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1 Mound Road
P.O. Box 3030
Miamisburg, Ohio 45343-3030
(937) 865-4020

ESC-249/98
November 16, 1998

98-TC/11-16

Mr. Richard B. Provencher, Director
Miamisburg Environmental Management Project
U.S. Department of Energy
P.O. Box 66
Miamisburg, OH 45343-0066

ATTENTION: Dewain Eckman

SUBJECT: Contract No. DE-AC24-97OH20044
DELIVERY OF PUBLIC REVIEW DRAFT OF MOUND 2000 WORK PLAN

REFERENCE: Statement of Work Requirement C.7.1e -- Regulator Reports

Dear Mr. Provencher:

The Public Review Draft of the "Work Plan for Environmental Restoration of the DOE Mound Site, the Mound 2000 Approach" is attached. Art Kleinrath of DOE/MEMP authorized the release of this document for public review. A copy of the newspaper ad announcing the public review is also attached.

Please advise if additional copies are required. If you require further information, please contact Dave Rakel at extension 4203.

Sincerely,

Linda R. Bauer, Ph.D.
Manager, Environmental Safeguards & Compliance

LRB/nmg

Enclosures as stated

cc: Tim Fischer, USEPA, (1) w/attachment
Jeff Raines, TechLaw, (1) w/attachment
Lisa Anderson, OEPA, (1) w/attachment
Brian Nickel, OEPA, (1) w/attachment
Kathy Lee Fox, OEPA, (1) w/attachment
Ruth Vandergrift, ODH, (1) w/attachment
Oba Vincent, DOE/MEMP, (1) w/attachment
Art Kleinrath, DOE/MEMP, (2) w/attachment
Linda Bauer, B&W, (1) w/attachment
Joe Geneczko, B&W, (1) w/attachment
Sue Mackey, B&W, (1) w/attachment
John Price, B&W, (1) w/attachment
Dave Rakel, B&W, (1) w/attachment
Monte Williams, B&W, (1) w/attachment
Public Reading Room, (5) w/attachment
Dann Bird, MMCIC, (1) w/attachment
DCC, w/o attachment
Mark Becker, BWO, w/o attachment

MOUND

Environmental Restoration Program

MOUND PLANT

Notice of Public Review Period

The **"Work Plan for Environmental Restoration of the DOE Mound Site, The Mound 2000 Approach"** is available for public review in the CERCLA Public Reading Room, 305 E. Central Ave., Miamisburg, Ohio. Public comment on this document will be accepted from November 18, 1998 through December 18, 1998. This Work Plan documents the process that the Core Team has been following with stakeholder support for making decisions about the environmental restoration of the Mound site. It includes, or incorporates by reference, the tools and criteria for these decisions.

Work Plan for Environmental Restoration of the DOE Mound Site, The Mound 2000 Approach

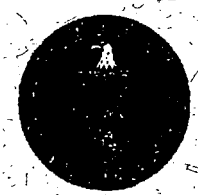
Questions can be referred to Paul Lucas at (937) 865-4578.

WORK PLAN FOR ENVIRONMENTAL RESTORATION OF THE DOE MOUND SITE, THE MOUND 2000 APPROACH

NOVEMBER 1998

Public Review Draft

(Revision 0)



Department of Energy

Babcock & Wilcox of Ohio

ACKNOWLEDGMENTS

This document was prepared for DOE, USEPA, and OEPA by Babcock and Wilcox of Ohio from a draft written by Project Performance Corporation. The contributors and reviewers for BWO were Linda Bauer, Sue Mackey, John Price, Monte Williams, Joe Geneczko, Dave Rakel, and Rick Ferguson (Remediation Services, Inc.). The contributors and reviewers for Project Performance Corporation were Eric Horstmann and Laura Crane. The contributors and reviewers for DOE were Art Kleinrath, Sam Cheng, and Paul Lucas. The contributors and reviewers for USEPA were Tim Fischer and Jeff Raines (TechLaw). The contributors and reviewers for OEPA were Brian Nickel, Lisa Anderson, and Kathy Lee Fox. Special thanks to Nita Grice who typed and formatted the final document.

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ACRONYM LIST

AM/EE/CA	Action Memorandum/Engineering Evaluation/Cost Analysis
ARAR	Applicable or Relevant and Appropriate Requirements
BDP	Building Data Package
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
D&D	Decontamination and Decommissioning
DOE	Department of Energy
DQO	Data Quality Objectives
EE/CA	Engineering Evaluation/Cost Analysis
ER	Environmental Restoration
FA	Further Assessment
FFA	Federal Facility Agreement
H&S	Health and Safety
HASP	Health and Safety Plan
MEMP	Miamisburg Environmental Management Project
MMCIC	Miamisburg Mound Community Improvement Corporation
MRC	Monsanto Research Corporation
NCP	National Contingency Plan
NFA	No Further Assessment
NPL	National Priorities List
OEPA	Ohio Environmental Protection Agency
OSC	On-Scene Coordinator
OFFO	Office of Federal Facilities Oversight
OU	Operable Unit
PAHs	Polynuclear Aromatic Hydrocarbons
PCBs	Polychorinated Biphenyls
PRS	Potential Release Site
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control

ACRONYM LIST (CONTINUED)

RA	Response Action
RAGS	Risk Assessment Guidance for Superfund
RCRA	Resource Conservation and Recovery Act
RD/RA	Remedial Design/Remedial Action
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RRE	Residual Risk Evaluation
RREM	Residual Risk Evaluation Methodology
SAP	Sampling and Analysis Plan
SD	Sanitary Disposal
SM	Special Metallurgical
SWMU	Solid Waste Management Unit
UGL	Underground Lines Project
USEPA	United States Environmental Protection Agency
VOCs	Volatile Organic Compounds
WD	Waste Disposal

EXECUTIVE SUMMARY

This Work Plan documents an approach to environmental restoration that emphasizes decisions and removal actions. Since late in 1995, DOE/MEMP, USEPA Region V, and OEPA Office of Federal Facilities Oversight (OFFO) have developed and tested this approach at Mound. This approach will be used for the remaining environmental restoration of the land and facilities at Mound. This Work Plan was written under the authority of the Federal Facility Agreement Under CERCLA Section 120 Section XIII and XIV[1] and is considered a primary document under the FFA. This Work Plan identifies the primary documents and enforceable events that are part of this process for environmental restoration.

Approved:

DOE/MEMP: _____ Art Kleinrath, On-Scene Coordinator — 11/16/98 Date

USEPA: _____ Timothy J. Fischer, Remedial Project Manager — 11/16/98 Date

OHIO EPA: _____ Brian K. Nickel, Project Manager — 11/16/98 Date

1. INTRODUCTION

In 1995, DOE and its regulators developed an approach to making decisions about the environmental restoration of the Mound site and its facilities. This approach is known as the Mound 2000 process. DOE and its regulators plan to use the Mound 2000 process to address the environmental issues associated with the restoration of the site, DOE's exit from the site, and deletion of the site from the National Priorities List (NPL).

The Mound 2000 process established a "core team" consisting of representatives of DOE/MEMP, USEPA, and OEPA who evaluate each of the potential site contamination problems and recommend the appropriate response. The core team uses site visits and existing data to determine whether or not any action is warranted concerning the possible problem area. If a decision cannot be made, the core team identifies specific information needed to make a decision (e.g., data collection, investigations). The core team also receives input from technical experts as well as the general public and/or public interest groups. Thus, all stakeholders have the opportunity to express their opinions or suggestions involving each potential problem area. DOE has been able to expedite action by adopting Mound 2000, a "*decision*-based" team approach.

The purpose of this Work Plan is to document how the Mound 2000 approach applies to the environmental restoration activities at the Mound Plant. Specifically the Work Plan:

- documents the elements of the Mound 2000 approach, including the Potential Release Site (PRS) evaluation process and building disposition process;
- describes how the Mound 2000 approach satisfies the intent of CERCLA; and
- describes how the Mound 2000 approach enables the exit plan goal of transferring property to the Miamisburg Mound Community Improvement Corporation (MMCIC) for economic redevelopment and ultimately delisting the site from the NPL.

This Work Plan also provides the basis for measuring performance of the environmental restoration of the Mound site by identifying the enforceable milestone events under Mound 2000. This Work Plan is considered a primary document under the existing Federal Facilities Agreement (FFA).[1]

2. SITE OPERATIONAL HISTORY AND PHYSICAL SETTING

This section provides an overview of the operational history and physical setting of the Mound Plant. This information is the basis for the current understanding of the site and associated contaminated areas. The operational history of the site provides insight to possible sources of contamination. Furthermore, the physical setting lends understanding to potential exposure pathways and receptors.

2.1 Physical Setting

The Mound Plant occupies a total of 305 acres within the southern city limits of Miamisburg, Ohio, located ten miles southwest of Dayton. As Figure 2.1 illustrates, the northern boundary of the site is approximately 0.1 mile south of Mound Avenue in Miamisburg. Mound Avenue curves south, becomes Mound Road, and runs along the eastern boundary of the plant. Benner Road forms the southern boundary of Mound Plant. Finally, the Conrail Railroad, formerly Penn-Central, roughly parallels the western boundary. A railroad spur enters the plant from the west and terminates in the lower plant valley. The Mound Plant is surrounded by residential/recreational properties and agricultural areas. Details of the plant property boundaries, fencing, and utilities are documented in the *OU-9 Site Scoping Report: Vol. 4 - Engineering Map Series.*[2]

The predominant geographical feature in the region surrounding the Mound Plant is the Great Miami River, which flows from northeast to southwest through Miamisburg. Mound Plant sits atop an elevated area overlooking Miamisburg, the Great Miami River, and the river plain area to the west. Also to the west of the plant is an abandoned section of the Miami-Erie Canal that parallels the river. An intermittent stream runs through the plant valley and drains to the river. Details of the plant topography and surface water features (springs, seeps, streams, and ponds) are documented in the *OU9 Site Scoping Report: Vol. 5 - Topographic Map Series.*[3]

In 1981, DOE purchased an additional 123 acres of land south of the original 182 acres for potential mission expansion. However, the property remains undeveloped due to the lack of additional work scope.

The physical setting of the site provides the basis for identifying possible contaminant exposure pathways. The core team must consider potential exposure to on-site workers as well as exposure to off-site residents.

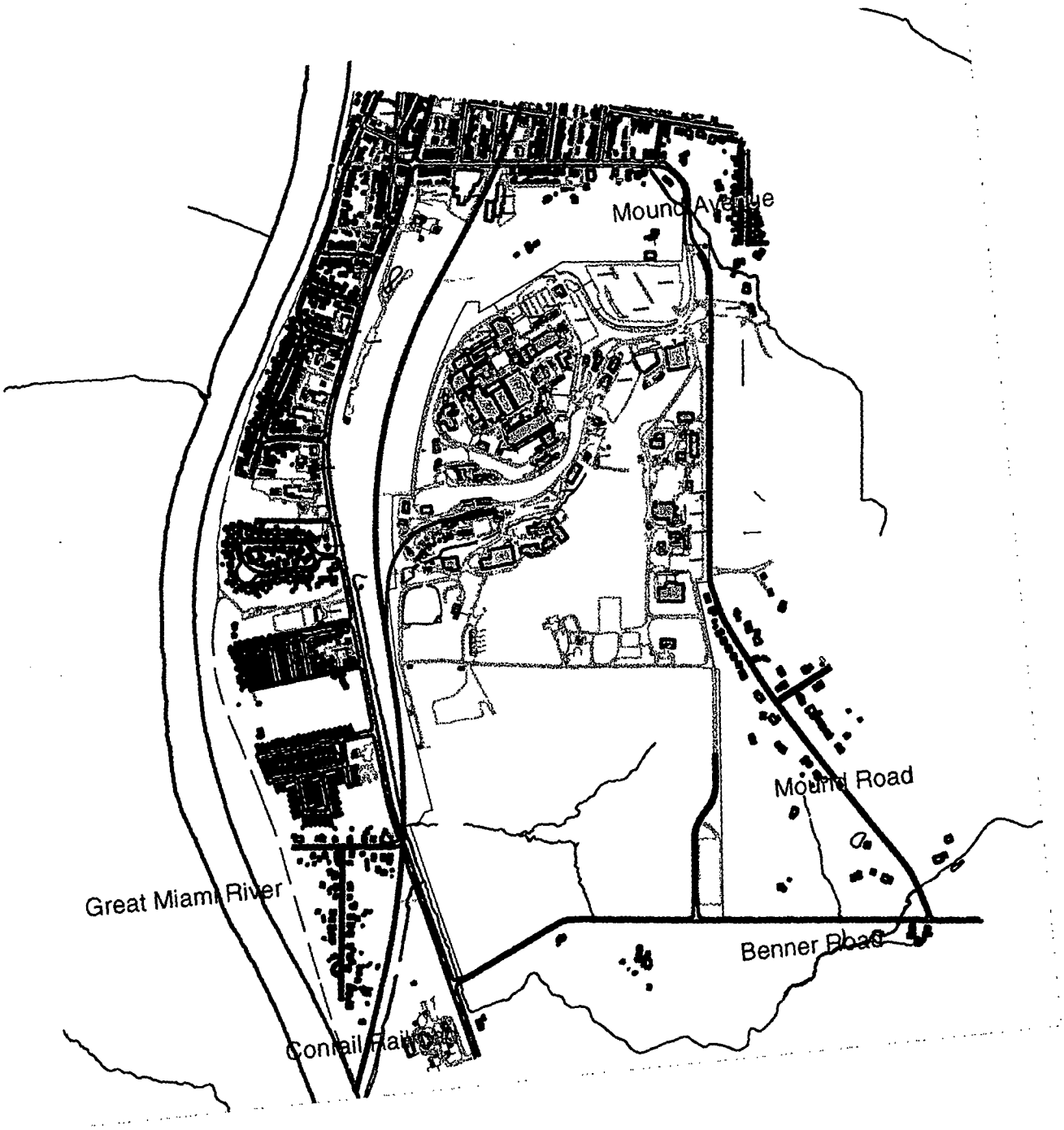

Figure 2.1 Mound Location

2.2 Site Operational History

In 1943, the Monsanto Research Corporation (MRC) accepted the mission to determine the chemical and metallurgical properties of polonium. MRC performed this work for the Manhattan Engineer District at a number of sites that are collectively referred to now as the Dayton Units. In 1946, 182 acres in Miamisburg were purchased for the permanent Mound Plant location. In 1948, the work being performed at the Dayton Units was moved to the Mound site. In January of 1949, the Mound Plant began research operations involving other radionuclides. This new work would propel Mound into other missions over the next 50 years.[4] A brief summary of the significant programs and events that occurred at the site is presented in Table 2.1.

Table 2.1 Summary of Significant Mound Programs and Events (Much of this table comes from Reference 5)

1946 Mound Laboratory planning started.

1948 Mound Laboratory occupied.

1949 Polonium operations moved to Mound Laboratory.

1950 Project to determine physical properties of the uranyl sulfate - heavy water fuel system for the aqueous homogeneous reactor at Oak Ridge National Laboratory.

1950 Project to separate polonium-208 and polonium-209 from proton (accelerator) irradiation of bismuth.

1950 Project to separate actinium-227 from irradiated radium-226.

1950 Part of the National Civilian Power Reactor research program; projects involve uranium, protactinium-231, and plutonium-239; mission ended in 1963.

1954 Separation research involving stable isotopes of noble gases initiated.

1954 Invention (and patent) of the thermoelectric generator fueled by polonium-210.

1954 Initiation of several programs requiring tritium-handling technologies.

1954 Construction of a thorium refinery began (never completed).

1955 Repackaging of 6,000 55-gallon drums containing thorium ore and sludges occurred through 1965 at 3 different times to help prevent the possibility of further contamination.

