNL (sections 4.1.5). However, the impacts of this alternative would be less than the impacts of the Proposed Action at SNL because the milliwatt heat source (MWHS) surveillance function would remain at Mound and not be relocated to SNL. The impacts of this alternative would also be less than the Proposed Action at LANL (section 4.1.3), which would receive only the neutron tube target loading function from Pinellas and the beryllium and pit support functions from RFP, but not the explosives or calorimeter functions from Mound. There would be no impacts at SRS under this alternative because the tritium-handling functions currently at Mound would remain at Mound and not be relocated to SRS. The explosives, tritium-handling, and electrical/mechanical functions currently performed at Mound would remain in place but at the same reduced workload as the Proposed Action.

4.2.1.1 *Land Resources*

Consolidation of electrical/mechanical functions at Mound would require modification of existing building space located at the Main Hill Area, SM/PP Hill Area, and Valley Area of the plant (figure 3.4.1-2). New construction would occur at the SM/PP Hill Area (heavily developed) and New Property Area (undeveloped). New construction at the SM/PP Hill Area and the New Property Area would disturb about 55 acres for new buildings, temporary construction laydown, and a parking area (FDI, 1992c).

During the construction period, the offsite land requirements for residential land uses from project-related in-migration (section 4.1.6.7) would be approximately 37 acres, distributed throughout the local jurisdictions of Butler, Montgomery, and Warren counties. The project-related offsite land requirements for residential land uses associated with operations would be approximately 267 acres. Land available for residential development in the tri-county area would easily meet these needs.

There are extensive public and private recreational facilities in the region that could easily absorb the increased demand resulting from the population increase. Impacts to recreational resources would be negligible.

Facilities of the Mound alternative would be located adjacent to existing industrial development and would be screened from viewpoints with high sensitivity levels by terrain and vegetation. The buildings would be similar in appearance to the existing structures and in keeping with the existing Class 5 VRM designation.

4.2.1.2 *Air Quality and Acoustics*

Air Quality. During the construction phase, minor construction-related air quality impacts would occur, including the generation of particulate matter such as dust and dirt. These impacts would be controlled through standard construction practices such as watering of construction sites. During operation, air emissions could increase at Mound for the criteria pollutants (totaling approximately 89 tons per year) and for approximately 25 HAPs/toxics (totaling approximately 40 tons per year) (FDI, 1992a). The emissions inventory for the Mound alternative is

TABLE 4.2.1.2-1.—*Contribution to Air Quality from the Mound Consolidation Alternative and Total Concentrations with Comparison to Applicable Regulations and Guidelines* [Page 1 of 2]

Pollutant	Averaging Time	Most Stringent Regulation or Guideline ($\mu g/m^3$)	Baseline Concentration ($\mu g/m^3$)[g]	Proposed Action Concentration ($\mu g/m^3$)	Total Concentration ($\mu g/m^3$)
Carbon Monoxide (CO)	8-hour	10,000[b]	4,467	2.2	4,469.2
	1-hour	40,000[b]	13,973	7.3	13,980.3
Lead (Pb)	Calendar Quarter	1.5[b]	d	f	d
Nitrogen Dioxide (NO_2)	Annual	100[b]	≥ 0.39[e]	0.15	0.54
Ozone (O_3)	1-hour	235[b]	d	f	d
Particulate Matter (PM_{10})	Annual	50[b]	29.6	f	29.6
	24-hour	150[b]	98.5	f	98.5
Sulfur Dioxide (SO_2)	Annual	80[c]	15.7	0.0003	15.7
	24-hour	365[c]	70.7	0.004	70.7
	3-hour	1,300[b]	120.4	0.02	120.4
Hazardous Air Pollutants and Other Toxic Compounds[a]					
1,1,1-Trichloroethane	1-hour	45,476[c]	≥42.5[e]	0.5	≥ 43
1,4-Dioxane	1-hour	2,143[c]	d	1.4	≥ 1.4
Acetone	1-hour	42,380[c]	≥56.6[e]	16.1	≥72.7
Acids	1-hour	h	d	23.61	≥23.61
Alcohols	1-hour	h	d	32.1	≥32.1
Ammonia	1-hour	405[c]	≥25.9[e]	f	≥25.9
D'Limonene	1-hour	h	d	2.4	≥2.4
Dichlorodifluoromethane	1-hour	117,857[c]	d	0.5	≥0.5
Dimethyl Foramide	1-hour	714[c]	d	0.5	≥0.5
Ethyl Benzene	1-hour	10,333[c]	d	0.9	≥0.9
Glycol Ethers	1-hour	571[c]	d	50.1	≥50.1
Hexane	1-hour	4,190[c]	d	1.4	≥ 1.4
Hydrogen Chloride	1-hour	179[c]	≥16.5[e]	f	≥16.5
Isopropyl Alcohol	1-hour	23,405[c]	≥20.9[e]	f	≥20.9
Methyl Ethyl Ketone	1-hour	14,048[c]	d	1.4	≥1.4
Methyl Isobutyl Ketone	1-hour	4,881[c]	d	2.8	≥2.8
Methylene Chloride	1-hour	4,143[c]	d	0.5	≥0.5
Miscellaneous Solvents	1-hour	h	d	17.47	≥17.47
Naptha/Mineral Spirits	1-hour	h	d	7.1	≥7.1

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Footnotes at end of table.

presented in table D3.1.2-1. Table 4.2.1.2-1 presents the predicted air quality impacts at Mound from the Mound consolidation alternative. These are all within applicable standards and guidelines. See appendix D for a description of the input parameters, assumptions, and methodology used to estimate impacts of this alternative on air quality at Mound.

Normal operations result in the emission of radioactive materials at Mound (MD DOE, 1991a). The Mound alternative to the Proposed Action

TABLE 4.2.1.2-1.—*Contribution to Air Quality from the Mound Consolidation Alternative and Total Concentrations with Comparison to Applicable Regulations and Guidelines* —Continued [Page 1 of 2]

Pollutant	Averaging Time	Most Stringent Regulation or Guideline (μg/m³)	Baseline Concentration (μg/m³)[g]	Proposed Action Concentration (μg/m³)	Total Concentration (μg/m³)
Hazardous Air Pollutants and Other Toxic Compounds[a]					
Tetrachloroethane	1-hour	8,071[c]	d	0.9	≥0.9
Toluene	1-hour	8,976[c]	d	8.0	≥8.0
Trichloroeythlene	1-hour	6,405[c]	d	9.0	≥9.0
Trichlorotrifluoroethane	1-hour	182,619[c]	≥17.5[e]	0.5	≥18.0
Xylene	1-hour	10,333[c]	d	5.2	≥5.2

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[a] Compounds listed are the major pollutants of concern (FDI, 1992a; Le, 1992).
[b] Federal Standard (40 CFR 50).
[c] State standard (Ohio EPA, 1991).
[d] Data unavailable.
[e] No Action concentration value, background concentration values unavailable.
[f] Emissions of this pollutant would be less than 100 lb/yr (0.01 lb/hr) (Le, 1992).
[g] Baseline Concentrations are from table 4.1.6.2-1.
[h] No state standard.

would not result in an increase in the emission of radioactive materials.

Acoustic Conditions. Changes in noise levels during the construction and operation periods have been estimated for the major traffic routes around Mound. The estimates are based on existing traffic volumes and projected changes in volumes as a result of proposed changes in employment at Mound. These changes in traffic volumes are predicted to result in an increase of 6 dB in peak-hour sound levels along Mound Road during operation. Changes in sound levels along other routes are estimated to be small. The increased noise levels along the major access routes would be expected to cause no increase in annoyance level to communities or individuals, except along Mound Road during operation when some increased reaction to traffic noise may be expected.

Noise emissions from onsite construction activities have not been analyzed but may be expected to result in a short-term increase in noise from heavy equipment operation and other construction noise sources. Construction activities include erection of major new buildings and parking areas on the southern part of the site and renovation of existing buildings. Noise emissions from onsite operation activities should be similar to those from existing sources. The facilities would be designed to minimize noise levels at the site boundary and to assure compliance with the City of Miamisburg's Noise Ordinance (appendix D.2.2.2).

Construction workers and personnel working at any of the reconfigured facilities at Mound would be exposed to varying levels of equipment noise. The requirements for worker hearing protection as described previously for current facilities would continue to be met at Mound.

Although no increase in annoyance is expected offsite from construction and operation onsite, measures would be necessary to protect workers' hearing. These measures include the use of standard silencing packages on construction equipment and providing workers in noisy environments during construction and operation with appropriate earmuffs or ear plugs approved by OSHA. Noise levels would be measured in worker areas and an effective hearing protection program conducted.

Traffic noise may be mitigated by providing access to the new facilities from Benner Road.

4.2.1.3 *Water Resources*

This section describes potential surface and groundwater impact due to the Mound consolidation alternative.

Surface Water. Since the water supply for Mound is from three onsite wells, the only potential impacts from site activities on the Great Miami River result from the planned water treatment processing facility and the existing wastewater treatment plant. The planned water treatment processing facility, scheduled for completion in 1995, would remove trace amounts of contamination from stormwater prior to release.

The additional sanitary wastewater generated by the transferred processes would be approximately 291 MGY (table 3.4.1-4). This additional wastewater would represent approximately a 620 percent increase over the current wastewater generation rate of approximately 47 MGY (table 3.2.2-2). The additional process/sanitary wastewater would require additional treatment capacity.

The total wastewater throughput of the relocated facilities would be approximately 291 MGY (1.2 ft^3/s). This represents less than 1 percent of the average 1990 flow of the Great Miami River of 3,369 ft^3/s. Influent to, and effluent from, the treatment facility would be required to meet all Federal and state discharge limits.

Surface Water Quality. Water quality could be affected if transferred activities increase discharges that adversely impact biochemical oxygen demand. As presented in section 4.1.6.3, previous noncompliances involving biochemical oxygen demand may require Mound to renew its NPDES permit with more stringent limits.

During the construction phase, erosion and transport of disturbed soils could create adverse impacts to the site drainage facilities and surface water quality. New construction in the Valley Area and the SM/PP Hill area could result in the disposition of eroded materials into the site's stormwater control system, thereby reducing its effectiveness. The New Property Area drains in the direction of the Great Miami River via the Miami-Erie Canal. The erosion and transport of disturbed materials could degrade receiving water quality; therefore, the use of control measures such as berms and silt fences would be implemented to minimize any adverse impacts during construction.

The proposed new parking areas would increase the impervious surface area and increase the flow of nonpoint source drainage towards the Miami-Erie Canal. Areas of surficial contamination exist in proximity to the proposed parking areas (MD DOE, 1987b). During periods of high runoff, the transport of contaminants in the direction of the Miami-Erie Canal could occur. The level of potential impact would be controlled or eliminated through the collection of runoff. Mitigation of impacts could involve the treatment of stormwater runoff before release to offsite surface waters, or the remediation of the areas of surficial contamination.

Groundwater. Water requirements for renovation of existing buildings and construction of new buildings would be approximately 13,000 GPD or 4.7 MGY for the 4-year construction period (table 3.4.1-3). During operations, approximately 0.94 MGD or 340 MGY of additional water would be required for domestic and industrial uses (table 3.4.1-5). The renovation and operations water usage estimates are within the 1.2 BGY capacity of the production wells and represent a less than 3 percent and approximately a 200 percent increase, respectively, in the approximately 0.48 MGD (table 3.2.2-3) currently withdrawn by Mound from its wells.

Groundwater Quality. Since no discharge of waste materials to the groundwater is planned, no adverse impact to groundwater quality are expected.

4.2.1.4 *Geology and Soils*

Mass movement, subsidence, seismic activity, and volcanism are unlikely to occur at a level that would impact construction or operation activities. There are no landslides, sinkholes, or other nontectonic movements at Mound. No impact would result to local geologic features from this action.

Transferring the electrical/mechanical functions to Mound would require a total of 55 acres for a new building, parking lot, and construction area (table 3.4.1-2). Disturbance during construction could temporarily lead to an increase in soil erosion from wind and water. Water erosion is likely to occur only sporadically during storm periods. Wind erosion is likely to occur intermittently depending on wind velocities. The maximum total soil loss rate associated with this construction is not expected to exceed the maximum acceptable soil loss of 5 tons per acre per year. Wind erosion control measures would include sprinkling, use of mulch, and other dust control methods on a daily basis. Water erosion control measures would include proper drainage and grading. Exposing only small areas for limited periods would reduce erosional effects and ensure that soil losses are within acceptable levels.

Soil disturbance during operations would be reduced from that of the construction period as areas temporarily given over to laydown and haul-road use are restored. Environmental consequences to soils during the periods of operations would include permanent alteration of soil cover as the result of emplacement of structures, parking lots, and other features. Control measures during construction would include regrading and reseeding. Paving, grading of slopes, establishment of ground cover, windbreaks, construction of engineered berms, and drainage ways would also reduce both wind and water erosion impacts.

4.2.1.5 *Biotic Resources*

The construction, modification, and operation of facilities for nonnuclear consolidation at Mound would require the loss of some natural vegetation and terrestrial wildlife habitat. Approximately 49 acres of forested and old field habitats within the largely undeveloped New Property Area would be required to accommodate new construction and parking lots. Remaining natural habitats within the western part of Mound would be fragmented by construction and exposed to an increased human presence for the operating life of the consolidated facilities. Approximately 6 acres of natural habitat would also be lost from the more heavily developed SM/PP Hill Area. Areas cleared of existing vegetation would be permanently occupied by structures, pavements, or new vegetation. About 29 acres of the total 55 acres to be disturbed would be used for construction laydown and parking (table 3.4.1-2). Where possible these areas would be revegetated with native species following construction. Additionally, new wastewater treatment and hazardous waste storage capacity would be required.

These impacts would represent a large reduction in the quantity and quality of terrestrial habitat within Mound but only an minor regional impact to terrestrial habitat. Old field and forested habitats are a common feature in the landscape surrounding Miamisburg. Potential mitigation measures include habitat disturbance minimization and revegetation with native species.

Wetlands may potentially be disturbed by construction of new facilities associated with the Mound consolidation alternative, and consultations with the Corps of Engineers have been initiated to determine the extent of potential disturbance. If disturbance to wetlands could not be avoided during construction, mitigation would involve constructing

or purchasing compensatory replacement wetlands within Mound or in the surrounding area at a ratio designated by the Corps of Engineers.

Increased water demands of the consolidated facilities would be met by onsite wells. Wastewater discharges would be required to meet all Federal and state discharge limits, thereby avoiding impacts to aquatic biota in the Great Miami River. Stormwater management structures associated with the new facilities would be constructed to prevent significant quantities of runoff from reaching the Miami-Erie Canal or other aquatic habitats near Mound.

DOE has initiated consulation with the FWS and Ohio Division of Natural Areas and Preservation to determine whether the proposed consolidation would potentially affect threatened or endangered species. In keeping with current environmental practice on Mound, all trees with peeling bark within the proposed construction footprint would be inspected for the presence of the Indiana Bat (*Myotis sodolis*) before any disturbance is initiated.

4.2.1.6 *Cultural Resources*

The construction, modification, and operation of facilities and equipment for the consolidation of electrical/mechanical functions at Mound may have impacts if important Native American resources are present and no impacts if such resources do not occur. No NRHP-eligible prehistoric or historic resources are expected to occur. Consultation with the Miami and Shawnee tribes has been initiated for this project, and important Native American resources may be identified through consultation. Construction activities may physically disturb Native American resources. Operations may decrease accessibility to traditional use areas or create audio or visual intrusions to sacred locations.

The environmental consequences of locating functions at SNL, LANL, and Y-12 as part of this alternative are discussed in sections 4.1.5.6, 4.1.3.6, and 4.1.4.6, respectively.

4.2.1.7 *Socioeconomics*

The following section discusses the potential environmental impacts of the Mound alternative. To provide a context for potential socioeconomic impacts to the ROI, a discussion of the local employment, population, housing, community services, and transportation is included for this alternative, which has not been previously discussed under the No Action or the Proposed Action (section 4.1). Assumptions, methodologies, and supporting data for the assessment of environmental consequences are presented in appendix E. Table 4.2.1.7-1 shows the economic and population characteristics for this alternative.

The construction, modification, and installation of facilities and equipment for the consolidation of electrical/mechanical and special products functions at Mound would require 804 employees at peak construction (FDI, 1992a). Operations employment would begin in 1997 and grow to a full complement of 3,500 jobs in the year 2000. In addition to those jobs created directly by the project, other employment, indirectly created, would lead to further in-migration to the ROI.

Locating electrical/mechanical and special products functions at Mound would increase population in the ROI by approximately 600 persons during 1995, the peak construction year, and by an estimated 4,700 persons during the year 2000, the peak operations period. The in-migrating population is primarily related to the in-migrating professional employees who are scientists, engineers, etc. (and their families), and who are not available in the regional unemployed labor force. In 2000, this project-related population would represent a negligible increase of less than 1 percent over the projected ROI baseline population of 1,009,000 persons. None of the cities or counties would experience population growth beyond 1 percent over the baseline during peak

TABLE 4.2.1.7-1.—*Mound Plant Alternative Economic and Population Characteristics*

Economics	1995 Peak Construction	Percent Over Baseline	2000 Peak Operation	Percent Over Baseline
Baseline Civilian Labor Force	501,291	NA	521,680	NA
Baseline Unemployment Rate	5.5%	NA	5.6%	NA
Baseline Personal Income (Thousands $)	$19,255,693	NA	$22,344,200	NA
Baseline Per Capita Income ($/Person)	$19,373	NA	$22,146	NA
Baseline Employment	473,813	NA	492,213	NA
Direct Jobs	804	0.17	3,508	0.71
Indirect Jobs	2,926	0.62	5,821	1.18
In-Migrating Workforce	265	0.06	1,837	0.37
Total In-Migration	591	0.06	4,658	0.46
Population Increase				
Butler County	62	0.02	489	0.16
Middletown	390	0.84	3,074	6.56
Montgomery County	437	0.07	3,442	0.58
Centerville	67	0.31	531	2.43
Dayton	159	0.09	1,253	0.66
Germantown	31	0.61	242	4.74
Miamisburg	102	0.56	826	4.35
Warren County	92	0.08	727	0.63
Carlisle	39	0.79	305	6.14
ROI (County Total)	591	0.06	4,658	0.46

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Source: Estimated from Census, 1977, 1983, 1990a; DOC, 1990a and b, 1991a; OH Employment, 1991; FDI, 1992a.

construction. However, four small cities would experience population changes that range from 4 percent (Miamisburg) to 7 percent (Middletown) over the baseline during peak operations.

The less than 1 percent change in population during the construction required for consolidating the electrical/mechanical and special products functions would create the need for approximately 200 housing units, which is less than a 1 percent addition to this large urban area. For operations in the year 2000, the less than 1 percent change in population would not create the need for additional housing units beyond a 1 percent increase. In past years, housing units in the ROI have been built at an annual rate of 2 percent. In the smaller cities, housing units have been built at annual average rates that ranged between 2 percent and 6 percent. Therefore, additional housing needed to accommodate the in-migrating population could be built without any adverse effect on the cities and counties in the ROI.

The estimated additional population during peak construction and peak operations would not affect any water and wastewater systems in the ROI because the existing capacities more than exceed the projected demand.

In the 1989-1990 school year, school districts in Butler, Montgomery, and Warren counties were operating, on average, between 83 percent and 87 percent of capacity. Under the No Action future baseline, these capacities will not be exceeded in either 1995 or 2000. Currently, one school district in each county exceeds capacity, but these capacities would not be affected beyond what would naturally occur under the No Action baseline growth because the Mound alternative would not add more than 1

percent to enrollments during construction or operations.

Existing health care facilities are more than adequate to accommodate the population increases, although approximately 10 new doctors (less than 1 percent increase over the projected baseline) would be needed during operations to maintain the current level of service.

Current staffing levels for police and fire services in the ROI counties and cities would be maintained relative to population increases during peak construction. To maintain current standards during operations, approximately 8 additional police officers and 12 firefighters would be needed in the ROI. Cities projected to have the greatest needs are Dayton (three officers; less than 1 percent over the projected baseline), Miamisburg (one officer and two firefighters; each at 4 percent over the projected baseline), and Centerville (two firefighters; 2 percent over the projected baseline).

Relative to baseline traffic projections, consolidation activities would have minimal impacts on the local transportation network serving Mound. Changes in conditions would be greatest along the segment of Mound Road between Main Street and Benner Road. Increased traffic associated with peak construction employment along this segment would cause a deterioration in service from the baseline free flow with no delays from disruptions, to a reduced flow with some deterioration of service from disruptions. Additional truck traffic associated with construction activities is estimated to be negligible relative to historic levels. Annual vehicle accidents would increase by approximately 19 and associated fatalities would increase by less than 1.

Conditions on most route segments in the local transportation network during typical operations are projected to remain consistent with baseline projections. However, projected conditions along the segment of Mound Road between Main Street and Benner Road would deteriorate from baseline free flow conditions, with no delays from disruptions, to a reduced flow with some deterioration of service conditions associated with disruptions due to consolidation activities. In addition, conditions on the segment of US 35 between Ohio State Road 835 and I-675 at Beavercreek would change from baseline stable flow conditions, with minor delays from disruptions, to a restricted flow with considerable deterioration of service from disruptions. Additional commercial truck traffic is estimated to be negligible relative to historic levels. An estimated 156 additional vehicle accidents and 1 associated fatality are projected to occur annually within the ROI due to consolidation activities.

In summary, peak activities would have an effect on transportation services at the plant and on roads near the plant. These services would be further burdened during the initial peak operations phase. The project would not adversely affect other community resources beyond what would naturally occur in the No Action baseline.

Under the Mound alternative, the neutron tube loading function would be relocated from Pinellas to LANL. During peak construction and operations, 10 workers and 5 additional employees, respectively, would be required, creating no adverse effect on the cities and counties in the LANL ROI.

4.2.1.8 *Waste Management*

Solid waste generated during construction of new buildings would include discarded packaging and construction materials (e.g., plasterboard, brick, wood, and scrap steel). All construction waste would be disposed of offsite. Sanitation sewage would be handled by an outside contractor. Because this contractor would also be responsible for disposing of this sewage, existing site wastewater treatment facilities would not be affected.

Hazardous waste generated during construction would consist of such materials as waste adhesives, oils, cleaning fluids, solvents, and coatings.

All hazardous waste would be appropriately packaged, manifested, and shipped under contract with RCRA-permitted transporters to RCRA-permitted offsite disposal facilities or recyclers.

The relocation of all current nonnuclear manufacturing activities from KCP to Mound would generate additional hazardous and nonhazardous wastes at Mound. The additional hazardous wastes generated would consist of the following: halogenated and nonhalogenated solvents, both ignitable and toxic; spent plating bath solutions; corrosives; combustibles; Toxicity Characteristic Leading Process (TCLP) materials; off-specification materials; sludge; oils/solvents; PCBs (expected to be phased out); and caustic and acid solutions. A summary of the wastes, effluents, and emissions and discussions related to their management can be found in appendix C.1.

Mound would have to manage a hazardous waste volume increase of more than 3 times existing volumes. The additional liquid hazardous waste volume of 47,600 gal/yr and 12,300 ft^3/yr of solid hazardous waste would require additional waste management considerations. Onsite storage facilities such as a building and storage tanks must be constructed and equipped to comply with the EPA hazardous waste storage requirements. The hazardous wastes generated and stored at the plant site would have to be shipped to offsite commercial treatment facilities, or to offsite disposal facilities.

The additional sanitary/industrial wastewater effluent discharge of 291 MGY due to the consolidation at Mound could not be handled by the existing wastewater treatment system which has a capacity of 47.4 MGY. A major upgrade/modification to the existing treatment plant would be necessary.

The additional 600,000 ft^3/yr of solid nonhazardous wastes would shorten the life expectancy of the offsite sanitary landfill. The landfill would have to be expanded or another landfill utilized. Amounts of paper and scrap metals available for recycling would increase.

Relocating only the tritium handling functions at Pinellas to SRS would mean the addition of 4,715 lb/yr of hazardous waste at SRS. The additional hazardous wastes include crushed containers, alkaline and acid liquids, and cyanide solution. These wastes could be stored onsite at SRS in three existing RCRA-permitted storage facilities. Since SRS has a contract with an offsite vendor to ship some hazardous waste offsite for treatment and disposal, there would be no need to add more storage facilities. The crushed containers would be shipped offsite for landfill disposal and the cyanide solution would be shipped offsite for treatment/landfilling. The alkaline and acid liquids would be shipped offsite and incinerated.

4.2.1.9 *Human Health: Facility Operations and Accidents*

Discussions of impacts to members of the public and the environment, worker exposures, and accidents for the No Action (Affected Environment) and the Proposed Action are presented in section 4.1 and sections 4.1.1 to 4.1.8. Information specific to the Mound alternative (i.e., different from the Proposed Action) is discussed below; actions that are the same as those for the proposed consolidation at KCP were discussed earlier and are not repeated here.

As discussed in the Air and Water Resources sections for Mound (4.2.1.2 and 4.2.1.3, respectively), exposures to members of the public associated with the release of chemical pollutants as a result of Mound operations, even after consolidation at Mound, meet all applicable permit, regulatory, and DOE operational requirements. Exposures to members of the public associated with radiological releases from current Mound operations are also well below applicable permit, regulatory, and DOE operational requirements (MD DOE,

1991a). Consolidating functions at Mound would not result in any increases of radiological releases.

A review of the recent Mound annual environmental and accident reports indicates that there have been no significant adverse impacts to workers, members of the public, or the environment. This review was performed to provide an indication of the site's accident history. The time of the review (1986-1990) was a period during which plant operations were much higher than in the past year and higher than anticipated in the future. Since the functions that would be consolidated at Mound are the same as or similar to those currently being performed at Mound and would be conducted in Mound facilities designed for these activities, the current accident profile at Mound would not change as a result of consolidating these functions at Mound.

This alternative involves relocation of the electrical/mechanical and special products functions to Mound as an alternative to consolidation at KCP. Differences in site characteristics between Mound and KCP would cause small differences of pollutant concentrations at Mound from those calculated for the KCP site. However, the conclusion remains that releases associated with relocating these functions would be below applicable permit, regulatory, and DOE operational requirements. Additionally, the concentrations of potentially hazardous chemicals associated with the functions to be relocated do not exceed levels which would cause adverse human health effects (see table F5-15 in appendix F).

4.2.2 Pinellas Plant

Impacts of the Pinellas alternative are similar to the Proposed Action because the tritium handling functions from Mound would be relocated to SRS (section 4.1.2). However, the impacts of this alternative would be less than the impacts of the Proposed Action at LANL (section 4.1.3), which would only receive the detonator and calorimeter functions from Mound and not the neutron tube target loading function from Pinellas, or the beryllium and pit support functions from RFP. The impacts of this alternative would also be less than those for the Proposed Action at SNL (section 4.1.5), which would receive only the MWHS surveillance function from Mound and not the neutron generator, cap assemblies, and thermal batteries functions from Pinellas. The neutron generator, cap assemblies, thermal batteries, electrical/mechanical, and neutron tube target loading functions currently performed at Pinellas would remain in place but at the same reduced workload as the Proposed Action.

4.2.2.1 *Land Resources*

Consolidation of electrical/mechanical functions at Pinellas would require the demolition of the existing parking lot at Building 1200, the parking lot north of Building 100, and a gas storage tank; and relocation of a contractor modular building complex. New facilities would include a five-story parking structure, a large three-story office/manufacturing building and a one-story mechanical technology building (see figure 3.4.2-2). Land disturbance for the above facilities, construction parking, and a 35-acre construction support area would total approximately 55 acres (FDI, 1992c). Pinellas does not have sufficient onsite land area to meet this requirement. Specific mitigation measures would be identified in the final design phase if this alternative were implemented.

During the construction period, the land requirements for residential land use from project-related in-migration (section 4.1.7.7) would be approximately 50 acres distributed throughout the local jurisdictions of Pinellas county. The project-related land requirements associated with operations would be approximately 258 acres. The offsite residential land use demand would easily be accommodated within the county.

Extensive public and private recreational facilities in the region could easily absorb the resulting increased demand. Impacts to recreational resources would be negligible.

Project-related impacts to visual resources would occur from the construction of a new three-story, 36-foot-high, approximately 500-foot-long office/manufacturing building and a new five-story, 60-foot-high, 425 feet long parking structure. The plant site, which is already heavily developed, is designated VRM Class 5. The viewpoints from the adjacent roads would have clear views of the new high-rise structures.

The viewpoints from the Lake Allen area, an expanding residential area with waterfront-oriented homes and a park with water frontage, are slightly more sensitive. The viewpoints from Lake Allen already contain limited views of industrial structures, which rise above the vegetation screening in the foreground. The new buildings would also be partially visible above the vegetation screen. The visual change could be termed moderate as these views already consist of a highly altered industrial landscape. As a result, the VRM Class would not change.

4.2.2.2 *Air Quality and Acoustics*

Air Quality. During the construction phase, minor construction-related air quality impacts would occur, including the generation of particulate matter such as dust and dirt. These impacts would be controlled through standard construction practices such as watering of construction sites. During operation, air emissions could increase at Pinellas for the criteria pollutants (totaling approximately 40 tons per year)

and for HAPs/toxics (totaling approximately 20 tons per year) (Le, 1992). The emissions inventory for the Pinellas alternative is presented in table D3.1.2-2. Table 4.2.2.2-1 presents the contribution to air quality at Pinellas from the Pinellas consolidation alternative and total concentrations with comparison to applicable regulations and guidelines. The 1-hour standard for ozone, the 24-hour standard for glycol ethers, and the annual standards for methylene chloride, nickel chloride, and trichloroethylene would be exceeded at the site boundary. All other pollutants are within applicable regulation or guidelines. The exceedances for ozone, methylene chloride, and nickel chloride are associated with baseline conditions at the site (section 4.1.7.2). Potential mitigation measures for glycol ethers and trichloroethylene include substitution with other compounds. See appendix D for a description of the input parameters, assumptions, and methodology used to estimate impacts of this alternative on air quality at Pinellas.

Normal operations result in the emission of radioactive materials at Pinellas (PI DOE 1991b). The Pinellas alternative to the Proposed Action would not result in an increase in the emission of radioactive materials.

Acoustic Conditions. Changes in noise levels during the construction and operation periods have been estimated for the major traffic routes around Pinellas. The estimates are based on existing traffic volumes and projected changes in traffic volumes as a result of changes in employment at Pinellas. These changes in traffic volumes are predicted to result in an increase of less than 1 dB in peak-hour sound levels along Belcher Road and no increase in peak-hour sound levels along Bryan Dairy Road. Changes in sound levels along other routes are estimated to be small. The increased noise levels along the major access routes would be expected to cause no increase in annoyance level to communities or individuals.

Noise emissions from onsite construction activities have not been analyzed but may be expected to result in a short-term increase in noise from heavy equipment operation and other construction noise sources at residential areas to the north. Construction activities include erecting a major new building and parking garage on the northern part of the site. Noise emissions from onsite operation activities should be similar to those from existing sources. The facilities would be designed to minimize noise levels at the site boundary and to assure compliance with the Pinellas County Noise Ordinance (see section D.2.2.3).

Construction workers and personnel working at any of the reconfigured facilities at Pinellas would be exposed to varying levels of equipment noise. The requirements for worker hearing protection as described previously for current facilities would continue to be met at Pinellas.

Although no increase in annoyance is expected offsite from construction and operation onsite, measures would be necessary to protect workers' hearing. These measures include the use of standard silencing packages on construction equipment and providing workers in noisy environments with appropriate earmuffs or earplugs approved by OSHA. Noise levels would be measured in worker areas and an effective hearing protection program conducted.

4.2.2.3 *Water Resources*

This section describes potential surface and groundwater impacts due to the Pinellas consolidation alternative.

Surface Water. Since all water is supplied from the county system and all wastewater is returned to the county wastewater collection system, there would be no impact on local surface water levels.

The addition of new buildings for office/manufacturing, mechanical technology, and onsite storage of hazardous waste would increase the amount of impervious area at Pinellas (FDI, 1992a).

TABLE 4.2.2.2-1.—*Contribution to Air Quality from the Pinellas Consolidation Alternative and Total Concentrations with Comparison to Applicable Regulations and Guidelines*

Pollutant	Averaging Time	Most Stringent Regulation or Guideline ($\mu g/m^3$)	Baseline Concentration ($\mu g/m^3$)[h]	Proposed Action Concentration ($\mu g/m^3$)	Total Concentration ($\mu g/m^3$)
Carbon Monoxide (CO)	8-hour	10,000[b]	8,016	2.8	8,018.8
	1-hour	40,000[b]	13,742	6.2	13,748.2
Lead (Pb)	Calendar Quarter	1.5	e	g	e
Nitrogen Dioxide (NO_2)	Annual	100[b]	e	0.2	≥ 0.2
Ozone (O_3)	1-hour	235[b]	243.4	g	243.4
Particulate Matter (PM_{10})	Annual	50[b]	e	g	e
	24-hour	150[b]	e	g	e
Sulfur Dioxide (SO_2)	Annual	60[c]	23	0.0005	23
	24-hour	260[c]	133	0.006	133
	3-hour	1,300[b]	526	0.02	526
Hazardous Air Pollutants and Other Toxic Compounds[a]					
1,1,1-Trichloroethane	Annual	10[c]	≥2.0[f]	0.04	≥2.04
	24-hour	9,168[c]	≥26[f]	0.39	≥26.39
	8-hour	38,200[c]	≥55[f]	1.07	≥56.07
1,4-Dioxane	Annual	0.71[c]	≥0.06[f]	0.11	≥0.17
	24-hour	216[c]	e	1.17	e
	8-hour	900[c]	e	3.20	e
Acetone	24-hour	8,544[c]	e	12.44	≥12.44
	8-hour	35,600[c]	e	34.18	≥34.18
Acids	Annual	d	e	1.79	≥1.79
Alcohol	Annual	d	e	2.37	≥2.37
D'Limonene	Annual	d	e	0.29	≥0.29
Dichlorodifluoro-methane	Annual	200[c]	e	0.04	≥0.04
	24-hour	23,760[c]	e	0.39	≥0.39
	8-hour	99,000[c]	e	1.07	≥1.07
Dimethyl Formamide	Annual	30[c]	e	0.04	≥0.04
	24-hour	72[c]	e	0.39	≥0.39
	8-hour	300[c]	e	1.07	≥1.07
Ethyl Benzene	Annual	1,000[c]	e	0.07	≥0.07
	24-hour	1,041.6[c]	e	0.78	≥0.78
	8-hour	4,340[c]	e	2.14	≥2.14
Glycol Ethers	24-hour	38.4[c]	e	43.93	≥43.93
	8-hour	160[c]	e	120.70	≥120.70
Hexane	Annual	200[c]	e	0.11	≥0.11
	24-hour	422.4[c]	e	1.17	≥1.17
	8-hour	1,760[c]	e	3.20	≥3.20
Lead Compound	Annual	0.09[c]	≥0.022[f]	g	≥0.022
	24-hour	0.36[c]	≥0.13[f]	g	≥0.13
	8-hour	1.5[c]	≥0.23[f]	g	≥0.23
Methyl Ethyl Ketone	Annual	80[c]	e	0.11	≥0.11
	24-hour	1,416[c]	e	1.17	≥1.17
	8-hour	5,900[c]	e	3.20	≥3.20
Methyl Isobutyl Ketone	24-hour	492[c]	e	2.33	≥2.33
	8-hour	2,050[c]	e	6.41	≥6.41

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Footnotes at end of table.

This would increase the volume of stormwater runoff to the South and East retention ponds and potentially to the Cross Bayou Canal into which they discharge. The increase in runoff would be controlled by the retention ponds so that offsite impacts would be minimized.

Surface Water Quality. The proposed location for the mechanical technology and office/manufacturing buildings lies within the Northeast Site solid waste management unit and Spray Irrigation Site, respectively, which contain contaminated groundwater in the near-surface aquifer (PI DOE, 1991a). The discharge of contaminated groundwater or soils to surface water during construction would be avoided.

The additional sanitary wastewater generated by the transferred processes is approximately 290 MGY (see table 3.4.2-4). The additional wastewater would represent an approximately 440 percent increase over the current rate of approximately 66 MGY (table 3.2.3-2). The additional discharge from transferred functions represents approximately 4 percent of the 7.3 BGY current treatment rate of the county system and approximately 3 percent of the 10.4 BGY capacity (PI DOE, 1987). The effluent to the Pinellas County system would be required to meet all Federal, state, and local discharge requirements.

As presented in section 4.1.7.3, Pinellas has had five noncompliances with permit limits for discharges to the Pinellas County wastewater treatment plant; four for pH and one for zinc. Under this alternative, Pinellas may be required to renew its NPDES permit with more stringent limits or more extensive pretreatment for discharges with pH and zinc, especially if transferred technologies increase the concentration of these substances in Pinellas discharges to the community wastewater treatment plant.

Groundwater. Currently, no groundwater is withdrawn beneath Pinellas. The Pinellas County Water System supplies the plant with water from the Floridan aquifer.

The Pinellas alternative would require approximately 13,000 GPD of additional water during the construction phase and approximately 0.95 MGD for operations (table 3.4.2-3 and 3.4.2-5, respectively). The construction usage would be less than a 10 percent increase in the approximately 0.14 MGD (table 3.2.3-3) current usage, with the operational use an approximately 680 percent increase. With current water demands and restrictions, the increase in operational usage could pose an adverse impact on water supply (PI GE, 1988). Conservation measures at the plant, such as domestic water use restrictions and industrial process water recycling, could reduce the amount of water required.

Groundwater Quality. Groundwater in the surficial aquifer beneath the proposed locations is contaminated with VOCs. Table 4.1.7.3-2 shows the groundwater quality near these locations. No intentional discharge of waste materials to groundwater would occur, and no adverse impacts would result to groundwater quality. Likewise, cleanup of the aquifer would not be impacted by activities of the Proposed Action.

4.2.2.4 *Geology and Soils*

Mass movement, subsidence, seismic activity, and volcanism are unlikely to occur at levels that would impact construction or operation activities. There are no landslides, active sinkholes, or other nontectonic movements at Pinellas. No impact would result to regional or local geologic features from this action.

Transferring the electrical/mechanical functions to Pinellas would require new building space. The total disturbance of approximately 55 acres (table 3.4.2-2) during construction could temporarily lead to an increase in soil erosion from wind and water. Water erosion is likely to occur only sporadically during

storm periods. Wind erosion is likely to occur intermittently depending on wind velocities. The maximum total soil loss rate associated with this construction is not expected to exceed the maximum acceptable soil loss of 5 tons per acre per year. Wind erosion control measures would include sprinkling, use of mulch, and other dust control methods. Water erosion control measures would include proper drainage, grading, and reseeding. Exposing only small areas for limited periods would reduce erosional effects and ensure that soil losses are within acceptable levels.

Soil disturbance during operations would be reduced from that of the construction period as areas temporarily given over to laydown and haul-road use are restored. Environmental consequences to soils during the periods of operations would include permanent alteration of soil cover as the result of emplacement of structures, parking lots, and other features.

4.2.2.5 *Biotic Resources*

The construction, modification, and operation of facilities and equipment for the consolidation of electrical/mechanical functions at Pinellas would disturb most of the remaining terrestrial habitat on the site. However, where possible, disturbed land would be revegetated using native species. Loss of a mowed field with scattered clusters of trees in the north-central part of the site would be necessary to accommodate new buildings. A new parking structure proposed for the east-central part of the site would only displace paved areas and landscaped vegetation. Additionally, new hazardous waste storage capacity would be required. Areas cleared of existing vegetation would be permanently occupied by structures, pavements, or new vegetation.

These impacts would not represent a large reduction in the quantity or quality of terrestrial habitat surrounding Pinellas. Although implementation of this alternative would result in the loss of most terrestrial habitat from Pinellas, all of this habitat is currently in a highly disturbed condition and none of it is unusual to the surrounding area. Potential mitigation measures include habitat disturbance minimization and revegetation with native species.

Although it is unlikely due to the lack of natural surface water on the site, wetlands may potentially be disturbed by construction activities associated with the Pinellas consolidation alternative. DOE has initiated consultations with the Corps of Engineers to determine whether any jurisdictional wetlands occur on the site.

Areas subject to disturbance would be inspected for the presence of wetlands by the COE and Florida Department of Environmental Regulation prior to disturbance. The areas to be disturbed do not include the known wetlands within the stormwater retention ponds on the site (PI FWS, 1982; PI DOE, 1983). Development of the consolidated facilities would increase the volume of runoff to the stormwater retention ponds. The increased volume of water within the ponds would potentially result in the alteration of the wetlands. Potential mitigation includes additional stormwater management and soil erosion control measures.

The increased water demands during operation of the consolidated facilities would be met by, and wastewater returned to, the local municipal systems, thereby avoiding impacts to aquatic habitats in the vicinity of the site. Increased stormwater runoff to the detention ponds could potentially affect any aquatic biota established within them, but likely impacts would be negligible.

DOE has initiated consultations with the FWS and the Florida Natural Areas Inventory would be consulted to determine whether the proposed construction would potentially impact threatened or endangered species.

4.2.2.6 *Cultural Resources*

The construction, modification, and operation of facilities and equipment for the consolidation of electrical/mechanical functions at Pinellas may have impacts if important Native American resources are present and no impacts if such resources do not occur. No NRHP-eligible prehistoric or historic resources are expected to occur. Consultation with the Seminole tribes has been initiated for this project, and important Native American resources may be identified through consultation. Construction activities may physically disturb Native American resources. Operations may decrease accessibility to traditional use areas or create audio or visual intrusions to sacred locations.

The environmental consequences of locating functions at SNL, SRS, LANL, and Y-12 as part of this alternative are discussed in sections 4.1.5.6, 4.1.2.6, 4.1.3.6, and 4.1.4.6, respectively.

4.2.2.7 *Socioeconomics*

The following section discusses the potential environmental impacts of the Pinellas alternative. To provide a context for potential socioeconomic impacts to the ROI, a discussion of the local employment, population, housing, community services, and transportation is included for this alternative, which has not been previously discussed under the No Action or the Proposed Action (section 4.1). Assumptions, methodologies, and supporting data for the assessment of environmental consequences are presented in appendix E. Table 4.2.2.7-1 shows the economic and population characteristics for this alternative.

TABLE 4.2.2.7–1.—*Pinellas Plant Alternative Economic and Population Characteristics*

Economics	1995 Peak Construction	Percent Over Baseline	2000 Peak Operation	Percent Over Baseline
Baseline Civilian Labor Force	1,078,854	NA	1,188,649	NA
Baseline Unemployment Rate	5.2%	NA	5.4%	NA
Baseline Personal Income (Thousands $)	$42,758,562	NA	$51,496,890	NA
Baseline Per Capita Income ($/Person)	$20,303	NA	$22,837	NA
Baseline Employment	1,022,608	NA	1,124,772	NA
Direct Jobs	1,021	0.10	3,414	0.30
Indirect Jobs	2,951	0.29	6,464	0.57
In-Migrating Workforce	334	0.03	1,773	0.16
Total In-Migration	744	0.04	4,496	0.20
Population Increase				
Hillsborough County	33	0.00	202	0.02
Pasco County	27	0.01	162	0.05
Pinellas County	684	0.08	4,132	0.42
Clearwater	171	0.16	1,034	0.92
Largo	132	0.19	800	1.07
Pinellas Park	78	0.17	472	0.95
Seminole	78	0.79	472	4.46
St. Petersburg	223	0.09	1,349	0.49
ROI (County Total)	744	0.04	4,496	0.20

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Source: Estimated from Census, 1977, 1983, 1990a; DOC, 1990a and b, 1991a; FL Labor, 1991; FDI, 1992a.

The construction, modification, and installation of facilities and equipment for the consolidation of electrical/mechanical and special products functions at Pinellas would require 1,021 employees at peak construction (FDI, 1992a). Operations employment would begin in 1997 and grow to a full complement of 3,400 jobs in the year 2000. In addition to those jobs created directly by the project, other employment, indirectly created, would lead to further in-migration to the ROI.

Locating electrical/mechanical and special products functions at Pinellas would increase population in the ROI by approximately 700 persons during 1995, the peak construction year, and by an estimated 4,500 persons during the year 2000, the peak operations period. The in-migrating population is primarily related to the in-migrating professional employees who are scientists, engineers, etc. (and their families), and who are not available in the regional unemployed labor force. In 2000, this project-related population would represent a negligible increase of less than 1 percent over the projected ROI baseline population of 2,259,000 persons. Except for Seminole, Largo, Pinellas Park, and Clearwater, none of the ROI cities or counties would experience population growth of more than 1 percent. Seminole would grow by almost 1 percent during peak construction and by about 4 percent by the year 2000. Largo, Pinellas Park, and Clearwater would each grow by about 1 percent by the start of peak operations in 2000.

The less than 1 percent change in population during the construction required for consolidating the electrical/mechanical and special products functions would create the need for approximately 280 housing units, which is less than a 1 percent addition to this large urban area. For operations in the year 2000, the less than 1 percent change in population would not create the need for additional housing units beyond a 1 percent increase except in Seminole where the greatest increase (3 percent) would occur. In past years, housing units in the ROI have been built at an annual rate of 4 percent and at an annual rate of 6 percent in Seminole. Therefore, additional housing needed to accommodate the in-migrating population could be built without any adverse effect on the cities and counties in the ROI.

As identified in the Affected Environment section, some water and wastewater systems would be nearing capacity by the year 2000, given the No Action future baseline. The Pinellas alternative would add no more than a 1 percent increase over the baseline projection to any of the affected systems.

In the 1989-1990 school year, school districts in Hillsborough and Pinellas counties were operating, on average, at 94 percent and 87 percent of capacity, respectively. However, these capacities are projected to be exceeded by the years 1995 and 2000 under the No Action future baseline. The largest increases are expected to occur in the school districts in Pinellas County where enrollments are projected to exceed current capacities by 34 percent in 1995 and 43 percent in 2000. Smaller increases are expected to occur in the school districts in Hillsborough County where enrollments are projected to exceed current capacities by 9 percent in 1995 and 17 percent in 2000. However, school capacities will not be affected beyond what would naturally occur under the No Action baseline growth because the Pinellas alternative would not add more than 1 percent to enrollments during construction or operations.

Existing health care resources are more than adequate to accommodate the projected population increases. Current staffing levels for police and fire services in the ROI are also adequate to support the projected population increases, while maintaining current service standards, because none of the counties or cities except Seminole would grow by more than 1 percent over the No Action baseline. Seminole would need to add two police officers and seven firefighters by the year 2000 in order to maintain its present service standards.

Relative to baseline traffic projections, consolidation activities would have minimal impacts on the local transportation network serving Pinellas. Conditions

on all route segments in the local transportation network are projected to remain consistent with baseline projections. During peak construction, additional daily truck traffic associated with construction activities would be negligible relative to historic levels. Annual vehicle accidents would increase by approximately 13, and associated fatalities would increase by less than 1.

Conditions on most route segments in the local transportation network during typical operations are projected to remain consistent with baseline projections. However, projected conditions along the segment of Florida State Route 688 between I-275 and US 19 would deteriorate from baseline restricted flow conditions, with considerable deterioration of service from disruptions, to extreme congestion and complete deterioration of service from disruptions due to consolidation activities. Additional commercial truck traffic is estimated to be negligible relative to historic levels. An estimated 78 additional vehicle accidents and 1 associated fatality are projected to occur annually within the ROI due to consolidation activities.

In summary, peak activities at Pinellas would have a minor effect on transportation services at the plant and on roads near the plant. These services would be further burdened during the initial peak operations phase. The Pinellas alternative would not adversely affect other community resources beyond what would naturally occur in the No Action baseline.

Under the Pinellas alternative, the milliwatt heat source surveillance function would be relocated from Mound to SNL. During peak construction, one additional employee would be required. Operations would require four additional employees, creating no adverse effect on the cities and counties in the ROI.

4.2.2.8 *Waste Management*

Solid waste generated during construction of new buildings would include discarded packaging and construction materials (e.g., plasterboard, brick, wood, and scrap steel). All construction waste would be disposed of offsite. Sanitation sewage would be handled by an outside contractor; therefore, existing site wastewater treatment facilities would not be affected.

Hazardous waste generated during construction would consist of such materials as waste adhesives, oils, cleaning fluids, solvents, and coatings. All hazardous waste would be appropriately packaged, manifested, and shipped under contract with RCRA-permitted transporters to RCRA-permitted offsite disposal facilities or recyclers.

The relocation of all current nonnuclear manufacturing activities from KCP to Pinellas would generate additional hazardous and nonhazardous wastes at Pinellas. The additional hazardous wastes generated would consist of the following: halogenated and nonhalogenated solvents, both ignitable and toxic; spent plating bath solutions; corrosives; combustibles; TCLP materials; off-specification materials; sludge; oils/solvents; PCBs (expected to be phased out); and caustics and acid solutions. A summary of the wastes, effluents, and emissions and discussions related to their management can be found in appendix C.2.

The increase in waste volumes at Pinellas due to the consolidation at Pinellas could have an adverse environmental impact. New onsite facilities would have to be added to handle the additional hazardous wastes. Pinellas would have to manage a volume increase of more than 2 times for hazardous liquid waste and 111 times for hazardous solid wastes over existing volumes. The additional liquid hazardous waste volume of 51,500 gal/yr and 12,300 ft^3/yr of solid hazardous waste would require additional waste management considerations. Onsite storage facilities such as a building(s) and storage tanks would need to be constructed and equipped to comply with the EPA hazardous waste storage requirements. The hazardous wastes generated and stored at the plant site would have to be shipped to

offsite commercial treatment facilities or to offsite disposal facilities.

The additional sanitary/industrial wastewater effluent discharge of 292 MGY due to the consolidation at Pinellas could not be handled by the existing waste treatment system which currently has a capacity of 110 MGY. A major upgrade/ modification to the existing treatment plant would be necessary.

The additional 610,000 ft^3/yr of solid nonhazardous wastes would shorten the life expectancy of the offsite sanitary landfill. The landfill would have to be expanded or another landfill utilized.

Relocating only the tritium handling functions at Mound to SRS would mean the addition of 50,900 lb/yr of hazardous waste at SRS; more than 99 percent of this waste is industrial wastewater pretreatment sludge. This waste could be stored onsite at SRS in three existing RCRA-permitted storage facilities. Since SRS has a contract with an offsite vendor to ship some hazardous waste offsite for treatment and disposal, there would be no need to add storage facilities. The industrial wastewater pretreatment sludge would be shipped offsite for landfill disposal and other hazardous wastes, such as acid liquid, would be shipped offsite and incinerated.

4.2.2.9 *Human Health: Facility Operations and Accidents*

Discussions of impacts to members of the public and the environment, worker exposures, and accidents for the No Action (Affected Environment) and the Proposed Action are presented in section 4.1 and sections 4.1.1 to 4.1.8. Information specific to Pinellas (i.e., different from the Proposed Action) is discussed below; actions that are the same as those for the proposed consolidation at KCP were discussed earlier and not repeated here.

Releases of chemical pollutants as a result of Pinellas operations are discussed in the Air and Water Resources sections for Pinellas (4.2.2.2 and 4.2.2.3, respectively). Cumulative releases of methylene chloride and trichlorethylene result in onsite (worker) and site boundary (public) individual cancer risks of 4.0×10^{-5} and 3.8×10^{-5}, respectively. Exposures to members of the public associated with radiological releases from current Pinellas operations are well below applicable permit, regulatory, and DOE operational requirements (PI DOE, 1991b). Consolidating functions at Pinellas would not result in any increases of radiological releases.

A review of the recent Pinellas annual environmental and accident reports indicates that there have been no significant adverse impacts to workers, members of the public, or the environment. This review was performed to provide an indication of the site's accident history. The time period of the review (1986-1990) was a period during which plant operations were much higher than in the past year and higher than anticipated in the future. Since the functions that would be consolidated at Pinellas are the same as or similar to those currently being performed at Pinellas and would be conducted in Pinellas facilities, the current accident profile at Pinellas would not change as a result of consolidating these functions at Pinellas.

This alternative involves relocation of the electrical/ mechanical and special products functions at Pinellas as an alternative to consolidation at KCP. Differences in site characteristics between Pinellas and KCP cause small differences of pollutant concentrations at Pinellas from those calculated for the KCP site. Both the existing and cumulative cancer risks exceed 10^{-6} (see table F5-19b in appendix F), which is the level considered acceptable since this incidence of cancers cannot be distinguished from the normal risks to an individual member of the public. Chemical concentrations that result in cancer risks from operations that are greater than 10^{-6} would require appropriate measures to reduce the risk to less than 10^{-6}.

4.2.3 Rocky Flats Plant

Impacts of the RFP alternative are similar to the Proposed Action because the tritium-handling functions from Mound and Pinellas would be relocated to SRS (section 4.1.2) and LANL (section 4.1.3), respectively, and the neutron generator, cap assemblies, and thermal batteries functions from Pinellas and the MWHS surveillance function from Mound would be relocated to SNL (section 4.1.5). However, the impacts of this alternative would be less than the impacts of the Proposed Action at LANL (section 4.1.3), which would only receive the detonator and calorimeter functions from Mound and the neutron tube target loading function from Pinellas, but not the beryllium and pit support functions from RFP. The electrical/mechanical, special products, and beryllium and pit support functions currently performed at RFP would remain in place but at the same reduced workload as the Proposed Action.

4.2.3.1 *Land Resources*

Consolidation of electrical/mechanical functions at RFP would be relocated into existing, vacant space in Buildings 444, 447, 460, 881, and 883. New construction would include a one-story mechanical technology building, a three-story office/manufacturing building, a two-story parking structure, and new surface parking and access roads (figure 3.4.3-2). The new construction would occur to the west of the existing fenced security area and would result in approximately 43 acres of disturbed land (FDI, 1992c). The new uses would be compatible with adjacent RFP uses, existing land use plans, and zoning.

During the construction period, the offsite land requirements for residential use would be approximately 26 acres primarily distributed throughout Jefferson and Boulder counties. The project-related land requirements for residential land uses associated with operations would be approximately 238 acres. This acreage represents a small percentage of the land available for development within the two counties and the region.

Regional recreational opportunities are widespread and plentiful in the RFP ROI. This alternative would not adversely affect regional recreation during the construction or operations phases.

The proposed new facilities would be located immediately adjacent to the west end of the fenced security area, which is heavily developed. The buildings would be similar in appearance to the existing structures and would be approximately 1.5 miles from State Highway 93, the closest public viewpoint. There would be no apparent change to the average offsite viewer. The impact to visual resources would be negligible and would not effect VRM classifications.

4.2.3.2 *Air Quality and Acoustics*

Air Quality. During the construction phase, minor construction-related air quality impacts would occur, including the generation of particulate matter such as dust and dirt. These impacts would be controlled through standard construction practices such as watering of construction sites. During operation, air emissions could increase at RFP for the criteria pollutants (totaling approximately 40 tons per year) and for HAPs/toxics (totaling approximately 20 tons per year) (Le, 1992). The emissions inventory for the RFP alternative is presented in table D.3.1.2-3. Table 4.2.3.2-1 presents the predicted impacts at RFP from the RFP consolidation alternative. Air emissions are all within applicable standards and guidelines except for ozone. The exceedance for ozone is associated with baseline conditions at the site (section 4.1.8.2). See appendix D for a description of the input parameters, assumptions, and methodology used to estimate impacts of this alternative on air quality at RFP.

Normal operations result in the emission of radioactive materials at RFP. The RFP alternative

TABLE 4.2.3.2-1.—*Contribution to Air Quality from RFP Consolidation Alternative and Total Concentration with Comparison to Applicable Regulations and Guidelines*

Pollutant	Averaging Time	Most Stringent Regulation or Guideline ($\mu g/m^3$)	Baseline Concentration ($\mu g/m^3$)[f]	Proposed Action Concentration ($\mu g/m^3$)	Total Concentration ($\mu g/m^3$)
Carbon Monoxide (CO)	8-hour	10,000[b]	4,444	5.7	4,449.7
	1-hour	40,000[b]	11,122	8.1	11,130.1
Hydrogen Sulfide (H_2S)	1-hour	142[c]	≥18.8[e]	h	≥18.8
Lead (Pb)	Calendar Quarter	1.5[b]	0.12	h	0.12
	30-day	1.5[c]	g	h	g
Nitrogen Dioxide (NO_2)	Annual	100[b]	21	0.1	21.1
Ozone (O_3)	1-hour	160[c]	561.5	h	561.5
Particulate Matter (PM_{10})	Annual	50[b]	21.9	h	21.9
	24-hour	150[b]	83.8	h	83.8
Sulfur Dioxide (SO_2)	Annual	80[b]	13.3	0.0003	13.3
	24-hour	365[b]	94.2	0.02	94.2
	3-hour	1,300[b]	133.9	0.03	133.9
Hazardous Air Pollutants and Other Toxic Compounds[a]					
1,1,1-Trichloroethane	Annual	d	≥0.42[e]	0.001	≥0.42
1,4-Dioxane	Annual	d	g	0.003	≥0.003
Acetone	Annual	d	≥0.003[e]	0.04	≥0.04
Acids	Annual	d	g	0.06	≥0.06
Alcohols	Annual	d	g	0.08	≥0.08
Ammonia	Annual	d	≥0.2[e]	h	≥0.2
Carbon Tetrachloride	Annual	d	≥0.76[e]	h	≥0.76
Cyclohexane	Annual	d	≥0.002	h	≥0.002
D'Limonene	Annual	d	g	0.009	≥0.009
Dichlorodifluoromethane	Annual	d	g	0.001	≥0.001
Dimethyl Foramide	Annual	d	g	0.001	≥0.001
Dioctyl Pthalate	Annual	d	≥0.004[e]	h	≥0.004
Ethyl Alcohol	Annual	d	≥0.003[e]	h	≥0.003
Ethyl Benzene	Annual	d	g	0.002	≥0.002
Ethylene Glycol	Annual	d	≥0.005[e]	h	≥0.005
Glycol Ethers	Annual	d	g	0.13	≥0.13
Hexane	Annual	d	g	0.003	≥0.003
Hydrogen Chloride	Annual	d	≥0.04[e]	h	≥0.04
Hydrogen Fluoride	Annual	d	≥0.12[e]	h	≥0.12
Isopropyl Alcohol	Annual	d	≥0.003[e]	h	≥0.003
Methyl Ethyl Ketone	Annual	d	g	0.003	≥0.003
Methyl Isobutyl Ketone	Annual	d	g	0.007	≥0.007
Methylene Chloride	Annual	d	≥0.07[e]	0.001	≥0.07
Miscellaneous Solvents	Annual	d	g	0.04	≥0.04
Naptha/Mineral Spirits	Annual	d	g	0.02	≥0.02
Nitric Acid	Annual	d	≥0.05[e]	h	≥0.05
Tetrachloroethylene	Annual	d	g	0.002	≥0.002
Toluene	Annual	d	g	0.02	≥0.02
Trichloroeythlene	Annual	d	g	0.02	≥0.02
Trichlorotrifluoroethane	Annual	d	≥0.43[e]	0.001	≥0.43
Xylene	Annual	d	g	0.01	≥0.01

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[a] Compounds listed are the major pollutants of concern (FDI, 1992a; Le, 1992).
[b] Federal Standard (40 CFR 50).
[c] State standard (CO Health, 1989).
[d] No state standard.
[e] No Action concentration value, background concentration value not available.
[f] Baseline Concentrations are from table 4.1.8.2-1.
[g] Data unavailable.
[h] Emissions of this pollutant would be less than 100 lb/yr (0.01 lb/hr) (Le, 1992).

to the Proposed Action would not result in an increase in the emission of radioactive materials.

Acoustic Conditions. Changes in noise levels during the construction and operation periods have been estimated for the major traffic routes around RFP. The estimates are based on existing traffic volumes and projected changes in traffic volumes as a result of anticipated changes in employment at RFP. These changes in traffic volumes are predicted to result in an increase of less than 2 dB in peak-hour sound levels along state highways 72 and 128, and Indiana Street. Changes in sound levels along other routes are estimated to be small. The increased noise levels along the major access routes would be expected to cause no increase in annoyance level to communities or individuals.

Noise emissions from onsite construction activities have not been analyzed but are not expected to result in any increase in offsite noise levels because of the distance to the site boundary. Construction activities include erecting a new building and renovation of existing buildings. Noise emissions from onsite operation activities should be similar to those from existing sources. The facilities would be designed to minimize noise levels at the site boundary. Noise emissions from construction equipment and machines, and from operational facilities, equipment, and machines are not expected to cause ambient noise levels to exceed the EPA guidelines set to protect the public from the effect of broadband environmental noise and to protect the public against hearing loss.

Construction workers and personnel working at any of the reconfigured facilities at RFP will be exposed to varying levels of equipment noise. The requirements for worker hearing protection as described previously for current facilities would continue to be met at RFP.

Although no increase in annoyance is expected offsite from construction and operation onsite, measures would be necessary to protect workers' hearing. These measures include the use of standard silencing packages on construction equipment and providing workers in noisy environments with appropriate earmuffs or earplugs approved by OSHA. Noise levels would be measured in worker areas and an effective hearing protection program conducted.

4.2.3.3 *Water Resources*

This section describes potential surface and groundwater impacts due to the RFP consolidation alternative.

Surface Water. Temporary water requirements during construction would result in the need for an additional 13,000 GPD, while the requirement due to consolidation operations would be approximately 0.92 MGD (tables 3.4.3-3 and 3.4.3-5, respectively). The water needed for construction represents approximately a 4-percent increase over the current water usage of approximately 0.32 MGD (table 3.2.4-3), with the water needed for operations approximately a 290-percent increase. Much of the water for RFP is obtained from the Denver Water Board (RF Tab F, 1992); therefore, no impacts from site surface water withdrawals would occur.

RFP has a water supply contract with the Denver Water Board for 1.5 MGD, but this contract is not guaranteed. The additional requirement of 1.5 MGD may require an amended agreement. The Denver Water Board's surface water sources are Gross Reservoir and Ralston Reservoir.

The existing RFP sewage treatment plant, which discharges to Walnut Creek, is the only discharger to surface waters. It has a capacity of 150 MGY (table 3.2.4-2). The additional sanitary wastewater generated by the transferred processes is approximately 280 MGY (see table 3.4.3-4). This additional wastewater would represent approximately a 3,500-percent increase over the current sanitary wastewater generation rate of 7.9 MGY (table 3.2.4-2). Additional wastewater treatment capacity would be required to accommodate this increase.

Surface Water Quality. Impacts to surface water quality may occur during the construction/ modification phase due to land disturbance. Disturbed soils may be transported via surface runoff or wind to receiving waters. Appropriate erosion control measures would be used to minimize soil loss to surface waters.

As already described, additional wastewater treatment capacity would be required; the influent and effluent would be required to meet all Federal, state, and local discharge requirements.

Water quality could be affected if transferred technologies increase the amount of biochemical oxygen demand or fecal coliform discharges. As presented in section 4.1.8.3, previous noncompliances involving these parameters may require more stringent limits or more extensive pretreatment when the NPDES permit is renewed.

The proposed new parking and building areas would increase the potential of nonpoint source pollutants being transported to Walnut and Woman Creeks. The treatment facilities and the capacity of the existing runoff-control holding ponds may have to be expanded due to the potential for increased runoff. Since water in the holding ponds is monitored before release to water bodies, no adverse impacts to downstream surface water bodies should occur as a result of increased runoff.

Groundwater. The Boulder Conservation Council supplies RFP with water from the Denver Basin aquifer for domestic and industrial use. Since no water is withdrawn from beneath RFP, there would be no adverse impacts to the available quantity of groundwater.

Groundwater Quality. Table 4.1.8.3-3 summarizes the groundwater quality closest to the proposed building sites. All data are within water quantity criteria and should not have an adverse impact on the RFP alternative. There are no plans to discharge waste materials directly to groundwater. Given normal safeguards and precautions, no adverse impacts would result to groundwater quality.

4.2.3.4 *Geology and Soils*

Mass movement, subsidence, seismic activity, and volcanism are unlikely to occur at a level that would impact construction or operation activities. There are no landslides, sinkholes, or other nontectonic movements at RFP. No impact would result to regional or local geologic features from this action.

Under the RFP alternative, construction could temporarily disturb about 43 acres of land and lead to an increase in soil erosion from wind and water (table 3.4.3-2). Water erosion is likely to occur only sporadically during storm periods. Wind erosion is likely to occur intermittently depending on wind velocities. The maximum total soil loss rate associated with this construction is not expected to exceed the maximum acceptable soil loss of 5 tons per acre per year. Wind erosion control measures can include sprinkling, use of mulch, and other dust control methods. Water erosion control measures would include proper drainage and grading. Exposing only small areas for limited periods would reduce erosional effects and ensure that losses remain within acceptable levels.

Soil disturbance during operations would be reduced from that of the construction period as areas temporarily given over to laydown and haul-road use are restored. Environmental consequences to soils during the periods of operations would include permanent alteration of soil cover as the result of emplacement of structures, parking lots and other features. There would be no adverse impact to soils.

4.2.3.5 *Biotic Resources*

The construction, modification, and operation of facilities and equipment for nonnuclear consolidation at RFP would require the loss of natural vegetation and terrestrial wildlife habitat. Losses of

approximately 43 acres of mostly short-grass prairie vegetation to the immediate west of the central developed area would be necessary to accommodate new buildings and parking, as well as construction laydown and construction parking. The latter would represent a temporary disturbance of about 18 acres and would be revegetated where possible using native species. Additionally, new wastewater treatment, hazardous waste storage, and landfill capacity would be required. Areas cleared of existing vegetation would be permanently occupied by structures, pavement, or new vegetation.

These actions would not represent a major reduction in the quantity or quality of terrestrial habitat surrounding RFP. Although approximately 43 acres of habitat would be lost, this represents less than 1 percent of the over 6,000-acre (section 4.1.8.1) security buffer zone. Potential mitigation measures include habitat disturbance minimization and revegetation with native species.

Although NWI Maps do not show any wetlands within the areas subject to disturbance (RF FWS, 1975), these areas would be inspected for the presence of wetlands by the Corps of Engineers. If any delineated wetlands are disturbed or destroyed during construction, compensatory replacement wetlands would be purchased or constructed elsewhere within RFP or its vicinity at a ratio designated by the Corps of Engineers.

Water for RFP is obtained from the Denver Water Board and thereby would not affect aquatic resources at RFP. Potential impacts to aquatic habitats could occur since discharge rates to onsite water bodies would significantly increase (section 4.2.3.3). All effluent discharged would be required to comply with conditions established in the NPDES permit. Therefore, adverse impacts to aquatic resources are not expected.

Consultations have been initiated with the FWS and Colorado Natural Resources Department to determine whether the proposed construction would potentially impact threatened or endangered species. An inspection for the black-footed ferret (*Mustele nigripes*) would be performed if any development would affect areas within or close to where prairie dog colonies occur.

4.2.3.6 *Cultural Resources*

The construction, modification, and operation of facilities and equipment for the consolidation of electrical/mechanical functions at RFP may have impacts if important Native American resources are present and no impacts if such resources do not occur. No NRHP-eligible prehistoric or historic resources are expected to occur. Consultation with the Comanche, Cheyenne, Arapaho, Southern Ute, Ute, Mountain Ute, and Apache groups has been initiated for this project, and important Native American resources may be identified through consultation. Construction activities may physically disturb Native American resources. Operations may decrease accessibility to traditional use areas or create audio or visual intrusions upon sacred locations.

The environmental consequences of locating functions at SNL, SRS, and LANL as part of this alternative are discussed in sections 4.1.5.6, 4.1.2.6, and 4.1.3.6, respectively.

4.2.3.7 *Socioeconomics*

The following section discusses the potential environmental impacts of the RFP alternative. To provide a context for potential socioeconomic impacts to the ROI, a discussion of the local employment, population, housing, community services, and transportation is included for this alternative, which has not been previously discussed under the No Action or the Proposed Action (section 4.1). Assumptions, methodologies, and supporting data for the assessment of environmental consequences are presented in appendix E. Table 4.2.3.7-1 shows the economic and population characteristics for this alternative.

TABLE 4.2.3.7-1.—*Rocky Flats Plant Alternative Economic and Population Characteristics*

Economics	1995 Peak Construction	Percent Over Baseline	2000 Peak Operation	Percent Over Baseline
Baseline Civilian Labor Force	1,103,180	NA	1,205,374	NA
Baseline Unemployment Rate	5.0%	NA	5.6%	NA
Baseline Personal Income (Thousands $)	$43,025,241	NA	$51,753,781	NA
Baseline Per Capita Income ($/Person)	$22,204	NA	$24,644	NA
Baseline Employment	1,047,492	NA	1,137,688	NA
Direct Jobs	538	0.05	3,163	0.28
Indirect Jobs	1,443	0.14	4,921	0.43
In-Migrating Workforce	176	0.02	1,644	0.14
Total In-Migration	392	0.02	4,170	0.20
Population Increase				
Adams County	75	0.03	802	0.25
Arapahoe County	22	0.01	229	0.05
Boulder County	100	0.04	1,069	0.42
Boulder	26	0.03	275	0.30
Broomfield	20	0.08	213	0.77
Denver County	36	0.01	379	0.07
Jefferson County	159	0.03	1,691	0.34
Arvada	66	0.07	701	0.71
Golden	22	0.16	238	1.59
Westminster	35	0.04	371	0.44
ROI (County Total)	392	0.02	4,170	0.20

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Source: Estimated from Census, 1977, 1983, 1990a; DOC, 1990a and b, 1991a; CO Labor, 1991; FDI, 1992a.

The construction, modification, and installation of facilities and equipment for the consolidation of electrical/mechanical functions at RFP would require 538 employees at peak construction (FDI, 1992a). Operations employment would begin in 1997 and grow to a full complement of 3,200 jobs in the year 2000. In addition to those jobs created directly by the project, other employment, indirectly created, would lead to further in-migration to the ROI.

Locating electrical/mechanical functions at RFP would increase population in the ROI by approximately 400 persons during 1995, the peak construction year, and by an estimated 4,200 persons during the year 2000, the peak operations period. The in-migrating population is primarily related to the in-migrating professional employees who are scientists, engineers, etc. (and their families) and who are not available in the regional unemployed labor force. In 2000, this project-related population would represent a negligible increase of less than 1 percent over the projected ROI baseline population of 2,100,000 persons. Only the city of Golden would experience population growth of more than 1 percent during construction or operations. However, population growth in Golden is not expected to exceed 2 percent above the projected No Action baseline.

The less than 1 percent change in population during the construction required for consolidating the electrical/mechanical functions would create the need for approximately 150 housing units, which is less than a 1 percent addition to this large urban area. For operations in the year 2000, the less than 1 percent change in population would not create the need for additional housing units beyond a 1 percent increase. Golden is the only city where additional housing units would need to be increased beyond 1

percent, but this need for additional units would not exceed a 2 percent increase. In past years, housing units in the ROI have been built at an annual rate of 3 percent. Therefore, additional housing needed to accommodate the in-migrating population could be built without any adverse effect on the cities and counties in the ROI.

As identified in the Affected Environment section, some wastewater systems would be nearing capacity by the year 2000, given the No Action future baseline. The Boulder system would be operating over 100 percent capacity. However, the RFP alternative would add no more than a 1 percent increase over the baseline projection to any of the affected systems.

In the 1989-1990 school year, school districts in Adams and Arapahoe counties were operating, on average, at 80 percent and 90 percent of capacity, respectively. Under the No Action future baseline, these capacities will not be exceeded in either 1995 or 2000. Currently, two school districts in Adams County exceed their capacities, but these capacities will not be affected beyond what would naturally occur under the No Action baseline growth because the RFP alternative would not add more than 1 percent to enrollments during construction or operations.

Existing health care resources are adequate to accommodate the projected population increases. Current staffing levels for police and fire services in the ROI are also adequate to support the projected population increases, while maintaining current service standards, because none of the counties or cities would grow by more than 1 percent over the No Action baseline.

Relative to baseline traffic projections, consolidation activities would have minimal impacts on the local transportation network serving RFP. Conditions on most route segments in the local transportation network are projected to remain consistent with baseline projections. However, projected conditions along the segment of US 40 between Colorado State Route 391 and I-25 in Denver would deteriorate as follows: from baseline stable flow conditions with minor deteriorations of service because of disruptions, to a restricted flow with considerable deterioration of service from disruptions due to consolidation activities. Additional daily truck traffic associated with construction would be negligible relative to historic levels. Annual vehicle accidents would increase by approximately 10, and associated fatalities would increase by less than 1.

Conditions on most route segments in the local transportation network during typical operations are projected to remain consistent with baseline projections. However, projected conditions along the segment of Colorado State Route 72 between I-70 and Colorado State Route 93 would deteriorate from baseline free flow conditions, with minor deterioration of service from disruptions, to a reduced flow with greater deterioration of service from disruptions. Projected conditions along the segment of Jefferson County Road 17 between Colorado State Routes 72 and 128 would deteriorate from a baseline stable flow condition to a restricted flow with considerable deterioration of service from disruptions. Additional commercial truck traffic would be negligible relative to historic levels. An estimated 110 additional vehicle accidents and 1 associated fatality are projected to occur annually within the ROI due to consolidation activities.

In summary, peak activities at RFP would have a slight effect on ROI transportation services at the plant and on roads near the plant. The RFP alternative would not adversely affect other community resources beyond what would naturally occur in the No Action baseline.

4.2.3.8 *Waste Management*

Solid waste generated during construction of new buildings would include discarded packaging and construction materials (e.g., plasterboard, brick, wood, and scrap steel). All construction waste would be disposed of offsite. Sanitation sewage would be

handled by an outside contractor; therefore, existing site wastewater treatment facilities would not be affected.

Hazardous waste generated during construction would consist of materials such as waste adhesives, oils, cleaning fluids, solvents, and coatings. All hazardous waste would be appropriately packaged, manifested, and shipped under contract with RCRA-permitted transporters to RCRA-permitted offsite disposal facilities or recyclers.

The relocation of all current nonnuclear manufacturing activities from KCP to RFP would generate additional hazardous and nonhazardous wastes at RFP. The additional hazardous wastes generated would consist of the following: halogenated and nonhalogenated solvents, both ignitable and toxic; spent plating bath solutions; corrosives; combustibles; TCLP materials; off-specification materials; sludge; oils/solvents; PCBs (expected to be phased out); and caustics and acid solutions. A summary of the wastes, effluents, and emissions and discussions related to their management can be found in appendix C.3.

The increase in hazardous and nonhazardous waste volume at RFP due to the consolidation of nonnuclear manufacturing at RFP would have an adverse environmental impact. RFP would have to manage a solid hazardous waste volume increase of more than 2 times existing volumes. The additional solid hazardous waste volume of 12,300 ft^3/yr would require additional waste management considerations. New onsite facilities would have to be added to handle the additional solid hazardous waste. Onsite storage facilities such as a building(s) would need to be constructed and equipped to comply with the EPA hazardous waste storage requirements. The hazardous wastes generated and stored at the plant site would have to be shipped to offsite commercial treatment facilities, or to offsite incineration or landfill disposal facilities.

The additional sanitary/industrial wastewater to be handled as a result of the consolidation of electrical/mechanical functions at RFP is 284 MGY, exceeding the current overall RFP sanitary sewage treatment capacity of 150 MGY. A major upgrade/modification to the existing treatment plant would be necessary.

The additional 530,000 ft^3/yr of solid nonhazardous wastes would reduce the useful operating life of the existing onsite sanitary landfill, resulting in an accelerated schedule for future expansion of the existing landfill, or development of new onsite landfill(s). Amounts of paper and scrap metals available for recycling would also increase.

4.2.3.9 *Human Health: Facility Operations and Accidents*

Discussions of impacts to members of the public and the environment, worker exposures, and accidents for the No Action (Affected Environment) and the Proposed Action are presented in section 4.1 and sections 4.1.1 to 4.1.8. Information specific to RFP (i.e., different from the Proposed Action) is discussed below; actions that are the same as those for the proposed consolidation at KCP were discussed earlier and not repeated here.