1956 Completed separation of 1.3 grams of protactinium-231 from feed.

1956 Ionium (thorium-230) in weighable quantities separated from Mallinckrodt Airport Cake.

1956 Plutonium-239/beryllium neutron sources manufactured.

1956 Development, production, and surveillance of detonators for nuclear weapons; mission ended in 1989.

1957 Helium-3 separated and purified.

1958 Plastics production facility operational.

1959 Plutonium-239 reactor fuels laboratory operational.

1959 Facility for recovery and purification of tritium from wastes.

1961 Plutonium-238 production started.

1961 Development of plutonium-238 heat sources eventually used in thermoelectric generators as an energy source in various space missions; program still active.

1962 Production of explosive timers started.

Table 2.1 Summary of Significant Mound Programs and Events (continued)

1963 High purity helium-3 (99.999%) made available.

1964 Carbon-13 became available for sale from Mound Laboratory.

1966 Thorium ore and sludges moved to bulk storage in Building 21.

1968 PP Building (#38) operational for processing plutonium-238.

1969 Waste line break results in plutonium-238 contamination of off-site portion of abandoned Miami-Erie Canal bed.

1972 Responsibility assigned for design and fabrication of product testers.

1972 Tritium effluent control project began.

1974 Thorium ore and sludges completely removed from site.

1974 Development of pyrotechnic powder blends started.

1975 Plutonium-238 recovery operations terminated.

1977 Californium Multiplier Neutron Radiography Facility installed.

1985 Components produced using the new tape technology developed in-house.

1985 First production in the Kyle program.

1993 DOE decides to transfer Defense Programs mission from Mound.

1994 Completed demolition of SM Building structure contaminated with plutonium-238.

2.3 Site Environmental Restoration History

In the early 1970s, as national concerns about the environment and the conservation of resources mounted, the Mound Plant expanded its programs in environmental control, waste management, and energy conservation.

In 1984 the Environmental Restoration Program at Mound was established to collect and assess environmental data in order to evaluate both the nature and extent of contamination and to identify potential exposure pathways and potential human and environmental receptors (i.e., develop a conceptual site model).

In November of 1989, the USEPA placed Mound on the National Priorities List (NPL) because of chemical contamination present in the site groundwater and the site's proximity to the Buried Valley Aquifer, a designated sole source aquifer. DOE, USEPA, and OEPA developed a procedural framework for the assessment and remediation of the site under CERCLA that was documented in the Federal Facility Agreements of 1990[6] and 1993.[1]

Initially, the remediation of the Mound Plant was organized around nine Operable Units (OUs):

OU1: Included volatile organic compound (VOC) contamination in the Buried Valley Aquifer originating from a presently buried landfill area. (Note: this is the reason for inclusion of Mound on the NPL.)

OU2: Included the main hill and the main hill seeps where contaminated groundwater perched on the bedrock.

OU3: Included 22 miscellaneous areas at Mound that required limited field investigations since little or no data were available.

OU4: Included the Miami-Erie Canal; an area adjacent to Mound Plant that had soils and/or sediments contaminated with plutonium-238 and tritium but no history of chemical contamination.

OU5: Included most of the SM/PP hill and South Property that contains numerous areas of concern contaminated principally with thorium and plutonium.

OU6: Included 12 areas of radioactive contamination that were part of the Decontamination and Decommissioning (D&D) program. The D&D program restored surplus facilities for reuse (decontamination) and dismantled and removed surplus contaminated facilities, utilities, equipment, and soil (decommissioning). The first D&D projects at Mound addressed the Dayton Units. The D&D program has been in continuous operation since 1978. Originally

the D&D and CERCLA programs were separate and distinct. After DOE decided to move production operations from Mound and exit the site, the differences between the programs started to dissolve.

OU7: Included 35 sites identified by the RCRA Facilities Assessment as requiring "No Further Action" per the assessment.

OU8: Included six underground storage tanks (later expanded to 108 tanks).

OU9: Included site-wide investigations designed to collect information about the site on a comprehensive basis and focused on media and contaminants with the potential to be transported off-site.

Before the introduction of the Mound 2000 process, there were many notable accomplishments at the Mound by the CERCLA and D&D programs. Some of those accomplishments are:

- Technical Building Decontamination: In 1974, decontamination of T-Building's operations and service floors (50% of building) was completed. Contaminant of concern was polonium-210.

- Soil Removal Near Building 34: In 1989, soil near Building 34 contaminated with uranium was removed.

- Research Building Decontamination: In 1990, decontamination of inactive laboratories in R-Building (10% of building) was completed. Contaminant of concern was plutonium-238.

- Underground Lines (UGL) Project (Area 14/19): In 1991, approximately 600 linear feet of contaminated pipe was unearthed and shipped off-site for burial. The pipe had been the waste line that connected HH Building with the WD facility. Contaminant of concern was plutonium-238.[7]

- Completion of multi-volume site scoping report. The Site Scoping report provides descriptions and summaries of the conditions and characteristics present in the late 1980's and consists of the following volumes:

  Volume 1. Groundwater Data: February 1987 - July 1990 with Addendum [8]

  Volume 2. Geological Log and Well Information Report [9]
  2.1 Addendum - Stratigraphic and Lithologic Logs

Volume 3. Radiological Site Survey [10]

Volume 4. Engineering Map Series [11]

Volume 5. Topographic Map Series [12]

Volume 6. Photo History [13]

Volume 7. Waste Management [14]

Volume 8. Environmental Monitoring Data [15]

Volume 9. Annotated Bibliography [16]

Volume 10. Permits and Enforcement Actions [17]

Volume 11. Spills and Response Actions [18]

Volume 12. Site Summary Report [19]

- PP Building Decontamination: In 1993 the decontamination of 90% of Plutonium Processing (PP Building, a.k.a. Building 38) and the Acid Leach Field (Area D) was completed. Contaminant of concern was plutonium-238.

- Special Metallurgical (SM) Building Demolition: The SM Building demolition was completed in the latter part of 1994. The building was a 20,000 square foot facility used for plutonium-238 research. Most of the structural steel was transported to the SEG Company located in Oak Ridge, Tennessee, where the metal was recycled for other DOE projects.

- OU1 ROD: In June, 1995 a Record of Decision[20] for the removal of volatile organic compounds in groundwater was approved. The remedial action (air stripping) officially began in February 1997. An air sparging/soil-vapor extraction system was added in December 1997 to augment the air stripper and accelerate the remediation.

- OU5 Removal Action: Completion in February, 1996 of removal and bioremediation of oil contaminated soil at the Fire Fighting Training Area.[21, 22]

- OU5 Removal Action: Completion in February, 1996 of Site Drainage Control Removal Action.[23, 24]

- OU2 Removal Action: Completion in February, 1996 of B-Building Solvent Storage Shed Removal Action.[25, 26]

- SD Building Demolition: The sanitary waste treatment facility (SD Building) was demolished in June of 1996. After demolition, contaminated soils were excavated.

- Building 21 Demolition: In the fall of 1996, Building 21 was demolished and contaminated soils surrounding the building were excavated. The facility had been used to store bulk quantities of thorium ore and thorium sludges.

- OU5 Removal Action: Completion in June 1997 of removal of soil contaminated with actinium-227 at PRS 86 (Area 7).[27, 28]

- OU4 Removal Action: Completion in May 1998 of field work for Miami-Erie Canal removal action.[29]

3. CURRENT UNDERSTANDING OF SITE

The physical setting and operational history discussed in Section 2 provide insight into the contamination sources and exposure pathways at the Mound Plant. In this section, the exposure pathways and potential receptors are further developed with consideration of the designation of Mound for "industrial use." Based upon this knowledge of the Mound Plant and its future use, a conceptual site model has been developed. This section describes the conceptual site model then discusses in more detail the components of that model.

3.1 Conceptual Site Model

Figure 3.1 shows the current conceptual site model for the Mound Plant.[30] The conceptual site model identifies the potential route of exposure to contaminants. The PRSs and buildings are the potential sources of contamination. The identified exposure points in the conceptual site model for populations of interest (receptors) are soil, air, ground water, and surface water/sediments. This conceptual site model was developed from the more general model presented in Reference 19. Reference 19 indicated that "The PRSs at Mound Plant can be grouped into five types of primary sources from which contaminants have entered or may enter the environment. These are:

- drums, tanks, and waste lines;
- landfills, the old cave, and other covered disposal sites;
- retention basins/wastewater treatment system;
- surface disposal sites; and
- operations or buildings.

Each of these primary sources may have contaminated surrounding soils through primary release mechanisms that include spills or leaks, leaching, infiltration, overflow and runoff... Contaminated soil represents a potential direct route to exposure to humans and biota through incidental ingestion, dermal contact, and direct radiation. Secondary routes of exposure may occur due to uptake by plants, resuspension of dust, vapor transfer into the air, and surface and groundwater contamination." Groundwater, soil, and surface water/sediments are monitored on a regular basis because they act as migration pathways for contaminated soil that has resulted from past activities.

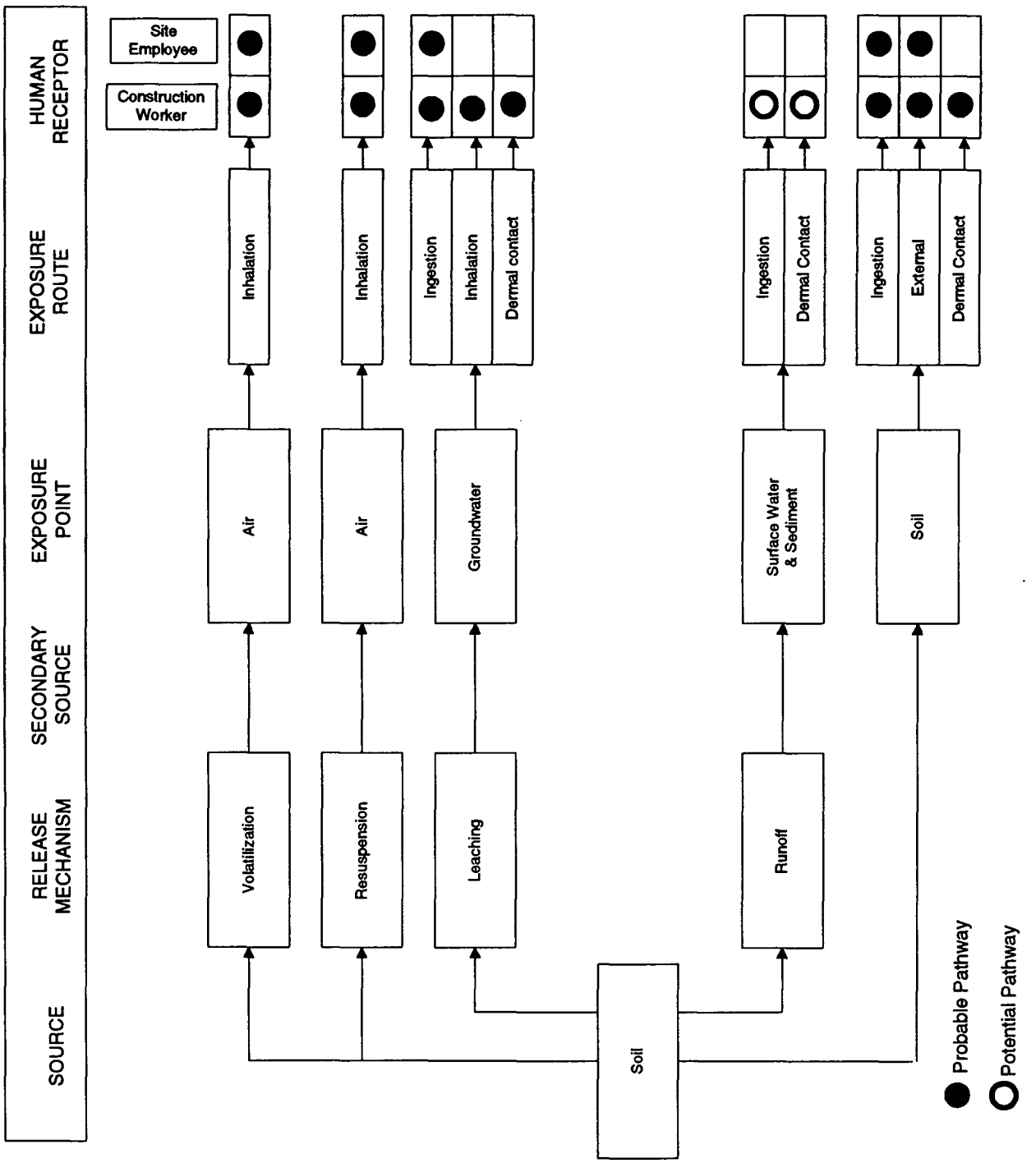

Figure 3.1 Residual Risk Evaluation Exposure Scenarios

"Air exposure pathways result from" stack emissions, "contaminated soil that may be resuspended into air by the natural action of wind or by actions of man. Activities such as... vehicle traffic, construction," excavation, "and mowing" can elevate "significant amounts of dust." Thus, "certain contaminants, such as volatile organics, tritium, or radon" or other radionuclides (plutonium-238, thorium-232) "may directly enter the breathing zone. These vapors, gases," or particulates "may pass through an environmental medium first (e.g., soil) or they may enter air directly from the source." Air is monitored during activities in areas of known or suspected contamination to ensure protection of human health and the environment.

"Groundwater can become contaminated by the leaching and further percolation of hazardous material from contaminated soil. Contamination in the groundwater represents potential exposure pathways through ingestion, inhalation" (e.g., from showering), "and dermal contact.

Surface water and associated sediments can become contaminated as a result of runoff and erosion from areas of contaminated soil, from seepage of contaminated groundwater, or historically from direct spills and effluent releases. Surface water exposure routes to be considered include ingestion of fish that have fed in contaminated areas, incidental" ingestion "of sediment, dermal contact with surface water and sediments, direct radiation from contaminated sediments, ...and ingestion of livestock... that drink from contaminated surface water."

3.2 Industrial Land Use

The core team's mission is to ensure that environmental restoration activities achieve protection of human health and the environment (10^{-4} to 10^{-6} excess cancer risk) for the anticipated future land use. DOE and MMCIC have agreed on "industrial use" as the future land use for the site.[31] The core team has identified the appropriate exposure pathways, parameters, and equations for performing the Residual Risk Evaluation for an industrial future land use. *The Risk Assessment Guidance for Superfund (RAGS)*, Part A[32] recommends the evaluation of exposures based on a reasonable maximum exposure. The core team used this national guidance to produce *"Mound 2000 Residual Risk Evaluation Methodology (January, 1997)."*[30] This document provides a basis for evaluating site conditions and justifying the release of portions of the site to the community for industrial use. This document indicates that industrial land use means the property use will be consistent with a 40 hour work week, 50 weeks per year for 30 years for a commercial worker and 5 years for a construction worker. Sensitive subgroups such as children and the elderly have not been considered in the exposure scenarios and generally are not allowed on the property for extended periods of time. By approving the *Residual Risk Evaluation Methodology*,[30] the core team endorsed "industrial use" as the future land use.

Institutional controls of industrial land use will be utilized to ensure the future use of the site is adequately controlled. These institutional controls may include fencing, deed restrictions, zoning conditions, and post-closure monitoring.

3.3 Extent of Known Contamination

Comprehensive chemical and radionuclide characterizations have been performed at various locations throughout the plant. Contamination has been found in four different media (soil, groundwater, surface water, and buildings/structures) at the Mound Plant. The majority is low-level radioactivity in soil. Table 3.1 lists some of the significant sampling events that have been conducted.

3.3.1 Soil

The organic chemicals detected in site soils include chlorinated solvents such as trichloroethene, petroleum hydrocarbons, and polynuclear aromatic hydrocarbons (PAHs).

Between 1982 and 1985, the DOE performed a systematic survey of soils for radiological contamination utilizing a combination of screening, radiochemical analysis of surface and subsurface soil samples, and *in-situ* analysis. Since this site survey project was conducted, maintenance and engineering activities have identified additional areas of radiological contamination. "Radionuclides present at levels above background include: plutonium-238, thorium (total and the isotope thorium-230), cobalt-60, cesium-137, tritium, actinium-227, americium-241, bismuth-207, and bismuth-210m. Depleted uranium (uranium-238) is suspected to be present in the metallic form in some areas." (Reference 10, page 11-1.) DOE performed two additional sampling events for radionuclides in surface soils at Mound in 1980 and 1988. Both sets of data are consistent in identifying similar areas of elevated activity levels of plutonium-238 and thorium-232.[33] There were some isolated locations of elevated levels of cobalt-60 and cesium-137. Overall, twenty-two areas of contamination were identified and are summarized below.[10] Figure 3.2 shows the location of these areas.

- Area 1, a historic thorium storage and redrumming area
- Area 2, a historic disposal trench for empty thorium drums and for polonium-210-contaminated sand
- Area 3, a historic thorium storage and redrumming area
- Area 4, area surrounding the WD Building where influent tanks containing polonium-210, cobalt-60, and plutonium-238 overflowed

- Area 4a, the old sewage disposal plant area contaminated by polonium-210, cobalt-60, and plutonium-238

- Area 5, location of a waste-line break containing polonium-210 and cobalt-60

- Area 6, a historic disposal trench for polonium-210-contaminated sand

- Area 7, a historic disposal area used for the disposal of empty thorium drums, a thorium-contaminated dump truck, and a polonium-210-contaminated washing machine, and including an area containing a historic septic tank contaminated with actinium-227 from the old SW Building

- Area 8, thorium-contaminated soils moved from Areas 1 and 9

- Area 9, a historic thorium storage and redrumming area

- Area 10, a historic disposal area containing concrete contaminated with polonium-210

- Area 11, a historic storage area for plutonium-238-contaminated wastes from the SM Building

- Area 12, thorium-contaminated soils moved from Area 1

- Area 13, a historic treatment area where debris contaminated with polonium-210 was burned

- Area 14, the location of the 1969 waste transfer line (plutonium-238) break

- Area 15, a historic radium-226/actinium-227 processing area entombed in concrete inside the SW Building

- Area 16, a historic sanitary leach field for the SM Building (plutonium-238)

- Area 17, the area under and surrounding the SM Building contaminated with plutonium-238 from spills of plutonium wastes

- Area 18, site sanitary landfill that may have received sediments from the ditch contaminated with plutonium-238

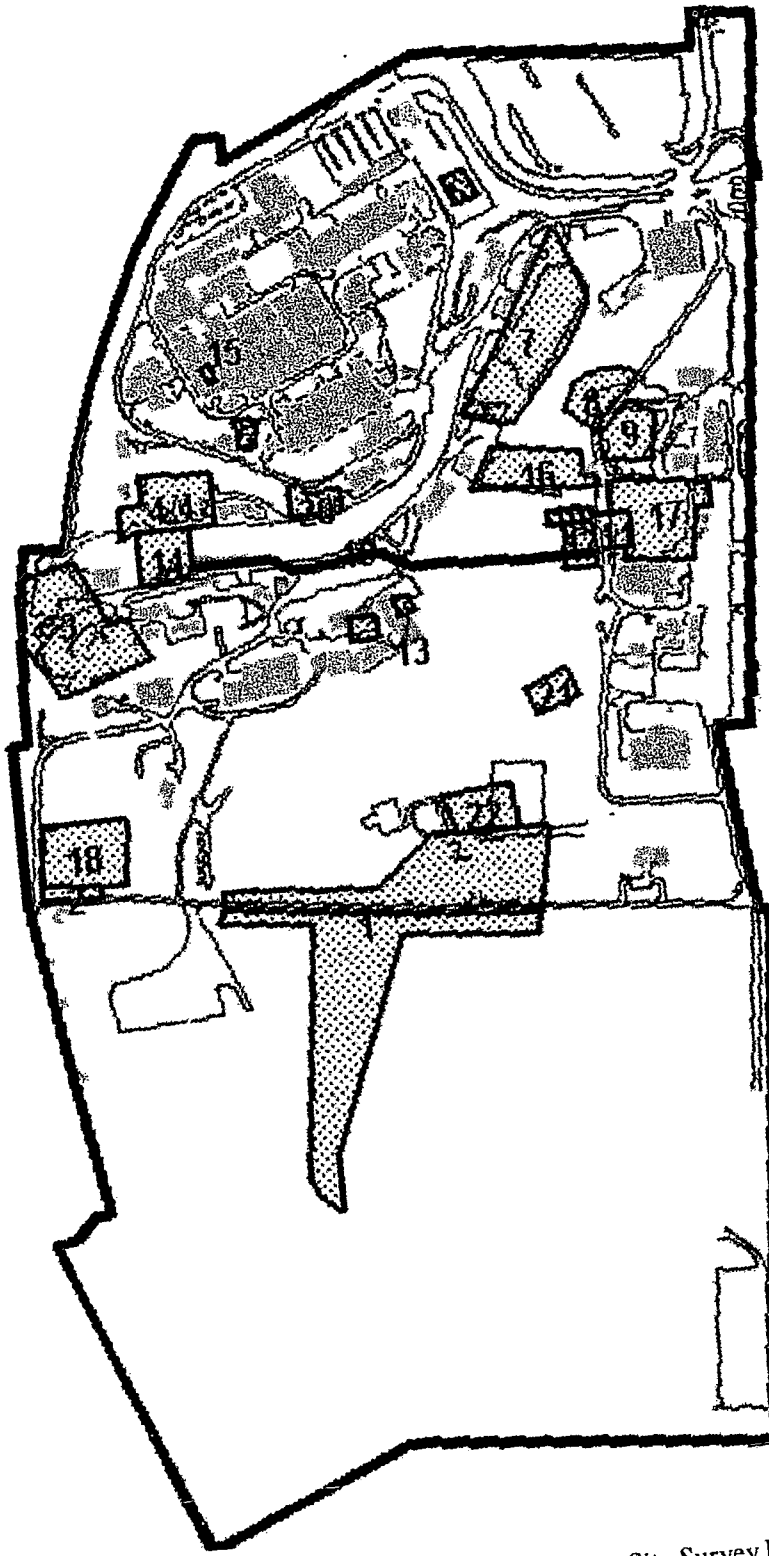

Figure 3.2 Location of Areas Identified by Site Survey Project

- Area 19, the historic underground waste transfer lines for plutonium-238 liquid wastes

- Area 20, the location of a waste-line break between the WD and the HH Buildings (cobalt-60, cesium-137, bismuth-210m, and bismuth-207)

- Area 21, a historic storage area used for storage of high-risk wastes from the SW Building (cesium-137 and radium-226)

- Area 22, a soil storage area containing soil with cobalt-60, cesium-137, and plutonium-238 contamination moved from Area 20 and other areas of the plant

3.3.2 Groundwater/Surface Water

Chemical contamination in groundwater consists primarily of three chlorinated solvents: tetrachlorethane, tricholorethene, and 1,2,-trans-dichloroethane with some associated breakdown products such as vinyl chloride. In addition to chlorinated solvents, metals (e.g. chromium, nickel, and cadmium) have been detected in groundwater at elevated levels (i.e., greater than drinking water standards).

Tritium contamination in groundwater is present at levels slightly above background, but well below the drinking water standard, in the Buried Valley Aquifer and is being monitored. Tritium contamination in the main hill bedrock area is above drinking water standards and presently being monitored. Surface water with tritium contamination has been detected in seeps located around the main hill.[10] Surface water is monitored routinely and is within discharge limits. A comprehensive sampling of sediments[34] noted that plutonium-238 was a common contaminant in the plant drainage ditch, asphalt-lined pond, Miami-Erie Canal, overflow creek, and NPDES outfall 002 sampling locations. "With the exception of the two sampling locations in the Miami-Erie Canal, which indicated the highest levels of plutonium-238 in both sediment and subsurface soils, no distinguishable pattern of downstream trends indicating migration of plutonium-238 was apparent. In addition, no other off-site locations yielded results for plutonium-238 greater than the established guideline values." [10]

Table 3.1 SAMPLING EVENTS

Miami-Erie Canal 1974 Plutonium Study	1974
Radiological Site Survey - OU9 Site Scoping Report	1982-1985
Building 31 Soil Characterization	1984
Ground Water Quality Data Sampling Hits	1984-1991
WTS Excavation Area Verification Survey	1986
Spring Fling Tritium Water Sampling (Pre Weston)	1986-1995
Area I - West Lagoon	1987
Area I - East Lagoon	1987
Area C	1987
Main Hill	1987-1988
OU9 Site Scoping Report Vol 1, Ground Water Data	1987-1990
Operable Unit 1	1987-1993
Mound Plant Screening Data	1987-1994
Mound Plant Environmental Survey	1987
Sewer Line investigation	1987
Reconnaissance Sampling OU6 D&D Areas	1989
Results of South Pond Sampling	1990
Underground Storage Tank Closure	1990
Cumulative Ground Water Monitoring Data Report	1990-1992
WD Building Soil Characterization	1991
Well Field protection program	1991
Area 14 Fuel Oil Storage Verification	1991
Ground Water and Seep Water Reports 91	1991
Area 17 SM Building Annex Verification	1991
Operable Unit 3 Limited Field Investigation	1991-1992
Ground Water Monitoring and Mapping Results	1992
Special Canal Sampling Miami-Erie Canal	1992
OU1 Area B Site Sanitary Landfill	1992
Main Hill and SM/PP Hill Reconnaissance. Soil Gas Survey	1992
Proposal for Additional Work Soils - Operable Unit 1(RIR)	1992-1993
Mound Water Sampling (TRITIUM)	1992-1995
OU9 Background Soils Investigation Soils	1993
Area D Verification	1993
Mound Operable Unit 5 Area 3 Sampling and Analysis	1993
Ground Water Monitoring and Mapping Results March	1993
Underground Line D Sampling & Analysis Report	1993
Underground Lines Investigation Data Report	1993
Mound - Operable Unit 9	1993
OU9 Groundwater Sweeps	1993-1994

Table 3.1 SAMPLING EVENTS (Continued)

Ground Water Monitoring and Mapping Results	1994
OU9 Regional Soils Investigation	1994
Operational Area Investigation (OU5)	1994
New Property	1994
New Property Extended Phase	1994
Area 19 and Area 14 Verification	1994
D&D Building 21 and Surrounding Soils	1994
SM Building Leachfield Area Analytical Results	1994
Residential, Municipal & Industrial Well Investigation	1994
Soil Vapor Reconnaissance OU2 Main Hill Phase 1	1994
Main Hill Seep Sampling	1994-1995
Surface Water and Sediment	1994-1996
SM East Asphalt Area Verification Report	1995
Ground Water Monitoring and Mapping Results April	1995
Ground Water Monitoring and Mapping Results June	1995
Main Hill Seep Sampling	1995
Other Soils Areas	1995
Ground Water Monitoring and Mapping Results	1995-1996
Soil Gas Confirmation Sampling	1996
Special Canal Sampling Miami-Erie Canal	1996-1997
Ground Water Protection Management Program Plan Annual Sampling	1996-1997
SM Foundation	1996-1997
SM South Asphalt phase I	1996-1997
Quarterly Groundwater Monitoring March	1997
D&D Building 21 and Surrounding Soils July	1997
Old SD Drying Beds	1997
OU-1 Pump & Treat Baseline, Spring Quarter	1997
PRS-86 SOIL VERIFICATION SAMPLING	1997
PRS111 Sampling	1997
SM West Asphalt (D&D)	1997
SM South Asphalt phase I	1997

3.3.3 Building/Structures

As of January, 1998, 116 buildings exist within the Mound Plant boundaries. Several of these buildings have been or are slated to be leased to private entities for commercial use. The following are short descriptions of the more significant remaining facilities for which demolition or clean-up effort is anticipated due to radiological and/or chemical contamination. Chemicals such as polychlorinated biphenyls (PCBs) and some laboratory solvents such as 2-butanone, and toluene have been detected infrequently throughout various facilities. Other possible non-radiological environmental concerns pertaining to buildings and structures include lead, lead paint, and asbestos. *Mound Site Radionuclides by Location* (MD-22153, June 1995) [35] provides descriptions of missions and projects performed in buildings HH, PP, R, SM, SW, T, WD and WDA. This document also lists the radionuclides used in each room and the dates they were present in the room. This information is summarized as follows:

- T Building housed tritium handling facilities, non-destructive testing, radon labs, calorimetry programs, health physics, and other testing programs. Radionuclides known to have been in the building include polonium, plutonium, tritium, and numerous others.

- SW Building contained component evaluation operations/metallurgy, analytical services, welding, process development, calibration lab, decontamination facilities, health physics, liquid radioactive waste processing, and tritium recovery. Radionuclides known to have been present in the building include tritium, actinium, radium, thorium, and numerous others.

- R Building housed operations such as materials analysis, research and development, library, administrative offices, and stable isotope separation. Radionuclides known to have been present in the building include polonium, plutonium, tritium, and numerous others.

- HH Building contained processes involving isotope separation, equipment for the measurement of the physical properties of gases, tritium technologies, and liquid-solid chromatography. Radionuclides know to have been present in the building include tritium, krypton-85, cobalt-60, uranium-233, -234, -235, -238, thorium-230, and numerous others.

- WD Building is used to process liquid radioactive waste. Radionuclides known to have been present in the building include plutonium-238, -239, tritium, uranium-235, -238, americium-241, and numerous others.

- Building 38 housed processes such as decontamination activities, partial heat source assembly, plutonium repackaging for storage, instrument calibration lab, health physics counting labs, and respirator cleaning. The primary radionuclide known to be in the building is plutonium-238.

Reference 4 is another good source of information about the use of hazardous substances at Mound. This report "provides a description of the history of ownership and operation of the plant with emphasis on the generation, treatment, storage, and disposal of hazardous wastes through the perspective of the major programs and projects at the plant." [19] The report also "provides a summary list of the hazardous substances generated through process information." [19]

4. MOUND 2000 APPROACH

Based upon the current understanding of the site (Section 3), the DOE and its regulators have developed an approach for making decisions about remediating the site. This process, referred to as Mound 2000, is described in this section. Mound 2000 primarily consists of 1) the PRS Evaluation Process, 2) the Building Disposition Process, and 3) a methodology for evaluating residual risk. The residual risk evaluation contributes to DOE's exit from the site, the sale of the site, and delisting of the site from the NPL. Section 5 provides a more detailed description of the various documents produced throughout the processes described below.

4.1 Overview

The DOE and its regulators had originally planned to address the plant's environmental restoration issues under a set of OUs, each of which would include a number of PRSs. For each OU, the site would follow the traditional CERCLA process: a Remedial Investigation/Feasibility Study (RI/FS) followed by a Record of Decision (ROD) followed by Remedial Design/Remedial Action (RD/RA). After initiating remedial investigations for several OUs, the DOE and its regulators realized during a strategic review in 1995 that, for Mound, the OU approach was inefficient. The DOE and its regulators agreed that it would be more appropriate to evaluate each PRS or building separately and use removal action authority to remediate them as needed. The DOE and its regulators plan to initiate and complete all remedial actions utilizing removal action authority. The Record of Decision (ROD) that will allow the site to be de-listed from the NPL will contain institutional controls, i.e., deed restrictions. Although the process is different from RI/FS, it is, by design, consistent with CERCLA and the NCP.

A "core team" was formed in order to ensure an effective means of working together. The core team consists of representatives of DOE, USEPA, and OEPA with decision-making authority.[1] This core team has the responsibility to reach consensus on whether or not certain areas of concern are protective of human health and the environment, and what subsequent action needs to be taken. In order to make these decisions, the core team works with and receives input from the project team. The project team is composed of technical experts from both the contractor and DOE. The members of the project team have in-depth knowledge of process history, regulations, and technologies appropriate for *identifying* environmental concerns and *addressing* concerns. The involvement of the project team is important not only to provide input to the core team, but also because the project team is responsible for implementing the core team's decisions and therefore needs to understand the core team's objectives. The core team receives input from stakeholders to ensure that the concerns of the local community and future site users are considered during decision making. The stakeholders provide comments on key

environmental concerns, selecting response actions, and ensuring that the overall goal of protecting human health and the environment is achieved as expediently as practicable. The teaming approach and the processes developed to implement Mound's innovative cleanup strategy together comprise **Mound 2000**.