Release of chemical pollutants as a result of RFP operations is discussed in the Air and Water Resources sections for RFP (4.2.3.2 and 4.2.3.3, respectively). Cumulative methylene chloride releases result in a cancer risk of 2.2×10^{-6} to an onsite worker and would require appropriate measures to produce an insignificant impact. Cumulative carbon tetrachloride releases would result in a cancer risk of 5.3×10^{-4} to an onsite worker and 1.2×10^{-5} at the site boundary (effect on the public). In the future, CCl_4 use would be reduced. Replacement non-carcinogenic solvents like 1,1,1-trichloroethane (TCA) would be used as a substitute for CCl_4 (see table F5-14b in appendix F). Exposures to members of the public associated with radiological releases from current RFP operations are well below applicable permit, regulatory, and DOE operational requirements (RF EG&G, 1991e). Consolidating

functions at RFP would not result in any increases of radiological releases.

A review of the recent RFP annual environmental and accident reports indicates that there have been no significant adverse impacts to workers, members of the public, or the environment. This review was performed to provide an indication of the site's accident history. The time period of the review (1986-1990) was a period during which plant operations were much higher than in the past year and higher than anticipated in the future. Since the functions that would be consolidated at RFP are the same as or similar to those currently being performed at RFP and would be conducted in RFP facilities designed for these activities, the current accident profile at RFP would not change as a result of consolidating these functions at RFP.

This alternative involves consolidation of electrical/ mechanical functions at RFP as an alternative to consolidation at KCP. Differences in site characteristics between RFP and KCP would cause small differences of pollutant concentrations at RFP from those calculated for the KCP site. However, the conclusion remains that releases associated with consolidating these functions would be below applicable permit, regulatory, and DOE operational and accident situation requirements. Additionally, the concentrations of potentially hazardous chemicals associated with the functions to be relocated are also not expected to exceed levels that would cause adverse human health effects (see appendix F). Releases of CCl_4 associated with current activities exceed applicable limits, as discussed earlier in this section. However, as indicated in section 4.2.3.2, relocating the identified functions to RFP would result in no increase of CCl_4 concentrations there.

4.2.4 Phasing Out Kansas City Plant

4.2.4.1 *Land Resources*

The phaseout of KCP would not adversely impact the comprehensive planning and zoning of the city of Kansas City. A review of socioeconomic data in section 4.2.4.7 would indicate no change to demand placed on regional recreation resources. The phaseout of KCP would also present no visible change to the facility. Future use of KCP facilities would be evaluated in the transition process.

4.2.4.2 *Air Quality and Acoustics*

Air Quality. Phasing out of the nonnuclear manufacturing operations at KCP would reduce emissions of criteria air pollutants from the major sources; i.e., the steam plant boilers and various manufacturing operations. Hazardous air pollutant emissions would be reduced from the laboratories and manufacturing operations. As a result, the air quality around KCP should improve.

Normal operations do not result in the emission of any radioactive materials at KCP. Therefore, phasing out DP missions at KCP would have no effect on the emissions of radioactive materials.

Acoustic Conditions. Traffic volumes on streets near KCP would be reduced and some reduction in traffic noise levels would result. Minimal reduction in sound levels in the community is expected from elimination of noise sources at KCP.

4.2.4.3 *Water Resources*

Surface Water. The phaseout of DP activities would reduce cooling water discharges from KCP. This would not adversely impact water levels in the Big Blue River and Indian Creek.

Surface Water Quality. The phaseout of DP activities would reduce cooling water discharges to local surface waters. This would have no adverse impact on water quality in the Big Blue River and Indian Creek.

Groundwater. By eliminating nonnuclear functions, less water would be required from the Kansas City municipal water supply system. No adverse impact on water resources is expected.

Groundwater Quality. Spill protection systems and plans exist to contain and minimize effects of releases of hazardous substances. Given normal safeguards and precautions, no adverse impacts to groundwater quality are expected to result from phaseout activities of the Proposed Action. Current environmental restoration programs would not be adversely impacted by phaseout activities.

4.2.4.4 *Geology and Soils*

The proposed phaseout of the nonnuclear functions at KCP would not result in impacts on the geologic features of the area, nor would the geology have any impacts on the phaseout of the plant.

Hazardous, radioactive, and mixed waste sources would be eliminated from the plant, thus decreasing future soil contamination potential. The proposed phaseout of the nonnuclear functions at KCP would not impact the soils of the area.

4.2.4.5 *Biotic Resources*

The phaseout of nonnuclear functions at KCP would not adversely affect biotic resources; instead, the phaseout would result in a reduction of existing operational impacts to natural habitats on and around the site. Because of continuing non–DP activities within the Bannister Federal Complex, phaseout may not increase the quantity or quality of natural habitat.

4.2.4.6 *Cultural Resources*

If the phasing out of nonnuclear functions at KCP does not include ground disturbance or building modifications, then there would be no effect on cultural resources.

4.2.4.7 *Socioeconomics*

The following section discusses the potential environmental impacts of phasing out existing nonnuclear functions at KCP. To provide a context for potential socioeconomic impacts to the ROI, a discussion of the local employment, population, housing, community services, and transportation is included for this alternative, which has not been previously discussed under the No Action or the Proposed Action (section 4.1). Assumptions, methodologies, and supporting data for the assessment of environmental consequences are presented in appendix E. Table 4.2.4.7-1 shows the economic and population characteristics for this alternative.

The phasing out of functions would result in decreases in economic activity and employment in the ROI. The transfer of functions from KCP would decrease employment in the ROI by an estimated 9,800 jobs (3,800 direct and 6,000 indirect). This reduction in jobs would increase the ROI unemployment rate from a projected baseline level of 6.0 percent to 6.9 percent. Earnings in the ROI would be reduced by about $345.5 million, with a related decrease in total personal income of $429.6 million.

Phasing out functions would reduce population in the ROI by approximately 4,980 persons. This project-related change would represent a slight population decrease of less than 1 percent from the

TABLE 4.2.4.7–1.—*Kansas City Plant Alternative Economic and Population Characteristics*

Economics	2000 Peak Operation	Percent Under Baseline
Baseline Civilian Labor Force	751,591	NA
Baseline Unemployment Rate	6.0%	NA
Baseline Personal Income (Thousands $)	$32,080,918	NA
Baseline Per Capita Income ($/Person)	$24,034	NA
Baseline Employment	706,818	NA
Direct Jobs Lost	3,793	0.54
Indirect Jobs Lost	5,982	0.85
Out–Migrating Workforce	1,963	0.28
Total Out–Migration	4,980	0.37
Population Decrease		
Cass County	747	1.12
Belton	234	1.23
Harrisonville	149	1.85
Jackson County	3,197	0.45
Kansas City	1,474	0.39
Lee's Summit	598	1.17
Johnson County	901	0.24
Overland Park	368	0.31
Wyandotte County	134	0.07
ROI (County Total)	4,980	0.37

E4 4024

Source: Estimated from Census, 1977, 1983, 1990a; DOC, 1990a and b, 1991a; KS HR, 1991; MO Employment, 1991.

projected ROI baseline of 1,335,000 persons. Populations in the Cities of Belton and Lee's Summit would decrease by slightly more than 1 percent, and Harrisonville would lose about 2 percent of its projected population.

The less than 1 percent change in population after phasing out the nonnuclear functions would create an estimated additional 1,900 vacant housing units, a relatively minor increase for this large urban area. The cities of Harrisonville, Belton, and Lee's Summit would be the most affected. Vacant housing units in Belton and Lee's Summit would increase by 1 percent, and by 2 percent in Harrisonville.

The less than 1 percent estimated population loss would not adversely affect any community infrastructure and services in the ROI but would, instead, reduce the burden on the capacity of the existing systems. Existing public education and health care capacity burdens would also improve by reducing utilization. Current staffing levels for police and fire services in the ROI counties and cities would not be adversely affected, and local traffic conditions would improve slightly.

4.2.4.8 *Waste Management*

Phaseout of nonnuclear functions at KCP would reduce annual onsite hazardous waste management by 3,101,400 pounds, having a beneficial impact on the environment. The majority of the reduction would be due to decreased generation of solvent, industrial wastewater processing facility sludge, demolition wastes, bulk oil, and oil/solvent debris. Operations that constitute the major generators of hazardous wastes such as wastewater treatment, plating and etching processes, and degreasing operations would be discontinued.

Phaseout would initiate closure of existing onsite RCRA hazardous waste storage facilities. Closure would comply with a detailed closure plan and schedule approved by the Missouri Department of Natural Resources. Hazardous wastes in storage would be manifested and shipped under contract with RCRA-permitted transporters to RCRA-permitted offsite treatment and disposal facilities. Equipment, structures, and soils (if contaminated) would also be decontaminated and disposed of in accordance with all applicable environmental regulatory requirements. Existing inventories of LLW, mixed waste, and classified waste would be shipped offsite to DOE disposal facilities certified to accept such wastes.

Due to the phaseout of nonnuclear functions, the KCP would no longer generate industrial wastewater effluents, which would have a positive impact on the environment. Treatment of dilute metal finishing rinsewaters, concentrated acids and caustics, and cyanide waste by the onsite industrial wastewater processing facility would discontinue. Treated industrial wastewater discharge effluents from the industrial wastewater processing facility to the Kansas City, MO, wastewater treatment system would cease.

Nonhazardous solid waste streams such as paper, cardboard, glass, wood, plastics, scrap, and metal containers would no longer continue to be generated. Trash that would have been disposed of in the local sanitary landfill by a commercial contractor would cease, extending the operating life of the local landfill. Nonhazardous liquid wastes would no longer continue to be discharged to the industrial wastewater processing facility or to the public sanitary sewer system.

4.2.4.9 *Human Health: Facility Operations and Accidents*

Phasing out KCP DP operations would eliminate hazardous materials currently used in production processes. Consequently, phasing out KCP would result in a decrease in adverse effects. The impacts at the DOE facilities that would receive the relocated functions from KCP are discussed in their respective sections.

4.3 COMPARISON OF ALTERNATIVES

A comparison of the environmental consequences of the Proposed Action and alternatives is presented in this section and summarized in table 4.3-1. Table 4.3-1 compares the impacts to each environmental resource associated with the No Action alternative; the Proposed Action; and the Mound, Pinellas, and RFP alternatives. Summaries of the environmental consequences associated with each alternative are presented below. Cumulative impacts, mitigation measures, and adverse impacts that cannot be avoided are also discussed in this section.

4.3.1 No Action

Recent initiatives to reduce the number of nuclear weapons are expected to substantially decrease the requirements for the number and type of nuclear weapons from current stockpile levels. As stockpile requirements decrease, fewer weapons would be built, which in turn means less manufacturing capacity would be needed. The impacts expected under No Action reflect the reduced stockpile requirements and manufacturing capacity.

The No Action alternative would not result in any significant environmental impacts at any sites. Land use surrounding each site would continue with no changes to land use plans or policies and no changes in land ownership. Under No Action, gradual reductions in emissions of criteria and hazardous toxic air pollutants would occur in response to anticipated lower workloads and facility upgrades. Except for Pinellas and RFP, all sites are in compliance with applicable Federal and state ambient air quality standards and regulations. At Pinellas, the analysis of chemicals used in current operations showed that two chemicals (trichloroethylene and methylene chloride) would cause excess cancer risks. Nickel chloride exceeded the Florida Department of Environmental Regulation "No Threat Limit." The lifetime cancer risk at the site boundary was estimated at 37 in 1 million. Approximately two-thirds of the risk is associated with the chemical methylene chloride. At RFP, alternative solvents are gradually being used such that ambient concentrations of carbon tetrachloride will be well below levels which would have any health effect. Noise levels would not increase at any sites, and planned future production level decreases are expected to reduce current operational noise levels.

For the No Action alternative, water use associated with nonnuclear functions would not increase at any sites, and planned future production decreases are expected to reduce current water use requirements at KCP, Mound, Pinellas, and RFP. Surface water and groundwater quality would not be degraded at any sites and may improve with anticipated reduced production levels. Ongoing cleanup activities related to past contamination would continue under No Action. All effluents would be required to meet applicable regulatory permits and standards.

The No Action alternative would not have any effects on geology, soils, or biotic resources at any sites. No disturbances of any biotic resources are expected from continued normal operations at any sites. No impacts to cultural resources are expected due to continued normal operation at any sites.

Continued operation at existing sites would not significantly impact socioeconomic and community services. Due to expected lower future production levels, facility staff levels would be reduced causing economic changes at KCP, Mound, SNL, and Y-12.

No increases in annual waste volumes due to DP nonnuclear manufacturing activities are expected with normal operations at any sites under No Action. Expected lower production levels would reduce annual waste volumes at most sites for certain waste types, thereby requiring less handling and reduced storage and disposal requirements.

At RFP, the toxic effects of chemicals to onsite (workers), a total onsite cancer risk of 5.3×10^{-4}, and a total site boundary (public) cancer risk of 1.2×10^{-5}

indicate the potential for adverse human health effects to occur. However, the toxic effects and the excess cancer risk are mainly due to carbon tetrachloride (CCl_4) emissions. If CCl_4 were eliminated, the primary source for adverse health effects would be removed. At Pinellas, the concentrations of methylene chloride and trichloroethylene, both onsite and at the site boundary, result in a cancer risk of about $4x10^{-5}$, which is 40 times higher than the 10^{-6} frequency considered acceptable by EPA. No health effects are expected to the public from normal operation at any of the other sites under No Action. An excess cancer risk of $1.5x10^{-6}$ would result onsite at LANL from exposure to chemicals. Impacts associated with potential accidents would remain the same or potentially decrease because of the lower production levels.

4.3.2 Proposed Action

At KCP, SRS, LANL, SNL, and/or Y-12, changes and/or modifications to existing buildings would be compatible with existing land use plans and policies.

The same sites would experience short-term minor increases in air emissions and noise during building renovations. During operations, increases in air emissions and noise are also expected but would not exceed applicable air quality standards. At Mound, Pinellas, and RFP, local air quality improvements could occur due to the phaseout of these facilities. At KCP, SRS, LANL, and Y-12, increases in water usage would be less than 1 percent of current usage. At SNL, the increase would be less than 4 percent. Water supplies are adequate to meet demand at all sites. No impacts to geologic resources or soils are expected at any sites. No permanent disturbance of any biotic resources at all sites from building renovations or operations.

Federal, state, and Native American consultations have been initiated for KCP, SRS, LANL, Y-12, and SNL to determine if the Proposed Action would have an adverse effect on important Native American resources or NRHP-eligible prehistoric or historic resources. Since implementation activities would be primarily limited to interior renovations of existing buildings, adverse effects are not anticipated. If any resources identified as potential locations for transferred functions and other facilities at KCP, SRS, LANL, Y-12, and SNL are considered NRHP-eligible or traditionally important after consultation, then mitigation measures would be implemented to avoid adverse effects. Mitigation measures could include, but are not limited to, siting project activities to avoid such resources, data recovery such as excavation of prehistoric sites or archival research and photo documentation of historic resources, and restricting access to important Native American resources.

Changes to socioeconomic and community service at KCP, SRS, LANL, Y-12, and SNL are expected. The Proposed Action would create 1,482 jobs (575 direct and 907 indirect) at KCP at peak operations. Total in-migration would be 755 persons. The change in population during the time of peak construction would be less than 1 percent. The need for additional housing would be negligible.

At SRS, 194 jobs (85 direct and 109 indirect) would be created. Total in-migration would be 113 persons. The change in population would be less than 1 percent. The need for additional housing units would be negligible.

At LANL, 153 jobs (60 direct and 93 indirect) would be created. Total in-migration would be 81 persons. The change in population would be less than 1 percent. The need for additional housing would be negligible.

An estimated 18 jobs (8 direct and 10 indirect) would be created at Y-12 at peak operations. Total in-migration would be 11 persons. The need for additional housing would be negligible.

At SNL, 854 jobs (350 direct and 504 indirect) would be created by peak operation. Total in-migration would be 468 persons. The change in population

would be less than 1 percent. The need for additional housing would be negligible.

Some minor, negative economic consequences would occur at Mound, Pinellas, and RFP due to the phaseout of DP missions at these sites. At Mound, approximately 3,200 jobs (1,200 direct and 2,000 indirect) would be lost. Earnings in the Mound ROI would be reduced by about $104.4 million, with a related decrease in total personal income of $133.8 million. The less than 1 percent change in population after phaseout would create an estimated 600 additional vacant housing units.

At Pinellas, approximately 4,200 jobs (1,450 direct and 2,750 indirect) would be lost. Earnings in the Pinellas ROI would be reduced by about $142.4 million, with a related decrease in the total personal income of $204.6 million. The less than 1 percent change in population after phaseout would create an estimated 700 additional vacant housing units.

At RFP, approximately 9,500 jobs (3,700 direct and 5,800 indirect) would be lost. Earnings in the Rocky Flats Plant ROI would be reduced by about $340.9 million, with a related decrease in the total personal income of $409 million. The less than 1 percent change in population after phaseout would create an estimated 2,000 additional vacant housing units.

Nonnuclear manufacturing activities associated with the Proposed Action would increase hazardous waste volumes by less than 5 percent at KCP, SRS, Y-12, and SNL and approximately 4,300 ft^3/yr at LANL and have minor, insignificant waste management effects. Sanitary/industrial wastewater volumes would increase 1.7 MGY at KCP; this is less than 1 percent over the current rate of 310 MGY. At Mound, Pinellas, and RFP, nonnuclear production waste streams would be eliminated.

No adverse impacts to the health of the public are expected from implementation or operation activities associated with the Proposed Action at any of the sites. The risks of cancer to onsite workers would be 1.5×10^{-6} and 6.0×10^{-6} at LANL and SNL, respectively. Appropriate measures such as substituting less toxic solvents or modifying production processes would be required to reduce the cancer risks to less than 10^{-6}. The cancer risk to workers at KCP, SRS, and Y-12 would be below the EPA acceptable level of 10^{-6}. The probability or consequences of potential accidents would not increase appreciably at any of the sites.

4.3.3 Mound Alternative

The Mound alternative would involve major new building construction; disturb or destroy approximately 55 acres of natural habitat; and require significant water resources and substantial new and/or upgraded infrastructure for hazardous waste storage, wastewater treatment, and parking areas at Mound.

For this alternative, SRS would not receive any new tritium handling functions and would, therefore, not be affected. Impacts at SNL would not be significant and would be the same as those discussed in section 4.1.5 for the Proposed Action and summarized in section 4.3.2. The impacts at LANL (section 4.1.3) would be less under the Mound alternative than under the Proposed Action because only neutron tube target loading, beryllium technology, and pit support functions would be transferred.

New construction at Mound and changes and/or modifications to existing buildings would be compatible with existing land use plans and policies.

Construction-related air emissions and noise at Mound would be short-term and not significant with standard construction mitigation measures. Air emissions and noise from operations at Mound would increase but would not exceed applicable air quality standards. At KCP, Pinellas, and RFP, local air quality improvements could occur due to the phaseout of these facilities. Construction-related soil erosion at Mound could occur but would be short-term and minor after incorporation of standard construction mitigation measures. Consolidation at

Mound would increase water requirements during operations by a factor of two over current water use. Water supplies are adequate to meet this demand. At Mound, approximately 55 acres of forested, old field, and other habitats would be lost to new construction. This loss would represent a substantial reduction in the remaining habitat at Mound but an insignificant portion of this type of terrestrial habitat in the general region.

Consultations regarding potential cultural resources at Mound, particularly Native American resources, have been initiated; however, the presence of such resources has not yet been confirmed. Construction of new facilities at Mound may have impacts if important Native American resources are present.

Changes to socioeconomic and community services at Mound are expected. Implementing the Mound alternative would create 9,329 jobs (3,508 direct and 5,821 indirect) at Mound by peak operations. Total in-migration would be 4,658 persons. The change in population would be less than 1 percent. The need for additional housing would be negligible. Local transportation systems near Mound would be affected due to increased worker and in-migration-related traffic.

Economic changes would occur at KCP, Pinellas, and RFP due to the phaseout of these facilities. At KCP, approximately 9,800 jobs (3,800 direct and 6,000 secondary) would be lost due to phaseout. This reduction in jobs would increase the ROI unemployment rate from a projected baseline level of 6.0 percent to 6.9 percent. The less than 1 percent change in population after phaseout would create an estimated additional 1,900 vacant housing units. Socioeconomics effects due to the phaseout of Pinellas and RFP would be the same as discussed under the Proposed Action in section 4.3.2.

Consolidating nonnuclear manufacturing functions at Mound would increase hazardous waste volumes by 18,644 ft^3/yr over current operational hazardous waste volumes of 5,348 ft^3/yr. Sanitary/industrial wastewater volumes would increase 291 MGY over the current rate of approximately 47 MGY. These volumes, which would exceed the current capacity of the Mound hazardous waste storage facilities and wastewater treatment plant, represent a potentially significant impact on Mound's waste management activities. New onsite hazardous waste storage facilities and a major upgrade/modification of Mound wastewater treatment plants could, however, mitigate these impacts. The phaseout of DP nonnuclear manufacturing activities at KCP, Pinellas, and RFP would eliminate those facilities' waste streams.

No impacts to the health of the public are expected from construction and operation activities associated with the Mound alternative. The probability or consequences of potential accidents would not increase appreciably with the Mound alternative.

4.3.4 Pinellas Alternative

The Pinellas alternative would involve major new building construction, disturb approximately 55 acres of land, and require significant water resources and substantial new and/or upgraded infrastructure for hazardous waste storage and new parking areas at Pinellas.

Y-12 would not be part of the Pinellas alternative and impacts discussed for LANL and SNL in sections 4.1.3 and 4.1.5, respectively, would be less because many of the functions transferred to these sites under the Proposed Action would remain at Pinellas (see figure 3.4.2-1). Impacts at SRS would be the same as described for the Proposed Action in section 4.3.2.

New construction at Pinellas and changes and/or modifications to existing buildings would be compatible with existing land use plans and policies.

Construction-related air emissions and noise impacts at Pinellas would be short-term and not significant with standard construction mitigation measures. Air emission and noise from operations at Pinellas would

increase but would not exceed applicable air qualtiy standards. At KCP, Mound, and RFP, local air quality improvements could occur due to the phaseout of these facilities. Consolidating nonnuclear manufacturing functions at Pinellas would increase its water use requirements by 7 times over current annual water use. Due to the recent rise in regional water demand and drought conditions, periodic restrictions on water use have been initiated in the Pinellas area The expected increase in water use due to the Pinellas alternative could potentially impact the Pinellas County Water System. No impacts to geologic resources are expected. Construction-related soil erosion could occur at Pinellas but would be short-term and not significant after standard construction mitigation measures. At Pinellas, onsite existing old field vegetation would be lost to new construction. All of this habitat is currently in a highly disturbed condition, and none of it is unusual to the surrounding area.

Consultations on cultural resources at Pinellas have been initiated; however, the presence of such resources has not yet been confirmed. Construction of new facilities at Pinellas may have adverse impacts if important Native American resources are present.

Changes to socioeconomic and community services at Pinellas are expected. Implementing the Pinellas alternative would create 9,878 jobs (3,414 direct and 6,464 indirect) at Pinellas by peak operations. Total in-migration would be 4,496 persons. The change in population would be less than 1 percent. The need for additional housing would be negligible except in Seminole where a 3 percent increase would occur. Local transportation systems at or near the plant would be affected due to increased worker and in-migration-related traffic.

Economic changes would occur at KCP, Mound, and RFP due to the phaseout of these facilities. Socioeconomic consequences discussed for the phaseout of KCP in section 4.3.3 and in section 4.3.2 for Mound and RFP would be the same for the Pinellas alternative.

Consolidating nonnuclear manufacturing functions at Pinellas would increase liquid hazardous waste volumes by 51,500 gal/yr over current operation volumes of 49,500 gal/yr. Hazardous solid waste would increase by 12,300 ft^3/yr over current operation volumes of 110 ft^3/yr. Sanitary/industrial wastewater volumes would increase 292 MGY over the current rate of 66 MGY. The hazardous waste volumes would exceed the current capacity of the plant's hazardous waste storage facilities and represent a potentially significant impact to Pinellas' waste management activities. New onsite hazardous waste storage facilities could potentially mitigate these impacts. The phaseout of DP nonnuclear manufacturing activities at KCP, Mound, and RFP would eliminate those facilities' waste streams.

Existing operations at Pinellas result in cancer risks of 4×10^{-5} and 3.8×10^{-5} to an onsite worker and a member of the public, respectively. These cancer risks would remain the same after nonnuclear consolidation at Pinellas unless mitigation measures were implemented. Appropriate mitigation measures such as substituting less toxic solvents or modifying production processes would be required to reduce the cancer risks to less than 10^{-6} to both workers and the public. The probability or consequences of potential accidents would not increase appreciably under the Pinellas alternative.

4.3.5 Rocky Flats Plant Alternative

The RFP alternative would involve major new building construction; disturb approximately 43 acres of short-grass prairie vegetation; and require substantial new and/or upgraded infrastructure for hazardous waste storage, wastewater treatment, and parking areas at RFP.

For this alternative, LANL would not receive beryllium and pit support functions and would, therefore, be affected less than under the Proposed

Action as described in section 4.1.4. Impacts at SRS and SNL would be the same as described for the Proposed Action in sections 4.1.3 and 4.1.5, respectively, and summarized in section 4.3.2.

New construction at RFP and changes and/or modifications to existing buildings would be compatible with existing land use plans and policies.

Construction-related air emissions and noise impacts at RFP would be short-term and not significant with standard construction mitigation measures. Air emissions and noise from operations at RFP would increase but would not exceed applicable standards. At KCP, Mound, and Pinellas, local air quality improvements could occur due to the phaseout of these facilities. Consolidation at RFP would increase water use requirements by three times over current annual water use. Adequate water supplies are available, however, this increase would require renegotiation of the present water supply contract. No impacts to geologic resources are expected. Construction-related soil erosion at RFP could occur but would be minor and short-term after incorporation of standard construction mitigation measures. At RFP, approximately 43 acres of short-grass prairie vegetation would be lost to new construction.

Consultations on cultural resources at RFP have been initiated; however, the presence of such resources has not yet been confirmed. Construction of new facilities at RFP may have adverse impacts if important Native American resources are present.

Changes to socioeconomic and community services at RFP are expected. Implementing the RFP alternative would create 8,084 jobs (3,163 direct and 4,921 indirect) at RFP by peak operations. Total in-migration would be 4,170 persons. The change in population would be less than 1 percent. The need for additional housing would be negligible. Golden is the only city where additional housing would need to be increased beyond 1 percent, but this need would not exceed 2 percent.

Economic changes would occur at KCP, Mound, and Pinellas due to the phaseout of DP nonnuclear manufacturing activities at these facilities. Socioeconomic consequences discussed for the phaseout of KCP in section 4.3.3 and in section 4.3.2 for Pinellas and RFP would be the same for the RFP alternative.

At RFP, liquid hazardous waste volumes generated from operations would increase by 43,300 gal/yr over current operational waste volumes of 280,000 gal/yr. Solid hazardous waste volumes would increase 12,300 ft^3/yr over the existing volume of 2,940 ft^3/yr. Sanitary/industrial wastewater volumes would increase approximately 284 MGY over the current rate of approximately 8 MGY. These volumes would exceed the current capacity of the RFP's hazardous waste storage facilities and wastewater treatment plant and represent a potentially significant impact on RFP's waste management activities. New onsite hazardous waste storage facilities and a major upgrade/modification of the RFP's wastewater treatment plant could, however, mitigate these impacts. The phaseout of DP nonnuclear manufacturing activities at KCP, Mound, and Pinellas would eliminate those facilities' waste streams.

Existing operations at RFP result in cancer risks of 5.3×10^{-4} and 1.2×10^{-5} to an onsite worker and a member of the public, respectively. These cancer risks would remain the same after nonnuclear consolidation at RFP unless mitigation measures were implemented. Appropriate mitigation measures such as substituting less toxic solvents or modifying production processes would be required to reduce the cancer risks at RFP to less than 10^{-6} to both workers and the public. The probability or consequences of potential accidents would not increase appreciably with the RFP alternative.

4.3.6 Cumulative Impacts

Cumulative effects are those impacts of the Kansas City Plant nonnuclear consolidation project when

considered with other past, present, and reasonably foreseeable future actions. No past, present, or reasonably foreseeable future projects have been identified onsite or offsite which when added to the effects of the Proposed Action would result in a significant impact.

Nonnuclear consolidation at KCP (Proposed Action) would have no program cumulative effects because the action represents a consolidation of existing activities and functions, rather than an initiation of new activities. Potential cumulative impacts due to consolidation of the nonnuclear functional element of the weapons complex would be the same or less than under No Action. In most instances, downsizing and consolidation would reduce potential environmental impacts from which would occur under the No Action alternative. Nonnuclear activities, now located within aging facilities at donor sites, would be transferred to sites with newly refurnished facilities. These facilities would incorporate ES&H DOE policy decisions on Complex reconfiguration; meet all codes and standards; and contain these operations, materials, and/or hazardous waste streams. At the donor sites consolidation would also eliminate operations, materials, and/or hazardous wastes streams associated with the DP nonnuclear activities to be transferred, thereby reducing the number of sites within the Complex with hazardous activities and/ or materials.

Implementing the Proposed Action would contribute to the cumulative effects described below on the site environment at KCP, SRS, LANL, SNL, and/or Y-12 (depending on the beryllium and pit support option). No cumulative environmental effects are expected at Mound, Pinellas, or RFP with the Proposed Action.

At KCP, SRS, LANL, SNL, and/or Y-12, changes and renovation to existing buildings would be compatible with land use plans and policies; therefore, no onsite cumulative effects on land use are expected. Total in-migration at all sites receiving relocated functions due to the Proposed Action would add less than 1 percent to the projected study area baseline population. Offsite direct and indirect cumulative effects to land use would be insignificant in relation to potential available regional land use resources.

Air emissions of radionuclides and other pollutants from operation of consolidated nonnuclear functions under the Proposed Action would have negligible to unmeasurable effects at the site boundaries. All pollutant concentrations when added to background concentrations are well within applicable standards and guidelines. These effects were analyzed in the Air Quality sections for each site in chapter 4. None of the predicted air pollutant concentrations of the Proposed Action are approaching a standard or guideline which could potentially be exceeded due to cumulative emissions from any unidentified present or future projects. No significant cumulative impacts to water resources are expected. Project water use would be insignificant in relation to regional water supplies and total site consumption. Project-related wastewater discharges would be directed to existing permitted outfalls or held for processing before release or disposal.

The socioeconomic and community services effects from the estimated peak construction and operations workforce requirements due to the Proposed Action at KCP, SRS, LANL, SNL, and/or Y-12 (see table 3.3-1) would result in less than one percent change in population and regional economic conditions. Due to the small size of the socioeconomic changes in relation to the ROI and the dispersed location of the sites involved in the Proposed Action, no significant cumulative socioeconomic impacts are expected. These effects were analyzed in Socioeconomic and Community Services discussions for each site affected by the project in sections 4.1.1 to 4.1.8 and summarized in section 4.3.

Solid and liquid waste generated from Proposed Action activities such as building decontamination and operations would add incrementally to KCP, SRS, LANL, SNL, and/or Y-12 solid and liquid

waste volumes. Only small increases in waste volume would occur, generally ranging from less than 1 percent to 5 percent, except at LANL where solid hazardous waste volumes are expected to increase by approximately 4,300 ft^3/yr. Although these waste volumes would reduce available treatment, storage, and disposal capacities they would not represent a significant cumulative impact to these sites waste management activities. All sites can accommodate the anticipated Proposed Action waste volumes as well as all other non-project system demands within existing waste management programs. The cumulative impact on the current liquid and solid waste storage and treatment facilities at these sites is, therefore, expected to be insignificant in relation to the volumes treated and/or stored annually at each site.

The cumulative effects resulting from existing releases and the releases of radionuclides and chemicals associated with relocated functions at KCP, SRS, and/or Y-12 are expected to be well below applicable permit, regulatory, DOE operational requirements, or not cause adverse health effects.

Modeling of TCE concentrations from current operations at LANL resulted in a cancer risk of 1.5×10^{-6} for the onsite worker. At SNL, using conservative assumptions (e.g., a single source term for all methylene chloride and TCE emissions) an incremented cancer risk of 6.0×10^{-6} to workers was predicted. Relocating nonnuclear functions to LANL and SNL would result in a cumulative impact to workers. Appropriate measures such as substituting less toxic solvents or changing the production process would be required to reduce cancer risk to less than 10^{-6} at these two sites. Since relocated functions involve activities that are the same or similar to those that are currently being performed at receiving sites, the cumulative effects of accidents on human health are not expected to increase appreciably.

4.3.7 Mitigation Measures and Adverse Impacts Which Cannot be Avoided

Proposed Action. No significant environmental impacts have been identified with the Proposed Action. At all Proposed Action sites, project design would include best available control technologies or modifying processes to reduce criteria and hazardous/toxic air emissions. All applicable mitigation measures for protection of the environment as required in DOE Order 6430.1A *General Design Criteria* would be incorporated in project design. Construction mitigation measures (e.g., dust control, vehicle maintenance to reduce air emissions, and erosion/sediment controls) would be used. Appropriate mitigation measures such as substituting less toxic solvents or modifying processes would be implemented to reduce chemical-related health effects to workers and the public to less than 10^{-6}. All relocated nonnuclear functions would be designed to meet waste minimization goals at receiving sites and all modified facilities would include appropriate design features which improve contamination control and release prevention. These features could include such measures as no interconnection among storm water systems, the sanitary waste systems, and radioactive or other hazardous material handling systems or areas; monitoring and sampling equipment; and spill overfill prevention devices.

Due to the phaseout of DP nonnuclear missions, unavoidable adverse economic consequences and out-migration of population would occur at Mound, Pinellas, and RFP. The phaseout of DP nonnuclear missions will, however, create new employment opportunities at these sites. Engineers and technologists capable of defining techniques for the workers skilled in applying remediation techniques for the cleanup and decontamination of buildings and facilities, along with workers skilled in applying remediation techniques, will be needed. These new employment opportunities would help alleviated the adverse economic consequences in communities surrounding these sites.

The personnel skills for a new mission of decontamination and decommissioning would differ, for the most part, from those needed for weapons production. However, some DP workers could be redeployed to meet new mission requirements. Others might receive additional professional and vocational training at local schools during the transition period. DOE could assist local colleges and vocational schools with the development of specialized environmental science, engineering, and other needed technical curriculums.

Out-placement and counseling services could help mitigate the effects on workers who cannot be redeployed. Such services could include academic and vocational counseling, help in preparing resumes, preparing for job interviews, financial planning, and job searching techniques.

Other mitigation measures include maintaining close coordination with local businesses and economic development agencies to identify available jobs and to inform the business community of skilled personnel in the labor market.

After decontamination and decommissioning, some of the site facilities may be available for use by the private sector, thereby creating additional jobs. DOE could coordinate with local economic development agencies in determining potential reuses of the facilities and to encourage appropriate businesses to relocate at the sites. DOE could also assist local agencies with efforts to obtain funding through grants and loans provided by Federal agencies such as U.S. Department of Commerce and U.S. Department of Labor.

Mound Plant Alternative. Potential waste management impacts could occur with consolidation at Mound (see section 4.2.1.8). Projected waste volumes would greatly exceed existing waste management facility capacities. Potential mitigation measures, such as constructing new onsite hazardous waste storage facilities and upgrading or modifying the Mound wastewater treatment plant to handle the increased waste volumes, could reduce these impacts.

The loss of approximately 55 acres of forested and old field habitats to accommodate new construction at Mound would be an adverse impact that cannot be avoided. This impact would be partially mitigated through using indigenous vegetation to landscape the new facilities and revegetating of construction laydown areas and parking lots. Potential mitigation measures for impacts to local transportation systems in the Mound area could include staggering work hours, carpooling, or modification of the road segments experiencing congestion. If cultural resources are found in the areas to be disturbed, mitigation measures would be coordinated with the SHPO.

The phaseout of DP-nonnuclear missions at KCP, Pinellas, and RFP under the Mound alternative would result in unavoidable adverse economic consequences and out-migration of population at these sites. Potential mitigation measures discussed above for the Proposed Action would also be applicable for this alternative.

Pinellas Plant Alternative. A potential land use impact could occur during the construction phase because vacant land at Pinellas is limited (see sections 4.1.7.1 and 4.2.2.1). Specific mitigation measures would be required during the design phase. Potential measures could include using off-site land for material stocking/storage and other construction support, or phasing construction to use available onsite land.

Potential waste management impacts could occur with consolidation at Pinellas (see section 4.2.2.8). Projected waste volumes would exceed existing waste management facility capacities. Potential mitigation measures, such as constructing new onsite hazardous waste storage facilities to handle the increased waste volumes, could reduce these impacts.

The loss of approximately 20 acres of mowed field to accommodate new construction at Pinellas would be an adverse impact that could not be avoided. This impact would be partially mitigated through using indigenous vegetation to landscape the new facilities and revegetating of construction laydown areas and parking lots. Potential mitigation measures for impacts to local transportation systems in the Pinellas area could include staggering work hours, carpooling, or modification of the road segments experiencing congestion. If cultural resources are found in the areas to be disturbed, mitigation measures would be coordinated with the SHPO.

The phaseout of DP-nonnuclear missions at KCP, Mound, and RFP under the Pinellas alternative would result in unavoidable adverse economic consequences and out-migration of population at these sites. Potential mitigation measures discussed above for the Proposed Action would also be applicable for the Pinellas alternative.

Rocky Flats Plant Alternative. Potential waste management impacts could occur with consolidation at RFP (see section 4.2.3.8). As with the Mound and Pinellas alternatives, the volume of expected waste due to consolidation at RFP would exceed existing storage and treatment capacity. Potential mitigation measures and their effectiveness would be similar to those described for Mound and Pinellas.

The loss of approximately 55 acres of short-grass prairie vegetation to accommodate new construction at RFP would be an adverse impact that could not be avoided. This impact would be partially mitigated through using indigenous vegetation to landscape the new facilities and revegetating of construction laydown areas and parking lots. Potential mitigation measures for impacts to local transportation systems in the RFP area could include staggering work hours, carpooling, or modification of the road segments experiencing congestion. If cultural resources are found in the areas to be disturbed, mitigation measures would be coordinated with the SHPO.

The phaseout of DP-nonnuclear missions at KCP, Mound, and Pinellas under the RFP alternative would result in unavoidable adverse economic consequences and out-migration of population at these sites. Potential mitigation measures discussed above for the Proposed Action would also be applicable for the RFP alternative.

TABLE 4.3–1.—*Summary Comparison of Environmental Consequences of the Proposed Action and Alternatives* [Page 1 of 16]

Environmental Resource	Kansas City Plant Proposed Action	Mound Plant Alternative	Pinellas Plant Alternative	Rocky Flats Plant Alternative	No Action
Land Resources	• No new construction is proposed. Impacts from building renovations or operation to land use, recreation, or visual resources are not expected at any site. No additional land would be required.	• New construction is required at Mound. New buildings and parking areas would permanently occupy 26 acres of onsite highly developed and undeveloped land. An additional 29 acres disturbed to support construction activities would be revegetated following construction. Impacts to recreation or visual resources at Mound are not expected. Impacts from building renovations or operation to land use, recreation, or visual resources at other sites are not expected.	• New construction is required at Pinellas. New buildings and parking areas would permanently occupy approximately 20 acres of onsite previously disturbed undeveloped and developed land. An additional 35 acres would be required to support construction activities; however, sufficient onsite land is not available. The potential use of offsite land, project design modification, or other measures to accommodate construction would be identified in the design phase. Impacts to visual resources would occur from new three- and five-story high-rise structures. Impacts to recreation resources at Pinellas are not expected. Impacts from building renovations or operation to land use, recreation, or visual resources at other sites are not expected.	• New construction is required at RFP. New buildings and parking areas would permanently occupy 25 acres of onsite undeveloped land. An additional 18 acres disturbed to support construction activities would be revegetated following construction. Impacts to recreation or visual resources at RFP are not expected. Impacts from building renovations or operation to land use, recreation, or visual resources at other sites are not expected.	• No impact to land use, recreation, or visual resources at any sites from continued operations.

E4 3465-1

TABLE 4.3–1.—*Summary Comparison of Environmental Consequences of the Proposed Action and Alternatives* —Continued
[Page 2 of 16]

Environmental Resource	Kansas City Plant Proposed Action	Mound Plant Alternative	Pinellas Plant Alternative	Rocky Flats Plant Alternative	No Action
Air Quality and Acoustics	• Increases in emissions and air quality impacts from building renovations would be negligible at all sites. • No exceedance of applicable Federal and state ambient air quality standards or guidelines associated with this action.	• Increases in emissions and air quality impacts from construction would be negligible at all sites. • No exceedance of applicable Federal and state ambient air quality standards or guidelines associated with this action.	• Increases in emissions and air quality impacts from construction would be negligible at all sites. • Except for Pinellas where the 24-hour standard for glycol ethers and the annual standard for trichloro-ethylene would be exceeded at the site boundary, no exceedance of applicable Federal and state ambient air quality standards or guidelines associated with this action. Potential mitigation measures could include substituting solvents or modifying processes.	• Increases in emissions and air quality impacts from construction would be negligible at all sites • No exceedance of applicable Federal and state ambient air quality standards or guidelines associated with this action.	• Emissions and air quality impacts from routine building renovations would be negligible at all sites. • No exceedance of applicable Federal and state ambient air quality standards or guidelines at any site except for Pinellas where nickel chloride, trichloro-ethylene and methylene chloride exceeded state air quality criteria. Gradual reduction in air emissions in response to reduced workloads.

E4 3465-2

TABLE 4.3–1.—*Summary Comparison of Environmental Consequences of the Proposed Action and Alternatives*—Continued
[Page 3 of 16]

Environmental Resource	Kansas City Plant Proposed Action	Mound Plant Alternative	Pinellas Plant Alternative	Rocky Flats Plant Alternative	No Action
Air Quality and Acoustics (continued)	• Phasing out DP nonnuclear missions at Mound, Pinellas, and RFP would reduce emissions of criteria and hazardous/toxic air pollutants. Emissions of tritium at Mound and Pinellas would be eliminated. Air quality in the vicinity of these plants should improve.	• Phasing out DP nonnuclear missions at KCP, Pinellas, and RFP would reduce emissions of criteria and hazardous/toxic air pollutants. Emissions of tritium at Pinellas would be eliminated. Air quality in the vicinity of these plants should improve.	• Phasing out DP nonnuclear missions at KCP, Mound, and RFP would reduce emissions of criteria and hazardous/toxic air pollutants. Emissions of tritium at Mound would be eliminated. Air quality in the vicinity of these plants should improve.	• Phasing out DP nonnuclear missions at KCP, Mound, and Pinellas would reduce emissions of criteria and hazardous/toxic air pollutants. Emissions of tritium at Mound and Pinellas would be eliminated. Air quality in the vicinity of these plants should improve.	• Local air quality should improve due to reduced emissions of criteria and hazardous/toxic pollutants from lower production levels
	• Increases in noise levels from building renovations and operation at all sites would be negligible. Traffic related noise during operation would increase less than 2 dB at KCP and LANL, and less than 1 dB at SRS, Y-12, and SNL.	• Increases in noise levels from construction and operation at all sites would be negligible. Traffic related noise during operation would increase 6 dB along Mound Road.	• Increases in noise levels from construction and operation at all sites would be negligible. Traffic related noise during operation would increase less than 1 dB along Belcher Road. No increase is expected along Bryan Dairy Road.	• Increases in noise levels from construction and operation at all sites would be negligible. Traffic related noise during operation would increase less than 2 dB along state highways 72 and 78, and Indiana Street.	• No increase in noise levels at any site.

E4 3465-3

TABLE 4.3–1.—*Summary Comparison of Environmental Consequences of the Proposed Action and Alternatives*—Continued
[Page 4 of 16]

Environmental Resource	Kansas City Plant Proposed Action	Mound Plant Alternative	Pinellas Plant Alternative	Rocky Flats Plant Alternative	No Action
Water Resources	• At KCP, SRS, LANL, and Y–12 increases in water usage would be less than 1 percent of current usage. At SNL the increase would be less than 4 percent. Water supplies are adequate to meet demand at all sites.	• Groundwater use at Mound would increase twofold from current use. At LANL, and Y-12, increases in water usage would be less than 1 percent of current usage. Water supplies are adequate to meet demand at all sites.	• Water use at Pinellas would increase seven-fold over current annual water use. Potential restrictions imposed by the Pinellas County Water System could impact operations during drought years. At SRS, LANL, and Y–12 increases in water usage would be less than 1 percent. Water supplies are adequate to meet demand at all sites.	• Water use at RFP would increase threefold over current annual water use. At SRS, LANL, and Y–12, increases in water usage would be less than 1 percent . Water supplies are adequate to meet demand at all sites.	• No increase in water use at any sites.

E4 3465-4

TABLE 4.3–1.—*Summary Comparison of Environmental Consequences of the Proposed Action and Alternatives*—Continued
[Page 5 of 16]

Environmental Resource	Kansas City Plant Proposed Action	Mound Plant Alternative	Pinellas Plant Alternative	Rocky Flats Plant Alternative	No Action
Water Resources (continued)	• Potential adverse impacts from building renovations and operation to surface water quantities or quality or groundwater quantity or quality are not expected.	• Potential impacts from erosion during construction and increased nonpoint source drainage during construction and operations could occur to surface water quantities or quality. Erosion control measures such as berms and silt fences would be used during construction. Measures to reduce potential impacts of nonpoint source contaminants could involve collection and/or treatment of stormwater runoff. All new and modified existing facilities would be designed to meet a zero-degradation of groundwater standards.	• Potential impacts from erosion during construction and increased nonpoint source drainage during operation are not expected since stormwater runoff is collected in onsite retention ponds. All new and modified existing facilities would be designed to meet a zero-degradation of groundwater standards.	• Potential impacts from erosion during construction would be controlled with berms and silt fences. Potential impacts from increased nonpoint source drainage would be controlled by existing onsite runoff-control holding ponds. All new and modified existing facilities would be designed to meet a zero-degradation of groundwater standards.	• No increase in degradation of surface water and groundwater quality at any sites. Current groundwater remediation activities would continue. All effluents would meet applicable regulatory permits and standards.
	• Water use would decrease due to plant phaseout of DP nonnuclear missions at Mound, Pinellas, and RFP.	• Water use would decrease due to phaseout of DP nonnuclear missions at KCP, Pinellas, and RFP.	• Water use would decrease due to phaseout of DP nonnuclear missions at KCP, Mound, and RFP.	• Water use would decrease due to phaseout of DP nonnuclear missions at KCP, Mound, and Pinellas.	• Potential decrease in water use at KCP, Mound, Pinellas, and RFP due to reduced production levels.

E4 3465-4

TABLE 4.3–1.—*Summary Comparison of Environmental Consequences of the Proposed Action and Alternatives*—Continued [Page 6 of 16]

Environmental Resource	Kansas City Plant Proposed Action	Mound Plant Alternative	Pinellas Plant Alternative	Rocky Flats Plant Alternative	No Action
Geology and Soils	• No impacts to geological resources. No impacts to soils at all sites during building renovations.	• No impacts to geological resources. Potential impacts to soils at Mound during construction from erosion and sediment transport would be controlled by berms, silt fences, and watering.	• No impacts to geological resources. Potential impacts to soils at Pinellas during construction from erosion and sediment transport would be controlled by berms, silt fences, and watering.	• No impacts to geological resources. Potential impacts to soils at RFP during construction from erosion and sediment transport would be controlled by berms, silt fences, and watering	• No impact.
Biotic Resources	• No permanent disturbance of any biotic resources is anticipated from building renovations or operation at any site.	• Approximately 55 acres of natural habitats at Mound would be disturbed by new construction. After construction, 29 acres would be revegetated with native species, resulting in a net habitat loss of 26 acres. This would represent a local reduction of terrestrial habitat within Mound. No permanent disturbance of biotic resources is anticipated at any other site.	• Most of the remaining vegetation at the Pinellas site, consisting of mowed fields with clusters of scattered trees, would be disturbed by new construction. The affected habitat is currently in a highly disturbed condition and not unique. No permanent disturbance of biotic resources is anticipated at any other site.	• Approximately 43 acres of mostly short-grass prairie vegetation would be disturbed by new construction. Following construction, 18 acres would be revegetated with native species, resulting in a net loss of 25 acres of prairie vegetation. No permanent disturbance of any biotic resources is anticipated at any other site.	• No impact.

E4 3465-6

TABLE 4.3–1.—*Summary Comparison of Environmental Consequences of the Proposed Action and Alternatives*—Continued
[Page 7 of 16]

Environmental Resource	Kansas City Plant Proposed Action	Mound Plant Alternative	Pinellas Plant Alternative	Rocky Flats Plant Alternative	No Action
Cultural Resources	• There would be no disturbance of Native American resources at KCP, SRS, Y-12, or SNL. SHPO consultation has been initiated with regard to potential minor (1/2-acre) ground disturbance at LANL.	• Impacts to cultural resources with regard to 55 acre ground disturbance at Mound cannot be determined until the presence of Native American resources can be confirmed. There would be no disturbance of prehistoric resources at Y-12 or SNL.	• Impacts to cultural resources with regard to 55 acre ground disturbance at Pinellas cannot be determined until the presence of Native American resources can be confirmed. There would be no disturbance of prehistoric resources at SRS, Y-12, or SNL.	• Impacts to cultural resources with regard to 43 acre ground disturbance at RFP cannot be determined until the presence of Native American resources can be confirmed. There would be no disturbance of prehistoric resources at SRS, Y-12, or SNL.	• No impact.
	• There would be no effect on historic resources at KCP, SRS, or Y-12. Agency consultation has been initiated with regard to structures that meet age criteria for NRHP-eligibility at LANL and SNL.	• There would be no effect on historic resources at Mound or Y-12. SHPO consultation has been initiated with regard to structures that meet age criteria for NRHP-eligibility at LANL and SNL.	• There would be no effect on historic resources at Pinellas, SRS, or Y-12. SHPO consultation has been initiated with regard to structures that meet age criteria for NRHP-eligibility at LANL and SNL.	• There would be no effect on historic resources at RFP, SRS, or Y-12. SHPO consultation has been initiated with regard to structures that meet age criteria for NRHP-eligibility at LANL and SNL.	• No Impact.
	• Native American consultation has been initiated at all sites.	• Native American consultation has been initiated at all sites.	• Native American consultation has been initiated at all sites.	• Native American consultation has been initiated at all sites.	

E4 3465-7

TABLE 4.3–1.—*Summary Comparison of Environmental Consequences of the Proposed Action and Alternatives*—Continued
[Page 8 of 16]

Environmental Resource	Kansas City Plant Proposed Action	Mound Plant Alternative	Pinellas Plant Alternative	Rocky Flats Plant Alternative	No Action
Socioeconomics and Community Services	• Changes to socio-economics and community services are expected during the renovation and operation phases at KCP, SRS, LANL, Y-12, and SNL. At KCP - 1,482 Total jobs created - 575 Direct jobs - 907 Indirect jobs - 755 in-migration - population <1 percent increase - housing <1 percent increase	• Changes to socio-economics and community services are expected during the construction and operation phases at Mound, LANL, Y-12, and SNL. At Mound - 9,329 Total jobs created - 3,508 Direct jobs - 5,821 Indirect jobs - 4,658 in-migration - population <1 percent increase - housing <1 percent increase	• Changes to socio-economics and community services are expected during the construction and operation phases at Pinellas, SRS, LANL, Y-12, and SNL. At Pinellas - 9,878 Total jobs created - 3,414 Direct jobs - 6,464 Indirect jobs - 4,496 in-migration - population <1 percent increase - housing <1 percent increase	• Changes to socio-economics and community services are expected during the construction and operation phases at RFP, SRS, LANL, Y-12, and SNL. At RFP - 8,084 Total jobs created - 3,163 Direct jobs - 4,921 Indirect jobs - 4,170 in-migration - population <1 percent increase - housing <1 percent increase	• Socioeconomic changes at all sites. Increases and reductions in staff levels at all sites may cause economic changes in the vicinity of each site. At KCP - 198 Direct jobs lost At Mound - 27 Direct jobs lost At Pinellas - 185 Direct jobs created At RFP - 156 Direct jobs created

E4 3465-8

TABLE 4.3–1.—*Summary Comparison of Environmental Consequences of the Proposed Action and Alternatives*—Continued
[Page 9 of 16]

Environmental Resource	Kansas City Plant Proposed Action	Mound Plant Alternative	Pinellas Plant Alternative	Rocky Flats Plant Alternative	No Action
Socioeconomics and Community Services (continued)	At SRS - 194 Total jobs created - 85 Direct jobs - 109 Indirect jobs - 133 in-migration - population <1 percent increase - housing <1 percent increase	At SRS - no change	At SRS - 85 Direct jobs created	At SRS - 85 Direct jobs created	At SRS - 495 Direct jobs created
	At LANL - 153 Total jobs created - 60 Direct jobs - 93 Indirect jobs - 81 in-migration - population <1 percent increase - housing <1 percent increase	At LANL - 5 Direct jobs created	At LANL - 31 Direct jobs created	At LANL - 36 Direct jobs created	At LANL - 156 Direct jobs created
	At Y–12 - 18 Total jobs created - 8 Direct jobs - 10 Indirect jobs - 11 in-migration - population <1 percent increase - housing <1 percent increase	No change at Y–12.	No change at Y–12.	No change at Y–12.	At Y–12 - 212 Direct jobs lost

E4 3465-9

TABLE 4.3–1.—*Summary Comparison of Environmental Consequences of the Proposed Action and Alternatives*—Continued
[Page 10 of 16]

Environmental Resource	Kansas City Plant Proposed Action	Mound Plant Alternative	Pinellas Plant Alternative	Rocky Flats Plant Alternative	No Action
Socioeconomics and Community Services (continued)	At SNL - 854 Total jobs created - 350 Direct jobs created - 504 Indirect jobs created - 468 in-migration - population <1 percent increase - housing <1 percent increase	At SNL - 346 Direct jobs created	At SNL - 4 Direct jobs created	At SNL - 350 Direct jobs created	At SNL - 73 Direct jobs lost
	• Benefits to local economies would occur at receiving sites. At most of these sites, including KCP, creation of new jobs would partially offset recent staff reductions.	• Benefits to local economies would occur at receiving sites. At most of these sites, including Mound, creation of new jobs would partially offset recent staff reductions.	• Benefits to local economies would occur at receiving sites. At most of these sites, including Pinellas, creation of new jobs would partially offset recent staff reductions.	• Benefits to local economies would occur at receiving sites. At most of these sites, including RFP, creation of new jobs would partially offset recent staff reductions.	• Additional benefits to local economies would not occur.

E4 3465-10

TABLE 4.3–1.—*Summary Comparison of Environmental Consequences of the Proposed Action and Alternatives*—Continued
[Page 11 of 16]

Environmental Resource	Kansas City Plant Proposed Action	Mound Plant Alternative	Pinellas Plant Alternative	Rocky Flats Plant Alternative	No Action
Socioeconomics and Community Services (continued)	• Local transportation systems would not be affected.	• Local transportation systems near Mound would be affected. Mound Road between Main Street and Benner Road would deteriorate from free flow conditions to a reduced flow condition. U.S. 35 between State Road 835 and I-675 at Beavercreek would change from stable flow conditions to a restricted flow condition. Potential mitigation could include staggering work hours, carpooling, or modification of the road segments.	• Local transportation systems near Pinellas would be affected. State Route 688 between I-275 and U.S. 19 would deteriorate from restricted flow conditions to extreme congestion conditions. Potential mitigation could include staggering work hours, carpooling, or modification of the road segments.	• Local transportation systems would be affected. U.S. 40 between State Route 391 and I-25 in Denver would deteriorate from stable flow conditions to a restricted flow condition. Potential mitigation could include staggering work hours, carpooling, or modification of the road segments.	• No change.
	• At Mound, Pinellas, and RFP, where functions would be phased out, there would be economic consequences as follows:	• At KCP, Pinellas, and RFP, where functions would be phased out, there would be economic consequences as follows:	• At KCP, Mound, and RFP, where functions would be phased out, there would be economic consequences as follows:	• At KCP, Mound, and Pinellas, where functions would be phased out, there would be economic consequences as follows:	• Socioeconomic changes at all potential phaseout sites.

E4 3465-11

TABLE 4.3–1.—*Summary Comparison of Environmental Consequences of the Proposed Action and Alternatives*—Continued
[Page 12 of 16]

Environmental Resource	Kansas City Plant Proposed Action	Mound Plant Alternative	Pinellas Plant Alternative	Rocky Flats Plant Alternative	No Action
Socioeconomics and Community Services (continued)	At Mound - 3,200 Total jobs lost - 1,200 Direct jobs - 2,000 Indirect jobs - $104.4M loss in earnings - $133.8M loss in income - Population <1 percent decrease - 600 vacant housing units added At Pinellas - 4,200 Total jobs lost - 1,450 Direct jobs - 2,750 Indirect jobs - $142.4M loss in earnings - $204.6M loss in income - Population <1 percent decrease - 700 vacant housing units added	At KCP - 9,800 Total jobs lost - 3,793 Direct jobs - 5,982 Indirect jobs - $345.5M loss in earnings - $429.6M loss in income - Population <1 percent decrease - 1,900 vacant housing units added At Pinellas - 4,200 Total jobs lost - 1,450 Direct jobs - 2,750 Indirect jobs - $142.4M loss in earnings - $204.6M loss in income - Population <1 percent decrease - 700 vacant housing units added	At KCP - 9,800 Total jobs lost - 3,793 Direct jobs - 5,982 Indirect jobs - $345.5M loss in earnings - $429.6M loss in income - Population <1 percent decrease - 1,900 vacant housing units added At Mound - 3,200 Total jobs lost - 1,200 Direct jobs - 2,000 Indirect jobs - $104.4M loss in earnings - $133.8M loss in income - Population <1 percent decrease - 600 vacant housing units added	At KCP - 9,800 Total jobs lost - 3,793 Direct jobs - 5,982 Indirect jobs - $345.5M loss in earnings - $429.6M loss in income - Population <1 percent decrease - 1,900 vacant housing units added At Mound - 3,200 Total jobs lost - 1,200 Direct jobs - 2,000 Indirect jobs - $104.4M loss in earnings - $133.8M loss in income - Population <1 percent decrease - 600 vacant housing units added	At Mound - 27 Direct jobs lost At KCP - 198 Direct jobs lost At Pinellas - 185 Direct jobs created At Mound - 27 Direct jobs lost

E4 3465-12

TABLE 4.3–1.—*Summary Comparison of Environmental Consequences of the Proposed Action and Alternatives*—Continued
[Page 13 of 16]

Environmental Resource	Kansas City Plant Proposed Action	Mound Plant Alternative	Pinellas Plant Alternative	Rocky Flats Plant Alternative	No Action
Socioeconomics and Community Services (continued)	At RFP - 9,500 Total jobs lost - 3,700 Direct jobs - 5,800 Indirect jobs - $340.9M loss in earnings - $409M loss in income - Population <1 percent decrease - 2,000 vacant housing units. Potential mitigation at phaseout sites could include worker retraining, redeployment, out-placement and counseling services, or assistance to local communities.	At RFP - 9,500 Total jobs lost - 3,700 Direct jobs - 5,800 Indirect jobs - $340.9M loss in earnings - $409M loss in income - Population <1 percent decrease - 2,000 vacant housing units added Potential mitigation at phaseout sites could include worker retraining, redeployment, out-placement and counseling services, or assistance to local communities.	At RFP - 9,500 Total jobs lost - 3,700 Direct jobs - 5,800 Indirect jobs - $340.9M loss in earnings - $409M loss in income - Population <1 percent decrease - 2,000 vacant housing units Potential mitigation at phaseout sites could include worker retraining, redeployment, out-placement and counseling services, or assistance to local communities.	At Pinellas - 4,200 Total jobs lost - 1,450 Direct jobs - 2,750 Indirect jobs - $142.4M loss in earnings - $204.6M loss in income - Population <1 percent decrease - 700 vacant housing units added Potential mitigation at phaseout sites could include worker retraining, redeployment, out-placement and counseling services, or assistance to local communities.	At RFP - 156 Direct jobs created At Pinellas - 185 Direct jobs created
Waste Management	• Waste management requirements during renovations and operation at all sites would be consistent with current waste management activities.	• No waste management impacts are expected during the construction phase at any site.	• No waste management impacts are expected during the construction phase at any site.	• No waste management impacts are expected during the construction phase at any site.	• At all sites increases in annual waste volumes are not expected.

E4 3465-13

TABLE 4.3–1.—*Summary Comparison of Environmental Consequences of the Proposed Action and Alternatives*—Continued
[Page 14 of 16]

Environmental Resource	Kansas City Plant Proposed Action	Mound Plant Alternative	Pinellas Plant Alternative	Rocky Flats Plant Alternative	No Action
Waste Management (continued)	• Only small increases in hazardous waste volumes: less than 1 percent for liquids at SRS and SNL and less than 5 percent at KCP; less than 1 percent for solids at KCP, SRS, and less than 5 percent at SNL. At Y-12, a 3 percent increase in hazardous waste (solid and liquid) is expected. At LANL, hazardous waste would increase approximately 4,304 ft^3/yr. The characteristics of the waste from new functions would be similar to those from existing operations at all sites.	• At Mound, liquid and solid hazardous waste volumes were reported combined as ft^3 of hazardous waste. Hazardous waste volumes from operations would increase by 18,664 ft^3/yr over the existing volume of 5,348 ft^3/yr. New onsite hazardous waste storage facilities would be required.	• At Pinellas, liquid hazardous waste volumes from operations would increase by 51,500 gal/yr over the existing volume of 49,555 gal/yr. Solid hazardous waste would increase by 12,300 ft^3/yr over the existing volume of 110 ft^3/yr. New onsite hazardous waste storage facilities would be required.	• At RFP, liquid hazardous waste volumes from operations would increase by 43,300 gal/yr over the existing volume of 280,000 gal/yr. Solid hazardous waste would increase by 12,300 ft^3/yr over the existing volume of 7,940 ft^3/yr. New onsite hazardous waste storage facilities would be required.	• Lower production levels would decrease waste management activities at most sites. At all sites, increases in annual liquid and solid hazardous waste volumes are not expected.

E4 3465-14

TABLE 4.3–1.—*Summary Comparison of Environmental Consequences of the Proposed Action and Alternatives*—Continued
[Page 15 of 16]

Environmental Resource	Kansas City Plant Proposed Action	Mound Plant Alternative	Pinellas Plant Alternative	Rocky Flats Plant Alternative	No Action
Waste Management (continued)	• Sanitary/industrial wastewater effluent discharges at KCP would increase 1.7 MGY, an increase of less than 1 percent over current rate of 310 MGY. Adequate treatment capacity is available at all sites.	• Sanitary/ industrial wastewater effluent discharge at Mound would increase 291 MGY, over current rate of 44 MGY. This volume would exceed the Mound existing wastewater treatment system capacity. A major upgrade/ modification to the Mound wastewater treatment plant would be necessary.	• Sanitary/industrial wastewater effluent discharge at Pinellas would increase 292 MGY, over current rate of 66 MGY. Adequate treatment capacity is available.	• Sanitary/industrial wastewater effluent discharge at RFP would increase 284 MGY, over current rate of 8 MGY. This volume would exceed the RFP existing wastewater treatment system capacity. A major upgrade/ modification to the RFP wastewater treatment plant would be necessary.	• Lower production levels would decrease sanitary/industrial wastewater effluent at most sites. At all sites, increases in sanitary/industrial wastewater effluent volumes due to nonnuclear manufacturing activities are not expected.
	• Solid nonhazardous waste volumes would increase annually by approximately 282 ft^3 at KCP over the existing volume of 105,300 ft^3; at SRS by 1,000 ft^3 over the existing 753,000 ft^3; at LANL by 28,680 ft^3 over the existing 302,200 ft^3; and at SNL by 9,340 ft^3 over the existing 800,000 ft^3.	• Solid nonhazardous waste volumes would increase annually by approximately 600,000 ft^3 at Mound over the existing volume of 140,130 ft^3; at LANL by 6,680 ft^3; and at SNL by 9,300 ft^3.	• Solid nonhazardous waste volumes would increase annually by approximately 610,000 ft^3 at Pinellas over the existing volume of 3,942 ft^3; at SRS by 1,000 ft^3; at LANL by 26,680 ft^3; and at SNL by 40 ft^3.	• Solid nonhazardous waste volumes would increase annually by approximately 530,000 ft^3 at RFP over the existing volume of 21,770 ft^3; at SRS by 1,000 ft^3; at LANL by 24,000 ft^3; and at SNL by 9,340 ft^3.	• Lower production levels would decrease solid nonhazardous waste volumes at most sites. At all sites, increases in solid nonhazardous waste volumes due to nonnuclear manufacturing activities are not expected.

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TABLE 4.3-1.—*Summary Comparison of Environmental Consequences of the Proposed Action and Alternatives*—Continued
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Environmental Resource	Kansas City Plant Proposed Action	Mound Plant Alternative	Pinellas Plant Alternative	Rocky Flats Plant Alternative	No Action
Waste Management (continued)	• Phaseout of DP nonnuclear activities at Mound, Pinellas, and RFP would result in the elimination of associated waste streams.	• Phaseout of DP nonnuclear activities at KCP, Pinellas, and RFP would result in the elimination of associated waste streams.	• Phaseout of DP nonnuclear activities at KCP, Mound, and RFP would result in the elimination of associated waste streams.	• Phaseout of DP nonnuclear activities at KCP, Mound, and Pinellas would result in the elimination of associated waste streams.	• No change
Human Health	• No adverse health effects to the public have been identified at any site as a result of activities associated with the Proposed Action. Air quality modeling predict cancer risks to workers at LANL ($1.5x10^{-6}$) and SNL ($6.0x10^{-6}$). Measures such as substituting less toxic solvents or modifying production processes would be required to reduce the cancer risks to less then 10^{-6}. No adverse health effects have been identified at any other site.	• No adverse health effects to the public have been identified at any site as a result of operation activities associated with the Mound alternative. Air quality modeling predict cancer risks to workers at LANL ($1.5x10^{-6}$) and SNL ($6.0x10^{-6}$). Measures such as substituting less toxic solvents or modifying production processes would be required to reduce the cancer risks to less then 10^{-6}. No adverse health effects have been identified at any other site.	• Some potential adverse health effects to workers and the public have been identified as a result of operation activities associated with the Pinellas alternative. Air quality modeling predict cancer risks to workers at LANL ($1.5x10^{-6}$) and SNL ($6.0x10^{-6}$). Measures such as substituting less toxic solvents or modifying production processes would be required to reduce the cancer risks to less then 10^{-6}. No adverse health effects have been identified at any other site.	• At RFP adverse health effects to workers and the public have been identified as a result of operation activities associated with the RFP alternative. Air quality modeling predict cancer risks to workers at LANL ($1.5x10^{-6}$) and SNL ($6.0x10^{-6}$). Measures such as substituting less toxic solvents or modifying production processes would be required to reduce the cancer risks to less then 10^{-6}. No adverse health effects have been identified at any other site.	• At RFP, there is the toxic effects of chemicals to workers and cancer risk to workers ($5.3x10^{-4}$) and the public ($1.2x10^{-5}$). At Pinellas, there is a cancer risk both onsite and at the site boundary of about $4x10^{-5}$. At LANL modeling predicts cancer risks to workers ($1.5x10^{-6}$). There are no significant human health effects expected at any of the sites as a result of continuing operations.
	• Consequences of potential accidents would not increase appreciably at any site.	• Consequences of potential accidents would not increase appreciably at any site.	• Consequences of potential accidents would not increase appreciably at any site.	• Consequences of potential accidents would not increase appreciably at any site.	• Consequences of potential accidents would not increase at any site.

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4.4 DECONTAMINATION AND DECOMMISSIONING

At the end of their useful life, all Complex facilities including the nonnuclear manufacturing facilities would require decontamination and decommissioning (D&D). Decontamination is the process of reducing and removing radioactive or hazardous materials from facilities, equipment, or soils. Decontamination techniques include washing, heating, chemical or electrochemical action, and mechanical cleaning. Decommissioning involves removing facilities, including those contaminated with radiation and hazardous materials, from active service. Cleanup and remediation activities involving soil and groundwater are also expected at most of the Defense Production facilities. These cleanup and remediation activities are not addressed in this EA. They are independently driven by regulatory programs (primarily RCRA and CERCLA) and are conducted pursuant to regulatory requirements, independent of Weapons Complex activities or programmatic decisions.

It is important to recognize that the decisions to conduct near-term cleanup and D&D activities at the potential phaseout sites does not depend on whether the proposal for consolidation is implemented. Indeed, regardless of whether nonnuclear manufacturing functions are phased out at these sites, substantial cleanup of both soil and groundwater contamination and substantial D&D of buildings already determined to be unnecessary for future operations is either occurring or planned. These cleanup and D&D activities, which are independent of nonnuclear consolidation decisions, represent a large majority of the total scope of such activity that must occur at the potential phaseout sites. At such time as there are specific proposals for the D&D of any facilities phased out as a result of the implementation of nonnuclear consolidation, the appropriate NEPA documentation will be prepared.

Depending on the level and type of contamination, D&D may involve decontamination and dismantling and return of an area to its original condition without restrictions on use or occupancy, or partial decontamination and isolation of remaining residues with continued surveillance and restrictions on use or occupancy. D&D of this latter type usually applies to facilities contaminated with long-lived radionuclides which can be expected to decay to levels that permit the property to be released for unrestricted use within a reasonable time (i.e., on the order of 100 years).

The D&D of Complex facilities is the responsibility of the DOE Office of Environmental Restoration and Waste Management (EM). DOE is committed to remediate these sites, to comply with all applicable environmental requirements, and to protect public's and workers' health and safety. EM is currently considering many technologies for the treatment of contaminated materials and equipment in D&D operations, and for the long-term management of sites following D&D. DOE is preparing an Environmental Restoration and Waste Management PEIS to analyze alternative strategies and policies for conducting its Environmental Restoration and Waste Management Program (see section 1.4 of this EA). The existing Environmental Restoration and Waste Management Program is divided into three areas: (1) environmental restoration, (2) waste management, and (3) technology development. The Environmental Restoration and Waste Management Program is driven by specific laws and regulations, and is regulated by the Environmental Protection Agency and the states where facilities are located. Activities conducted by the Environmental Restoration and Waste Management Program must integrate the requirements of several different regulatory programs such as NEPA, CERCLA, TSCA, Clean Air, Clean Water, and RCRA, and must also integrate the requirements of state and local regulatory programs. The environmental analyses in the Environmental Restoration and Waste Management PEIS will support DOE decisions on how to best manage processes or facilities for treatment, storage, or disposal of radioactive, hazardous, or mixed waste; approaches to be used to remediate contaminated sites; treatment

technology application or development; land use; and technology and policy consideration for D&D of DOE facilities at the end of their useful lives. To the extent that decisions based on the Environmental Restoration and Waste Management PEIS change DOE's current waste management and D&D operations, subsequent site- specific NEPA analysis will consider such new practices. At the same time, any substantial changes to existing regulatory program requirements, and the resulting impacts on DOE's operations will also be addressed by subsequent NEPA analysis.

4.4.1 Decontamination at Consolidation Sites

Site preparation of facilities to be modified to accept the missions associated with nonnuclear consolidation would include some decontamination and remedial measures. As discussed in section 3.3, these would include such measures as removal of asbestos floor tiles and insulation, PCB- and asbestos-contaminated concrete, and removal of tritium-contaminated equipment. These activities are not unlike decontamination and renovation of facilities presently conducted at all sites being considered for nonnuclear consolidation as part of their ongoing health and safety programs to protect workers and to adapt to changes in work requirements. Decontamination of any facilities resulting from nonnuclear consolidation activities would be conducted in accordance with site procedures and guidelines as directed by applicable Federal, state, local regulations and relevant DOE Orders. Such activities could uncover additional contamination which would require environmental restoration. It is not expected that such activities would entail substantially greater levels of effort or environmental consequences than the ongoing decontamination and remedial activities conducted on a regular basis at all DOE facilities in order to protect the health and safety of workers.

All proposed facility modifications to accommodate nonnuclear consolidation functions would be designed to make future D&D of such facilities as simple and inexpensive as feasible, and to minimize the impacts of future D&D, as required by DOE Order 5820.2A, Radioactive Waste Management, and DOE Order 6430.1A, General Design Criteria. Examples of design features that would be incorporated into nonnuclear consolidation to facilitate future D&D are shown in table 4.4–1.

4.4.2 Decontamination and Decommissioning at Phaseout Sites

Implementing the Proposed Action would result in the phaseout of the Defense Programs Mission at Mound and Pinellas, and the phaseout of nonnuclear manufacturing functions at RFP, and would entail the transition of those plants to the DOE Office of Environmental Restoration and Waste Management for D&D. If one of the alternatives is selected, the Defense Programs Mission at KCP would be phased out and transferred to one of the alternative facilities. This would entail transition of KCP to environmental cleanup under the Office of Environmental Restoration and Waste Management for D&D.

The complexity and actual conduct of the D&D activities at phaseout sites resulting from nonnuclear consolidation would vary from site to site. The required level of effort to complete D&D of their sites would be a function of the types of chemical and radiological materials utilized when the site was operational, and the extent to which radioactive and hazardous/toxic materials have been deposited on the internal and external surfaces of components, systems, and structures. For example, at Mound Defense Programs operations have included recovery and purification of tritium from scrap metals and investigations on chemical explosives, pyrotechnics, plastics, elastomers, and adhesives. At RFP, Defense Programs operations have included the manufacture of nuclear weapons components from plutonium, uranium, and beryllium; nuclear manufacturing; and chemical processing for plutonium recovery. At Pinellas, past Defense

TABLE 4.4-1.—*Potential D&D Design Features*

- Modular, separable confinements for radioactive and other hazardous materials that preclude contamination of fixed portions of the structure
- Localized liquid transfer systems that avoid long runs of buried contaminated piping, including special provisions that ensure the integrity of joints in buried pipelines
- Exhaust filtration components of the ventilation systems at or near individual enclosures to minimize long runs of internally contaminated ductwork
- Equipment, including effluent decontamination equipment, that precludes the accumulation of radioactive or other hazardous materials in relatively inaccessible areas, including curves and turns in piping and ductwork
- Easily decontaminated materials that reduce the amount of radioactive and other hazardous materials requiring disposal
- Designs that ease cutup, dismantlement, removal, and packaging of contaminated equipment for the facility
- Modular radiation shielding in lieu of or in addition to monolithic shielding walls
- Lifting lugs on large tanks and equipment
- Fully drainable piping systems that carry contaminated or potentially contaminated liquids

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Programs operations involved the use of plutonium as a sealed source, while current operations involved the use of tritium in loading of neutron generator components, and analytical laboratory operations. At KCP, the principal operation performed is the manufacture of nonnuclear components for nuclear weapons; no radioactive materials are machined or processed.

The characterization of the extent and type of contamination, the decontamination and remedial measures required, and the schedule of D&D activities would be identified in the transition planning process conducted by the DOE Office of Environmental Restoration and Waste Management. The transition process is conducted on a building-by-building basis and involves a range of activities that begins when a specific building is formally declared surplus and ends when responsibility is transferred to EM and the building is ready for final disposition (i.e., decontamination and removal from service or transfer for alternative uses, including those by DOE, other government agencies, or the private sector). The transition of a specific building would be detailed in a Transition Program Management Plan prepared by DOE for each facility. Appropriate site-specific NEPA documentation will be performed for the D&D of any building phased out as a result of implementing alternatives selected for the nonnuclear consolidation proposal. As stated above, the proposal for D&D of specific facilities would require the preparation of appropriate NEPA documentation.