4.2 PRS Evaluation Process

A Potential Release Site (PRS) is an area where knowledge of historic or current use indicates that the site may have had releases of radioactive and/or hazardous materials.[36] The original list of PRSs can be found in *OU9-Site Scoping Report Vol. 12, Site Summary Report.*[19] As information becomes available, the core team may identify additional locations as PRSs.

The purpose of the PRS evaluation process is to:

1) Identify environmental concerns

2) Identify which of those environmental concerns warrant action (fulfill removal site evaluation requirements 40 CFR 300.410);

3) Identify appropriate response actions; and

4) Communicate the recommendations of the core team to the stakeholders and provide a forum to receive their input.

A PRS is the primary unit on which decisions are made about potential environmental problems. The PRS process is the mechanism by which the core team will establish whether a PRS represents a site problem. Four elements must be present for a PRS to be considered a potential site problem:

1) a source of contamination,
2) a release mechanism,
3) a current or future exposure pathway/route, and
4) a receptor(s).

For some PRSs it is obvious that a site problem does or does not exist. In other cases, this determination is less clear and the Mound conceptual site model[30] is utilized in evaluating if a complete exposure pathway exists.

The project team compiles and consolidates information such as site history and possible contamination data into a PRS package. The site history describes the general location of the

PRS, identifies any process history or incidents (e.g., spills, leaks) relevant to the site, and identifies the site's current status. The contamination information identifies and describes any contamination identified at the site location. A comparison is made between the existing contaminant levels and the applicable guideline criteria and/or Mound background levels. [37] The core team reviews the information in the PRS package and ultimately categorizes each PRS as one of the following designations, thus determining the future course of action:

- Sites that require *no further assessment* based on existing information (i.e., no problem exists at the site);
- Sites for which a *response action* is warranted based on existing information (i.e., a problem does exist); or
- Sites for which there is *insufficient information* available to make a determination (i.e., unclear if a problem exists).

The eight step process for evaluating Potential Release Sites (PRSs) is illustrated in Figure 4.1 and described below.

Step 1: Evaluate existing information to determine if the PRS is **not** a site problem - This initial step may be straightforward and obvious. There are a number of criteria and tools that the core team can utilize to determine if a PRS is not a site problem. Examples include:

- Historical knowledge;
- Lack of a complete exposure pathway (current or future);
- Existing site standards;
- Background [38] (either naturally occurring or anthropogenic);
- Precedent;
- Risk information;
- Leaching equation [39];
- Soil gas back calculation [38]; and
- Guideline values (*Risk Based Guideline Values*, March 1997 [40])

The core team uses the conceptual model in *Mound 2000 Residual Risk Evaluation Methodology* to determine if a complete exposure pathway exists. If a complete exposure pathway does exist, or if uncertainty exists as to whether a No Further Assessment (NFA)designation is appropriate, proceed to Step 2 for further evaluation. If the core team determines that the site is not a problem, that PRS is designated NFA, pending stakeholder consensus. Advance to Step 6 in the PRS process.

Step 2: Evaluate existing information and data to determine if the PRS is a site problem - This step may also be straightforward. The core team uses the criteria previously listed to designate a PRS as a site problem. If the core team concurs that data and information for the PRS clearly indicate that conditions warrant a response action, proceed to Step 6 in the process. Further evaluation to determine specifics for implementing a response action, if needed, is conducted as part of the response action process (Section 4.2.1).

If the PRS has not been designated NFA or RA, further data collection, field characterization, and/or more quantitative risk evaluation may be required. Proceed to Step 3.

Step 3: Identify uncertainties and data needs - For PRSs where the existence of a site problem is uncertain, the core team identifies what information is needed to determine if the PRS is a site problem.[41] If obtaining the additional information involves sampling and analysis, the core team identifies the appropriate Data Quality Objectives (DQOs). Proceed to Step 4.

Step 4: Compare data collection costs to removal costs - For some PRSs (particularly small sites) it may be less expensive to perform a response action than to collect sufficient data to prove that a problem does not exist. The core team informally compares the cost of data collection to the expected cost of a response action (including disposal costs) before data are collected. If the expected cost of a response action is clearly less than the cost of characterization, the core team designates the PRS for a response action. Proceed to Step 6. If the expected cost for restoration is not clearly less than the cost of characterization, proceed to Step 5.

Step 5: Collect data required to determine if the PRS is a problem - If more data are required to determine if the PRS constitutes a site problem, DOE

collects the necessary data and the core team re-evaluates the PRS. Return to Step 1.

Step 6: Present preliminary recommendations to stakeholders for input - The core team presents to the stakeholders the recommendations developed through Steps 1-5 of the PRS Process (i.e., either to initiate a response action or No Further Assessment (NFA) is needed). The data and/or information and the rationale to support each recommendation are summarized in the format of a PRS package. The PRS package includes:

- A description of the PRS, including process history;
- A photograph of the PRS;
- A summary of the data and indicated levels of contamination at the PRS;
- References from which data are summarized;
- Guideline Values
- Conclusions / recommendations of the core team.

One purpose of this step is to solicit stakeholder involvement early in the process so that their input can be utilized to help guide program decisions and the site remediation strategy. Stakeholders will be asked to review the core team's recommendations, focusing on the problem statement. If stakeholders disagree with the designation of a PRS as either a site problem or as an area requiring NFA, they will be asked to provide input that will either eliminate, create, or modify a problem statement. Proceed to Step 7.

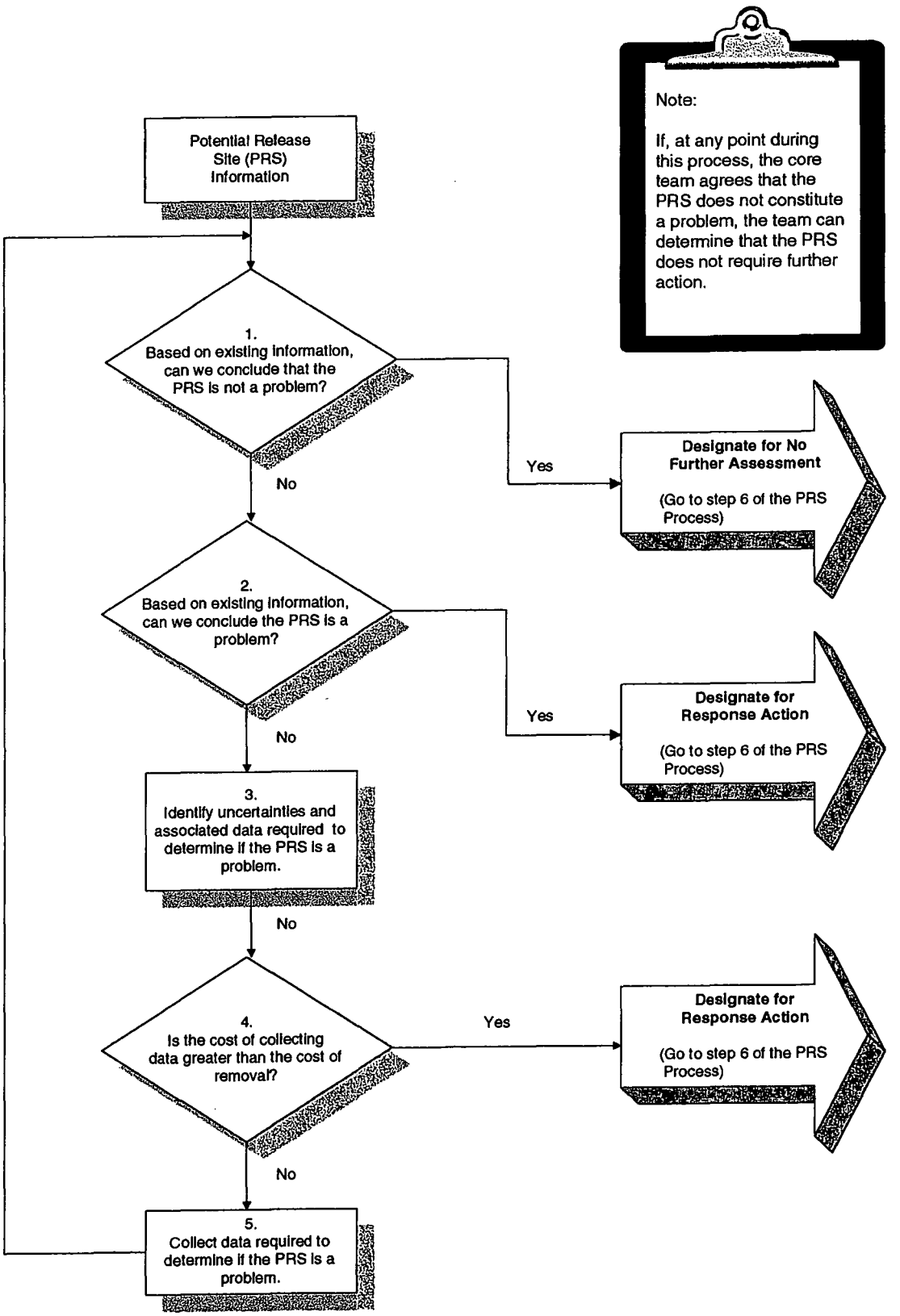

Figure 4.1 The PRS Process

Step 7: Determine whether it is necessary to reassess "problem" - This step evaluates stakeholder input and, if necessary, reassesses the PRS through Steps 1-5 of the process. A PRS warrants reassessment under two scenarios:

(1) If stakeholder input eliminates or resolves the problem statement of a PRS designated as a RA.

(2) If stakeholder input results in a statement of concern or a problem statement for a PRS designated for NFA.

When stakeholder input simply adds to or modifies a problem statement, a revised PRS package with the core team's response to comments will be issued.

For those PRSs that do not require reassessment, proceed to Step 8.

Step 8: Finalize recommendation - At this point in the process, each PRS is recommended for either 1) a response action or 2) NFA, based on core team consensus. After receiving stakeholder input, the core team evaluates the input and either reassesses the recommendation or responds to comments as needed. Generally, the responses are drafted by the project team for the core team's review and signature. If the PRS has been designated as a site problem that requires action, proceed to the response action process (Section 4.2.1). If the PRS has been designated for NFA, proceed to the land transfer process (Section 4.4).

If at any time additional information is found, a PRS can be reevaluated with the additional information. Any additional information must be brought to the attention of the Core Team.

4.2.1 Response Action Process

Those PRSs designated for response action proceed through the response action process. The seven step process is illustrated in Figure 4.2 and described below.

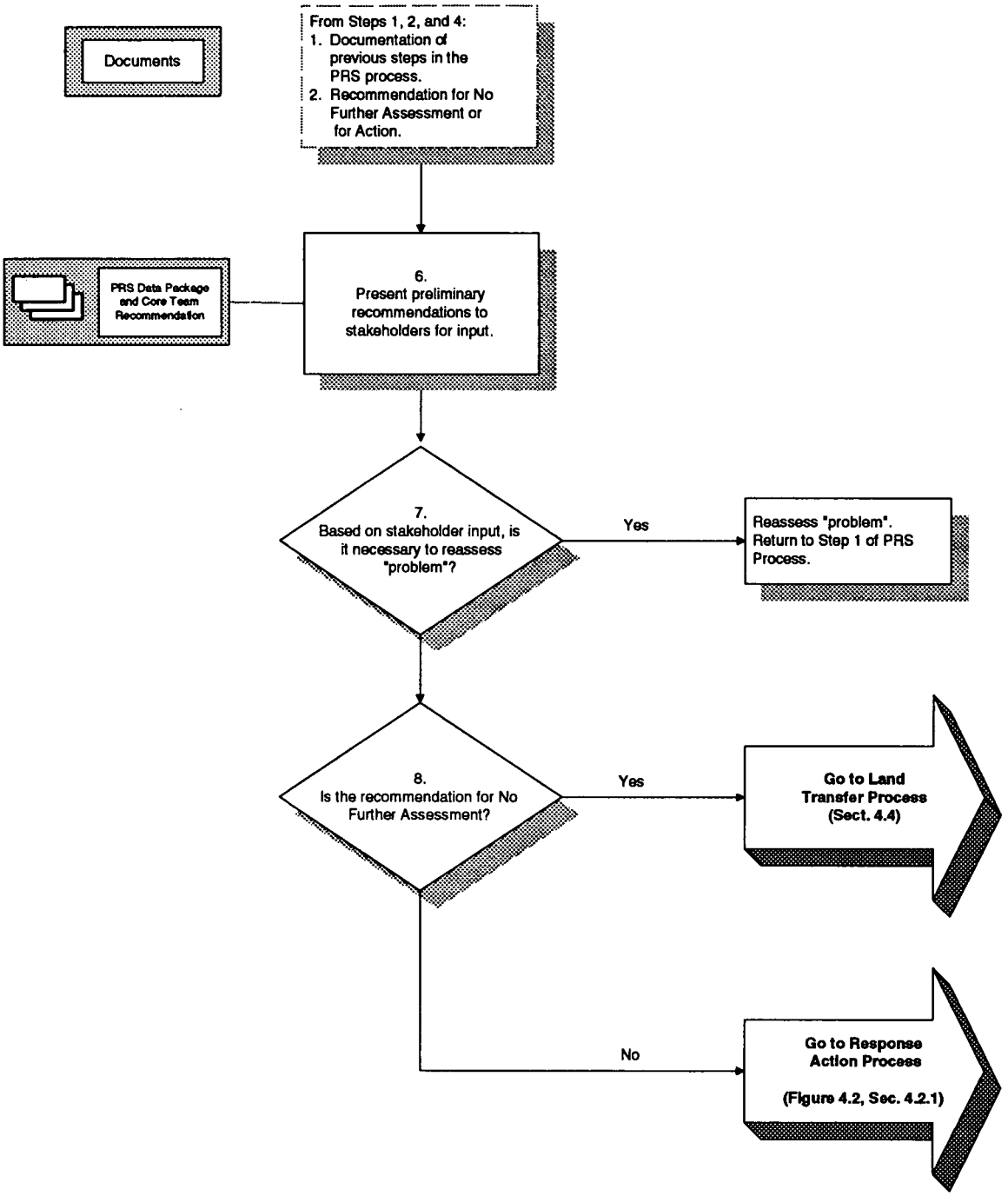

Figure 4.1 The PRS Process (continued)

Step 1: Evaluate alternatives for addressing the site problem -

The objective of this step is to conduct a focused evaluation based on the problem warranting action for each PRS. The focused evaluation identifies a preferred likely response action, identifies which existing uncertainties can be managed, and identifies which uncertainties, if any, require additional information gathering prior to implementing the response action. The information generated during this step is summarized in the Action Memorandum/Engineering Evaluation/Cost Analysis, which is then presented to the stakeholders in Step 2. It also provides the technical basis for developing the Work Plan in Step 4. Proceed to Step 2.

Step 2: Present proposed response actions to stakeholders for review - DOE presents to the stakeholders the proposed response actions developed in Step 1. The format for presenting these recommendations will be a Action Memorandum/Engineering Evaluation/Cost Analysis which includes:

- The site conditions and background,
- An endangerment determination,
- The proposed response action,
- The rationale for the proposed response action,
- Alternative Technologies,
- Applicable or Relevant and Appropriate Requirements (ARARs),
- Identified uncertainties,

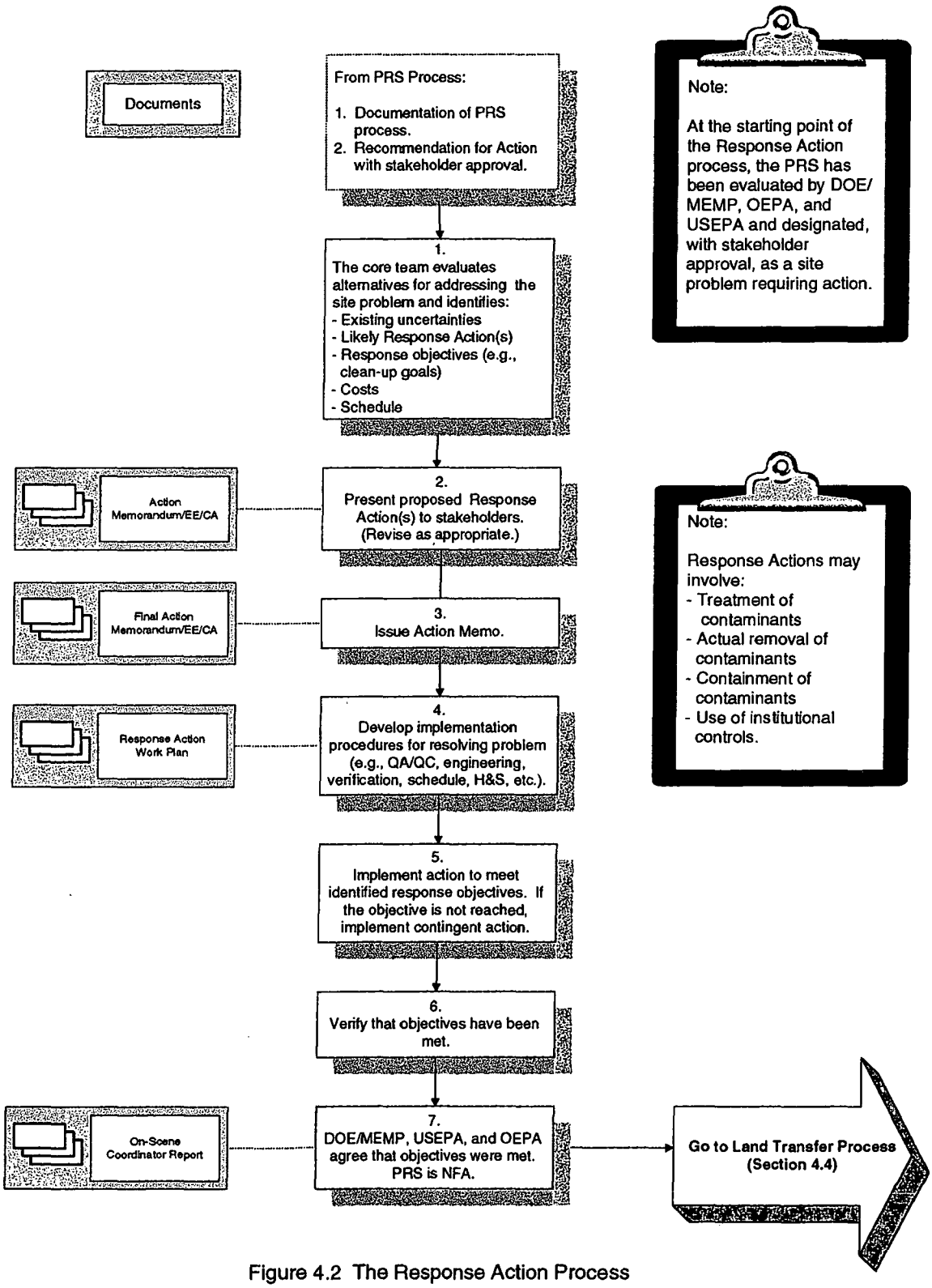

Figure 4.2 The Response Action Process

- Response action objectives,
- Proposed schedule, and
- Estimated cost.

In short, the Action Memorandum/EE/CA outlines the path forward for taking action. Stakeholders will be asked to comment specifically on the proposed likely response action(s), the schedule, and the response action objectives. Proceed to Step 3.

Step 3: Issue Action Memorandum - Following stakeholder input on the proposed action, DOE designates the Action Memorandum as a final document and places it in the Administrative Record. Proceed to Step 4.

Step 4: Develop implementation procedures for resolving the site problem - DOE develops a Work Plan based on the focused evaluation conducted in Step 1. The Work Plan consists of the procedures to implement the response action described in the action memo, including quality assurance / quality control (QA/QC) procedures, verification procedures, and the schedule for implementation. DOE identifies and approves the health and safety (H&S) requirements to be included in the Work Plan. These documents are provided to the regulators for review, comment, and comment resolution.

As the response action is implemented in Step 5, some of the field conditions encountered inevitably require modifications to the original response strategy (e.g., changes in engineering design, H&S requirements, etc.). To the extent possible, these field changes are anticipated and planned for by developing contingency plans. The final Work Plan document presents the rationale and approach for implementing the response action and provides detailed guidance for conducting Step 5. Proceed to Step 5.

Step 5: Implement action to meet identified response objectives - DOE implements the response action in accordance with the approved Work Plan until the response objectives are reached. If necessary, DOE implements contingency plans. Proceed to Step 6.

Step 6: Verify that objectives have been met - Verification that the response objectives have been met is conducted in accordance with the approved

Verification Sampling and Analysis Plan (VSAP). Proceed to Step 7.

Step 7: Attain agreement that objectives were met - DOE, USEPA, and OEPA reach agreement that the objectives for the PRS were met, pending the final residual risk evaluation (Section 4.7.1). Verification and documentation of the completed action is formalized in the On-Scene Coordinator report. The core team approves the OSC report and it is available in the public reading room. When the core team approves the OSC report, the PRS is designated NFA.

4.3 Building Disposition Process

The production and development programs at the Mound Plant left many of the buildings with known or suspected contamination from radioactive and/or hazardous materials that may pose a threat to human health and the environment. DOE is committed to addressing all of these environmental concerns as well as working with the local community to make property (buildings and land) available to the city for economic development. The core team does not decide whether or not a facility will be utilized for economic development. This is determined by representatives of MMCIC, DOE, the site contractor and others.

The core team does ensure that the environmental concerns associated with buildings are addressed. The core team has adopted an approach very similar to the PRS process known as the Building Disposition Process. This process is the mechanism to determine if a particular facility or structure represents a site problem. The process is illustrated in Figure 4.3 and described below.

To evaluate a particular building, the project team compiles pertinent information in a "Building Data Package (BDP)" (Step 3 of Figure 4.3). The BDP includes:

- Site description and history (e.g., location and description, building characteristics, process history);
- Records review (e.g., past sampling data, data on lead paint and asbestos, data on radon, listing of chemicals removed from the building, history of past spills and releases); and

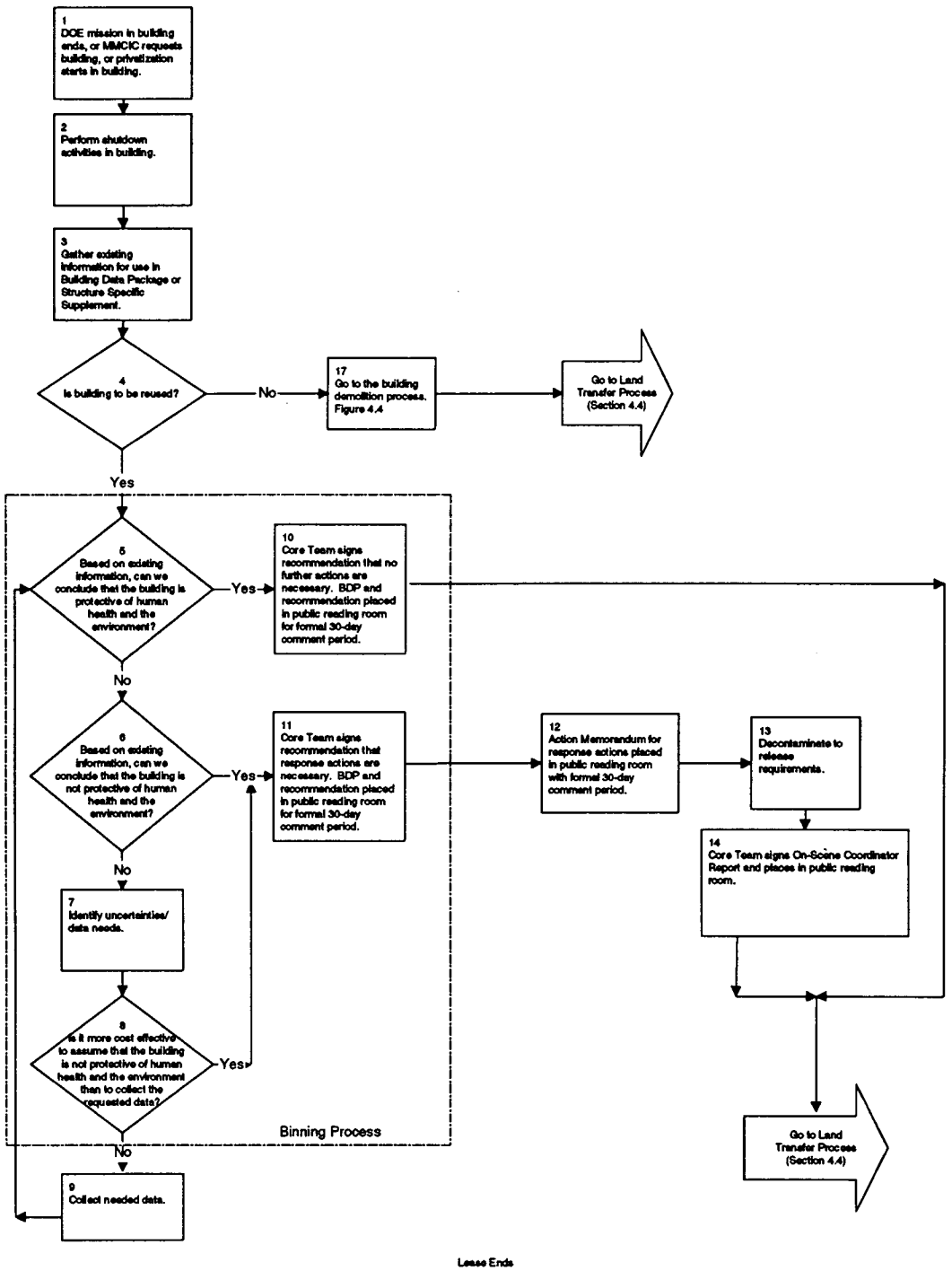

Figure 4.3 Building Disposition Process

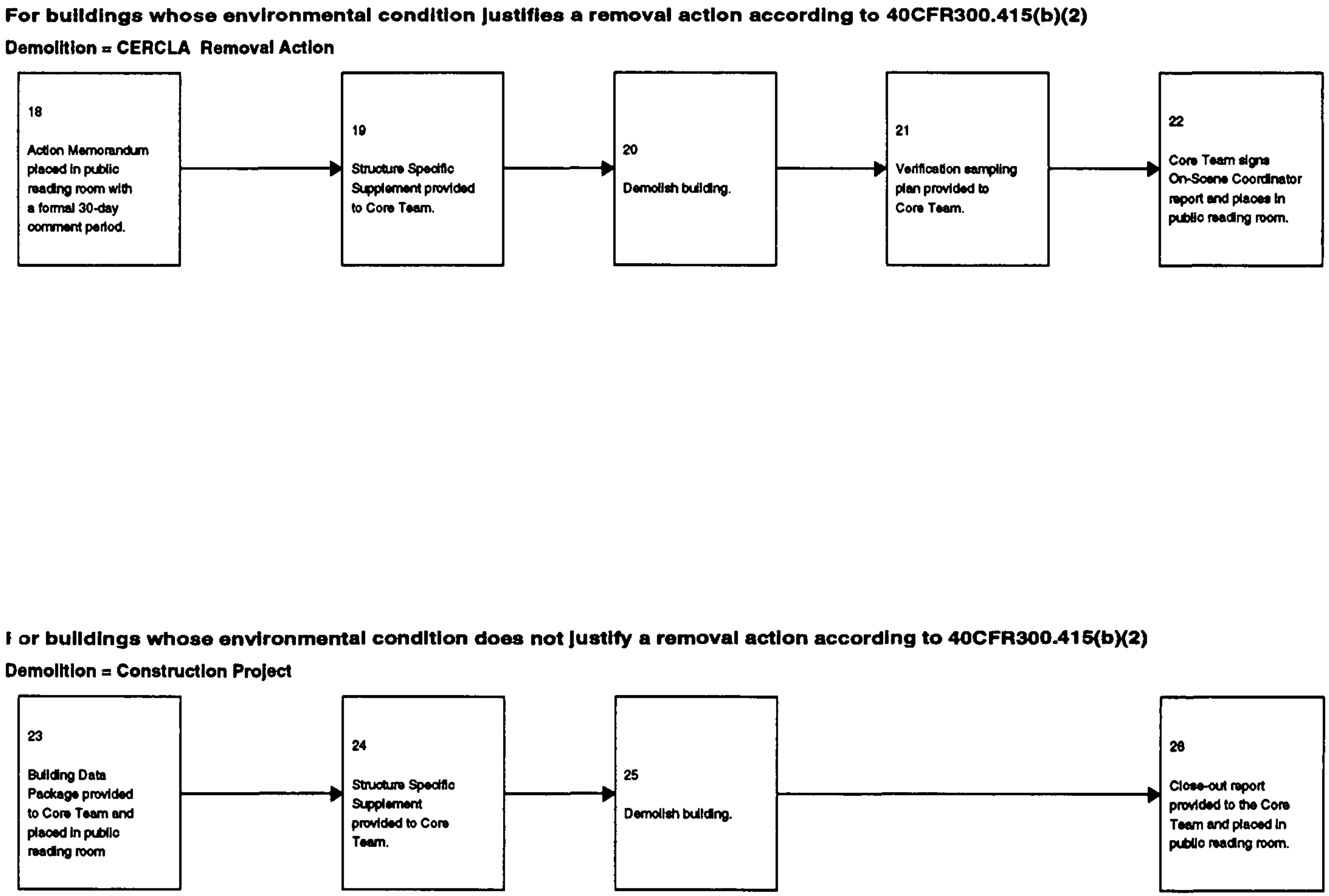

Figure 4.4 Building Demolition Process

- Information from site investigation and interviews (e.g., contractor walk-through, radiation survey).

- A "Building Evaluation Matrix" from the existing information that includes:

    - Environmental concerns associated with the building;

    - Proposed resolution for those environmental concerns; and

    - Schedule for resolution.

A building may have many areas (labs, floor drains, piping, offices, etc.) that could contain materials which may pose a threat to human health and the environment. The building evaluation matrix summarizes the environmental concerns to allow the core team to focus on the specific building problems requiring action.

The core team evaluates the information in the Building Data Package (Figure 4.3 "Binning Process"). If there are no environmental concerns identified, the core team bins the building *No Further Assessment (NFA)* needed to address potential threats to human health and the environment (Box 5). If there are environmental concerns identified, the core team bins the building *"Response Action" (RA)* needed to address threats to human health and the environment (Box 6). The binning decision is documented in a "Recommendation" which is signed by the core team members to document the path forward for the building (Box 10 and 11). This "recommendation," along with the building data package, is then placed in the reading room for public review and comment. If the core team can not decide whether or not there are environmental concerns based on existing information, the building is binned *"Further Assessment" (FA).* In addition, the core team identifies to the project team the information the core team needs to make a decision (Box 7 and 8).

If it is recommended by the core team that an action be taken to address an environmental concern, the project team prepares an Action Memorandum/Engineering Evaluation/Cost Analysis. The action memorandum formally documents:

- the site conditions and background,

- the endangerment determination,

- the proposed response action,

- the rationale for the proposed response action,

- identified uncertainties,
- response action objectives,
- alternative technologies,
- Applicable or Relevant and Appropriate Requirements (ARARs),
- proposed schedule, and
- estimated cost.