To achieve readiness for decontamination due to phaseout of DP nonnuclear missions at Mound, Pinellas, RFP, or KCP, specific building-level activities would be initiated at each proposed phaseout site. The sequence of activities includes review and correction of immediate safety issues, initial screening of buildings, and hazard assessments; stabilization of physical and chemical

conditions in the building; inventory and disposal of hazardous materials and chemicals; consolidation and removal of classified documents, parts, products, tooling, and materials; and preparation of documentation to substantiate building condition and need for decontamination and disposition. The D&D of equipment and facilities would be done in accordance with standards and procedures based on DOE Orders and other Federal and state laws, regulatory programs, and guidelines.

RFP was placed on the CERCLA National Priorities List in October 1989. The environmental restoration activities at RFP are implemented by an interagency agreement involving EPA, the State of Colorado, and DOE. The interagency agreement encompasses all activities associated with identifying environmental problems and all measures to be implemented for remediation of those problems that pose a threat to human health and the environment. The activities performed according to the interagency agreement are conducted under the regulatory authority and guidance of CERCLA and RCRA. Regulatory constraints at RFP are more stringent than those at the other proposed phaseout sites due to the specific provisions of the Federal Facility Compliance Agreements, in place, which require extensive site characterization and regulator approval of all demolition and construction activities. These constraints would impact the duration of D&D activities at RFP by limiting the rate at which particular buildings can be cleaned up and restricting the generation of certain waste types expected to result from the D&D activities until suitable treatment, storage, or disposal facilities are available.

Mound was designated as a CERCLA National Priorities List site in November 1989. A Federal Facilities Agreement between DOE and EPA followed in October 1990. The Statement of Work for the Federal Facilities Agreement requires DOE to characterize Mound in terms of all hazardous substances that potentially pose a threat to human health or the environment. A multi-year program of remedial investigations, feasibility studies, and actual remediation is in progress and will continue pursuant to the regulatory requirements of CERCLA and other applicable regulatory requirements, regardless of Defense Production activities. Mound also has a Groundwater Protection Management Program that was established pursuant to DOE Order 5400.1. These program and agreement constraints could also impact the duration of D&D activities at Mound.

Pinellas has a RCRA Hazardous and Solid Waste Amendments Permit issued by EPA in February 1990. A condition of this permit requires site characterization and the remediation of several solid waste management units. D&D activities conducted at Pinellas would have to conform to the requirements of these activities which could add additional time and administrative requirements to D&D activities.

In March 1989, DOE entered into a RCRA Section 3008(h) Administrative Order on Consent, requiring that DOE conduct all environmental restoration activities at KCP under RCRA. This requirement is not expected to appreciably affect any D&D activities that would be required at KCP.

4.5 INTERSITE TRANSPORTATION

The proposed transfer of nonnuclear functions would not require transporting significant quantities of hazardous materials, such as chemicals, between DOE sites. Any hazardous materials, except tritium, to be transferred would be transported by commercial carriage in compliance with Department of Transportation (DOT) regulations. Tritium would be transported by authorized Government means. The disposal or transfer of other hazardous materials at Mound and Pinellas would be addressed separately in site cleanup and closure plans during phaseout of these sites.

Reservoir surveillance operations, gas transfer systems, neutron tube target loading, and commercial sales/inertial confinement fusion target loading involve the transportation of tritium and tritium components that have the potential to impact the environment under both normal (incident-free) and accident conditions. Of these activities, reservoir surveillance operations have the greatest potential for impact because they involve transportation of the largest quantities of tritium. Existing tritium reserves for the four functions are allocated approximately as follows: 95 percent for reservoir surveillance operations, 4 percent for commercial sales/inertial confinement fusion target loading, and less than 1 percent for gas transfer systems and neutron tube target loading combined. The quantities of tritium transported in connection with gas transfer systems, neutron tube target loading, and commercial sales/inertial confinement fusion target loading are very small. As such, these activities do not have the inherent potential to cause significant impacts from tritium-related transportation, and these activities do not require further analysis as a result of the Proposed Action. Thus, for both the No Action and the Proposed Action, this section assesses the potential transportation impacts associated with reservoir surveillance operations. The reservoir surveillance operations would be transferred to SRS under the Proposed Action. The assessment consists of three elements: (1) a general discussion of normal (incident-free) and accident impacts associated with tritium transportation; (2) a discussion of the tritium-related transportation that would continue under the No Action scenario and would result from the Proposed Action; and (3) a discussion of the changes in impacts that might result from the Proposed Action as compared to the No Action baseline.

Tritium and tritium-containing components are shipped between Complex sites in compliance with regulations established by the DOT, Nuclear Regulatory Commission (NRC), and DOE Orders. Tritium is always shipped in DOT/NRC/DOE-approved packagings that are designed and constructed so that under normal transport conditions there would be no radioactive releases and no reduction in the effectiveness of the packaging.

Tritium shipments between Complex sites are managed by the DOE Transportation Safeguards System, and are made almost exclusively by air via DOE's contractor, Ross Aviation. A small number of shipments is made by DOE-owned and -operated safe secure trailers. The safe secure trailers are vehicles designed specifically to enhance structural and thermal performance and, in conjunction with internal DOT/NRC/DOE-approved packagings, provide a combined package for the safety and security of the tritium cargo. Shipments by safe secure trailers are accompanied by armed guards and are monitored by a tracking system.

DOE has evaluated the radiological risk to the public of transporting tritium between Mound and SRS (DOE, 1992k). Specifically, the study evaluated the probability of a tritium release corresponding to one shipment. The analysis assumed that 50,000 Ci would be released in the elemental form for each transportation accident except in the case of a fire coupled with the release, where it was assumed that the entire release would be converted to the oxide form. It was estimated that a 50 percent probability of such a fire exists because of the prevalence of ignition sources, especially for an aircraft accident. In either the elemental form or oxide form, DOE's analysis estimated the probability of total

environmental release (ci per shipment) to be 2.5×10^{-4}. In other words, there is about 1 chance in 4,000 shipments that a release would occur.

Tritium, a low-energy beta emitter, is shielded by stainless steel in its packaging to prevent detectable radiation outside the packaging. Thus, during normal operations, radiation exposure to personnel involved in tritium-related transportation is negligible. The DOE Albuquerque Field Office is currently finalizing an aviation transport study of the Nuclear Weapons Complex materials and components that is expected to show that the cumulative radiation exposure from tritium-related transportation to Ross Aviation flight crew members is zero (DOE, 1992f). Thus, during normal operations, tritium-related transportation poses no significant risk to transportation workers or the public.

The DOE Albuquerque study is also expected to show that the accident probability for Ross Aviation aircraft is 0.00023 per year. This equates to less than one accident in 4,000 years of operation. The annual accident probability is based on data from the last 10 of 19 years that Ross Aviation has logged over 60 million miles and 140,000 flying hours of operating transport aircraft for DOE. Finally, there have been no known deaths or serious injuries to the public or transportation industry personnel as a result of the radioactive nature of tritium involved in an accident.

Under No Action, tritium associated with reservoir surveillance operations would continue to be transported from Pantex to Mound in order to conduct component evaluations. Once component evaluations are completed, tritium would be shipped to SRS for purification, storage, and/or reuse. This would result in a total of 1,325 miles of transport for a given tritium shipment.

For the Proposed Action to transfer the reservoir surveillance operations function to SRS, tritium would be transported from Pantex to SRS to conduct component evaluations, purification, storage, and/or reuse. This would result in a total of 1,010 miles of transport for a given tritium shipment.

The phaseout of tritium-related operations at Mound and Pinellas as a result of the Proposed Action would not cause any significant increase in the amount of tritium-related transportation from these sites. These sites are presently reducing their existing tritium inventories in response to future workloads that are expected to require less tritium. Thus, any phaseout of tritium resulting from the Proposed Action would not cause any significant change and would be consistent with No Action.

During normal operations, the potential impacts from tritium-related transportation are negligible and independent of transport miles. Therefore, the Proposed Action to transfer reservoir surveillance operations functions from Mound to SRS would have no effect on potential impacts.

For the accident analysis, the likelihood of an accident and the resultant impacts are proportional to the number of tritium-related transport miles. As discussed above, the option to transfer the reservoir surveillance operations function to SRS would reduce tritium-related transportation by 24 percent compared to No Action. Therefore, this option would also reduce the probability of an accident by 24 percent. However, it is unlikely that an accident would occur under No Action.

CHAPTER 5

CHAPTER 5: ENVIRONMENTAL PERMITS AND REGULATIONS

Chapter Five identifies the major laws, regulations, Executive orders, DOE orders, agreements, and approval requirements that apply to the Proposed Action and alternatives.

Federal environmental regulations have been established to protect the environment and to control the handling, emission, discharge, and disposal of waste substances. At the Federal level, these environmental regulations are promulgated and enforced primarily by the Environmental Protection Agency (EPA). Compliance with these national requirements must be met by all Federal agencies whether they are enforced directly by the Federal Government or delegated to the states. In many cases, these requirements are applied to sources of potential impact through review, approval, and permitting programs that control the release of pollutants or other impacts on the environment.

States can set stricter standards than those required by Federal law. Some of the Federal legislation that delegates permitting or review authority to qualifying states includes: the National Emission Standards for Hazardous Air Pollutants (NESHAP) and the Prevention of Significant Deterioration (PSD) permits under the *Clean Air Act* (CAA); the Water Quality Standards and the National Pollutant Discharge Elimination System (NPDES) program under the *Clean Water Act* (CWA); the Hazardous Waste Programs under the *Resource Conservation and Recovery Act* (RCRA); and the Drinking Water and Underground Injection Control programs under the *Safe Drinking Water Act* (SDWA). Conversely, the *Toxic Substances Control Act* (TSCA) is administered entirely by the Federal Government.

Except for limited Presidential exemptions, Federal agencies must comply with all provisions of Federal environmental statutes and regulations, as well as all applicable state and local requirements. In addition, Executive Orders stress the mandate for Federal facilities to fully comply with environmental requirements and establish procedures for ensuring that this is accomplished. The Department of Energy (DOE) also expresses many of these requirements through DOE Orders and regulations.

When a specific site is unable to comply with regulatory standards, needs additional time to achieve compliance, or when the applicability of the actual standard is in doubt, DOE may enter into an agreement with the regulatory agency or agencies. Parties to the agreement normally concur on a time frame, interim standards, and a schedule for reaching full compliance. The agreement then becomes the applicable standard during the agreed upon time frame.

Table 5-1 presents the Federal legislation applicable to the Proposed Action and other alternatives. This legislation is divided into seven categories: air resources, water resources, waste management, biotic resources, cultural resources, public/worker health, and other. Within each category a law is cited, the responsible agency is named, the permitting requirements are identified, and the "potential applicability" of that particular law is briefly indicated.

Table 5-2 presents the state legislation applicable to the Proposed Action at KCP in Missouri. Under that consolidation, different sites may receive various nonnuclear functions. When a function (e.g., neutron generator) is relocated to a site, a modification to an

existing permit or the acquisition of a new permit may be required. In the "potential applicability" column, the permit requirements for each state are discussed. This approach is also used for the other three alternatives in table 5-3.

Table 5-3 presents the state legislation that is applicable to the other alternatives: the Mound alternative (Ohio), the Pinellas alternative (Florida), and the RFP alternative (Colorado).

Each alternative is composed of specific DOE sites that transfer or receive specific nonnuclear functions. In turn, each site must comply with its respective state legislation. This legislation covers air resources, water resources, waste management, and chemical and material storage.

Under each alternative, DOE must comply with the legislation of the respective state in which the specific sites are located.

Each alternative and the states affected by the respective alternative are listed below:

Proposed Action	Mound Alternative
Missouri	Ohio
New Mexico	New Mexico
Tennessee	
South Carolina	

Pinellas Alternative	RFP Alternative
Florida	Colorado
New Mexico	New Mexico
South Carolina	South Carolina

If the Mound alternative is chosen, the specific sites (and corresponding states) include: Mound (Ohio); Sandia National Laboratories, Albuquerque (New Mexico); and Los Alamos National Laboratory (New Mexico).

If the Pinellas alternative is chosen, the specific sites (and corresponding states) include: Pinellas (Florida); Los Alamos National Laboratory (New Mexico); and the Savannah River Site (South Carolina).

If the RFP alternative is chosen, the specific sites (and corresponding states) include: RFP (Colorado); Sandia National Laboratories, Albuquerque (New Mexico); Los Alamos National Laboratory (New Mexico); and the Savannah River Site (South Carolina).

Table 5-4 presents the environmental agreements currently in force that are applicable to the Proposed Action and other alternatives. The agreements between regulatory agencies and the DOE include Federal Facility Agreements, Federal Facility Compliance Agreements, Settlement Agreements, Agreements in Principle, and Consent Orders, and are divided into three categories: air resources, water resources, and land resources. The table identifies the facility, parties involved and effective date for each agreement plus a brief "scope of agreement" description.

TABLE 5–1.—*Federal Legislation and DOE Orders Applicable to All Alternatives* [Page 1 of 5]

Resource Area	Legislation/Order	Citation	Responsible Agency	Permit or Requirements	Potential Applicability
Air Resources	Clean Air Act (CAA)	42 USC 7401 et seq.	EPA	Permit	DOE shall comply with all applicable sections of CAA.
	National Ambient Air Quality Standards (NAAQS)	42 USC 7409	EPA	Permit	DOE shall comply with standards regulating chemicals including SO_2, NO_x, CO, PM_{10}, O_3, and Pb.
	Standards of Performance - New Stationary Sources	42 USC 7411	EPA	Permit	DOE shall comply with state-submitted standards governing stationary sources.
	National Emission Standards for Hazardous Air Pollutants (NESHAP)	42 USC 7412	EPA	Permit	DOE shall comply with standards governing hazardous pollutants including radionuclides.
	Prevention of Significant Deterioration (PSD)	42 USC 7470 et seq.	EPA	Permit	DOE will be held accountable for preventing the further deterioration of air quality.
	CAA Amendments of 1990 - State Implementation Plan (SIP)	42 USC 7410	EPA	Permit	DOE shall comply with the relevant requirements from each state's SIP.
Water Resources	Clean Water Act (CWA)	33 USC 1251 et seq.	EPA	Permit	DOE shall comply with all applicable sections of CWA.
	National Pollutant Discharge Elimination System Permit (NPDES)	33 USC 1342	EPA	Permit	DOE shall obtain a new, or modify an existing, NPDES permit if required.
	Storm Water Discharge Permit (section 402 of NPDES)	40 CFR 122.26	EPA	Permit	DOE shall obtain a new, or modify an existing, storm water permit if required.
	Dredge and Fill Activity	33 USC 1344	Corps of Engineers	Permit	DOE shall obtain a new, or modify an existing, dredge/fill permit if required.
	Underground Injection Control Program	40 CFR 144-149	EPA	Permit	DOE shall obtain approval from EPA for any modification to the drinking water supply resulting from underground injection activities.
	Rivers and Harbors Appropriations Act of 1899	33 USC 401 et seq.	EPA	Permit	DOE shall obtain a section 10 permit for work affecting navigable waters.
	Safe Drinking Water Act (SDWA)	42 USC 300 (f) et seq.	EPA	Permit	DOE shall obtain approval from EPA for any modification to the drinking water supply.
	Wild and Scenic Rivers Act	16 USC 1274 et seq.	DOI	Compliance	If applicable, DOE shall not degrade the physical or biological properties of a river designated wild and scenic.
	Executive Order 11988: Floodplain Management	3 CFR, 1977 Comp., p. 117	EPA	Compliance	DOE shall comply with all applicable requirements of the order, as amended.
	Executive Order 11990: Protection of Wetlands	3 CFR, 1977 Comp., p. 121	EPA	Compliance	DOE shall comply with all applicable requirements of the order.
	Compliance with Floodplain/Wetlands Environmental Review Requirements	10 CFR 1022	EPA	Compliance	DOE shall follow implementing procedures.

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TABLE 5–1.—*Federal Legislation and DOE Orders Applicable to All Alternatives*–Continued [Page 2 of 5]

Resource Area	Legislation/Order	Citation	Responsible Agency	Permit or Requirements	Potential Applicability
Waste Management	Resource Conservation and Recovery Act (RCRA)	42 USC 6901 et seq.	EPA	Permit	DOE shall comply with all applicable sections of RCRA.
	Authorization under subpart C	42 USC 6926	EPA	Part B Permit	DOE shall modify any part B permits if required.
	Subtitle 1 - Underground Storage Tanks (UST)	42 USC 6991 et seq.	EPA	Compliance	DOE shall comply with the design criteria and permit requirements for USTs.
	Comprehensive Environ. Response, Compen., and Liability Act (CERCLA)	42 USC 9601 et seq.	EPA	Permit	DOE shall comply with all applicable sections of CERCLA.
	Executive Order 12580: Superfund Implementation	3 CFR, 1987 Comp., p. 193	EPA	Compliance	DOE shall comply with the National Contingency Plan (NCP) in addition to the other requirements of the order, as amended.
	Hazardous Materials Transportation Act	49 USC 1801 et seq.	DOT	Compliance	DOE shall comply with the requirements governing hazardous materials transportation.
	Toxic Substances Control Act (TSCA)	15 USC 2601-2671	EPA	Compliance	DOE shall comply with all applicable sections of TSCA.
	Hazardous Materials Packaging for Transport-Administrative Procedures	DOE Order 1540.2	DOE	Compliance	DOE shall comply with the order.
	Base Technology for Radioactive Material Transportation Packaging Systems	DOE Order 1540.3	DOE	Compliance	DOE shall comply with the order.
	Hazardous and Radioactive Mixed Waste Program	DOE Order 5400.3	DOE	Compliance	DOE shall comply with the order.
	CERCLA Requirements	DOE Order 5400.4	DOE	Compliance	DOE shall comply with the order.
	NEPA Compliance Program	DOE Order 5440.1E	DOE	Compliance	DOE shall comply with the order.
	Safety Requirements for the Packaging and Transportation of Hazardous Materials, Hazardous Substances, and Hazardous Wastes	DOE Order 5480.3	DOE	Compliance	DOE shall comply with the order.
	Radioactive Waste Management	DOE Order 5820.2A	DOE	Compliance	DOE shall comply with the order.
Biotic Resources	Wild Free-Roaming Horses and Burros Act of 1971	16 USC 1331 et seq.	DOI	Compliance	DOE shall consult with DOI and minimize impact.
	Wilderness Act of 1964	16 USC 1131 et seq.	DOI	Compliance	DOE shall consult with DOI and minimize impact.
	Endangered Species Act	16 USC 1531 et seq.	DOC/DOI	Compliance	DOE shall study the impact on endangered species and comply with the act.

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TABLE 5–1.—*Federal Legislation and DOE Orders Applicable to All Alternatives*–Continued [Page 3 of 5]

Resource Area	Legislation/Order	Citation	Responsible Agency	Permit or Requirements	Potential Applicability
Biotic Resources (cont.)	Migratory Bird Treaty Act	16 USC 703 et seq.	DOI	Compliance	DOE shall consult with DOI and minimize impact.
	Bald and Golden Eagle Protection Act	16 USC 668-668d	DOI	Compliance	DOE shall consult with DOI and minimize impact.
	Fish and Wildlife Coordination Act	16 USC 661 et seq.	FWS	Compliance	DOE shall consult with the U.S. Fish and Wildlife Service and minimize impact.
Cultural Resources	Archaeological Resources Protection Act	16 USC 470aa-470ll	DOI	Compliance	DOE shall obtain authorization for any excavation or removal of archaeological resources.
	Archaeological and Historic Preservation Act	16 USC 469a et seq.	DOI	Compliance	DOE shall obtain authorization for any disturbance of archaeological resources.
	Antiquities Act	16 USC 431-33	DOI	Compliance	DOE shall comply with all applicable sections of the act.
	National Historic Preservation Act of 1966	16 USC 470 et seq.	DOI	Compliance	DOE shall consult with the State Historic Preservation Office (SHPO).
	Executive Oder 11593: Protection and Enhancement of the Cultural Environment	3 CFR, 1971-1975 Comp., p. 559	DOI	Compliance	DOE shall aid in the preservation of historic and archaeologic data that may be lost during construction activities pursuant to the order.
	American Indian Religious Freedom Act of 1978	42 USC 1996	DOI	Compliance	DOE shall consult with pertinent Native American groups regarding their inherent rights to religious freedom.
	Native American Graves Protection and Repatriation Act of 1990	25 USC 3001	DOI	Compliance	DOE shall consult with pertinent Native American groups regarding the disposition of human remains and certain objects of cultural patrimony.
Public/ Worker Health	Occupational Safety and Health Act	5 USC 5108	OSHA	Compliance	DOE shall comply with all applicable safety and health legislation.
	Occupational Safety and Health Administration (OSHA) Guidelines	29 USC 660	OSHA	Compliance	DOE shall comply with all applicable safety and health legislation.
	Occurrence Reporting and Processing of Operations Information	DOE Order 5000.3A	DOE	Compliance	DOE shall comply with the order.
	Radiation Protection of the Public and the Environment	DOE Order 5400.5	DOE	Compliance	DOE shall comply with the order.
	Environmental, Safety, and Health Program for DOE Operations	DOE Order 5480.1B	DOE	Compliance	DOE shall comply with the order.
	Environmental Protection, Safety, and Health Protection Standards	DOE Order 5480.4	DOE	Compliance	DOE shall comply with the order.

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TABLE 5–1.—*Federal Legislation and DOE Orders Applicable to All Alternatives*–Continued [Page 4 of 5]

Resource Area	Legislation/Order	Citation	Responsible Agency	Permit or Requirements	Potential Applicability
Public/ Worker Health (cont.)	Safety of DOE-Owned Nuclear Reactors	DOE Order 5480.6	DOE	Compliance	DOE shall comply with the order.
	Fire Protection	DOE Order 5480.7	DOE	Compliance	DOE shall comply with the order.
	Construction Safety and Health Program	DOE Order 5480.9	DOE	Compliance	DOE shall comply with the order.
	Contractor Industrial Hygiene Program	DOE Order 5480.10	DOE	Compliance	DOE shall comply with the order.
	Radiation Protection for Occupational Workers	DOE Order 5480.11	DOE	Compliance	DOE shall comply with the order.
	Nuclear Safety Analysis Reports	DOE Order 5480.23	DOE	Compliance	DOE shall comply with the order.
	Occupational Safety and Health Program for DOE Contractor Employees at Government-Owned Contractor-Operated Facilities	DOE Order 5483.1A	DOE	Compliance	DOE shall comply with the order.
	Environ. Protection, Safety, and Health Protection Info. Reporting Requirements	DOE Order 5484.1	DOE	Compliance	DOE shall comply with the order.
	Safeguards and Security Program	DOE Order 5630.11	DOE	Compliance	DOE shall comply with the order.
	Safeguards and Security Inspection and Evaluation Program and Assessment Program	DOE Order 5630.12A	DOE	Compliance	DOE shall comply with the order.
	Atomic Energy Act of 1954	42 USC 2011	DOE	Compliance	DOE shall follow its own standards and procedures to ensure the safe operation of its facilities.
Other	National Environmental Policy Act (NEPA)	42 USC 4321 et seq.	Council on Environmental Quality	Compliance	DOE shall comply with all applicable sections of NEPA.
	National Environmental Policy Act; Implementing Procedures and Guidelines Revocation	10 CFR 1021	DOE	Compliance	DOE shall comply with NEPA implementing procedures.
	Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)	7 USC 136	EPA	Compliance	DOE shall comply with all applicable sections of FIFRA.
	Emergency Planning and Community Right-To-Know Act of 1986 (EPCRA)	42 USC 11001-11050	EPA	Compliance	DOE shall comply with the requirements of the act.

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TABLE 5–1.—*Federal Legislation and DOE Orders Applicable to All Alternatives*–Continued [Page 5 of 5]

Resource Area	Legislation/Order	Citation	Responsible Agency	Permit or Requirements	Potential Applicability
Other (cont.)	Executive Order 12088: Federal Compliance with Pollution Control Standards	3 CFR, 1978 Comp., p. 243	EPA	Compliance	DOE shall comply with all relevant Federal pollution control standards pursuant to the order, as amended.
	Noise Control Act of 1972	42 USC 4901 et seq.	EPA	Compliance	DOE shall comply with reducing noise levels that jeopardize the health and safety of the public.
	Uranium Mill Tailings Radiation Control Act	42 USC 7901 et seq.	EPA	Compliance/ Licenses	DOE shall enforce and implement health and environmental standards.
	General Environmental Protection Program	DOE Order 5400.1	DOE	Compliance	DOE shall comply with the order.
	Environmental Compliance Issue Coordination	DOE Order 5400.2A	DOE	Compliance	DOE shall comply with the order.
	Environment, Safety, and Health Appraisal Program	DOE Order 5482.1B	DOE	Compliance	DOE shall comply with the order.
	Emergency Management System	DOE Order 5500.1B	DOE	Compliance	DOE shall comply with the order.
	Planning and Preparedness for Operational Emergencies	DOE Order 5500.3A	DOE	Compliance	DOE shall comply with the order.
	Quality Assurance	DOE Order 5700.6C	DOE	Compliance	DOE shall comply with the order.
	General Design Criteria	DOE Order 6430.1A	DOE	Compliance	DOE shall comply with the order.
	Farmland Protection Policy Act	7 USC 4201 et seq.	Soil Conservation Service	Compliance	DOE shall prevent any adverse effects to prime and unique farmlands.

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TABLE 5–2.—*State Permit and Notification Requirements-Proposed Action* [Page 1 of 4]

Resource Area	Legislation	Citation	Responsible Agency	Permit or Requirements	Potential Applicability
Air Resources	Missouri Air Conservation Law	MO Stat., Title 40, Chapter 643	MO Department of Natural Resources	Permit	Required prior to the construction or modification of an air contaminant source.
	Missouri Air Quality Standards	MO Code 10-6.060	MO Department of Natural Resources	Permit	Required prior to the construction or modification of an air contaminant source.
	South Carolina Pollution Control Act	SC Code, Title 48, Chapter 1	SC Department of Health and Environ. Control	Permit	Required prior to the construction or modification of an air contaminant source.
	New Mexico Air Quality Control Act	NM Stat., Title 74, Article 2	NM Health and Environ. Dept.	Permit	Required prior to the construction or modification of an air contaminant source.
	New Mexico Air Quality Standards and Regulations	NM Air Quality Control Regs., §100	NM Health and Environ. Dept.	Permit	Required prior to the construction or modification of an air contaminant source.
	Tennessee Air Quality Act	TN Code, Title 68, Chapter 25	TN Air Pollution Control Board	Permit	Required prior to the construction or modification of an air contaminant source.
	Tennessee Air Pollution Control Regulations	TN Rules, Division of Air Pollution	TN Air Pollution Control Board	Permit	Required prior to the construction or modification of an air contaminant source.

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TABLE 5–2.—*State Permit and Notification Requirements-Proposed Action*–Continued [Page 2 of 4]

Resource Area	Legislation	Citation	Responsible Agency	Permit or Requirements	Potential Applicability
Water Resources	Missouri Clean Water Law	MO Stat., Title 40, Chapter 644	MO Department of Natural Resources	Permit	Required prior to the construction or modification of a water discharge source.
	New Mexico Water Quality Act	NM Stat., Title 74, Article 6	NM Water Quality Control Com.	Permit	Required prior to the construction or modification of a water discharge source.
	New Mexico Water Quality Regulations	NM Water Regulations	NM Water Quality Control Com.	Permit	Required prior to the construction or modification of a water discharge source.
	South Carolina Pollution Control Act	SC Code, Title 48, Chapter 1	SC Department of Health and Environ. Control	Permit	Required prior to the construction or modification of a water discharge source.
	South Carolina Water Quality Standards	SC Code, Chap. 61, Regulation 68	SC Department of Health and Environ. Control	Permit	Required prior to the construction or modification of a water discharge source.
	Tennessee Water Quality Control Act	TN Code 70-324 et seq.	TN Water Quality Control Board	Permit	Required prior to the construction or modification of a water discharge source.
	Tennessee General Regulations	TN Code, §1200-4-1-.05	TN Water Quality Control Board	Permit	Required prior to the construction or modification of a water discharge source.

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TABLE 5–2.—*State Permit and Notification Requirements-Proposed Action*–Continued [Page 3 of 4]

Resource Area	Legislation	Citation	Responsible Agency	Permit or Requirements	Potential Applicability
Waste Management	Missouri Solid Waste Law	MO Code, Title 10, Division 80	MO Department of Natural Resources	Permit	Required prior to the construction or modification of a solid waste disposal facility.
	Missouri Hazardous Waste Management Law	MO Code, Title 10, Division 25	MO Department of Natural Resources	Permit	Required prior to the construction or modification of a hazardous waste disposal facility.
	New Mexico Solid Waste Act	NM Stat., Chap. 74, Article 8	NM Health and Environ. Dept.	Permit	Required prior to the construction or modification of a solid waste disposal facility.
	New Mexico Solid Waste Management Regulations	NM Solid Waste Mgmt. Regs.	NM Environmental Improvement Div.	Permit	Required prior to the construction or modification of a solid waste disposal facility.
	New Mexico Hazardous Waste Management Regulations	NM Hazardous Waste Mgmt. Regs.	NM Environmental Improvement Div.	Permit	Required prior to the construction or modification of a hazardous waste disposal facility.
	South Carolina Solid Waste Regulations	SC Code, Chap. 61, Regulation 60	SC Department of Health and Environ. Control	Permit	Required prior to the construction or modification of a solid waste disposal facility.
	South Carolina Industrial Solid Waste Disposal Site Regulations	SC Code, Chap. 61, Regulation 66	SC Department of Health and Environ. Control	Permit	Required prior to the construction or modification of a solid waste disposal facility.

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TABLE 5–2.—*State Permit and Notification Requirements-Proposed Action*–Continued [Page 4 of 4]

Resource Area	Legislation	Citation	Responsible Agency	Permit or Requirements	Potential Applicability
Waste Management (cont.)	South Carolina Hazardous Waste Management Act	SC Code, Title 44, Chapter 56	SC Department of Health and Environ. Control	Permit	Required prior to the construction or modification of a hazardous waste disposal facility.
	Tennessee Solid Waste Processing and Disposal Regulations	TN Rules, §1200-1-7-.02	TN Division of Solid Waste Mgmt.	Permit	Required prior to the construction or modification of a solid waste disposal facility.
	Tennessee Hazardous Waste Management Act	TN Code, Title 68, §1200-1-11	TN Division of Solid Waste Mgmt.	Permit	Required prior to the construction or modification of a hazardous waste disposal facility.
Chemical and Material Storage	New Mexico Underground Storage Tank Regulations	NM Under–ground Storage Tank Regulations	NM Health and Environ. Dept.	Permit	Required to comply with tank requirements prior to the construction or modification of an underground storage tank.
	Missouri Underground Storage Tank Act	MO Code, Title 10	MO Department of Natural Resources	Permit	Required to comply with tank requirements prior to the construction or modification of an underground storage tank.
	South Carolina Underground Storage Tanks Bank Act	SC Code, Title 44, Chapter 2	SC Department of Health and Environ. Control	Permit	Required to comply with tank requirements prior to the construction or modification of an underground storage tank.
	Tennessee Underground Storage Tank Program Regulations	TN Rules, Chapter 1200-1-15	TN Division of UST Programs	Permit	Required to comply with tank requirements prior to the construction or modification of an underground storage tank.

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TABLE 5–3.—*State Permit and Notification Requirements–Alternatives* [Page 1 of 2]

Resource Area	Legislation	Citation	Responsible Agency	Permit or Requirements	Potential Applicability
Air Resources	Ohio Air Pollution Control Law	OH Code, Title 37, Chapter 3704	OH Environmental Protection Agency	Permit	Required prior to the construction or modification of an air contaminant source.
Water Resources	Ohio Water Pollution Control Act	OH Code, Title 61, Chapter 6111	OH Environmental Protection Agency	Permit	Required prior to the construction or modification of a water discharge source.
	Ohio Water Quality Standards	OH Admin. Code, Title 3745	OH Environmental Protection Agency	Permit	Required prior to the construction or modification of a water discharge source.
Waste Management	Ohio Solid Waste Disposal Regulations	OH Admin. Code, Title 3745	OH Environmental Protection Agency	Permit	Required prior to the construction or modification of a solid waste disposal facility.
	Ohio Hazardous Waste Management Regulations	OH Admin. Code, Title 3745	OH Environmental Protection Agency	Permit	Required prior to the construction or modification of a hazardous waste disposal facility.
Chemical and Material Storage	Ohio Underground Storage Tank Law	OH Admin. Code, Title 37	OH Fire Marshal/Bureau of Underground Storage Tanks	Permit	Required to comply with tank requirements prior to the construction or modification of an underground storage tank.
Air Resources	Florida Air Pollution Rules	FL Rules/ Regulations, Title 17	FL Department of Environ. Regs.	Permit	Required prior to the construction or modification of an air contaminant source.
Water Resources	Florida Air and Water Pollution Control Act	FL Stat., Title 29, Chapter 403	FL Department of Environ. Regs.	Permit	Required prior to the construction or modification of a water discharge source.
Waste Management	Florida Solid and Hazardous Waste Management Act	FL Stat., Title 29, Chapter 403	FL Department of Environ. Regs.	Permit	Required prior to the construction or modification of a solid/hazardous waste disposal facility.

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TABLE 5–3.—*State Permit and Notification Requirements–Alternatives*–Continued [Page 2 of 2]

Resource Area	Legislation	Citation	Responsible Agency	Permit or Requirements	Potential Applicability
Waste Management (cont.)	Florida Statewide Multipurpose Hazardous Waste Facility Citing Act	FL Stat., Title 29, Chap. 403	FL Department of Environ. Regs.	Permit	Required prior to the construction or modification of a hazardous waste disposal facility.
Chemical and Material Storage	Florida Underground Storage Tanks Regulations	FL Rules/ Regulations, Title 17	FL Department of Environ. Regs.	Permit	Required to comply with tank requirements prior to the construction or modification of an underground storage tank.
Air Resources	Colorado Air Quality Act	CO Stat., Title 25, Article 7	CO Air Quality Control Com.	Permit	Required prior to the construction or modification of an air contaminant source.
Water Resources	Colorado Discharge Permit System Regulations	CO Code, Title 5	CO Water Quality Control Com.	Permit	Required prior to the construction or modification of a water discharge source.
	Colorado Primary Drinking Water Regulations	CO Code, Title 5, Chapter 1003	CO Water Quality Control Com.	Permit	Required prior to the construction or modification of a water discharge source.
Waste Management	Colorado Solid Waste Disposal Sites and Facilities Law	CO Stat., Title 20, Article 20	CO Department of Health	Permit	Required prior to the construction or modification of a solid waste disposal facility.
	Colorado Hazardous Waste Notification and Permit Rules	CO Code, Title 6, Chapter 1007	CO Department of Health	Permit	Required prior to the construction or modification of a hazardous waste disposal facility.
Chemical and Material Storage	Colorado Underground Storage Tanks Law	CO Stat., Title 24, Article 18	CO Department of Waste	Permit	Required to comply with tank requirements prior to the construction or modification of an underground storage tank.

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TABLE 5–4.—*DOE Agreements with Federal and State Environmental Regulatory Agencies*

Resource Area	Facility	Parties	Scope of Agreement	Date
Air Resources	Savannah River Site	DOE/EPA	CAA-NESHAP	10/31/91
	Oak Ridge/Y-12	DOE/EPA	CAA-NESHAP	05/26/92
Water Resources	Savannah River Site	DOE/SC	CWA-Thermal discharge limitations	01/03/84, 08/31/87
	Savannah River Site	DOE/SC	CWA-Construction of a wastewater treatment facility	02/27/90, 01/16/91
	Savannah River Site	DOE/SC	CWA-Thermal mitigation of minor discharges	06/05/90
	Savannah River Site	DOE/SC	CWA-Fish kill mitigation	06/05/90
	Savannah River Site	DOE/SC	CWA-NPDES	07/31/91
	Rocky Flats Plant	DOE/EPA	CWA-NPDES	03/25/91
	Los Alamos	DOE/EPA	CWA-NPDES permit violation	08/29/91
Land Resources	Kansas City Plant	DOE/EPA	RCRA-Groundwater cleanup primarily for VOCs and PCBs	06/23/89
	Savannah River Site	DOE/SC	RCRA-Generator requirements	10/06/86
	Savannah River Site	DOE/SC	RCRA-Part A & B application deficiencies; groundwater monitoring	05/01/87, 06/14/89
	Savannah River Site	DOE/SC	RCRA-Part B application deficiencies; groundwater monitoring	11/12/87, 05/10/91
	Savannah River Site	DOE/SC	RCRA-Mgt. of salt-crete drums; 90-day accumulation	02/16/89
	Savannah River Site	DOE/SC	RCRA-Greater than 90-day storage violations	09/05/90
	Savannah River Site	DOE/EPA	RCRA-Land disposal restrictions	03/13/91, 04/24/92
	Savannah River Site	DOE/SC	RCRA-(Solvent rags)	08/26/91
	Savannah River Site	DOE/SC	RCRA	04/13/92
	Savannah River Site	DOE/SC	RCRA	04/29/92
	Oak Ridge/Y-12	DOE/EPA/TN	CERCLA	01/01/92
	Oak Ridge/Y-12	DOE/EPA	RCRA-Land disposal restrictions	06/12/92
	Sandia (Albuquerque)	DOE/NM	RCRA-Groundwater monitoring at chemical waste landfill	12/29/89
	Mound Plant	DOE/EPA	CERCLA-RI/FS and RD/RA	08/06/90
	Rocky Flats Plant	DOE/EPA/CO	CERCLA/RCRA-Cleanup permits, closure plans, waste analysis	7/31/86
	Rocky Flats Plant	DOE/CO	RCRA-Part A for mixed waste	07/14/89
	Rocky Flats Plant	DOE/CO	RCRA-Classification of plutonium residues	11/03/89
	Rocky Flats Plant	DOE/EPA	CERCLA-RI/FS and RD/RA	01/22/91
	Rocky Flats Plant	DOE/EPA	RCRA-Land disposal restrictions	05/10/91

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REFERENCES

REFERENCES

All references cited in the text can be found in the following list, organized by the relevant site or plant. References used by multiple sites or regulations are listed without a site location and can be found in the first two sections of this list. The references follow the same organization found at the 14 designated reading rooms located near cities listed in figure 1.7-1.

Regulations

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10 CFR 1021 — 10 CFR Energy Part 1021, Compliance with the National Environmental Policy Act.

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GLOSSARY

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Abnormal occurrence: Any accidental, unplanned, or uncontrolled release of radioactivity.

Absorbed dose: The energy imparted to matter by ionizing radiation per unit mass of irradiated material at the place of interest in that material. Expressed in units of rad (or Gy, where 1 rad = 0.01 Gy).

Acute standard: A numerical limit on the amount of a particular contaminant that an organism may be exposed to over a short period of time.

Air Quality Control Region: An interstate area designated by the Environmental Protection Agency (EPA) for the attainment and maintenance of National Ambient Air Quality Standards.

Air quality standards: The level of pollutants prescribed by regulations that may not be exceeded during a specified time in a defined area.

Alkalinity: Acid-neutralizing capacity of water.

Alluvial deposits: Deposits of earth, sand, gravel, and other materials carried by moving surface water and deposited at points of weak water flow.

Alpha particle: A positively charged particle, consisting of two protons and two neutrons, that is emitted during radioactive decay from the nucleus of certain nuclides. It is the least penetrating of the three common types of radiation (alpha, beta, and gamma).

Alpha wastes: Wastes containing radioactive isotopes which decay by producing alpha particles.

Ambient air: The surrounding atmosphere, as it exists around people, plants, and structures.

American Indian Religious Freedom Act (AIRFA) (1978): This policy states national policy to protect and preserve for Native Americans their inherent right of freedom to believe, express, and exercise their traditional religions, including the rights of access to religious sites, use and possession of sacred objects, and the freedom to worship through traditional ceremonies and rites.

Aquatic biota: The sum total of living organisms within any designated aquatic area.

Aquifer: A saturated geologic unit that can transmit significant quantities of water under natural hydraulic gradients.

Aquitard: A less-permeable geologic unit in a stratigraphic sequence. The unit is not permeable enough to transmit significant quantities of water. Aquitards separate aquifers.

Archaeological sites (resources): Any location where humans have prehistorically altered the terrain or discarded artifacts.

Atmospheric dispersion: The process of air emissions being dispersed in the atmosphere. This occurs by the wind that carries the pollutants away from their source and by turbulent air motion that results from solar heating of the earth's surface and air movement over rough terrain and surfaces.

Atomic Energy Act (1946): Created the Atomic Energy Commission (AEC) to supervise nuclear weapons design, development, manufacturing, maintenance, modification, and dismantlement.

Atomic Energy Commission (AEC): A five-member commission, established by the *Atomic Energy Act.* In 1974, the AEC was abolished and some of its functions were transferred to the Energy

Research and Development Administration, and was subsequently merged in 1977 with other Federal energy functions into the Department of Energy (DOE).

Attainment area: An area considered to have air quality as good as or better than the national ambient air quality standards as defined in the *Clean Air Act.* An area may be an attainment area for one pollutant and a non-attainment area for others.

Average Daily Traffic (ADT): The total volume of traffic during a given time period, in whole days greater than one day and less than one year, divided by the number of days in that time period.

Baseline: A quantitative expression of conditions, costs, schedule, or technical progress to serve as a base or standard for measurement during the performance of an effort; the established plan against which the status of resources and the progress of a project can be measured. The environmental baseline is the site environmental conditions as they are projected to occur in a specified time period.

Bedroom community: An area, adjacent to a city, where a large number of individuals who work in the city reside.

Beryllium: An extremely lightweight, strong metal used in weapons systems, with atomic number 4.

Biota (biotic): The plant and animal life of a region (pertaining to biota).

Calcareous: Containing calcium carbonate (e.g., calcite and limestone).

Calorimeter: A device used for measurement of thermal constants, such as specific heat, latent heat, or calorific value.

Capable fault: A fault which has had movement at or near the ground surface at least once within the past 35,000 years or movement of a recurring nature within the past 500,000 years.

Carbon monoxide (CO): A colorless, odorless gas that is toxic if inhaled in high concentration over a period of time.

Carolina bay: Ovate, intermittently flooded depression of a type occurring on the Coastal Plain from New Jersey to Florida.

Chronic standard: A numerical limit on the amount of a particular contaminant that an organism may be exposed to over an extended period of time. The allowable exposure concentration for the chronic standard is less than that of the acute standard.

Claystone: A massive sedimentary rock made up largely of clay minerals, having the composition of shale, but lacking its fine lamination.

Clean Air Act Amendments (CAAA) of 1990: Expands the EPA enforcement powers and adds restrictions on air toxics, ozone depleting chemicals, stationary and mobile emissions sources, and emissions implicated in rain and global warming.

Clean Air Act (CAA): Federal law mandating and enforcing air pollutant emissions standards for stationary sources and motor vehicles.

Clean room: An uncontaminated room with filtered air that meets a specific level of cleanliness in which work is performed or in which uncontaminated equipment and materials are stored.

Clean Water Act (CWA) (1972, 1987): This law makes it illegal to discharge pollutants from a point source into navigable waters of the U.S. except in compliance with a National Pollution Discharge Elimination System (NPDES) permit.

Code of Federal Regulations (CFR): All Federal Regulations in force are published in codified form in the Code of Federal Regulations.

Committed dose equivalent: The predicted total dose equivalent to a tissue or organ over a 50-year

period after an intake of radionuclide into the body. It does not include external dose contributions. Committed dose equivalent is expressed in units of rem (or Sv).

Committed effective dose equivalent: The sum of the committed dose equivalents to various tissues in the body, each multiplied by the appropriate weighting factor. Committed effective dose equivalent is expressed in units of rem (or Sv).

Community (biotic): All plants and animals occupying a specific area under relatively similar conditions.

Complex: The U.S. Nuclear Weapons Complex which is a set of Federal sites and government owned/contractor operated facilities administered by the DOE.

Complex 21: The reconfigured nuclear weapons complex to be fully operational early in the 21st century that will sustain the nation's nuclear deterrent until the middle of that century.

Comprehensive Environmental Response Compensation and Liability Act (CERCLA or Superfund): A statutory framework for remediation of past contamination.

Concentration: The quantity of a substance in a unit of sample media (e.g., milligrams per liter, or micrograms per kilogram).

Confined aquifer: A permeable geological unit with an upper boundary that is at a pressure higher than atmospheric pressure.

Consent Decree: A legal document, approved by a judge, that formalizes an agreement reached between EPA and potentially responsible parties through which the parties would conduct all or part of a cleanup action at a Superfund site; cease or correct actions or processes that are polluting the environment; or otherwise comply with regulations where the party's failure to comply caused EPA to initiate regulatory enforcement actions. The consent decree describes the actions parties would take and may be subject to a public comment period.

Consumptive water use: The difference in the volume of water withdrawn from a body of water and the amount released back into the body of water.

Container: The metal envelope in the waste package that provides the primary containment function of the waste package and is designed to meet the containment requirements of 10 CFR Part 60.

Contrast: The effect of a striking difference in form, line, color, or texture of a landscape's features.

Criteria pollutants: Six air pollutants for which national ambient air quality standards are established by EPA: sulfur dioxide, nitric oxides, carbon monoxide, ozone, particulate matter (smaller than 10 microns in diameter or PM_{-10}), and lead.

Crystalline rock: Rock consisting of minerals in a crystalline state.

Cultural chronology: The science of arranging time in periods and ascertaining the dates and historical order of past events.

Cultural resources: Archaeological sites, architectural features, traditional use areas, and Native American sacred sites.

Cumulative impact: An impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what organization or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

Day-Night Average Level (DNL): The average noise level in dBA over a 24-hour period with a 10dB adjustment for events occurring during the

night (10 p.m. to 7 a.m.), and ignoring an evening-hour adjustment.

Decibel (dB): A unit of sound measurement. In general, a sound doubles in loudness for every increase of ten decibels.

Decibel, A-weighted (dBA): A unit of weighted sound pressure level, measured by the use of a metering characteristic and the "A" weighting specified by the American National Standard Institute (ANSI) S1.4-1971(R176).

Decommissioning: Removing facilities contaminated with radiation (such as processing plants, waste tanks, and burial grounds) from service and reducing or stabilizing radioactive contamination. Decommissioning includes the following concepts: (1) decontamination, dismantling, and return of an area to its original condition without restrictions on use or occupancy, and (2) partial decontamination, isolation of remaining residues, and continued surveillance and restrictions on use or occupancy.

Decontamination: The removal of radioactive or chemical contamination from facilities, equipment, or soils by washing, heating, chemical or electrochemical action, mechanical cleaning, or other techniques.

Demography: The statistical study of human populations, including population size, density, distribution, and such vital statistics as age, sex, and ethnicity.

Depleted uranium: Uranium whose content of the isotope U-235 is less than 0.7 percent, which is the U-235 content of naturally occurring uranium.

Derived concentration guide: The concentration of a radionuclide in air or water which, under conditions of continuous exposure by one exposure mode (i.e., ingestion of water or submersion or inhalation of air), for one year, a "Reference Man" would receive the most restrictive of: (1) an effective dose equivalent or 100 mrem (1 mSv), or (2) a dose equivalent of 5 rem (50 mSv) to any tissues, including skin and lens of the eye.

Design Laboratory: DOE facilities involved in the design of nuclear weapons.

Dip: The acute angle that a structural surface (e.g., a bedding or fault plane) in geologic material makes with the horizon, measured perpendicular to the strike of the surface. Updip is at a higher elevation on the surface.

Direct economic effects: The initial increases in output from different sectors of the economy resulting from some new activity within a predefined geographic region.

Disposition: The ultimate "fate" or end use of a deactivated DOE facility following the transfer of the facility to the Office of Environmental Restoration and Waste Management.

Dose equivalent: The product of absorbed dose in rad (or Gy) in tissue (quality factor.) Dose equivalent is expressed in units of rem (or Sv, where 1 rem = 0.01 Sv). The dose equivalent to an organ, tissue, or the whole body will be that received from the direct exposure plus the 50-year committed dose equivalent received from the radionuclides taken into the body during the year.

Drainage basin: An above-ground area that supplies the water to a particular creek or stream.

Drawdown: The height difference between the natural water level in a formation and the reduced water level in the formation caused by the withdrawal of groundwater.

Drinking-water standards: The prescribed level of constituents or characteristics in a drinking water supply that cannot be exceeded legally.

Effective dose equivalent: The summation of the products of the dose equivalent received by specified

tissues of the body and a tissue-specific weighting factor. This sum is a risk-equivalent value and can be used to estimate the health effects risk of the exposed individual. The tissue-specific weighting factor represents the fraction of the total health risk resulting from uniform whole-body irradiation that would be contributed by that particular tissue. The effective dose equivalent includes the committed effective dose equivalent from internal deposition of radionuclides, and the effective dose equivalent due to penetrating radiation from sources external to the body. Effective dose equivalent is expressed in units of rem (or Sv).

Effective porosity: A measure of the interconnected pore space in a rock or soil material that permits the flow of water.

Effluent: A gas or fluid discharged into the environment.

Emission standards: Legally enforceable limits on the quantities and/or kinds of air contaminants that can be emitted into the atmosphere.

Endangered Species Act: Established in 1973, this act requires Federal agencies, with the consultation and assistance of the Secretaries of the Interior and Commerce, to insure that their actions will not likely jeopardize the continued existence of any endangered or threatened species or adversely affect the habitat of such species.

Endangered species: Animals, birds, fish, plants, or other living organisms threatened with extinction by man-made or natural changes in their environment. Requirements for declaring species endangered are contained in the *Endangered Species Act.*

Entrainment: The involuntary capture and inclusion of organisms in streams of flowing water. Term often applied to the cooling water systems of power plants/reactors. The organisms involved may include phyto- and zooplankton, fish eggs and larvae (ichthyoplankton), shellfish larvae, and other forms of aquatic life.

Environment, Safety, and Health Program (ES&H): In the context of DOE, this program encompasses those DOE requirements, activities, and functions in the conduct of all DOE and DOE-controlled operations that are concerned with impacts to the biosphere; compliance with environmental laws, regulations, and standards controlling air, water, and soil pollution; limiting the risks to the well being of both operating personnel and the general public to acceptably low levels; and protecting property adequately against accidental loss and damage. Typical activities and functions related to this program include, but are not limited to, environmental protection, occupational safety, fire protection, industrial hygiene, health physics, occupational medicine, and process and facilities safety.

Environmental Assessment (EA): A written environmental analysis which is prepared pursuant to the *National Environmental Policy Act* (NEPA) to determine whether a Federal action would significantly affect the environment and thus require preparation of a more detailed Environmental Impact Statement (EIS).

Environmental audit: A documented assessment of a facility to monitor the progress of necessary corrective actions, to ensure compliance with environmental laws and regulations, and to evaluate field organization practices and procedures.

Environmental documentation: Documents describing information and results from studies and evaluations required by NEPA. This documentation includes both an EA and EIS.

Environmental Impact Statement (EIS): A document required of Federal agencies by NEPA for major proposals or legislation significantly affecting the environment. A tool for decision making, it describes the positive and negative effects of the undertaking and alternative actions.

Ephemeral stream: A stream whose flow is intermittent.

Epicenter: The point on the earth's surface directly above the focus of an earthquake.

Equivalent sound (pressure) level (L_{eq}): The equivalent steady sound level that, if continuous during a specified time period, would contain the same total energy as the actual time-varying sound. For example, L_{eq} (1-hr) and L_{eq} (24-hr) are the 1-hour and 24-hour equivalent sound levels, respectively.

Estuary: An area of a surface water body where freshwater flows mix with seawater.

Evapotranspiration: The loss of water from the soil both by evaporation and by transpiration from the plants growing in the soil.

Exceedance: Violation of environmental protection standards by exceeding allowable limits or concentration levels.

Finding of No Significant Impact (FONSI): A document by a Federal agency briefly presenting the reasons why an action, not otherwise excluded, will not have a significant effect on the human environment and will not require an EIS.

Floodplain: The lowlands adjoining inland and coastal waters and relatively flat areas including at a minimum that area inundated by a 1 percent or greater chance flood in any given year. The base floodplain is defined as the 100-year (1.0 percent) floodplain. The critical action floodplain is defined as the 500-year (0.2 percent) floodplain. "Critical Action" means any activity for which even a slight chance of flooding would be too great. Such actions may include the storage of highly volatile, toxic or water reactive materials. (Source 10 CFR 1022).

Gaussian plume: The distribution of material (a plume) in the atmosphere resulting from the release of emissions from a stack or other source. The distribution of concentrations about the centerline of the plume, which is assumed to decrease as a function of its distance from the source and centerline (Gaussian distribution), depends on the mean wind speed and atmospheric stability.

General public: Individuals who are normally at and beyond the DOE facility boundary; includes individuals who are on DOE facility open-access ways (roads, rivers, creeks, railways, etc.).

Glass melter: A development refractory chamber containing molten glass over which the waste is burned.

Glove box: An airtight box used to work with hazardous material, vented to a closed filtering system, having gloves attached inside of the box to protect the worker.

Groundwater: The supply of fresh water found beneath the Earth's surface, usually in aquifers, which is often used for supplying wells.

Guideline level: A suggested, desired level of concentration. It is not a regulatory value, but is a value offered as desirable by an agency to protect human health or the environment.

Hazardous material: A substance or material, including a hazardous substance, which poses a risk to health, safety, and property when transported or handled.

Hazardous/toxic waste: Any solid waste (can also be semisolid or liquid, or contain gaseous material) having the characteristics of ignitability, corrosivity, toxicity, or reactivity, defined by the *Resource Conservation and Recovery Act* (RCRA) and identified or listed in 40 CFR 261 or by the *Toxic Substances Control Act* (TSCA).

Heavy metals: Metallic or semimetallic elements of high molecular weight, such as mercury, chromium, cadmium, lead, and arsenic, that are toxic to plants and animals at known concentrations.

HEPA Filter: A filter used to remove particulates from dry gaseous effluent streams.

High-level waste: The highly radioactive waste material that results from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing and any solid waste derived from the liquid. High-level waste contains a combination of transuranic waste and fission products in concentrations requiring permanent isolation.

Highly-enriched uranium: Uranium in which the abundance of the isotope U-235 is increased well above normal (naturally occurring) levels.

Historic resources: Archaeological sites, architectural structures, and objects produced after the advent of written history dating to the time of the first Euro-American contact in an area.

Holocene: The current epoch of geologic time, thought to have begun approximately 100,000 years ago.

Honeycomb: A structural configuration of material that allows for an increase in strength without a significant increase in weight.

Hydrostratigraphic unit: Rock or soil body extending laterally for a considerable distance that is a recognized water bearing unit.

Indigenous labor pool: An area's native labor pool composed of workers normally residing in the area who do not leave the area after termination of a construction project.

Indirect economic effects: Indirect effects resulting from the need to supply industries experiencing direct economic effects with additional outputs to allow them to increase their production. The additional output from each directly affected industry requires inputs from other industries within a region (that is, purchases of goods and services). This results in a multiplier effect to show the change in total economic activity resulting from a new activity in a region.

Induced economic effects: The spending of households resulting from direct and indirect economic effects. Increases in output from a new economic activity lead to an increase in household spending throughout the economy as firms increase their labor inputs.

Inertial confinement fusion: A laser initiated nuclear fusion using the inertial properties of the reactants as a confinement mechanism.

In-migration: The relocating of persons to a defined geographic area as a result of the proposed program, usually calculated on an annual basis.

Interim (Permit) Status: Period during which treatment, storage, and disposal facilities coming under RCRA in 1980 are temporarily permitted to operate while awaiting denial or issuance of a permanent permit. Permits issued under these circumstances are usually called "Part A" or "Part B" permits.

Isotope: An atom of a chemical element with specific atomic number and atomic mass. Isotopes of the same element have the same number of protons but different numbers of neutrons and different atomic masses.

Lab packs: Small containers that contain laboratory hazardous wastes such as chemical bottles, rags, wipes, etc. These lab packs are placed in over-packed drums.

Lacustrine: Found or formed in lakes; also, a type of wetland situated on or near a lake.

Landlord: The DOE Headquarters program which has funding or institutional budget responsibility for general purpose equipment and maintenance activities at a site. Landlord responsibilities refer to general support activities such as management and maintenance of roads, utilities, fencing, security, fire

protection, and building maintenance which are unrelated to specific programs at a DOE site or facility.

Level of service (LOS): A qualitative measure describing operating conditions within a traffic stream as perceived by motorists and/or passengers.

Lithic scatter: An archaeological site consisting only of stone artifacts (incomplete and complete tools).

Low-level waste (LLW): Waste that contains radioactivity but is not classified as high-level waste, transuranic waste, spent nuclear fuel, or "11e(2) by-product material" as defined by DOE Order 5820.2A. Test specimens of fissionable material irradiated for research and development only, and not for the production of power or plutonium, may be classified as low-level waste, provided the concentration of transuranic waste is less than 100 nCi/g. Some LLW is considered classified because of the nature of the generating process and/or constituents, as the waste would tell too much about the process.

Maximum Contaminant Level: The maximum permissible level of a contaminant in water delivered to any user of a public water system. MCLs are enforceable standards.

Milliwatt generator heat source surveillance (MGHS): The heat source, encapsulated plutonium-238 used in an Radioisotopic Thermoelectric Generator (RTG).

Mixed waste: Waste that contains both hazardous and radioactive waste.

Mixing layer (or height or depth): The layer above a surface through which relatively vigorous vertical mixing occurs.

Moderator: A material used to decelerate neutrons from fission (high) energies to thermal (low) energies.

Modified Mercalli Intensity (MMI): A level on the Modified Mercalli scale. A measure of the intensity of earthquake ground shaking with 12 divisions, from I (not felt by people) to XII (damage nearly total).

Nano: Prefix indicating one thousandth of a micro unit; one billionth; 1 nanocurie=10^{-9} curie.

National Ambient Air Quality Standards (NAAQS): Air quality standards established by the *Clean Air Act.* The primary NAAQS are intended to protect the public health with an adequate margin of safety, and the secondary NAAQS are intended to protect the public welfare from any known or anticipated adverse effects of a pollutant.

National Emission Standards for Hazardous Air Pollutants (NESHAP): A set of national emission standards for listed hazardous pollutants emitted from specific classes or categories of new and existing sources. These were introduced in the *Clean Air Act Amendments* of 1977.

National Environmental Policy Act (NEPA, 1969): The basic national charter for the protection of the environment. It requires the preparation of an EIS for every major Federal action that may significantly affect the quality of the human or natural environment. Its main purpose is to provide environmental information to decision makers so that their actions are based on an understanding of the potential environmental consequences of a proposed action and its reasonable alternatives.

National Environmental Research Parks (NERP): Outdoor laboratories set aside for research to study the environmental impacts of energy developments. The parks were established under DOE to provide protected land areas for research and education in the environmental sciences and to demonstrate the environmental compatibility of energy technology development and use.

National Historic Preservation Act (NHPA) (1966, as amended): This law provides that

property resources with significant national historic value be placed on the National Register of Historic Places. It does not require any permits but, pursuant to Federal code, if a proposed action might impact an historic property resource, consultation with the proper agencies is required.

National Pollutant Discharge Elimination System (NPDES): Federal permitting system required for hazardous effluents regulated through the CWA.

National Register of Historic Places (NRHP): A list maintained by the National Park Service of architectural, historical, archaeological, and cultural sites of local, state, or national significance. The list is expanded as authorized by Section 2(b) of the *Historic Sites Act of 1935* (16 U.S.C. 462) and Section 101(a)(1)(A) of the NHPA.

New Source Performance Standards (NSPS): A set of national emission standards enforced by the EPA for both criteria and designated pollutants from specific classes or categories of new, modified, or reconstructed sources.

Nitric acid (HNO_3): The acid used to dissolve nuclear fuel rods so that the fissionable elements can be extracted. In the environment, nitric acid combines with oxygen to produce water and nitrogen dioxide.

Nitrogen dioxide (NO_2): A major component of photochemical smog. When nitrogen dioxide combines with volatile organic compounds, such as ammonia or carbon monoxide, ozone is produced.

Noise Control Act: This law directs all Federal agencies to carry out programs in a manner that furthers a national policy of promoting an environment free from noise that jeopardizes health or welfare.

Nonattainment Area: An air quality control region (or portion thereof) in which the U.S. Environmental Protection Agency has determined that ambient air concentrations exceed national ambient air quality standards for one or more criteria pollutants.

Nonnuclear production: Production operations for components of nuclear weapons that are not fabricated from plutonium, uranium, or other nuclear materials. Raw material stock may include beryllium.

Notification level: A term used only in NPDES permitting. Discharges are permitted under NPDES for particular parameters; however, when parameters that have not been permitted appear in excess of a predetermined concentration (i.e., 100 µg/L), the discharger is required by his NPDES permit to notify the permitter (EPA) that a new parameter has appeared. Violations of NPDES concentration limits are usually called "noncompliances."

NO_X: Refers to the oxides of nitrogen, primarily NO and NO_2. These are produced in the combustion of fossil fuels and can constitute an air pollution problem.

Nuclear facility: A facility whose operations involve radioactive materials in such form and quantity that a nuclear hazard potentially exists to the employees or the general public. Included are facilities that: (1) produce, process, or store radioactive liquid or solid waste, fissionable materials, or tritium; (2) conduct separations operations; (3) conduct irradiated materials inspection, fuel fabrication, decontamination, or recovery operations; or (4) conduct fuel enrichment operations. Incidental use of radioactive materials in a facility operation (e.g., check sources, radioactive sources, and X-ray machines) does not necessarily require a facility to be included in this definition.

Nuclear material: Composite term applied to: (1) special nuclear material; (2) source material such as uranium or thorium or ores containing uranium or thorium; and, (3) by-product material, which is any radioactive material that is made radioactive by

exposure to the radiation incident to the process of producing or using special nuclear material.

Nuclear production: Production operations for components of nuclear weapons that are fabricated from nuclear materials, including plutonium and uranium.

Nuclear reactor: A device in which a fission chain reaction is maintained, and which is used for irradiation of materials or the generation of electricity.

Nuclide: A species of atom characterized by the constitution of its nucleus and hence by the number of protons, the number of neutrons, and the energy content.

Occupational Safety and Health Administration (OSHA): Oversees and regulates workplace health and safety, created by the *Occupational Safety and Health Act* (1970).

Onsite population (co-located workers): DOE and contractor employees who are on duty, and badged onsite visitors.

Outfall: The discharge point of a drain, sewer, or pipe as it empties into a body of water.

Ozonation process: A water treatment process in which ozone is employed as a disinfectant.

Ozone (O_3): The triatomic form of oxygen; in the stratosphere, ozone protects the Earth from the sun's ultraviolet rays, but in lower levels of the atmosphere, ozone is considered an air pollutant.

Paleoindian: American hunting and gathering peoples extant in the late Pleistocene and later who hunted megafauna.

Paleontology: The study of fossils.

Palustrine: Found or formed in marshes; also, a type of wetland situated in or near a marsh.

Peak Hour Volume (PHV): The maximum volume of vehicles in an hour long period passing a point during a given day, often estimated to be 10 percent of total ADT.

Perched: A water-bearing area or aquifer of small lateral dimensions lying above a more extensive aquifer.

pH: A measure of the hydrogen ion concentration in an aqueous solution; specifically, the negative logarithm of the hydrogen ion concentration. Acidic solutions have a pH from 0 to 7; basic solutions have a pH greater than 7.

Physiography: Description of earth surface features, including air, water, and land.

Piedmont province: Area of rolling topography between the Appalachian mountains and the coastal plain, extending from New Jersey to Alabama.

Pits: An assembly at the center of a nuclear device containing a sub-critical mass of fissionable material.

Plume: The elongated pattern of contaminated air or water originating at a point-source, such as a smokestack or a hazardous waste disposal site.

Plutonium: A heavy, radioactive, metallic element with the atomic number 94. It is produced artificially in a reactor by bombardment of uranium and is used in the production of nuclear weapons.

Pondcrete: The solidified mixture of (waste) sludge from solar ponds and Portland Cement (Pondcrete is categorized as a low-level mixed waste containing solvents under the Land Disposal Restrictions Rule).

Population (biological term): All the members of a given species that live at a given time in a particular area.

Potentiometric surface: An imaginary surface defined by the level that water will rise to in a tightly-cased well.

Pounds per square inch (psi): A measure of pressure; atmospheric pressure is about 14.7 psi.

Prevention of Significant Deterioration (PSD): Regulations established by the 1977 *Clean Air Act Amendments* to limit increases in criteria air pollutant concentrations above baseline.

Prime farmland: Land that has the best combination of physical and chemical characteristics for producing food, feed, fiber, forage, oil-seed, and other agricultural crops with minimum inputs of fuel, fertilizer, pesticides, and labor without intolerable soil erosion, as determined by the Secretary of Agriculture (*Farmland Protection Policy Act*, 7 CFR 7, paragraph 658).

Probable maximum flood: Flood levels predicted for a scenario having hydrological conditions that maximize the flow of surface waters.

Protected area: An area encompassed by physical barriers, subject to access controls, surrounding material access areas, and meeting the standards of DOE order 5632.2A.

Protohistoric: Of or relating to times just preceding recorded history.

Quality factor: The principal modifying factor that is employed to derive dose equivalent from absorbed dose.

Radioisotopic Thermoelectric Generators (RTG): An electric generator using a thermocouple with the decaying heat of encapsulated plutonium-238 as its heat source.

Radioactive waste: Materials from nuclear operations that are radioactive or are contaminated with radioactive materials, for which use, reuse, or recovery are impractical.

Radionuclide: A radioactive nuclide.

Receiving waters: Rivers, lakes, oceans, or other bodies of water into which wastewaters are discharged.

Rem: The unit of radiation dose for biological absorption: equal to the product of the absorbed dose in rads, a quality factor, and a distribution factor.

Residual noise level: The residual level represents a low-level value to which the ambient environmental noise level frequently drops, but seldom goes below.

Resource Conservation and Recovery Act (RCRA): A "cradle to grave" regulatory program for hazardous waste which established, among other things, a system for managing hazardous waste from its generation until its ultimate disposal.

Retort: A container in which substances are distilled or decomposed by heat.

Riparian wetlands: Wetlands on or around rivers and streams.

Risk assessment: The qualitative and quantitative evaluation performed in an effort to define the risk posed to human health and/or the environment by the presence or potential presence and/or use of specific pollutants.

Safe Drinking Water Act (SDWA): This law protects the quality of public water supplies, water supply and distribution systems, and all sources of drinking water.

Safety Analysis Report (SAR): A safety document providing a concise but complete description and safety evaluation of a site, design, normal and emergency operation, potential accidents, predicted consequences of such accidents, and the means proposed to prevent such accidents or mitigate their consequences. A safety analysis report is designated as final when it is based on final design information. Otherwise, it is designated as preliminary.

Saltcrete: A solidified mixture of salt residue from the evaporation process at a liquid waste treatment facility and Portland Cement.

Saltstone: A low-permeability (less than 10^{-7} centimeter per second) mixture of cement/flyash/slag or lime/flyash/slag used to immobilize low-level radioactive or mixed wastes for disposal.

Sanitary wastes: Any waste, liquid or solid (includes sludge), which is neither a RCRA regulated waste, a TSCA regulated waste, nor radioactive.

Scintillation: Minute flash caused when alpha, beta, or gamma rays strike certain phosphors.

Secondary system: The system that circulates a coolant (water) through a heat exchanger to remove heat from the primary system; also called the cooling water or light-water system.

Sedimentation: The settling out of soil and mineral solids from suspension in water.

Seepage basin: An unlined excavation in the ground that receives aqueous effluent.

Seismic zone: An area defined by the U.S. Uniform Building Code (1991), designating the amount of damage to be expected as the result of earthquakes. The U.S. is divided into six zones: (1) Zone 0 - no damage; (2) Zone 1 - minor damage; corresponds to intensities V and VI of the MMI scale; (3) Zone 2A - moderate damage; corresponds to intensity VII of the MMI scale (eastern U.S.); (4) Zone 2B - slightly more damage than 2A (western U.S.); (5) Zone 3 - major damage; corresponds to intensity VII and higher of the MMI scale; (6) Zone 4 - areas within Zone 3 determined by proximity to certain major fault systems.

Seismic: Pertaining to any earth vibration, especially an earthquake.

Shrink-swell potential: Refers to the potential for soils to contract while drying and expand after wetting.

Silica: Silicon dioxide, a common mineral that occurs naturally as quartz.

Socioeconomic baseline characterization: A description and discussion of the social and economic characteristics of a study area, including a profile of local government, housing supply, land use, and public and private services.

Special nuclear materials: Plutonium, uranium enriched in the isotope 233 or 235, and any other material that DOE, pursuant to the provisions of Section 51 of the *Atomic Energy Act of 1954*, determines to be special nuclear material.

Sulfur dioxide (SO_2): A heavy pungent, colorless gas (formed in the combustion of coal), which is considered a major air pollutant.

Surface water: Water on the earth's surface, as distinguished from water in the ground (groundwater).

Surplus: Any equipment, facility, building, or site that has no identified or planned programmatic use as determined by the program secretarial office currently administering the program.

System: A collection of interdependent equipment and procedures assembled and integrated to perform a well-defined purpose. It is an assembly of procedures, processes, methods, routines, or techniques united by some form of regulated interaction to form an organized whole.

Threatened species: Any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Threshold limit values (TLV): The recommended concentrations of airborne contaminants workers

may be exposed to according to the American Council of Governmental Industrial Hygienists.

Tiger Team: A team set up by the Secretary of Energy to assess the environment, safety, and health operations at all DOE facilities to determine whether changes were needed to improve the protection of the environment, safety, and health.

Transition: The range of activities that begins when a building is formally declared surplus to its production mission and ends when responsibility is formally transferred to the Office of Environmental Restoration and Waste Management and is ready for final disposition.

Transuranic (TRU) waste: Waste contaminated with alpha-emitting radionuclides with half-lives greater than 20 years and concentrations greater than 100 nanocuries/gram at time of assay. It is not a mixed waste.

Trim: Machine cutting fluids used to cool parts that are being milled.

Tritium: A radioactive isotope of the element hydrogen with two neutrons and one proton. Common symbols for the isotope are H^3 and T.

Unconsolidated: Loosely arranged or uncemented sediment.

Upthrow: The wall of a fault that has moved upward relative to the other wall.

Uranium: A heavy (atomic mass = 238.03), silvery-white metal with 14 radioactive isotopes. Uranium-235 is most commonly used as a fuel for nuclear fission. Another isotope, uranium-238, is transformed into fissionable plutonium-239 following its capture of a neutron in a nuclear reactor.

Viewshed: The extent of the area that may be viewed from a particular location. Viewsheds are generally bounded by topographic features such as hills or mountains.

Visual Resource Management (VRM) Classes: These classes define the different degrees of modification allowed to the basic elements of landscape. They are Class 1–applied to wilderness areas, wild and scenic rivers, and other similar situations; Class 2–contrasts are seen but do not attract attention; Class 3–contrasts caused by a cultural activity are evident, but remain subordinate to the existing landscape; Class 4–contrasts that attract attention and are dominant features of the landscape in terms of scale, but repeat the contrast of the characteristic landscape; Class 5–applied to areas where unacceptable cultural modification has lowered scenic quality, (where the natural character of the landscape has been disturbed to a point where rehabilitation is needed to bring it up to one of the four other classifications).

Vitrification: A waste treatment process that uses glass (e.g., borosilicate glass) to encapsulate or immobilize radioactive wastes to prevent them from reacting in disposal sites.

Volatile organic compounds (VOC): A broad range of organic compounds, often halogenated, that vaporize at ambient or relatively low temperatures, such as benzene, chloroform, and methyl alcohol.

Waste Isolation Pilot Plant (WIPP): A facility not yet in operation in southeastern New Mexico being developed as the disposal site for transuranic and transuranic mixed waste.

Water quality standard and criteria: Concentration limit of constituents or characteristics allowed in water; often based on water use classifications (e.g., drinking water, recreation use, propagation of fish and aquatic life, and agricultural and industrial use).

Weighting factor: Represents the fraction of the total health risk resulting from uniform whole-body irradiation that could be contributed to that particular tissue.

Well injection: Process in which liquids are injected into an underlying geologic formation through wells.

Wetland: Land or areas exhibiting hydric soil conditions, saturated or inundated soil during some portion of the year, and plant species tolerant of such conditions.

Woodland Period: A stage of prehistoric cultural development, recognized throughout North America, primarily characterized by horticultural economies in most regions. The material remains are usually recognized by the presence of ceramics, and the construction of earthworks and burial mounds. Specific characteristics and dates of the Woodland Period vary from one region to another.

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AGENCIES AND PERSONS CONSULTED

The Federal, state and local agencies and private organizations/agencies that were contacted during the course of preparing this Environmental Assessment, except for those pertaining to Socioeconomics, are listed below. A detailed list of Socioeconomic Consultation and Coordination Contacts can be found at the end of Appendix E.