The Action Memorandum/EE/CA is then reviewed and approved by the core team and placed in the public reading room for a formal 30-day comment period (Box 12). The project team prepares a Work Plan that consists of the procedures to decontaminate to release requirements and includes quality assurance/quality control (QA/QC) procedures. DOE identifies and approves the health and safety requirements to be included in the Work Plan. The documents are provided to the regulators for review, comment, and comment resolution. Once the action, as defined in the action memorandum, is approved, the core team also agrees on an appropriate verification strategy. This strategy will identify the types of information needed (e.g., sampling and analysis) to confirm protection of human health and the environment has been achieved after the decontamination activities have taken place. If environmental sampling is involved in the verification strategy, the project team develops a Verification Sampling and Analysis Plan. The core team reviews and comments on this plan. The project team responds to comments and revises the plan as needed (Box 13). The Verification Sampling and Analysis Plan can be incorporated in the Work Plan. Final verification and documentation of the completed action is formalized in a On-Scene Coordinator Report (Box 14). This report is approved by the core team and is available in the public reading room.

4.3.1 Building Demolition Process

Figure 4.3 indicates that buildings that will not be reused follow the building demolition process (Box 17). The core team involvement in the demolition process is illustrated in Figure 4.4. There are two possible paths to building demolition: demolition as a CERCLA removal action and demolition as a construction project. Buildings whose environmental conditions justify a removal action according to 40 CFR 300.415(b)(2) will be demolished as a removal action under CERCLA.

For this type of building, the project team will prepare an Action Memorandum/Engineering Evaluation/Cost Analysis for the core team's approval. The

Action Memorandum/EE/CA documents:

- the site conditions and background,
- the endangerment determination,
- the proposed response action,
- the rationale for the proposed response action,
- identified uncertainties,
- response action objectives,
- alternative technologies
- Applicable or Relevant and Appropriate Requirements
- a proposed schedule, and
- estimated cost.

The approved Action Memorandum/EE/CA is placed in the public reading room for a formal 30-day public comment period (Box 18). The project team prepares a Work Plan (sometimes referred to as a Structure Specific Supplement) that consists of the procedures to demolish, dismantle, and dispose of the building. Quality assurance/quality control (QA/QC) procedures are included. DOE identifies and approves the health and safety requirements to be included in the Work Plan. The documents are provided to the regulators for review, comment, and comment resolution (Box 19). The core team also agrees on an appropriate verification strategy. If environmental sampling is involved in the verification strategy, the project team develops a Verification Sampling Analysis Plan. The core team reviews and comments on the Verification Sampling Plan. The project team responds to comments and revises the plan as needed (Box 21). Documentation of the completed action is formalized in the On-Scene Coordinator report. The document is approved by the core team and is available in the public reading room (Box 22).

The core team is also involved in demolitions that progress as construction projects. This involvement is illustrated in the lower path shown in Figure 4.4. The project team prepares the Building Data Package and Work Plan (sometimes referred to as a Structure Specific Supplement). These documents are simultaneously provided to the core team and placed in the public reading room (Box 23 and 24). The availability of these

documents is advertised in the local newspaper.

If the core team does not object within 30 days, the building is then demolished per the Work Plan. A closeout report is prepared and provided to the core team and the public (Box 26).

4.3.2 Exceptions To The Building Process

The core team has reviewed the list of "modular" or "personal property" buildings at Mound. These are the structures that will be sold at auction, then dismantled and removed from the site by the new owner. The core team decided that these buildings do not need to go through the Building Data Package/Binning process. Core team involvement in this process is less formal and takes place through the project managers meetings (FFA Sec. XII E Meeting of the Project Managers on Development of Reports).

As the building process was developed, the following D&D projects were already in progress; SM Building, Building 21, and SD. The plans for documenting completion of these projects under Mound 2000 are:

- SD Building - field work is complete. Because of its proximity to WD, completion of SD (verification and documentation) will be part of the WD project.

- Building 21 - field work is complete. Existing information will be assembled in the PRS Package (PRS 407) and presented to the core team.

- SM Building - verification of the leach field will be treated as a PRS and presented to the core team. Verification of the remaining scope will be accomplished in the disposition process for Building 38 (PP).

4.4 Land Transfer Process

The Mound 2000 Process was designed to promote the transfer of the site from DOE to MMCIC. Transfer of ownership of a piece of property involves a number of issues in addition to environmental considerations. The core team plays a key role in the process, but is not alone. This section describes and Figure 4.5 illustrates the core team's vision of its role in the land transfer process.

In the original descriptions for the Mound 2000 Process, the Mound property was divided into 18 "release blocks," which are contiguous tracts of property designated for transfer of ownership. The term "release block" is an informal term not defined by regulation or the FFA. The term could be replaced by another term that indicates only a piece of the site is

being considered. The original eighteen release blocks may be reconfigured into more or fewer blocks with different geographic boundaries. The first step in the Land Transfer Process is to identify a piece of the site for transfer (Figure 4.5, Step 1).

The Residual Risk Evaluation Methodology (RREM) was developed as a framework for evaluating human health risks associated with residual levels of contamination that remain within the limited area of a release block after all necessary action is taken, and the remaining PRSs or buildings in that release block have been designated as NFA. Once all of these environmental concerns have been adequately addressed per the core team, a residual risk evaluation is performed (Figure 4.5, Step 2). This RREM consists of five steps:

Step 1: Identification of contaminants to be evaluated

Step 2: Exposure assessment

Step 3: Toxicity Assessment

Step 4: Risk Characterization

Step 5: Evaluation of potential residual risks.

Reference 30 provides a complete description of how to perform a RRE via the Mound 2000 process. After the core team reviews and approves the RRE, it is placed in the public reading room for a formal 30 day public review period (Figure 4.5, Step 3).

A Record of Decision (ROD) will be generated for each piece of property to be transferred (Figure 4.5, Step 4). The ROD will document the most appropriate remedy that meets statutory requirements and ensures protection of human health and the environment. The core team expects that institutional controls will be specified in the ROD. The format for the ROD is specified in 40 CFR 300.430. The process for developing a ROD is in Sections X and XI of the FFA.

DOE will submit to USEPA and OEPA documentation that shows the property meets *CERCLA 120 (h)(3)* requirements. This documentation is expected to be similar to the Finding of Suitability to Transfer (FOST) used by DOD (Figure 4.5, Step 5).

The title of the property is formally transferred. The purchaser must acknowledge and commit to abiding by documented deed restrictions (Figure 4.5, Step 6).

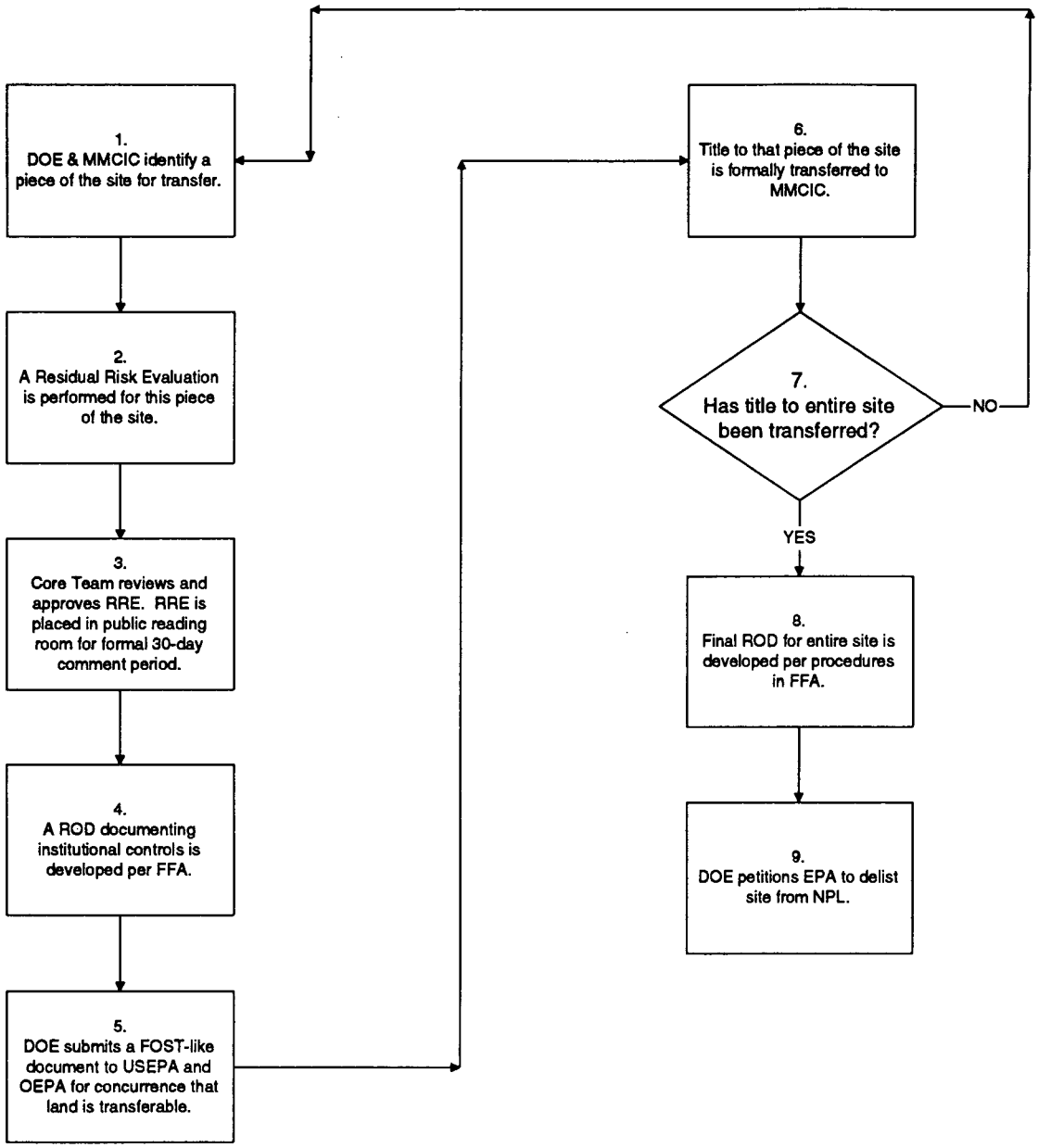

Figure 4.5 The Land Transfer Process

The core team plans for a final Site-wide ROD. This ROD will contain institutional controls, i.e., deed restrictions. At this point, DOE could petition USEPA to delist the Mound site from the NPL (Figure 4.5, Steps 8 & 9).

4.5 Public Involvement

The public was involved throughout the development of the Mound 2000 process through articles in the Superfund Update Newsletter and presentations/fact sheets at public meetings. The public is involved throughout the implementation of the Mound 2000 process. The PRS and building data packages are placed in the Public Reading Room along with the signed recommendation for Response Action or No Further Assessment. The public has 30 days to review this information and provide feedback. This provides information for the public to review early in the process before additional work is conducted in a response action or the property is ready to transfer.

The public also provides review and comment on action memoranda. This 30-day review provides the public the opportunity to comment on the preferred response, the environmental concerns, established clean-up goals, and the proposed schedule for action.

Finally, decision documents (PRS and Building Data Package, Action Memoranda, On-Scene Coordinator Reports, Residual Risk Evaluations and Records of Decision) are placed in the Administrative Record which is available for public review at any time. Other documents that contain information supporting decisions are available in the Public Reading Room. In addition, the public is briefed on restoration progress at public meetings such as Mound Action Committee meetings.[42, 43]

4.6 Benefits of the Mound 2000 Approach

The Mound 2000 Approach provides the following benefits to the environmental restoration program at the Mound Plant:

Expedites decision-making and action. Through Mound 2000, the DOE is working directly with its regulators to identify the most appropriate response, including NFA, for each PRS or building. Because problems are addressed individually rather than in combination, the evaluation process is less complex and decisions are made quickly. The project team can proceed with action to address individual problems as soon as the core team reaches agreement and public involvement is complete.

If, at any stage of the Mound 2000 process, the information indicates that a PRS should be moved to another path (i.e., from FA to RA), the core team can agree to do so.

Minimizes data collection. In developing the processes that comprise the Mound 2000 strategy, the core team recognized the benefits of minimizing necessary data collection.

The core team reduces data collection by:

- ***Evaluating existing information initially.*** In the PRS and building disposition processes, the core team first reviews existing information to determine if: 1) the area clearly does not pose a problem, and therefore can be designated for no further action, or 2) the area definitely requires action and must be evaluated through the response action process. By making this decision initially whenever possible, the core team is able to expedite action.

- ***Defining specific data needs.*** If existing information is insufficient for the core team to determine if the PRS or building constitutes a problem (i.e., whether action is required), the core team pinpoints the specific additional data needed to make this decision. If the cost of collecting these data is greater than the cost of performing the response action, the team minimizes use of site resources by assuming that the problem exists and proceeding with action.

- ***Assessing uncertainties.*** As previously stated, the core team uses existing information, whenever possible, to identify the preferred response action for those areas that constitute problems. The core team uses uncertainty management to proceed with implementation of this response even though some factors may be uncertain. For each uncertain factor, the core team defines the expected condition, identifies potential deviations from these uncertainties, and assesses the likelihood and impact of those deviations. Based on this evaluation, the core team determines if the uncertainty should be reduced through data collection or managed through up-front planning. In some cases, the core team may determine that an uncertainty can be ignored because the impact of a potential deviation is negligible. Management of an uncertainty is appropriate if implementation of a contingency plan can effectively minimize the impact of encountering potential deviations. By distinguishing amongst the uncertainties in this way, the core team focuses characterization activities on obtaining only that data necessary to proceed with implementation.

Streamlines documentation and facilitates stakeholder comment and review. In addition to expediting decision-making and action, the Mound 2000 process reduces and simplifies the documentation that must be produced in support of cleanup activities. Once a decision is made for a PRS or building, the core team issues a recommendation documenting the decision (i.e., NFA or the selected response action). This recommendation along with existing information for the PRS or building (data package) is

made available for public review and comment. Because the documentation addresses a discrete site problem, it is concise and easier to follow for both stakeholders and the public. Thus, in addition to reducing the cost and time necessary to develop documents, this approach facilitates stakeholder review.

5. MOUND 2000 DOCUMENTATION

Having defined the Mound 2000 process in Section 4, Section 5 now focuses on a more detailed look at the various documents of the streamlined approach. The core team has agreed that documents are created to either assist in decision-making or implement actions. Several of the key documents developed during the process represent enforceable milestones required by the regulators (i.e., USEPA and OEPA). These, as well as other highly visible references/events of Mound 2000, are outlined in three sub-sections: 1) Pre-binning documentation, 2) Post-binning documentation, and 3) Site-wide documentation for Mound 2000. The level of detail with each specific document is commensurate with the level of effort required for the disposition activities. For example, a small soil removal task would not require the same extent of design work and specifications as would the demolition of a contaminated nuclear facility.

5.1 Pre-binning Documentation

In determining whether or not a problem exists in regards to a building or land area, the core team must first evaluate existing data and historical knowledge associated with the area in question. With this information, the core team can determine the appropriate course of action at the binning meeting. A "tool" utilized by the core team in evaluating this initial information is a PRS Package for land areas or BDP for the site's structures.