General

Bureau of Economic Analysis, U.S. Department of Commerce
U.S. Fish and Wildlife Service, Central Office, Virginia

Kansas City Plant

Contacts in the State of Kansas:

City of Kansas City, Development Department
City of Kansas City, Parks and Recreation
Kansas State Department of Health and Environment, Division of Environment, Bureau of Water Protection
Kansas State Department of Human Resources
State Department of Health and Environment, Division of Environment, NEPA Point of Contact

Contacts in the State of Missouri:

Missouri Department of Natural Resources
Missouri Department of Natural Resources, Drinking Water Section - Bill Hills
Missouri Department of Natural Resources, Water Pollution Section - Mike Phillips
Missouri Department of Natural Resources, Water Quality Management Division - Richard George
Missouri State Division of Employment Security
Missouri State Public Service - James McGrath
State Clearinghouse, Office of Administration, NEPA Point of Contact
U.S. Fish and Wildlife Service, Columbia
U.S. Geological Survey - Terry Perkins

Los Alamos / Sandia National Laboratories, New Mexico

City of Albuquerque, Albuquerque International Airport
City of Albuquerque, Open Space Department
City of Albuquerque, Parks and Recreation Department
City of Española, Building and Planning Department
City of Santa Fe, Planning and Land Use Department
County of Los Alamos, Community Development Department
County of Santa Fe, Planning and Land Use Department
IT Corporation
Los Alamos County, Planning Department
Los Alamos Historical Society
Los Alamos County, Parks and Recreation Department
New Mexico Department of Game and Fish
New Mexico Environment Department, Drinking Water Division
New Mexico Environment Department, NEPA Point of Contact
New Mexico State Employment Security Department
New Mexico State Energy, Minerals and Natural Resources Department, Forestry and Resources Conservation Division

New Mexico State Highway and Transportation Department, District 3 and Headquarters
New Mexico State Park and Recreation Division
Public Service Company of New Mexico
Pueblo De San Ildefonso, Office of the First Lt. Governor
Pueblo De San Ildefonso, Office of the Governor
Rio Arriba County, County Manager
Ski New Mexico
U.S. Bureau of Land Management, State Office, Planning/Environmental Coordination and Engineering
U.S. Bureau of Land Management, State Office, Public Affairs
U.S. Bureau of Land Management, Taos Resource Area Office
U.S. Department of Agriculture, Cibola National Forest, Sandia Ranger District
U.S. Department of Agriculture, Forest Service, Santa Fe National Forest
U.S. Department of Agriculture, Forest Service, Santa Fe National Forest, Española Ranger District
U.S. Fish and Wildlife Service, Albuquerque, New Mexico
U.S. Forest Service, Cibola National Forest
U.S. Forest Service, Santa Fe National Forest
U.S. National Park Service, Bandelier National Monument
U.S. National Park Service, Southwest Regional Office, Bandelier National Monument, Planning
Zephyr Design

Mound Plant

Contacts in the State of Ohio:

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Butler Soil and Water Conservation District
Cincinnati Museum of Natural History
City of Miamisburg, Parks and Recreation Department, and City Engineer
City of Miamisburg, Planning Department
City of West Carrollton, Parks and Recreation Department
Dayton Museum of Natural History
Dayton-Montgomery County, Park District
Miami Conservancy District - Paul Plummer
Miami Township, Planning and Zoning
Miami Valley Regional Planning Commission
Miamisburg Historical Society
Montgomery County Historical Society
Montgomery County Planning Commission
Ohio State Historical Society
Ohio State Bureau of Employment Services
Ohio State Office of Budget and Management, State Clearinghouse, NEPA Point of Contact
Ohio State Department of Natural Resources, Heritage Program, Division of Natural Areas and Preservation
State of Ohio EPA, Division of Drinking and Groundwater
U.S. Fish and Wildlife Service, Reynoldsburg, Ohio
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Wright State University

Contacts in the State of Kentucky:

Kentucky State Employment Security Agency

Pinellas Plant

City of Largo, Community Development Department
City of Pinellas Park, Economic Development Department
City of Pinellas Park, Planning Department
City of Seminole, Community Development Department
City of St. Petersburg, Planning Department
Cooperative Extension Service, Pinellas County
County of Pasco, Planning Department
County of Pinellas, Planning Department
CSXT, Engineering Department
Department of Environmental Regulation, Bureau of Drinking Water and Groundwater Resources
Florida State Community Development Department
Florida Department of Environmental Regulation, Water Management Division - Mark Peterson

Florida State Department of Labor and Employment Security
U.S. Fish and Wildlife Service, Vero Beach, Florida
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Florida Natural Areas Inventory, Heritage Program
Florida State Office of Planning and Budget, Executive Office of the Governor, NEPA Point of Contact
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Pinellas County Water Authority - Dan Christy
SMS, Inc.
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Rocky Flats Plant

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City of Boulder, Parks Planning and Construction, Open Space Department
City of Broomfield Water Plant - Dan Mayo, Raw Water Technology and Rich Coufal, Superintendent
Colorado Department of Health, Division of Drinking Water
Colorado Department of Natural Resources, Division of Wildlife
Colorado Department of Natural Resources - Greg Hammer, Dave Safeip Inspector
Colorado Natural Heritage Program
Colorado State Clearinghouse, NEPA Point of Contact
Colorado Ski Country
Colorado State Department of Labor and Employment
Denver Water Department - Rocky Wiley, Manager of General Planning
Jefferson County Planning Department
Jefferson County Public Works Department
U.S. Fish and Wildlife Service, Golden
U.S. National Park Service, Statistics Department
U.S. Soil Conservation Service

Savannah River Site

Contacts in the State of Georgia:

Central Savannah River Planning and Development Commission
Georgia State Department of Community Affairs
Georgia State Department of Natural Resources, NEPA Point of Contact
Norfolk Southern Corporation, Railroad Department
Richmond County, Planning Department

Contacts in the State of South Carolina:

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Aiken County, Planning Department
Allendale County, Development Board
Barnwell County, Administration Office
Lower Savannah River Council of Governments
Office of the Governor, NEPA Point of Contact
South Carolina Department of Health and Environmental Control Bureau of Drinking Water Protection
South Carolina Department of Wildlife and Marine Resources
South Carolina Division of Wildlife and Fresh Water Fisheries
South Carolina State Employment Security Commission
U.S. Forest Service, Sumter National Forest
U.S. Fish and Wildlife Service, Charleston

Contacts in the State of North Carolina:

North Carolina Employment Security Commission

Y-12 Plant

City of Knoxville, Recreation Department
Tennessee State Department of Employment Security
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Knoxville-Knox County Metropolitan Planning Commission

Loudon County, Administration and Planning
Oak Ridge University of Tennessee
Ober Gatlinburg Ski Area
Tennessee Department of Agriculture, Division Plant Industries
Tennessee Department of Conservation, Division of Drinking Water Pollution Control
Tennessee Department of Environment and Conservation, Division of Ecological Services
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Tennessee State Planning Office, NEPA Point of Contact
Tennessee Valley Authority - Larry Stewart
University of Tennessee, Department of Anthropology
U.S. Soil Conservation Service, Roane County

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Acronyms and Abbreviations

ACRONYMS AND ABBREVIATIONS

ADT	average daily traffic
AQCR	Air Quality Control Region
CAA	Clean Air Act, as amended
DOD	Department of Defense
DOE	Department of Energy
DOT	Department of Transportation
EA	Environmental Assessment
EPA	Environmental Protection Agency
HAP	Hazardous Air Pollutants
HE	high explosive
HEPA	High Efficiency Particulate Air
ISCST	Industrial Source Complex Short Term
KAFB	Kirtland Air Force Base, Albuquerque, NM
KCP	Kansas City Plant
L_{eq}	equivalent sound level
LANL	Los Alamos National Laboratory
LLW	low-level waste
LOS	level of service
Mound	Mound Plant
MWHS	milliwatt heat source
NAAQS	National Ambient Air Quality Standards
NCP	Nonnuclear Consolidation Plan
NESHAP	National Emissions Standards for Hazardous Air Pollutants
NIOSH	National Institute for Occupational Safety and Health
NPDES	National Pollutant Discharge Elimination System
NTS	Nevada Test Site
NWS	National Weather Service
OEL	occupational exposure level
ORR	Oak Ridge Reservation
OSHA	Occupational Safety and Health Administration
PEL	Permissible Exposure Limit
PHV	peak hour volume
Pinellas	Pinellas Plant
PSD	Prevention of Significant Deterioration
RAPCA	Regional Air Pollution Control Agency
RCRA	Resource Conservation and Recovery Act, as amended
RFP	Rocky Flats Plant
ROI	region-of-influence
SARA	Superfund Amendment and Reauthorization Act
SNL	Sandia National Laboratories, Albuquerque
SRS	Savannah River Site

TLV	Threshold Limit Value
TSCA	Toxic Substances Control Act, as amended
TSP	total suspended particulates
TWA	time-weighted average
VOC	volatile organic compounds
Y-12	Y-12 Plant, Oak Ridge Reservation

CHEMICALS AND UNITS OF MEASURE

CCl_4	carbon tetrachloride
CO	carbon monoxide
dB	decibel
dBA	decibel A-weighted
ft^2	square feet
ft^3	cubic feet
ft^3/s	cubic feet per second
gal	gallon
GPD	gallons per day
GPY	gallons per year
HMX	cyclotetramethylenetetranitramine, or 1,3,5,7-tetranitro-1,3,5,7-tetrazocine
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
mg/m^3	milligrams per cubic meters
MGD	million gallons per day
MGY	million gallons per year
NO_2	nitrogen dioxide
NO_x	nitrogen oxides
O_3	ozone
Pb	lead
PCB	polychlorinated biphenyl
PETN	pentaerythritol tetranitrate
PM_{10}	particulate matter of aerodynamic diameter (diameter less than 10 micrometers)
ppb	parts per billion
SO_2	sulfur dioxide
TCA	1,1,1-trichloroethane
TCE	trichloroethylene
yd^3	cubic yards
µg	microgram (one-millionth of a gram)
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
$\mu g/m^3$	micrograms per cubic meter
µm	micron (one-millionth of a meter)

APPENDIX A

APPENDIX A: CURRENT OPERATIONS

This appendix contains more detailed descriptions of the nonnuclear manufacturing activities currently located at existing facilities which might be consolidated. It also contains backup data concerning waste management operations at these facilities. The Kansas City Plant (KCP) is discussed in section A.1, Mound in section A.2, Pinellas in section A.3, and Rocky Flats Plant (RFP) in section A.4.

A.1 KANSAS CITY PLANT (SECTION 3.2.1)

A.1.1 Description of Kansas City Plant Functions

Electrical/Mechanical Activities.

Squib Valve Assembly. The manufacture of pyrotechnic devices that provide valving functions for various nuclear weapons systems. Assembly of these valves requires handling of Class 1.4 explosives in a static-free environment using fixture assisted assembly techniques.

Hybrid Microcircuit Assembly. The manufacture of hybrid microcircuits resistor/conductor networks using alumina oxide substrates with thin film or thick film technologies for radars, programmers, timers, and fire sets. Assembly includes the attachment of electrical components to these networks. Assembly of this product requires a Class 10,000 clean room with temperature and humidity controls.

Hybrid Microcircuit Assembly for Joint Test Assemblies. The manufacture of hybrid microcircuits that consists of an insulating substrate such as alumina that contains a thin or thick resistor/conductor network interconnected with active (transistors and integrated circuits) and passive (resistors and capacitors) components that are enclosed in a metal or ceramic package.

Microminiature Electrical Assembly. The manufacture of hybrid microcircuits (semiconductors packaged in ceramic leadless chip carriers, transistor outline headers, or kovar flatpacks). These products perform multiple electronic functions in weapons systems such as switches, radars, programmers, fire sets, clocks, and telemetry.

Telemetry Assembly. The manufacture of telemetry assemblies, neutron detectors, and test component firing systems. The telemetry assemblies and neutron detectors, as part of the joint test assembly, provide warhead scoring data in flight tests. The test component firing systems are high energy transfer systems manufactured for use in underground testing at the Nevada Test Site (NTS).

Radar Assembly. The manufacture of radars used in weapons fusing systems for bombs and warheads. Included in this product line are antenna assemblies that can be an integral part of a radar fuse assembly or a separate component used in the fusing system. Facility requirements include controlled humidity environment, solvent cleaning stations, and electrostatic control.

Timers, Programmers, & Trajectory Sensing Signal Generators. The manufacture of trajectory sensing signal generators (electronic assemblies that accept environmental data, verify correctness of that data, and produce predetermined and sequenced output functions for the weapon). The trajectory sensing signal generators product is part of the nuclear safety system of the weapon. The primary function is to

help assure that accidental detonation due to abnormal thermal and shock environments does not occur.

Test Equipment Design & Fabrication. The manufacture of custom designed and fabricated test equipment able to accept products produced internally and by vendors. This function is capable of performing electrical and mechanical design, producing definition drawings, developing computer software, and fabricating the necessary hardware.

Cellular Silicone & Filled Elastomers. The production of cellular silicone cushions that are used as filler to cushion components and to allow for thermal expansion.

Foam Molding. The production of structural foam supports using urethane foam materials.

Syntactic Foam Molding & Plastics Machining. The production of foam molding that is capable of withstanding higher operating temperatures than conventional foam molding supports. These products are made using high temperature resins and microspheres, which are sintered in a high temperature oven. Facility requirements include an environmentally-controlled (temperature & moisture) plastics machining facility, due to the physical requirements of plastic products.

Laminates & Desiccants. The production of aluminum silicate desiccant powders and resins used to provide a dry environment in sealed nuclear assemblies, and the production of fiber-reinforced plastic laminates.

Noncryptographic Coded Switch Assembly. The manufacture of electronic devices utilizing hybrid microcircuits and magnetic core memory used in the Permissive Action Link to permit the controlled use of nuclear weapons upon proper authorization and to prevent unauthorized use under all conditions.

Strong Link Switch Assembly. The manufacture of complex electromechanical safety devices used in all modern weapons programs. Facility requirements include clean rooms for switch assembly and testing.

Fire Set Assembly. The manufacture of high-voltage circuitry firing systems capable of supplying the energy required to initiate a weapon system. Energy is derived from low-voltage battery power and is converted by this system to several thousand volts and stored until an initiating signal is received. Components include: capacitors, inductors, hybrid microcircuits, flat cable and flex circuit technologies, and switches.

Composite Structures. The manufacture of fiber-reinforced molding resins.

Stockpile Support. Evaluation of components and subsystems removed from stockpile for reuse, systems testing, or component cycle testing. No unique processes, materials, or technologies are utilized for stockpile support.

Category F Permissive Action Link Electronics Assembly. The manufacture of electronic assemblies that are part of the nuclear surety system.

Special Products-Special Electronics Assembly. Restricted access area is where electronic products having special security requirements are manufactured. The primary product line is a special access program and the product description and the function are very carefully limited only to those with an absolute need to know.

Cryptographic Coded Switch Assembly. The assembly of a Permissive Action Link Switch Adapter, an electronic device designed to provide an "electrical block" to the arming switch of the weapon. The Permissive Action Link Switch Adapter utilizes both thin and thick film hybrid microcircuit technology and is packaged in a foam plastic housing.

T-Gear Containing Cryptographic Keying Material. The manufacture of cryptographic keying material

used to code and recode Permissive Action Link Switch Adapter devices in weapons. The presence of these codes prevents unauthorized access to weapons.

MK5 Arming, Fusing, & Firing Set Assembly. The assembly of arming, fusing, and firing assemblies. This assembly incorporates a radar, a programmer, an accelerometer, a decelerometer, thermal batteries, a fire set, a contact fuse, and a force balance integrating accelerometer.

B83 Weapon Subassembly. The assembly of electronic and mechanical structures into a case structure with environmental protection. Assemblies provide distance, timing, velocity sensing, velocity control, and electrical power for weapon assemblies.

Machining Technology. Activity providing a wide variety of traditional and non-traditional metal-removing processes including conventional and numerically controlled turning, milling, drilling, boring, and grinding processes.

Other Mechanical Technology. Activity providing support for mechanical product manufacturing including sheet metal hydroforming, fire edge blanking, punch pressing, riveting, laser marking, threaded insert installation, and manual assembly operations.

Plastics Technology. The manufacture of a wide range of polyurethane foam components, epoxy encapsulants, and modified commercial products for the Nuclear Weapons Complex.

Electrical/Electronic Fabrication & Assembly Technology. The fabrication of printed wiring assemblies which are used in weapon timers, programmers, trajectory sensing devices, and various other electrical/electronic components.

Secondary Support Areas. Activity providing support functions that service nearly all product lines, including a broad range of standard industrial processes (plating, painting, heat treating & welding), some of which are uniquely tailored to meet special weapon requirements.

Production Support (Labs). The Analytical Sciences Laboratory provides analytical services in support of production operations including mechanical analysis, organic chemistry, inorganic chemistry testing, and product diagnostics.

Product Procurement. Purchasing organization responsible for the acquisition of all goods and services required to support the activities of the KCP. Procurement activities include acquisition of electronic/electrical, mechanical, and electro-mechanical components and assemblies and all bulk materials.

A.1.2 Waste Management

Waste operations at KCP consist of management of four broad waste types: low-level waste (LLW), mixed waste, hazardous/toxic waste, and nonhazardous waste. Information on waste stream generation processes/activities, onsite management, storage and treatment capabilities and ultimate disposition of the four waste types is provided in tables A1-1 through A1-4.

Yearly inventories of hazardous waste are provided in table A1-1. The numbers reflect quantities generated, disposed of, and/or reclaimed. The major hazardous waste streams and the current offsite disposal methods are listed in table A1-2. KCP currently operates 11 *Resource Conservation and Recovery Act* (RCRA) interim status waste storage areas for containerized nonradioactive hazardous waste, and 6 bulk storage tanks for nonradioactive hazardous waste, as shown in table A1-3. Onsite waste processing facilities at Kansas City are listed in table A1-4. A summary of hazardous waste disposal quantities and number of shipments is provided in table A1-5.

TABLE A1-1.—*Kansas City Plant: Hazardous/Toxic Waste Streams*

Waste Stream	Process	Quantities (ft^3)[a]		
		Actual (1990)	Actual (1991)	Actual (1992)
Acid	Plating Operations	475	363	336
Acid	Precious Metal Recovery	30	40	45
Alkaline	Plating Operations	1,297	1,323	968
Alkaline	Precious Metal Recovery	2	6	6
Oil/Coolants	Machining & Lubrication Services	6,062	1,697	750
Halogenated & Non-Halogenated Solvents	Degreasing Operations	7,312	3,756	1,506
PCB Liquid & Debris	Oil (ft^3) Heat Transfer System	3,466	81	1,144
	Electrical Units & Debris (lb)	238,840 lb	118,100 lb	298,900 lb
PCB Soil & Debris	Miscellaneous on-site Remediation	243 tons	27 tons	348 tons
Cyanide Salts	Precious Metal Recovery	1	115	4
Resin, Paint, Curing Agents Adhesive & Rubber	Potting and Manufacturing Operations	1,934	1,213	1,806
Infectious Waste	Medical Lab Operations	447	582	1,111
Mercury Contaminated Debris	Manufacturing Operations	58	15	15
Solvent/Oil Contaminated Filters & Debris	Manufacturing, Potting, Cleaning & Degreasing Operations	10,301	5,895	7,763
F006, F0019 Sludge	Wastewater Treatment	7,722	5,346	4,158
Batteries	Lead-acid	83,600 lb	49,960 lb	57,740 lb
Lead-acid, Solid for Lead Reclamation	Batteries from Vehicle Maintenance			
Batteries, Thermal Lithium, Gel-Cell and Miscellaneous	Manufacturing Operations	110	88	103
Toluene Diisocyanate	Molding and Encapsulation	111	68	369
Classified Hazardous Material	Manufacturing Operations	15	9	9
Classified Waste (Nonhazardous)	Manufacturing Operations	13	15	15
Cyanide, Liquid	Precious Metals Recovery	60	115	41
MDA Contaminated Debris	Potting & Encapsulation Operations	3,060	48	368
Acid/Chromate Contaminated Debris	Metal Finishing, Spill Clean-up, Filtration	27	60	266
Cyanide/Alkaline Contaminated Debris	Spill Clean-up, Lab Trash, Filtration	20	32	160
Miscellaneous Lab Reagents, Off-spec. Commercial Product	Facility Clean-out of Discarded Chemicals	78	60	70
Non-empty Aerosol Cans	Use of Items With Aerosol Propellants	0	0	588
Compressed Gas Cylinders	Miscellaneous Manufacturing Operations	0	0	29
Non-regulated Empty Crushed Containers	Miscellaneous Manufacturing Operations	677	677	1,103
Trichloroethylene Contaminated Soil	Miscellaneous Site Soil Assessments	0	15,525	1,147
Polyol R Component Off-Spec.	Molding and Encapsulation	-	-	397

E4 3191

[a] Quantities are in cubic feet unless otherwise stated.

TABLE A1-2.—*Kansas City Plant: Hazardous/Toxic Waste Streams and Offsite Disposal Methods*

Waste	Disposal Method
Acid	Incinerator
Adhesive	Incinerator
Alkaline	Incinerator
Asbestos	Landfill
Cyanide	Treatment/Landfill
Oil/Solvent Solid Debris	Incinerator
Infectious Waste	Incinerator
Oil/Coolant	Incinerator
Paint	Incinerator
PCB Liquids	Incinerator
PCB Solid	Landfill
Resin	Incinerator
Rubber Compounds	Incinerator
Solvents	Incinerator

E4 3190

Source: KC DOE, 1991b.

TABLE A1-3.—*Kansas City Plant: Hazardous/Toxic and Radioactive Waste Storage Facilities*

Facility	Contents	Capacity
Above-Ground Tanks (2)	Waste Oil/Coolant (Bulk)	16,000 gal
Above-GroundTanks (2)	Nonchlorinated and Chlorinated Solvents (Bulk)	16,000 gal
Above-GroundTanks (2)	Acidic Plating and Alkaline Plating (Bulk)	12,000 gal
Tank Farm Container Area	PCB, Solvent, Oil, and Acid Alkaline (Container)	3,677 ft^3
Red-X Lot	Rubber, Paint, Adhesive, Epoxy, and Misc. Ignitable (Container)	8,824 ft^3
L-Lot	Acid, Alkaline, Lead-Acid Batteries, and Oil (Container)	26,737 ft^3
Demolition Lot	PCB, Lead-Acid Batteries, Acid, and Alkaline (Container)	23,561 ft^3
Waste Storage Test Cells (4)	Cyanide, PCB, and Lab-Pack (Container)	11,648 ft^3
Mixed Waste Storage Area	LLW and LL-Mixed Waste With Toxic Metal and/or Organic Concentration	705 ft^3
Acid Pad	Acid, Alkaline Cyanide (Carboys)	6,353 ft^3
Reclamation Area	Cyanide, Acid, and Alkaline	552 ft^3

E4 3375

Source: KC ASAC, 1992a.

TABLE A1-4.—*Kansas City Plant: Waste Processing Facilities*

Facility	Operation
Scrap Dock	Nonhazardous metal scrap segregation
Solid Waste Building	Glass and metal container crushing, plant refuse compacting
Oil Skimmer	Separation of oil/water mixtures before discharge of water to municipal sewer system
Container Rinse Area	Rinsing of hazardous material containers
Solvent Distillation Unit	Reclaim various solvents for reuse in-plant
Precious Metal Recovery	Silver Recovery
Thermal Emulsion Breaker	Thermally separates water-based coolants and water for volume reduction
Oil/Water Separator and Carbon Filter	Separates oil with trace amounts of PCBs and removes VOCs from water
Paper Mill	Waste Compaction

E4 3187

Source: KC DOE, 1991b

TABLE A1-5.—*Kansas City Plant: Hazardous/Toxic Waste Disposal—Annual Summary (1990)*

Waste Material	Amount (lbs)	Number Of Shipments
Acid Liquid, Bulk	32,300	1
Alkaline Liquid, Bulk	83,200	2
Alkaline Liquid MacDermid	79,400	2
Batteries (Misc.)	9,700	
Cyanide Solution	5,800	1
Flammable Liquids (Overpacks-Adhesives, Resins Curing Agents, Paint, and Rubber)	42,400	2
Combined Misc. Isocyanates	19,300	1
Industrial Waste Processing Facility F006 Sandfilter Sand	76,200	3
Industrial Waste Processing Facility F006 Sandfilter Sludge	364,600	14
Lab Reagents (Misc.) & Off-Spec Commercial Product	4,700	1
Mercury Compound Debris (Thermometers, Relay Switches)	2,400	1
Mercury Compound Debris (D/61 Declassification)	32,000	2
Mercury/Thallium Sludge	3,000	1
Oil, Bulk	276,200	7
Oil/Solvent Debris	191,900	7
Oil/Solvent Debris (Step Can Waste)	88,000	4
PCB/EP Toxic Solid Debris (Plating Bldg.)	23,700	1
PCB Liquid, Bulk	83,700	7
PCB Solid Debris	1,064,600	51
Petroleum & Dimethylformamide Contaminated Soil	91,300	2
Solvent, CHL	527,000	13
Totals	3,101,400 lbs	123 shipments

E4 3224

Source: FDI, 1992a.

A.2 MOUND PLANT (SECTION 3.2.2)

A.2.1 Description of Mound Plant Functions

Electrical/Mechanical Activities.

Flat Cable Products. Manufacture of slapper used to detonate the main explosive charge of the weapon.

Mechanical Assemblies. Manufacture of electromechanical devices consisting of a slapper cable discriminator assembly and actuator assembly.

Round Wire Detonator Cables. Manufacturing of exploding bridgewire detonators for igniting various explosive devices used in weapons systems.

Nonnuclear Acorn. Manufacture of the nonnuclear components of reservoirs. This activity complements the Rocky Flats reservoir production activities.

Plastic Headers. Manufacture of transfer molded plastic devices having imbedded electrode wires, to which bridgewires are ultimately attached.

Tritium Handling.

Reservoir Surveillance Operations. Activity providing assessment of quality, reliability, and safety of gas boosting systems, including preproduction evaluations, gas transfer systems functions, material testing, and product acceptance testing.

Gas Transfer Systems. Activity providing the development of processes and components for the manufacture of gas transfer systems. This includes research into component manufacturing/development, filling and storage, and function testing. In addition, activities necessary to empty tritium from transfer system components are included.

Commercial Sales/Inertial Confinement Fusion Target Loading. This function consists of loading small uranium beds (U-beds), stainless steel cylinders, and inertial confinement fusion microspheres for commercial customers.

High Explosive Activities.

High Power Detonators. This functions includes the following components:

- Slapper Detonators. Manufacture of detonator assemblies used in explosive devices.
- Explosive Powder Processing. Processing of explosives such as cyclotetramethylenetetranitramine (HMX) and pentarythritol tetranitrate (PETN) powders to be incorporated into various devices in weapons systems.
- Explosive Component Testing. The process of destructively testing explosive components in support of production, development, and surveillance efforts.
- Explosive Component Surveillance. Activities such as stockpile, shelf life, and accelerated aging evaluations, specified by the three design laboratories.
- Exploding Bridgewire Detonators. Assembly of detonators used in main charge initiation trains, timing subsystems, disablement devices, and other applications.
- Explosive Fireset Assembly. Assembly of precision electrical components used to produce the electrical energy required to initiate explosive systems.

TABLE A2–1.—*Mound Plant: Hazardous/ Toxic Waste Nature and Handling Procedures*

Waste Stream	Nature of Waste	Handling of Waste	Location
Organic Solvents	Flammable liquids	Picked up weekly, consolidated at staging area, and stored in steel drums in Bldg. 72 prior to offsite disposal	B-Bldg., E-Bldg., R-Bldg., COS Bldg.
Waste Oils	Flammable or combustible liquids	Consolidated in 55-gal drums at operating area, and stored in Bldg. 72 for offsite disposal	PM-Bldg., M-Bldg., garage
Discarded Excess Paints and Thinners	Flammable or combustible liquids	Consolidated in 55-gal drums at operating area, and stored in Bldg. 72 for offsite disposal	Paint shop
Waste Corrosive Solutions	Mostly caustic and acid solutions	Consolidated in 55-gal or other size drums at operating area, and stored in Bldg. 72 for offsite disposal	Plating shop, DS Bldg., garage
Spent Plating-Bath Solution	Toxic liquid containing heavy metals	Consolidated in 55-gal or other size drums at operating area, and stored in Bldg. 72 for offsite disposal	Plating shop
Waste PCBs	Toxic liquid	Stored in marked cans or drums labeled and placed in diked area and covered vaults or controlled storage facility near P-Bldg.	Various transformers and capacitors throughout the plant
Toxicity Characteristic Waste	Various liquid and solid wastes	Consolidated in 55-gal or other size drums at operating area, and stored in Bldg. 72 for offsite disposal	Approx. 10 locations throughout the plant
Photoprocessing Waste	Waste containing precious metals, caustic solution, and acetic acid	Picked up weekly, consolidated into polyethylene-lined 55-gal drums and stored in Bldg. 72 for potential silver recovery (fixer) or offsite disposal (nonfixer)	OSW Bldg., OSE Bldg., Bldg. 2
Explosive Solid Waste	Containing small amounts of explosives/ pyrotechnics	Stored in magazine; small quantities are treated by open burning, retorting, or "incineration" in controlled-access area	Approx. 15 locations throughout the plant
Solvent-Water Wastes Containing Trace Amounts of Explosives	Ignitable and possibly reactive	Filtered and containerized in polyethylene-lined 55-gal drums and staged near Bldg. 27 prior to offsite shipment for treatment/disposal	Bldg. 27
Laboratory Wastes	Solvents; flammable, reactive, toxic liquids in small quantities	Packed in steel containers with vermiculite for incineration or land-filling	Various labs throughout the plant

E4 3245

Source: MD DOE, 1991c.

TABLE A2–2.—*Mound Plant: Low–Level Mixed Waste Types and Quantities in Storage*

Waste Type	Quantity
Liquid Scintillation (vials)	189 drums (1,418 ft^3) containing closed vials
Lead Residue and Bricks	One 30-gal drum residue; two 30-gal drum bricks; one 55-gal drum lead scrap; two 5-gal. 37-A can bricks and scrap; two 55-gal drums RCRA corrosive TRU waste; two plywood boxes (strong, tight) waste batteries; one steel box (U.S. DOT 7A) containing lead waste. Total volume waste lead - 185 ft^3
PCBs	21 drums solid; 10 drums liquid; 1 box solid (equipment-machine press) Total volume PCBs - 250 ft^3
Contaminated Mercury	Four containers totalling less than 3 liters

E4 3243

Source: MD DOE, 1991c.

TABLE A2–3.—*Mound Plant: Hazardous Waste Storage and Treatment Facilities*

Facility	Use	Approximate Dimensions
Hazardous Waste Storage Facility (Bldg. 72)	Principal hazardous waste storage area	40 ft x 60 ft; 10 ft high
Explosive Waste Storage Magazine 53	Explosive waste storage bunker	10 ft x 15.5 ft; 10 ft high
Pyro Shed Storage	Storage area for pyrotechnic materials	9 ft x 15 ft; 7 ft high
Glass Melter Thermal Treatment	System in Waste Disposal Annex to be used for burning hazardous and radioactive mixed waste	Melter, with internal dimensions 87 in long, 30.5 in high, 27.5 in wide, is located at 24 ft x 57 ft area
Thermal Treatment of Explosive	Drum unit for burning explosives-contaminated materials	55-gallon drum in 10 ft x 10 ft x 10 ft structure
Opening Burning of Explosive Waste	Apparatus for burning solid explosives-contaminated materials/scrap	Located in same structure with drum unit (above)
Retort	Unit for burning fabricated components/assemblies containing/explosives	3 ft diameter, 10 ft long
Pyro Waste Conversion Unit	Apparatus for treatment of pyrotechnic cleanup solutions	1 ft diameter, 2 ft high cylinder in a 30 in x 30 in x 6 in tray

E4 3392

Source: MD DOE, 1991c.

TABLE A2–4.—*Mound Plant: Radioactive Waste Management Facilities*

Facility	Waste Managed	Facility Description
Waste Disposal Solidification (WD Bldg.)	Liquid alpha waste (Pu-238)	Equipment for coprecipitation/flocculation of waste, solidification of sludge, and adsorption/filtration of supernatant liquid
Staging Area (Bldg. 23)	Tritiated waste; TRU waste; non-TRU alpha waste; mixed waste	One-story concrete block building, 14 ft high x 30 ft wide x 117 ft long, having a gross area of 3,500 ft^2
Compactor (WD Bldg.)	Alpha waste	Hydraulic-ram compactor
Staging Area (Bldg. 31)	Tritiated waste; TRU waste; non-TRU alpha waste	One-story sheet metal building, 12 ft high x 60 ft wide x 102 ft long having a gross area of 6,100 ft^2
Waste Solidification Facility (SW-149)	Tritiated waste	Tritiated liquid solidification and packaging for off-site shipment and burial
Effluent Removal System (SW)	Tritiated waste	Air detritiation system removes tritium from process effluent streams before they are released to the atmosphere
Compactor (T-Bldg.)	Low Specific Activity (beta)	Hydraulic-ram compactor
Glass Melter (WDA)	(alpha, beta, gamma)	Development refractory chamber containing molten glass over which waste is burned, wet off-gas treatment system, and high-efficiency filter used for line-generated wastes. (Mound expects to permit the unit for use with radioactive mixed and hazardous waste.)
Compactor (SW Bldg.)	Low Specific Activity (beta)	Hydraulic-ram compactor
Equipment at Various Waste Generating Areas	Low-level alpha solid waste	Where practical, compactors are used to reduce waste volume in drums prior to shipment

E4 3391

Source: MD DOE, 1991c.

Special Products.

Calorimeters. This mission consists of manufacturing, calibrating, testing, and storing heat standards equipment.

A.2.2 Waste Management

The major hazardous waste types, nature and handling procedures at Mound are described in table A2-1. Low-level mixed waste types and quantities in storage at Mound are described in table A2-2. Hazardous waste storage and treatment facilities at Mound are described in table A2-3. Radioactive waste management facilities at Mound are described in table A2-4.

A.3 PINELLAS PLANT (SECTION 3.2.3)

A.3.1 Description of Pinellas Plant Functions

Electrical/Mechanical Activities.

Support Pads. Manufacturing model pads from synthetic foam materials with controllable mechanical crushing characteristics that are used to protect weapons components within the weapon assembly.

Optoelectronics Assemblies. Production of electrical devices using the properties of light rather than electrical conductivity to transfer information, perform switching functions, and act as sensors.

Neutron Detectors. Production of electronic detectors used to verify the output of neutron generators in joint test assemblies.

Lightning Arrestor Connectors. Production and testing of electrical connectors for weapons cables that are designed to short circuit lightning strike pulses to ground.

Transducers. Manufacture of mechanical shock sensing devices used in weapons testing sequences.

Tritium Handling Activities.

Neutron Tube Target Loading. Loading small amounts of tritium into specific neutron generator components.

Neutron Generators, Cap Assemblies, and Batteries.

Thermal Batteries. The activity provides for development and backup manufacturing capabilities for thermal batteries. Thermal batteries are currently procured from commercial sources.

Neutron Generators. Production of neutron generators which provide a controlled source of neutrons. Major subassemblies that are produced include neutron tubes, electronic and ferroelectric power supplies, and vacuum switch tubes. These tubes are low-energy arc-activated, high-vacuum gap switches designed to withstand high thermal and mechanical shock and capable of holding off 10,000 volts.

Cap Assemblies. This process involves the manufacture of a weapons component associated with gas transfer systems.

Lithium Ambient Batteries. Production of long-life battery assemblies using individual lithium ambient battery cells procured from commercial suppliers.

A.3.2 Waste Management

Waste operations at Pinellas consist of management of three broad types of waste: low-level waste, hazardous/toxic waste and nonhazardous waste.

Pinellas does not dispose of hazardous/toxic wastes onsite. Annually, Pinellas ships approximately 100 drums of hazardous/toxic waste, 3,500 gallons of ignitable hazardous waste, 300 drums of laboratory wastes, and 100 drums of LLW for offsite disposal.

Table A3-1 provides projected quantities of hazardous wastes to be shipped offsite. Table A3-2 shows the offsite disposition of the hazardous wastes. Table A3-3 defines the hazardous waste container and tank storage units at the site and table A3-4 shows radioactive solid waste volumes for 1990 and those projected for 1991 and 1992.

TABLE A3-1.—*Pinellas Plant: Hazardous Waste Quantities Projected to be Shipped Offsite in 1992*

Waste	EPA Waste Code Number	Quantity (yd^3)
Calcium Chromate (Solid)	D007, U032	0.81
Iron Disulfide and Residue[a]	D003	0.00
Calcium Chromate Batteries	D003	0.81
Lithium Silicon Batteries	D003	1.62
Lithium Silicon	D003	0.54
Titanium Metal Powder[b]	D003	0.00
Flammable Liquids[c]	F003, F005, D001	24.72
Halogenated Hydrocarbons[d]	F001, F002	2.72
Waste Epoxy Resin	D001	1.09
Methylene Chloride Resin	F001, F002	1.09
Trim Cutting Coolants	—	9.90
Laboratory Wastes	—	47.60
New Waste Streams (Contingency)	—	4.08
Waste Cyanide[b]	D002, D003, F007	0.00
Waste Asbestos[b]	—	0.00

E4 3199

[a] Off-specification iron disulfide is being returned to vendor for reprocessing.
[b] Waste is being shipped in small quantities as laboratory waste.
[c] Consists of acetone, alcohol, amyl acetate toluene, and mineral spirits.
[d] Consists of methylene chloride, 1,1,1-trichloroethane, trichloroethylene, and freon.

Source: PI DOE, 1991d.

TABLE A3-2.—*Pinellas Plant: Offsite Disposition of Hazardous Wastes*

Waste	Disposal Method
Laboratory Packs	Incinerator
Asbestos	Landfill
Calcium Chromate	Landfill
Halogenated and Nonhalogenated Solvents	Recycling
Lead (Contaminated)	Treatment
Thermal Batteries and Reactive Metals	Incineration and hydrolysis
Still Bottoms from Recycling	Landfill
Ashes from Incineration	Landfill

E4 3198

Source: PI DOE, 1991d.

TABLE A3-3.—*Pinellas Plant: Hazardous Waste Drum and Tank Storage*

Storage Location/ Storage Capacity	Waste Description	Waste Defined by EPA Waste Code Number
Building 1040, Bay 1 Drum Storage—forty 55-gallon drums; 24 lab-pack drums	Waste halogenated solvents, spent plating bath solutions, stripping compounds. Waste methylene chloride/resin, waste epoxy resin	F001-F003, F005-F009, D001, D002, D004, D007, D008, D009, D011, U032, U223 (will contain free liquids)
Building 1040, Bay 2 Drum Storage—thirty-six 55-gallon drums; 18 lab-pack drums	Calcium chromate contaminated solid waste, thermal batteries (calcium chromate and lithium silicon)	D001-D004, D007-D009, U032, U223 (does not contain free liquids)
Building 1040, Bay 3 Drum Storage—three 55-gallon drums	Miscellaneous laboratory chemicals stored until properly identified and classified for packaging, shipping, and disposal	D002, D004, D008, D009 (does not contain free liquids)
Building 1000, Center Bay Drum Storage—thirty-eight 55-gallon drums	Mixed waste storage when necessary	D008 mixed with low-level radioactive waste (does not contain free liquids)
Tank No. 1—5,000 gallons	—	Standby-any of below
Tank No. 2—2,000 gallons	Mixtures of methylene chloride, 1,1,1-trichloroethane, trichloroethylene, and Freon	F001, F002
Tank No. 5—5,000 gallons	Mixture of alcohol, toluene, acetone, amyl acetate and liquids with ignitable characteristics	F003, F005, D001

E4 3197

Source: PI DOE, 1991d.

TABLE A3-4.—*Pinellas Plant: Radioactive Solid Waste Generation*

Tritium Waste Type	1990 Actual Volume (ft^3)	1991 Projected Volume (ft^3)	1992 Projected Volume (ft^3)
Contaminated Equipment	700	1,000	400
Contaminated Dry Solids	3,900	1,500	1,500
Contaminated Product	330	300	310
LLW Total	4,930	2,800	2,210

E4 3196

Source: PI DOE, 1991d.

A.4 ROCKY FLATS PLANT (SECTION 3.2.4)

A.4.1 Description of Rocky Flats Plant Nonnuclear Functions

Electrical/Mechanical Activities.

Reservoirs. Production involves the fabrication, assembly and shipping of weapon and working gas reservoir assemblies. Typically these units are fabricated from stainless steel. The fabrication process for these parts begins with metal forging at the Oxnard, CA, facility. The parts are then machined, inspected, radiographed, cleaned, and welded. Assemblies undergo final dimensional, visual, proof, and nondestructive testing.

Special Products.

Nuclear Grade Steels/Oxnard. This activity involves the procurement, certification, and storage of bulk stock for a variety of metals for the Department of Energy (DOE) Nuclear Weapons Complex (Complex). These materials are fabricated and certified to tightly defined material specifications, and are generally available in a wide range of sizes in bar, plate, and thin-wall tubing configurations.

Safe Secure Trailers. Fabrication, repair, and refurbishment of safe and secure highway semi–tractor trailers used to transport weapon components and material.

Weapon Trainer Shop. This activity provides weapon component and assembly illustrations as well as display and instructional models for use within the DOE Complex and Department of Defense (DOD). The illustrations are of delivery systems and cutaway views of weapon assemblies, missiles, and bombs. The models range from fractional scale to full size. The models often incorporate working features and cutaway sections to illustrate internal features. Typical models include nuclear warheads, aircraft, and transport vehicles.

Metrology Services. Metrology services are provided to several nonnuclear weapon component customers. The metrology activities are related to calibration of dimensional standards such as thread gages, height blocks, comparator charts, special design gauges, surface plates, optical flats, etc.

Beryllium and Pit Support

Beryllium Technology. A commercial supplier provides semimachined parts to RFP for finish machining, ultrasonic cleaning, heat treatment, inspection, nondestructive testing, and other post-machining processing such as coating or brazing. Development and support activities include:

- Vacuum Induction Melting. The Vacuum Induction Melting facility combines recycled scrap beryllium with varying amounts of pure beryllium flake to produce a casting of the desired chemical composition and impurity levels for powder production. The Vacuum Induction Melting is also used to cast the scrap metal into anodes for the electrorefining process.

- Near Net Shape Forming. Near net shape forming processes consolidate powder into formed part shapes for machining. The processes provide the range of shape/mechanical properties combinations required by the customers.

Pit Support Functions.

- Pit Support Forming Operation. Pit support forming operation consists of a spin–forming technique which produces parts from vendor supplied metal blanks. The parts are manufactured out of various nonuranium materials.

- Heat Treating Operation. Heat treating operation involves heat treating various metal shells. Heat treating occurs in

electrically heated furnaces after spin–forming operation.

- Machining Operation. Machining operation consists of a machine shop utilizing a T-bed lathe to perform the finish machining of the various metal shells, material samples for certification and testing, and support miscellaneous developmental efforts.

- Post-Machining Operation. Post-machining operations performed on finished metal shells. The operations consist of analysis, testing, and certification of the finished metal shells.

- Pit Support Functions (Tubes). Pit support functions consist of machining, joining, and post joining operations. Machining operations involve cutting and boring the tubing with a small jeweler's lathe. The tubing is procured as certified tubing from an outside vendor and cut and bored to meet required specifications.

- Joining Operations. Joining operations consist of operations required to join the tubes to various pit components. This involves brazing and welding. The welding operations required for the tubing consist of electron beam and gas tungsten arc welds, depending on the type of material being welded and the location of the welded tubing on the pit components. The brazing operation is performed in a vacuum brazing furnace.

- Post-Joining Operations. Post-joining operations involve inspecting, testing, and certifying the tubes that are installed on the pit components.

A.4.2 Waste Management

The majority of the process wastes generated at the site are radioactive; thus, treatment and handling facilities have been designed to provide the additional safeguards necessary to effectively manage radioactive wastes. Treatment technologies include thermal, chemical, physical, immobilization, and waste solidification techniques.

Table A4-1 shows the low-level and low-level mixed waste streams generated at RFP in 1990. Table A4-2 lists the principal RFP treatment facilities and the categories of waste treated.

TABLE A4-1.—*Rocky Flats Plant: Types of Low-Level/Low-Level Mixed Waste Generated in 1990*

Waste Stream	Percentage
Combustibles	49
Saltcrete	19
Metals	14
Mixed Item Description Codes (Residues)	8
Aqueous Sludge	3
Filters	2
Blacktop, Concrete, Dirt & Sand	2
Other	2
Pondcrete	1
Total	100

E4 3247

Source: RF DOE, 1991b.

TABLE A4-2.—*Rocky Flats Plant: Principal Treatment Facilities*

Location	Waste Description	Treatment Description
Building 774	TRU and TRU-mixed caustic waste, acidic waste and organic waste—370,000 gallons of aqueous waste processed annually.	Concentrates and solidifies TRU and low-level liquid radioactive materials; TRU caustic waste and TRU acidic waste-two stage precipitation process. TRU organic waste-neutralized, then solidified with gypsum cement. Transfer of remaining water for evaporation in Building 374.
Building 374	Radioactive and nonradioactive liquid wastes—18 million gallons of aqueous waste processed annually—a total of 2,700 boxes of saltcrete and 8,100 drums of filtered sludge should be produced.	Precipitation, filtration, scrubbing, chemical preparation and drying of radioactive and nonradioactive liquid wastes. TRU waste streams treated in a precipitation process, and the resultant sludge is solidified. Low-level waste streams treated in evaporation process, resultant salts are immobilized with cement. Waste acids are neutralized, then treated in the precipitation process. Produces distilled product water for utility reuse.
Building 776	TRU, TRU-mixed, low-level, low-level mixed waste and hazardous wastes-combustibles, metal, glass, large HEPA filters, waste filter media, insulation, glove box filters.	Waste volume reduction activities, repackaging, and adding cement for neutralization.

E4 3455

Source: RF DOE, 1991b.

APPENDIX B

APPENDIX B: WASTE MANAGEMENT—PROPOSED ACTION

This appendix contains more detailed information concerning waste management operations at the sites involved in consolidating activities in the Proposed Action.

B.1 KANSAS CITY PLANT CONSOLIDATION (SECTION 3.3.1) WASTE MANAGEMENT

Products from the nonnuclear weapons component manufacturing operations at Pinellas, Mound, and Rocky Flats Plant (RFP) would be consolidated into the existing production space at the Kansas City Plant (KCP). Table B1-1. lists the operations proposed for transfer to KCP. Table B1-2. shows the additional annual amounts of hazardous/toxic liquid wastes, hazardous/toxic solid wastes, nonhazardous liquid wastes, nonhazardous solid wastes, liquid and solid low-level waste (LLW), and liquid and solid mixed waste associated with the relocated functions.

Support Pads. All processes that are being transferred would affect the volume of plant waste streams. However, there would be no additional waste streams. Since only the volumes of existing plant waste streams are affected, no special waste handling capability would be needed.

Optoelectronics Assemblies. All processes that are being transferred would affect the volume of plant waste streams. However, there would be no additional waste streams added. Existing capabilities would be used to handle the small yearly increase from the optoelectronics production.

Neutron Detectors. The volume of plant waste streams would be affected, but no new waste streams would be added. Since only the volumes of existing plant waste streams are affected, no special waste handling capability would be needed.

Lightning Arrestor Connectors. The most significant new process is the chemical preparation of varistor material. No significant increases in wastes and effluents has been identified as a result of lightning arrestor connector production. No new waste handling capability would be required. Additional lead monitoring equipment would be required in the Lead Titanate development area.

TABLE B1-1.—*Operations Transferring to KCP*

Pinellas	Mound	RFP
Support Pads	Flat Cable Products	Reservoirs
Optoelectronics Assemblies	Mechanical Assemblies	Nuclear Grade Steels/Oxnard
Neutron Detectors	Round Wire Detonator Cables	Safe Secure Trailers
Lightning Arrestor Connectors	Nonnuclear Acorn	Weapon Trainer Shop
Transducers	Plastic Headers	Metrology Services
Lithium Ambient Batteries		

E4 3715

TABLE B1-2.—*Kansas City Plant: Estimated Additional Annual Wastes Associated With Relocated Functions*

	Waste Type			
	Hazardous/ Toxic	Nonhazardous	LLW	Mixed
Product	Liquid/ Solid (lbs)	Liquid/ Solid (lbs)	Liquid/ Solid (lbs)	Liquid/ Solid (lbs)
Support Pads	100	1,548,800	None	None
	518	1,371	None	None
Optoelectronics Assembly	365	5,280	None	None
	128	109	None	None
Neutron Detectors	153	0	None	None
	30	13	None	None
Lightning Arrestor Connectors	510	1,725	None	None
	23	213	None	None
Transducers	153	0	None	None
	55	5	None	None
Lithium Ambient Batteries	22	0	None	None
	23	0	None	None
Flat Cable Products	2,414	5,956	None	None
	3,327	1,965	None	None
Mechanical Assemblies	6,646	42,078	None	None
	702	1,046	None	None
Round Wire Detonator Cables	50	150,000	None	None
	25	7	None	None
Plastic Headers	0	0	None	None
	0	404	None	None
Reservoirs and Nonnuclear Acorn	68,850	15,003,100	None	None
	250	13,400	None	None
Nuclear Grade Steels/Oxnard	0	0	None	None
	0	0	None	None
Safe Secure Trailers	2,000	7,000	None	None
	3,000	2,000	None	None
Weapon Trainer Shop	60	0	None	None
	0	600	None	None
Metrology Services	0	0	None	None
	0	0	None	None
Total	81,323	16,763,939	None	None
	8,081	21,133	None	None

E4 3716

Table assumes conversion of 1 gallon = 10 lbs.
Source: KC ASAC, 1992a and e.

Transducers. The volume of plant waste streams would be affected, but no new waste streams would be added due to the transfer processes. No special waste handling capabilities would be needed.

Flat Cable Products. There would be no new waste streams, but there would be slight increases in existing stream volume. Since only the volumes of existing plant waste streams are affected, no special waste handling capability would be needed.

Round Wire Detonator Cables. This work would result in waste streams that are the same as the waste streams in machining, except the waste volume increase would be small. Since only the volumes of

existing plant waste streams are affected, no special waste handling capability would be needed.

Plastic Headers. This work would result in a slight increase in volume of KCP waste streams. No special waste handling capability would be needed.

Lithium Ambient Batteries. This work would result in a slight increase in volume of KCP waste streams. No special waste handling capability would be needed.

Reservoirs and Nonnuclear Acorn. The volume of plant waste streams would be affected, but no new waste streams would be added due to the transferred processes. Any wastes generated would be incremental additions to existing KCP waste streams.

Nuclear Grade Steels/Oxnard. Procurement and testing activities would yield no new waste streams at KCP. Any waste generated would be minor incremental additions to existing KCP waste streams.

Safe Secure Trailers. Manufacturing of trailers at KCP would yield no new waste streams. Any wastes generated would be incremental additions to existing KCP waste streams.

Weapon Trainer Shop. Shop activities would yield no new waste streams at KCP. Any waste generated would be minor incremental additions to current KCP waste streams.

Metrology Services. Metrology support activities would yield no new waste streams at KCP. Any waste generated would be minor incremental additions to current KCP waste streams.

B.1.1 Management of Radioactive Waste Streams

No radioactive solid or liquid waste streams are anticipated as a result of the relocated nonnuclear functions.

B.1.2 Management of Hazardous/Toxic Waste Streams

No new hazardous waste streams would be generated at the KCP as a result of consolidation operations.

As shown in table B1-2, the largest annual liquid hazardous waste streams are from the reservoirs and nonnuclear Acorn function (68,850 lb), mechanical assemblies (6,646 lb), and flat cable products (2,414 lb). The major contributor to the reservoirs and Nonnuclear Acorn waste stream is 64,000 lbs of coolant.

The major contributors of hazardous wastes from existing KCP operations include wastewater treatment, plating and etching processes, degreasing operations, and remedial action. The quantities of solid and liquid hazardous wastes due to the Proposed Action represent minor incremental additions to the current KCP waste streams.

Waste generated from the consolidation of operations would continue to be managed and disposed of through KCP's existing Waste Management Department. KCP's existing 11 waste storage areas for containerized waste and 6 bulk storage tanks are identified in table B1-3. The March 1987 *Resource Conservation and Recovery Act* (RCRA) Part A Application identifies the use of container storage and tank storage facilities with total storage design capacities of 44,000 ft^3 for liquid hazardous wastes and 83,000 ft^3 for solid hazardous wastes, respectively (KC DOE, 1988).

KCP's Pollution Prevention Program goals call for the reduction of Freons, chlorinated hydrocarbons, and potential carcinogenic materials. The reduction or elimination of these materials would be pursued both during and after actual transition of operations.

TABLE B1-3.—*Kansas City Plant: Hazardous/Toxic and Radioactive Waste Storage Facilities*

Facility	Contents	Capacity
Above-Ground Tanks (2)	Waste Oil/Coolant (Bulk)	16,000 gal
Above-Ground Tanks (2)	Nonchlorinated and Chlorinated Solvents (Bulk)	16,000 gal
Above-Ground Tanks (2)	Acidic Plating and Alkaline Plating (Bulk)	12,000 gal
Tank Farm Container Area	PCB, Solvent, Oil, Acid, Alkaline (Container)	3,677 ft^3
Red-X Lot	Rubber, Paint, Adhesive, Epoxy, Misc. Ignitable (Container)	8,824 ft^3
L-Lot	Acid, Alkaline, Lead-Acid Batteries, Oil (Container)	26,737 ft^3
Demolition Lot	PCB, Lead-Acid Batteries, Acid and Alkaline (Container)	23,561 ft^3
Waste Storage Test Cells (4)	Classified Hazardous Waste, Cyanide, PCB and Lab-Pack (Container)	11,648 ft^3
Mixed Waste Storage Area	LLW and LL-Mixed Waste With Toxic Metal and/or Organic Concentration	705 ft^3
Acid Pad	Acid, Alkaline Cyanide (Carboys)	6,353 ft^3
Reclamation Area	Cyanide, Acid and Alkaline	552 ft^3

E4 3717

Source: KC ASAC, 1992a.

B.1.3 Management of Nonhazardous Waste Streams

As shown in table B1-2, over 16.7 million lbs of liquid industrial effluents would be generated annually from the relocated functions. Most of these numerous liquid acidic and alkaline effluents would be suitable for treatment in the KCP industrial waste pretreatment facility. The largest annual waste streams suitable for treatment in the industrial waste pretreatment facility would include aqueous cleaners from the reservoirs (15 million lb) and the support pads (1.5 million lb). The KCP's industrial waste pretreatment facility design capacity is approximately 1 million gallons per day (MGD). According to the supervisory engineer at the industrial waste pretreatment facility, the addition of less than 3,000 gallons per day (GPD) of relatively "clean" wastewater, as compared to spent plating baths, would have a positive impact on operations at the industrial waste pretreatment facility.

Nonhazardous solid waste streams consist mainly of recyclable products such as steel chips, copper, and aluminum wire, and would not place any long-term storage burdens on existing KCP storage capabilities. Reservoirs machining could generate an estimated 12,000 lb of stainless steel metal chips, which would require recycling at a scrap processor.

B.2 SAVANNAH RIVER SITE (SECTION 3.3.2) WASTE MANAGEMENT

Tritium handling functions from operations at Mound would be relocated to Savannah River Site (SRS). Table B2-1 lists the three operations proposed for transfer to SRS. Table B2-2 shows the additional annual amounts of hazardous liquid wastes, hazardous solid wastes, nonhazardous liquid wastes, nonhazardous solid wastes, liquid and solid LLW, and liquid and solid mixed waste associated with the relocated functions.

Reservoir Surveillance Operations. Functions include measurement, monitoring, testing, and evaluation operations.

Gas Transfer Systems. Activities include: component manufacturing/development, a general

TABLE B2-1.—*Operations Transferring to SRS*

Mound
Reservoir Surveillance Operations
Gas Transfer Systems
Commercial Sales/ICF Target Loading

E4 3720

metal cleaning, machining, welding, assembly and inspection type operation, and environmental storage, an activity where tritium-containing units transferred from Mound would be stored in environmental chambers.

Commercial Sales/Inertial Confinement Fusion Target Loading. This activity receives empty, small uranium beds, small stainless steel cylinders, and glass/plastic microspheres from various (DOE) commercial sources that use tritium in their operation. Uranium beds and cylinders are checked for exterior contamination, measured to determine any residual amounts of tritium, and filled and shipped to commercial customers or research institutions.

B.2.1 Management of Radioactive Waste Streams

No high-level radioactive, transuranic, or mixed wastes would be generated at SRS from relocated tritium functions. All radioactive waste generated would be LLW. A small portion of the LLW would be classified radioactive waste.

The reservoir surveillance operations, gas transfer systems, and commercial sales/inertial confinement fusion target loading would generate both compactible and non-compactible LLW from nitrogen and argon-blanketed glove boxes and waste resulting from decontamination of tritium-contaminated components (gloves, aprons, plastic sheets). Non-compactible materials may include nonrepairable contaminated equipment such as disabled pumps, motors, metal shavings, etc. Such wastes must be free of any kind of liquids prior to disposal. These wastes would be checked for radioactivity, off-gassing tritium, and hazardous contamination, and placed in 96 ft^3 metal containers, before removal to a temporary storage facility and eventual disposal in the Area-E burial ground per DOE Order 5480.2A. The reservoir surveillance operations would generate 200 ft^3/yr of LLW. The quantity of LLW anticipated at SRS due to gas

TABLE B2-2.—*Savannah River Site: Estimated Additional Wastes Associated With Relocated Functions*

	Waste Type			
	Hazardous/ Toxic	Nonhazardous	LLW	Mixed
Product	Liquid/ Solid	Liquid/ Solid	Liquid/ Solid	Liquid/ Solid
Reservoir Surveillance Operations	None None	82,125 gal 500 ft^3	None 200 ft^3	None None
Gas Transfer Systems and Commercial Sales/ICF Target Loading	None None	219,000 gal 500 ft^3	None 300 ft^3	None None
Total	None None	301,125 gal 1,000 ft^3	None 500 ft^3	None None

E4 3719

Source: SR DOE, 1992b.

transfer systems and commercial sales/inertial confinement fusion target loading is 300 ft^3/yr.

B.2.2 Management of Hazardous/Toxic Waste Streams

The reservoir surveillance operations functions, gas transfer systems, and commercial sales/inertial confinement fusion target loading operations would not generate hazardous liquid or solid wastes.

B.2.3 Management of Nonhazardous Waste Streams

The reservoir surveillance operations functions would generate 82,125 gallons and 500 ft^3, respectively, of liquid and solid nonhazardous wastes. Nonhazardous wastes would be accumulated in 55-gallon drums and sent to the onsite sanitary landfill for disposal.

Gas transfer systems and commercial sales/inertial confinement fusion target loading operations would generate 219,000 gallons and 500 ft^3, respectively, of liquid and solid nonhazardous wastes.

The gas transfer systems process, in which component parts are cleaned using ethanol and water, would generate small quantities of wastewater. The wastewater is not expected to be hazardous, and will be disposed of at the onsite industrial wastewater treatment plant. The remaining gas transfer systems missions would not generate any liquid wastes. The commercial sales/ inertial confinement fusion target loading operation would not generate any wastewater effluents.

B.3 Los Alamos National Laboratory (Section 3.3.3) Waste Management

As shown in Table B3-1, high-power detonators and calorimeters operations at Mound are proposed for transfer to Los Alamos National Laboratory (LANL). The beryllium technology and pit support functions from RFP, and neutron tube target loading from Pinellas would also be transferred to LANL. Table B3-2. shows the additional annual amounts of hazardous liquid wastes, hazardous solid wastes, nonhazardous liquid wastes, nonhazardous solid wastes, liquid and solid LLW, and solid mixed wastes associated with the relocated functions.

Table B3-1.—*Operations Transferring to LANL*

Mound
High Power Detonators Calorimeters
Pinellas
Neutron Tube Target Loading
RFP
Beryllium Technology Pit Support Functions

E4 3732

High Power Detonators. This activity includes manufacture of detonator assemblies used in explosive devices, explosive powder processing, explosive component testing, surveillance, and assembly of precision electrical components.

Calorimeters. This activity is required for measurement of various heat producing nuclear materials for accountability purposes. No new waste management facilities would be required for LANL to manage calorimeters waste streams.

Neutron Tube Target Loading. In this process, pure tritium gas is transferred from a uranium bed onto the assemblies where it is captured by a previously deposited thin, metal film through the hydrating process.

Beryllium Technology. The liquid waste streams generated would include beryllium-contaminated process water, beryllium-contaminated dilute nitric acid solutions, and non-contaminated waste machine oils and lubricants. It is assumed that the only solvents used in the process would be the non-RCRA

TABLE B3-2.—*LANL: Estimated Additional Wastes Associated With Relocated Functions*

Product	Waste Type			
	Hazardous/ Toxic	Nonhazardous	LLW	Mixed
	Liquid/ Solid	Liquid/ Solid	Liquid/ Solid	Liquid/ Solid
High Power Detonators	7,000 gal 3,200 ft^3	244,400 gal 20,000 ft^3	None None	None None
Calorimeters	None None	98,800 gal 2,000 ft^3	None None	None None
Neutron Tube Target Loading	None None	41,600 gal 2,000 ft^3	30 gal 200 ft^3	None 20 ft^3
Beryllium Technology Functions	500 gal 60 ft^3	26,000 gal 3,120 ft^3	None None	None None
Pit Support Functions	8 gal 40 ft^3	31,200 gal 1,560 ft^3	None None	None None
Total	7,508 gal 3,300 ft^3	442,000 gal 28,680 ft^3	30 gal 200 ft^3	None 20 ft^3

E4 3733

Source: LA FDI, 1992b.

solvent "Water Chaser 140" and maybe small amounts of isopropanol (not in RCRA amounts). The solid wastes generated would include beryllium-contaminated scrap metal, beryllium-contaminated combustibles, and beryllium-contaminated non-metals. Several steps in the processing of beryllium would generate scrap metal in the form of fines, chips, prototype parts, destructive testing remnants, etc. Since the scrap beryllium is recyclable, it is not considered waste.

Pit Support Functions. Pit support function components could be manufactured in Building 141 where permitted beryllium activities currently take place.

B.3.1 Management of Radioactive Waste Streams

Low-level Waste. The high power detonators, calorimeters, pit support function, and beryllium technology operations would generate no additional LLW.

It is expected that there will be up to 30 gallons per year (GPY) of liquid LLW from analysis dissolution and 200 ft^3/yr of solid LLW generated consisting of cloth, protective clothing, and contaminated tools. The liquid and solid LLW will be treated/solidified and/or packaged stored on site until disposed of as solid LLW at LANL or an alternate offsite burial site.

Mixed Waste. Only neutron tube loading is expected to generate any mixed waste. The estimated 20 ft^3/yr will be stored onsite until a disposal option can be identified.

B.3.2 Management of Hazardous Waste Streams

Calorimeter operations and neutron tube target loading would generate no hazardous liquid or solid wastes.

The high power detonators operations would generate 7,000 GPY of liquid hazardous waste and 3,200 ft^3/yr of solid hazardous waste. Liquid waste would include high explosive (HE)-contaminated

solvents. Solid waste would include scrap HE, HE-contaminated metal parts, HE-contaminated solid waste, epoxies, and glues. No new storage facilities would be required to store these wastes. All HE hazardous waste and potentially contaminated HE waste is picked up by LANL and delivered to the TA-16 incinerator or flash pad where it is burned. Ash residue is drummed and buried by LANL at the TA-54 burial ground according to RCRA rules. All developer and fix photo wastes, ferric chloride and sodium hydroxide liquid and solid hazardous wastes would be packaged for transport and incineration at offsite RCRA-approved facilities by a commercial contractor.

Beryllium technology functions would generate 500 GPY of liquid hazardous wastes from acid etching of steel cans and solvent baths. Sixty ft^3/yr (ten 55-gallon drums) of solid hazardous wastes from dust collectors, High Efficiency Particulate Air (HEPA) Filters, and residue from destructive testing will also be generated. Permitted beryllium activities already are conducted in LANL Building 141. No additional waste management facilities would be necessary to support the additional waste streams.

Pit support functions would generate 8 GPY of liquid hazardous wastes from solvents used in parts cleaning and 40 ft^3/yr of solid hazardous wastes from various miscellaneous metal contaminated materials, filters, tools, protective clothing, and destructive examination residues that cannot be recycled.

B.3.3 Management of Nonhazardous Waste Streams

The high power detonator facility would generate 20,000 ft^3/yr of nonhazardous solid wastes and 244,400 GPY of nonhazardous liquid wastes. Nonhazardous solid wastes would be disposed of at an offsite sanitary landfill.

The neutron tube target loading facility would generate 2,000 ft^3/yr of nonhazardous solid wastes and 41,600 GPY of nonhazardous liquid wastes. Acidic wastewater from various analyses and lab users will be treated in the wastewater treatment plant. The disposal of nonhazardous solid wastes would be made at an offsite sanitary landfill.

The calorimeter operations would generate 2,000 ft^3/yr of nonhazardous solid wastes and 98,800 GPY of nonhazardous liquid wastewater effluents. The solid wastes would be checked for radiation, stored in 55-gallon drums, and sent offsite for disposal in a sanitary landfill. The liquid waste stream would be treated in the onsite industrial wastewater treatment system.

The beryllium technology functions would generate 26,000 GPY of wastewater effluent, which would be treated onsite at the LANL wastewater treatment plant. This function would also generate 3,120 ft^3/yr of solid nonhazardous waste that would be disposed of at an offsite sanitary landfill.

The pit support functions would generate 31,200 GPY of liquid nonhazardous wastes, which would be treated onsite at the LANL wastewater treatment plant. This function would also generate 1,560 ft^3/year of solid nonhazardous waste that would be disposed of at an offsite sanitary landfill.

B.4 Y–12 Plant (Section 3.3.4) Waste Management

Beryllium technology and pit support functions from operations at RFP might be relocated to Y-12. Table B4-1 lists the two operations proposed for transfer to Y-12. These operations are discussed in section B.3. Table B4-2 shows the additional annual amounts of hazardous liquid wastes, hazardous solid wastes, nonhazardous liquid wastes, nonhazardous

Table B4-1.—*Operations Transferring to Y-12*

RFP
Beryllium Technology
Pit Support Functions

B4 3756

TABLE B4-2.—*Y-12 Plant: Estimated Additional Annual Wastes Associated With Relocated Functions*

Product	Waste Type			
	Hazardous/ Toxic	Nonhazardous	LLW	Mixed
	Liquid/ Solid	Liquid/ Solid	Liquid/ Solid	Liquid/ Solid
Beryllium Technology and Pit Support Functions	4,310 gal 950 ft^3[a]	3,579 gal[b] Negligible	None 22.2 ft^3	None None
Total	4,310 gal 950 ft^3[a]	3,579 gal[b] Negligible	None 22.2 ft^3	None None

E4 3757

[a] Assumes 15 percent sludge generated from water during treatment @ Y–12 Central Pollution Control Facility & West End Treatment Facility.

[b] This amount is Central Pollution Control Facility & West End Treatment Facility–treated water discharge into East Fork Poplar Creek.

Source: Y-12 MMES, 1992d.

solid wastes, liquid and solid LLW, and liquid and solid mixed wastes associated with the relocated functions. Process-specific wastes, generation rates, and waste management alternatives are shown in table B4-3. Beryllium technology and pit support function waste streams are described in section B.4.1.

B.4.1 Management of Radioactive Waste Streams

Due to relocation of the beryllium technology and pit support functions, 22.2 ft^3/yr of additional solid LLW would be generated at Y–12. The LLW would be compacted, if necessary, in the Y–12 Waste Feed Preparation Facility, placed in metal 4x6x4 ft waste storage boxes, and temporarily stored in the salvage yard. No liquid LLW or mixed wastes would be generated.

B.4.2 Management of Hazardous/Toxic Waste Streams

Beryllium technology functions would generate less than 100 GPY of liquid organic hazardous wastes. These wastes would be treated and disposed of in the K-25 *Toxic Substances Control Act* (TSCA) incinerator. An estimated 4,210 GPY of liquid aqueous hazardous wastes would be treated in the West End Treatment Facility and Central Pollution Control Facility waste treatment facilities at Y–12. An estimated 632 ft^3/yr of solid hazardous waste sludges would be stored at the Y–12 tank farm, and removed offsite to RCRA-permitted disposal facilities. Other solid hazardous wastes (less than 318 ft^3/yr) would be disposed of onsite in a new hazardous waste landfill. No additional waste management facilities would be necessary to support the additional waste streams.

Pit support functions would generate small quantities of various metallic wastes as a result of the shell and tube component manufacture. These wastes would be recycled and/or stored for future disposal.

B.4.3 Management of Nonhazardous Waste Streams

The beryllium technology functions and the pit support functions would generate 3,579 GPY of wastewater effluents, which would be treated onsite at the Y–12 wastewater treatment plants. Negligible amounts of solid nonhazardous waste streams would be generated.

TABLE B4–3.—*Y–12 Plant: Process–Specific Wastes, Generation, and Waste Management Alternatives*
[Page 1 of 2]

Category	Description	Generation Point(s)[a]	Estimated Generation Rate	Waste Handling Procedures/Facilities
Aqueous Waste	Be–contaminated, nonradioactive process water	MACH, PH, UC	3,600 gal/yr	Ship to Y–12 Central Pollution Control Facility (CPCF) for Be removal
Solid, Non–RCRA Hazardous Waste	Nonsolvent contaminated. Be contaminated wipes, rags, gloves, plastic bags and other combustibles	VIM, MACH, PH	Variable < 5 drums/yr	Declare "no–radiation added" and ship to offsite secure hazardous landfill or Convert to BeO and dispose of in Y–12 permitted landfill or Store onsite
Recyclable Feed	Be metal scrap (fines, chips, spilled powder, scrap parts, etc.)	VIM, MACH, GA, PH	Variable	Recycle–NA
Recyclable Scrap Metal and Nonrecyclable Scrap Metal (Solid Non–RCRA Hazardous Waste)	Be–contaminated scrap metal (elements, shielding, foils, machine tools, steel tooling, etc.)	VIM, HT, MACH, GA, PH, BRAZ	Variable < 1 drum/yr	Decontaminate via surface cleaning and recycle metal as scrap. Process cleaning water as process water above or For non–cleanable metals, prove "no–radiation added" and ship to offsite secure (RCRA) landfill or Store onsite (Y–12 Salvage Yard) in 8'x 8'x 20' waste storage boxes
Free Gases	He, Ar process gas exhausts	GA, HIP, VIM, PH, HT	Variable	Existing air permits for tie–in sources will be upgraded as required
Solid, Non–RCRA Hazardous Waste	Be–contaminated floor sweepings	VIM, PH, MACH, GA	<2 drums/yr	Declare "no–radiation added" and ship to offsite secure landfill or Store onsite
Liquid Organic Waste	Noncontaminated hydraulic oils and lubricants	MACH, GA, HT	<100 gal/yr	Store and analyze. Declare "no–radiation added" and ship to offsite disposal or Store onsite for future Toxic Substances Control Act (TSCA) incineration

E4 3758-1

Footnotes at end of table.

TABLE B4-3.—*Y–12 Plant: Process–Specific Wastes, Generation, and Waste Management Alternatives*—Continued
[Page 2 of 2]

Category	Description	Generation Point(s)[a]	Estimated Generation Rate	Waste Handling Procedures/Facilities
Solid, Nonhazardous Waste	Metal machine turnings & other nonhazardous metal scrap (SS, Ti, Ta, Va, etc.)	MACH, SF	3 drums/yr	Treat as low–radiation contaminated metallic waste and send to Y–12 salvage yard to be stored in 8'x 8'x 20' waste storage boxes
Liquid Aqueous Wastes	LLW machine coolant (Trimsol)	MACH	2 drums/yr	Treated at Y–12 West End Treatment Facility
Aqueous Wastes	Be–contaminated nitric acid solutions	DECAN	<500 gal/yr	Send to Y–12 West End Treatment Facility
Solid, Non–RCRA Hazardous Waste	Be–contaminated HEPA filters & prefilters	9201–5 3rd floor exhaust system	Est. 60 filters/yr (240 ft^3/yr uncompacted)	Convert to BeO and dispose of in Y–12 landfill or Declare "no–radiation added" and ship to offsite secure landfill
Solid Nonhazardous	Be–contaminated Oil/coolant filters	MACH	Variable <1 drum/yr	Long term storage as RCRA CWSA. Keep as "no–radiation added"
Solid, Non–RCRA Hazardous	Be–contaminated graphite	VIM, GA	<200 lb/yr	Convert to BeO and dispose of in Y–12 landfill or For noncleanable metals, prove "no–radiation added "and ship to offsite secure landfill or Bag and store onsite in 4'x 6'x 4' waste storage boxes

E4 3758-2

[a] Abbreviations used for consumption points are as follows:
BRAZ = brazing; CIP = cold isostatic pressing; DECAN = can dissolution; ER = electrorefining; GA = gas atomization; HIP = hot isostatic pressing; HT = post machining heat treat; IG = impact grinding; MACH = machining operations; NNS = near net shape forming process; PH = powder handling (NNS step); SIN = sintering (NNS step); SYNT = $BeCl_2$ synthesis; VIM = vacuum induction melting; UC = ultrasonic cleaning; SF = spinforming

Source: Y-12 MMES, 1992d.

B.5 SANDIA NATIONAL LABORATORIES, ALBUQUERQUE (SECTION 3.3.5) WASTE MANAGEMENT

As shown in Table B5-1 neutron generators, thermal batteries, and cap assemblies operations at Pinellas and milliwatt heat source surveillance from Mound are proposed for transfer to Sandia National Laboratories (SNL). Table B5-2. shows the additional annual amounts of hazardous liquid wastes, hazardous solid wastes, nonhazardous liquid wastes, nonhazardous solid wastes, liquid and solid LLW, and liquid and solid mixed wastes associated with the relocated functions.

TABLE B5-1.—*Operations Transferring to Sandia National Laboratories*

Mound
Milliwatt Heat Source Surveillance
Pinellas
Neutron Generators
Thermal Batteries
Cap Assemblies

E4 3759

Neutron Generators. Additional waste streams would be generated at SNL as a result of the relocation of the neutron generator manufacturing capability. Effluent wastewaters in the form of liquid sanitary sewage, industrial wastewater, and tritium-contaminated waste consisting of solids and water would result from the operation of the neutron generator function. Hazardous waste would be produced in various neutron generator fabrication steps. Neutron tube assembly machining and forming metals requires a coolant, which generates a contaminated coolant stream. Chemical cleaning is a small batch type operation utilizing degreasers, cleansers, solvents, and acids that become contaminated with metals and generates a liquid chemical waste stream. Metallizing involves airbrush screen painting and hand-painting generates paint waste. Plating/firing operations occasionally result in generating a spent plating solution waste stream.

Thermal Batteries. Additional effluent wastewaters in the form of liquid sanitary sewage, and process and industrial wastewater would result from the operation of the thermal battery facility.

Cap Assemblies. Additional effluent wastewaters in the form of liquid sanitary sewage, and process and industrial wastewater would result from the operation of the cap assemblies facility.

TABLE B5-2.—*SNL: Estimated Additional Wastes Associated With Relocated Functions*

	Waste Type			
	Hazardous/ Toxic	**Nonhazardous**	**LLW**	**Mixed**
Product	**Liquid/ Solid**	**Liquid/ Solid**	**Liquid/ Solid**	**Liquid/ Solid**
Cap Assemblies	250 gal 3 ft^3	216,000 gal 800 ft^3	None None	None 0.005 ft^3
Neutron Generators	1,000 gal 150 ft^3	3,000,000 gal 8,500 ft^3	100 gal 294 ft^3	None None
Thermal Batteries	None 44 ft^3	None None	None None	None None
Milliwatt Heat Source Surveillance	2 gal 12 ft^3	None 40 ft^3	None None	None None
Total	1,252 gal 209 ft^3	3,216,000 gal 9,340 ft^3	100 gal 294 ft^3	None 0.005 ft^3

E4 3760

Source: SNL, 1992a; SN FDI, 1992; SNL, 1992i.

MWHS Surveillance. Additional waste streams would be generated at SNL as a result of the relocation of the milliwatt heat source surveillance activities. These activities involve thermal aging, pressure-vent testing, and evaluation of heat source container samples. Liquid and solid hazardous waste and nonhazardous wastes would be generated.

B.5.1 Management of Radioactive Waste Streams

Low-level Waste. The neutron generator function could generate up to 100 GPY of LLW Tritiated wastewater. The tritium-contaminated water would be collected at the source in drums. This water would be treated by solidification or an approved alternate technology, and disposed of at an approved site.

The neutron generator function may generate 294 ft^3/year of solid LLW in the tritium management area due to wiping tritium contaminated surfaces with wipes and solvents. Solid LLW would be taken to the Radioactive and Mixed Waste Management Facility (Building 6920). If necessary to meet transportation and/or disposal site requirements, it would be re-packaged. It would then be shipped to an authorized offsite disposal site. The Radioactive and Mixed Waste Management Facility is expected to begin operations in 1996.

There are no radioactive wastes from thermal batteries production and MWHS surveillance.

Mixed Waste. The only relocated function to generate any mixed waste is cap assemblies. Approximately 0.005 ft^3/yr of solid mixed wastes would be generated from this function.

B.5.2 Management of Hazardous/Toxic Waste Streams

The neutron generator function would generate 1,000 GPY of liquid hazardous wastes and 150 ft^3/yr of solid hazardous wastes. The hazardous wastes would be stored in local accumulation areas before transfer to the SNL hazardous waste storage area.

Thermal batteries function would generate 44 ft^3/yr of solid hazardous waste. Waste would be stored in local accumulation areas and then transferred to the SNL hazardous waste storage area.

The cap assemblies would generate approximately 250 GPY of additional liquid hazardous wastes and 3 ft^3/yr of solid hazardous wastes. Waste would be stored in local accumulation areas and then transferred to the SNL hazardous waste storage area.

MWHS surveillance would generate 2 GPY of additional liquid hazardous waste and 12 ft^3/yr of additional solid hazardous waste. Waste would be stored in local accumulation areas and then transferred to the SNL hazardous waste storage area.

Acidic or basic wastes not disposed of through SNL's existing hazardous waste program would be neutralized at the Building 870 Chemical Wastewater Neutralization Facility.

B.5.3 Management of Nonhazardous Waste Streams

Neutron generator operations would generate 3 million gallons per year (MGY) of liquid sanitary wastewater effluent. Administrative offices and the cafeteria produce nonhazardous sanitary solid wastes and sanitary sewage. The medical department would produce nonhazardous sanitary sewage. Sanitary sewage would be sent directly to a Kirtland Air Force Base (KAFB) sanitary sewer system and then to the city of Albuquerque sanitary sewer to be treated at the municipal wastewater treatment plant. The estimated sanitary sewage flow is 35,000 GPD (12.25 MGY based on 350 days per year).

Neutron generator operations would generate 8,500 ft^3/yr of nonhazardous solid wastes. These wastes would be disposed of in the onsite sanitary landfill.

The thermal batteries functions would result in no increase in sanitary sewage or chemical wastewater volume. Existing sanitary tie-ins and chemical drain system would be utilized.

Cap assemblies would generate 216,000 GPY of liquid sanitary wastewater effluent, and 800 ft^3/yr of solid nonhazardous waste. The solid wastes would be disposed of in the onsite sanitary landfill.

Milliwatt heat source surveillance would generate no additional liquid nonhazardous waste but would generate 40 ft^3/yr of additional solid nonhazardous waste. The solid wastes would be disposed of in the onsite sanitary landfill.

APPENDIX C

APPENDIX C: WASTE MANAGEMENT CONSOLIDATION ALTERNATIVES

This appendix discusses the waste management of the alternative consolidation sites of Mound, Pinellas, and Rocky Flats Plant (RFP).

C.1 MOUND ALTERNATIVE (SECTION 3.4.1)

The additional consolidation wastes generated from the nonnuclear consolidation at Mound are low-level wastes (LLW), mixed wastes, hazardous/toxic wastes, and nonhazardous wastes.

C.1.1 Radioactive Waste Management

The additional consolidation LLW volumes based on 1991 as a representative year are estimated at 15 ft^3/yr. The additional LLW includes: tritium exit signs, smoke detectors, irradiated components, analytical equipment sources, that have been declared excess, static master brushes, gap tubes removed from electronic assemblies, and small amounts of contaminated clean-up towels, disposable gloves, and packing materials.

All liquid LLW would be solidified in concrete or plaster of paris prior to being temporarily stored in an indoor limited access storage area. LLW would be transferred offsite for final disposal.

Based on 1991 generation of mixed wastes, it is estimated that 9 ft^3 of additional mixed wastes would be generated per year. However, it is expected that the amount of additional mixed wastes would decrease due to efforts to minimize the mixed waste stream. The additional mixed waste consists of classified and unclassified encapsulated assemblies such as contaminated printed circuit boards and shielding. The mixed wastes would be stored in the same area as LLW in a Resource Conservation and Recovery Act (RCRA)-permitted facility.

C.1.2 Hazardous/Toxic Waste Management

All existing hazardous/toxic wastes generated at Mound are currently shipped offsite for treatment and/or disposal. Prior to offsite shipment, all hazardous/toxic waste is packaged in Department of Transportation (DOT)-approved containers, usually 55-gallon drums. Plating bath waste and other corrosive wastes are packaged in polyethylene-lined steel drums or other chemically-compatible containers. Small quantity lab chemical wastes are sorted by hazard class and placed in 55-gallon drums for offsite landfilling or incineration.

Onsite storage facilities include a building and storage tanks constructed and equipped to comply with Environmental Protection Agency (EPA) hazardous waste storage requirements. The building is divided into three storage areas to maintain incompatible-material segregation. These are: (1) liquid waste, (2) solid waste, and (3) miscellaneous laboratory waste areas. The liquid waste area contains all liquid drummed wastes, which include waste epoxy resin, waste methylene chloride/resin, and chemical waste streams awaiting disposal approval, including laboratory packs. The solid waste area stores solidified process solutions, batteries, solids debris, and off-specification materials. The miscellaneous laboratory waste area stores miscellaneous laboratory chemicals until properly identified and classified for packaging, shipping, and disposal.

All bulk liquid waste streams are stored in above-ground, concrete-diked, 5,000-gallon storage tanks

with the exception of nonhazardous petroleum-based oils, which are stored in a 500-gallon storage tank. Chemicals stored in separate 5,000-gallon tanks include flammable liquids, halogenated hydrocarbons, waste polychlorinated biphenyls (PCB), caustic and acid solutions, and nonhazardous metal cutting coolant. Hazardous/toxic wastes generated at the plant site are shipped to commercial treatment facilities or to offsite disposal facilities.

Table C1-1 summarizes the increase of the hazardous/toxic wastes and the disposal method. The additional liquid hazardous wastes and solid

TABLE C1-1.—*Mound Alternative: Waste Management of Hazardous/Toxic Waste, Disposal Method, and Volume (ft^3/yr)*[a]

Waste Stream	Disposal Method	Kansas City	Rocky Flats	Pinellas	Total [c]
Acid Liquid Bulk	Incineration/ Recovery	380	40	b	420
Alkaline	Incineration/ Recovery	970	b	b	970
Oil/Coolants	Incineration	750	1,060	b	1,810
Halogenated & Nonhalogenated Solvent	Incineration	1,510	20	20	1,550
Resin, Paint, Curing Agent, Adhesive & Rubber	Incineration	1,510	b	b	1,510
Toluene Diisocyanate	Incineration	70	b	b	70
Cyanide, Liquid	Cyanide Destruction	40	b	b	40
Cyanide Salts	Recovery	10	b	b	10
Mercury Contaminated Debris	Landfilled	20	b	b	20
F006, F009 Sludge	Landfilled	4,200	b	b	4,200
Batteries (others)	Recovery/ Landfilled	100	b	b	100
Classified Hazardous	Declassified/ Landfilled	10	b	b	10
Acid/Chromate Contaminated Debris	Incineration	160	b	b	160
Cyanide/Alkaline Contaminated Debris	Incineration	100	b	b	100
Miscellaneous Lab Reagent/Off Spec. Product	Incineration/ Landfilled	70	b	b	70
Non-Empty Aerosol Cans	Incineration	590	b	b	590
Solvent/Oil Contaminated Debris & Miscellaneous	Incineration	6,830	80	50	6,960
Compressed Gas Cylinders	Destruction/ Incineration	30	b	b	30
Total		17,350	1200	70	18,620

E4 4108

[a] Projected for 1995 workload.
[b] Not significant quantities (less than 10 ft^3/yr).
[c] Total does not include quantities noted in b.

Source: FDI, 1992e.

hazardous/toxic wastes are shown in table C1-2 and C1-3 for the nonnuclear consolidation at Mound.

C.1.3 Nonhazardous Waste Management

Mound currently has an activated sludge process to treat the sanitary waste generated throughout the site. The sewage treatment plant provides secondary treatment of sanitary waste using biologically extended aeration with disinfection. The treatment consists of primary settling, aeration, sludge digestion, clarification, and chlorination. After processing, the sanitary sludge is sent to a belt dryer, then mixed with flyash and sorbond, and packaged for offsite disposal. The sanitary effluent is

TABLE C1-2.—*Mound Alternative: Additional Liquid Hazardous/Toxic Wastes (ft^3/yr)*[a]

Waste Stream	Kansas City	Rocky Flats	Pinellas	Total[c]
Acid Liquid, Bulk	380	40	b	420
Alkaline Liquid	970	b	b	970
Oil/Coolants	750	1,060	b	1,810
Halogenated & Nonhalogenated Solvent	1,510	20	20	1,550
Resin, Paint, Curing Agent, Adhesive & Rubber	1,510	b	b	1,510
Toluene Diisocyanate	70	b	b	70
Cyanide, Liquid	40	b	b	40
Total	5,230	1,120	20	6,370

E4 4107

[a] Projected for 1995 workload.
[b] Not significant quantities (less than 10 ft^3/yr).
[c] Total does not include quantities noted in b.

Source: FDI, 1992e.

TABLE C1-3.—*Mound Alternative: Additional Solid Hazardous/Toxic Wastes (ft^3/yr)*[a]

Waste Stream	Kansas City	Rocky Flats	Pinellas	Total[c]
Cyanide Salts	10	b	b	10
Mercury Contaminated Debris	20	b	b	20
F006, F0019 Sludge	4,200	b	b	4,200
Batteries (Others)	100	b	b	100
Classified Hazardous	10	b	b	10
Acid/Chromate Contaminated Debris	160	b	b	160
Cyanide/Alkaline Contaminated Debris	100	b	b	100
Misc. Lab Reagent/Off Specification Product	70	b	b	70
Non-Empty Arerosol Cans	590	b	b	590
Solvent/Oil Contaminated Debris & Misc.	6,830	80	50	6,960
Compressed Gas Cylinders	30	b	b	30
Total	12,120	80	50	12,250

E4 4113

[a] Projected for 1995 workload.
[b] Not significant quantities (less than 10 ft^3/yr).
[c] Total does not include quantities noted in b.

Source: FDI, 1992e.

discharged through a closed pipe to the Great Miami River. The quantity of the sanitary effluent is monitored continuously to document compliance with the Mound National Pollutant Discharge Elimination System (NPDES) permit. The existing sewage treatment plant has a capacity of approximately 47.4 million gallons per year (MGY). The additional wastewater to be handled at Mound is 291 MGY.

The additional solid nonhazardous wastes for the nonnuclear consolidation at Mound is estimated at approximately 600,000 ft^3/yr.

C.2 PINELLAS ALTERNATIVE (SECTION 3.4.2)

The additional wastes generated from the nonnuclear consolidation at Pinellas are LLW, mixed wastes, hazardous/toxic wastes, and nonhazardous wastes.

C.2.1 Radioactive Waste Management

See section C.1.1 for discussion of radioactive waste management associated with nonnuclear consolidation for the alternative sites.

C.2.2 Hazardous/Toxic Waste Management

The additional required hazardous waste management facilities include onsite storage and offsite disposal facilities. Onsite storage facilities include a building and storage tanks constructed and equipped to comply with EPA hazardous waste storage requirements. The building is divided into three storage areas to maintain incompatible-material segregation: (1) liquid waste, (2) solid waste, and (3) miscellaneous laboratory waste areas. The liquid waste area contains all liquid drummed wastes which include waste epoxy resin, waste methylene chloride/ resin, and chemical waste streams awaiting disposal approval, including laboratory packs. The solid waste area stores solidified process solutions, batteries, solids debris, and off-specification materials. The miscellaneous laboratory waste area stores miscellaneous laboratory chemicals until properly identified and classified for packaging, shipping, and disposal.

All bulk liquid waste streams are stored in above-ground, concrete-diked, 5,000-gallon storage tanks with the exception of nonhazardous petroleum-based oils, which are stored in a 500-gallon storage tank. Chemicals stored in separate 5,000-gallon tanks include flammable liquids, halogenated hydrocarbons, waste PCBs, caustic and acid solutions, and nonhazardous metal cutting coolant. Hazardous/toxic wastes generated at the plant site are shipped to commercial treatment facilities or to offsite disposal facilities.

Table C2-1 summarizes the increase of the hazardous/toxic wastes and the disposal method. The additional liquid hazardous/toxic wastes and solid hazardous/toxic wastes are shown in table C2-2 and C2-3 for the nonnuclear consolidation at Pinellas.

C.2.3 Nonhazardous Waste Management

Pinellas is currently treating industrial wastewater by equalization/neutralization onsite, then mixing it with site-generated sanitary waste. This combined waste is then discharged to the municipal water treatment facility. The existing Pinellas discharge rates for the industrial wastes and sanitary wastes are approximately 43 MGY and 29 MGY, respectively. The existing combined discharge rate is 72 MGY. The additional wastewater discharge rates due to the consolidation is approximately 292 MGY. The existing sanitary sewage treatment system has a capacity of approximately 110 MGY.

The additional solid nonhazardous wastes for the nonnuclear consolidation at Pinellas is estimated at approximately 610,000 ft^3/yr.

TABLE C2-1.—*Pinellas Alternative: Waste Management of Hazardous/Toxic Waste, Disposal Method, and Volume (ft^3/yr)*[a]

Waste Stream	Disposal Method	Kansas City	Mound	Rocky Flats	Total [c]
Acid Liquid Bulk	Incineration/ Recovery	380	40	40	460
Alkaline	Icineration/ Recovery	970	30	b	1,000
Oil/Coolants	Incineration	750	400	1,060	2,210
Halogenated & Nonhalogenated Solvent	Incineration	1,510	70	20	1,600
Resin, Paint, Curing Agent, Adhesive & Rubber	Incineration	1,510	b	b	1,510
Toluene Diisocyanate	Incineration	70	b	b	70
Cyanide, Liquid	Cyanide Destruction	40	b	b	40
Cyanide Salts	Recovery	10	b	b	10
Mercury Contaminated Debris	Landfilled	20	b	b	20
F006, F009 Sludge	Landfilled	4,200	b	b	4,200
Batteries (others)	Recovery/ Landfilled	100	b	b	100
Classified Hazardous	Declassified/ Landfilled	10	b	b	10
Acid/Chromate Contaminated Debris	Incineration	160	b	b	160
Cyanide/Alkaline Contaminated Debris	Incineration	100	b	b	100
Miscellaneous Lab Reagent/Off Spec. Product	Incineration/ Landfilled	70	b	b	70
Non-Empty Aerosol Cans	Incineration	590	b	b	590
Solvent/Oil Contaminated Debris & Miscellaneous	Incineration	6,830	110	80	7,020
Compressed Gas Cylinders	Destruction/ Incineration	30	b	b	30
Total		17,350	650	1,200	19,200

E4 4114

[a] Projected for 1995 workload.
[b] Not significant quantities (less than 10 ft^3/yr).
[c] Total does not include quantities noted in b.

Source: FDI, 1992e.

C.3 ROCKY FLATS ALTERNATIVE (SECTION 3.4.3)

The additional wastes generated from the nonnuclear consolidation at Rocky Flats are LLW, mixed wastes, hazardous/toxic wastes, and nonhazardous wastes.

C.3.1 Radioactive Waste Management

See section C.1.1 for discussion of radioactive waste management associated with nonnuclear consolidation for the alternative sites.

TABLE C2-2.—*Pinellas Alternative: Additional Liquid Hazardous/Toxic Wastes (ft^3/yr)*[a]

Waste Stream	Kansas City	Mound	Rocky Flats	Total [c]
Acid Liquid, Bulk	380	40	40	460
Alkaline Liquid	970	30	b	1,000
Oil/Coolants	750	400	1,060	2,210
Halogenated & Nonhalogenated Solvent	1,510	70	20	1,600
Resin, Paint, Curing Agent, Adhesive & Rubber	1,510	b	b	1,510
Toluene Diisocyanate	70	b	b	70
Cyanide, Liquid	40	b	b	40
Total	5,230	540	1,120	6,890

E4 4110

a Projected for 1995 workload.
b Not significant quantities (less than 10 ft^3/yr).
c Total does not include quantities noted in b.

Source: FDI, 1992e.

TABLE C2-3.—*Pinellas Alternative: Additional Solid Hazardous/Toxic Wastes (ft^3/yr)*[a]

Waste Stream	Kansas City	Mound	Rocky Flats	Total [c]
Cyanide Salts	10	b	b	10
Mercury Contaminated Debris	20	b	b	20
F006, F0019 Sludge	4,200	b	b	4,200
Batteries (Others)	100	b	b	100
Classified Hazardous	10	b	b	10
Acid/Chromate Contaminated Debris	160	b	b	160
Cyanide/Alkaline Contaminated Debris	100	b	b	100
Misc. Lab Reagent/Off Specification Product	70	b	b	70
Non-Empty Arerosol Cans	590	b	b	590
Solvent/Oil Contaminated Debris & Misc.	6,830	110	80	7,020
Compressed Gas Cylinders	30	b	b	30
Total	12,120	110	80	12,310

E4 4112

a Projected for 1995 workload.
b Not significant quantities (less than 10 ft^3/yr).
c Total does not include quantities noted in b.

Source: FDI, 1992e.

C.3.2 Hazardous/Toxic Waste Management

All existing hazardous/toxic wastes generated at RFP are currently shipped offsite for treatment or disposal. The additional required hazardous waste management facilities include onsite storage and offsite disposal facilities.

Onsite storage facilities include a building and storage tanks constructed and equipped to comply with EPA hazardous waste storage requirements. The building is divided into three storage areas to maintain incompatible-material segregation: (1) liquid waste, (2) solid waste, and (3) miscellaneous laboratory waste areas. The liquid waste area contains all liquid drummed wastes, which include waste epoxy resin, waste methylene chloride/resin, and chemical waste streams awaiting disposal approval, including laboratory packs. The solid waste area stores solidified process solutions, batteries, solids debris, and off-specification materials. The miscellaneous laboratory waste area stores miscellaneous laboratory chemicals until properly identified and classified for packaging, shipping, and disposal requirements.

All bulk liquid waste streams are stored in above-ground, concrete-diked, 5,000-gallon storage tanks with the exception of nonhazardous petroleum-based oils, which are stored in a 500-gallon storage tank. Chemicals stored in separate 5,000-gallon tanks include flammable liquids, halogenated hydrocarbons, waste PCBs, caustic and acid solutions, and nonhazardous metal cutting coolant. Hazardous/toxic wastes generated at the plant site are shipped to commercial treatment facilities or to offsite disposal facilities.

Table C3-1 summarizes the increase of the hazardous/toxic wastes and the disposal method. The additional liquid hazardous wastes and solid hazardous wastes are shown in tables C3-2 and C3-3, respectively, for the nonnuclear consolidation at RFP.

C.3.3 Nonhazardous Waste Management

RFP currently has an activated sludge process to treat the sanitary waste generated throughout the site. The sewage treatment plant provides secondary treatment of sanitary waste using biologically extended aeration with disinfection. The treatment consists of primary settling, aeration, sludge digestion, clarification, and chlorination. After processing, the sanitary sludge is digested and then dried before sending to the RFP landfill, which is located within the buffer zone. The sanitary effluent is discharged to Pond 3 for recycling or used for irrigation.

The additional wastewater to be handled at RFP is 284 MGY. The overall sanitary sewage treatment plant capacity is 150 MGY.

The additional amount of nonhazardous solid wastes for the nonnuclear consolidation at RFP is estimated at approximately 530,000 ft^3/yr.

TABLE C3-1.—*Rocky Flats Alternative: Waste Management Hazardous/Toxic Waste, Disposal Method, and Volume (ft^3/yr)*[a]

Waste Stream	Disposal Method	Kansas City	Mound	Pinellas	Total [c]
Acid Liquid Bulk	Incineration/ Recovery	380	40	b	420
Alkaline	Incineration/ Recovery	970	30	b	1,000
Oil/Coolants	Incineration	750	400	b	1,150
Halogenated & Nonhalogenated Solvent	Incineration	1,510	70	20	1,600
Resin, Paint, Curing Agent, Adhesive & Rubber	Incineration	1,510	b	b	1,510
Toluene Diisocyanate	Incineration	70	b	b	70
Cyanide, Liquid	Cyanide Destruction	40	b	b	40
Cyanide Salts	Recovery	10	b	b	10
Mercury Contaminated Debris	Landfilled	20	b	b	20
F006, F009 Sludge	Landfilled	4,200	b	b	4,200
Batteries (others)	Recovery/ Landfilled	100	b	b	100
Classified Hazardous	Declassified/ Landfilled	10	b	b	10
Acid/Chromate Contaminated Debris	Incineration	160	b	b	160
Cyanide/Alkaline Contaminated Debris	Incineration	100	b	b	100
Miscellaneous Lab Reagent/Off Spec. Product	Incineration/ Landfilled	70	b	b	70
Non-Empty Aerosol Cans	Incineration	590	b	b	590
Solvent/Oil Contaminated Debris & Miscellaneous	Incineration	6,830	110	50	6,990
Compressed Gas Cylinders	Destruction/ Incineration	30	b	b	30
Total		17,350	650	70	18,070

E4 4115

[a] Projected for 1995 workload.
[b] Not significant quantities (less than 10 ft^3/yr).
[c] Total does not include quantities noted in b.

Source: FDI, 1992e.

TABLE C3-2.—*Rocky Flats Alternative: Additional Liquid Hazardous Wastes (ft^3/yr)*[a]

Waste Stream	Kansas City	Mound	Pinellas	Total [c]
Acid Liquid, Bulk	380	40	b	420
Alkaline Liquid	970	30	b	1,000
Oil/Coolants	750	400	b	1,150
Halogenated & Nonhalogenated Solvent	1,510	70	20	1,600
Resin, Paint, Curing Agent, Adhesive & Rubber	1,510	b	b	1,510
Toluene Diisocyanate	70	b	b	70
Cyanide, Liquid	40	b	b	40
Total	5,230	540	20	5,790

E4 4109

[a] Projected for 1995 workload.
[b] Not significant quantities (less than 10 ft^3/yr).
[c] Total does not include quantities noted in b.

Source: FDI, 1992e.

TABLE C3-3.—*Rocky Flats Alternative: Additional Solid Hazardous Wastes (ft^3/yr)*[a]

Waste Stream	Kansas City	Mound	Pinellas	Total [c]
Cyanide Salts	10	b	b	10
Mercury Contaminated Debris	20	b	b	20
F006, F0019 Sludge	4,200	b	b	4,200
Batteries (Others)	100	b	b	100
Classified Hazardous	10	b	b	160
Acid/Chromate Contaminated Debris	160	b	b	100
Cyanide/Alkaline Contaminated Debris	100	b	b	100
Misc. Lab Reagent/Off Specification Product	70	b	b	70
Non-Empty Arerosol Cans	590	b	b	590
Solvent/Oil Contaminated Debris & Misc.	6,830	110	50	6,990
Compressed Gas Cylinders	30	b	b	30
Total	12,120	110	50	12,280

E4 4111

[a] Projected for 1995 workload.
[b] Not significant quantities (less than 10 ft^3/yr).
[c] Total does not include quantities noted in b.

Source: FDI, 1992e.

APPENDIX D

APPENDIX D: AIR QUALITY AND ACOUSTICS

D.1 METHODOLOGY

The methodology used to assess potential impacts to air resources is described in this appendix. Models used and associated assumptions are described.

D.1.1 Air Quality

The assessment of air quality at each site requires applicable input data, including ambient air quality monitoring data representative of the background and emissions inventories of criteria, hazardous and toxic pollutants. Concentrations determined from the modeling of these emissions are then compared to applicable standards and guidelines.

The Industrial Source Complex-Short Term (ISCST) model (EPA, 1986a), recommended by the Environmental Protection Agency (EPA), was used to model emissions. The ISCST model estimates dispersion of emissions from stack (point), area, and volume sources. It estimates the dispersion from stack and volume sources using a steady-state Gaussian plume equation and estimates dispersion from area sources using the equation for a continuous and finite cross-wind line source.

Field data have been used to evaluate the performance of the ISCST model including its point source submodel (EPA, 1977; EPRI, 1983, 1985, and 1988) and its special features, such as the gravitational settling/dry deposition option (EPA, 1981 and 1982) and the building downwash option (EPA, 1981; Schulman, 1986). The validation studies for the point source model (CRSTER) indicate that the model acceptably predicts the upper percentile of the frequency distribution of 1-hr concentrations and of the corresponding distributions of 24-hr concentrations. Concentrations over the remainder of the frequency distributions are significantly underpredicted. The highest second-highest 1-hr concentrations were predicted within a factor of two at two-thirds of the field sampling sites for elevated power-plant plumes. The highest second-highest 24-hr concentrations were underpredicted by the model, with the ratio of predicted concentration to measured concentration ranging from 0.2 to 2.7 at about 90 percent of the sampling sites (EPA, 1977).

In other validation studies for the point source model, the CRSTER model predicted peak short-term (1-, 3-, and 24-hr) concentration values within 30-70 percent at a level, unobstructed site (EPRI, 1983). The CRSTER model predicted peak 1-hr concentrations within 2 percent and underpredicted peak 3-hr concentrations by about 30 percent at a moderately complex terrain site (EPRI, 1985). The ISCST model overpredicted 1-hr concentrations by about 60 percent, with better predictions for longer time periods at an urban site (EPRI, 1988). The gravitational settling/dry deposition and building downwash options improve the model's performance significantly over that of the model without such features (EPA, 1981 and 1982; Schulman, 1986).

The ISCST modeling was performed according to EPA's guideline on air quality modeling (EPA, 1986b). The model input data included the emissions inventories, source characteristics (stack height, stack diameter, exit velocity, and exit temperature), and one full year of hourly meteorological data and twice daily mixing height data. Emissions inventories and source characteristics were generally provided by each DOE site.

To achieve a conservative estimate, the "highest-high" concentration was selected for comparison to

applicable standards and guidelines, instead of the "highest second-high" concentration as recommended by the EPA (EPA, 1986b). This concentration was the maximum occurring at or beyond the site boundary.

Terrain data for the ISCST model were input for the sites considered to be other than "flat." The sites with terrain considered in the modeling were as follows: Kansas City Plant (KCP), Mound, Oak Ridge Reservation Y-12 Plant (Y-12), Los Alamos National Laboratory (LANL), and Rocky Flats Plant (RFP). The terrain data were based on information contained on U.S. Geological Survey topographical maps.

The emission rates for each pollutant were those provided by each site or by the Architect/Engineer who provided the design information. For most sources, data were provided on an annual emission rate basis in units of pounds per year or tons per year. The ISCST model requires units in pounds per hour. The data provided were converted to pounds per hour assuming that the source was operated for the entire year, or 8,760 hours (the number of hours in a year). Data were generally not available to determine actual operating hours.

Not all characteristics were provided for each emission source. In those cases, characteristics were assumed based on similar source configurations at the particular site, or from other sites with similar processes.

It was also assumed that the emissions for each site originated from a single point source. This assumption resulted in higher concentrations than would actually occur, since emission sources are generally geographically separated from one another.

Meteorological data were either provided by the site or obtained from representative offsite sources. These were generally collected at National Weather Service (NWS) stations, considered representative of onsite meteorology. Use of NWS data for modeling purposes is in accordance with EPA guidance (EPA, 1986b).

D.1.2 Acoustics

This section describes the analyses performed to assess noise impacts from the proposed action and each alternative. In depth noise impact analyses of construction and operation for each site were not performed because the detailed information on the construction and design of these facilities necessary for such an analysis has not been developed. Analyses of traffic noise impacts have been performed for each site based on baseline traffic volumes and the maximum projected construction and operation employment for each alternative. For those sites where more detailed analysis of employee distribution was performed, that information was incorporated in the traffic noise analysis.

To estimate the noise levels resulting from highway traffic for existing conditions and for each alternative, a computerized version of the Federal Highway Administration's Traffic Noise Prediction Model, Version OFA (FHWA, 1978) was used. The model calculations take into account the traffic volume and vehicle mix (i.e., automobiles, medium-duty trucks, and heavy-duty trucks), as well as the speed of traffic flow, number of lanes, and slope of the road. The modeling assumed that areas next to the roads were covered with vegetation and that there were no barriers along the roads. The model assumes standard day meteorological conditions (59 °F [15 °C], 70 percent relative humidity). Equivalent sound levels (L_{eq}) were estimated for the peak traffic hour. Noise level increases from highway traffic were estimated at a distance of 50 ft (15 meters) from the centerline of the nearest lane.

The criterion used to evaluate the degree of impacts caused by intermittent traffic noise is based on the fact that noise levels, both in time and space, can fluctuate by as much as 5 decibels (dB). Previous experience shows that a change in noise level of less than 5 dB would not produce a significant

change in community reaction to the noise (Stevens, 1955).

The performance of the Federal Highway Administration model has been verified with actual noise measurements (FHWA, 1978). The overall correlation coefficient for linear least-squares regression of 66 predicted values versus measured values at distances of 50, 100, and 200 feet (15, 30, and 60 meters) from the centerline of the nearest lane of the roadway, was greater than 0.9. The correlation coefficient was higher (0.93) at 50 feet, but lower (0.86) at 200 feet. No measured value exceeded the predicted value by more than 3 dB, while the predicted value was sometimes as much as 5 dB greater than the measured value. The model overpredicts the higher end of noise levels at a given distance from the roadway centerline.

D.2 AFFECTED ENVIRONMENT

This section provides supporting information related to the baseline environment for air quality and acoustics for each of the eight reconfiguration sites. Data are presented on applicable standards, background monitoring results, and relevant emissions inventories.

D.2.1 Air Quality

D.2.1.1 *Kansas City Plant*

The Kansas City Plant (KCP) is located in Jackson County, MO, within the Metropolitan Kansas City Intrastate Air Quality Control Region (AQCR). This AQCR is designated as attainment for all criteria pollutants (40 CFR 81.326). An attainment area is any area that meets the national primary or secondary ambient air quality standard for the pollutant. The criteria pollutants are the pollutants for which national ambient air quality standards exist, defined in 40 CFR 50. These pollutants are sulfur dioxide (SO_2), nitrogen dioxide (NO_2) or oxides of nitrogen (NO_x), carbon monoxide (CO), lead (Pb), ozone (O_3), and particulate matter less than 10 microns in diameter (PM_{10}). The National Ambient Air Quality Standards (NAAQS) and Missouri ambient air quality standards are listed in table D2.1.1-1.

Ambient air quality within and near KCP is monitored at three site perimeter locations for each of the criteria pollutants. The data from each of these monitoring stations for 1990 are presented in table D2.1.1-2. With the exception of the ozone (1-hr) standard, the ambient air quality in the Bannister Federal Complex area does not exceed applicable guidelines or regulations. The ozone standard is exceeded primarily due to chemical reactions that involve vehicle emissions.

The principal sources of criteria air pollutants are from the four boilers serving the entire Bannister Federal Complex. Table D2.1.1-3 presents the emissions inventory from these sources.

Federal standards for Prevention of Significant Deterioration (PSD) were promulgated to regulations (40 CFR 52.21) in 1977. PSD is defined such that if increases in concentrations of SO_2, (NO_2), and total suspended particulates (TSP) are above certain limits, those increases constitute "significant deterioration." The magnitude of the allowable increment depends on the classification of the area affected, with a Class I area (National Parks, wilderness areas) having the smallest increment. Table D2.1.1-4 presents the maximum allowable PSD increments. Since the promulgation of the PSD regulations, no PSD permits have been required for any source at KCP.

Table D2.1.1-5 presents emission rates and maximum ground level concentrations of hazardous/toxic air pollutants from KCP (for emission rates greater than approximately 100 lb/yr). Concentrations are low in comparison to the proposed standards.

Missouri has standards for the pollutants regulated by the National Emission Standards for Hazardous Air Pollutants (NESHAP). In May 1992, the

TABLE D2.1.1–1.—*Ambient Air Quality Standards (μg/m³)* [Page 1 of 2]

Pollutant	Averaging Time	Primary NAAQS[a]	Secondary NAAQS[a]	Texas Standards	Colorado Standards[c]	Idaho Standards	South Carolina and Georgia Standards[d]	Nevada Standards[c]	Tennessee Standards
Beryllium	24-hour	b	b	0.01	b	b	b	b	b
Carbon Monoxide (CO)	8-hour	10,000	b	10,000	10,000	10,000	10,000	10,000	10,000
	1-hour	40,000	b	40,000	40,000	40,000	40,000	40,000	40,000
Heavy Metals	30-day	b	b		b		b		b
Hydrogen Fluoride (HF)	30-day	b	b	3.7	b	b	0.8	b	1.2
	7-day	b	b	2.9	b	b	1.6	b	1.6
	24-hour	b	b	1.6	b	b	2.9	b	2.9
	12-hour	b	b	0.8	b	b	3.7	b	3.7
Hydrogen Sulfide (H_2S)	1-hour	b	b	b	142	b	b	112	b
Lead (Pb)	Calendar Quarter	1.5	1.5	1.5	b	1.5	1.5	1.5	1.5
	30-day	b	b	b	1.5	b	b	b	b
Nitrogen Dioxide (NO_2)	Annual	100	100	100	100	100	100	100	100
	24-hour	b	b	b	b	b	b	472	b

E4 4063-1

Footnotes at end of table.

TABLE D2.1.1–1.—*Ambient Air Quality Standards ($\mu g/m^3$)* [Page 2 of 2]

Pollutant	Averaging Time	Primary NAAQS[a]	Secondary NAAQS[a]	Florida Standards	Colorado Standards[c]	Missouri Standards	South Carolina and Georgia Standards[d]	New Mexico Standards[c]	Tennessee Standards
Nonmethane Hydrocarbons	3-hour	b	b	b	b	b	b	606[f]	b
Ozone (O_3)	1-hour	235	235	235	160	235	235	117.8	235
Particulate Matter (PM_{10})	Annual	50	50	50	50	50	50	b	50
	24-hour	150	150	150	150	150	150	b	150
Sulfur Dioxide (SO_2)	Annual	80	b	60	80	80	80	52	80
	24-hour	365	b	260	365	365	365	262	365
	3-hour	b	1,300	1,300	700	1300	1,300	b	1,300
Total Reduced Sulfur (S)	1-hour	b	b	b	b	b	b	3.9	b
Total Suspended Particulates (TSP)	Annual[e]	b	b	b	b	b	75	60	60[k]
	30-day	b	b	b	b	b	b	90	b
	7-day	b	b	b	b	b	b	110	b
	24-hour	b	b	b	b	b	b	150	150[k]
Sulfuric Acid (H_2SO_4)	24-hour	b	b	b	b	10[i]	b	b	b
	1-hour	b	b	b	b	30[j]	b	b	b

E4 4063-2

a The NAAQS, other than those for O_3, PM_{10}, and those based on annual averages, are not to be exceeded more than once per year. The O_3 standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above the standard is less than or equal to one. The 24-hour PM_{10} standard is attained when the expected number of days with a 24-hour average concentration above the standard is less than or equal to one. The annual arithmetic mean PM_{10} standard is attained when the expected annual arithmetic mean concentration is less than or equal to the standard. Ohio state standards are the same as the NAAQS.

b There is no standard.

c The Colorado and New Mexico annual standards are never to be exceeded; short-term standards are not to be exceeded more than once per year, unless otherwise noted.

d The Federal TSP standards have been replaced by the PM_{10} standards, but the annual TSP standard is retained in South Carolina.

e Geometric mean; all other means are arithmetic.

f Assumed to be benzene.

g 1/2-hour average NOT to be exceeded more than 2 times per year.

h 1/2-hour average not to be exceeded more than 2 times per year in any 5 consecutive days.

i 24-hour average not to be exceeded more than once in any 90 consecutive days.

j 1-hour average not to be exceeded more than once in any 2 consecutive days.

k TSP standards listed are secondary standards. Primary standards are 75 and 260 $\mu g/m^3$, respectively.

Sources: 40 CFR 50; FL DER, 1992; CO Health, 1989; MO Resources, 1992; SC DHEC, 1989; LANL, 1990a; TDHE, 1991.

TABLE D2.1.1-2.—*Existing Ambient Air Quality Data for KCP*

Monitoring Station	Ambient Concentration ($\mu g/m^3$)											
	Sulfur Dioxide			Carbon Monoxide[d]		Nitrogen Dioxides	TSP[b]		PM_{10}[c]		Lead	Ozone
	Annual	Max. 24-hour	Max. 3-hour	Max. 8-hour	Max. 1-hour	Annual	Annual	Max. 24-hour	Annual	Max. 24-hour	Max. Calendar Quarter	Max. 1-hour
Bendix #1	3.4	13.0	35.8	4.0[a]	68.7	22.7	47.8	95.1	25.0	54.7	<0.1	263.1
Bendix #2	3.8	16.2	42.7	3.0[a]	73.3	24.9	48.6	105.5	27.8	53.0	<0.1	243.4
Bendix #3	2.9	18.8	63.7	5.2[a]	81.3	23.3	50.8	135.4	25.6	48.3	<0.1	261.1

E4 3702

[a] Indicates running average, the average of 8-hour periods beginning at each hour of the year.
[b] Total suspended particulate. Missouri has no TSP standard to compare with these data.
[c] Particulate matter less than 10 microns in diameter.
[d] From Roth, 1992.

Source: KC ASAC, 1991a.

TABLE D2.1.1-3.—*Source Emissions Inventory for KCP—Criteria Pollutants*

Pollutant	Source	Emission Rate (lbs/hr)	Coordinates (UTM[a])		Stack Parameters				
			Easting	Northing	Base Elevation (ft)	Height (ft)	Inner Diameter (ft)	Exit Temperature (°F)	Exit Velocity (ft/s)
Carbon Monoxide (CO)	Boiler 1	2.01	363485	4313414	835.7	81	4.5	320	21.2
	Boiler 2	5.40	363483	4313152	835.7	81	4.5	320	20.7
	Boiler 3	0.02	363482	4313161	835.7	81	4.5	320	18.8
	Boiler 4	3.54	363480	4313170	835.7	81	4.5	320	17.3
Nitrogen Dioxide (NO_2)	Boiler 1	1.77	363485	4313414	835.7	81	4.5	320	21.2
	Boiler 2	1.81	363483	4313152	835.7	81	4.5	320	20.7
	Boiler 3	2.07	363482	4313161	835.7	81	4.5	320	18.8
	Boiler 4	3.36	363480	4313170	835.7	81	4.5	320	17.3
Sulfur Dioxide (SO_2)	Boiler 1	0.74	363485	4313414	835.7	81	4.5	320	21.2
	Boiler 2	0.94	363483	4313152	835.7	81	4.5	320	20.7
	Boiler 3	1.90	363482	4313161	835.7	81	4.5	320	18.8
	Boiler 4	1.17	363480	4313170	835.7	81	4.5	320	17.3
Total Suspended Particulates (TSP)	Boiler 1	0.02	363485	4313414	835.7	81	4.5	320	21.2
	Boiler 2	0.005	363483	4313152	835.7	81	4.5	320	20.7
	Boiler 3	0.06	363482	4313161	835.7	81	4.5	320	18.8
	Boiler 4	0.03	363480	4313170	835.7	81	4.5	320	17.3

E4 3703

[a] Universal Transverse Mercator Coordinates (in meters).

Source: KC Tab F, 1992

TABLE D2.1.1–4.—*Maximum Allowable Prevention of Significant Deterioration (PSD) Concentration Increments (all sites)*

Pollutant	Averaging Time	PSD Increment ($\mu g/m^3$)[a]		
		Class I	Class II	Class III
Nitrogen Dioxide (NO_2)	Annual	2.5	25	50
Sulfur Dioxide (SO_2)	Annual	2	20	40
	24-hour	5	91	182
	3-hour	25	512	700
Total Suspended Particulates (TSP)	Annual	5	19	37
	24-hour	10	37	75

E4 3568

[a] Short-term increments are not to be exceeded more than once per year.

Source: 40 CFR 52.21.

TABLE D2.1.1–5—*Emission Rates and Maximum Site Boundary Concentration of Hazardous/Toxic Air Pollutants at KCP*

Hazardous/Toxic Air Pollutant	Emission Rate (lb/hr)[a]	Maximum Concentration ($\mu g/m^3$)	Missouri State Standards and Guidelines ($\mu g/m^3$)
Acetone	0.37	6.3	161[d]
Acids	0.57	18.0	b
Alchohols	0.71	22.3	b
Dichlorodifluoremethane	0.01	0.4	b
Dimethyl Formamide	0.01	0.2	b
D'Limonene	0.06	1.8	b
1,4-Dioxane	0.03	0.6	24.5[d]
Ethylbenzene	0.02	0.4	118[d]
Glycol Ethers	1.20	37.8	b
Hexane	0.03	1.1	2,400[c]
Methyl Ethyl Ketone	0.03	0.6	32.1[d]
Methyl Isobutyl Ketone	0.07	1.2	55.7[d]
Methylene Chloride	0.01	0.4	b
Miscellaneous Solvents	0.39	12.25	b
Naphtha (mineral spirits)	0.17	5.4	b
Tetrachloroethylene	0.02	0.4	922[d]
Toluene (methylbenzene)	0.19	3.3	10.2[d]
1,1,1-Trichloroethane	0.01	0.2	1,040[d]
Trichloroethylene	0.22	3.7	36.5[d]
Trichlorotrifluoroethane	0.01	0.4	101,333[c]
Xylene (dimethylbenzene)	0.13	4.0	5,800[c]

E4 4064

[a] Only those emitted at rates greater than or equal to 100 lb/yr (0.01 lb/hr) are listed.
[b] No standard.
[c] 8-hour average standard.
[d] 24-hour average standard.

Source: FDI, 1992a, KC ASAC, 1992h.

Missouri Department of Natural Resources published guidance levels of Hazardous Air Pollutants HAPs/toxics. These include the 189 HAPs specified in the 1990 *Clean Air Act* Amendments (CAA).

D.2.1.2 *Mound Plant*

The Mound Plant (Mound) is located in Montgomery County, OH, within the Metropolitan Dayton Intrastate AQCR. In addition to Montgomery County, this AQCR includes Clark, Darke, Greene, Miami, and Preble counties. The region is under the authority of the Regional Air Pollution Control Agency (RAPCA), which monitors ambient levels of criteria pollutants. This AQCR is designated as attainment with respect to SO_2, NO_2, and CO (40 CFR 81.336). However, several counties within the AQCR, including Montgomery County, have been classified as nonattainment for TSP and O_3. The NAAQS and Ohio state ambient air quality standards are listed in table D2.1.1-1.

Table D2.1.2-1 shows the maximum ambient air quality concentrations data measured from the RAPCA regional monitoring program and that of the Southwestern Ohio Air Pollution Control Agency for sites near Mound (MD RAPCA, 1987, 1988, 1989, 1990, 1991).

The principal sources of criteria air pollutants at Mound are the two boilers associated with the steam plant and the Keystone heat exchanger. Other sources include fugitive particulate emissions from process emissions, and emissions from laboratory operations and vehicles. Predominant hazardous/ toxic air pollutant emissions from Mound include acetone, TCA, isopropyl alcohol, and nitric acid. The emissions inventory is presented in table D2.1.2-2.

Table D2.1.1-4 presents the maximum allowable PSD increments. Since the promulgation of the PSD regulations, no PSD permits have been required for any source at Mound.

The Ohio EPA has standards for the pollutants (asbestos, beryllium, mercury, benzene, vinyl chloride, and radionuclides) regulated by NESHAPs. As of July 1991, the Ohio EPA has not promulgated standards for the additional 189 HAPs specified in the 1990 CAA. However, Ohio EPA uses the American Conference of Governmental Industrial Hygienists list of pollutants threshold limit values (TLV). Maximum 1-hr ground-level concentrations cannot exceed the TLV time-weighted average (TWA) established by the American Conference of Governmental Industrial Hygienists, divided by a "safety conversion factor" of 42 (Ohio EPA, 1991). Table D2.1.2-3 presents the emission rates and maximum ground-level concentrations of hazardous/toxic air pollutants from Mound.

TABLE D2.1.2-1.—*Existing Ambient Air Quality Data for Mound*

	Ambient Concentration ($\mu g/m^3$)											
	Sulfur Dioxide			Carbon Monoxide		Nitrogen Dioxide	TSP[b]		PM_{10}[c]		Lead	Ozone
Monitoring Station	Annual	Max. 24-hour	Max. 3-hour	Max. 8-hour	Max. 1-hour	Annual	Annual	Max. 24-hour	Annual	Max. 24-hour	Max. Calendar Quarter	Max. 1-hour
McEwen	a	a	a	a	a	a	a	a	22	75	a	a
E. Monument	a	a	a	a	a	a	a	a	29	89	a	a
Timberlane	a	a	a	a	a	a	36	104	a	a	0.1	233.5
W. Third St.	15.7	57.6	112.7	a	a	a	a	a	a	a	a	a
E. Fourth St.	a	a	a	4,466	13,969	a	a	a	a	a	a	a
W. Fairview Ave.	a	a	a	3,664	6,985	a	a	a	a	a	a	a

E4 3561

[a] Not measured.
[b] Total suspended particulates. Ohio has no TSP standard to compare with these data.
[c] Particulate matter less than 10 microns in diameter.

Source: MD DOE, 1991b.

TABLE D2.1.2–2.—*Source Emission Inventory for Mound Plant—Criteria Pollutants*

Pollutant	Source	Emission Rate (lbs/hr)	Coordinates (UTM)[a]		Stack Parameters				
			Easting	Northing	Base Elevation (ft)	Height (ft)	Inner Diameter (ft)	Exit Temperature (°F)	Exit Velocity (ft/sec)
Carbon Monoxide (CO)	Boiler 1	0.241	732723	4389704	907.7	46.0	3.7	550	123.1
	Boiler 2	0.936	732728	4389705	907.7	56.5	4.1	260	99.3
	Keystone 14M	1.321	732903	4389609	907.7	46.0	3.7	550	123.1
Nitrogen Dioxide (NO_2)	Boiler 1	0.960	732723	4389704	907.7	46.0	3.7	550	123.1
	Boiler 2	3.743	732728	4389705	907.7	56.5	4.1	260	99.3
	Keystone 14M	5.284	732903	4389609	907.7	46.0	3.7	550	123.1
Particulate Matter (PM_{10})	Boiler 1	0.021	732723	4389704	907.7	46.0	3.7	550	123.1
	Boiler 2	0.080	732729	4389705	907.7	56.5	4.1	260	99.3
	Keystone 14M	0.113	732903	4389609	907.7	46.0	3.7	550	122.6
	37–EF–01	0.010	733265	4389842	907.7	19.8	2.3	72	14.3
	49–CHF–01	0.011	732925	4389647	907.7	45.0	2.5	72	29.5
	COS–EF–01	0.003	732927	4389865	907.7	55.0	2.7	72	46.9
	DS–EF–13	0.100	732879	4389896	907.7	45.0	2.3	72	7.1
	DS–EF–27	0.231	732908	4389908	907.7	45.0	1.6	72	9.3
	W–EF–B	0.421	732927	4390105	907.7	38.0	1.0	72	42.5
Sulfur Dioxide (SO_2)	Boiler 1	0.004	732723	4389704	907.7	46.0	3.7	550	123.1
	Boiler 2	0.016	732728	4389705	907.7	56.5	4.1	260	99.3
	Keystone 14M	0.023	732903	4389609	907.7	46.0	3.7	550	123.1

E3A 3571

[a] Universal Transverse Mercator Coordinates (in meters)

Source: MD Tab F, 1992.

TABLE D2.1.2–3.—*Emission Rates and Maximum Site Boundary Concentration of Hazardous/Toxic Air Pollutants at Mound Plant*

Hazardous/Toxic Air Pollutant	Emission Rate[a] (lbs/hr)	Maximum 1-hour Source Contribution at Site Boundary (μg/m³)	Ohio State Standards[a] (μg/m³)
1,1,1-Trichloroethane	1.03	42.5	1,310
Acetone	1.37	56.6	42,380
Ammonia	0.63	25.9	405
Freon-113	0.42	17.5	182,619
Hydrogen Chloride	0.40	16.5	179
Isopropyl Alcohol	0.50	20.9	23,405

E4 3573

[a] ACGIH's TVLs divided by a safety conversion factor of 42.

Source: MD Tab F, 1992.

D.2.1.3 *Pinellas Plant*

The Pinellas Plant (Pinellas) is located in Pinellas County, FL, within the West Central Florida Intrastate AQCR. This AQCR is designated as attainment for all criteria pollutants with the exception of O_3 (40 CFR 81.310). The NAAQS and Florida state ambient air quality standards (which are the same as the NAAQS) are listed in table D2.1.1-1.

Ambient air quality within and near Pinellas is monitored by the state for each criteria pollutant. The ambient air quality data for SO_2, CO, TSP, and O_3 collected at these stations during 1990 are presented in table D2.1.3-1.

The principal sources of criteria air pollutants at Pinellas are the boilers and diesel generators in Building 500. Building 100 is a source of solvent, acid, and particulate emissions and Buildings 700 and 1040 are sources of emissions from solvent use or storage and other particulate sources (Kirby, 1992). Other sources include vehicular emissions (PI DOE, 1989). The emissions inventory used in the analysis is included in table D2.1.3-2.

Table D2.1.1-4 presents the maximum allowable PSD increments. Since the promulgation of the PSD regulations, no PSD permits have been required for any source at the Pinellas plant.

The Florida Department of Environmental Regulation has standards for the hazardous pollutants regulated by the NESHAPs. In addition, the FDER maintains a working list of toxics which is used in regulatory and air permitting analyses of sources for air hazardous impacts. This list, published in January 1992, is the Draft Florida Air Hazardous Permitting Strategy Guidelines (FL DER, 1992), and covers 751 compounds including all 189 HAPs listed under Title III of the 1990 CAA. HAPs/toxics from the plant include acids, resin compounds and common industrial solvents. Sources include laboratories, coating and plating operations, production and test facilities, and various manufacturing operations. Table D2.1.3-3 presents the potential emission rates and resulting ground-level concentrations for HAPs/toxics from Pinellas used in the assessment. As shown in the table, the Florida Department of Environmental Regulation Air Toxic Working List annual guidelines are exceeded at the Pinellas boundary for concentrations of methylene chloride, nickel chloride, and TCE.

TABLE D2.1.3-1.—*Existing Ambient Air Quality Data for the Pinellas Plant*

Monitoring Station	Ambient Concentration ($\mu g/m^3$)							
	Sulfur Dioxide			Carbon Monoxide		TSP[b]		Ozone
	Annual	Max. 24-hour	Max. 3-hour	Max. 8-hour	Max. 1-hour	Annual	Max. 24-hour	Max. 1-hour
Clearwater	a	a	a	a	a	33	56	a
Sheriff Dept	a	a	a	a	a	41	236	a
19th St. N., St. Petersburg	a	a	a	a	a	54	155	a
Azalea Park	a	a	a	a	a	36	61	a
Derby Lane	23	118	526	a	a	40	89	a
Anclote Road, Tarpon Springs	5	30	114	a	a	45	97	a
Coast Guard Station, Tampa	a	a	a	3,435	5,725	a	a	243.4
Tampa Stadium	a	a	a	6,870	9,160	a	a	a
Seminole Hts. School	a	a	a	8,016	13,742	a	a	a
Madison Avenue, Tampa	a	a	a	5,725	10,305	a	a	a
Pinellas Park	12	80	503	a	a	a	a	a
Brooker Creek Park	9	56	198	a	a	a	a	a
Simons Park	a	a	a	a	a	a	a	231.5

E4 3569

[a] No data available.
[b] Total suspended particulates.
Source: PI Tab F, 1992.

TABLE D2.1.3–2.—*Source Emission Inventory for Pinellas Plant—Criteria Pollutants*

Pollutant	Source Number	Emission Rate (lb/hr)	Coordinates (UTM)[a]		Stack Parameters				
			Easting	Northing	Base Elevation (ft)[b]	Height (ft)	Inner Diameter (ft)	Exit Temperature (°F)	Exit Velocity (ft/s)
Lead (Pb)	1	0.0014	327768	3084340	0	32.9	0.89	70	24.3
	2	0.0014	327730	3084287	0	25.3	1.05	70	54.7
	3	0.0014	327731	3084261	0	27.5	1.87	70	37.8
	4	0.0014	327731	3084261	0	25.8	1.57	70	51.1
	5	0.0014	327872	3084288	0	28.6	1.41	70	34.4
	6	0.0014	327960	3084261	0	34.0	0.92	70	15.4
	7	0.0014	327962	3084229	0	32.8	0.92	70	14.1
	8	0.0014	327956	3084229	0	34.2	0.92	70	37.0
	9	0.0014	327990	3084200	0	39.8	2.17	70	21.9
	10	0.0014	327983	3084238	0	31.6	1.31	70	17.0
Sulfur Dioxide (SO_2)	1	0.637	327874	3084324	0	28.5	1.80	175	7.5

E4 3574

[a] Universal Transverse Mercator Coordinates (in meters).
[b] Assumed elevation for modeling purposes, no terrain effects included.

Source: PI Tab F, 1992.

TABLE D2.1.3–3.—*Emission Rates and Maximum Site Boundary Concentration of Hazardous/Toxic Air Pollutants at Pinellas*

Hazardous/Toxic Air Pollutant	Emission Rate (lbs/hr)[a]	Maximum Source Contribution at Site Boundary (μg/m³)			FDER Air Toxic Working List Guidelines (μg/m³)		
		Annual	24-hour	8-hour	Annual	24-hour	8-hour
1,1,1-Trichloroethane	4.07	2	26	55	10	9,168	38,200
1,4 Dioxane	4.07	0.06	b	b	0.71	216	900
Lead Compound	0.014	0.022	0.13	0.23	0.09	0.36	1.5
Methylene Chloride	8.48	1.2	33.4	75	0.24	417.6	1,740
Nickel Chloride	0.007	0.0126	0.12	0.25	0.0042	0.24	1
Tetrachloroethylene	0.25	0.13	b	b	1.9	813.6	3,390
Trichloroethylene	2.2	1.18	8	14	0.59	645.6	2,690

E4 3575

[a] Only those emitted at rates greater than or equal to 100 lb/yr (0.01 lb/hr) are listed.
[b] Data unavailable.

Source: PI DOE, 1992a.

D.2.1.4 *Rocky Flats Plant*

The Rocky Flats Plant (RFP) is located in Jefferson County, in the Metropolitan Denver Intrastate AQCR. As of 1991, the areas within this AQCR were designated as non-attainment with respect to the NAAQS for PM_{10}, TSP, O_3, and CO, and listed as attainment for SO_2 and NO_2 (40 CFR 81.306); that is, listed as "does not meet primary standards" for PM_{10}, TSP, O_3, and CO, and "cannot be classified" or "better than national standards" for SO_2 and NO_2. The NAAQS and Colorado state ambient air quality standards are listed in table D2.1.1-1.

Ambient air monitoring data provide an indication of the background air quality unaffected by the site. Ambient air quality is monitored near the east entrance to the plant (RF EG&G, 1991e). Monitoring is performed for TSP, PM_{10}, Pb, CO, O_3, SO_2, and NO_2. The ambient air quality data collected at this station are presented in table D2.1.4-1.

The principal sources of criteria pollutants at RFP are the steam plant boilers. Minor combustion sources include various small boilers and diesel generators. Other sources include fugitive particulate emissions from construction processes, roads, and vehicular emissions. The emissions inventory for the sources used in the analysis is presented in table D2.1.4-2.

PSD regulations (40 CFR 52.21) limit the maximum allowable incremental increases in ambient concentrations of SO_2, NO_2, and TSP above established baseline conditions. The PSD regulations, which are designed to protect ambient air quality in attainment areas, apply to new sources and major modifications to existing sources. The maximum allowable increments are listed in table D2.1.1-4. Since the promulgation of the PSD regulations, no PSD permits have been required for any source at RFP.

The Colorado Department of Health has standards for the hazardous pollutants regulated by the NESHAP. The Colorado Department of Health has not promulgated HAPS regulations for new sources. Emission estimates and predicted concentrations for the HAPs/toxics used in the analysis are presented in table D2.1.4-3. It is expected that concentrations of carbon tetrachloride (CCl_4) will be substantially reduced with the relocation of various facilities and operations from RFP. Regardless of the outcome of this and other actions at RFP, the use of CCl_4 will be replaced with other cleaning agents over the next 2 to 3 years.

TABLE D2.1.4-1.—*Existing Ambient Air Quality Data for RFP*

Monitoring Station	Ambient Concentration (μg/m³)											
	Sulfur Dioxide			Carbon Monoxide		Nitrogen Oxides	TSP[b]		PM_{10}[c]		Lead	Ozone
	Annual	Max. 24-hour	Max. 3-hour	Max. 8-hour	Max. 1-hour	Annual	Annual	Max. 24-hour	Annual	Max. 24-hour	Max. Calendar Quarter	Max. 1-hour
RFP East Entrance	13.1[d]	86.4[d]	120.4[d]	4,437[d]	11,108[d]	20.7[d]	47.7[e]	156.4[e]	20.9[f]	42.5[f]	0.119[d]	561.5[d]
Collocated duplicate	a	a	a	a	a	a	51.7[e]	145.5[e]	21.2[g]	43.4[g]	a	a

E4 3524

[a] Not monitored.
[b] Total suspended particulates. Colorado has no TSP standard to compare with these data.
[c] Particulate matter less than 10 microns in diameter.
[d] 1985 - 1988 data.
[e] 1985 - 1990 data.
[f] 1989 - 1990 data.
[g] 1985, 1989, and 1990 data.

Sources: RF Rockwell, 1986b, 1987, 1988, 1989; RF EG&G, 1990a, 1991e.

TABLE D2.1.4–2.—*Source Emission Inventory for RFP—Criteria Pollutants*

Pollutant	Source	Emission Rate (lbs/hr)	Coordinates (UTM)[a]		Stack Parameters				
			Easting	Northing	Base Elevation (ft)	Height (ft)	Inner Diameter (ft)	Exit Temperature (°F)	Exit Velocity (ft/s)
Carbon Monoxide (CO)	Bldg 443-44-86	24.0	482264	4415343	6035.8	85.0	5.0	490	35.78
	Bldg 440-D.GEN.	24.0	482220	4415093	6035.8	8.4	0.5	70	0.03
Nitrogen Dioxide (NO_2)	Bldg 44-44-86	3.01	482264	441543	6035.8	85.0	5.0	490	35.78
	Bldg 440-D.GEN.	0.25	482220	4415093	6035.8	8.4	0.5	70	0.03
	Bldg 776-73	0.46	482779	4415791	6035.8	52.0	0.8	70	0.03
	Bldg 776-74	0.46	482766	4415791	6035.8	52.0	0.5	70	0.03
	Bldg 776-112	0.46	482769	4415801	6035.8	14.0	0.5	70	0.03
	Bldg 776-117	0.46	482778	4415803	6035.8	14.0	0.5	70	0.03
	Bldg 771-86	0.46	482823	4415891	6035.8	150.0	10.1	70	38.59
Particulate Matter (PM_{10})	Bldg 333-18	0.34	482332	4415421	6035.8	16.0	3.4	100	0.03
	Bldg 334-13	0.21	482396	4415481	6035.8	15.0	0.7	75	33.33
	Bldg 776-24	0.29	482741	4415732	6035.8	35.5	24.8	70	2.50
	Bldg 776-32	0.11	482845	4415753	6035.8	35.5	24.8	70	0.65
	Bldg 451-201	0.71	482239	4415151	6035.8	15.0	6.87	70	35.55
	Bldg 443-44-86	1.28	482264	4415343	6035.8	85.0	5.0	490	35.78
	Bldg 440-G5	0.37	482277	4415093	6035.8	17.0	3.0	70	0.03
	Bldg 444- 106	5.25	482344	4415261	6035.8	14.6	2.9	70	59.07
	Bldg 444-122	0.43	482344	4415261	6035.8	20.0	2.6	70	26.88
	Bldg 44-200	0.39	482344	4415261	6035.8	17.0	13.8	70	11.12
	Bldg 776-32	0.41	482845	4415753	6035.8	35.5	24.8	70	0.65
	Bldg 374-3	1.62	482417	4415778	6035.8	30.0	1.3	70	62.82
Sulfur Dioxide (SO_2)	Bldg 44315	0.62	482264	441543	6035.8	28.0	0.8	500	77.85
	Bldg 443-44-86	10.82	482264	441543	6035.8	85.0	5.0	490	35.78

E4 3579

[a] Universal Transverse Mercator Coordinates (in meters).

Source: RF EG&G, 1990a, 1991e.

TABLE D2.1.4-3.—*Emission Rates and Maximum Site Boundary Concentration of Hazardous/Toxic Air Pollutants at RFP*

Hazardous/Toxic Air Pollutant	Emission Rate (lbs/hr)[a]	Maximum Annual Average Concentration ($\mu g/m^3$)	Standard or Guideline ($\mu g/m^3$)
1,1,1-Trichloroethane	4.70	0.42	1000[c]
Acetone	0.03	0.003	b
Ammonia	1.87	0.2	b
Carbon Tetrachloride	8.45	0.76	0.067
Cyclohexane	0.02	0.002	b
Dioctyl Phthalate	0.05	0.004	b
Ethyl Alcohol	0.02	0.003	b
Ethylene Glycol	0.07	0.005	b
Freon-113	4.82	0.43	27,000[c]
Hydrogen Chloride	0.46	0.04	b
Hydrogen Flouride	1.29	0.12	b
Isopropyl Alcohol	0.03	0.003	b
Lead	0.05	0.004	b
Methylene Chloride	0.81	0.07	2.128
Nitric Acid	0.56	0.05	b

E4 3526

a Only those emitted at rates greater than or equal to approximately 100 lb/yr (0.01 lb/hr) are listed.
b No state standard.
c 30-day average concentration

Source RF Tab F, 1992.

D.2.1.5 *Savannah River Site*

The Savannah River Site (SRS) is located in Aiken, Barnwell, and Allendale counties, SC, in the Augusta-Aiken Interstate AQCR. As of 1991, the area within this AQCR was designated as attainment with respect to the NAAQS (40 CFR 81.341). The basis for assessing the air quality of a given location is by comparison to applicable Federal and state ambient air quality standards. The applicable Federal standards are the NAAQS (40 CFR 50), and the applicable state standards are those adopted by the South Carolina Department of Health. Table D2.1.1-1 presents these standards for the criteria air pollutants (SO_2, NO_2, PM_{10}, TSP, CO, and Pb). South Carolina also has standards for gaseous fluorides. These are also presented in the table.

Currently, ambient air quality within the SRS site boundary is monitored at five locations. The ambient air quality data, as summarized in table D2.1.5-1, are small percentages of the limits set in applicable ambient standards.

The emissions inventory for the criteria pollutants used in the analysis is presented in table D2.1.5-2. The principal sources of criteria air pollutants at SRS are (1) the 13 coal-burning boilers for producing steam and electricity (A-, D-, H-, K-, and P-Areas); (2) fuel and target fabrication (M-Area), and processing facilities (F- and H-Areas); and (3) continuously operating diesel generators (F-, H-, K-, L-, and P-Areas). Other emissions include fugitive particulate emissions from coal piles and coal processing facilities, vehicular emissions, and temporary emissions from various construction-related activities.

Since the adoption of PSD regulations, PSD permits have not been required for any of the new SRS emission sources or modifications to existing ones. In South Carolina, the only source in the Augusta-Aiken Interstate AQCR that has been issued a PSD permit is located near Orangeburg, about 40 miles northeast of the nearest SRS boundary. Four sources in the Georgia portion of the AQCR have been issued PSD permits. The closest of these is approximately 10 miles west of the nearest SRS boundary (DOE, 1991c). Because of the substantial distances between these sources and the SRS boundary, the PSD concentration increments used at the SRS boundary by these sources are expected to be negligible (see table D2.1.1-4 for the maximum allowable PSD increments).

The annual emission rates of HAPs/toxics from existing SRS facilities during 1990 and the estimated maximum 24-hour average ground-level concentrations at the SRS boundary are listed in table D2.1.5-3. These are compared to the applicable HAP/toxics concentration limits adopted by the South Carolina Department of Health (SC DHEC, 1991).

TABLE D2.1.5-1.—*Existing Ambient Air Quality Data for SRS*

Monitoring Station	Time Period	Sulfur Dioxide			Nitrogen Dioxide	PM_{10}[a]		TSP[b]
		Annual	Max. 24-hour	Max. 3-hour	Annual	Annual	Max. 24-hour	Annual
36 G, 38 G, 39 G, 40 G, and 41 G	1985	5	34	48	6	27	47	27

E4 3515

[a] Particulate matter less than 10 microns in diameter.
[b] Total suspended particulates.

Source: DOE, 1991f.

TABLE D2.1.5-2.—*Source Emission Inventory for SRS—Criteria Pollutants* [Page 1 of 5]

Pollutant	Source	Emission Rate		Coordinates (UTM)[a]		Stack Parameters					
		Stack (lbs/hr)	Area (lbs/hr/ft^2)	Easting	Northing	Base Elevation (ft)[b]	Height (ft)	Inner Diameter (ft)	Exit Temp (°F)	Exit Velocity (ft/sec)	Width of the Area Source (ft)
Carbon Monoxide (CO)	784-A Boiler 1	14.0		431659	3688870	0	75	5.9	340	12.13	
	784-A Boiler 2	14.0		431659	3688870	0	75	5.9	340	12.13	
	484-D Boiler 1	9.6		430841	3673873	0	125	9.84	300	26.57	
	484-D Boiler 2	9.6		430869	3673840	0	125	9.84	300	26.57	
	484-D Boiler 3	9.6		430887	3673748	0	125	9.84	300	26.57	
	484-D Boiler 4	9.6		430904	3673748	0	125	9.84	300	26.57	
	284-H Boiler 1	14.0		430314	3682953	0	75	5.9	340	12.13	
	284-H Boiler 2	14.0		430314	3682953	0	75	5.9	340	12.13	
	284-H Boiler 3	14.0		430314	3682953	0	75	5.9	340	12.13	
	184-K Boiler 1	37.9		438443	3676349	0	21	2.62	556	7.55	
	184-K Boiler 2	37.9		438443	3676349	0	21	2.62	556	7.55	
	184-P Boiler 1	37.9		446195	3676349	0	21	2.62	556	7.55	
	184-P Boiler 2	37.9		446195	3676349	0	21	2.62	556	7.55	
	H Diesel Gen(2)	0.794		440314	3682953	0	30	0.33	340	12.13	
	F Diesel Gen(2)	0.714		437393	3682862	0	30	0.33	340	12.13	
	K Diesel Gen(2)	0.873		438443	3674542	0	30	0.33	340	12.13	
	L Diesel Gen(2)	0.873		441963	3674695	0	30	0.33	340	12.13	
	P Diesel Gen(2)	0.873		446195	3676349	0	30	0.33	340	12.13	
	CIF	0.033		431659	3688870	0	150	8.53	1600	10.0	
	K Source		1.0E-6	438000	3674400	0	25				1912
	L Source		1.0E-6	441700	3674300	0	25				1870
	P Source		1.0E-6	445700	3676400	0	25				1827
	S Source		1.0E-6	440300	3683700	0	25				1325
	Z Source		1.0E-5	436900	3678800	0	25				463
	B source		1.0E-6	438800	3678400	0	25				1407
	TNX Source		4.0E-6	432300	3682800	0	25				761
	C Source		1.0E-6	440300	3684700	0	25				1936
	CS Source		1.0E-6	429100	3674500	0	25				1975

E4 3517-1

Footnotes at end of table.

TABLE D2.1.5-2.—*Source Emission Inventory for SRS—Criteria Pollutants*—Continued [Page 2 of 5]

Pollutant	Source	Emission Rate		Coordinates (UTM)[a]		Stack Parameters					
		Stack (lbs/hr)	Area (lbs/hr/ft^2)	Easting	Northing	Base Elevation (ft)[b]	Height (ft)	Inner Diameter (ft)	Exit Temp (°F)	Exit Velocity (ft/sec)	Width of the Area Source (ft)
Nitrogen Dioxide (NO_2)	784-A Boiler 1	39.13		431659	3688870	0	75	5.9	340	12.13	
	784-A Boiler 2	39.13		431659	3688870	0	75	5.9	340	12.13	
	484-D Boiler 1	544.9		430841	3673873	0	125	9.84	300	26.57	
	484-D Boiler 2	544.9		430869	3673840	0	125	9.84	300	26.57	
	484-D Boiler 3	544.9		430887	3673792	0	125	9.84	300	26.57	
	383-D Boiler 4	544.9		430904	3673748	0	125	9.84	300	26.57	
	284-H Boiler 1	39.13		430314	3682953	0	75	5.9	340	12.13	
	284-H Boiler 2	39.13		430314	362953	0	75	5.9	340	12.13	
	284-H Boiler 3	39.13		430314	3682953	0	75	5.9	340	12.13	
	184-K Boiler 1	106.4		438443	3676349	0	21	2.62	556	7.55	
	184-K Boiler 2	106.4		438443	3676349	0	21	2.62	556	7.55	
	184-P Boiler 1	106.4		446195	3676349	0	21	2.62	556	7.55	
	184-P Boiler 2	106.4		446195	3676349	0	21	2.62	556	7.55	
	H Diesel Gen(2)	12.3		440314	3682953	0	30	0.33	340	12.13	
	F Diesel Gen(2)	9.603		437393	3682862	0	30	0.33	340	12.13	
	K Diesel Gen(2)	13.49		438443	3674542	0	30	0.33	340	12.13	
	L Diesel Gen(2)	13.49		4411963	3674695	0	30	0.33	340	12.13	
	P Diesel Gen(2)	13.49		446195	3676349	0	30	0.33	340	12.13	
	CIF	8.651		431659	3688870	0	150	8.53	1600	10.0	
	A Source		7.0E-6	431300	3688400	0	25				2831
	D Source		9.0E-6	430800	3673700	0	25				2415
	H Source		7.0E-6	440100	3682700	0	25				2579
	F Source		7.0E-6	436700	3682400	0	25				2831
	K Source		1.4E-5	438000	3674400	0	25				1912
	L Source		1.5E-5	441700	3674300	0	25				1870
	P Source		1.5E-5	445700	3676400	0	25				1827
	S Source		2.9E-5	440300	3683700	0	25				1325
	Z Source		2.4E-4	436900	3678800	0	25				463
	B source		2.6E-5	438800	3678400	0	25				1407
	TNX Source		8.8E-5	432300	3682800	0	25				761
	C Source		1.3E-5	440300	3684700	0	25				1936
	CS Source		1.3E-5	429100	3674500	0	25				1975

E4 3517-2

Footnotes at end of table.

TABLE D2.1.5-2.—*Source Emission Inventory for SRS—Criteria Pollutants*—Continued [Page 3 of 5]

Pollutant	Source	Emission Rate		Coordinates (UTM)[a]		Stack Parameters					
		Stack (lbs/hr)	Area (lbs/hr/ft^2)	Easting	Northing	Base Elevation (ft)[b]	Height (ft)	Inner Diameter (ft)	Exit Temp (°F)	Exit Velocity (ft/sec)	Width of the Area Source (ft)
Nitrogen Dioxide (NO_2) (continued)	F Pu Separation	137.0		436838	3683138	0	200	9.84	68	53.15	
	H H3 Separation	6.826		440342	3683266	0	200	9.84	68	42.98	
	M Air Stripper	2.302		431327	3688558	0	100	2.62	68	45.93	
	DWPF Nitrate PR	8.413		440336	3684139	0	100	2.62	68	45.93	
Particulate Matter (PM_{10})	784-A Boiler 1	10.16		431659	3688870	0	75	5.9	340	12.13	
	784-A Boiler 2	10.16		431659	3688870	0	75	5.9	340	12.13	
	484-D Boiler 1	21.67		430841	3673873	0	125	9.84	300	26.57	
	484-D Boiler 2	21.67		430869	3673840	0	125	9.84	300	26.57	
	484-D Boiler 3	21.67		430887	3673792	0	125	9.84	300	26.57	
	484-D Boiler 4	21.67		430904	3673748	0	125	9.84	300	26.57	
	284-H Boiler 1	10.16		430314	3682953	0	75	5.9	340	12.13	
	284-H Boiler 2	10.16		430314	3682953	0	75	5.9	340	12.13	
	284-H Boiler 3	10.16		430314	3682953	0	75	5.9	340	12.13	
	184-K Boiler 1	27.78		438443	3676349	0	21	2.62	556	7.55	
	184-K Boiler 2	27.78		438443	3676349	0	21	2.62	556	7.55	
	184-P Boiler 1	27.78		446195	3676349	0	21	2.62	556	7.55	
	184-P Boiler 2	27.78		446195	3676349	0	21	2.62	556	7.55	
	H Diesel Gen(2)	0.794		440314	3682953	0	30	0.33	340	12.13	
	F Diesel Gen(2)	0.714		437393	3682862	0	30	0.33	340	12.13	
	K Diesel Gen(2)	0.873		438443	3674542	0	30	0.33	340	12.13	
	L Diesel Gen(2)	0.873		441963	3674695	0	30	0.33	340	12.13	
	P Diesel Gen(2)	0.873		446195	3676349	0	30	0.33	340	12.13	
	CIF	5.0E-4		431659	3688870	0	150	8.53	1600	10.0	
	K Source		1.0E-6	438000	3674400	0	25				1912
	L Source		1.0E-6	441700	3674300	0	25				1870
	P Source		1.0E-6	445700	3676400	0	25				1827
	S Source		1.0E-6	440300	3683700	0	25				1325
	Z Source		7.0E-6	436900	3678800	0	25				463
	B Source		1.0E-6	438800	3678400	0	25				1407
	TNX Source		3.0E-6	432300	3682800	0	25				761
	C Source		1.0E-6	440300	3684700	0	25				1936
	S Concrete Batch	45.40		440336	3684139	0	20	1.64	70	1.97	

E4 3517-3

Footnotes at end of table.

TABLE D2.1.5-2.—*Source Emission Inventory for SRS—Criteria Pollutants*—Continued [Page 4 of 5]

Pollutant	Source	Emission Rate		Coordinates (UTM)[a]		Stack Parameters					
		Stack (lbs/hr)	Area (lbs/hr/ft^2)	Easting	Northing	Base Elevation (ft)[b]	Height (ft)	Inner Diameter (ft)	Exit Temp (°F)	Exit Velocity (ft/sec)	Width of the Area Source (ft)
Particulate Matter (PM_{10}) (continued)	D Coal Pile Top		1.0E-6	431137	3673619	0	30				547
	D Coal Pile Bottom		4.0E-6	431218	3673518	0	30				394
	P Coal Pile		1.0E-6	445978	3676296	0	30				318
	K Coal Pile		2.0E-6	438194	3674437	0	30				318
	F Coal Pile		1.0E-6	437221	3682731	0	30				223
	H Coal Pile		1.0E-6	440314	3682953	0	30				220
	A Coal Pile		3.0E-6	431645	3688756	0	30				184
	D Area Coal Crush		8.7E-4	431137	3673619	0	30				52
Sulfur Dioxide (SO_2)	784-A Boiler 1	106.8		431659	3688870	0	75	5.90	340	12.13	
	784-A Boiler 2	106.8		431659	3688870	0	75	5.90	340	12.13	
	484-D Boiler 1	743.0		430841	3673873	0	125	9.84	300	26.57	
	484-D Boiler 2	743.0		430869	3673840	0	125	9.84	300	26.57	
	484-D Boiler 3	743.0		430887	3673792	0	125	9.84	300	26.57	
	383-D Boiler 4	743.0		430904	3673748	0	125	9.84	300	26.57	
	284-H Boiler 1	106.8		430314	3682953	0	75	5.90	340	12.13	
	284-H Boiler 2	106.8		430314	362953	0	75	5.9	340	12.13	
	284-H Boiler 3	106.8		430314	3682953	0	75	5.9	340	12.13	
	184-K Boiler 1	289.7		438443	3676349	0	21	2.62	556	7.55	
	184-K Boiler 2	289.7		438443	3676349	0	21	2.62	556	7.55	
	184-P Boiler 1	289.7		446195	3676349	0	21	2.62	556	7.55	
	184-P Boiler 2	289.7		446195	3676349	0	21	2.62	556	7.55	
	H Diesel Gen(2)	0.794		440314	3682953	0	30	0.33	340	12.13	
	F Diesel Gen(2)	0.714		437393	3682862	0	30	0.33	340	12.13	
	K Diesel Gen(2)	0.873		438443	3674542	0	30	0.33	340	12.13	
	L Diesel Gen(2)	0.873		4411963	3674695	0	30	0.33	340	12.13	
	P Diesel Gen(2)	0.873		446195	3676349	0	30	0.33	340	12.13	
	CIF	0.079		431659	3688870	0	150	8.53	1600	10.0	

E4 3517-4

Footnotes at end of table.