5.1.1 PRS Package

The PRS Package is a document containing relevant information utilized by the core team to evaluate a PRS, and properly "bin" it in one of three categories: NFA, RA, or FA. Multiple PRSs can be addressed with a single PRS Package. The project team compiles and consolidates information such as site history and possible contamination data into a PRS package. The site history describes the general location of the PRS, identifies any process history or incidents (e.g., spills, leaks) relevant to the site, and identifies the site's current status. The contamination information identifies and describes any contamination identified at the site location. A comparison is made between the existing contaminant levels and the applicable guideline criteria and/or Mound background levels.[44]

Once the core team reaches a NFA or RA decision, the core team's recommendation (FA or RA) is appended to the PRS package. This recommendation contains the contaminant(s), the magnitude of contamination, the pathways/receptors associated with the PRS, and process history information. The information is summarized in a "Therefore, the core team recommends..." statement. Each member of the core team signs the recommendation, signifying concurrence with the statement. The

recommendation and PRS Package are advertised in the local paper and are available for formal review by the public for 30 days. For the public's convenience, DOE has prepared a document entitled "How to Read a PRS" which describes PRS packages. This document is available in the public reading room and on the Mound Plant web site (http://www.doe-md.gov/cgi-bin/folioisa.dll/PRS.NFO). The core team responds to comments received from the public and revises the PRS package appropriately.

The PRS package is an Administrative Record document.

5.1.2 Building Data Package

The BDP provides relevant information utilized by the core team to either: 1) evaluate a building identified for transfer, and properly bin it in one of three categories (NFA, RA, or FA), or 2) document the condition of a facility slated for demolition. (See Section 4.3.) The BDP includes information about the building itself and conditions within 15 feet (nominally) of the building. Multiple buildings can be addressed with a single Building Data Package. The project team compiles and consolidates information such as building history and possible contamination data in and around the facility. The history section of the BDP gives the general location of the building, identifies any processes or incidents relevant to the building, and identifies the building's current status. The data package also contains the past radiological and chemical survey data, information on past spills and releases (including PRSs), lead and asbestos, radon, and other miscellaneous information. A comparison is made between the existing contaminant levels to the applicable guideline criteria and/or applicable Mound background levels. The BDP identifies PRSs associated with the building. The core team may simultaneously bin the building and associated PRSs.

Similar to the PRS data package, once a building goes through the binning process, the project team attaches the core team's recommendation (RA or NFA) to the building data package. This recommendation relates the contaminant(s), the magnitude of contamination, the pathways/receptors, and process history information summarized in a "Therefore, the core team recommends..." statement. Each member of the core team signs the recommendation signifying concurrence with the statement. The recommendation and BDP are advertised in the local paper and are available for formal review by the public for 30 days. The core team responds to comments received from the public and revises the BDP appropriately. Unlike the PRS evaluation process, buildings designated for demolition do not go through the formal binning process. For buildings designated for demolition as construction projects, a BDP is prepared and made available to the core team and the public for 30 days before field work is initiated.

The BDP is an Administrative Record document.

5.2 Post-binning Documentation

As a PRS or building moves from binning to closure, a variety of documents may be generated. The documents that mark the progress of a PRS or building during the environmental restoration process are briefly described in this section.

5.2.1 Data Package Revisions

If additional information becomes available after the original data package is submitted, the project team makes revisions and the package is re-submitted, if necessary, to the core team for binning. The package is re-submitted to the core team for binning if the new information represents a change in the understanding of the area of concern. If the new information simply further substantiates the decision made by the core team, the package is updated and no re-submission is necessary. New information includes, but is not limited to: additional study results, summary statements of new sampling data, and newly acquired historical knowledge.

5.2.2 Sampling and Analysis Plan

If an area is designated for *further assessment,* the core team requires additional information to make a decision. If the needed information is to come from sampling, the project team prepares a Sampling and Analysis Plan (SAP) to document the plan for gathering more information at the site in accordance with the Mound Compendium. [45] The SAP identifies all monitoring procedures, sampling and field measurements, and sampling analysis types performed during the investigation to characterize the area and to ensure that all information, data, and resulting decisions are technically sound and properly documented. This plan is reviewed and approved by the core team to ensure that the characterization plan will fill the gaps needed for the team to make a decision concerning the proposed area of concern.

5.2.3 Sampling and Analysis Results

The project team conducts data evaluation and analysis once they have verified that the data are of acceptable accuracy and precision. The following are typical data evaluation activities pursuant to guidance contained in the FFA:

- Data reduction and tabulation,
- Environmental fate and transport modeling/evaluation, and

- Task management and quality control.

The project team then adds the results of field sampling and analysis in an appendix to the PRS package or BDP. The revised PRS or BDP is presented to the core team again for binning. After the PRS or BDP is binned either NFA or RA, the appended document is available for public review in the public reading room.

Completion of a Further Assessment is considered by the core team as a significant event. Delivery of a Results Report to the core team is considered a potential milestone event. Because of the variety, dynamic nature, and number of Further Assessments, it is impractical to designate the completion of each Further Assessment as an enforceable milestone. **PRSs will be grouped and a milestone established for the delivery of the Results Report for the group. The dates for the groups of PRSs are identified in the annual schedule.**

5.2.4 Action Memorandum/Engineering Evaluation/Cost Analysis

The purpose of this document is to describe the proposed course of action for the removal activities, record the evaluation of possible alternative technologies, state the selection of the response, and document the decision making process. During the evaluation of possible alternate technologies, this document uses a screening process and analysis of removal actions based upon such factors as technical feasibility, institutional considerations, reasonableness of cost, timeliness of the option with respect to threat mitigation, environmental impacts, and the protectiveness of the alternative. The content and format of the document is based on the EPA guidance for non-time critical removal actions. These documents are outlined in OSWER Publication 9360.3-01, *"Superfund Removal Procedures-Action Memorandum Guidance" (December 1990).*[46] The Action Memorandum/EE/CA is approved by the core team. It is subject to formal review and comment by the public prior to initiation of the affected removal. The final version of the Action Memorandum/EE/CA is an Administrative Record document.

5.2.5 Work Plan

The Work Plan establishes the technical approach for field activities. The "field activities" typically described in the Work Plan are:

- Excavation/demolition

- Transportation of wastes

- Waste characterization
- Waste reduction
- Waste treatment
- Media sampling
- Geology/hydrogeological investigations
- Field screening/analysis
- Site survey/topographic mapping
- Site restoration
- Task management and quality control
- Verification sampling
- Health and safety considerations

The Work Plans associated with either PRS or building Response Actions are developed by the project team and reviewed and approved by the core team. In the case of the buildings that are slated for demolition under the construction pathway, the project team creates the Work Plan and provides it thirty days in advance of field work to the core team and the public.

5.2.6 Verification Sampling and Analysis Plan

40 CFR 300.415 indicates that, if environmental samples are to be collected to demonstrate completion of a removal action, a Verification Sample and Analysis Plan (VSAP) should be prepared. The VSAP consists of two parts; the Field Sampling Plan (FSP) and the Quality Assurance Project Plan (QAPP). The FSP describes the number, type and location of samples and the type of analyses. The QAPP describes the measures necessary to obtain data of adequate quality. The VSAP is reviewed and approved by USEPA and OEPA. The VASP can be a stand alone document or incorporated in the Work Plan.

5.2.7 On-Scene Coordinator Report

After a removal action has been successfully completed, the project team submits an On-Scene Coordinator Report (OSC) to record the situation, the actions taken, the resources committed, and the problems encountered by the on-scene coordinator. The OSC report documents the effectiveness of the RA. The on-scene coordinator for the Mound Plant is currently a DOE employee and also a member of the core team. There is an established format for the OSC report available in 40 CFR 300.165. **The delivery of the draft OSC report to the regulators is an enforceable milestone required by the regulators.**

The OSC report is approved by the core team. The approved OSC is an Administrative Record document.

5.2.8 Close-Out Reports

For buildings that are demolished as a construction project, completion of the project is documented in a Close-Out Report. This report describes the original situation, the action taken, resources committed, and problems encountered. This report is submitted by the contractor project team to DOE/MEMP. It is provided to the core team for information.

5.2.9 FOST-Like Document

This document shows that property to be transferred meets CERCLA 120(h)(3) requirements. The FOST-like document is similar to the DOD's Finding of Suitability to Transfer. This document provides a description of the environmental condition of a parcel or piece of property proposed for transfer. It describes the conditions of the buildings and the land proposed for transfer. It incorporates the information from the PRSs and buildings designated NFA, the On-Scene Coordinator reports, and the Residual Risk Evaluation.

A FOST-like document will be issued for each parcel of land proposed for transfer. **The FOST-like document for the last parcel of land proposed for transfer is an enforceable milestone required by the regulators.**

5.3 Site-wide Documentation for Mound 2000

Several documents generated for the Mound 2000 process address the site as a whole. These documents embody the status and activities of numerous PRSs and BDPs. Monthly progress reports and annual schedules are produced to update the core team and stakeholders of planned activities and accomplishments. Furthermore, the ROD for

the site will be utilized as the final tool with which DOE (with the core team's approval) will justify that there are no more environmental and human health concerns associated with DOE's past missions at the site.

5.3.1 Monthly Progress Reports

A Monthly Progress Report is prepared and submitted as described in the FFA *(Section XII and XVI. Reporting Requirements A. Monthly Progress Reports).* This requirement is unaffected by the Mound 2000 approach.

5.3.2 Annual Schedules

Each year, DOE submits to the USEPA and OEPA a schedule of environmental restoration activities. Typically the federal budget development cycle makes March an effective month for this submission. This schedule is prepared in accordance with the description set forth in the FFA (FFA Attachment II). ***The annual schedules submitted by DOE are an enforceable milestone required by the regulators.*** (FFA Sec. XII.C. Primary Documents)

5.3.3 Residual Risk Evaluation

After the environmental concerns within a release block have been addressed to the satisfaction of the core team, the human health risks associated with remaining levels of contamination are evaluated. Reference 30 provides a complete description of how to perform a RRE via the Mound 2000 process. After the core team reviews and approves the RRE, it is placed in the public reading room for a formal 30 day public review period. The RRE is an Administrative Record document. A RRE will be performed for each parcel of land proposed for transfer. **The RRE for the last parcel of land to be transferred is an enforceable milestone required by the regulators.**

5.3.4 Record of Decision

The process for developing a Record of Decision (ROD) is addressed in Sections X and XI of the FFA.[47] The ROD summarizes the problems posed by the area of concern, the technical analysis of alternative approaches to addressing those problems, and the technical aspects of the selected remedy. The ROD also specifies monitoring requirements, institutional controls, and five-year reviews, as required. The proposed plan (draft ROD) for the ROD is available for 30 day formal public review. The actual ROD is then submitted to the core team for review and comment. An established format for a ROD is available in 40 CFR 300.430. A ROD will be implemented for each parcel of land proposed for transfer. In addition, a final plant-wide ROD is anticipated. ***This ROD***

is an enforceable milestone required by the regulators. The ROD will contain institutional controls as well as call for a plan describing how the controls will be monitored to ensure the site remains protective of human health and environment. Long term environmental monitoring may also be required.

6.0 ENFORCEMENT

The core team consisting of DOE, USEPA, and OEPA has agreed to use the Mound 2000 approach. The work described in this document does not create a waiver of any rights under the Federal Facility Agreement, nor is it intended to create a waiver of any rights under the Federal Facilities Agreement. The DOE is the sole party responsible for implementing this clean-up. Therefore, DOE is undertaking the role of lead agency, per CERCLA and the NCP, for the investigation and clean-up of the site. The funding for this will be through DOE budget authorization and no Superfund monies will be required.

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APPENDIX A

Radiological Tools Team Report

SURFACE AND VOLUMETRIC RELEASE CRITERIA
FOR
BUILDING DISPOSITION

Group Members: Tim Fischer, USEPA; Kathy Lee Fox, OEPA; Joseph Geneczko, BWO; David Rakel, BWO; Amy Snyder, BWO; Alan Spesard, DOE MEMP; and James Webb, ODH.

Introduction

The necessity of environmental cleanup was determined by the CERCLA status of the site. Mound 2000 is an integrated approach (DOE, USEPA, and OEPA) for making decisions regarding the degree of environmental cleanup and the release of Mound property for private industrial enterprise.

As part of the Mound Building Disposition Process, the Mound Building Disposition Core Team (DOE, USEPA, and OEPA) created a Radiological Decision Tools Team to review and discuss various options for addressing any potential radiological contamination within buildings to be released. This does not include bulk materials or bulk building materials that are to be physically removed as waste or recycled for use at the Mound facility. The Radiological Decision Tools Team purpose is to provide radiological decision tools (recommendations) that the Core Team can use to support protective decisions; and to use in determining unacceptable levels of contamination and define appropriate clean-up criteria with respect to reuse of buildings. Radiological surface and volume contamination decision tools will be addressed in this context.

Each building should be addressed on a case-by-case basis. To determine whether a part or parts of a building or structure may contain residual radioactivity, the Site Characterization Survey Data will be used. In some cases, additional survey data may be needed. Process knowledge and patterns of known contamination will be used to assess the potential for residual radioactivity, including areas inaccessible to surveys [13]. After the Contractor has demonstrated that the Building Reuse Release Criteria have been met, then information will be presented to the Core Team for approval. Radiological data used in the data evaluations will be valid and useable for making environmental protectiveness decisions. The data evaluations will be based on standard statistical methods per NUREG 5849 and/or the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) appropriate to statistically demonstrate that the release criteria have been met.

Surface Release Criteria

Surface release criteria apply to measurements taken on surfaces such as floors, walls, and ceiling and the results expressed in units of dpm/100cm^2 above background. The strategy of addressing residual surface contamination parallels the commercial industry's approach for

leasing/transferring a building that was radiologically contaminated or has the potential to contain residual contamination [4,9,10,11,12,15,16,17,18,19].

DOE Order 5400.5, *Radiation Protection of the Public and the Environment*, offers generic release criteria for building surfaces, equipment, etc. Per the November 1995 DOE position paper [4], DOE Order 5400.5 values are consistent with NRC guidance ("Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source and Special Nuclear Material," July 1992 and "Termination of Operating Licenses for Nuclear Reactors," Regulatory Guide 1.86, July 1974). Table 1 lists these permissible surface concentration guidelines which are adapted from NRC Regulatory Guide 1.86. Tritium at the Mound is an exception. For tritium, 10,000 dpm/100 cm^2 was selected based on the technical information presented in references 2, 8, and 11. However, Stakeholder buy-in for this value is recommended. The values listed in Table 1 represent levels of radioactivity found on building or equipment surfaces, which are expressed in units of dpm/100cm^2. Table 1 values are considered protective of human health based on current NRC, DOE and EPA criteria [4,11,15,17,19]. Therefore, Mound structures that have surface contamination are acceptable for transfer to the public for industrial use if the values in Table 1 are met.

Table 1
SURFACE CONTAMINATION GUIDELINES

Allowable Total Residual Surface Contamination (dpm/100 cm^2)[1]			
Radionuclides[2]	**Average[3,4]**	**Maximum[5,6]**	**Removable[6]**
Group 1 - Transuranics, I-125, I-129, Ra-226, Ac-227, Ra-228, Th-228, Th-230, Pa-231	100	300	20
Group 2 - Th-Natural, Sr-90, I-126, I-131, I-133, Ra-223, Ra-224, U-232, Th-232	1000	3,000	200
Group 3 - U-Natural, U-235, U-238, and associated decay products, alpha emitters	5,000	15,000	1,000
Group 4 - Beta-gamma emitters (radionuclides with decay modes other than alpha emission or spontaneous[7] fission) except for Sr-90 and other noted above.	5,000	15,000	1,000
Tritium	N/A	N/A	10,000

1. As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by counts per minute measured by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

2. Where surface contamination by both alpha- and beta-gamma-emitting radionuclides exits, the limits established for alpha- and beta-gamma-emitting radionuclides should apply independently.

3. Measurements of average contamination should not be averaged over an area of more than $1 m^2$. For objects of smaller surface area, the average should be derived for each object.

4. Dose Rate: The average and maximum dose rates associated with surface contamination resulting from beta-gamma emitters should not exceed 0.2 mrad/hr and 1.0 mrad/hr, respectively, at 1 cm. Since building materials have naturally occurring radioactive material, background should be accounted for.