TABLE D2.1.5-2.—*Source Emission Inventory for SRS—Criteria Pollutants*—Continued [Page 5 of 5]

Pollutant	Source	Emission Rate		Coordinates (UTM)[a]		Stack Parameters					
		Stack (lbs/hr)	Area (lbs/hr/ft^2)	Easting	Northing	Base Elevation (ft)[b]	Height (ft)	Inner Diameter (ft)	Exit Temp (°F)	Exit Velocity (ft/sec)	Width of the Area Source (ft)
Sulfur Dioxide (SO_2) (Continued)	A Source		1.0E-6	431300	3688400	0	25				2831
	D Source		3.0E-6	430800	3673700	0	25				2415
	H Source		2.0E-6	440100	3682700	0	25				2579
	F Source		1.0E-6	436700	3682400	0	25				2831
	K Source		4.0E-6	438000	3674400	0	25				1912
	L Source		4.0E-6	441700	3674300	0	25				1870
	P Source		4.0E-6	445700	3676400	0	25				1827
	S Source		9.0E-6	440300	3683700	0	25				1325
	Z Source		7.2E-5	436900	3678800	0	25				463
	B source		7.0E-6	438800	3678400	0	25				1407
	TNX Source		2.7E-5	432300	3682800	0	25				761
	C Source		4.0E-6	440300	3684700	0	25				1936
	CS Source		4.0E-6	429100	3674500	0	25				1975

E4 3517-5

[a] Universal Transverse Mercator Coordinates (in meters).
[b] Assumed elevation for modeling purposes, no terrain effects included.

Source: SR Tab F, 1992.

TABLE D2.1.5-3.—*Emission Rates and Maximum Site Boundary Concentration of Hazardous/Toxic Air Pollutants at SRS*

Hazardous/Toxic Air Pollutant	Emission Rate (lbs/hr)[c]	Maximum 24-hour Source Contributions at Site Boundary (μg/m^3)	South Carolina Ambient Standard (μg/m^3)[a]
1,1,1-Trichloroethane	2.44	1.3	9,550
Freon-113	1.26	23.3	b
Nitric Acid	2.17	1.1	125

E4 3514

[a] 24-hour average concentration.
[b] No standard.
[c] Only those emitted at rates greater than or equal to 100 lb/yr (0.01 lb/hr) are listed.

Sources: DOE 1991c; SC DHEC, 1991.

D.2.1.6 *Los Alamos National Laboratory*

The Los Alamos National Laboratory (LANL) is located in Los Alamos County, New Mexico, within the New Mexico Intrastate AQCR (AQCR 157). All of the areas within LANL and its surrounding counties are designated as attainment areas with respect to the NAAQS (40 CFR 50). The nearest nonattainment area for CO and TSP is in Bernalillo County, about 40 miles south. The applicable NAAQS and New Mexico ambient air quality standards are given in table D2.1.1-1.

PSD regulations (40 CFR 52.21) limit the maximum allowable incremental increases in ambient concentrations of SO_2, NO_2, and TSP above established baseline conditions. The PSD regulations, which are designed to protect ambient air quality in attainment areas, apply to new sources and major modifications to existing sources. One PSD Class I area, the Bandelier National Monument's Wilderness Area, borders LANL to the south. The maximum allowable PSD increases are listed in table D2.1.1–4. Since the promulgation of the PSD regulations (40 CFR 52.21) in 1977, no PSD permits have been required for any source at LANL (LANL, 1990a).

Ambient air quality within and near the LANL site boundary is currently monitored for TSP (LANL, 1990a). The ambient air quality data are summarized in table D2.1.6-1.

The principal sources of criteria air pollutants at LANL (LANL, 1990a) are: (1) the steam plants and power plant; (2) beryllium operations including machining in shop 4 at area TA-3-39, in shop 13 at area TA-3-102, the beryllium shop at area TA-35-213, and the beryllium processing facility at area TA-3-141; (3) the asphalt plant; (4) burning of high-explosive wastes and experimental detonation of conventional explosives at the TA-16 burnground; and (5) the lead pouring facility for casting lead at area TA-3-38. Other emissions include fugitive particulate emissions from waste-burial activities and coal piles, other process emissions, vehicular emissions, and temporary emissions from various construction activities. Emission estimates for the sources used in the analyses are presented in table D2.1.6-2.

Ambient concentration limits have been adopted by New Mexico for HAPs/toxics. Applicants for new sources must meet emission limits or ambient concentration limits at or beyond the site boundary. For new sources, the concentrations cannot exceed a factor of one one-hundredth of the Occupational Exposure Limit (OEL) contained in New Mexico Environmental Improvement Board regulation 702, appendix A (NMEIB, 1991a). Existing sources must demonstrate that the ambient concentrations are less than the OEL as contained in New Mexico Environmental Improvement Board regulation 752, appendix A (NMEIB, 1991a). The emission rates of HAPs/toxics from existing LANL facilities during 1989 and estimates of their maximum 8-hour average ground-level concentrations at the boundary are listed in table D2.1.6-3. For a conservative estimate of existing sources, one one-hundredth of the OEL is presented in the table for these sources.

TABLE D2.1.6–1.—*Existing Ambient Air Quality Data for LANL*

Monitoring Station	Time Period	Ozone Max 1-hour	TSP[b] Annual	TSP[b] 24-hour
Los Alamos	1985 - 1989	a	26.6	150.8
White Rock	1985 - 1989	a	29.7	92.6
Bandelier	Jan.- June 1986	149	a	a

E4 3544

[a] Not measured.
[b] Total suspended particulates.

Sources: LANL, 1986, 1987a, 1988a, 1989a, 1990b.

TABLE D2.1.6–2.—*Source Emission Inventory for LANL—Criteria Pollutants*

Pollutant	Source	Emission Rate (lbs/hr)	Coordinates (UTM)[a] Easting	Northing	Stack Parameters Base Elevation (ft)	Height (ft)	Inner Diameter (ft)	Exit Temperature (°F)	Exit Velocity (ft/sec)
Carbon Monoxide (CO)	TA–3 Boiler	22.88	381286	3972297	7,269	61	4.5	320	17.3
	TA–16 Boiler	1.49	379521	3969247	7,269	37	4.5	320	17.3
	TA–21 Boiler	1.49	385057	3972256	7,269	50	4.5	320	17.3
	West Area Boiler	1.575	381286	3972297	7,269	30	0.3	340	12.0
	NG–Burning	1.133	381286	3972297	7,269	30	0.3	340	12.0
	LPG–Burning	0.005	381286	3972297	7,269	30	0.3	340	12.0
	Diesel–Burning	1.806	381286	3972297	7,269	30	0.3	340	12.0
Nitrogen Dioxide (NO_2)	TA–3 Boiler	14.1	381286	3972297	7,269	61	4.5	320	17.3
	TA–16 Boiler	5.95	379521	3969247	7,269	37	4.5	320	17.3
	TA–21 Boiler	5.95	385057	3972256	7,269	50	4.5	320	17.3
	West Area Boiler	6.3	381286	3972297	7,269	30	0.3	340	12.0
	NG–Burning	5.67	381286	3972297	7,269	30	0.3	340	12.0
	LPG–Burning	0.023	381286	3972297	7,269	30	0.3	340	12.0
	Diesel–Burning	8.306	381286	3972297	7,269	30	0.3	340	12.0
Particulate Matter (PM_{10})	TA–3 Boiler	1.62	381286	3972297	7,269	61	4.5	320	17.3
	TA–16 Boiler	0.13	379521	3969247	7,269	37	4.5	320	17.3
	TA–21 Boiler	0.13	385057	3972256	7,269	50	4.5	320	17.3
	West Area Boiler	0.135	381286	3972297	7,269	30	0.3	340	12.0
	NG–Burning	0.17	381286	3972297	7,269	30	0.3	340	12.0
	Diesel–Burning	0.59	381286	3972297	7,269	30	0.3	340	12.0

E4 3572

[a] Universal Transverse Mercator Coordinates (in meters).

Source: LA Tab F, 1992

TABLE D2.1.6-3.—*Emission Rates and Maximum Site Boundary Concentration of Hazardous/Toxic Air Pollutants at LANL*

Hazardous/Toxic Air Pollutant	Emission Rate[a] (lbs/hr)	Maximum 8-hour Average Concentration ($\mu g/m^3$)	New Mexico State Standard[b] ($\mu g/m^3$)
2-Butoxyethanol	0.11	2.5	1,200
Acetic Acid	0.01	0.23	250
Acetone	1.23	26.3	5,900
Acetonitrile	0.03	0.54	340
Ammonia	0.43	9.2	180
Chloroform (trichloromethane)	0.05	1.07	97.5
Dioxane	0.01	0.29	36
Fluoride Compounds	0.01	0.29	25
Hexane (N-hexane)	0.05	1.05	1,800
Hydrogen Chloride	0.21	4.4	70
Isopropyl Alcohol	0.09	2.0	9,800
Methyl Acetate	0.17	3.6	6,100
Methyl Alcohol	0.5	10.7	2,600
Methyl Ethyl Ketone	0.37	7.7	5,900
Methylene Chloride (dichloromethane)	0.08	1.7	2,610
N-butyl Acetate	0.01	0.24	7,100
Nitric Acid	0.19	4.1	50
Nitric Oxide	0.12	2.5	300
Nitrogen Oxide	0.12	2.5	300
Nitrous Oxide	0.05	1.09	449
sec-Butyl Alcohol	0.01	0.26	3,050
Stoddard Solvent	0.11	2.3	5,250
Sulfuric Acid	0.01	0.29	10
Tetrahydrofuran	0.02	0.47	5,900
Toluene (methylbenzene)	0.03	0.65	3,750
Trichloroethylene	0.14	3.0	250
Turpentine	0.07	1.4	5,600
VM&P Naphtha	0.25	5.2	13,500
Xylene (dimethylbenzene)	0.15	3.3	4,350

E4 3540

a Only those emitted at rates greater than or equal to 100 lb/yr (0.01 lb/hr) are listed.
b One one-hundredth of the OEL (Occupational Exposure Level).

Source: LANL, 1990b.

D.2.1.7 *Y-12 Plant*

The Y-12 Plant (Y-12) is located within the Oak Ridge Reservation (ORR). ORR is located in Anderson and Roane counties in the Eastern Tennessee-Southwestern Virginia Interstate AQCR. As of 1990, the areas within this AQCR were designated as attainment with respect to any of the NAAQS (40 CFR 81.343); that is, listed as "cannot be classified" or "better than national standards" for TSP, SO_2, O_3, CO, and NO_2. Table D2.1.1-1 presents these standards for the criteria air pollutants.

Ambient air monitoring data provide an indication of the background air quality unaffected by the site. Ambient air quality within Y-12 is monitored at two locations. The data from these monitoring stations for 1989 and 1990 are presented in table D2.1.7-1. The maximum background concentrations were used in the analysis.

The principal sources of criteria air pollutants at Y-12 is the ORR steam plant. Other sources include fugitive particulate emissions from coal piles, other process emissions, vehicular emissions, and temporary emissions from various construction processes (Y-12 MMES, 1987). Table D2.1.7-2 presents criteria pollutants emissions from ORR by source group.

PSD regulations (40 CFR 52.21) limit the maximum allowable incremental increases in ambient concentrations of SO_2, NO_2, and TSP above established baseline conditions. The PSD regulations, which are designed to protect ambient air quality in attainment areas, apply to new sources and major modifications to existing sources.

Table D2.1.1-4 presents the maximum allowable PSD increments. Since the promulgation of the PSD regulations, no PSD permits have been required for any source at ORR.

The Tennessee Department of Health and Environment (TDHE, 1991) uses the list of HAPs promulgated by Title III of the 1990 CAA. The acceptable ambient concentration is defined as 10 percent of the TLV or Permissible Exposure Limit (PEL), whichever is the most restrictive. For those "high-risk pollutants," the acceptable ambient air concentration is defined as 1 percent of the TLV or PEL, whichever is the most restrictive.

Table D2.1.7-3 presents the estimated emissions and predicted concentrations of HAPs/toxics from the Y-12 Plant.

TABLE D2.1.7–1.—*Existing Ambient Air Quality Data for the Oak Ridge Reservation*

Monitoring Station	Time Period	Ambient Concentration ($\mu g/m^3$)						
		Sulfur Dioxide			TSP[a]		Hydrogen Fluoride	
		Annual	Max. 24-hour	Max. 3-hour	Annual	Max. 24-hour	Max. 30-Day	Max. 7-Day
Y-12 East	1989 - 1990	35.1	165.6	322.0	45.0	129.2	b	b
Y-12 West	1989 - 1990	18.6	110.5	253.8	76.0	385.6	b	b
Y-12 #4	1989 - 1990	b	b	b	b	b	0.16	0.28

E4 3546

[a] Total suspended particulates.
[b] Not measured.

Sources: Y-12 MMES, 1990, 1991b.

TABLE D2.1.7–2.—*Source Emission Inventory for the Oak Ridge Reservation—Criteria Pollutants*

Pollutant	Source	Emission Rate (lbs/hr)	Coordinates (UTM)[a]		Stack Parameters				
			Easting	Northing	Base Elevation (ft)	Height (ft)	Inner Diameter (ft)	Exit Temperature (°F)	Exit Velocity (ft/sec)
Carbon Monoxide (CO)	Y–9401 West Stk	24	747586	3985269	981	190	12.5	310	29.0
	Y–9401 East Stk	24	747586	3985269	981	190	15.0	310	20.0
Nitrogen Dioxide (NO_2)	Y–9401 West Stk	782	747586	3985269	981	190	12.5	310	29.0
	Y–9401 East Stk	782	747586	3985269	981	190	15.0	310	20.0
Particulate Matter (PM_{10})	Y–9401 West Stk	103	747586	3985269	981	190	12.5	310	29.0
	Y–9401 East Stk	103	747586	3985269	981	190	15.0	310	20.0
Sulfur Dioxide (SO_2)	Y–9401 West Stk	2,420	747586	3985269	981	190	12.5	310	29.0
	Y–9401 East Stk	2,420	747586	3985269	981	190	15.0	310	20.0

E4 3547

[a] Universal Transverse Mercator Coordinates (in meters).

Source: Y-12 Tab F, 1992.

TABLE D2.1.7-3.—*Emission Rates and Maximum Site Boundary Concentration of Hazardous/Toxic Air Pollutants at the Oak Ridge Reservation*

Hazardous/Toxic Air Pollutant	Emission Rate (lbs/hr) [b]	Maximum 8-hour Average Concentration ($\mu g/m^3$)	Tennessee Department of Health and Environment Standard ($\mu g/m^3$)
1,1,1–Trichloroethane	3.49	92.6	19,000
Acetic Acid	0.007	0.2	2,500
Acetonitrile	0.30	7.9	6,700
Chlorine	0.07	2.1	150
Freon-113	6.58	174.9	a
Hydrogen Chloride	2.35	62.6	700
Methyl Alcohol	10.05	266.8	26,000
Nitric Acid	6.62	175.8	500
Sulfuric Acid	0.005	0.1	100
Tetrarchloroethylene	1.87	49.9	17,000

E4 3548

[a] No state standard.
[b] Only those emitted at rates greater than or equal to approximately 100 lb/yr (0.01 lb/hr) are listed.

Sources: Y-12 Tab F, 1992; TDHE, 1991.

D.2.1.8 *Sandia National Laboratories, Albuquerque*

Sandia National Laboratories, Albuquerque (SNL) is located in Bernalillo County, NM, within the Albuquerque Mid-Rio Grande New Mexico Intrastate AQCR. This AQCR is designated as nonattainment for CO and TSP (40 CFR 42-81.332) and attainment for the other criteria pollutants. The applicable NAAQS and New Mexico ambient air quality standards are given in table D2.1.1-1.

Ambient air quality is currently monitored by the state at various locations throughout Albuquerque for NO_2, PM_{10}, O_3, and CO. Ambient air data collected at these monitoring stations are summarized in table D2.1.8-1.

The principal sources of criteria air pollutants at SNL (SNL, 1988) are: (1) the steam plant at Area I; (2) the paint shops, hazardous machine shop, process development laboratory, emergency diesel generator plant, and the solvent spray booth, all located at Area I; and (3) the explosive testing at Area II. Other emissions include fugitive particulate emissions from waste-burial activities, other process emissions, vehicular emissions, and temporary emissions from various construction activities. Emission estimates for these sources are presented in table D2.1.8-2.

Since the promulgation of the PSD regulations in 1977, no PSD permits have been required for any source at SNL. Table D2.1.1-4 presents the maximum allowable PSD increments. One PSD Class I area, the Bandelier National Monument's Wilderness Area, is approximately 60 miles north of SNL.

Ambient concentration limits have been adopted by New Mexico for HAPs/toxics. Applicants for new sources must meet emission limits or ambient concentration limits at or beyond the site boundary for HAPs/toxics. For new sources the concentrations cannot exceed one one-hundredth of the Occupational Exposure Level (OEL) contained in New Mexico Environmental Improvement Board regulation 702, appendix A (NMEIB, 1991a). Existing sources must demonstrate that the ambient concentrations are less than the Occupational Exposure Level (OEL) as contained in New Mexico Environmental Improvement Board regulation 752, appendix A (NMEIB, 1991a). The emission rates of HAPs/toxics from existing SNL facilities during 1991 and estimates of their maximum 8-hour average ground-level concentrations at the SNL boundary are listed in table D2.1.8-3. For a conservative estimate of existing sources, one-hundredth of the OEL is presented in the table.

TABLE D2.1.8–1.—*Existing Ambient Air Quality Data for SNL*

Monitoring Station[d]	Ambient Concentration (μg/m³)					
	Carbon Monoxide		Nitrogen Dioxide	PM_{10}[b]		Ozone
	Max. 8-hour	Max. 1-hour	Annual	Annual	Max. 24-hour	Max. 1-hour
2G	a	a	a	21.3[c]	48	a
2R	5,153	10,305	a	31.3[c]	63	174.6
2ZE	6,527	10,305	a	17.0[c]	31	170.7
2ZF	a	a	a	a	a	192.3
2ZH	a	a	a	35.8[c]	104	186.4
2ZK	7,537	13,740	a	21.2[c]	36	a
2ZL	2,045	8,015	a	18.8[c]	39	a
2ZM	5,954	13,740	159.9[c]	19.2[c]	45	160.9
2ZN	a	a	a	18.9[c]	53	a
2ZO	a	a	a	29.4[c]	56	a

E4 3567

[a] Not monitored.
[b] Particulate matter less than 10 microns in diameter.
[c] Indicates that less than 75 percent of readings were present for calculation.
[d] Monitoring Station Information:

2G: City Yards 5501 Pino Road N.E., Albuquerque, Bernalillo
2R: 4100 Isleta S.W., Albuquerque, Bernalillo
2ZE: Charles Well #1 2421 Mesilla N.E., Albuquerque, Bernalillo
2ZF: Well 1 mi. W of Tramway & Tramway, Albuquerque, Bernalillo
2ZH: Alameda Fire Station - 9819 2nd N.W., Albuquerque, Bernalillo
2ZK: LE CO #2621 San Mateo N.E., Albuquerque, "Micro CO," Bernalillo
2ZL: 10155 Coors Road N.W., Albuquerque, Bernalillo
2ZM: 4700-A San Mateo N.E., Albuquerque, Bernalillo
2ZN: N.S.E., Albuquerque, Bernalillo
2ZO: 1500 Broadway N.E., Albuquerque, Bernalillo

Sources: NMEIB, 1991b.

TABLE D2.1.8–2.—*Source Emission Inventory for SNL—Criteria Pollutants*

Pollutant	Source	Emission Rate (lbs/hr)	Coordinates (UTM)[a]		Stack Parameters				
			Easting	Northing	Base Elevation[b] (ft)	Height (ft)	Inner Diameter (ft)	Exit Temperature (°F)	Exit Velocity (ft/sec)
Carbon Monoxide (CO)	Boiler 1	0.667	358800	3879700	0	64	3.75	450	6.15
	Boiler 2	0.429	358800	3879700	0	64	3.75	450	4.33
	Boiler 3	0.511	358800	3879700	0	64	3.75	450	6.83
	Boiler 5	0.269	358800	3879700	0	64	5.1	350	17.8
	Boiler 6	1.123	358800	3879700	0	64	5.1	350	6.32
	Diesel Generator	0.034	359200	3879700	0	29	0.67	700	280.0
Hydrocarbons (HC)	Boiler 1	0.053	358800	3879700	0	64	3.75	450	6.15
	Boiler 2	0.034	358800	3879700	0	64	3.75	450	4.33
	Boiler 3	0.041	358800	3879700	0	64	3.75	450	6.83
	Boiler 5	0.009	358800	3879700	0	64	5.1	350	17.8
	Boiler 6	0.039	358800	3879700	0	64	5.1	350	6.32
Nitrogen Dioxide (NO_2)	Boiler 1	2.670	358800	3879700	0	64	3.75	450	6.15
	Boiler 2	1.710	358800	3879700	0	64	3.75	450	4.33
	Boiler 3	2.050	358800	3879700	0	64	3.75	450	6.83
	Boiler 5	3.700	358800	3879700	0	64	5.1	350	17.8
	Boiler 6	15.46	358800	3879700	0	64	5.1	350	6.32
	Diesel Generator	0.297	359200	3879700	0	29	0.67	700	280.0
Sulfur Dioxide (SO_2)	Boiler 1	0.011	358800	3879700	0	64	3.75	450	6.15
	Boiler 2	0.007	358800	3879700	0	64	3.75	450	4.33
	Boiler 3	0.009	358800	3879700	0	64	3.75	450	6.83
	Boiler 5	0.005	358800	3879700	0	64	5.1	350	17.8
	Boiler 6	0.016	358800	3879700	0	64	5.1	350	6.32
Total Suspended Particulates (TSP)	Boiler 1	0.096	358800	3879700	0	64	3.75	450	6.15
	Boiler 2	0.062	358800	3879700	0	64	3.75	450	4.33
	Boiler 3	0.073	358800	3879700	0	64	3.75	450	6.83
	Boiler 5	0.034	358800	3879700	0	64	5.1	350	17.8
	Boiler 6	0.142	358800	3879700	0	64	5.1	350	6.32

E4 3562

[a] Universal Transverse Mercator Coordinates (in meters).
[b] Assumed elevation for modeling purposes, no terrain effects included.

Source: SN Tab F, 1992.

TABLE D2.1.8–3.—*Emission Rates and Maximum Site Boundary Concentration of Hazardous/Toxic Air Pollutants at SNL*

Hazardous/Toxic Air Pollutant	Emission Rate (lbs/hr)[b]	Maximum 8-hour Average Concentration ($\mu g/m^3$)	New Mexico State Standard[a]
1,1,1-Trichloroethane	0.18	0.73	c
Acetone	0.07	0.27	5,900
Freon-113	0.02	0.09	c
Hydrogen Chloride	0.01	0.04	70
Isopropyl Alcohol	0.03	0.12	9,800
Methyl Alcohol	0.03	0.12	2600
Methylene Chloride (dichloromethane)	0.01	0.04	2610
Toluene (methylbenzene)	0.14	0.57	3,750
Trichloroethylene	0.03	0.11	250
Xylene (dimethylbenzene)	0.15	0.61	4,350

E4 3522

[a] One one-hundredth of the OEL (Occupational Exposure Level).
[b] Only those emitted rates greater than or equal to approximately 100 lb/yr (0.01 lb/hr) are listed.
[c] No standard.

Source: SN Tab F, 1992.

D.2.2 Acoustics

D.2.2.1 *Kansas City Plant*

Kansas City noise control regulations specify an equivalent sound level at a residential property boundary of 60 decibels A-weighted (dBA) during the daytime (7 a.m. to 10 p.m.) and 55 dBA during nighttime (10 p.m. to 7 a.m.) and 80 dBA at a property boundary with a commercial/light industrial district (Kansas City, 24).

D.2.2.2 *Mound Plant*

The city of Miamisburg noise ordinance (Miamisburg Ordinance) specifies a maximum sound level at a residential property boundary of 60 dBA during the hours 7 a.m. to 9 p.m. and 50 dBA during the hours 9 p.m. to 7 a.m.. Sound levels at a commercial property boundary are limited to 65 dBA and at an industrial property boundary to 70 dBA.

D.2.2.3 *Pinellas Plant*

The Pinellas County Ordinance (Pinellas Ordinance) specifies a maximum noise level at the property boundary of an industrial source of 72 dBA at an adjoining commercial zone, 66 dBA at an adjoining residential zone between 7 a.m. to 6 p.m. Monday through Saturday, and 55 dBA at a residential property all other times. An exception is provided for established industrial or commercial businesses when development has encroached upon such facilities.

D.2.2.4 *Rocky Flats Plant*

There are no state or local regulations applicable to RFP which specify environmental noise levels.

D.2.2.5 *Savannah River Site*

Ambient sound level data collected at SRS in 1989 and 1990 were summarized in a 1990 report (SR NUS, 1990b). The States of Georgia and South Carolina, and the counties in which SRS is located, have not yet established any noise regulations that specify acceptable community noise levels except for a provision of the Aiken County Nuisance Ordinance which limits daytime and nighttime noise by frequency band (table D2.2.5-1).

D.2.2.6 *Los Alamos National Laboratory*

Los Alamos County has adopted a noise ordinance that specifies maximum sound levels in residential areas (Los Alamos Ordinance). Sound levels at a residential property line are limited to 65 dBA during the hours 7 a.m. to 9 p.m., and to 53 dBA during the hours 9 p.m. to 7 a.m. The 65 dBA limit may be exceeded by up to 10 dB for up to 10 minutes of any hour between 7 a.m. and 9 p.m.

D.2.2.7 *Y-12 Plant*

Maximum allowable noise limits for the City of Oak Ridge are presented in table D2.2.7-1. The limits range from 50 to 75 dBA for residential districts to major streets, respectively.

D.2.2.8 *Sandia National Laboratories, Albuquerque*

The city of Albuquerque has adopted a noise ordinance that specifies a maximum sound level in residential areas (Albuquerque Ordinance). Sound levels at a residential property line are limited to 50 dBA during nighttime hours, or 10 dB above the ambient sound level.

TABLE D2.2.5–1.—*Aiken County Maximum Allowable Noise Levels*[a]

Frequency Band (Hz)	Nighttime (9:00 p.m. - 7:00 a.m.) Sound Pressure Levels (dB)	
	At Non-residential Lot Line	At Residential Lot Line
20 - 75	69	65
75 - 150	60	50
150 - 300	56	43
300 - 600	51	38
600 - 1,200	42	33
1,200 - 2,400	40	30
2,400 - 4,800	38	28
4,800 - 10,000	35	20
Daytime (7:00 am - 9:00 pm) Sound Pressure Levels: Apply only one of the following corrections to the nighttime levels above.		
Type of Operation in Character of Noise		**Correction (dB)**
Daytime operation only		plus 5
Noise source operates less than 20% of any one-hour period		plus 5
Noise source operates less than 5% of any one-hour period		plus 10
Noise source operates less than 1% of any one-hour period		plus 15
Noise of impulsive character (hammering, etc.)		minus 5
Noise of periodic character (hum, speech, etc.)		minus 5

E4 3578

[a] Noise from construction between 7:00 am and 9:00 pm is exempt from these limits.

Source: Aiken County, 1991.

TABLE D2.2.7–1.—*City of Oak Ridge Maximum Allowable Noise Limits Applicable to ORR*

Adjacent Uses	Where Measured	Maximum Sound Level (dBA)
All Residential Districts	Common Lot Line	50
Neighborhood Business District	Common Lot Line	55
General Business District	Common Lot Line	60
Industrial District	Common Lot Line	65
Major Street	Street Lot Line	75
Secondary Residential Street	Street Lot Line	60

E4 3551

Source: Y–12 City, 1984.

D.3 ENVIRONMENTAL CONSEQUENCES

This section provides additional information in support of the conclusions on environmental consequences related to ambient air quality and acoustics.

D.3.1 Air Quality

Major sources of air pollutant emissions and the associated environmental consequences for each Proposed Action at each site are described in section 4.1. A complete emissions inventory associated with each action is presented in these sections.

D.3.1.1 *Proposed Actions*

Tables D3.1.1-1 through D3.1.1-3 present the emissions inventory for each of the actions proposed for the nonnuclear reconfiguration.

Table D3.1.1-1 presents the emissions inventory related to activities of consolidation of the electrical/ mechanical functions at KCP (KC ASAC, 1992f).

The emissions related to relocating tritium functions to SRS are expected to be negligible and no emission rates were provided in the design documentation (WSRC, 1992a-c; SR Factsheet, 1992).

Table D3.1.1-2 presents the emissions inventory for each of the activities associated with relocating the explosive functions to LANL (LA DOE, 1992b). Inventories are presented for five technologies: explosive timers, slapper detonator, explosive component testing, explosive powder processing, and explosive component surveillance. No information was provided on potential emissions

TABLE D3.1.1–1.—*Potential Emission Rates of Hazardous/Toxic Air Pollutants from Proposed Actions at Kansas City Plant*

Hazardous/Toxic Air Pollutant	Emission Rate (lbs/hr)
Acetic Acid	0.02
Acetone	0.02
Alcohol	0.10
D-Limonene	0.04
Ethyl Alcohol	0.001[a]
Freon-113	0.10
Hydrogen Chloride	0.02
Hydrogen Fluoride	0.02
Isopropyl Alcohol	0.16
Methyl Alcohol	0.04
Methylene Chloride	0.02
Nitric Acid	0.02
Sulfuric Acid	0.02
Trichloroethane	0.10
Trichloroethylene	0.13

E4 3566

[a] Impacts of the release of this compound were not assessed since it would be released at a rate of less than 100 lb/yr (0.01 lb/hr).

Source: KC ASAC, 1992f.

TABLE D3.1.1–2.—*Potential Emission Rates for Explosive Functions to be Relocated to LANL*

Description	Emission Rate (lbs/hr)
Explosive Component Surveillance	
No additional air emissions anticipated	–
Explosive Component Testing	
No additional air emissions anticipated	–
Explosive Powder Processing	
Acetone	a
Butyrolactone	a
DiMethyl Sulfoxide (DMSO)	a
Ethyl Alcohol	a
Explosive Timers	
Ethyl Alcohol	0.009[a]
Freon-113	0.009[a]
Hexane	0.009[a]
Slapper Detonator	
Hydrogen Chloride	0.009[a]
Ethyl Alcohol	0.009[a]

E4 3560

[a] Impacts of the release of this compound were not assessed since it would be released at a rate of less than 100 lb/yr (0.01 lb/hr).

Source: LA DOE, 1992b.

from exploding bridgewire detonators, special explosives, and explosive firesets. Consequently, no table of emissions for these functions is provided.

The emissions inventory associated with relocating the beryllium functions to Y-12 are expected to be negligible; no emission rates were provided in the design documentation (Y-12 MMES, 1992c). Consequently, no emissions inventory is presented.

Table D3.1.1-3 presents the emissions inventory associated with the transfer of manufacturing of neutron generators at SNL (SN FDI, 1992).

D.3.1.2 *Other Alternatives*

Tables D3.1.2-1 through D3.1.2-3 present the emissions inventories for other alternatives; i.e.,

TABLE D3.1.1–3.—*Potential Emission Rates of Hazardous/Toxic Air Pollutants for Manufacture of Neutron Generators at SNL*

Hazardous/Toxic Air Pollutant	Emission Rate (lbs/hr)
1,1,1-Trichloroethane	0.12
Acetone	0.10
Amyl Acetate	0.10
Freon-113	0.14
Isopropyl Acetate	0.05
Methylene Chloride	0.24
Toluene (methylbenzene)	0.13
Trichloroethylene	0.13

E4 3591

Source: FDI, 1992a.

relocating functions to Mound, Pinellas, or Rocky Flats, respectively (FDI, 1992b). The potential changes to air quality for each of these alternatives are presented in section 4.2.

D.3.2 Acoustics

Sections D3.2.1 through D3.2.8 describe the results of traffic noise analyses performed for each site.

D.3.2.1 *Kansas City Plant*

The change in peak hourly traffic noise levels along the major roads leading to KCP were estimated for the Proposed Action for the peak construction year (1995) and for operation (2000). Estimated change in peak hourly traffic noise levels along the major roads leading to KCP are small based on the anticipated increase in employment and operation for the Proposed Action.

The estimated maximum noise level increase during construction or operation along Troost Avenue and Bannister Road is less than 2 dBA. No change in community reaction to traffic noise is expected.

TABLE D3.1.2–1.—*Emissions Inventory for the Nonnuclear Consolidation Plant at Mound (lb/hr)*

Pollutant	Kansas City	Rocky Flats	Pinellas	Total[b]
Criteria Pollutants				
Carbon Monoxide (CO)	2.53	a	0.02	2.56
Nitrogen Dioxide (NO_2)	5.37	a	0.06	5.42
Sulfur Dioxide (SO_2)	0.01	a	a	0.01
Total Suspended Particulates (TSP)	0.32	a	a	0.32
Hazardous Air Pollutants and Other Toxic Compounds				
1,4-Dioxane	0.03	a	a	0.03
1,1,1-Trichloroethane	0.01	a	a	0.01
Acetone	0.37	a	0.02	0.39
Acids[c]	0.57	a	a	0.57
Alcohols	0.71	0.01	0.06	0.78
CFC-12	0.01	a	a	0.01
CFC-113	0.01	a	a	0.01
D'Limonene	0.06	a	a	0.06
Dimethyl Formamide	0.01	a	a	0.01
Ethylbenzene	0.02	a	a	0.02
Glycol Ethers	1.20	a	0.01	1.21
Hexane	0.03	a	a	0.03
Methyl Ethyl Ketone	0.03	a	a	0.03
Methyl Isobutyl Ketone	0.07	a	a	0.07
Methylene Chloride (dichloromethane)	0.01	a	a	0.01
Mineral Spirits/Naptha	0.17	a	a	0.17
Miscellaneous Solvents	0.39	0.03	a	0.42
Tetrachloroethylene	0.02	a	a	0.02
Toluene (methylbenzene)	0.19	a	a	0.19
Trichloroethylene	0.22	a	a	0.22
Volatile Organic Compounds	0.38	a	a	0.38
Xylene (dimethylbenzene)	0.13	a	a	0.13
Total[b]	12.88	0.05	0.17	13.09

E4 3592

[a] If emitted at all, compound would be released at a rate of less than 100 lb/yr (0.01 lb/hr).
[b] The individual values may not add up to the total because of rounding.
[c] Includes nitric, sulfuric and hydrochloric acids (Gentile, 1992).

Source: Le, 1992.

TABLE D3.1.2–2.—*Emissions Inventory for the Nonnuclear Consolidation Plant at Pinellas (lb/hr)*

Pollutant	Kansas City	Mound	Rocky Flats	Total[b]
Criteria Pollutants				
Carbon Monoxide (CO)	2.53	0.01	a	2.55
Nitrogen Dioxide (NO_2)	5.37	0.03	a	5.40
Sulfur Dioxide (SO_2)	0.01	a	a	0.01
Total Suspended Particulates (TSP)	0.32	a	a	0.32
Hazardous Air Pollutants and Other Toxic Compounds				
1,4-Dioxane	0.03	a	a	0.03
1,1,1-Trichloroethane	0.01	a	a	0.01
Acetone	0.37	a	a	0.37
Acids[c]	0.57	a	a	0.57
Alcohols	0.71	0.03	0.01	0.75
CFC-12	0.01	a	a	0.01
CFC-113	0.01	a	a	0.01
D'Limonene	0.06	0.03	a	0.09
Dimethyl Formamide	0.01	a	a	0.01
Ethylbenzene	0.02	a	a	0.02
Glycol Ethers	1.20	0.09	a	1.29
Hexane	0.03	a	a	0.03
Methyl Ethyl Ketone	0.03	a	a	0.03
Methyl Isobutyl Ketone	0.07	a	a	0.07
Methylene Chloride (dichloromethane)	0.01	a	a	0.01
Mineral Spirits/Naptha	0.17	a	a	0.17
Miscellaneous Solvents	0.39	a	0.03	0.42
Tetrachloroethylene	0.02	a	a	0.02
Toluene (methylbenzene)	0.19	a	a	0.19
Trichloroethylene	0.22	a	a	0.22
Volatile Organic Compounds	0.38	a	a	0.38
Xylene (dimethylbenzene)	0.13	a	a	0.13
Total[b]	12.88	0.21	0.05	13.13

E4 3593

[a] If emitted at all, compound would be released at a rate of less than 100 lb/yr (0.01 lb/hr).
[b] The individual values may not add up to the total because of rounding.
[c] Includes nitric, sulfuric and hydrochloric acids (Gentile, 1992).

Source: Le, 1992.

TABLE D3.1.2–3.—*Emissions Inventory for the Nonnuclear Consolidation Plant at Rocky Flats (lb/hr)*

Pollutant	Kansas City	Pinellas	Mound	Total[b]
Criteria Pollutants				
Carbon Monoxide (CO)	2.53	0.02	0.01	2.57
Nitrogen Dioxide (NO_2)	5.37	0.06	0.03	5.46
Sulfur Dioxide (SO_2)	0.01	a	a	0.01
Total Suspended Particulates (TSP)	0.32	a	a	0.32
Hazardous Air Pollutants and Other Toxic Compounds				
1,4-Dioxane	0.03	a	a	0.03
1,1,1-Trichloroethane	0.01	a	a	0.01
Acetone	0.37	0.02	a	0.39
Acids[c]	0.57	a	a	0.57
Alcohols	0.71	0.06	0.03	0.80
CFC-12	0.01	a	a	0.01
CFC-113	0.01	a	a	0.01
D'Limonene	0.06	a	0.03	0.09
Dimethyl Formamide	0.01	a	a	0.01
Ethylbenzene	0.02	a	a	0.02
Glycol Ethers	1.20	0.01	0.09	1.30
Hexane	0.03	a	a	0.03
Methyl Ethyl Ketone	0.03	a	a	0.03
Methyl Isobutyl Ketone	0.07	a	a	0.07
Methylene Chloride (dichloromethane)	0.01	a	a	0.01
Mineral Spirits/Naptha	0.17	a	a	0.17
Miscellaneous Solvents	0.39	a	a	0.39
Tetrachloroethylene	0.02	a	a	0.02
Toluene (methylbenzene)	0.19	a	a	0.19
Trichloroethylene	0.22	a	a	0.22
Volatile Organic Compounds	0.38	a	a	0.38
Xylene (dimethylbenzene)	0.13	a	a	0.13
Total[b]	12.88	0.17	0.21	13.25

E4 3594

[a] If emitted at all, compound would be released at a rate of less than 100 lb/yr (0.01 lb/hr).
[b] The individual values may not add up to the total because of rounding.
[c] Includes nitric, sulfuric and hydrochloric acids (Gentile, 1992).

Source: Le, 1992.

D.3.2.2 *Mound Plant*

Estimated peak hourly traffic volumes and associated noise levels along the major roadways leading to Mound are listed in table D3.2.2-1 for baseline years, and for the relocation to Mound alternative. The estimated maximum noise level increase of 6 dBA along Mound Road during operation may result in some increase in community reaction to traffic noise. The increase in traffic and the resulting increase in noise levels along Mound Road could be mitigated by providing access to the new facilities from Benner Road. Increases in traffic noise along Mound Road during construction and operation are less than 3 dBA. No increase in community reaction to traffic noise along these roads is expected.

The phaseout of Mound under the Proposed Action would be expected to result in a decrease in traffic noise levels along Mound Road and other roads leading to Mound.

D.3.2.3 *Pinellas Plant*

Estimated peak hourly traffic volumes and associated noise levels along the major roadways leading to Pinellas are listed in table D3.2.3-1 for baseline years, and for relocation to Pinellas alternative. The estimated maximum noise level increase of 1 dBA along Belcher Road during operation is less than 5 dBA, the increase below which no significant change in community reaction is expected.

Increases in traffic noise along Belcher Road during construction and along other roads during construction and operation are expected to be less than 1 dBA. No increase in community reaction to traffic noise along these routes is expected.

The phaseout of Pinellas under the Proposed Action would result in a decrease in traffic noise levels along Belcher Road and other nearby roads.

TABLE D3.2.2–1.—*Estimated Hourly Traffic Volumes and Traffic Noise Levels Along the Access Routes to Mound*

Route	Peak Hour Traffic Volume (veh/hr)		Noise Level in L_{eq} (1-hr) (dBA)[a]	
	Baseline	Relocate to Mound	Baseline	Relocate to Mound
Construction				
Mound Road	251	405	67	69
Benner Road	293	316	65	65
Main Street (north of Mound Avenue)	794	895	67	67
6th Street	139	170	58	59
Operation				
Mound Road	258	933	66	72
Benner Road	301	403	65	66
Main Street (north of Mound Avenue)	816	1,258	67	69
6th Street	143	279	58	61

E4 3925

[a] L_{eq}(1-hr) is the hourly L_{eq} in dBA, and is predicted for a receptor located 50 feet from the center line of nearest lanes.

TABLE D3.2.3–1.—*Estimated Hourly Traffic Volumes and Traffic Noise Levels Along the Access Routes to Pinellas*

Route	Peak Hour Traffic Volume (veh/hr)		Noise Level in L_{eq} (1-hr) (dBA)[a]	
	Baseline	Relocate to Pinellas	Baseline	Relocate to Pinellas
Construction				
Belcher Road	3,483	3,501	76	76
Bryan Dairy Road	3,557	3,657	76	76
Operation				
Belcher Road	4,191	4,270	76	77
Bryan Dairy Road	4,280	4,687	77	77

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[a] L_{eq}(1-hr) is the hourly L_{eq} in dBA, and is predicted for a receptor located 50 feet from the center line of nearest lanes.

D.3.2.4 *Rocky Flats Plant*

Estimated peak hourly traffic volumes and associated noise levels along the major roadways leading to RFP are listed in table D3.2.4-1 for baseline years and for relocation to RFP alternative. The estimated maximum noise level increase of 1 dBA along Highway 72, Highway 128, and Indiana Street is less than 5 dBA, the increase below which no significant change in community reaction is expected.

Increases in traffic noise along other roads during construction and operation are expected to be less than 2 dBA. No increase in community reaction to traffic noise along these routes is expected.

The phaseout of RFP under the Proposed Action would be expected to result in some decrease in traffic noise near RFP.

D.3.2.5 *Savannah River Site*

The estimated changes in peak hourly traffic noise levels along the major roadways leading to SRS are small, based on the small increase in employment for construction and operation for the Proposed Action. The estimated maximum noise level increase along U.S. 125 and other routes is less than 1 dBA. No change in community reaction to traffic noise is expected.

D.3.2.6 *Los Alamos National Laboratory*

The estimated changes in peak hourly traffic noise levels along the major roadways leading to LANL are small, based on the small increase in employment for construction and operation for the Proposed Action. The estimated maximum noise level increase along Route 4 and other routes is less than 2 dBA. No significant change in community reaction to traffic noise is expected.

D.3.2.7 *Y-12 Plant*

The estimated changes in peak hourly traffic noise levels along the major roadways leading to ORR are small, based on the small increase in employment for construction and operation for the Proposed Action. The estimated maximum noise level increase of 1 dBA along TN 95 and other routes is less than 5 dBA, the increase below which no significant change in community reaction is expected.

TABLE D3.2.4–1.—*Estimated Hourly Traffic Volumes and Traffic Noise Levels Along the Access Routes to Rocky Flats*

Route	Peak Hour Traffic Volume (veh/hr)		Noise Level in L_{eq} (1-hr) (dBA)[a]	
	Baseline	Relocate to Mound	Baseline	Relocate to Mound
Construction				
HWY 93	1,547	1,563	78	78
HWY 72	540	566	71	71
HWY 128	817	875	73	73
Indiana Street	1,036	1,094	74	74
Operation				
HWY 93	1,983	2,081	79	79
HWY 72	692	847	72	73
HWY 128	1,048	1,385	74	75
Indiana Street	1,329	1,667	75	76

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[a] L_{eq}(1-hr) is the hourly L_{eq} in dBA, and is predicted for a receptor located 50 feet from the center line of nearest lanes.

D.3.2.8 *Sandia National Laboratories, Albuquerque*

The estimated changes in peak hourly traffic noise levels along the major roadways leading to SNL are small, based on the small increase in employment for construction and operation for the Proposed Action. The estimated maximum noise level increase along Eubank Boulevard is less than 1 dBA. No significant change in community reaction to traffic noise is expected.

APPENDIX E

APPENDIX E: SOCIOECONOMICS AND COMMUNITY SERVICES

E.1 INTRODUCTION

This appendix includes the methodologies, models, assumptions, and supporting data used for assessing the potential impacts on each of the resources in the Socioeconomics and Community Services sections. Section E.2 presents the methods and assumptions used to evaluate the potential socioeconomic effects of the proposed consolidation of nonnuclear manufacturing functions of the Nuclear Weapons Complex. The socioeconomic analysis for this environmental assessment (EA) involved two major steps: the characterization and projection of existing social, economic, and infrastructure conditions surrounding each of the selected consolidation sites (i.e., the Affected Environment); and the evaluation of potential changes in socioeconomic conditions that could result from the construction and operation of nonnuclear manufacturing functions in the eight regions involved in the consolidation program (i.e., the Environmental Consequences). Supporting data for the Affected Environment and Environmental Consequences sections are contained in section E.3.

E.2 METHODOLOGIES AND MODELS

E.2.1 Population and Employment

The description of socioeconomic conditions includes indicators such as population, labor force, employment, earnings, and income that provide a basis for comparison of regional socioeconomic conditions among the sites both with and without the Proposed Action and alternatives. The No Action alternative was considered equivalent to future baseline conditions without consolidation activities. The baseline for the No Action alternative was established from the total employment projected for each of the sites at the end of fiscal year 1993. These 1993 employment estimates are believed to best reflect the staffing level to be needed as a result of recent stockpile requirement reductions.

Region of Influence. The primary factor in determining the Region-of-Influence (ROI) was the distribution of residences for current Department of Energy (DOE) and contractor personnel working at each of the eight proposed sites. The ROIs were determined to be those areas in which approximately 90 percent of the current DOE and contractor employees reside. This residential distribution reflects existing commuting patterns and attractiveness of area communities for people employed at each site, and was used to estimate the future distribution of direct workers associated with the proposed consolidation.

As an example, table E3.6-1a displays the residential distribution by city and county for all personnel employed at Mound. Data on residential location for a large portion of facility employees were obtained from Mound personnel offices. Similar data were provided by the other locations in tables E3.1-1 through E3.8-1.

Existing and Future Baseline. Historical and existing population, labor force, employment, and income data were obtained from the U.S. Bureau of Economic Analysis Regional Economic Information Systems (DOC, 1991a). Historical personal income and per capita income values were converted to constant 1992 dollars using the current Department of Commerce National Income deflator index. Employment by place of work was converted to employment by place of residence on the basis of ratios derived from Bureau of Census, Bureau of

Labor Statistics, and Bureau of Economic Analysis data.

Growth projections for population, labor force, employment, and income were based on Bureau of Economic Analysis Regional Projections to 2040 (DOC, 1990a and b) for Bureau of Economic Analysis economic regions and metropolitan statistical areas. Bureau of Economic Analysis projections are for multi-county economic regions or whole metropolitan statistical areas; therefore, projections for individual counties were made by applying the appropriate growth rates for each Bureau of Economic Analysis data series (population, employment, etc.) to each county in the identified ROI for each site. Data series forecasts for counties within a metropolitan statistical area were based on the higher Bureau of Economic Analysis growth rates projected for metropolitan areas, while forecasts for other counties in the ROI were based on generally lower regional growth projections.

Potential Project Effects. Total output multipliers for each region were obtained from the U.S. Department of Commerce, Bureau of Economic Analysis Regional Interindustry Multiplier System, and utilized in an economic model developed for evaluation of socioeconomic impacts of large-scale government programs.

The model includes four major components for the analysis:

- A regional inter-industry component that produced a regional input-output table and output multipliers for each specified sector of the economy for each ROI.

- A direct effects component that produced a matrix of final demands (estimated changes in industry and household spending due to project activities) on the basis of direct employment and procurement associated with the project.

- An employment impact component that calculated region-wide indirect output, earning, and employment estimates.

- A macroeconomic impact component that calculated regional population impacts on the basis of assumptions concerning possible changes in unemployment, the share of the labor force with the necessary skills to take direct project jobs, and the portion of the direct employment that would in-migrate to the ROI.

These inter-industry multipliers were estimated using the U.S. input-output table in combination with the most recent region-specific information describing the relationship of the regional economy to the national economy.

The same methodology was used to develop quantitative projections of economic activity for No Action conditions, the Proposed Action, and the alternatives. Project-related changes in regional demand in each local industrial and household sector were first estimated as follows:

- Construction-phase demands were based on construction labor and cost data provided by Fluor-Daniel, Inc. engineers and the sites from parameters developed in support of the description of Proposed Action and alternatives development.

- Operations-phase demands were estimated from Department of Energy (DOE) operations employment estimates and procurement requirements from existing DOE facilities that provide similar manufacturing activities.

The direct effects component uses the construction and operations demand to determine the

procurement in the specific industries and the personal consumption expenditures (household spending) due to the project activities, taking into consideration the disposable income of each type of direct employment category.

These primary or direct effects were then multiplied, using Regional Interindustry Multiplier System coefficients specific to the regional economy, to provide estimated total spending associated with the Proposed Action and the alternatives. Input-output sectors were selected to reflect the anticipated spending profile associated with the Proposed Action and alternatives in order to capture the economic characteristics of each scenario within the ROI. The employment impact component thus estimates the indirect employment, earnings, and personal income due to the Proposed Action and alternatives. Table E2.1 presents the assumptions for direct and indirect employment that were used for the regional socioeconomic analysis.

The macroeconomic impact component uses the information regarding the direct and indirect employment from the direct effects and employment impact components as well as the baseline information to estimate the direct as well as indirect employment that would in-migrate into the region. Numbers of in-migrant workers associated with the Proposed Action and each alternative were estimated according to a set of assumptions concerning the availability of required labor skill levels within each regional labor force and the recognition that competitive bidding for both construction and operations activities would bring in a certain number of workers regardless of available labor. Since the labor demands for nonnuclear consolidation construction and operations activities are generally small in comparison to regional labor availability, in-migrant workers were primarily associated with contract award relocation assumptions.

Average household sizes for in-migrant workers were assumed to correspond, for most categories, with the average size of state-to-state migrating families between 1980 and 1990.

The intra-regional allocation analysis accounts for the distribution of direct and indirect workers and their families among the various residential areas within each region. The direct portion of the effect allocation process accounts for the two main factors affecting the distribution of in-migrant direct workers: (1) the number of workers anticipated to be directly involved with each alternative, and (2) the locations and relative attractiveness of residential opportunities within the region.

Population changes associated with the Proposed Action and the alternatives are an important determinant of other socioeconomic and environmental impacts. These population changes have three key components: (1) baseline growth, (2) relocation of workers and their dependents, and (3) natural increase of population (births minus deaths) over the long term. To evaluate anticipated population effects, potential future changes associated with the Proposed Action and the alternatives were compared to projected baseline conditions.

The computer output of the macroeconomic impact component for the Mound Alternative at the Mound Plant is presented in table E2.2. The first page of the table presents the employment and population parameter values used for this analysis and baseline and project information. The second page presents direct and indirect project impacts and a summary of effects for the year 1993. Similar output was created for all project years through 2000. Table E3.6-1b is a summary of the macroeconomic component results for the Mound Plant for selected years between 1990 and 2040. Population and economic data for all the sites are given in tables E3.1-1b through E3.8-1b.

E.2.2 Housing

Housing characteristics are presented in tables E3.1-2 through E3.8-2. Projected housing needs are based upon housing unit and population data obtained for 1990 for each ROI (Census, 1990c). Future housing

TABLE E2.1.—*Assumptions for Regional Economic Analysis, Mound Plant Example*

Employment	Category								
	DSHARE[a]	DUR[a]	PRDEP	DURDEP[a]	HHS	FF	NLOC	IUR[a]	FUR[a]
Direct									
Construction									
Direct	0.075	0.045	0.238[b]	0.054	3.11[c]	0.589[c]	0.25		
Support	0.050	0.045	0.238[b]	0.054	2.93[c]	0.618[c]	0.75		
Operations									
DOE Operations	0.195	0.045	0.247[b]	0.054	3.17[d]	0.708[d]	0.50		
Indirect									
Personal Consumption					3.17[d]	0.708[d]		0.054	
Procurement					3.17[d]	0.708[d]		0.054	
Related Investment					3.17[d]	0.708[d]		0.054	
Other Parameters									0.045

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[a] This varies from site to site.
[b] OWRC, 1975.
[c] COE, 1981.
[d] DOC, 1991a.
[e] Council, 1992.

Notes:

DSHARE - Employable share of available resident labor force. This is the proportion of current unemployed labor force with the necessary skills. For Direct Construction Workforce it is 1.5 times construction workers as proportion of the total employment for year 1989 as measured by Bureau of Economic Analysis. The factor 1.5 is used, as historically the unemployment rate is higher for construction workers. This ratio is assumed to be 0.05 for Support/Design. For DOE Operations, this is the proportion of manufacturing related employment in 1989 as given by Bureau of Economic Analysis.

DUR - Unemployment rate, in-migrant workers (direct employment). This is assumed to be same as the minimum unemployment rate.

DURDEP - Unemployment rate, dependents of in-migrant workers. This is assumed to be the unemployment rate at the start of the project.

FF - Fraction of workers accompanied by dependents.

HHS - Household size of workers accompanied by dependents.

IUR - Unemployment rate, in-migrant workers (indirect employment).

NLOC - Proportion of workers assumed to be non-local.

PRDEP - Labor force participation rate of the dependents of in-migrating workforce.

FUR - Floor value for minimum employment rate. The unemployment rate for any region cannot go lower than this value. This is determined as the lowest unemployment rate in the region for 1970-1990 period. Proportion of population that is working age: 0.643[e]

TABLE E2.2.—*Parameters Used by the Model Mound Plant Example* [Page 1 of 2]

Parameters Used By the Model
MSLF = .1000 FUR = .0450

Direct Employment Parameters:

Category	DSHARE	DUR	PRDEP	DURDEP	HHS	FF	DCIV	NLNDTR	NLRLOC	SHWCON
Construction-Direct	.075	.045	.238	.054	3.110	.589	1.000	.000	.250	.000
Construction-Support	.050	.045	.238	.054	2.930	.618	1.000	.000	.750	.000
DOE Operations	.195	.045	.247	.054	3.170	.708	1.000	.000	.500	.000

Indirect Employment Parameters:

Category	IUR	HHS	FF
Personal Consumption	.054	3.170	.708
Procurement	.054	3.170	.708
Related Investment	.054	3.170	.708

Logistic Labor Force Response Parameters:
Proportion of population which is working age = .643
Beta parameter of effect of project jobs on labor force participation (0 = no effect) = 1.0500

Abbreviations Used:
MSLF : Maximum share of baseline labor force employed with project - but unemployed without it.
FUR : Floor value for minimum unemployment rate.
DSHARE : Employable share of available resident labor force.
DUR : Unemployment rate, in-migrant workers (Direct employment).
PRDEP : Labor force participation rate, dependents of in-migrant workers.
DURDEP : Unemployment rate, dependents of in-migrant workers.
HHS : Household size, workers accompanied by dependents.
FF : Fraction of workers accompanied by dependents.
DCIV : Fraction of direct employment which can be filled by civilians.
IUR : Unemployment rate, in-migrant workers (indirect employment).
NLNOTR : Share of employment assumed to be non-local, and not relocating from out of region.
NLRLOC : Share of employment assumed to be non-local, but relocating from out of region.
SHWCOM : Share of direct workers who are weekly commuters.

Year: 1993
Baseline Information

Population	988,026
Civilian Labor Force	493,321
Labor Force Participation Rate (w/o Proj.)	.4993
Employed Civilian Labor Force (w/o Proj.)	466,633
Unemployment Rate	.054
Total Employment (w/o Proj.)	466,646
Earnings ($1,000)	12,464,970
Personal Income ($1,000)	18,143,330
Per Capita Income (w/o Proj.)	18,363

Project Information:

Employment Category	Direct Employment	Earnings ($1,000)	Personal Income ($1,000)
Construction-Direct	252.0	7,292	7,292
Construction-Support	38.0	1,475	1,475
DOE Operations	0.0	0	0
Subtotal	**290.0**	**8,768**	**8,768**
Indirect Employment			
Personal Consumption	140.4	3,637	5,294
Procurement	641.0	20,421	29,724
Related Investment	0.0	0	0
Subtotal	**781.3**	**24,058**	**35,018**
Total-Place of Work	1,071.3	32,826	43,786
Weekly Commuting Adjustment			0
Total-Place of Residence			43,786

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TABLE E.2.2—*Parameters Used by the Model Mound Plant Example*—Continued [Page 2 of 2]

Direct and Indirect Project Impacts

Direct Employment Category:

Category	Avail. Res. L. F.	Excess Demand	L. F. Increase	Dependents	Pop. Impacts	Weekly Commuters	Accomp. L. F.
Construction-Direct	336.87	63.00	65.97	81.99	147.95	.00	19.51
Construction-Support	224.58	28.50	29.84	35.59	65.44	.00	8.47
DOE Operations	875.87	.00	.00	.00	.00	.00	.00
Subtotal	**1,437.32**	**91.50**	**95.81**	**117.58**	**213.39**	**.00**	**27.98**

Indirect Employment Category:

Category	Demand Share of Avail. Res. L. F.	Excess Demand	L. F. Increase	Dependents	Pop. Impacts	L. F. Share
Personal Consumption	548.66	.00	.00	.00	.00	.12
Procurement	2,505.65	.00	.00	.00	.00	.56
Related Investment	.00	.00	.00	.00	.00	.00
Subtotal	**3,054.32**	**.00**	**.00**	**.00**	**.00**	**.68**
Total	**4,491.64**	**91.50**	**95.81**	**117.58**	**213.39**	

Summary of Effects:

Employment-	Direct Employment (All Categories)	290
	Indirect Employment (All Categories)	781
	Total Project-Related Employment	1,071
	Project-Related Civilian Employment	1,071
	Civilian Labor Force Increase	124
	Civilian Labor Force (w/Project)	493,711
	Employed Civilian Labor Force (w/Project)	467,704
	Unemployment Rate (w/Project)	.053
	Total Employment (w/Project)	467,717
	Adjusted Baseline L. F. Partic. Rate (w/Project)	.4996
	Labor Force Partic. Rate (w/Project)	.4996
	Maximum Employment of Accomp. Labor Force	26
Population-	Total Population Impact	213
	Total Population (w/Project)	988,239
	Direct Weekly Commuters	0
Income-	Direct Project-Related Earnings ($1,000)	8,768
	Direct Project-Related Resident Earnings ($1,000)	8,768
	Indirect Project-Related Earnings ($1,000)	24,058
	Earnings (w/Project $1,000)	12,497,790
	Personal Income Impact of Project ($1,000)	43,786
	Personal Income (w/Project $1,000)	18,187,110
	Per Capita Income (w/Project)	18,404

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units needed for cities and counties in each ROI were developed by estimating the household size from the current population and housing unit ratios. The household size-to-population ratios were then applied to the estimated future population trends to obtain the number of housing units needed to accommodate the projected population for a No Action alternative future baseline.

Projected housing needs for the Proposed Action and the alternatives were developed in the same manner as the estimates for a No Action baseline. These estimates, however, include projected in-migrating workforces (and their families) from outside the ROI. Future housing needs for the in-migrating populations, resulting from employment created directly or indirectly by the project, were estimated from the national average household size (Census, 1990c).

E.2.3 Utilities

The primary water supply and wastewater treatment systems providing service to the counties and municipalities in each ROI were identified through available written information or through telephone interviews. Information was collected on current capacities, average demands and, where available, peak demands, population served, and ongoing system modifications. These data are presented in tables E3.1-3 through E3.8-3.

All future demand projections were based on the population estimates for those counties and municipalities established for a No Action Alternative baseline in each ROI. However, water and wastewater system service areas are usually not defined by county or municipal boundaries. Large municipal systems often serve the municipality in which they are located, as well as other parts of the region. County systems often serve a portion of the population in the unincorporated areas of the county and may also provide service to municipalities within the county. Systems not operated by a municipality or county may also provide service in a region. Populations in rural areas often utilize wells and septic tanks or very small municipal systems.

Where several systems were identified in an ROI, only the systems that provided the majority of the service in the region were evaluated. Where a system, or a combination of systems, was found to serve only a portion of an area's total population, the percentage of that total population represented by that system's service population was estimated. Future projections were based on the general assumption that the future service population would remain a consistent percentage of the total future population in that area. If no service population information was available for a system, the service population was estimated from current average demands. Values of 200 gallons per capita day for water consumption and 100 gallons per capita day for wastewater generation were used as conservative estimates for all future demand projections.

E.2.4 Education

Education characteristics for each ROI are presented in tables E3.1-4 through E3.8-4. Statistics on kindergarten through twelfth grade public school enrollments, school facility capacities, and the number of teachers were collected for all school districts in each ROI from state education departments and telephone interviews for the 1989-1990 school year. For the No Action alternative, future enrollment projections for counties in each ROI were developed by calculating the appropriate state percentage of school age children from the population (Census, 1990c) and then applying this percentage to future baseline population trends. Enrollment projections for in-migrating future populations under the Proposed Action and alternatives were developed using the national percentage of school age children (Census, 1990c).

Estimates of additional teachers needed for the No Action alternative, the Proposed Action, and the other alternatives were based upon the 1989-1990 pupil-to-teacher ratios. Under the assumption that the current pupil-to-teacher ratios represent each community's standard for level of service, these standard ratios were applied to the projected student enrollments to obtain the number of additional teachers needed in the future to maintain the current level of service.

E.2.5 Health Care

The number of physicians, hospitals, hospital bed capacities, and occupancy rates were obtained for counties in each ROI for 1990 from the American Medical Association, American Hospital Association, and telephone interviews. Future population estimates for the No Action alternative, the Proposed Action, and the other alternatives were applied to current hospital occupancy rates and capacities to determine the number of additional hospital beds in excess of capacity that would be needed to accommodate the projected population.

Under the assumption that the current ratio of doctors per 1,000 persons represented the counties' current level of service, population trends were applied to future population scenarios for the different alternatives to obtain the number of additional physicians that would be needed to maintain the counties' current levels of service.

E.2.6 Public Safety

Statistics on sworn police officers and volunteer and professional firefighters for 1990 were obtained from the U.S. Department of Justice, American Fire Services, and telephone interviews for each of the ROI cities and counties. It was assumed that the current sworn police officer and firefighter per 1,000 persons ratios represented the communities' standards for level of service. Under this assumption, population trends were applied to future population scenarios for the Proposed Action and alternatives to derive the number of additional police officers and firefighters that would be needed to maintain current levels of service.

E.2.7 Local Transportation

The ROI road segments for each site were selected for analysis based on employee residence distribution. Traffic data for interstate, U.S., and state highway routes were provided by each state's transportation department. Traffic data for local roads were provided by city, county, or regional highway and planning departments. Accident data for each ROI county were provided by either state highway or police departments. Truck traffic information associated with commercial deliveries at each site were provided by each respective DOE facility. Impacts to local transportation were assessed using traffic level changes, incremental vehicle accidents, and fatalities in the ROI of each site. Modeling of consequences was conducted for the ROIs where the Proposed Action or alternatives could result in substantial workforce and/or population growth. Baseline estimates and project impacts were assessed for specific road segments within the ROI. Baseline traffic data are provided in tables E3.1-5 through E3.8-5.

The baseline analysis focuses on projected population changes in the study area. Projected ROI traffic conditions (average daily traffic (ADT)) were derived by applying an average of trips generated by residential townhouse/condominium and single family detached housing units (trips per day per person) obtained from the Institute of Transportation Engineer's Trip Generation Report (ITE, 1991), to the estimated changes in total population. Projected trips were distributed to the roadway network based on existing traffic conditions. These trips, when added to existing trips, were considered to be the baseline rate. Baseline analyses include 1995 (year of peak construction) and 2000 (typical year of operations).

Local transportation impacts of DOE facility consolidation were assessed in terms of the effects of direct and indirect employment changes on ADT and the level of service (LOS). Definitions and LOS ratings are provided in table E2.3. Direct employment trips were distributed on the roadway network based on existing employment trip distribution. Indirect employment trips were allocated to the roadway network based on existing ROI road segment traffic conditions. To determine the impacts of DOE consolidation activities, direct and indirect employment trips were added to the baseline and existing trips. Analyses for 1995 (year of peak construction) and for 2000 (typical year of operations) were presented to correspond with baseline analyses.

Incremental truck traffic associated with consolidation construction and operations activities was also assessed relative to baseline truck traffic at each DOE facility. In addition to ADT, peak hour volume (PHV) and roadway capacity were considered in deriving traffic impacts. Peak hour volumes are typically assumed to be 10 percent of the ADT. Segment capacity was calculated using standard definitions of roadway types, including non-interstate multi-lane roads, rural and urban interstates, and two-lane roads. Volume estimates were assessed relative to the design capacity of the route in order to determine the associated LOS.

Peak hour volume to capacity ratios correspond to a specific LOS for each of the three roadway types. The ranges of volume to capacity ratio for each LOS were obtained from the Transportation Research

TABLE E2.3.—*Definition of Level of Service Used for Transportation System Assessments*

Level of Service	Definition
A–Free flow	Operation of vehicles is virtually unaffected by the presence of other vehicles, and operations are constrained only by the geometric features of the highway and driver preferences. Minor disruptions to flow are easily absorbed at this level without causing significant delays or queuing.
B–Stable flow (upper speed limit)	Indicative of free flow, although the presence of other vehicles begins to be noticeable. Average travel speeds are generally over 53 mph on sections with 70 mph design speed. Minor disruptions are easily absorbed at this level, though local deterioration in the level of service will be more obvious.
C–Stable flow	A range where the influence of traffic density becomes marked. Ability to maneuver within the traffic stream and to select an operating speed is clearly influenced by the presence of other vehicles. Average travel speeds are reduced to about 50 mph on 70 mph design speed sections. Minor disruptions may be expected to cause serious local deterioration in service, and queues may form behind any significant travel disruptions. Severe or long term disruptions may result in deterioration of service to forced flow conditions.
D–Approaching unstable flow	Speeds and ability to maneuver are severely restricted because of traffic congestion. Average traffic speeds are approximately 40 mph on 70 mph design speed sections. Only the most minor disruptions can be absorbed without the formation of extensive queues and deterioration of levels of service to forced flow conditions.
E–Unstable flow	Operations at or near capacity. Disruptions cannot be dampened or dissipated and any disruption, however minor, will cause queues to form and the level of service to deteriorate to forced flow conditions. Average speeds at capacity are approximately 30 mph.
F–Forced flow[a]	Occurs at a point where vehicles arrive either at a rate greater than that at which they are discharged, or at a point in a planned facility where forecasted demand exceeds computed capacity. While operations at such points and on immediately downstream sections will appear to be at capacity or better, queues will form behind these breakdowns. Operations within queues are highly unstable, with vehicles experiencing short spurts of movement followed by stoppages. Average travel speeds within the queues are generally below 30 mph.

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[a] Also called breakdown flow.

Board's 1985 Highway Capacity Manual (TRB, 1985).

Accident and fatality rates were based on 1990 statistics of the number of accidents and fatalities per person in the ROI. These rates are assumed to be constant and were multiplied by the projected populations for both baseline and consolidation activities to estimate the number of accidents and fatalities in future years.

E.3 SUPPORTING DATA

Data and analyses used to support the assessments made for the socioeconomics and community services sections are presented in the following tables. The tables are organized by sites and resource areas. For example, table E.3.1-1a is the first site (Kansas City Plant) and the first table for the resource area of population and employment.

TABLE E3.1–1a.—*Distribution of Kansas City Plant Employees by Place of Residence, 1991*[a]

County/City	Number of Employees	Percent of Site
Missouri		
Cass County	761	14.0
Belton	237	4.4
Harrisonville	150	2.8
Jackson County	3,246	59.8
Grandview	305	5.6
Independence	311	5.7
Kansas City	1,499	27.6
Lee's Summit	609	11.2
Raytown	199	3.7
Kansas		
Johnson County	915	16.9
Olathe	188	3.5
Overland Park	376	6.9
Wyandotte County	135	2.5
Kansas City	126	2.3
ROI (County Total)	5,057	93.2

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[a] Includes employees from Allied-Signal Aerospace Company which represent 96 percent of the Kansas City Plant total.

Source: Sullivan.

TABLE E3.1-1b.—*Indicators of Regional Growth at Kansas City Plant, 1970-2040*

Local Region-of-Influence (ROI)	1970	1980	1990	2000	2020	2040
Civilian Labor Force	471,743	575,360	670,954	751,591	767,937	740,450
Unemployment Rate (%)	3.4	6.4	5.0	6.0	6.0	5.9
Personal Income (thousand $)	4,759,582	12,271,703	23,160,096	32,080,918	40,374,573	48,005,367
Per Capita Income ($/person)	4,319	10,912	19,076	24,034	27,410	31,764
Four-County Population						
Cass County, MO	39,448	51,029	63,808	66,926	73,855	75,775
Belton	9,783	12,708	18,150	19,037	21,008	21,554
Harrisonville	5,052	6,372	7,683	8,058	8,893	9,124
Jackson County, MO	654,558	629,266	633,232	702,723	775,476	795,638
Grandview	17,456	24,502	24,967	27,707	30,575	31,370
Independence	111,630	111,806	112,301	124,625	137,527	141,103
Kansas City	507,330	448,159	341,179	378,620	417,819	428,682
Lee's Summit	16,230	28,741	45,985	51,031	56,315	57,779
Raytown	33,306	31,759	30,601	33,959	37,475	38,449
Johnson County, KS	217,662	270,269	355,054	376,813	415,824	426,636
Olathe	17,917	37,258	63,352	67,234	74,195	76,124
Overland Park	79,034	81,784	111,790	118,641	130,924	134,328
Wyandotte County, KS	186,845	172,335	161,993	188,352	207,852	213,256
Kansas City	168,213	161,087	149,767	174,137	192,165	197,161
ROI (County Total)	1,098,513	1,122,899	1,214,087	1,334,814	1,473,007	1,511,305

E4 3993

Total employment includes only civilian employment. Personal Income and Per Capita Income are in current $ for 1970-1990 and are in constant 1992 $ for 2000-2040.

Source: Derived from Census, 1973, 1977, 1983, 1990a; DOC, 1990a and b, 1991a; KS HR; MO Employment, 1991.

TABLE E3.1–2.—*Kansas City Plant ROI Housing Characteristics*

County/City	Total Units	Owner-occupied Units		Renter-occupied Units		Mobile Homes
		Number of Units	Percent Vacant	Number of Units	Percent Vacant	
1970						
Missouri						
Cass County	13,122	8,339	2	3,738	8	1,121
Jackson County	241,919	137,019	2	87,350	1	2,411
Kansas City	272,212	157,186	1	96,519	11	2,782
Lee's Summit	5,625	3,420	1	1,688	3	5
Kansas						
Johnson County	67,482	48,806	1	16,128	9	340
Overland Park	23,022	16,165	1	5,896	10	23
Wyandotte County	63,484	40,802	1	19,496	8	1,049
ROI (County Total)	386,007	234,966	1	126,712	4	4,921
1980						
Missouri						
Cass County	19,129	13,306	9	4,117	9	1,642
Jackson County	262,356	149,608	6	92,477	10	2,667
Kansas City	191,904	101,481	7	73,746	11	1,821
Lee's Summit	11,923	6,944	5	4,208	8	9
Kansas						
Johnson County	102,827	71,583	5	25,344	7	958
Overland Park	31,244	20,718	5	8,928	6	23
Wyandotte County	68,506	41,490	6	21,902	10	1,890
ROI (County Total)	452,818	275,987	6	143,840	9	7,157
1990						
Missouri						
Cass County	24,337	17,486	2	5,408	9	2,859
Jackson County	280,729	154,859	2	97,723	13	5,467
Kansas City	161,763	77,287	3	63,603	15	2,749
Lee's Summit	18,608	11,479	2	6,009	10	118
Kansas						
Johnson County	144,155	94,661	2	41,772	9	1,747
Overland Park	48,043	28,959	2	15,977	9	263
Wyandotte County	69,102	38,714	3	22,800	16	3,109
ROI (County Total)	518,323	305,720	2	167,703	12	13,182

E4 3991

Source: Census 1972, 1982, 1990c.

TABLE E3.1–3.—*Primary Municipal Water and Wastewater Systems in the KCP ROI*

Location	Capacity (MGD)	Average Daily Demand (MGD)	Percent of Capacity
Water Systems (1991)			
Jackson County, MO			
Kansas City, MO Water Department	240.00	115.00	48
City of Independence Water Department[a]	36.00	23.00	64
Cass County, MO			
City of Harrisonville	2.20	1.47	67
Johnson County, KS			
Johnson County Water District #1[b]	105.00	44.60	42
City of Olathe[c,d]	10.50	10.00	95
Wyandotte County, KS			
Kansas City, KS Board of Public Utilities	60.00	30.00	50
Totals:	453.70	224.07	49
Wastewater Systems (1991)			
Jackson County, MO			
Kansas City, MO Publication-Owned Treatment Works	132.43	101.81	77
Little Blue Valley Sewer District	40.00	27.00	68
City of Independence	10.00	8.00	80
Cass County, MO			
City of Harrisonville	3.00	1.00	33
Johnson County, KS			
Johnson County Unified Wastewater District[e]	32.65	31.29	96
City of Olathe	5.20	3.20	62
Wyandotte County, KS			
Kansas City, KS Water Pollution Control Division	42.00	20.24	48
Totals:	265.28	192.54	73

E4 3926

[a] To expand system capacity to 42 MGD by summer 1992.
[b] To expand one of two current plants from 50 MGD to 75 MGD by 1995, total system capacity to 130 MGD.
[c] Approximately 1-1.5 MGD purchased from Johnson County in 1991.
[d] Water for city plants from Lake Olathe (plant #1, 4.0 MGD) and 11 wells at Kaw River (plant #2, 6.5 MGD).
[e] To replace 6 of 14 plants in (5 in Johnson Co., 1 in Lenexa) and increase overall system capacity by 4.1 MGD to 36.75 MGD by 1995.

Source: Sidleman, Kwan, Vest, Grey, Veal, Carter, Fain, Brunner, Turner, McQuerry, Lopez, Metzler, Celter, Gill, Patten, Smith, Creek, Vangordon, Woodring, Kirch.

TABLE E3.1–4.—*Kansas City Plant ROI Education Characteristics, 1990*

County/School District	Enrollment [a]	Enrollment Capacity [b]	Pupil-Teacher Ratio [a,c,d]	Per Pupil Expenditure [a,d]
Missouri				
Cass County	12,301	13,290	16.3	3,023.86
Belton #124	3,946	3,950	16.9	2,982.91
Cass County	454	650	13.8	3,072.91
Drexel	293	310	13.3	3,035.16
East Lynne	169	210	13.0	4,982.03
Harrisonville	2,061	2,195	14.9	3,343.07
Midway	584	600	15.4	2,976.57
Pleasant Hill	1,238	1,250	18.2	2,619.91
Raymore-Peculiar	2,696	3,000	17.2	2,906.19
Sherwood	750	1,000	15.6	2,799.96
Strasburg	110	125	15.7	4,478.86
Jackson County	96,502	105,128	15.8	4,586.84
Blue Springs	10,914	11,000	19.6	3,098.95
Center School #58	2,888	3,000	14.5	5,041.36
Fort Osage	5,203	5,600	19.4	3,102.86
Grain Valley	938	1,200	16.9	2,846.55
Grandview	4,461	5,500	15.8	4,261.08
Hickman Hills	7,505	12,425	15.6	4,135.86
Independence	11,020	10,300	18.0	3,329.52
Kansas City #33	34,640	35,297	13.6	6,356.29
Lee's Summit	8,826	8,826	18.3	3,467.39
Lone Jack	355	380	13.9	3,057.84
Oak Grove	1,523	1,600	18.5	2,880.10
Raytown	8,229	10,000	15.5	3,943.06
Kansas				
Johnson County	57,559	65,252	13.8	4,919.16
Blue Valley	8,572	10,002	14.1	5,572.85
DeSoto	1,786	1,971	14.3	4,332.14
Gardner, Edgerton, Antioch	1,698	1,772	14.5	5,147.52
Olathe	13,974	13,980	12.7	5,267.16
Shawnee-Mission	30,235	36,027	14.1	4,616.30
Spring Hill	1,294	1,500	16.0	4,417.70
Wyandotte County	29,715	32,389	14.6	4,400.23
Bonner Springs	2,134	2,149	16.9	4,276.34
Kansas City	22,543	25,000	14.4	4,447.70
Piper-Kansas City	1,054	1,040	16.5	4,606.64
Turner-Kansas City	3,984	4,200	14.3	4,143.39
ROI (County Total)	196,077	216,059	15.0	4,558.06

E4 3839

[a] KS Education, 1990; MO Education, 1990a; Slaughter.
[b] Fields, Gordon, Moore, Sagaser, Akers, Hanna, Harris, Barnett, Collins, Hill, Manning, Briegel, Wiggins, Miller, Dean, Malicoat, Esselman, Williams, Walker, Carter, Foraker, Plummer, Braley, Jones, Bush, Cook, Marsh, Norris, Wisely, Shephard, Vielbig,
[c] Jones.
[d] MO Education, 1990b; Watson.

TABLE E3.1-5.— *Baseline Traffic by Link, Kansas City Plant* [a]

Route #	From	To	1995			2000		
			ADT	PHV	LOS	ADT	PHV	LOS
Bannister Rd	Holmes Rd	I-435	29589	2959	B	31579	3158	B
Troost Ave	Bannister Rd	85th St	21667	2167	E	23125	2313	E
Troost Ave	85th St	47th St	27026	2703	E	28844	2884	F
95th St	Bannister Rd East	Blue River Rd	15610	1561	D	16660	1666	D
95th St	Blue River Rd	Bannister Rd West	14678	1468	D	15665	1567	D

E4 3902

[a] Truck traffic is estimated to comprise 15.7 percent of the total baseline traffic composition.

Source: Cunningham; KS DOT, 1991b; MO HTD, 1989, 1990; TRB, 1985.

TABLE E3.2–1a.—*Distribution of Savannah River Site Employees by Place of Residence, 1991*[a]

County/City	Number of Employees	Percent of Site
South Carolina		
Aiken County	9,978	51.9
Aiken	4,928	25.7
North Augusta	2,666	13.9
Allendale County	217	1.1
Bamberg County	329	1.7
Barnwell County	1,401	7.3
Edgefield County	288	1.5
Orangeburg County	305	1.6
Georgia		
Columbia County	2,036	10.6
Richmond County	3,358	17.5
Augusta	2,780	14.5
ROI (County Total)	17,912	93.3

E4 3848

[a] Includes DOE, Westinghouse, University of Georgia, U.S. Forest Service, and Wackenhut Services.

Source: Shedrow.

TABLE E3.2-1b.—*Indicators of Regional Growth at Savannah River Site, 1970-2040*

Local Region-of-Influence (ROI)	1970	1980	1990	2000	2020	2040
Civilian Labor Force	146,087	201,596	256,074	288,560	299,537	289,567
Unemployment Rate (%)	5.1	7.3	5.0	6.3	6.2	6.3
Personal Income (thousand $)	1,193,114	3,488,841	7,638,990	10,629,518	13,702,827	16,403,069
Per Capita Income ($/person)	2,959	7,310	14,446	18,246	21,551	25,292
Eight-County Population						
Aiken County, SC	91,023	105,625	120,940	133,076	144,345	146,943
Aiken	13,436	14,978	19,872	21,866	23,718	24,145
North Augusta	12,883	13,593	15,344	16,884	18,313	18,643
Allendale County, SC	9,692	10,700	11,722	11,543	12,521	12,746
Bamberg County, SC	15,950	18,118	16,902	19,166	20,789	21,164
Barnwell County, SC	17,176	19,868	20,293	22,869	24,806	25,252
Edgefield County, SC	15,692	17,528	18,375	20,473	22,207	22,607
Orangeburg County, SC	69,789	82,276	84,803	93,345	99,607	101,101
Columbia County, GA	22,327	40,118	66,031	69,438	76,694	78,458
Richmond County, GA	162,437	181,629	189,719	212,645	234,867	240,269
Augusta	59,864	47,532	44,639	50,033	55,262	56,533
ROI (County Total)	404,086	475,862	528,785	582,555	635,836	648,540

E4 3992

Total employment includes only civilian employment. Personal Income and Per Capita Income are in current $ for 1970-1990 and are in constant 1992 $ for 2000-2040.

Source: Derived from Census, 1973, 1977, 1983, 1990a; DOC, 1990a and b, 1991a; GA Labor, 1991; SC Employment, 1991.

TABLE E3.2–2.—*Savannah River Site ROI Housing Characteristics* [Page 1 of 2]

County/City	Total Units	Owner-occupied Units		Renter-occupied Units		Mobile Homes
		Number of Units	Percent Vacant	Number of Units	Percent Vacant	
1970						
South Carolina						
Aiken County	29,400	19,951	3	7,022	12	1,656
Aiken	4,759	2,950	4	1,377	11	31
North Augusta	4,342	2,050	2	1,449	15	26
Allendale County	3,022	1,599	2	1,141	8	102
Bamberg County	4,852	2,658	2	1,607	10	247
Barnwell County	5,384	3,075	2	1,975	10	388
Edgefield County	4,552	2,733	1	1,481	6	388
Orangeburg County	20,857	11,861	2	6,987	7	1,123
Georgia						
Columbia County	6,740	4,419	2	1,806	7	1,381
Richmond County	47,751	26,116	2	18,340	9	2,031
Augusta	21,159	8,674	1	11,203	7	4
ROI (County Total)	122,558	72,412	2	40,359	9	7,316
1980						
South Carolina						
Aiken County	39,791	27,751	7	8,705	12	4,260
Aiken	6,173	3,623	6	2,134	7	40
North Augusta	5,470	3,549	4	1,488	16	18
Allendale County	3,939	2,346	13	1,102	12	340
Bamberg County	6,384	3,976	14	1,648	7	4,492
Barnwell County	7,282	4,622	12	1,849	8	793
Edgefield County	6,207	4,078	12	1 ,458	7	837
Orangeburg County	29,114	18,224	13	7,419	9	3,339
Georgia						
Columbia County	14,099	10,326	8	2,508	15	2,205
Richmond County	64,846	35,211	7	24,290	10	3,160
Augusta	20,825	8,173	9	10,935	8	5,365
ROI (County Total)	171,662	106,534	9	48,979	10	19,426

E4 3990-1

Footnotes at end of table.

TABLE E3.2–2.—*Savannah River Site ROI Housing Characteristics* —Continued [Page 2 of 2]

County/City	Total Units	Owner-occupied Units		Renter-occupied Units		Mobile Homes
		Number of Units	Percent Vacant	Number of Units	Percent Vacant	
1990						
South Carolina						
Aiken County	49,266	33,491	2	11,392	11	10,083
Aiken	8,543	5,128	4	2,621	9	211
North Augusta	6,818	3,972	4	2,300	9	91
Allendale County	4,242	2,584	2	1,207	7	810
Bamberg County	6,408	4,052	2	1,535	9	1,396
Barnwell County	7,854	5,194	1	1,906	11	2,049
Edgefield County	7,290	4,904	2	1,520	7	1,807
Orangeburg County	32,340	21,165	1	7,744	10	8,368
Georgia						
Columbia County	23,745	17,322	2	4,519	8	3,697
Richmond County	77,288	38,762	2	29,913	10	7,205
Augusta	21,588	8,064	3	10,755	9	330
ROI (County Total)	208,433	127,474	2	59,736	10	35,415

E4 3990-2

Source: Census 1972, 1982, 1990c.

TABLE E3.2–3.—*Primary Municipal Water and Wastewater Systems in the SRS ROI*

Location	Capacity (MGD)	Average Daily Demand (MGD)	Percent of Capacity
Water Systems (1989)			
Aiken County, SC			
Aiken County	16.13	8.82	55
Aiken City	10.30	8.70	84
City of North Augusta	8.00	2.51	31
City of New Ellenton	1.54	0.51	33
City of Jackson	1.00	0.17	17
Allendale County, SC			
Allendale County	6.79	0.91	13
Bamberg County, SC			
Bamberg County	3.11	1.58	51
Barnwell County, SC			
Barnwell County	1.91	0.62	32
Barnwell City	4.75	0.70	15
Edgefield County, SC			
Edgefield County (1991)	4.40	2.51	57
Orangeburg County, SC			
Orangeburg County (1991)	11.00	5.96	54
Columbia County, GA			
Columbia County	16.72	6.73	40
Richmond County, GA			
Richmond County	22.00	12.00	55
City of Augusta	60.00	28.00	47
Totals:	167.65	79.72	48
Wastewater Systems (1989)			
Aiken County, SC			
Aiken County Public Service Authority	20.00	9.00	45
Allendale County, SC			
Allendale County	1.30	0.80	62
Bamberg County, SC			
Bamberg County	4.00	0.50	13
Barnwell County, SC			
Barnwell County	0.33	0.27	82
Barnwell City	1.00	0.80	80
Edgefield County, SC			
Edgefield County (1991)	1.69	0.73	43
Orangeburg County, SC			
Orangeburg County (1991)	9.00	3.70	41
Columbia County, GA			
Columbia County	5.38	3.30	61
Richmond County, GA			
Richmond County	1.71	1.27	74
City of Augusta	46.10	29.00	63
Totals:	90.51	49.37	55

E4 3952

Source: SR NUS, 1990a; Nichols, Montebello.

TABLE E3.2–4.—*Savannah River Site ROI Education Characteristics, 1990*

County/School District	Enrollment[a]	Enrollment Capacity[b]	Pupil-Teacher Ratio[a,c]	Per Pupil Expenditure[a]
South Carolina				
Aiken County	23,973	23,290	20.0	3,218.90
Allendale County	2,467	2,400	15.7	3,881.65
Bamberg County	3,405	3,756	17.3	3,722.60
Bamberg District #1	1,928	2,056	18.2	3,584.78
Bamberg District #2	1,477	1,700	16.1	3,902.50
Barnwell County	4,796	5,670	18.1	3,627.89
Barnwell District #19	1,271	1,300	18.7	3,589.91
Barnwell District #29	999	1,670	16.8	3,841.88
Barnwell District #45	2,526	2,700	18.2	3,562.38
Edgefield County	3,812	4,500	16.6	3,409.08
Orangeburg County	16,803	18,357	17.9	3,789.49
Orangeburg District #1	1,098	1,300	15.8	3,735.23
Orangeburg District #2	918	1,200	16.1	3,714.62
Orangeburg District #3	3,440	3,400	17.5	3,660.18
Orangeburg District #4	2,080	2,225	19.5	3,123.32
Orangeburg District #5	6,676	7,394	18.7	4,142.71
Orangeburg District #6	966	1,100	17.6	3,413.91
Orangeburg District #7	985	938	17.1	3,758.34
Orangeburg District #8	640	800	17.0	3,780.32
Georgia				
Columbia County	13,161	13,161	20.7	2,657.45
Richmond County	31,669	38,350	16.9	3,462.95
ROI (County Total)	100,086	109,484	18.2	3,378.40

E4 3840

[a] SC Education, 1991.
[b] Clark, Gamele, Steadman, Wright, Huggins, Frederick, Williams, Christie, Williams, Rice, Middleton, Barr, Myers, Lynn, Hardwick, Ethridge, Price, Rovell.
[c] Hall.

TABLE E3.2-5.—*Baseline Traffic by Link, Savannah River Site*[a]

Route #	From	To	1995			2000		
			ADT	PHV	LOS	ADT	PHV	LOS
US 278	US 1/25/78 @ North Augusta	SCSR 39	4473	447	A	5185	519	B
SCSR 19	US 1/78 @ Aiken	US 278	20259	2026	E	23483	2348	E
SCSR 64	US 278	Snelling	2193	219	A	2541	254	A
SCSR 125	Silverton St @ Jackson	SCSR 3	2061	206	A	2389	239	A

E4 3905

[a] Truck traffic is estimated to comprise 15.7 percent of the total baseline traffic composition.

Source: GA DOT, 1991; SC DOH, 1990; TRB, 1985.

TABLE E3.3–1a.—*Distribution of Los Alamos National Laboratory Employees by Place of Residence, 1991*[a]

County/City	Number of Employees	Percent of Site
New Mexico		
Los Alamos County	4,697	48.3
Rio Arriba County	2,027	20.8
Espanola	944	9.7
Santa Fe County	1,851	19.0
Santa Fe	1,548	15.9
ROI (County Total)	8,575	88.2

E4 3849

[a] Includes employees from Los Alamos National Laboratory, BDM, Butler Services, Ewing Technical Design, Johnson Controls, Johnson Engineering Services, Kirk Mayer, Mason and Hanger, Ray Rashkin Lissac, and SAIC.

Source: Van Hecke.

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TABLE E3.3-1b.—*Indicators of Regional Growth at Los Alamos National Laboratory, 1970-2040*

Local Region-of-Influence (ROI)	1970	1980	1990	2000	2020	2040
Civilian Labor Force	34,467	58,796	84,107	98,872	106,360	104,125
Unemployment Rate (%)	9.6	7.7	5.1	6.0	5.8	5.9
Personal Income (thousand $)	324,662	1,062,136	2,323,835	3,133,307	4,167,776	5,080,519
Per Capita Income ($/person)	3,396	8,642	15,348	18,578	21,807	25,736
Three-County Population						
Los Alamos County, NM	15,198	17,599	18,115	22,347	25,411	26,275
Rio Arriba County, NM	25,170	29,262	34,365	37,034	41,449	42,651
Espanola	4,528	6,803	8,389	6,692	7,490	7,707
Santa Fe County, NM	53,756	75,360	98,928	109,278	124,262	128,487
Santa Fe	41,167	48,953	55,859	61,703	70,164	72,549
ROI (County Total)	94,124	122,221	151,408	168,659	191,122	197,413

E4 3995

Total employment includes only civilian employment. Personal Income and Per Capita Income are in current $ for 1970-1990 and are in constant 1992 $ for 2000-2040.

Source: Derived from Census, 1973, 1977, 1983, 1990a; DOC, 1990a and b, 1991a; NM Employment, 1991.

TABLE E3.3-2.—*Los Alamos National Laboratory ROI Housing Characteristics*[a]

County/City	Total Units	Owner-occupied Units		Renter-occupied Units		Mobile Homes
		Number of Units	Percent Vacant	Number of Units	Percent Vacant	
1970						
New Mexico						
Los Alamos County	4,706	3,210	1	1,251	13	126
Rio Arriba County	7,503	4,910	2	1,483	8	550
Espanola	1,362	799	1	430	5	122
Santa Fe County	16,135	10,321	1	4,979	5	785
Santa Fe	12,558	7,881	1	4,182	5	379
ROI (County Total)	28,344	18,441	1	7,713	7	1,461
1980						
New Mexico						
Los Alamos County	6,585	4,629	4	1,654	7	197
Rio Arriba County	11,107	7,086	20	1,992	11	2,372
Espanola	2,641	1,718	10	662	11	625
Santa Fe County	28,314	17,460	8	8,827	6	2,865
Santa Fe	19,028	10,932	7	6,919	4	548
ROI (County Total)	46,006	29,175	11	12,473	7	5,434
1990						
New Mexico						
Los Alamos County	7,565	5,367	1	1,846	5	411
Rio Arriba County	14,357	9,218	1	2,243	13	4,468
Espanola	2,461	1,548	2	669	14	846
Santa Fe County	41,464	25,621	1	12,219	7	7,234
Santa Fe	24,681	13,592	1	9,197	7	1,464
ROI (County Total)	63,386	40,206	1	16,308	8	12,113

E4 3736

Source: Census 1972, 1982, 1990c.

TABLE E3.3-3.—*Primary Municipal Water and Wastewater Systems in the LANL ROI*

Location	Capacity (MGD)	Average Daily Demand (MGD)	Percent of Capacity
Water Systems (1991)			
Los Alamos County, NM			
LANL (DOE) (1988)[a]	4.92	4.10	83
Santa Fe County, NM			
City of Santa Fe	18.00	8.90	49
Rio Arriba County, NM			
City of Espanola	1.50	1.00	67
Totals:	24.42	13.99	57
Wastewater Systems (1991)			
Los Alamos County, NM			
Los Alamos County Utilities[b]	3.12	1.30	42
Santa Fe County, NM			
City of Santa Fe	6.50	6.00	92
Rio Arriba County, NM			
City of Espanola[c]	1.01	1.00	99
Totals:	10.63	8.30	78

E4 3928

[a] Capacity reflects current state water rights of 5514.3 acre-feet per year.
[b] Currently closing one of three plants (cap. 0.87 MGD), to expand largest plant from 1.39 to about 1.9 MGD by 1996.
[c] Scheduled to complete expansion to 1.6 MGD capacity by 1993.

Source: LANL, 1989a; LANL, 1990a; Pizzoli, George, Stowe, Farmer.

TABLE E3.3-4.—*Los Alamos National Laboratory ROI Education Characteristics, 1990*

County/School District	Enrollment[a]	Enrollment Capacity[b]	Pupil-Teacher Ratio[a]	Per Pupil Expenditure[a]
New Mexico				
Los Alamos County	3,522	3,532	15.7	4,971.39
Los Alamos	3,522	3,532	15.7	4,971.39
Rio Arriba County	7,073	8,850	18.0	3,482.05
Chama Valley	582	1,250	15.8	4,407.43
Dulce	635	1,000	15.8	3,776.97
Espanola	5,363	6,000	18.8	3,212.13
Jemez Mountain	493	600	16.4	4,946.01
Santa Fe County	14,373	15,983	18.5	2,840.20
Pojoaque Valley	1,817	2,000	19.6	3,187.15
Santa Fe	12,556	13,983	18.4	2,789.99
ROI (County Total)	24,968	28,365	17.9	3,322.65

E4 3841

[a] NM Education, 1990.
[b] Barck, Valdez, Martinez, Rodriquez, Gomez, Blea, Padilla.

TABLE E3.3-5.—*Baseline Traffic by Link, Los Alamos National Laboratory*[a]

Route #	From	To	1995			2000		
			ADT	PHV	LOS	ADT	PHV	LOS
NMSR 4	NMSR 126	NMSR 501 N @ Los Alamos W Gate	723	72	A	790	79	A
NMSR 4	NMSR 501 N @ Los Alamos W Gate	NMSR 502	3013	301	A	3294	329	A
NMSR 501	NMSR 4 East	NMSR 502 @ Los Alamos	9327	933	C	10197	1020	C
NMSR 502	NMSR 501 @ Los Alamos	NMSR 4	8941	894	C	9776	978	C
NMSR 502	NMSR 4	NMSR 30	12267	1227	C	13412	1341	C

E4 3906

[a] Truck traffic is estimated to comprise 15.7 percent of the total baseline traffic composition.

Source: NM HTD, 1990; NM HTD, 1991d; TRB, 1985.

TABLE E3.4–1a.—*Distribution of Oak Ridge Reservation Employees by Place of Residence, 1990*[a]

County/City	Number of Employees	Percent of Site
Tennessee		
Anderson County	7,849	33.3
Clinton	1,744	7.4
Oak Ridge	4,861	20.6
Blount County	566	2.4
Knox County	8,464	35.9
Knoxville	7,452	31.6
Loudon County	1,331	5.6
Lenoir City	986	4.2
Roane County	3,900	16.5
Harriman	1,253	5.3
Kingston	1,561	6.6
ROI (County Total)	22,110	93.8

E4 3850

[a] Includes employees from Martin Marietta Energy Systems (Oak Ridge Reservation, Y-12 Departments 2000 - 2999, and Paducah Departments 5400-5499), U.S. Department of Energy, M.K. Ferguson of Oak Ridge Company, and Oak Ridge Associated Universities.

Source: Williams, Truex, Miller, Counties.

TABLE E3.4-1b.—*Indicators of Regional Growth at Oak Ridge Reservation, Y-12 Plant, 1970-2040*

Local Region-of-Influence (ROI)	1970	1980	1990	2000	2020	2040
Civilian Labor Force	195,220	237,820	277,630	319,419	330,165	321,394
Unemployment Rate (%)	3.3	6.7	4.6	7.0	7.1	7.0
Personal Income (thousand $)	1,501,397	4,628,061	9,033,962	12,862,302	16,534,511	19,899,624
Per Capita Income ($/person)	3,228	8,518	15,892	20,547	23,841	27,853
Five-County Population						
Anderson County, TN	60,300	67,346	68,250	78,265	86,858	89,550
Clinton	4,794	5,245	8,972	10,289	11,418	11,772
Oak Ridge	28,319	27,662	24,743	28,374	31,489	32,465
Blount County, TN	63,744	77,770	85,969	93,652	103,934	107,156
Knox County, TN	276,293	319,694	335,749	366,417	406,646	419,252
Knoxville	174,587	175,030	165,121	180,203	199,988	206,188
Loudon County, TN	24,266	28,553	31,255	33,852	37,108	38,036
Lenoir City	5,324	5,446	6,147	6,658	7,298	7,481
Roane County, TN	38,881	48,425	47,227	53,816	58,992	60,467
Harriman	8,734	8,303	7,119	8,112	8,892	9,115
Kingston	4,142	4,441	4,552	5,187	5,686	5,828
ROI (County Total)	463,484	541,788	568,450	626,002	693,538	714,461

E4 3994

Total employment includes only civilian employment. Personal Income and Per Capita Income are in current $ for 1970-1990 and are in constant 1992 $ for 2000-2040.

Source: Derived from Census, 1973, 1977, 1983, 1990a; DOC, 1990a and b, 1991a; TN Employment, 1991.

TABLE E3.4-2.—*Oak Ridge Reservation ROI Housing Characteristics*

County/City	Total Units	Owner-occupied Units		Renter-occupied Units		Mobile Homes
		Number of Units	Percent Vacant	Number of Units	Percent Vacant	
1970						
Tennessee						
Anderson County	20,451	13,536	1	5,595	9	790
Clinton	1,702	1,128	1	483	6	26
Oak Ridge	9,972	6,205	1	3,235	10	1
Blount County	21,835	15,300	2	5,041	7	1,242
Knox County	93,011	57,656	2	29,709	7	2,507
Knoxville	61,042	32,767	1	24,292	9	689
Loudon County	8,439	5,924	1	1,901	7	529
Roane County	13,189	9,188	1	2,985	8	687
ROI (County Total)	156,925	101,604	1	45,231	7	5,755
1980						
Tennessee						
Anderson County	25,849	17,667	4	6,949	6	2,077
Clinton	2,073	1,415	3	571	7	38
Oak Ridge	11,487	7,082	3	3,939	6	19
Blount County	30,836	21,112	9	7,065	8	2,473
Knox County	125,883	74,569	8	43,382	4	5,091
Knoxville	73,263	35,075	5	33,499	8	3,153
Loudon County	10,835	8,077	5	2,212	5	1,024
Roane County	18,732	13,229	8	3,849	11	1,821
ROI (County Total)	212,135	134,654	7	63,457	5	12,486
1990						
Tennessee						
Anderson County	29,323	19,401	1	7,983	9	3,260
Clinton	4,006	2,229	1	1,566	6	230
Oak Ridge	11,664	6,962	1	3,852	12	60
Blount County	26,947	25,072	2	8,552	8	4,548
Knox County	143,582	85,369	2	48,270	8	9,222
Knoxville	76,453	34,892	2	35,081	9	1,402
Loudon County	12,995	9,428	2	2,727	7	1,919
Roane County	20,334	14,102	1	4,351	10	3,041
ROI (County Total)	233,181	153,372	2	71,883	8	21,990

E4 3737

Source: Census 1972, 1982, 1990c.

TABLE E3.4-3.—*Primary Municipal Water and Wastewater Systems in the Y-12 (Oak Ridge Reservation) ROI* [Page 1 of 2]

Location	Capacity (MGD)	Average Daily Demand (MGD)	Percent of Capacity
Water Systems (1991)			
Anderson County, TN			
Oak Ridge Reservation (DOE)	32.10	18.30	57
City of Clinton Utilities Board(1988)	2.25	1.46	65
Anderson County Utility Board	2.00	0.95	48
Blount County, TN			
City of Alcoa Utilities	24.00	7.50	31
City of Maryville	6.00	3.00	50
Knox County, TN			
City of Knoxville Utilities Board	63.60	33.09	52
First Utility Dist. of Knox County	14.00	5.82	42
West Knox Utility Dist.	8.50	3.98	47
Hallsdale Powell Utility District	6.29	4.00	64
Knox-Chapman Utility District	2.80	2.00	71
Northeast Knox Utility District (1988)	2.30	1.05	46
Loudon County, TN			
Loudon Utilities Board	8.70	4.90	56
Tellico Area Service System	3.50	1.31	37
Lenoir City Utility Board (1988)	3.00	0.97	32
Roane County, TN			
Rockwood Water System	6.00	1.65	28
City of Harriman Utility Board (1988)	3.00	1.64	55
City of Kingston Water System	2.00	0.41	20
Totals:	190.04	92.03	48

E4 3949-1

Footnotes at end of table.

TABLE E3.4-3.—*Primary Municipal Water and Wastewater Systems in the Y-12 (Oak Ridge Reservation) ROI*—Continued [Page 2 of 2]

Location	Capacity (MGD)	Average Daily Demand (MGD)	Percent of Capacity
Wastewater Systems (1991)			
Anderson County, TN			
City of Oak Ridge	5.87	5.00	85
Clinton Utilities Board	2.05	0.70	34
City of Lake City	1.00	0.35	35
Blount County, TN			
City of Maryville Utilities	10.00	6.20	62
Knox County, TN			
City of Knoxville Utilities Board	62.89	44.33	70
Hallsdale Powell Utility Dist.	5.55	3.90	70
First Utility Dist. of Knox County[a]	5.00	4.70	94
West Knox Utility Dist.	4.00	2.48	62
Loudon County, TN			
Loudon Utilities Board	7.60	5.08	67
Lenoir City Utilities Board	2.00	1.11	56
Roane County, TN			
City of Harriman Utilities Board	1.50	1.50	100
Rockwood Wastewater System	1.50	1.50	100
Kingston Water and Wastewater Dept.	1.00	0.08	8
Totals:	109.04	76.91	71

E4 3949-2

[a] Currently expanding to 10 MGD capacity.

Source: TN Commerce; Y-12 DOE, 1991; TDC, 1992; Y–12 ETDD 1991, 1992.

TABLE E3.4–4.—*Oak Ridge Reservation ROI Education Characteristics, 1990*

County/School District	Enrollment[a]	Enrollment Capacity[b]	Pupil-Teacher Ratio[a]	Per Pupil Expenditure[a]
Tennessee				
Anderson County	12,102	11,360	17.3	3,703.21
Anderson County	6,466	5,560	17.4	3,385.93
Clinton City Elementary	1,122	980	19.4	2,787.89
Oak Ridge	4,514	4,820	16.8	4,385.20
Blount County	14,139	12,440	19.6	3,038.21
Alcoa	1,380	1,520	16.7	4,191.19
Blount County	9,429	7,760	21.3	2,738.85
Maryville	3,330	3,160	17.0	3,408.07
Knox County	54,943	50,640	19.7	2,944.89
Loudon County	5,650	5,280	20.9	2,629.37
Lenoir City	1,831	1,860	23.0	2,447.94
Loudon County	3,819	3,420	20.0	2,716.35
Roane County	7,873	6,640	19.4	2,870.09
Harriman	1,915	1,940	17.7	2,932.66
Roane County	5,958	4,700	20.0	2,849.97
ROI (County Total)	94,707	86,360	19.4	3,030.68

E4 3842

[a] TN Education, 1990.
[b] TN Education.

TABLE E3.4-5.—*Baseline Traffic by Link, Oak Ridge Reservation Y-12 Plant*[a]

Route #	From	To	1995			2000		
			ADT	PHV	LOS	ADT	PHV	LOS
TSR 58	TSR 95	I-40	11216	1122	C	11985	1199	C
TSR 61	US 25W @ Clinton	TSR 62 E/O Oliver Springs	7296	730	A	7796	780	A
TSR 62	TSR 61 @ Oliver Springs	TSR 95 @ Oak Ridge	41490	4149	C	44333	4433	C
TSR 62	TSR 95 @ Oak Ridge	TSR 170	26680	2668	E	28508	2851	F
TSR 95	TSR 61	TSR 62 @ Oak Ridge	22760	2276	E	24319	2432	E
TSR 95	TSR 62 @ Oak Ridge	TSR 58	15790	1579	D	16872	1687	D
TSR 95	TSR 58	I-40/US 321	8058	806	C	8611	861	C
TSR 170	US 25W	TSR 62	12959	1296	C	13847	1385	C
Bear Creek Valley Rd	TSR 62 @ Oak Ridge	TSR 95	9147	915	C	9774	977	C

E4 3907

[a] Truck traffic is estimated to comprise 15.7 percent of the total baseline traffic composition.

Source: Bonine; TN DOT, 1991; TRB 1985.

TABLE E3.5–1a.—*Distribution of Sandia National Laboratories, Albuquerque, Employees by Place of Residence, 1991*[a]

County/City	Number of Employees	Percent of Site
New Mexico		
Bernalillo County	6,815	91.3
Albuquerque	6,429	86.1
Sandoval County	146	2.0
Valencia County	188	2.5
ROI (County Total)	7,149	95.8

E4 3851

[a] Includes all regular and part-time employees from Sandia National Laboratories, Albuquerque.

Source: McMahon

TABLE E3.5-1b.—*Indicators of Regional Growth at Sandia National Laboratories, Albuquerque, 1970-2040*

Local Region-of-Influence (ROI)	1970	1980	1990	2000	2020	2040
Civilian Labor Force	133,798	239,672	310,252	379,866	407,837	400,068
Unemployment Rate (%)	6.9	7.9	5.3	6.0	5.9	5.9
Personal Income (thousand $)	1,295,347	4,558,795	9,421,284	14,078,925	18,980,452	23,252,742
Per Capita Income ($/person)	3,438	8,808	15,992	20,640	24,629	29,228
Three-County Population						
Bernalillo County, NM	315,774	420,164	480,577	568,051	642,992	664,211
Albuquerque	243,751	331,767	384,736	454,765	514,761	531,748
Sandoval County, NM	17,492	34,799	63,319	68,387	76,540	78,760
Valencia County, NM	40,539	61,115	45,235	45,667	51,112	52,594
ROI (County Total)	373,805	516,078	589,131	682,105	770,644	795,565

E4 3999

Total employment includes only civilian employment. Personal Income and Per Capita Income are in current $ for 1970-1990 and are in constant 1992 $ for 2000-2040.

Source: Derived from Census, 1973, 1977, 1983, 1990a; DOC, 1990a and b, 1991a; NM Employment, 1991.

TABLE E3.5-2.—*Sandia National Laboratories, Albuquerque, ROI Housing Characteristics*

County/City	Total Units	Owner-occupied Units		Renter-occupied Units		Mobile Homes
		Number of Units	Percent Vacant	Number of Units	Percent Vacant	
1970						
New Mexico						
Bernalillo County	98,638	61,509	1	32,714	6	3,886
Albuquerque	78,788	48,830	1	28,826	11	2,068
Sandoval County	4,785	3,323	1	818	7	239
Valencia County	11,554	7,574	2	2,761	12	1,388
ROI (County Total)	114,977	72,406	1	36,293	6	5,513
1980						
New Mexico						
Bernalillo County	162,126	95,533	5	55,504	10	9,503
Albuquerque	132,788	75,389	5	48,649	10	5,056
Sandoval County	12,286	8,711	15	1,753	14	1,300
Valencia County	22,353	15,503	2	3,610	17	5,495
ROI (County Total)	196,765	119,747	7	60,867	10	16,298
1990						
New Mexico						
Bernalillo County	201,235	112,589	2	72,993	10	15,869
Albuquerque	166,870	88,186	2	65,632	10	9,159
Sandoval County	23,667	17,268	2	3,599	8	2,746
Valencia County	16,781	12,650	3	2,520	15	5,664
ROI (County Total)	241,683	142,507	2	79,112	10	24,279

E4 3738

Source: Census 1972, 1982, 1990c.

TABLE E3.5-3.—*Primary Municipal Water and Wastewater Systems in the Sandia National Laboratories, Albuquerque, ROI*

Location	Capacity (MGD)	Average Daily Demand (MGD)	Percent of Capacity
Water Systems (1991)			
Bernalillo County, NM			
City of Albuquerque	280.00	117.00	42
Sandoval County, NM			
City of Rio Rancho	16.00	9.00	56
City of Bernalillo	1.94	1.36	70
Valencia County, NM			
City of Los Lunas	3.38	1.00	30
City of Belen	3.00	1.00	33
Totals:	304.33	129.36	43
Wastewater Systems (1991)			
Bernalillo County, NM			
City of Albuquerque[a]	61.00	53.00	87
Sandoval County, NM			
City of Rio Rancho	4.00	3.00	75
City of Bernalillo	0.80	0.45	56
Valencia County, NM			
City of Los Lunas	0.70	0.48	69
City of Belen	1.20	1.00	83
Totals:	67.70	57.93	86

E4 3946

[a] Wastewater system capacity to be expanded to approximately 72 MGD by 1993.

Source: SN USAF, 1990; Walsh, Barrett, Knott, Wortman, Brown, Mcdonnaugh, Gaterias, Tobey, Padilla, Sanchez.

TABLE E3.5-4.—*Sandia National Laboratories, Albuquerque, ROI Education Characteristics, 1990*

County/School District	Enrollment[a]	Enrollment Capacity[b]	Pupil-Teacher Ratio[a]	Per Pupil Expenditure[a]
New Mexico				
Bernalillo County	86,653	86,716	17.9	3,194.07
Albuquerque	86,653	86,716	17.9	3,194.07
Sandoval County	4,322	5,392	17.0	3,695.78
Bernalillo	3,164	3,250	18.0	3,328.18
Cuba	644	725	15.5	5,109.87
Jemez Valley	514	1,417	14.0	4,186.83
Valencia County	9,600	10,563	20.3	2,945.34
Belen	4,189	4,574	20.1	3,084.37
Los Lunas	5,411	5,989	20.5	2,837.71
ROI (County Total)	100,575	102,671	18.1	3,191.89

E4 3843

[a] NM Education, 1990.
[b] Adamo, Whitcamp, Spradling, Goodalay, Perry, Baca, Marcus.

TABLE E3.5-5.—*Baseline Traffic by Link, Sandia National Laboratories, Albuquerque*[a]

Route #	From	To	1995			2000		
			ADT	PHV	LOS	ADT	PHV	LOS
Broadway Blvd	Gibson Blvd	NMSR 47	13006[b]	1301[b]	C	15306[b]	1531[b]	D
Eubank Blvd	I-40 @ Albuquerque	Gibson Blvd	19232[b]	1923[b]	E	54387[b]	5439[b]	F
Gibson Blvd	I-25 @ Albuquerque	Louisiana Blvd	46213[b]	4621[b]	F	39406[b]	3941[b]	F
Louisiana Blvd	Gibson Blvd	I-40 @ Albuquerque	33484[b]	3348[b]	F	46652[b]	4665[b]	F
Wyoming Blvd	I-40 @ Albuquerque	Kathryn Ave	39641[b]	3964[b]	F	22634[b]	2263[b]	E

E4 3908

[a] Truck traffic is estimated to comprise 15.7 percent of the total baseline traffic composition.
[b] Derived from average weekday traffic only.

Source: NM HTD, 1990, 1991a, 1991b; TRB 1985.

TABLE E3.6-1a.—*Distribution of Mound Plant Employees by Place of Residence, 1991*[a]

County/City	Number of Employees	Percent of Site
Ohio		
Butler County	195	9.3
Middletown	122	5.8
Montgomery County	1,371	65.1
Centerville	212	10.1
Dayton	369	17.5
Germantown	97	4.6
Kettering	128	6.1
Miamisburg	320	15.2
West Carrollton	136	6.5
Warren County	289	13.7
Carlisle/Franklin	243	11.5
ROI (County Total)	1,855	88.1

E4 3852

[a] Mound Plant employee headcount totals, September 30, 1991.

Source: Hatfield.

TABLE E3.6-1b.—*Indicators of Regional Growth at Mound Plant, 1970-2040*

Local Region-of-Influence (ROI)	1970	1980	1990	2000	2020	2040
Civilian Labor Force	380,253	427,787	481,700	521,680	523,780	502,189
Unemployment Rate (%)	5.1	7.9	5.3	5.6	5.6	5.9
Personal Income (thousand $)	3,802,566	9,141,306	16,594,092	22,344,200	27,930,592	33,139,543
Per Capita Income ($/person)	4,132	9,821	16,947	22,146	25,772	30,048
Three-County Population						
Butler County, OH	226,207	258,787	291,479	296,762	322,832	329,934
Middletown	48,767	43,719	46,022	46,856	50,972	52,094
Montgomery County, OH	606,148	571,697	573,809	595,964	635,941	645,480
Centerville	10,333	18,886	21,082	21,896	23,365	23,715
Dayton	242,917	203,371	182,044	189,073	201,756	204,782
Germantown	4,088	5,015	4,916	5,106	5,448	5,530
Kettering	71,864	61,186	60,569	62,908	67,127	68,134
Miamisburg	14,797	15,304	17,834	18,523	19,765	20,062
West Carrollton	10,748	13,148	14,403	14,959	15,963	16,202
Warren County, OH	84,925	99,276	113,909	116,211	124,969	127,469
Carlisle	3,821	4,276	4,872	4,970	5,345	5,452
Franklin	10,075	10,711	11,026	11,249	12,097	12,339
ROI (County Total)	917,280	929,760	979,197	1,008,937	1,083,742	1,102,883

E4 3998

Total employment includes only civilian employment. Personal Income and Per Capita Income are in current $ for 1970-1990 and are in constant 1992 $ for 2000-2040.

Source: Derived from Census, 1973, 1977, 1983, 1990a; DOC, 1990a and b, 1991a; OH Employment, 1991.

TABLE E3.6-2.—*Mound Plant ROI Housing Characteristics*

County/City	Total Units	Owner-occupied Units		Renter-occupied Units		Mobile Homes
		Number of Units	Percent Vacant	Number of Units	Percent Vacant	
1970						
Ohio						
Butler County	69,284	46,512	0	20,598	6	1,760
Montgomery County	197,397	122,311	0	68,494	5	3,049
Centerville	2,984	2,244	0	647	6	n/a
Dayton	85,401	41,609	1	39,998	6	815
Miamisburg	4,837	3,116	0	1,611	4	94
Warren County	24,059	17,155	1	6,139	4	426
ROI (County Total)	290,740	185,978	1	95,231	5	5,235
1980						
Ohio						
Butler County	92,528	61,518	4	26,612	7	3,760
Montgomery County	227,582	136,729	6	75,128	9	3,026
Centerville	6,922	4,884	3	1,677	11	2
Dayton	86,789	39,265	12	38,387	10	767
Miamisburg	5,891	3,689	4	1,902	7	1
Warren County	33,292	23,849	4	7,776	8	624
ROI (County Total)	353,402	222,096	5	109,516	9	7,410
1990						
Ohio						
Butler County	110,353	72,365	2	32,170	8	5,783
Montgomery County	240,820	142,371	1	83,821	8	5,939
Centerville	8,801	5,297	2	2,401	9	802
Dayton	80,370	37,049	2	35,621	10	1,601
Miamisburg	6,844	4,364	1	2,272	4	51
Warren County	40,636	29,252	1	9,898	6	1,213
ROI (County Total)	391,809	243,988	1	125,889	8	12,935

E4 3739

Source: Census 1972, 1982, 1990c.

TABLE E3.6-3.—*Primary Municipal Water and Wastewater Systems In the Mound ROI*

Location	Capacity (MGD)	Average Daily Demand (MGD)	Percent of Capacity
Water Systems (1991)			
Montgomery County, OH			
City of Dayton Water Supply and Treatment	192.00	87.00	45
Ohio Suburban Water Company (Huber Heights)	6.00	4.00	67
City of Miamisburg Water and Sewer	4.30	2.09	49
City of West Carrollton	3.60	1.37	38
City of Germantown	1.30	0.42	32
Warren County, OH			
City of Franklin Water Department	4.70	0.50	11
Warren County Water and Sewer Department	4.50	2.80	62
Butler County, OH			
City of Hamilton Utilities Department[a]	25.00	17.60	70
City of Middletown Department of Public Works	20.00	11.00	55
City of Fairfield Department of Public Works	6.00	4.50	75
Totals:	267.40	131.27	49
Wastewater Systems (1991)			
Montgomery County, OH			
City of Dayton Wastewater	72.00	55.00	76
Montgomery County Utilities	33.00	20.00	61
Miami Conservancy District (North Regional)	11.20	6.50	58
City of West Carrollton	4.27	1.50	35
City of Miamisburg Water and Sewer	3.00	2.00	67
Warren County, OH			
Miami Conservancy District (Franklin Regional)	4.50	3.00	67
Warren County Water and Sewer Department	3.64	2.40	66
Butler County, OH			
City of Hamilton Utilities Department	32.00	22.00	69
City of Middletown Department of Public Works	26.00	21.00	81
Butler County Water and Sewer Department[b]	10.00	8.10	81
City of Fairfield Department of Public Works	10.00	4.85	49
Totals:	209.61	146.35	70

E4 3940

[a] South Plant (17 MGD) capacity to be expanded to 34 MGD by 1997.
[b] Upper Mill Creek Plant (4 MGD) capacity to be expanded to 8 MGD by 1994.

Source: Ohio EPA, 1992; Schwendeman, Nelson, Cook, Hickey, Smallwood, Dursch, Westerfield, Alvey, Gupta, Patrick, Baynes, Savage, Burkhardt, Bunger, Hill, Thrower.

TABLE E3.6-4.—*Mound Plant ROI Education Characteristics, 1990*

County/School District	Enrollment[a]	Enrollment Capacity[b]	Pupil-Teacher Ratio[a,c]	Per Pupil Expenditure[a,d]
Ohio				
Butler County	48,049	55,058	19.2	3,493.83
Madison	1,565	2,000	19.2	3,297.16
Edgewood City	2,481	2,450	18.4	3,477.87
Fairfield	7,883	7,910	20.9	3,486.67
Lakota	8,712	10,100	20.2	3,371.75
Hamilton	10,553	11,088	18.7	3,422.21
Middletown	9,749	12,675	17.7	3,747.41
New Miami	1,073	1,735	17.3	3,401.19
Ross	2,624	2,875	21.3	3,160.55
Talawanda	3,409	4,225	19.5	3,706.52
Montgomery County	85,832	99,503	17.5	4,353.78
Brookville	1,527	1,725	18.9	3,245.58
Centerville	6,730	8,050	17.9	4,214.22
Dayton	27,662	27,661	16.0	5,373.03
Huber Heights	7,855	7,800	21.0	3,293.17
Jefferson	1,126	1,750	15.4	4,213.83
Kettering	7,520	9,881	16.3	4,625.94
Mad River	4,303	5,400	17.3	4,049.70
Miamisburg	4,254	6,011	19.4	3,477.85
New Lebanon	1,342	2,000	18.8	3,151.19
Northmont	6,116	7,520	20.8	3,308.03
Northridge	2,315	3,600	17.8	4,368.22
Oakwood	1,362	1,835	14.0	5,477.83
Trotwood-Madison	4,228	4,500	17.6	4,052.87
Valley View	1,892	1,970	19.4	3,321.88
Vandalia-Butler	3,412	4,000	18.1	3,859.41
West Carollton City	4,188	5,800	19.3	3,701.91
Warren County	19,236	23,307	19.4	3,331.70
Carlisle	2,025	2,800	19.4	3,619.25
Clearcreek (Springboro)	2,209	2,400	20.2	3,330.60
Franklin	3,304	4,300	19.3	3,487.97
Kings	2,643	3,675	20.1	3,206.09
Lebanon	3,245	3,432	20.8	2,928.11
Little Miami	2,165	2,700	18.8	3,360.92
Mason	2,572	2,500	18.6	3,432.59
Wayne	1,073	1,500	16.5	3,539.18
ROI (County Total)	153,117	177,868	18.3	3,955.52

E4 3844

[a] OH Education, 1990a.
[b] Pieratt, Cash, Grady, Glass, Citizen, DiStuala, Surface, Robinson, Purdue, Williams, DePalma, Keith, Franklin, Barry, Elms, Lauter, McCabe, Tipton, Blessing, Jarbo, Public Information Office, Dayton School District, Montgomery County, OH. Laman, Bowman, Karn, Cornn, Keebah, Mummal, Draffen, Oldfield, Gogole, Porter, Groth, Rogers, Wallace, DeRosa, Williams.
[c] OH Education, 1990c.
[d] OH Education, 1990b.

TABLE E3.6-5.—*Baseline Traffic by Link, Mound Plant* [a]

Route #	From	To	1995			2000		
			ADT	PHV	LOS	ADT	PHV	LOS
Benner Rd	Main St	Mound Rd	2926[b]	293[b]	A	3006[b]	301[b]	A
Main St	Central Ave	Mound Rd	7943[c]	794[c]	C	8160[c]	816[c]	C
Main St	Mound Rd	Benner Rd	1812	181	A	1861	186	A
Mound Rd	Main St	Benner Rd	2508	251	A	2577	258	A
6th St	Central Ave	Mound Rd	1394	139	A	1431	143	A

E4 3909

[a] Truck traffic is estimated to comprise 15.7 percent of the total baseline traffic composition.
[b] Derived from 1991 data.
[c] Derived from 1989 data.

Source: Brown; OH DOT, 1990; TRB, 1985.

TABLE E3.7-1a.—*Distribution of Pinellas Plant Employees by Place of Residence, 1991*[a]

County/City	Number of Employees	Percent of Site
Florida		
Hillsborough County	75	4.4
Pasco County	61	3.6
Pinellas County	1,545	91.5
Clearwater	387	22.9
Largo	300	17.8
Pinellas Park/Seminole	353	20.9
St. Petersburg	505	29.9
ROI (County Total)	1,681	99.6

E4 3853

[a] Includes 100 percent Pinellas Plant employees.

Source: Kikel.

TABLE E3.7-1b.—*Indicators of Regional Growth at Pinellas Plant, 1970-2040*

Local Region-of-Influence (ROI)	1970	1980	1990	2000	2020	2040
Civilian Labor Force	378,426	648,159	979,201	1,188,649	1,299,759	1,289,236
Unemployment Rate (%)	3.7	5.1	5.1	5.4	5.4	5.4
Personal Income (thousand $)	4,122,288	14,866,918	35,503,010	51,496,890	70,394,909	87,852,847
Per Capita Income ($/person)	3,749	9,404	18,051	22,837	26,183	30,424
Three-County Population						
Hillsborough County, FL	490,265	646,960	834,054	966,709	1,152,626	1,237,920
Pasco County, FL	75,955	193,661	281,131	314,527	375,017	402,768
Pinellas County, FL	522,329	728,531	851,659	973,706	1,160,969	1,246,881
Clearwater	52,074	85,528	98,784	112,940	134,661	144,626
Largo	22,031	58,977	65,674	75,085	89,526	96,151
Pinellas Park	22,287	32,811	43,426	49,649	59,198	63,578
Seminole	1,000	4,586	9,251	10,577	12,611	13,544
St. Petersburg	216,232	238,647	238,629	272,826	325,296	349,367
ROI (County Total)	1,088,549	1,569,152	1,966,844	2,254,942	2,688,612	2,887,569

E4 3997

Total employment includes only civilian employment. Personal Income and Per Capita Income are in current $ for 1970-1990 and are in constant 1992 $ for 2000-2040.

Source: Derived from Census, 1973, 1977, 1983, 1990a; DOC, 1990a and b, 1991a; FL Labor, 1991.

TABLE E3.7–2.—*Pinellas Plant ROI Housing Characteristics*

County/City	Total Units	Owner-occupied Units		Renter-occupied Units		Mobile Homes
		Number of Units	Percent Vacant	Number of Units	Percent Vacant	
1970						
Florida						
Hillsborough County	168,555	115,857	2	42,893	10	11,380
Pasco County	34,816	26,000	3	4,360	15	5,807
Pinellas County	228,771	159,881	2	51,420	12	22,042
Clearwater	23,333	14,470	2	6,746	12	1,976
Largo	9,244	6,970	2	1,743	11	1,283
St. Petersburg	97,116	62,743	2	26,159	11	2,906
ROI (County Total)	432,142	301,738	2	98,673	11	39,229
1980						
Florida						
Hillsborough County	263,619	159,104	10	78,139	9	15,562
Pasco County	100,846	69,317	20	12,029	15	19,621
Pinellas County	377,052	229,769	17	89,758	11	34,106
Clearwater	44,183	23,786	17	13,574	13	2,354
Largo	31,366	18,237	17	8,671	8	5,638
St. Petersburg	119,486	68,159	14	35,935	11	3,297
ROI (County Total)	741,517	458,190	15	179,926	10	69,289
1990						
Florida						
Hillsborough County	367,740	204,966	4	119,906	14	45,459
Pasco County	148,965	98,384	4	23,290	15	41,445
Pinellas County	458,341	263,388	4	117,247	14	57,149
Clearwater	53,833	27,267	4	16,871	16	4,457
Largo	38,711	21,012	4	10,909	12	11,914
St. Petersburg	125,452	66,577	4	39,126	14	6,747
ROI (County Total)	975,046	566,738	4	260,443	14	144,053

E4 3740

Source: Census 1972, 1982, 1990c.

TABLE E3.7-3.—*Primary Municipal Water and Wastewater Systems in the Pinellas ROI*

Location	Capacity (MGD)	Average Daily Demand (MGD)	Percent of Capacity
Water Systems			
Pinellas County, FL (1988)			
Pinellas County Water System[a,b]	101.70	76.10	75
St. Petersburg Water Supply System[a]	68.00	42.90	63
City of Clearwater Water Division[b,c]	6.00	4.90	82
Hillsborough County, FL (1988)			
Hillsborough County Northwest Service Area[d]	8.80	8.80	100
Hillsborough County South-Central Service Area[e]	24.10	21.90	91
City of Tampa Water Department	130.00	69.00	53
City of Temple Terrace Water Department (1991)	5.00	3.31	66
Pasco County, FL (1991)			
Pasco County Utilities Department	35.00	11.25	32
City of New Port Richey	10.00	4.50	45
Totals:	388.60	242.66	62
Wastewater Systems			
Pinellas County, FL (1988)			
Pinellas County Sewer System (1990)	45.26	29.07	64
City of St. Petersburg	68.40	50.90	74
City of Clearwater	23.20	15.14	65
City of Largo	15.00	10.20	68
City of Tarpon Springs (1990)	4.00	2.70	68
City of Dunedin	5.00	3.70	74
City of Oldsmar	2.25	1.00	44
Town of Belleair	0.90	0.70	78
Hillsborough County, FL (1988)			
Hillsborough County	24.73	16.53	67
City of Tampa	212.10	61.40	29
Pasco County, FL (1991)			
Pasco County Utilities Department	15.00	12.00	80
City of New Port Richey[f]	4.50	3.50	78
Totals:	420.34	206.84	49

E4 3941

[a] Supplemented by West Coast Regional Water Supply Authority.
[b] Also supplies water to Pasco County.
[c] Approximately 10.2 MGD additional purchased from Pinellas County.
[d] Supplemented by City of St. Petersburg, City of Tampa, and West Coast Regional Water Supply Authority.
[e] Supplemented by City of Tampa and West Coast Regional Water Supply Authority.
[f] Expansion of capacity to 7.5 MGD by 1993.

Source: Pinellas County, 1991b; PI HCPC, 1989a and b; Williams, Finley, Bungard, Soltau, Stentz, McKinnan.

TABLE E3.7-4.—*Pinellas Plant ROI Education Characteristics, 1990*

County/School District	Enrollment[a]	Enrollment Capacity[b]	Pupil-Teacher Ratio[a]	Per Pupil Expenditure[c]
Florida				
Hillsborough County	120,364	128,734	21.5	4,626.62
Pasco County	32,626	41,206	22.8	3,698.04
Pinellas County	92,490	106,012	21.5	3,983.37
ROI (County Total)	245,480	275,952	21.7	4,260.84

E4 3845

[a] FL Education, 1990.
[b] Wooten.
[c] FL Education, 1991.

TABLE E3.7-5.—*Baseline Traffic by Link, Pinellas Plant*[a]

Route #	From	To	1995			2000		
			ADT	PHV	LOS	ADT	PHV	LOS
Belcher Rd	Ulmerton Rd	Bryan Dairy Rd	39271[b]	3927[b]	F	47263[b]	4726[b]	F
Belcher Rd	Bryan Dairy Rd	Park Blvd	34825[b]	3483[b]	F	41912[b]	4191[b]	F
Bryan Dairy Rd	Starkey Rd	Belcher Rd	35566[c]	3557[c]	F	42804[c]	4280[c]	F
Bryan Dairy Rd	Belcher Rd	66th St	35751[b]	3575[b]	F	43027[b]	4303[b]	F

E4 3912

[a] Truck traffic is estimated to comprise 15.7 percent of the total baseline traffic composition.
[b] Derived from 1991 data.
[c] Derived from 1989 data.

Source: FL DOT 1988a and b, 1990; Pinellas County, 1992; TRB, 1985.

TABLE E3.8-1a.—*Distribution of Rocky Flats Plant Employees by Place of Residence, 1991*[a]

County/City	Number of Employees	Percent of Site
Colorado		
Adams County	1,415	17.8
Broomfield	159	2.0
Thornton	341	4.3
Westminster	327	4.1
Arapahoe County	407	5.1
Boulder County	1,889	23.7
Boulder	488	6.1
Broomfield	372	4.7
Longmont	428	5.4
Denver County	669	8.4
Denver	669	8.4
Jefferson County	2,985	37.5
Arvada	1,239	15.6
Broomfield	106	1.3
Golden	420	5.3
Lakewood	259	3.3
Westminster	657	8.2
ROI (County Total)	7,365	92.5

E4 3854

[a] Includes employees from EG&G Rocky Flats, U.S. Department of Energy, and Wackenhut Services.

Source: Powell, Duffy, West.

TABLE E3.8-1b.—*Indicators of Regional Growth at Rocky Flats Plant, 1970-2040*

Local Region-of-Influence (ROI)	1970	1980	1990	2000	2020	2040
Civilian Labor Force	511,935	870,145	1,009,650	1,205,374	1,283,093	1,262,184
Unemployment Rate (%)	3.7	5.2	4.5	5.6	5.6	5.6
Personal Income (thousand $)	5,572,132	18,754,878	35,768,813	51,753,781	67,743,112	81,833,679
Per Capita Income ($/person)	4,503	11,690	20,006	24,644	28,343	33,192
Five-County Population						
Adams County, CO	185,789	245,944	265,038	325,679	370,664	382,526
Thornton	13,326	40,343	55,031	67,622	76,963	79,425
Arapahoe County, CO	162,142	293,621	391,511	453,401	516,028	532,541
Boulder County, CO	131,889	189,625	225,339	251,892	286,676	294,703
Boulder	66,870	76,685	83,312	93,017	105,862	108,826
Broomfield	7,261	20,730	24,638	27,541	31,344	32,222
Longmont	23,209	42,942	51,555	57,630	65,588	67,425
Denver County, CO	514,678	492,365	467,610	570,460	649,256	670,032
Jefferson County, CO	233,033	371,753	438,430	498,602	567,473	585,632
Arvada	46,814	84,576	86,888	98,813	112,462	116,060
Golden	9,817	12,237	13,116	14,973	17,041	17,586
Lakewood	92,787	112,860	126,481	143,840	163,708	168,947
Westminster	19,432	50,211	74,625	84,867	96,589	99,680
ROI (County Total)	1,227,531	1,593,308	1,787,928	2,100,034	2,390,097	2,465,434

E4 3996

Total employment includes only civilian employment. Personal Income and Per Capita Income are in current $ for 1970-1990 and are in constant 1992 $ for 2000-2040.

Source: Derived from Census, 1973, 1977, 1983, 1990a; DOC, 1990a and b, 1991a; CO Labor, 1991.

TABLE E3.8-2.—*Rocky Flats Plant ROI Housing Characteristics*

County/City	Total Units	Owner-occupied Units		Renter-occupied Units		Mobile Homes
		Number of Units	Percent Vacant	Number of Units	Percent Vacant	
1970						
Colorado						
Adams County	51,457	37,603	1	12,421	5	3,506
Arapahoe County	48,919	34,481	1	13,048	3	1,708
Boulder County	44,307	25,012	1	15,842	5	1,963
Boulder	21,632	10,718	1	8,131	4	557
Denver County	193,754	93,156	1	92,175	6	594
Jefferson County	72,092	50,800	1	17,563	4	2,016
Arvada	12,551	10,344	1	2,056	3	4
Westminster	5,224	3,935	0	1,210	4	5
ROI (County Total)	410,529	241,052	1	151,049	5	9,787
1980						
Colorado						
Adams County	89,280	58,354	5	25,865	8	10,297
Arapahoe County	113,229	75,471	6	30,547	7	2,294
Boulder County	74,638	42,428	9	26,536	6	3,608
Boulder	30,287	13,489	6	15,185	5	723
Denver County	227,879	106,299	6	105,267	8	718
Jefferson County	138,542	98,633	6	36,145	7	1,751
Arvada	29,360	20,860	3	7,342	6	10
Westminster	18,560	12,083	7	5,093	7	578
ROI (County Total)	643,568	381,185	6	224,360	8	18,668
1990						
Colorado						
Adams County	106,947	63,129	4	33,224	14	12,803
Arapahoe County	168,665	98,376	3	56,334	13	3,411
Boulder County	94,621	54,031	2	34,371	5	4,730
Boulder	36,270	16,007	2	18,674	5	1,070
Denver County	239,636	103,765	4	107,187	14	2,645
Jefferson County	178,611	116,830	3	49,715	9	3,107
Arvada	33,643	23,085	2	8,813	9	181
Westminster	29,868	18,151	3	9,677	10	652
ROI (County Total)	788,480	436,131	3	280,831	11	26,696

E4 3741

Source: Census 1972, 1982, 1990c.

TABLE E3.8–3.—*Primary Municipal Waste and Wastewater Systems in the Rocky Flats Plant ROI*

Location	Capacity (MGD)	Average Daily Demand (MGD)	Percent of Capacity
Water Systems (1989)			
Adams County, CO			
City of Thornton	50.00	12.70	25
City of Westminster	36.00	23.00	64
City of Northglenn	15.00	4.22	28
City of Brighton	12.00	2.80	23
South Adams County Water and Sewer District (1991)	15.50	3.50	23
Arapahoe County, CO			
City of Aurora	130.00	40.00	31
City of Englewood	34.00	8.00	24
Boulder County, CO			
City of Boulder	55.00	20.10	37
City of Longmont	50.00	12.60	25
City of Broomfield[a]	8.00	2.68	34
City of Lafayette	8.00	2.20	28
Denver County, CO			
Denver Water Board	715.00	211.68	30
Jefferson County, CO			
City of Arvada	52.00	15.60	30
City of Golden	15.00	3.44	23
Totals:	1,195.50	362.52	30
Wastewater Systems (1989)			
Adams County, CO			
City of Westminster	5.50	4.18	76
City of Northglenn	6.50	3.10	48
City of Brighton	2.63	1.76	67
South Adams County Water and Sewer Dist. (1991)	4.00	2.60	65
Arapahoe County, CO			
City of Aurora[b]	2.50	2.30	92
City of Englewood	35.00	23.00	66
Boulder County, CO			
City of Boulder (1991)	16.00	16.00	100
City of Broomfield	5.40	2.52	47
City of Lafayette	1.80	1.20	67
City of Longmont	11.55	6.99	61
Denver County, CO			
Denver (Metro WW Reclimation District) (Metro)	185.00	140.00	76
Totals:	275.88	203.65	74

E4 3945

[a] Purchases an average of 1.8 MGD in addition to city-supplied water.
[b] Represents only approximately 10 percent of Auroras daily flow, remaining 90 percent to Metro system.

Source: CO Municipal, 1991; CO Health, 1992; Roecker, Simpson, Jones, Fabisiak, Bebler, Schat.

TABLE E3.8-4.—*Rocky Flats Plant ROI Education Characteristics, 1990*

County/School District	Enrollment[a]	Enrollment Capacity[b]	Pupil-Teacher Ratio[a]	Per Pupil Expenditure[a,c]
Colorado				
Adams County	47,496	57,625	18.5	4,681.70
Adams County	5,981	13,000	19.5	4,549.76
Bennett	810	931	15.1	5,313.05
Brighton	3,925	4,565	17.9	5,217.36
Mapleton	4,727	6,000	20.0	4,448.24
Northglen-Thornton	20,692	22,304	18.5	4,715.89
Strasburg	437	325	13.2	6,132.97
Westminster	10,924	10,500	18.3	4,492.88
Arapahoe County	74,811	80,731	18.6	5,332.17
Adams-Arapahoe	25,345	25,983	18.2	5,264.16
Byers	339	520	13.3	6,164.35
Cherry Creek	28,027	28,097	18.6	5,733.66
Deer Trail	181	350	10.3	6,441.77
Englewood	4,039	7,000	20.0	4,708.99
Littleton	15,356	17,200	19.4	4,818.58
Sheridan	1,524	1,581	17.5	5,589.22
Boulder County	35,942	45,322	18.3	5,318.49
Boulder Valley	21,013	28,255	18.0	5,980.55
St. Vrain Valley	14,929	17,067	18.8	4,386.63
Denver County	58,299	81,851	16.0	6,192.31
Denver	58,299	81,851	16.0	6,192.31
Jefferson County	75,164	83,674	21.1	4,775.62
Jefferson	75,164	83,674	21.1	4,775.62
ROI (County Total)	291,712	349,203	18.5	5,253.07

E4 3846

[a] CO Education, 1990.
[b] Goldberg, Lathrop, Bennett, Pocello, Hill, Keanan, Pachello, Morris, Glanstaff, Phillips, Collins, Colt, Dempsey, Beabar, Atchinson, Geist, Eckering, Saltzman.
[c] CO Education, 1989.

TABLE E3.8-5.—*Baseline Traffic by Link, Rocky Flats Plant* [a]

Route #	From	To	1995			2000		
			ADT	PHV	LOS	ADT	PHV	LOS
CSR 93	CSR 58 @ Golden	CSR 128	15473	1547	D	19834	1983	E
CSR 128	CSR 93	CSR 121	8174	817	C	10479	1048	C
Indiana St	CSR 72	CSR 128	10364	1036	C	13285	1329	C

E4 3914

[a] Truck traffic is estimated to comprise 15.7 percent of the total baseline traffic composition.

Source: CO Highways, 1990, 1991b; TRB, 1985.

Consultation and Coordination

The Federal, state, and local agencies and private organizations/agencies that were contacted in 1992 during the course of preparing the Socioeconomics and Community Services sections of this Environmental Assessment are listed below.

Kansas City Plant

Contacts in the State of Kansas:

Aubrey Township Fire Department, Johnson County

Charlene Braley, Clerk of the Board, DeSoto School District, Johnson County

Dorothy Bush, Secretary to the Director of Student Services, Olathe School District, Johnson County

Myran Celter, Kansas City, Kansas Water Pollution Control Division

Consolidated Fire District #2, Johnson County

Charlene Cook, Budget Analyst, Shawnee-Mission School District, Johnson County

Edgerton Community Fire Department, Johnson County

Edwardsville Fire Department, Wyandotte County

Gardner Community Fire Department, Johnson County

Glen Gill, Kansas City, Kansas Water Pollution Control Division

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APPENDIX F

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APPENDIX F: EXPOSURES AND HEALTH EFFECTS METHODOLOGY

F.1 GENERAL CONSIDERATIONS

Normal Operations Impacts. The information contained in the site environmental reports and received in response to the datacall was used to evaluate the No Action, Proposed Action, and other consolidation alternatives at host and donor sites. The Air and Water Resources sections for each site in chapter 4 discuss potential releases and resulting concentrations of hazardous and radioactive materials and compare these data to applicable permit, regulatory, and Department of Energy (DOE) operational limits. These estimated air concentrations were compared to acceptable reference concentrations (for chronic exposures) and adjusted Threshold Limit Values (TLV) or Permissible Exposure Levels (PEL) (for acute exposures). The exposure concentrations for air were converted to doses in milligrams per kilogram(mg/kg) per day and multiplied by a cancer potency factor (slope factor) to calculate the cancer risk (see section F.3 of this appendix). Additionally, each operation was examined for the hazardous and radioactive materials used in the processes. When available, monitoring data were compared to DOE, Occupational Safety and Health Administration (OSHA), and National Institute for Occupational Safety and Health (NIOSH) limits for worker exposure. The results of these comparisons were used to assess human health effects.

Accident Impacts. The hazardous and radioactive materials associated with each activity proposed for transfer were assessed for their potential to impact human health in the event of an accident. These impacts are bounded by the atmospheric pathway as well as engineering barriers, catchments, and mitigation plans that would ameliorate the hydrologic pathway. Since the designs of the various activity transfers have not been finalized, a probabilistic risk assessment, which considers engineering mitigation and initiating events, was not possible. However, a preliminary identification of hazardous/toxic chemicals was conducted to generate a list of toxicants associated with the processes. In addition, quantitative hazard assessments and safety analyses and assessments that had been previously performed and documented, were reviewed to determine the accidents that had been assessed or analyzed. Accidents at receiver sites involving hazardous and radioactive materials used in processes to be relocated to the receiver sites were used to make qualitative comparisons. In all cases, the hazardous and radioactive materials and processes assessed or analyzed at receiver sites were the same or very similar to those hazardous and radioactive materials and processes at donor sites. Additionally, the amount of hazardous and radioactive materials from donor sites was small compared to existing receiver site inventories. The hazards associated with the relocated functions are expected to be of the same kind and the consequences of the same magnitude as those previously reviewed and documented.

F.2 APPROACH TO THE RISK ASSESSMENT OF THE WORKERS (ONSITE) AND THE GENERAL PUBLIC (OFFSITE) FOR NONNUCLEAR MATERIALS

Objectives. This risk assessment achieved two objectives:

- Establishment of risk due to normal facility operations.
- Establishment of risk due to facility accidents or failure.

Definitions. Normal operations is a concept that assumes all process operations are in place and that all equipment, procedures, devices, and controls (including engineering, etc.) are in the best possible condition and function as intended. If a process, by necessity, involves some level of exposure to humans, either onsite or offsite, to an identified hazardous/toxic substance, the process will be designed so the exposure is below the level that could cause adverse health effects.

Accident or upset condition is a concept that assumes a failure in some control or containment system (e.g., facility or engineering), or procedure that could potentially lead to human exposure to a hazardous/toxic substance at an unacceptable level. In some instances, this exposure may include a level/concentration above the normal condition, but still within a safe range. For example, in a complex control system designed for maximum protection, one of several safety controls may not perform as expected, leading to an exposure that still lies within a safe range.

Approach. For purposes of this environmental assessment (EA), information on hazardous chemicals was made available from the Kansas City Plant (KCP), Pinellas Plant, Sandia National Laboratories, Albuquerque (SNL), Y-12 Plant, Rocky Flats Plant (RFP), and Mound Plant facilities. Several steps were involved in the total process of establishing risk for purposes of the EA. These include the following:

- *Process Identification.* This activity involves the identification of the processes and associated materials that go into (input) and come out of (output) each process.

- *Screening for Hazardous Substances.* This activity involves development and implementation of a screening procedure for hazardous substances that are used or produced in the processes. It also involves selection of those substances with the potential to elicit adverse health effects.

- *Selection of Significant Hazardous Substances.* This activity involves the selection of hazardous substances and associated processes for substances at sufficient volumes and toxicity to cause adverse health effects to workers (onsite) or the public (offsite) should a release occur.

- *Hazard Identification.* This is the identification of chemicals, their location, quantities, and the nature of the hazard (within a process/module) they pose. This step was of sufficient depth to verify or validate that a potential hazard could exist. The chemical(s) name(s) and properties associated with chemical/physical structure was defined; a toxicity profile was developed; the approximate level of concern or other concentration-effect parameters were defined; and maximum/average quantities stored or input into a process were assessed. At this stage, the selected chemicals are ones likely to be used extensively and/or associated with a previous history of adverse health effects, including cancer or other chronic/continuous exposure-related endpoints.

- *Release Analysis.* The areas affected by the release (vulnerable zones) were determined from estimated quantities of extremely hazardous substances released to the air, the rate of release, dispersion, and the airborne concentrations causing death or adverse health effects. However, not all of the quantity of an extremely hazardous substance would actually be released, and of that released, not all would become airborne. Furthermore, certain

variables may affect the vulnerable zones. Although these factors were recognized, the initial estimates of the vulnerable zones were made using conservative estimates. The essential information for these assumptions included:

- Identification of the chemical(s).
- The maximum potential quantity in a single vessel, interconnected vessel, or input into a process.
- The location of the chemical source within the process/module.
- The physical state under assumed sets of conditions.
- Quantity of extremely hazardous substances likely to be released (past performances including facility toxic release inventories were used).
- Site specific topographical considerations.
- Site specific meteorological conditions.
- The level of concern, TLV, PEL, Protection Action Guides, or other action/response parameters.

A Protection Action Guide is defined as an exposure or concentration that can trigger a protective response or action, i.e., the necessary action to avoid or reduce a projected harmful exposure. The Emergency Response Planning Guidelines, developed by the American Industrial Hygiene Association (AIHA, 1992) for airborne concentrations up to one hour, were the Protection Action Guides used when applicable. These effect levels are as follows:

- *Emergency Response Planning Guidelines-1.* The subject experiences a mild transient adverse health effect, encounters an objectionable odor, or lacrimation (e.g., excessive eye watering) occurs.
- *Emergency Response Planning Guidelines-2.* Irreversible or other serious health effects occur which could impair the ability to take protective action. Treatment may be required, and this treatment may reverse some effects.
- *Emergency Response Planning Guidelines-3.* Life threatening health effects occur; impairment of ability to take protective action also occurs.

Other Protection Action Guides include the following:

- Short-term Public Exposure Guidance Level that applies to exposures from 1 to 24 hours. (National Research, 1986).
- Level of concern that applies to concentrations that might cause serious irreversible health effects or death. The 0.1 Immediately Dangerous Life and Health level, derived from animal toxicity data, was also used for guidance since this level defines the maximum concentration from which a worker could escape within 30 minutes without irreversible health effects (EPA, FEMA/DOT, 1987; NIOSH, 1990).
- OSHA's PELs are regulatory limits legislated for worker protection. PELs refer to air concentrations and may be expressed as either a time-weighted average (TWA) or ceiling

value, to which an employee can be exposed for a normal 8-hour day, 40-hour work week without ill effect (29 CFR 1910).

- American Conference of Governmental Industrial Hygienists, a recognized professional society, recommend their own exposure values or TLV. TLVs may also be expressed as TWAs, a level to which workers can be exposed for a normal 8-hour day, 40-hour work week without ill effects. TLV ceiling limits indicate an exposure limit that must not be exceeded at any time during the work day. A TLV STEL is a short-term exposure limit, usually a 15-minute TWA, which should not be exceeded (ACGIH, 1991; 29 CFR 1910).

- NIOSH is another group that recommends exposure limits for workers. Following an extensive review of the literature and analysis, recommended exposure levels are put forward by NIOSH to protect worker health (Sax, 1992).

The PEL and TLV values were used for short term exposures because they represent typical exposure protections for workers which are both official and widely accepted.

Although the approach discussed above deals with air emissions, these principles are also broadly applicable to potential exposure through water.

- *Exposure Assessment.* This process measured or estimated the intensity, frequency, and duration of human exposures to substances which could arise if chemicals were released into the environment.

Several critical components were characterized for this exposure assessment. These were as follows:

— Population and population distribution.

— Exposure pathway (e.g., inhalation, ingestion, dermal).

— Source of exposure and documentation of these sources (e.g., modeling of air dispersion, toxic release inventory data, National Pollutant Discharge Elimination System (NPDES) data, environmental monitoring).

— Duration of exposure (i.e., continuous, intermittent, sporadic).

From the above, uptake values were calculated, where uptake consists of concentration of the pollutant in water or air (converted from parts per billion (ppb), when required, to micrograms (μg) or micrograms per liter (mg/L) or micrograms per cubic meter (μg/m^3), respectively), ingestion or respiration rate (absorption in the case of dermal), and body weight of the exposed person.

- *Risk Characterization.* In this process, the incidence of health effects under various conditions/scenarios of human exposure (developed in the exposure assessment) were estimated. This process used exposure assessment and dose-response data for an identified hazardous chemical and incorporated the uncertainties associated with the type and quality of the data used (e.g., human epidemiology vs. animal bioassay data or complete data vs. limited data). Both acute and chronic exposures were evaluated, as appropriate, for each chemical release. For chronic exposures, the risk was divided into non-carcinogenic health outcomes

(threshold) and carcinogenic (probabilistic) outcomes. Health risks were characterized for the following:

— Noncarcinogenic effects for single compounds by comparing reference levels (reference concentration or reference dose) to uptake levels.

— Noncarcinogenic effects for exposure to multiple compounds by summation of single compound effects.

— Cancer risk due to individual compounds.

— Cancer risk as summation of risk due to all identified carcinogens.

Reference dose, reference concentration, and cancer unit risk were taken from the Integrated Risk Information System, Health Effects Assessment Summary Tables, and the Battelle Pacific Northwest Laboratories database (see table F5-3).

F.3 Determination of Risks from Nonradioactive Materials

Carcinogens. The procedure for calculating risk of exposure to carcinogenic compounds is well documented (National Research, 1983; EPA, 1983; EPA, 1989a; Roderick, 1984; SR Dupont, 1987a). A non-threshold dose-related model was used to calculate a cancer potency factor (slope factor) for each carcinogenic chemical; table F5-3 gives a unit value of slope factors for selected constituents based on oral or inhalation reference values developed in the Environmental Protection Agency (EPA) Integrated Risk Information System. The cancer potency factor was multiplied by the estimated average daily lifetime dose experienced by the exposed population to the chemical of concern to derive an estimate of risk as follows:

- $R=DxSF$

Where: D=average daily lifetime dose (milligrams per kilogram of body weight per day) derived from the exposed concentration of the chemical for the pathway of concern (ingestion or inhalation). The inhalation concentration is converted to the same units as the reference dose when used in the above equation, where $0.286 x mg/m^3 = mg/kg\text{-}day$.

SF=slope factor for this pathway of concern (milligrams per kilogram of body weight per day)$^{-1}$. The slope factor converts estimated daily intakes averaged over a lifetime of exposure to the incremental risk of an individual developing cancer. Slope factors are usually documented, i.e., in the Integrated Risk Information System for each individual toxic chemical according to the potential exposure pathway; however, the unit risk can be used to determine a slope factor. The following equation can be used to convert an air concentration to a slope factor:

- $SF = \text{Unit Risk}(\mu g/m^3)^{-1} x 70\ kg x 10^3\ (\mu g/mg)/20(m^3/day)$

Where: 70 kg is the assumed average weight of an adult, $10^3(\mu g/mg)$ converts micrograms to milligrams and $20(m^3/day)$ is the estimated volume of air inhaled by an average adult.

R is an explicit estimate of the upper limit of risk for the pathway of concern and would have a value between zero and one.