5. The maximum concentration level applies to an area of not more than 100 cm^2.

6. The amount of removable material per 100 cm^2 of surface area should be determined by wiping the area of that size with dry filter or soft absorbent paper, applying moderate pressure, and measuring the amount of radioactive material on the wiping with an appropriate instrument of known efficiency. When removable contamination on objects of surface area less than 100 cm^2 is determined, the activity per unit area should be based on the actual area and the entire surface should be wiped.

7. This category of radionuclides includes mixed fission products, including Sr-90 which is present in them. It does not apply to Sr-90 which has been separated from the other fission products or mixtures where the Sr-90 has been enriched.

Volumetric Release Criteria

Volumetric release criteria are expressed in concentration units above background such as activity per unit mass or volume and usually apply to bulk materials such as solid and liquid media. The strategy of addressing residual volume contamination in buildings for reuse parallels the commercial industry's approach for leasing/transferring a building with or with the potential to contain residual radioactivity in bulk form [16,17,19]. Bulk materials that are part of a building structure may contain trace amounts of radioactive contamination. Another way to express such a situation is that the radioactivity is residual in bulk form or the material is volume contaminated.

Volume contamination building reuse criteria may be established so that it can be demonstrated that exposure/dose to residual radioactivity in bulk materials is protective of human health from a dose standpoint. If this demonstration is necessary, the Core Team will use these criteria to base its decision on whether or not to release such material (as part of the building structure) from restricted use.

If there is no surface contamination above the surface contamination criteria (Table 1), it is reasonable to assume that there is no significant exposure due to existence of residual volumetric contamination. Exceptions to this rule apply if there are unusual conditions or circumstances such as weathering, coatings, or inaccessible surfaces which have not been surveyed in a building that have the potential to contain residual contamination due to process history. In these cases, core or material samples are needed for adequate evaluation.

For those buildings that have been determined to contain residual bulk contamination, building reuse shall depend on the dose to the public that could occur based on planned use. Dose assessment depends on measurement of contamination present, future use of the material/building and exposure pathways. A dose limit of 15 mrem/yr, excluding NORM in building materials and soil, will be used based on current USEPA guidance [15,16]. Since 15 mrem/yr and its corresponding risk are considered to be protective of human health, then conversion of the dose result to risk is not required. The 15 mrem/yr dose limit is considered the upper bound.

In cases where the Core Team has determined that bulk contamination exists, the following will be accomplished: Radionuclides present will be identified; the average concentration of the contaminated domain will be determined and used in the dose assessment; all complete and applicable exposure pathways will be assessed; and the

amount of variation in data/contamination will be identified. In order to obtain the above information, representative samples of bulk material(s) using standard statistical methods are required as well as appropriate analysis(es) of samples for contaminants expected using standard techniques. In order to ensure the appropriate samples were collected, useable of the data, and acceptable quality of the data are obtained, Data Quality Objectives shall be established before bulk sampling is conducted.

The computer code RESRAD-Build may be used to assess dose for reuse of buildings/structures at the Mound Site [1,19]. Results shall be documented. RESRAD-Build is a detailed modeling of the transport of contaminants inside the building and the exposure pathways to the individual in the building. Use of such a code allows one to take into account the fact that buildings vary from site to site, structural materials may be different, the size and air exchange of the building and rooms may differ, and the contamination may differ in size, thickness, and shape.

Building occupancy will be addressed using two scenarios: 1) office worker use, long term exposure, and release of contaminants via normal use and cleaning of the building/structure and; 2) building renovation which addresses the building renovation worker and short term exposure. For both scenarios, the computed dose shall be compared against the dose limit. The dose limit must not be exceeded in either scenario. The Core Team must agree upon the intended use of the building, the person likely to have the highest risk, the exposure pathways, and input parameter data.

References

1. ANL/EAD/LD-3, RESRAD-Build: A Computer Model for Analyzing the Radiological Doses Resulting from the Remediation and Occupancy of Buildings Contaminated with Radioactive Material, November 1994.

2. DOE, 1991, Recommended Tritium Surface Contamination Release Guides, DOE/EH-0201T, March 1991.

3. DOE 90, DOE 5400.5, Radiation Protection of the Public and the Environment, February 8, 1990.

4. DOE 95, "Application of DOE 5400.5 requirements for release and control of property containing residual radioactive material," R. Pelletier (EH-41) to distribution, November 17, 1995.

5. DOE 96, Development of an Unconditional Release Process for Mound for Building Expected to be Radiologically Contaminated, April 1996.

6. DOE 97a, " Establishment and Coordination of Authorized Limits for Release of Hazardous Waste Containing Residual Radioactive Material," M. Frei (EM-30) to distribution, January 7, 1997.

7. DOE 97b, "Radiological Control Technical Position (RCTP 97-E-01)."

8. Mound Tritium Committee, Appendix A, Health-Based Risk Assessment for Unconditional Release of Items Contaminated with Tritium.

9. MARSSIM/NUREG- 1575, Multiagency Radiation Survey and Site Investigation Manual, Dec 1977.

10. NUREG/CR- 5849, Manual for Conducting Radiological Surveys of License Termination,

11. NUREG-1500, Working Draft Regulatory Guide on Release Criteria for Decommissioning

12. NUREG-1505, A Nonparametric Statistical Methodology for the Design and Analysis of Final Status Decommissioning Surveys.

13. Ohio Federal Facilities Issues and Challenges Forum 97, Generic Process for the Disposition of Buildings That Have Potential or Actual Radiological Contamination, developed by the Cleanup Standard Committee, January 7, 1997.

14. US EPA 1994, Memorandum from William E. Muno to Waste Management Division Staff, "Recommended Soil Cleanup Criteria for Region 5 Sites Contaminated With Uranium, Thorium, and Radium, May 13, 1994.

15. US EPA 1997, OSWER No., 9200.4-18, Memorandum from Stephen D. Luftig and Larry Weinstock to addresses, "Establishment of Cleanup Levels for CERCLA Sites with Radioactive Contamination," August 22, 1997.

16. US NRC, 39058 Federal Register, Vol. 62, No. 139, July 21, 1997, Rules and Regulations, Radiological Criteria for License Termination, Final License Termination Rule, 10 CFR 20.

17. US NRC, Reg Guide 1.86, Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Operating Licenses for Nuclear Reactors, 1974.

18. US NRC, NUREG/CR-5512, "Residual Radioactive Contamination from Decommissioning, Oct 1992.

19. US NRC, SECY-94, Policy Issue, "Increase of Tritium and Iron-55 Unrestricted Use Limits for Surface Contamination at Shoreham and Fort St. Vrain," May 27, 1994.

APPENDIX B

Chemical Tools Team Report

BUILDING DISPOSITION TOOLS - CHEMICAL

Revision 8, Final, March 1998

Group Members: Kevin Donovan, DOE MEMP; (Doug Draper, BWO); Tim Fischer, USEPA; Kathy Lee Fox, Ohio EPA.

Introduction

As part of the Mound Building Disposition Process meetings for building Decontamination and Decommissioning (D&D) binning, release, and property transfer of the Mound Plant, the D&D Core Team commissioned a chemical decision tools team to review and discuss various options for addressing any potential chemical contamination within buildings. Subsequently, these options are to be used to determine "clean-up" levels for chemical contamination present in a building which will be released to the Miamisburg Mound Community Improvement Corporation (MMCIC). The D&D process, which is part of the Mound 2000 initiative as presented in the FFA work plan, requires the Mound Plant be remediated to the extent that it meets a level of protection based upon an industrial scenario under CERCLA. The strategy of approaching potential chemical contamination should parallel the private sector's approach for leasing/transferring a potentially chemical contaminated building. There is a DOE policy of performing D&D work under CERCLA entitled "Policy on Decommissioning Department of Energy Facility Under CERCLA," Memorandum of Understanding between USDOE and USEPA, May 22, 1995. Mound 2000 is an integrated approach (DOE, USEPA, Ohio EPA) to make decisions about remediation regarding the environmental cleanup and release of Mound property to the MMCIC for private industrial use.

Approaches

I. Each building should be addressed on a case-by-case basis, in which the Core Team will take an individual building response approach based on the status or history of the building pertaining to possible chemical contamination, the exact process and chemicals involved, the location of the chemicals, and the toxicity of particular chemicals. Any reports of chemical spills are considered.

II. The strategy of approaching potential chemical contamination should parallel the private sector's approach for leasing/transferring a potentially chemical contaminated building. This strategy takes into account the American Society for Testing and Materials (ASTM) Standards on Environmental Site Assessments for Commercial Real Estate: *E 1527-94 Standard Practice for Environmental Site*

Assessments: Phase I Environmental Site Assessment Process and *E 1528-93 Standard Practice for Environmental Site Assessments: Transaction Screen Process*. These publications are available from ASTM, 1916 Race Street, Philadelphia, PA 19103.

III. The Core Team may also consider the USEPA's *Guide for Decontaminating Buildings, Structures, and Equipment at Superfund Sites*.

IV. Any remaining level of residual contamination in soils under and within fifteen (15) feet of a building and/or ancillary structures will meet criteria consistent with the *Mound 2000 Residual Risk Evaluation Methodology*, Revision 4, March 1997.

V. The standards, regulatory guidelines, health and safety information, scientific studies, and private sector procedures used to make decisions will be referred to as "tools." These tools will be applied based upon the individual response approach. The tools selected are based on the particular situation and characteristics of the chemical in-question. If guidelines or standards exist which can be applied to a building's situation, the Core Team will utilize these guidelines or standards as the tool to address the contamination, e.g., lubricating oil in an underground tank under a foundation will require application of Ohio's underground storage tank regulations, i.e., Ohio Administrative Code (OAC) 1301:7-9-01 through -15.

VI. The information required by the Core Team to evaluate and provide concurrence on building protectiveness will be compiled in a Building Data Package. The package will include a description of the property, a history of the property, and environmental data. Several tools exist for evaluating building conditions. Examples of some tools are:

(1) NESHAPS (National Emission Standards for Hazardous Air Pollutants), Code of Federal Regulations 40 CFR 61

(2) RCRA (Resource Conservation and Recovery Act) 40 CFR 260 through 270 and Ohio Administrative Code (OAC) 3745-50 through -69.

(3) CRO (Cessation of Regulated Operations), ORC 3752 and OAC 3745-352-01 through -30

(4) Construction and Demolition Debris Regulations and Law, ORC 3714, OAC 3745-37, and OAC 3745-400

(5) Solid Waste Disposal Regulations, OAC 3745-27 to 30 and 3745-27-37

(6) ORC 6111, Ohio's Water Pollution Control law

(7) 40 CFR Part 300, National Oil and Hazardous Substances Pollution Contingency Plan (NCP), the Superfund Amendments and Reauthorization Act of 1986 (SARA), and the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA)

(8) Underground Storage Tank Regulations, OAC 1301:7-7-28, OAC 1301:7-9-01 through -15

(9) Agency for Toxic Substances and Disease Registry (ATSDR)

(10) E 1527-94 Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process and E 1528-93 Standard Practice for Environmental Assessments: Transaction Screen Process, ASTM.

VII. Mound Industrial Safety and Hygiene has maintained an inventory of chemicals used at the Mound. This chemical inventory forms the basis for the preliminary evaluation of buildings. This chemical inventory provides information such as the chemical name, manufacturer, location used, and annual usage amounts. This inventory is compiled annually since the later 1980's. In affiliation with the chemical inventory, Mound Industrial Safety and Hygiene have maintained an inventory of Material Safety Data Sheets (MSDS) for these chemicals.

There were discussions early in the development of the process as to whether OSHA Permissible Exposure Levels (PEL), American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLV), and NIOSH Recommended Exposure Levels (REL) could be used as potential clean-up criteria by the Core Team. These standards were developed to evaluate airborne exposure potentials **in operating** processes for worker protection and represent conditions under which it is believed that nearly all workers may be

repeatedly exposed day after day. The D&D Core Team evaluation, in contrast, is a one time assessment of conditions, usually after all operations have ceased and all chemicals have been removed from the building. In instances where a process and associated chemicals may be left in place for some future potential buyer, its condition and integrity would be verified by the Core Team through observations on the routine walk through of the building and a history and records review prior to building release.

The Core Team, therefore, decided the OSHA, ACGIH, and NIOSH occupational exposure limit values were inappropriate for use in determining release guidelines for excessed buildings as they were not developed for application to situations where CERCLA risk scenarios are evaluated for the general public or the environment.

The ATSDR at the Centers for Disease Control (CDC) has available the most current health information on chemicals. The Core Team has the option of contacting staff at the ATSDR via telephone and Internet. The ATSDR web sites for information include "hazdat" and "toxfacts," available at http://atsdr1.atsdr.cdc.gov.8080. "Hazdat" is organized by ATSDR staff who can be contacted at (404) 639-5289 (Dr. Mike Fay), and is the most likely database of use to the Core Team. Direct discussion of information is available by calling staff at (404) 639-5281 (Dr. Moiz Mumtaz).

A draft document entitled "Wipe Sample Assessment," which describes a quantitative risk assessment approach for chemically contaminated buildings, was obtained from USEPA Region 3. The methodology was evaluated by the Core Team. There are several reasons why the Core Team believes it is not appropriate to apply quantitative risk assessment methods to evaluating building chemical contamination. The evaluation is included here as an attachment.

ATTACHMENT

From: TIMOTHY FISCHER ("FISCHER.TIMOTHY@EPAMAIL.EPA.GOV")
To: prbonin@aol.com.
Date: Wednesday, February 5, 1997 9:21pm
Subject: Wipe Sample Assessment Methodology from Region 3 (SMTP Id#: 221)

To the Chemical Group and others:

As part of our discussions for evaluating buildings at Mound for free release, we reviewed a document entitled "Wipe Sample Assessment" which Ohio EPA obtained from USEPA Region 3. The document attempts to evaluate risks to exposed workers from contamination on building surfaces. After reviewing the document myself and then discussing it with Mark Johnson, a risk assessor in our Federal Facilities Section in Region 5, we have determined that the methodology would not be an effective tool for determining the appropriateness of building transfer at Mound.

The document discusses the fact that there are many uncertainties associated with estimating human risk from building surface wipe samples. It states that, for this reason, the assessment in the document is not performed "in the usual manner: that is, with data assessment, exposure assessment, toxicity assessment, risk characterization, and uncertainty analysis, in that order." The document states that the most effective methods for estimating the risk to a person would be to rely on exposure parameters like frequency of skin contact with a building surface and the fraction of the chemical concentration transferred from surface to skin. It then states that there exists no reliable information on estimating either of these parameters. The document never does settle on a methodology that is acceptable to a wide audience of risk assessors.

Mark Johnson said that he does not think that the methodology has gained general acceptance among USEPA risk assessors. He stated there are too many uncertainties and risk assessment is not really appropriate for this situation. Risk assessment was developed to evaluate risks over a long period of time. This methodology is more attempting to address situations where short term exposures would take place, such as spills or fires. It does not seem reasonable to assume that someone is going to be making contact with floors and walls very often over many years, and then to be rubbing exposed skin against them enough to result in a significant exposure to any

chemical.

Finally, the relevance of any quantitative sampling and risk assessment for chemicals in buildings would be questionable. In most cases, there are very few options for addressing building contamination from chemicals. If chemical contamination exists on some building surface, it will be scrubbed until no more contamination can be removed. If a stain is found on a building floor, it may be scrubbed or the stained area removed. Process tanks which hold chemicals will be emptied, removed, or grouted in place. There are very few instances where quantitative sampling data would be useful in building situations. Quantitative results will not change the likely response action (scrubbing, removal, etc.) or the levels which the response action can achieve (you can only clean it so much or remove it entirely). In addition, in many cases (e.g., asbestos), no standard exists to compare sample results to anyway.

For these reasons, we recommend against using the "Wipe Sample Assessment" document for estimating building risks at Mound. If you have any questions, please call me at (312) 886-5787.

Tim Fischer
Mound Remedial Project Manager

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Contains Proprietary Information