If the inhaled dose, D, is given in mg/m^3, it can be converted to units of mg/kg-day by the following calculation:

- $[x\ mg/m^3]x[20m^3/day x 70\ kg]=0.286$

or $0.286 x mg/m^3 = mg/kg\text{-}day$

Noncarcinogens. The traditionally accepted practice of evaluating exposure to a noncarcinogenic

compound has been to determine experimentally a no-observable-adverse-effect level and to divide this by an uncertainty factor to establish a reference dose for ingestion and a reference concentration for inhalation. The reference concentration values were compared to the exposure concentration according to the pathway of concern (ingestion or inhalation) to obtain a Hazard Quotient as follows:

- Hazard Quotient=C/RfC

Where: C=average daily lifetime concentration derived from the concentration level of the chemical for the pathway of concern at the point of potential exposure.

Human health effects resulting from multiple exposures are addressed by the Hazard Index.

- Hazard Index=$C_1/RfC_1+C_2/RfC_2+ \ldots +C_i/RfC_i$ where C_i=average daily lifetime dose for i^{th} toxic chemical and RFC_i=reference concentration for the ith toxic chemical.

Establishing acceptable exposure limits implies that the application of uncertainty factors to an experimentally derived no-observable-adverse-effect level would prevent an adverse health risk. The reference doses typically are derived by making assumptions about the nature of dose-response relationships at low doses and by drawing inferences based on the available data (National Research, 1983).

The Hazard Index value derived for noncarcinogens could vary from less than one to more than one. It is to be recognized that these values for non-carcinogens represent the potential for an adverse health effect at the assessed exposure level if the Hazard Index is greater than one. There is no effect risk if the Hazard Index is less than one since these values are very conservative. This Hazard Index is only a numerical indicator of the threshold between acceptable and unacceptable exposure levels and is not a mathematical prediction of incidence of effects or their severity.

F.4 Evaluation of Potential Offsite (Public) and Onsite (Worker/ Occupational) Risks for Hazardous Chemicals

Although the endpoint health effects of onsite and offsite releases can be similar, it is not valid to assume that this would be the case. Distance, and exposure pathways, the hazardous materials that are candidates for onsite or offsite exposures may differ, and even the effects from the same material may differ according to concentration level and route of exposure (e.g., inhalation vs. ingestion and low-chronic vs. high-acute exposures). The initiating events for onsite and offsite exposures are also likely to differ and the mitigation and control procedures can be entirely different. Therefore, different approaches were chosen to identify the hazardous chemicals likely to cause offsite and onsite health effects, should they be released.

Offsite Impacts. The screening of hazardous chemicals for the potential to cause offsite effects involves assessing the emission or discharge potential to the public. The physiochemical properties, especially the physical state (e.g., vapor pressure, boiling point, solubility, and mobility characteristics) were considered in assessing container and/or control failures. The hazard potential (e.g., toxic dose and potential health effects at various concentration levels) was assessed. The quantities stored, transported, or used during a given process were determined. A limited number of major source terms (i.e., quantities released or potentially released over a given period) were identified. The most likely release and dispersion media for source terms were also considered; air and water were the major candidates for planned and/or unplanned releases that could result in either acute or chronic adverse health effects offsite. A third medium, soil, was also considered, although it was not of major importance for a plant (production)

operation due to the flow route, containment barriers, and other engineering controls that are frequently in place (e.g., spill tanks and troughs) at a state-of-the-art facility. However, it was recognized that hazardous chemical plumes have developed in soil and underground water from large accidental releases or waste management practices in the past. Solid substances, because of their relatively low mobility and complexity, were generally given low priority unless a scenario involved a release associated with fire or explosion.

For source term selection with a potential offsite effect, extremely hazardous materials exceeding the *Superfund Amendments and Reauthorization Act* (SARA) Title III Tier Two threshold were identified; also considered were less hazardous chemicals whose plant site storages were identified in design documents as being stored in bulk quantities chemicals with release of less than 100 pounds were excluded. Tier Two threshold is based on physical and health hazards, i.e., fire, sudden release of pressure, acute health hazard, chronic health hazard, and reactivity with the environment or other chemicals within the site.

Offsite chemical effects were evaluated relative to Protection Action Guides and other parameters for protection against adverse health effects.

The methodology used for modeling normal releases is described in appendix D. The concentrations of chemicals developed using this methodology are presented in tables F5-6 though F5-11; these values were used to calculate Hazard Quotients for individual chemicals and the Hazard Indexes (chemicals summed) at individual sites.

Occupational/Worker. As was stated previously, the chemical hazards involving onsite workers may be significantly different from those that may cause offsite (public) adverse effects. Depending on several factors, some onsite, worker exposures can trigger a Protection Action Guideline (e.g., exceeding the PEL), whereas the quantity/toxicity offsite would fall far below a measurable concentration or observable effect. In addition, onsite workers are more likely to encounter more chemicals than offsite (i.e. the public). The controls to prevent occupational exposure may include engineering/mechanical barriers and special protective devices (e.g., respirators, goggles, and chemical-impermeable outerwear). Since numerous factors are involved, the selection of hazardous chemicals should be monitored to protect workers. However, it is possible to apply a scoring system based on the experience with industrial hygiene. It is important to determine which processes employ hazardous materials and the points at which safety devices and engineering barriers are required to prevent worker exposure. Under normal conditions, there should be no measurable exposure to most hazardous chemicals, but exposures cannot be entirely avoided. In those instances where exposures are expected, an acceptable/permissible exposure level was established and monitoring conducted to ensure that a safe concentration was not exceeded. The necessity for monitoring was determined by the sites and provided the criteria/basis for establishing the potential risk for adverse health effects. The industrial hygiene assessment matrix developed for Allied-Signal's KCP was used for this purpose, and includes a score based on the criteria which follow:

- *Health Rating.* This rating is based on the toxicological properties associated with a given hazardous chemical (e.g., the Diamond Label established by the National Fire Protection Association, which uses a range of 0 to 4 with 4 being the most hazardous), and both acute and chronic toxicity should be considered.

- *Frequency of Use.* The frequency is based on length of exposure per month; the matrix uses a range of 0 to 3 with 3 being the highest frequency.

  0 - on inventory list, but not in use
  1 - low (less than 4 hours/month)
  2 - medium (4 to 39 hours/month)
  3 - high ($\geq$ 49 hours/month)

- *Permissible Exposure Level (PEL – OSHA).* The PEL established by OSHA for each toxicant serves as the standard for this component of the matrix score.

  0 - Evaluated within 1 year and detected in work area or in personnel
  1 - Evaluated within 1 year and < 25 percent of PEL determined
  2 - Evaluated within 2 years and < 50 percent of PEL determined
  3 - Evaluated within 2 years and > 50 percent of PEL determined.

Based on a maximum possible score of ten as a sum of the three criteria, all candidate chemicals were considered and those with a combined score of six or more were further evaluated.

The approach for deciding which chemicals to model for occupational exposure and the potential for adverse health effects is process-dependent. Each process (independent of site designation) to be included in the DOE's Nonnuclear Consolidation Plan (NCP) was studied and evaluated for potential exposures that the worker might encounter. The hazardous materials used as input into each process were identified, along with the quantity and frequency of use. This process permitted application of a scoring matrix to hazardous materials that might create a concern rather than random selection from an inventory. Where actual monitoring data were available or there was sufficient evidence that a process operates safely under normal conditions, scenarios for upset conditions were considered along with engineering/procedural controls and the ability to mitigate.

F.5 Identification of Hazardous Materials and Their Associated Processes

Activities to be Transferred. Processes were identified with associated materials required to operate the process (input) as well as the end products, releases, and wastes (output); the objective was to identify hazardous materials associated with each process and to assess/identify those having potential for causing adverse health effects, i.e., toxicants. The first review of the transferred processes produced the following list of toxicants:

Compounds Considered

- Lithium thionyl chloride
- Isopropyl alcohol
- Sulfur Dioxide (SO_2) gas
- Methylene chloride
- Methylene diisocyanate
- Trichloroethylene (TCE)
- 4,4-methylene dianiline (from epoxy mixture)
- Nickel compounds
- 1,1,1-trichloroethane (TCA)
- Chromium trioxide
- Hydrogen fluoride
- Toluene diisocyanate, free state
- Lead titinate
- Beryllium compounds
- Chlorine gas
- Volatile organic compounds (VOC)
- Polycyclicaromatic hydrocarbons

From this list, compounds were selected if they were considered hazardous and of concern for a potential exposure generated as a consequence of conducting work which involved nonnuclear processes. This selection was based upon compound toxicity, concentrations used, frequency of use, and on the fact that the process(es) were selected for transfer to a consolidation site. The compounds and processes identified for further analysis because of their hazard potential are identified in table F5-1.

The toxic chemicals associated with processes proposed for transfer and others of major concern with ongoing plant processes were characterized according to their general properties and chemical toxicity (table F5-2) and according to various exposure limits or standards (table F5-3). By

comparing these values to the concentrations occurring onsite (worker exposure) and to those offsite (public exposure) the potential for adverse health effects could be assessed. The values presented in these tables and exposure levels could then be used to determine risk for adverse health effects.

By modeling the Toxic Air Pollutant emission rates for each site (appendix D), the current and proposed Toxic Air Pollutant concentrations onsite and at the site boundary were calculated. Tables F5-4 to F5-11 present the Toxic Air Pollutant concentrations for the No Action alternatives (current operations) and for the proposed consolidation alternatives relative to each site. The exposure limits, i.e., lifetime reference concentration (reference dose or reference concentration), 8-hr PEL, 8-hr TLV, and slope factor (unit risk for carcinogenic compounds) are also presented in these tables to permit the reader to evaluate the potential for adverse health effects. If the concentrations of hazardous chemicals presented in this table fall below the exposure limits, no adverse health effects can be expected. If the limits are exceeded, there is a possibility for adverse health effects to occur, such as those presented in table F5-2. However, it is cautioned that exposure limits are usually very conservative to ensure that both workers and the public are protected. The difference in the exposure concentration and the appropriate reference concentration, PEL, TLV, etc., therefore, represents the margin of safety; the Hazard Index, as discussed in section F.3, is the ratio of the exposed level to its established reference.

Using the information in tables F5.4 through F5.11, the Hazard Quotients (values for single hazardous chemicals) and the Hazard Indexes (summation of quotients for all chemicals) were consolidated for the workers and the public at each site. The RfC, PEL, and TLV values for each toxic chemical appearing in tables F5.4 through F5.11 (according to site) are those listed in table F5.3 (official sources appear in the table footnotes). The RfCs represent lifetime exposure limits which were compared to the annual exposure concentrations for a conservative estimate of the potential for chronic adverse health effects. The PEL (regulatory standard) and TLV (guideline) values were compared to eight hour exposures to estimate the possibility for adverse health effects induced by short-term acute exposures. In the event that the PEL and TLV values differed, the lower of the two was chosen so that calculations would be as conservative as possible.

By way of example, the RfC value for acetone is 10.5 mg/m^3 and the cumulative annual onsite level at KCP is 0.0021 mg/m^3 (see table F5.4), so dividing the onsite concentration by the RfC gives a Hazard Quotient of 0.0002 for cumulative onsite acetone (see table F5.12a). The PEL (8 hr) for acetone is 1,815 mg/m^3 and the onsite 8 hr concentration is 0.032 mg/m^3, so dividing the onsite concentration by the PEL, gives a Hazard Quotient value of 1.76×10^{-5} for eight hours. The sums of all Hazard Quotients for all chemicals gives the Hazard Indexes at each site.

In addition, the cancer risk to workers and to the public were determined for those chemicals where a cancer potency (slope factor) was available. The calculation methods are presented in section F.3 of this appendix; the results for these calculations are presented in tables F5-12 through F5-19. By way of example, the No Action onsite cancer risk for methylene chloride at KCP was calculated using a methylene chloride concentration of 0.00005 mg/m^3. This concentration was converted to a dose (mg/kg-day) using the multiplier of 0.286 (section F.3) to give an average daily lifetime dose (D) of 1.43×10^{-5} mg/kg-day. When this dose was multiplied by the slope factor for methylene chloride, i.e., 1.6×10^{-3} (mg/kg/day)-1, and individual cancer risk of 2.3×10^{-8} for cancer at this level of exposure was obtained (see table F5-12b). The total risk was the sum of all cancer risks. The chemicals identified in table F5-1 were assessed separately and used to assess the accident baseline.

F.6 EVALUATION OF POTENTIAL OFFSITE (PUBLIC) AND ONSITE (WORKER/ OCCUPATIONAL) RISKS FOR RADIOACTIVE MATERIALS

Releases of radioactive materials at the sites from normal operations and associated doses were taken from the sites' annual environmental reports. Increases in releases as a result of the Proposed Action were also taken from the sites' Annual Environmental Reports and the associated doses were ratioed. The radiological risks were calculated using the following methodology.

Health impacts from radiation exposure, whether from sources external or internal to the body, generally are identified as "somatic" (affecting the individual exposed) or "genetic" (affecting descendants of the exposed individual). Radiation is more likely to produce somatic effects rather than genetic effects. Therefore, for this EA, only the somatic risks are evaluated. The somatic risks of most importance are the induction of cancers.

The fatal cancer risk estimators presented in this appendix technically apply only to low Linear Energy Transfers radiation (gamma rays and beta particles). However, on a per rem basis, the fatal risk estimators are higher for this type radiation than for high-Linear Energy Transfers radiation (alpha particles). In this EA, the low-Linear Energy Transfers risk estimators are conservatively assumed to apply to all radiation exposures.

The National Research Council's Committee on the Biological Effects of Ionizing Radiation has prepared a series of reports to advise the U.S. Government on the health consequences of radiation exposures. The latest of these reports, Biological Effects of Ionizing Radiation V (NAS/NRC, 1990), provides the most current estimates for excess mortality from leukemia and cancers other than leukemia expected to result from exposure to ionizing radiation. The Biological Effects of Ionizing Radiation V report updates the models and risk estimates provided in the earlier report of the Biological Effects of Ionizing Radiation III Committee published in 1980 (NAS/ NRC, 1980). Biological Effects of Ionizing Radiation V models were developed for application to the U.S. population. Thus, consideration of the recent report of the Biological Effects of Ionizing Radiation V Committee is especially important.

Biological Effects of Ionizing Radiation V provides risk estimates that are consistently higher than those in Biological Effects of Ionizing Radiation III. This is attributed to several factors including the use of a linear dose response model for cancers other than leukemia, revised dosimetry for the Japanese A-bomb survivors, and additional follow-up of the A-bomb survivors and other cohorts. Biological Effects of Ionizing Radiation III employs constant relative and absolute risk models, with separate coefficients for each of several sex- and age-at-exposure groups, while Biological Effects of Ionizing Radiation V develops models where the excess relative risk is expressed as a function of age at exposure, time after exposure, and sex for each of several cancer categories. Biological Effects of Ionizing Radiation III models were based on the assumption that absolute risks are comparable between the A-bomb survivors and the U.S. population, while Biological Effects of Ionizing Radiation V models were based on the assumption that relative risks are comparable. For a disease such as lung cancer, where baseline risks in the U.S. are much larger than those in Japan, the Biological Effects of Ionizing Radiation V approach leads to larger risk estimates than the Biological Effects of Ionizing Radiation III approach.

The models and risk coefficients in Biological Effects of Ionizing Radiation V were derived through analysis of relevant epidemiologic data including the Japanese A-bomb survivors, ankylosing spondylitis patients, Canadian and Massachusetts fluoroscopy patients (breast cancer), New York postpartum mastitis patients (breast cancer), Israel Tinea Capitis (thyroid cancer), and Rochester thymus patients (thymus cancer). Models for leukemia, respiratory cancer, digestive cancer, and other cancer used only the A-bomb survivor data,

TABLE F5-1.—*Compounds and Processes of Major Concern Because of Their Hazardous Potential*[a]

Compounds	Compound Associated Processes	Use
Methylene Chloride	Support Pads (Sunshine Foam) Optoelectronics CAP Assembly Reservoir Assembly and Testing (in Cee Bee)	Cleaning
Methylene Dianiline	Transducers	Resins/Epoxy Mixtures
Beryllium Compounds (BeO, $BeCl_2$, BeS)	Electro-refining Vacuum Induction Melting $BeCl_2$ Synthesis Machining Technology	Alloy Parts Mfg
Trichloroethylene	Optoelectronics CAP Assembly Transducers Neutron Detectors Flats Cable Products Round Wire Cables Reservoirs	Degreasing
Toluene Diisocyanate &Methylene Diisocyanate	Lightning Arrestor Connectors	Foam Mixing
Chlorine Gas (Cl_2)	$BeCl_2$ Synthesis	Intermediate for Metal Alloy

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[a] Alternative chemicals or reduced levels of these chemicals may be proposed in order to reduce or eliminate the risk to workers (onsite) and/or the public (offsite).

although results of analyses of the anklosing spondylitis patients were considered. A-bomb survivor analyses were based on revised DS86 dosimetry with an assumed Radio Biological Effectiveness of 20 for neutrons, and were restricted to doses less than 400 rads. Estimates of risks of fatal cancers other than leukemia were obtained by summing the estimates for breast cancer, respiratory cancer, digestive cancer, and other cancer.

Risk Estimates For Doses Received During An Accident. Biological Effects of Ionizing Radiation V includes risk estimates for a single exposure of 10 rem to a population of 100,000 people (10^6 person-rem). In this case, mortality estimates for leukemia, breast cancer, respiratory cancer, digestive cancer, and other cancers are given for both sexes and nine age-at-exposure groups. These estimates are summarized in table F6-1. The average risk estimate for all ages and both sexes is 885 excess cancer mortalities per million person-rem. This is the risk value used in this EA for accident situations.

Risk Estimates For Doses Received During Normal Operations. For low dose rates, a linear-quadratic model was found to provide significantly better fit to the data for leukemia than a linear one, and leukemia risks were based on a linear-quadratic function. This reduces effects by a factor of two over estimates that are obtained from the linear model. For other cancers, linear models were found to provide an adequate fit to the data, and were used for extrapolation to low doses. However, the Biological Effects of Ionizing Radiation V Committee recommended reducing these linear estimates by a factor between 2 and 10 for doses received at low dose rates. For this EA, a value of two was used. The resulting risk estimate would

then be equal to half the value observed for accident situations or approximately 445 excess cancer mortalities per million person-rem. This is the risk value used in this EA for normal operations.

TABLE F5-2.—*Chemical Toxicity Profiles* [Page 1 of 3]

Compounds	CAS No.[a]	Solubility[a]	Vapor Pressure[a]	Flammability[a,b]	Incompatibilities[a]	Route of Exposure[a]	Target Organs[a]	Carcinogenicity[d]
Acetone	67-64-1	miscible	180 mm	1B	oxidizers, acids	inh,ing,con[c]	respiratory system, skin	j
Ammonia	7664-41-7	34% in water at 68°F	> 1 atm.	combustible gas, but difficult to burn	strong oxidizers, acids, halogens, salts of silver & zinc	inh,ing,con[c]	respiratory system, eyes	j
Beryllium and Beryllium Compounds	7440-41-7	insoluble	0 mm	non-combustible	acids, caustics, chlorinated hydrocarbons, oxidizers, molten lithium	inh[c]	lungs, skin, eyes, muc. membranes	sufficient evidence in animals, limited evidence in humans
Cadmium Dust	7440-43-9	insoluble	0 mm	non-combustible solid, but will burn in powder form	strong oxidizers, elemental sulfur, selenium & tellurium	inh, ing[c]	respiratory system, kidneys, prostate, blood	sufficient evidence in animals, limited evidence in humans
Cadmium Fume	1306-19-0	insoluble	0 mm	non-combustible	not applicable	inh[c]	respiratory system, kidneys, blood	i
Carbon Tetrachloride	56-23-5	0.05%	91 mm	non-combustible	chemically-active metals such as sodium, potassium & magnesium; fluorine; aluminum; Note: forms highly toxic phosgene gas when exposed to flames or welding arcs	inh, abs, ing, con[c]	CNS, eyes, lungs, liver, kidneys, skin	sufficient evidence in animals, no data for humans
Chlorine	7782-50-5	0.7%	> 1 atm.	noncombustible gas, but a strong oxidizer	reacts explosively or forms explosive compounds with many common substances such as acetylene, ether, ammonia, fuel gas, hydrogen, finely divided metals[g]	inh, con[c]	respiratory system	j
Chromium Trioxide	1333-82-0	very soluble[g]	i	contact with combustible materials may cause fires[g]	Alcohol, ether, glycerol, spirit nitrous ether and almost every organic substance, bromides chlorides, iodides, hypophosphites, sulfites, sulfides[g]	inh, ing, con[g]	skin, respiratory system, kidney	sufficient evidence in both animals and humans

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Footnotes at end of table.

TABLE F5-2.—*Chemical Toxicity Profiles*—Continued [Page 2 of 3]

Compounds	CAS No.	Solubility	Vapor Pressure	Flammability[a,b]	Incompatibilities	Route of Exposure[a]	Target Organs	Carcinogenicity[d]
Dimethylform-Amide	68-12-2	miscible	4 mm (77°F)	IIIA	carbon tetrachloride, other halogenated compounds when in contact with iron; strong oxidizers; alkyl aluminums; inorganic nitrates	inh, abs, ing, con[c]	liver, kidneys, skin, cardiovascular system	j
1,4-Dioxane	123-91-1	misible	29 mm	flammable liquid[f]	strong oxidizers, decaborane, triethynyl aluminum	inh, abs, ing, con[c]	skin, liver, eyes, kidneys[e], CNS[g]	sufficient evidence in animals, insufficient evidence in humans
Formaldehyde	50-00-0	misible	> 1 atm/1mm	IIIB	strong oxidizers, alkalis & acids; phenols; urea; pure formaldehyde has a tendency to polymerize	inh, ing, con[c]	respiratory system, eyes, skin	sufficient evidence in animals, limited evidence in humans
Freon 113	76-13-0			flammable[e]	aluminum, barium, lithium, samarium, sodium potassium alloy, titanium[e]	inh[e], ing, con[e]	CNS, skin[e]	
Hydrogen Cyanide	74-90-8	miscible	630 mm	IA	amines, oxidizers, acids, sodium hydroxide,calcium hydroxide, sodium carbonate, water, caustics, ammonia	inh, abs, ing, con[c]	CNS, cardiovascular systems, liver, kidneys	j
Isopropyl Alcohol	67-63-0	miscible	33 mm	IB	strong oxidizers, acetaldehyde, chlorine, ethylene oxide, acids, isocyanates	ing, con[e]	eyes, respiratory system, skin	j
Lead Titanate	12060-00-3	i	i	i	i	i	i	i
Lithium Thionyl Chloride	i	i	i	i	i	i	i	i
Methylene Chloride	75-09-2	2%	350 mm	combustible liquid	strong oxidizers; caustics; chemically-active metals such as aluminum, magnesium, powders, potassium and sodium; concentrated nitric acid	Ing, con[e]	skin, cardiovascular system, eyes, CNS	Sufficient evidence in animals, limited evidence in humans
4,4 Methylene Dianiline	101–77–9	slightly soluble[g]	i	combustible solid[e]	i	inh, ing, con[c]	liver, eye[e]	sufficient evidence in animals, insufficient evidence in humans
Methylene Diisocyanate	4747–90–4	i	i	i	polymerizes violently on contact with dimethyl formamide (DMF)[e]	i	i	i

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Footnotes at end of table.

TABLE F5-2.—*Chemical Toxicity Profiles*—Continued [Page 3 of 3]

Compounds	CAS No.[a]	Solubility[a]	Vapor Pressure[a]	Flammability[a,b]	Incompatibilities[a]	Route of Exposure[a]	Target Organs[a]	Carcinogenicity[d]
Methyl Ethyl Ketone (2-Butanone)	78-93-3	28%	71 mm	IB	strong oxidizers, amines, ammonia, inorganic acids, caustics, copper, isocyanates, pyridines	inh, ing, con[c]	CNS, lungs	inadequate evidence in animals, no data in humans[h]
Nickel Chloride	77/8-54-9[g]	soluble[g]	i	i	i	ing[e]	i	i
Nitric Acid	7697-37-2	miscible	48 mm	non-combustible liquid but increases flammability of combustible materials	combustible materials; metallic powders; hydrogen sulfide; carbides; alcohols	inh, ing, con[c]	eyes, respiratory system, skin, teeth	j
Phenol Isocyanate	i	i	i	i	i	i	i	i
Toluene	108-88-3	0.05%	20 mm (65° F)	IB	strong oxidizers	inh, abs, ing, con[c]	CNS, liver, kidneys, skin	j
Toluene Diisocyanate	26471-62-5	i	i	combustible liquid[e]	bases and acyl chloride[e]	inh, con, ing[e]	eye, skin, respiratory system, nose[e]	sufficient evidence in animals, no data in humans
1,1,1-Trichloroethane	71-55-6	insoluble[g]		non-combustible liquid[g]		inh[g]	CNS, eyes, mucus membrane[g]	j
1,1,2-Trichloroethane	79-00-5	0.4%	19 mm	noncombustible liquid	strong oxidizers and caustics; chemically-active metals such as aluminum, magnesium powders, sodium & potassium	inh, abs, ing, con[c]	CNS, eyes, nose, liver, kidneys	limited evidence in animals, no evidence in humans[h]
Trichloroethylene	79-01-6	0.1% (77° F)	58 mm	IC	strong caustics & alkalis; chemically-active metals such as barium, lithium, sodium, magnesium, titanium, and beryllium	inh, ing, con[c]	Respiratory system, heart, liver, kidneys, CNS, skin	sufficient evidence in animals, inadequate evidence in humans[h]

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[a] *NIOSH Pocket Guide to Chemical Hazards*, June 1990.
[b] Flammable liquids are classified by OSHA (29 CFR 1910.106) as follows: Class IA- Fl.P below 73 °F and BP below 100 °F; Class IB- Fl.P below 73 °F and BP at or above 100 °F; Class IC-Fl. P at or above 73 °F and below 100 °F. Class II-Fl.P at or above 100 °F and below 140 °F; Class IIIA- Fl.P at or above 140 °F and below 20 °F; Class IIIB- l.P at or above 200 °F.
[c] Routes of exposure abbreviated as follows: inh-inhalation; abs- skin absorption; ing-ingestion; con- skin and/or eye contact.
[d] *Sixth Annual Report on Carcinogens, Summary*, 1991.
[e] Sax's Dangerous Properties of Industrial Materials, Eighth Edition, 1992.
[f] Registry of Toxic Effects of Chemical Substances (RTECS).
[g] Merck Index, 11th Edition, 1989.
[h] Integrated Risk Information System (IRIS).
[i] Information is not available.
[j] Not applicable.

TABLE F5-3.—*Exposure Limits* [Page 1 of 4]

Compounds	CAS No.	RfD (mg/kg/day) (oral)[a]	RfC (mg/m^3) (inhalation)[a]	Cancer Class[b]	Slope Factor $(mg/kg/day)^{-1}$[b]	Conversion Factors (mg/m^3)[c]	Occupational Exposure Levels
Acetone	67-64-1	0.1	10.5 (PNL)	D	e	2.42	OSHA-PEL: 1800 mg/m^3 and 15-minute STEL of 2400 mg/m^3[c] ACGIH-TLV: 1780 mg/m^3 and a 15-minute STEL of 2380 mg/m^3[e] NIOSH-REL: 590 mg/m^3[c]
Ammonia	7664-41-7	0.014[g]	0.1	e	e	0.71	OSHA-PEL: 27 mg/m^3[c] ACGIH-TLV: 17 mg/m^3 and a 15-minute STEL of 24 mg/m^3[c] NIOSH-REL: 18 mg/m^3 and a 15-minute STEL of 27 mg/m^3[c]
Beryllium and Beryllium Compounds	7440-41-7	5×10^{-3}	0.018[i]	B2	4.3 (oral)		OSHA-PEL: 2 $\mu g/m^3$ [8-hr TWA], 5 $\mu g/m^3$ [ceiling], 25 $\mu g/m^3$ [30-min max peak][c] ACGIH-TLV: 0.002 mg/m^3 [8-hr TWA][d] NIOSH-REL: not to exceed 0.5 $\mu g/m^3$[c]
Cadmium Dust	7440-43-9	5×10^{-4}	0.0018[i]	B1	e		OSHA-PEL: 0.2 mg/m^3 [8-hr TWA], 0.6 mg/m^3 [ceiling][d] ACGIH-TLV: 0.05 mg/m^3[d] NIOSH-REL: reduce exposure to lowest feasible concentration[d]
Cadmium Fume	1306-19-0	7×10^{-4}[h]	2.5×10^{-3}[h]	f	e		OSHA-PEL: 0.1 mg/m^3 [8-hr TWA], 0.3mg/m^3 [ceiling][l] NIOSH-REL: reduce exposure to lowest possible concentration[d]
Carbon Tetrachloride	56-23-5	7×10^{-4}	0.0025[i]	B2	1.3×10^{-1} (oral) 5.3×10^{-2} (inhal)[j]	6.39	OSHA-PEL: 12.6 mg/m^3 [8-hr TWA][c] ACGIH: 31 mg/m^3 [skin][c] NIOSH-REL: 12.6 mg/m^3 [60-min ceiling limit][c]
Chlorine	7782-50-5	0.011[h]	3.9×10^{-2} (PNL)	e	e	2.95	OSHA-PEL: 1.5 mg/m^3 and a 15-minute ceiling STEL of 3 mg/m^3[c] ACGIH-TLV: same as above[d] NIOSH-REL: same as above[c]

E4 3935-1

Footnotes at end of table.

TABLE F5-3.—*Exposure Limits*—Continued [Page 2 of 4]

Compounds	CAS No.	RfD (mg/kg/day) (oral)[a]	RfC (mg/m^3) (inhalation)[a]	Cancer Class[b]	Slope Factor $(mg/kg/day)^{-1}$[b]	Conversion Factors (mg/m^3)[c]	Occupational Exposure Levels
Chromium Trioxide	1333-82-0	3.5×10^{-3}[h]	1.23×10^{-2}[h]	f	f		OSHA-PEL: 0.1 mg/m^3 [ceiling][d] ACGIH-TLV: 0.05 mg/m^3[d] NIOSH-REL: 0.025 mg/m^3[d] [10 hr TWA], 0.05 mg/m^3 [15-min ceiling][d]
Dimethylforma-mide	68-12-2	0.112[g]	3×10^{-2}	f	f	3.04	OSHA-PEL: 30 mg/m^3 [8-hr TWA skin][c] ACGIH-TLV: same as above[d] NIOSH-REL: same as above[c]
1,4-Dioxane	123-91-1	0.08[g]	0.28[g]	B2	1.1×10^{-2} (oral)	3.66	OSHA-PEL: 90 mg/m^3[c] [skin] ACGIH-TCV: 90 mg/m^3[d] [skin] NIOSH-REL: 3.6 mg/m^3 [30-minute exposure][c]
Formaldehyde	50-00-0	0.2	0.7[i]	B1	4.5×10^{-2} (inhal); unit risk factor: 1.3 x 10-5 (inhal)	1.2	OSHA-PEL: 0.9 mg/m^3 with a 15-minute STEL of 2.4 mg/m^3[l] ACGIH-TLV: 1 .2 mg/m^3[c] NIOSH-REL: limit to lowest feasible level[d]
Freon 113	76-13-1	3×10^{1}	105 (PNL)	e	e		OSHA-PEL: 7600 mg/m^3 with a 15-minute STEL of 9500 mg/m^3[d] ACGIH-TLV: Same as above[d]
Hydrogen Cyanide	74-90-8	2×10^{-2}	f	e	e	1.12	OSHA-PEL: 5 mg/m^3[c] [15-minute STEL] ACGIH-TLV: 11 mg/m^3 [skin][ceiling][c] NIOSH-REL: 5 mg/m^3 [15-min STEL limit][skin][c]
Isopropyl Alcohol	67-63-0	0.202[g]	24.15 (PNL)	e	e	2.50	OSHA-PEL: 980 mg/m^3 [8-hr TWA], 1225 mg/m^3, [15-min STEL limit][c] ACGIH-TLV: 983 mg/m^3 and STEL of 1230 mg/m^3[c] NIOSH-REL: same as above[d]
Lead Titanate	12060-00-3	0.0011[h]	f	f	f		OSHA-PEL: 0.05 mg pb/m^3[d] ACGIH-TLV: 0.15 mg pb/m^3[d] NIOSH-REL: 0.10mg pb/m^3[d]

E4 3935-2

Footnotes at end of table.

TABLE F5-3.—*Exposure Limits*—Continued [Page 3 of 4]

Compounds	CAS No.	RfD (mg/kg/day) (oral)[a]	RfC (mg/m^3) (inhalation)[a]	Cancer Class[b]	Slope Factor $(mg/kg/day)^{-1}$[b]	Conversion Factors (mg/m^3)[c]	Occupational Exposure Levels
Lithium Thionyl Chloride	f	f	f	f	f		f
Methylene Chloride	75-09-2	6×10^{-2}	3 *	B2	7.5×10^{-3} (oral) 2.6×10^{-3} (inhal)[k]	3.53	OSHA-PEL: 1765 mg/m^3 [8-hr TWA], 3500 mg/m^3 [ceiling], 7000 mg/m^3 [5-min max peak in any 2 hours][c] ACGIH-TLV: 174 mg/m^3[d] NIOSH-REL: reduce exposure to lowest feasible concentration[c]
4,4 -Methylene Dianiline	101-77-9	7×10^{-4}[h]	under review 2.5×10^{-3}[h]	f	f		ACGIH-TLV: 0.81 mg/m^3 [skin][c]
Methylene Diisocyanate	4747-90-4	f	f	f	f		f
Methyl Ethyl Ketone (2-Butanone)	78-93-3	5×10^{-2} * (withdrawn)	1.0	D	e		OSHA-PEL: 590 mg/m^3 [8-hr TWA], 885 mg/m^3[15-min STEL limit][d] ACGIH-TLV: same as above[d] NIOSH-REL: same as above[d]
Nickel Chloride	7718-54-9	7×10^{-4}[h]	2.45×10^{-3}[h]	f	f		OSHA-PEL: 1.0 mg/m^3[d] ACGIH-TLV: same as above[d] NIOSH-REL: 0.015mg/m^3[d]
Nitric Acid	7697-37-2	0.035[h]	0.123 (PNL)	e	e	2.62	OSHA-PEL: 5 mg/m^3 and a 15-minute STEL 10 mg/m^3[c] NIOSH-REL: same as above[c]
Phenol Isocyanate	f	f	f	f	f	f	f

E4 3935-3

Footnotes at end of table.

TABLE F5-3.—*Exposure Limits*—Continued [Page 4 of 4]

Compounds	CAS No.	RfD (mg/kg/day) (oral)[a]	RfC (mg/m^3) (inhalation)[a]	Cancer Class[b]	Slope Factor $(mg/kg/day)^{-1}$[b]	Conversion Factors (mg/m^3)[c]	Occupational Exposure Levels
Toluene	108-88-3	3.46×10^{-1} #	2.0 (PNL)	D	e	3.83	OSHA-PEL: 375 mg/m^3 [8-hr TWA], 560 mg/m^3 [15-min STEL limit][c] ACGIH-TLV: 377 mg/m^3 [8-hr TWA], 565 mg/m^3 [15-minute STEL] NIOSH-REL: same as above[c]
Toluene Diisocyanate	584-84-9	2.8×10^{-4}[h]	9.8×10^{-4}[h]	f	f	7.24	OSHA-PEL: 0.04 mg/m^3 [8-hr TWA], 0.15 mg/m^3 [15-min STEL limit][c] ACGIH-TLV: 0.036 mg/m^3, 15-minute STEL 0.14 mg/m^3[c] NIOSH-REL: same as above[c]
1,1,1-Trichloroethane	71-55-6	3.5×10^{-2} #	1.0 *	D	e		OSHA-PEL: 1910 mg/m^3 15-min STEL 2450 ppm mg/m^3[l] ACGIH-TLV: 1910 mg/m^3, 15-minute STEL 2460 mg/m^3[c]
1,1,2-Trichloroethane	79-00-5	4×10^{-3}	under review	C	5.7×10^{-2} (inhal)	5.55	OSHA-PEL: 45 mg/m^3[c] [skin] ACGIH-TLV: 55 mg/m^3 [skin][c] NIOSH-REL: same as above[c]
Trichloroethylene	79-01-6	7.35×10^{-3} #	0.046 (PNL)	B2	f	5.46	OSHA-PEL: 270 mg/m^3; STEL 1080 mg/m^3[c] ACGIH-TLV: 269 mg/m^3 and STEL of 1070 mg/m^3[c] NIOSH-REL: 136.5 mg/m^3[c]

E4 3935-4

[a] The majority of the RfD and RfC values in this table are taken from July 1992 versions of the Integrated Risk Information System (IRIS) file for the particular chemical. In a few cases, values were copied from the Health Effects Assessment Summary Tables (HEAST), March 1992 edition. Values from the HEAST tables are denoted with the symbol (*). Values followed by the symbol (#) were taken from the Office of Drinking Water's Health Advisories, issued March 31, 1987. Values followed by PNL were taken from Pacific Northwest Laboratories of Battelle (1991).

[b] Values in the table are taken from the 1992 IRIS.

[c] *NIOSH Pocket Guide to Chemical Hazards*, June 1990; *1991-1991 Threshold Limit Values for Chemical Substances and Physical Agents*, ACGIH, 1991; conversion factors used to convert ppm to mg/m^3.

[d] *Sax's Dangerous Properties of Industrial Materials*, Eighth Edition, 1992.

[e] Not Applicable.

[f] Information is not available.

[g] Calculated from LD_{50} in Sax's Eighth Edition, 1992/Registry of Toxic Effects of Chemical Substances (RTECS).

[h] Calculated from TWA value in this table.

[i] Calculated from RFD in this table.

[j] Health Effects Assessment Summary Table (HEAST), 1992.

[k] National Toxicology Program, 1986. NTP-TRS-306.

[l] 29 CFR 1910.1000.

TABLE F5-4.—*Comparison of Toxic Air Pollutant Concentrations (mg/m^3) to Exposure Limits[a] (mg/m^3) at Kansas City Plant*

Compound	RfC (Lifetime)	PEL (8 Hr)	TLV (8 Hr)	Slope Factor[b]	No Action Alternative				Cumulative Levels[e]			
					Onsite		Site Boundary		Onsite		Site Boundary	
					(Annual)	(8 Hr)	(Annual)	(8 Hr)	(Annual)	(8 Hr)	(Annual)	(8 Hr)
Acetone	10.5	1,800.0	1,780	---	0.002	0.030	0.0006	0.0115	0.0021	0.032	0.0006	0.023
Chromium Trioxide	1.23×10^{-2}	0.1	0.05	---	---	0.0006	---	---	---	0.0006	---	---
Dimethylformamide	3.0×10^{-2}	30	30	---	0.00005	0.001	0.00002	0.0004	0.00005	0.001	0.00002	0.0004
1,4 Dioxane	0.28	90	90	1.1×10^{-2}[d]	0.0001	0.003	0.00005	0.001	0.0001	0.003	0.00005	0.001
Freon-113	105.0	7,600	7,600	---	0.00005	0.001	0.00002	0.0004	0.00005	0.001	0.00002	0.00004
Isopropyl Alcohol	24.15	980.0	983.0	---	0.003	0.058	0.001	0.022	0.0037	0.0715	0.0012	0.027
Methylene Chloride	3.0	1,765.0	174.0	2.6×10^{-3}[d]	0.00005	0.001	0.00002	0.0004	0.00005	0.001	0.00002	0.0004
Toluene	2.0	375.0	377	---	0.0008	0.016	0.0003	0.006	0.0008	0.016	0.0003	0.006
1,1,1-Trichloroethane	1.0	1,910.0	1,910.0	---	0.00005	0.001	0.00002	0.0004	0.00045	0.0093	0.00022	0.0035
Trichlorethylene	0.046	270.0	269.0	---	0.001	0.018	0.0004	0.0069	0.001	0.018	0.0004	0.0069
Methyl Ethyl Ketone	1.0	590.0	590.0	---	0.0001	0.003	0.00005	0.001	0.0001	0.003	0.00005	0.001
Nitric Acid	0.123	5.0	5.0	---	0.006	0.198	0.018	0.23	0.006	0.198	0.018	0.230

E4 4010

[a] Levels below which there are no adverse health effects.

[b] Slope factor for compounds treated as carcinogenic or potentially carcinogenic are given in units of $(mg/kg/day)^{-1}$.

[c] Personnel monitoring data provided by Allied-Signal Co. (KC ASAC, 1992g).

[d] Oral value (mg/kg/day).

[c] Cumulative levels reflect the amount of a compound released from a site under No Action alternative operating levels, plus any additional compound projected to be released following the reconfiguration of the plant site.

TABLE F5-5.—*Comparison of Toxic Air Pollutant Concentrations (mg/m^3) to Exposure Limits[a] (mg/m^3) at Los Alamos National Laboratory*

Compound	RfC (Lifetime)	PEL (8 Hr)	TLV (8 Hr)	Slope Factor[b]	No Action Alternative				Cumulative Levels			
					Onsite		Site Boundary		Onsite		Site Boundary	
					(Annual)	(8 Hr)	(Annual)	(8 Hr)	(Annual)	(8 Hr)	(Annual)	(8 Hr)
Acetone	10.5	1,800	1,780	---	0.006	0.165	0.0006	0.026	0.006	0.165	0.0006	0.026
Ammonia	0.1	27.0	17.0	---	0.002	0.058	0.0002	0.009	0.002	0.058	0.0002	0.009
Chromium Trioxide	1.23×10^{-2}	0.1	0.05	---	5.5×10^{-7}	1.5×10^{-5}	5.2×10^{-8}	2.4×10^{-6}	5.5×10^{-7}	1.5×10^{-5}	5.2 x 10-8	2.4×10^{-6}
Dimethylformamide	3.0×10^{-2}	30.0	30.0	---	3.0×10^{-5}	8.3×10^{-4}	2.8×10^{-6}	1.3×10^{-4}	3×10^{-5}	8.3×10^{-4}	2.8×10^{-6}	1.3×10^{-4}
1,4 Dioxane	0.28	90	90	1.1×10^{-2}	6.6×10^{-5}	1.8×10^{-3}	6.3×10^{-6}	2.9×10^{-4}	6.6×10^{-5}	1.8×10^{-3}	6.3×10^{-6}	2.9×10^{-4}
Formaldehyde	0.7	0.9	1.2	4.5×10^{-2}	5.5×10^{-6}	1.5×10^{-4}	5.2×10^{-7}	2.4×10^{-5}	5.5×10^{-6}	1.5×10^{-4}	5.23×10^{-7}	2.4×10^{-4}
Isopropyl Alcohol	24.15	980	983	---	0.0005	0.013	0.00004	0.002	0.0005	0.013	0.00004	0.002
Methylene Chloride	3.0	1,765.0	174	2.6×10^{-3}	0.0004	0.011	0.00004	0.002	0.0004	0.011	0.00004	0.002
Trichloroethylene	0.046	270.0	269	4.6×10^{-3}[d]	0.0007	0.019	0.00006	0.003	0.0007	0.019	0.00006	0.003
Methyl Ethyl Ketone	1.0	590.0	590.0	---	0.002	0.049	0.0002	0.008	0.002	0.049	0.0002	0.008
Nitric Acid	0.123	5.00	---	---	0.0009	0.026	0.00009	0.004	0.0009	0.026	0.00009	0.004

E4 4011

[a] Levels below which there are no adverse health effects.

[b] Slope factor for compounds treated as carcinogenic or potentially carcinogenic are given in units of $(mg/kg/day)^{-1}$.

[c] Cumulative levels reflect the amount of a compound released from a site under No Action alternative operating levels, plus any additional compound projected to be released following the reconfiguration of the plant site.

[d] Slope factor calculated from unit risk where $1 \mu g/m^3$ of TCE in air is 1.3×10^{-6}, see toxicity profiles.

TABLE F5-6.—*Comparison of Toxic Air Pollutant Concentrations (mg/m^3) to Exposure Limits[a] (mg/m^3) at Rocky Flats Plant*

Compound	RfC (Lifetime)	PEL (8 Hr)	TLV (8 Hr)	Slope Factor[b]	No Action Alternative				Cumulative Levels[d]			
					Onsite		Site Boundary		Onsite		Site Boundary	
					(Annual)	(8 Hr)	(Annual)	(8 Hr)	(Annual)	(8 Hr)	(Annual)	(8 Hr)
Ammonia	0.1	27.0	17.0	---	0.008	0.347	0.0002	0.028	0.008	0.347	0.0002	0.028
Beryllium	1.8×10^{-2}	0.002	0.002	---	c	c	c	c	c	c	c	c
Carbon Tetrachloride	2.5×10^{-3}	12.6	31.0	5.3×10^{-2}	0.035	1.567	0.0008	0.125	0.035	1.567	0.0008	0.125
Freon 113	105.0	7,600	7,600	---	0.020	0.894	0.0004	0.071	0.021	0.89621	0.000401	0.07117
Methylene Chloride	3.0	1,765.0	174	2.6×10^{-3}	0.003	0.148	0.00007	0.012	0.0031	0.15021	0.000071	0.01217
1,1,1 Trichloroethane	1.0	1,910	1,910	---	0.020	0.873	0.0004	0.070	0.020	0.87521	0.000401	0.07017

E4 4012

[a] Levels below which there are no adverse health effects.

[b] Slope factor for compounds treated as carcinogenic or potentially carcinogenic are given in units of $(mg/kg/day)^{-1}$.

[c] Information was not available.

[d] Cumulative levels reflect the amount of compound released from a site under No Action alternative operating levels, plus any additional compound projected to be released following the reconfiguration of the plant site.

TABLE F5-7.—*Comparison of Toxic Air Pollutant Concentrations (mg/m^3) to Exposure Limits[a] (mg/m^3) at Mound Plant*

Compound	RfC (Lifetime)	PEL (8 Hr)	TLV (8 Hr)	Slope Factor[b]	No Action Alternative				Cumulative Levels			
					Onsite		Site Boundary		Onsite		Site Boundary	
					(Annual)	(8 Hr)	(Annual)	(8 Hr)	(Annual)	(8 Hr)	(Annual)	(8 Hr)
Acetone	10.5	1,800.0	1,780.0	---	0.008	0.143	0.0001	0.008	0.0104	0.1835	0.00014	0.0104
Ammonia	0.1	27.0	17.0	---	0.004	0.064	0.00006	0.004	0.004	0.064	0.00006	0.004
Freon 113	105.0	7,600.0	7,600.0	---	0.002	0.043	0.00004	0.003	0.00207	0.0442	0.000041	0.003
Isopropyl Alcohol	24.15	980.0	983.0	---	0.003	0.052	0.00005	0.003	0.003	0.052	0.00005	0.003
Methylene Chloride	3.0	1,765.0	179.0	2.6×10^{-3}	---	---	---	---	---	---	---	---
1,1,1 Trichloroethane	1.0	1,910.0	1,910.0	---	0.0002	0.004	0.000003	0.0002	0.0027	0.0052	0.000004	0.0002

E4 4013

[a] Levels below which there are no adverse health effects.

[b] Slope factor for compounds treated as carcinogenic or potentially carcinogenic are given in units of $(mg/kg/day)^{-1}$.

[c] Cumulative levels reflect the amount of a compound released from a site under No Action alternative operating levels, plus any additional compound projected to be released following the reconfiguration of the plant site.

TABLE F5-8.—*Comparison of Toxic Air Pollutant Concentrations (mg/m^3) to Exposure Limits[a] (mg/m^3) at Sandia National Laboratories*

Compound	RfC (Lifetime)	PEL (8 Hr)	TLV (8 Hr)	Slope Factor[b]	No Action Alternative				Cumulative Levels[d]			
					Onsite		Site Boundary		Onsite		Site Boundary	
					(Annual)	(8 Hr)	(Annual)	(8 Hr)	(Annual)	(8 Hr)	(Annual)	(8 Hr)
Acetone	10.5	1,800.0	1,780.0	---	---	---	---	---	0.002	0.041[c]	0.00008[c]	0.002[c]
Chromium Trioxide	1.23×10^{-2}	0.1	0.05	---	1.3×10^{-6}	2.7×10^{-5}	5.5×10^{-8}	1.4×10^{-6}	1.26×10^{-6}	2.75×10^{-5}	5.49×10^{-8}	1.4×10^{-6}
Methylene Chloride	3.0	1,765.0	174.0	2.6×10^{-3}	---	---	---	---	0.004[c]	0.094[c]	0.0002[c]	0.005[c]
Nickel Chloride	2.45×10^{-3}	1.0	1.015	---	1.4×10^{-6}	3.0×10^{-5}	6.0×10^{-8}	1.6×10^{-6}	1.4×10^{-6}	3.0×10^{-5}	6.0×10^{-8}	1.6×10^{-6}
Toluene	2.0	375.0	377.0	---	0.0005	0.011	0.00002	0.0006	0.0005	0.011	0.00002	0.0006
1,1,1 Trichloroethane	1.0	1,910.0	1,910.0	---	0.0007	0.014	0.00003	0.0007	0.002[c]	0.047[c]	0.0001[c]	0.0025[c]
Trichlorethylene	0.046	270.0	269.0	4.6×10^{-3}[e]	---	---	---	---	0.002[c]	0.051[c]	0.0001[c]	0.003[c]

E4 4014

[a] Levels below which there are no adverse health effects.
[b] Slope factor for compounds treated as carcinogenic or potentially carcinogenic are given in units of $(mg/kg/day)^{-1}$.
[c] New introduction at site.
[d] Cumulative levels reflect the amount of compound releaseed from a site under No Action alternative operating levels, plus any additional compound projected to be released following the reconfiguration of the plant site.
[e] Slope factor calculated from unit risk where 1µg/m^3 of TCE in air is 1.3×10^{-6}, see toxicity profile.

TABLE F5-9.—*Comparison of Toxic Air Pollutant Concentrations (mg/m^3) to Exposure Limits[a] (mg/m^3) at Pinellas Plant*

Compound	RfC (Lifetime)	PEL (8 Hr)	TLV (8 Hr)	Slope Factor[b]	No Action Alternative				Cumulative Levels[d]			
					Onsite		Site Boundary		Onsite		Site Boundary	
					(Annual)	(8 Hr)	(Annual)	(8 Hr)	(Annual)	(8 Hr)	(Annual)	(8 Hr)
Methylene Chloride	3.0	1,765.0	174.0	2.6×10^{-3}	0.036	0.597	0.036	0.547	0.03605	0.5978	0.03405	0.54774
Nickel Chloride	2.45×10^{-3}	1.0	0.015	---	---	---	1.3×10^{-5}	2.5×10^{-4}	---	---	1.3×10^{-5}	2.5×10^{-4}
1,1,1 Trichloroethane	1.0	1910.0	1910.0	---	0.017	0.287	0.017	0.262	0.01705	0.287	0.01705	0.26274
Trichloroethylene	0.046	270.0	269.0	4.6×10^{-3}[c]	0.009	0.155	0.009	0.142	0.00992	0.1703	0.00988	0.1560
Nitric Acid	0.123	5.0	5.0	---	---	---	---	---	---	---	---	---
Cadmium Fume	2.5×10^{-3}	0.1	---	---	---	---	---	---	---	---	---	---
Cadmium Dust	1.8×10^{-3}	0.2	0.05	---	---	---	---	---	---	---	---	---
Freon 113	105.0	7,600.0	7,600.0	---	---	---	---	---	---	---	---	---
Isopropyl Alcohol	24.15	980.0	983.0	---	0.0002	0.0040	0.00023	0.0037	0.0002	0.0040	0.00023	0.0037

E4 4015

[a] Levels below which there are no adverse health effects.
[b] Slope factor for compounds treated as carcinogenic or potentially carcinogenic are given in units of $(mg/kg/day)^{-1}$.
[c] Slope factor calculated from unit risk where 1 µg/m^3 of TCE in air is 1.3×10^{-6}, see toxicity profiles.
[d] Cumulative levels reflect the amount of compound released from a site under No Action alternative operating levels, plus any additional compound projected to be released following the reconfiguration of the plant site.

TABLE F5-10.—*Comparison of Toxic Air Pollutant Concentrations (mg/m^3) to Exposure Limits[a] (mg/m^3) at Savannah River Site*

Compound	RfC (Lifetime)	PEL (8 Hr)	TLV (8 Hr)	Slope Factor[b]	No Action Alternative				Cumulative Levels[c]			
					Onsite		Site Boundary		Onsite		Site Boundary	
					(Annual)	(8 Hr)	(Annual)	(8 Hr)	(Annual)	(8 Hr)	(Annual)	(8 Hr)
Freon 113	105	7,600	7,600	---	0.007	0.137	0.0001	0.006	0.007	0.137	0.0001	0.006

E4 4016

[a] Levels below which there are no adverse health effects.

[b] Slope factor for compounds treated as carcinogenic or potentially carcinogenic are given in units of $(mg/kg/day)^{-1}$.

[c] Cumulative levels reflect the amount of compound released from a site under No Action alternative operating levels, plus any additional compound projected to be released following the reconfiguration of the plant site.

TABLE F5-11.—*Comparison of Toxic Air Pollutant Concentrations (mg/m^3) to Exposure Limits[a] (mg/m^3) at Y-12 Plant*

Compound	RfC (Lifetime)	PEL (8 Hr)	TLV (8 Hr)	Slope Factor[b]	No Action Alternative				Cumulative Levels[d]			
					Onsite		Site Boundary		Onsite		Site Boundary	
					(Annual)	(8 Hr)	(Annual)	(8 Hr)	(Annual)	(8 Hr)	(Annual)	(8 Hr)
Beryllium	1.8×10^{-2}	0.002	0.002	---	c	c	c	c	c	c	c	c
Chlorine	0.039	1.50	1.50	---	0.0007	0.009	0.00002	0.002	0.0007	0.009	0.00002	0.002
Freon 113	105	7,600	7,600	---	0.071	0.907	0.002	0.175	0.071	0.907	0.002	0.175

E4 4017

[a] Levels below which there are no adverse health effects.

[b] Slope factor for compounds treated as carcinogenic or potentially carcinogenic are given in units of $(mg/kg/day)^{-1}$.

[c] Cumulative levels reflect the amount of compound released from a site under No Action alternative operating levels, plus any additional compound projected to be released following the reconfiguraton of the plant site.

TABLE F5-12a.—*Hazard Quotients and Hazard Index for Kansas City Plant*

Compound	No Action Alternative				Proposed Increment				Cumulative Levels			
	Onsite		Site Boundary		Onsite		Site Boundary		Onsite		Site Boundary	
	Annual	8 Hr	Annual	8 Hr	Annual	8 Hr	Annual	8 Hr	Annual	8 Hr	Annual	8 Hr
Acetone	$1.98x10^{-4}$	$1.7x10^{-5}$	$5.71x10^{-5}$	$6.46x10^{-6}$	$9.52x10^{-6}$	$1.1x10^{-6}$	0	$6.5x10^{-6}$	$2.0x10^{-4}$	$1.76x10^{-5}$	$5.71x10^{-5}$	$1.3x10^{-5}$
Chromium Trioxide	0	0.012	0	0	0	0	0	0	0	0.012	0	0
Dimethyl Formamide	$1.7x10^{-3}$	$3.3x10^{-5}$	$6.67x10^{-4}$	$1.33x10^{-5}$	0	0	0	0	$1.67x10^{-3}$	$3.33x10^{-5}$	$6.67x10^{-4}$	$1.3x10^{-5}$
1,4 Dioxane	$3.6x10^{-4}$	$3.33x10^{-5}$	$1.79x10^{-4}$	$1.11x10^{-5}$	0	0	0	0	$3.57x10^{-4}$	$3.33x10^{-5}$	$1.8x10^{-4}$	$1.11x10^{-5}$
Freon 113	$4.8x10^{-7}$	$1.31x10^{-7}$	$1.9x10^{-7}$	$5.26x10^{-8}$	0	0	0	0	$4.76x10^{-7}$	$1.31x10^{-7}$	$1.9x10^{-7}$	$5.26x10^{-9}$
Isopropyl Alcohol	$1.2x10^{-4}$	$5.92x10^{-5}$	$4.14x10^{-5}$	$2.24x10^{-5}$	$2.9x10^{-5}$	$1.38x10^{-5}$	$8.28x10^{-6}$	$5.1x10^{-6}$	$1.53x10^{-4}$	$7.3x10^{-5}$	$4.97x10^{-5}$	$2.76x10^{-5}$
Methylene Chloride	$1.7x10^{-5}$	$5.7x10^{-6}$	$6.67x10^{-6}$	$2.3x10^{-6}$	0	0	0	0	$6.67x10^{-5}$	$5.7x10^{-6}$	$6.67x10^{-6}$	$2.3x10^{-6}$
Toluene	$4.0x10^{-4}$	$4.27x10^{-5}$	$1.5x10^{-4}$	$1.6x10^{-5}$	0	0	0	0	$4.0x10^{-4}$	$4.27x10^{-5}$	$1.5x10^{-4}$	$1.6x10^{-5}$
1,1,1-Trichloroethane	$5.0x10^{-5}$	$5.23x10^{-7}$	$2.0x10^{-5}$	$2.09x10^{-7}$	$4.0x10^{-4}$	$4.3x10^{-6}$	$2.0x10^{-4}$	$1.6x10^{-6}$	$4.5x10^{-4}$	$4.9x10^{-6}$	$2.2x10^{-4}$	$1.8x10^{-6}$
Trichlorethylene	0.022	$6.69x10^{-5}$	0.0087	$2.57x10^{-5}$	0	0	0	0	0.0217	$6.7x10^{-5}$	0.0087	$2.6x10^{-5}$
Methyl Ethyl Ketone	$1.0x10^{-4}$	$5.08x10^{-6}$	$5x10^{-5}$	$1.69x10^{-6}$	0	0	0	0	$1.0x10^{-4}$	$5.08x10^{-6}$	$5x10^{-5}$	$1.69x10^{-6}$
Nitric Acid	0.0488	0.0378	0.1463	0.0461	0	0	0	0	0.0488	0.0396	0.1463	0.0461
Hazard Index	0.0737	0.050	0.1562	0.0461	$4.4x10^{-4}$	$1.9x10^{-5}$	$2.1x10^{-4}$	$1.3x10^{-5}$	0.0739	0.0520	0.1564	0.0462

E4 4047

TABLE F5-12b.—*Cancer Risk to Workers and Public (Kansas City Plant)*

Compound	No Action Alternative		Proposed Increment		Cumulative Levels	
	Onsite Annual	Site Boundary Annual	Onsite Annual	Site Boundary Annual	Onsite Annual	Site Boundary Annual
1,4 Dioxane	$3.14x10^{-7}$	$1.57x10^{-7}$	0	0	$3.14x10^{-7}$	$1.57x10^{-7}$
Methylene Chloride	$3.72x10^{-8}$	$1.49x10^{-8}$	0	0	$3.72x10^{-8}$	$1.49x10^{-8}$
Total Risk	$3.5x10^{-7}$	$1.72x10^{-7}$	0	0	$3.5x10^{-7}$	$1.72x10^{-7}$

E4 4048

TABLE F5-13a.—*Hazard Quotients and Hazard Index for Los Alamos National Laboratory*

Compound	No Action Alternative				Proposed Increment				Cumulative Levels			
	Onsite		Site Boundary		Onsite		Site Boundary		Onsite		Site Boundary	
	Annual	8 Hr	Annual	8 Hr	Annual	8 Hr	Annual	8 Hr	Annual	8 Hr	Annual	8 Hr
Acetone	0.000571	$9x10^{-5}$	$5.7x10^{-5}$	$1.4x10^{-5}$	0	0	0	0	0.000571	$9x10^{-5}$	$5.7x10^{-5}$	$1.4x10^{-5}$
Ammonia	0.02	0.0034	0.002	0.0005	0	0	0	0	0.02	0.0034	0.002	0.0005
Chromium Trioxide	$4.4x10^{-5}$	0.0003	$4x10^{-6}$	$4.8x10^{-5}$	0	0	0	0	$4.4x10^{-5}$	0.0003	$4x10^{-6}$	$4.8x10^{-5}$
Dimethylformamide	0.0010	$3x10^{-5}$	$9.3x10^{-5}$	$4.2x10^{-5}$	0	0	0	0	0.0010	$3x10^{-5}$	$9.3x10^{-5}$	$4.2x10^{-5}$
1,4 Dioxane	0.0002	$2x10^{-5}$	$2.2x10^{-5}$	$3x10^{-6}$	0	0	0	0	0.0002	$2x10^{-5}$	$2.2x10^{-5}$	$3x10^{-6}$
Formaldehyde	$7x10^{-6}$	$1.6x10^{-4}$	$7x10^{-7}$	$2.6x10^{-5}$	0	0	0	0	$7x10^{-6}$	$1.6x10^{-4}$	$7x10^{-7}$	$2.6x10^{-5}$
Isopropyl Alcohol	$2x10^{-5}$	$1.3x10^{-5}$	$1x10^{-6}$	$2x10^{-6}$	0	0	0	0	$2x10^{-5}$	$1.3x10^{-5}$	$1x10^{-6}$	$2x10^{-6}$
Methylene Chloride	0.0001	$6.3x10^{-5}$	$1x10^{-5}$	$1.1x10^{-5}$	0	0	0	0	0.0001	$6.3x10^{-5}$	$1x10^{-5}$	$1.1x10^{-5}$
Trichloroethylene	0.0152	$6.9x10^{-5}$	0.0013	$1.1x10^{-5}$	0	0	0	0	0.0152	$6.9x-10^{-5}$	0.0013	$1.1x10^{-5}$
Methyl Ethyl Ketone	0.002	$8.3x10^{-5}$	0.0002	$1.3x10^{-5}$	0	0	0	0	0.002	$8.3x10^{-5}$	0.0002	$1.3x10^{-5}$
Nitric Acid	0.0073	0.0050	0.0007	0.0008	0	0	0	0	0.0073	0.0050	0.0007	0.0008
Hazard Index	0.0464	0.0092	0.0044	0.0015	0	0	0	0	0.0465	0.0092	0.0044	0.0015

E4 4049

TABLE F5-13b.—*Cancer Risk to Workers and Public (Los Alamos National Laboratory)*

Compound	No Action Alternative		Proposed Increment		Cumulative Levels	
	Onsite Annual	Site Boundary Annual	Onsite Annual	Site Boundary Annual	Onsite Annual	Site Boundary Annual
1,4 Dioxane	$2.08x10^{-7}$	$1.98x10^{-8}$	0	0	$2.08x10^{-7}$	$1.98x10^{-8}$
Formaldehyde	$7.10x10^{-8}$	$6.72x10^{-9}$	0	0	$7.10x10^{-8}$	$6.72x10^{-9}$
Methylene chloride	$1.83x10^{-7}$	$1.83x10^{-8}$	0	0	$1.83x10^{-7}$	$1.83x10^{-8}$
Trichloroethylene	$1.0x10^{-6}$	$7.9x10^{-7}$	0	0	$1.0x10^{-6}$	$7.9x10^{-7}$
Total Risk	$1.46x10^{-6}$	$1.24x10^{-7}$	0	0	$1.46x10^{-6}$	$1.24x10^{-7}$

E4 4050

TABLE F5-14a.—*Hazard Quotients and Hazard Index for Rocky Flats Plant*

Compound	No Action Alternative				Proposed Increment				Cumulative Levels			
	Onsite		Site Boundary		Onsite		Site Boundary		Onsite		Site Boundary	
	Annual	8 Hr	Annual	8 Hr	Annual	8 Hr	Annual	8 Hr	Annual	8 Hr	Annual	8 Hr
Ammonia	0.08	0.0195	0.002	0.0016	0	0	0	0	0.08	0.0195	0.002	0.0016
Carbon Tetrachloride	14	0.124	0.32	0.0099	0	0	0	0	14	0.124	0.32	0.0099
Freon 113	0.0002	0.0001	3.8×10^{-6}	9×10^{-6}	5×10^{-7}	3×10^{-7}	9.5×10^{-9}	2.2×10^{-8}	0.0002	0.0001	3.8×10^{-6}	9×10^{-6}
Methylene Chloride	0.001	0.0008	2.3×10^{-5}	6.8×10^{-5}	2×10^{-5}	1.3×10^{-5}	3×10^{-7}	4.3×10^{-6}	0.001	0.0008	2.3×10^{-5}	7.2×10^{-5}
1,1,1 Trichloroethane	0.02	0.0005	0.0004	3.7×10^{-5}	5×10^{-5}	1.2×10^{-6}	1.0×10^{-6}	0	0.02	0.0005	0.0004	3.7×10^{-5}
Hazard Index	14.1012	0.1449	0.3224	1.16×10^{-2}	0.00007	1.4×10^{-5}	1.0×10^{-6}	4.3×10^{-6}	14.1012	0.1449	0.3224	1.16×10^{-2}

E4 4051

TABLE F5-14b.—*Cancer Risk to Workers and Public (Rocky Flats Plant)*

Compound	No Action Alternative		Proposed Increment		Cumulative Levels	
	Onsite Annual	Site Boundary Annual	Onsite Annual	Site Boundary Annual	Onsite Annual	Site Boundary Annual
Carbon Tetrachloride	5.30×10^{-4}	1.21×10^{-5}	0	0	5.30×10^{-4}	1.21×10^{-5}
Methylene Chloride	2.2×10^{-6}	5.2×10^{-8}	3.7×10^{-8}	7.4×10^{-10}	2.2×10^{-6}	5.3×10^{-8}
Total Risk	5.32×10^{-4}	1.22×10^{-5}	3.7×10^{-8}	7.4×10^{-10}	5.3×10^{-4}	1.22×10^{-5}

E4 4052

TABLE F5-15.—*Hazard Quotients and Hazard Index for Mound Plant*

	No Action Alternative				Proposed Increment				Cumulative Levels			
	Onsite		Site Boundary		Onsite		Site Boundary		Onsite		Site Boundary	
Compound	**Annual**	**8 Hr**	**Annual**	**8 Hr**	**Annual**	**8 Hr**	**Annual**	**8 Hr**	**Annual**	**8 Hr**	**Annual**	**8 Hr**
Acetone	0.0008	8.0×10^{-5}	9×10^{-6}	4×10^{-6}	2.3×10^{-4}	2.3×10^{-5}	4.0×10^{-6}	1.3×10^{-6}	0.0010	1×10^{-4}	1.3×10^{-5}	6×10^{-6}
Ammonia	0.04	0.00376	0.0006	0.00024	0	0	0	0	0.04	0.00376	0.0006	0.00024
Freon 113	1.9×10^{-5}	5×10^{-6}	3.81×10^{-7}	3.95×10^{-7}	6.7×10^{-7}	1.5×10^{-7}	9.0×10^{-9}	9.0×10^{-9}	1.9×10^{-5}	5×10^{-6}	3.9×10^{-7}	4.03×10^{-7}
Isopropyl Alcohol	0.00012	5.3×10^{-5}	2.1×10^{-6}	3.1×10^{-6}	0	0	0	0	0.00012	5.3×10^{-5}	2.1×10^{-6}	3.1×10^{-6}
1,1,1 Trichloroethane	0.0002	2×10^{-6}	3×10^{-6}	1.04×10^{-7}	0.0025	6.3×10^{-7}	1×10^{-6}	3.6×10^{-8}	0.00027	2×10^{-6}	4×10^{-6}	1.41×10^{-7}
Hazard Index	0.0411	0.0039	0.00061	0.00025	2.7×10^{-3}	2.4×10^{-5}	5.0×10^{-6}	1.3×10^{-6}	0.044	0.0039	0.0006	0.00025

E4 4053

TABLE F5-16.—*Hazard Quotients and Hazard Index for Savannah River Site*

	No Action Alternative				Proposed Increment				Cumulative Levels			
	Onsite		Site Boundary		Onsite		Site Boundary		Onsite		Site Boundary	
Compound	**Annual**	**8 Hr**	**Annual**	**8 Hr**	**Annual**	**8 Hr**	**Annual**	**8 Hr**	**Annual**	**8 Hr**	**Annual**	**8 Hr**
Freon 113	6.67×10^{-5}	1.80×10^{-5}	9.52×10^{-7}	7.89×10^{-7}	0	0	0	0	6.67×10^{-5}	1.80×10^{-5}	9.52×10^{-7}	7.89×10^{-7}
Hazard Index	6.67×10^{-5}	1.80×10^{-5}	9.52×10^{-7}	7.89×10^{-7}	0	0	0	0	6.67×10^{-5}	1.80×10^{-5}	9.52×10^{-7}	7.89×10^{-7}

E4 4054

TABLE F5-17.—*Hazard Quotients and Hazard Index for Y–12 Plant*

Compound	No Action Alternative				Proposed Increment				Cumulative Levels			
	Onsite		Site Boundary		Onsite		Site Boundary		Onsite		Site Boundary	
	Annual	8 Hr	Annual	8 Hr	Annual	8 Hr	Annual	8 Hr	Annual	8 Hr	Annual	8 Hr
Chlorine	0.0179	0.00638	5.13×10^{-4}	0.00133	0	0	0	0	0.0179	0.00638	5.13×10^{-4}	0.00133
Freon 113	6.76×10^{-4}	1.19×10^{-4}	1.90×10^{-5}	2.30×10^{-5}	0	0	0	0	6.76×10^{-4}	1.19×10^{-4}	1.90×10^{-5}	2.30×10^{-5}
Hazard Index	0.0186	0.0061	5.32×10^{-4}	0.0014	0	0	0	0	0.0186	0.0061	5.32×10^{-4}	0.0014

E4 4055

TABLE F5-18a.—*Hazard Quotients and Hazard Index for Sandia National Laboratories*

Compound	No Action Alternative				Proposed Increment				Cumulative Levels			
	Onsite		Site Boundary		Onsite		Site Boundary		Onsite		Site Boundary	
	Annual	8 Hr	Annual	8 Hr	Annual	8 Hr	Annual	8 Hr	Annual	8 Hr	Annual	8 Hr
Acetone	0	0	0	0	0.0002	$2.3x10^{-5}$	$7x10^{-6}$	$1x10^{-6}$	0.0002	$2.3x10^{-5}$	$7x10^{-6}$	$1x10^{-6}$
Chromium Trioxide	0.0001	$5.5x10^{-4}$	$4x10^{-6}$	$2.8x10^{-5}$	0	0	0	0	0.0001	$5.5x10^{-4}$	$4x10^{-6}$	$2.8x10^{-5}$
Methylene Chloride	0	0	0	0	0.0013	0.0005	$6.6x10^{-5}$	$2.8x10^{-5}$	0.0013	0.0005	$6.6x10^{-5}$	$2.8x10^{-5}$
Nickel Chloride	0.0006	$2.9x10^{-5}$	$2.4x10^{-5}$	$1x10^{-6}$	0	0	0	0	0.0006	$2.9x10^{-5}$	$2.4x10^{-5}$	$1x10^{-6}$
Toluene	0.0003	$2.9x10^{-5}$	$1x10^{-5}$	$1x10^{-6}$	0	0	0	0	0.0003	$2.9x10^{-5}$	$1x10^{-5}$	$1x10^{-6}$
1,1,1–Trichloroethane	0.0007	$7x10^{-6}$	$3x10^{-5}$	$3.7x10^{-7}$	0.0013	$1.7x10^{-5}$	$7x10^{-5}$	$9.4x10^{-7}$	0.002	$2.4x10^{-5}$	0.0001	$1x10^{-6}$
Trichlorethylene	0	0	0	0	0.0435	0.0002	0.0022	$1.1x10^{-5}$	0.0435	0.0002	0.0022	$1.1x10^{-5}$
Hazard Index	0.0017	$6.2x10^{-4}$	$6.8x10^{-5}$	$3.0x10^{-5}$	0.0463	$7.4x10^{-4}$	0.0023	$4.2x10^{-5}$	0.0479	0.0014	0.0024	$7.3x10^{-5}$

E4 4056

TABLE F5-18b.—*Cancer Risk to Workers and Public (Sandia National Laboratories)*

Compound	No Action Alternative		Proposed Increment		Cumulative Levels	
	Onsite Annual	Site Boundary Annual	Onsite Annual	Site Boundary Annual	Onsite Annual	Site Boundary Annual
Methylene Chloride	0	0	$3.0x10^{-6}$	$1.5x10^{-7}$	$3.0x10^{-6}$	$1.5x10^{-7}$
Trichlorethylene	0	0	$2.7x10^{-6}$	$1.3x10^{-7}$	$2.7x10^{-6}$	$1.3x10^{-7}$
Total Risk	0	0	$6.0x10^{-6}$	$3.0x10^{-7}$	$6.0x10^{-6}$	$3.0x10^{-7}$

E4 4057

TABLE F5-19a.—*Hazard Quotients and Hazard Index for Pinellas Plant*

Compound	No Action Alternative				Proposed Increment				Cumulative Levels			
	Onsite		Site Boundary		Onsite		Site Boundary		Onsite		Site Boundary	
	Annual	8 Hr	Annual	8 Hr	Annual	8 Hr	Annual	8 Hr	Annual	8 Hr	Annual	8 Hr
Methylene Chloride	0.012	$3.4x10^{-3}$	0.0113	$3.1x10^{-3}$	$1.7x10^{-5}$	$5.0x10^{-6}$	$1.7x10^{-5}$	$4.0x10^{-6}$	0.012	0.0034	0.0113	$3.1x10^{-3}$
Nickel Chloride	---	---	$5.1x10^{-3}$	$1.7x10^{-2}$	---	---	0	0	---	---	$5.1x10^{-3}$	$1.7x10^{-2}$
1,1,1–Trichloroethane	0.017	$1.5x10^{-4}$	0.017	$1.0x10^{-4}$	$5x10^{-5}$	$4.2x10^{-7}$	$5.0x10^{-5}$	$3.9x10^{-7}$	0.017	$1.5x10^{-4}$	0.017	$1.0x10^{-4}$
Trichlorethylene	0.1957	$6.0x10^{-4}$	0.1957	$5.0x10^{-4}$	0.02	$5.7x10^{-5}$	0.019	$5.2x10^{-5}$	0.2156	$6.0x10^{-4}$	0.2148	$6.0x10^{-4}$
Isopropyl Alcohol	$8.28x10^{-6}$	$4.08x10^{-6}$	$9.52x10^{-6}$	$3.78x10^{-6}$	0	0	0	0	$8.28x10^{-6}$	$4.08x10^{-6}$	$9.52x10^{-6}$	$3.78x10^{-6}$
Hazard Index	0.225	$4.2x10^{-3}$	0.229	$2.1x10^{-2}$	$2.01x10^{-2}$	$6.24x10^{-5}$	$1.91x10^{-2}$	$5.64x10^{-5}$	0.2446	$4.15x10^{-3}$	0.2482	$2.08x10^{-2}$

E4 4058

TABLE F5-19b.—*Cancer Risk to Workers and Public (Pinellas Plant)*

Compound	No Action Alternative		Proposed Increment		Cumulative Levels	
	Onsite Annual	Site Boundary Annual	Onsite Annual	Site Boundary Annual	Onsite Annual	Site Boundary Annual
Methylene Chloride	$2.68x10^{-5}$	$2.53x10^{-5}$	$3.72x10^{-8}$	$3.72x10^{-8}$	$2.68x10^{-5}$	$2.53x10^{-5}$
Trichlorethylene	$1.18x10^{-5}$	$1.18x10^{-5}$	$1.2x10^{-6}$	$1.2x10^{-6}$	$1.3x10^{-5}$	$1.3x10^{-5}$
Total Risk	$3.86x10^{-5}$	$3.7x10^{-5}$	$1.24x10^{-6}$	$1.2x10^{-6}$	$3.98x10^{-5}$	$3.8x10^{-5}$

E4 4059

TABLE F6.1–1.—*Excess Cancer Mortality Estimates from a Single Exposure of 10 Rem; Lifetime Risks per 100,000 Exposed Persons*

Sex	Type of Cancer		
	Leukemia[a]	Cancers Other Than Leukemia	Total Cancers
Male	220	660	880
Female	160	730	890
Average	190	695	885

E4 4061

[a] These are the linear estimates, and are double the linear-quadratic estimates provided in BEIR V for leukemia at low doses and dose-rates.

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