Formerly Utilized Sites Remedial
Action Program (FUSRAP)

Maywood Chemical Company Superfund Site

ADMINISTRATIVE RECORD

Document Number

MISS- 073.

US Army Corps
of Engineers®

Department of Energy

Oak Ridge Operations
P.O. Box 2001
Oak Ridge, Tennessee 37831—

MAY 12 1994

Ms. Liz O'Donoghue
Office of U.S. Senator Lautenberg
SH-506 Hart Senate Office Building
Washington,DC 20510

Dear Ms. O'Donoghue:

MAYWOOD SITE - PUBLIC RELEASE OF THE EE/CA TO REMEDIATE THE STORAGE PILE

The purpose of this letter is to inform you that the engineering evaluation/cost analysis (EE/CA) for remediation of the storage pile has been released for a 30-day public comment period. A copy of this report has been enclosed for your information. The public comment period is scheduled to end on June 13. A summary the comments received and their responses will be attached to the final EE/CA and placed in the administrative record file for the site.

Please feel free to contact me at (615) 576-5724, if you have any questions or comments.

Sincerely,

Susan M. Cange

Susan M. Cange, Site Manager
Former Sites Restoration Division

Enclosure

EE/CA LETTER AND REPORT RECIPIENTS

EPA

Jeff Gratz

NJDEPE

Nicholas Marton

DOE-HQ

Al Johnson

Bradley

1) Mr. Eugene Peters (1 copy)
Office of U.S. Senator Bradley
SH-731 Hart Senate Office Bldg.
Washington, DC 20510-3001

2) The Honorable Bill Bradley (1 copy)
District Office of U. S. Senator Bradley
P.O. Box 1720
609 Vauxhall Road
Union, NJ 07083

Lautenberg

3) Ms. Liz O'Donoghue (1 copy)
Office of Senator Lautenberg
SH-506 Hart Senate Office Building
Washington, DC 20510

4) Ms. Lisa Pleavin
District Office of U.S. Senator Lautenberg (1 copy)
Gateway One
Gateway Center
Newark, NJ 07102

Torricelli

5) Mr. Herb Nelson (1 copy)
Office of U.S. Representative Torricelli
2159 Rayburn House Office Bldg.
Washington, DC 20515

6) Mr. Phillip Goldberg (1 copy)
District Office of U.S. Representative Torricelli

Court Plaza North
25 Main Street
Hackensack, NJ 07601

Roukema

7) Mr. Bruce Butler (1 copy)
Office of U.S. Representative Roukema
2244 Rayburn House Office Bldg.
Washington, DC 20515-3005

8) Mr. Frank Covelli (1 copy)
District Office of U.S. Representative Roukema
1200 East Ridgewood Avenue
Ridgewood, NJ 07450

Mayors

The Honorable John A. Steuert, Jr. (2 copies)
Borough of Maywood
459 Maywood Avenue
Maywood, NJ 07607

The Honorable Richard LoCascio (2 copies)
Rochelle Park Township
405 Rochelle Avenue
Rochelle Park, NJ 07662

The Honorable Philip Toronto (2 copies)
Lodi Borough Hall
One Memorial Drive
Lodi, NJ 07644

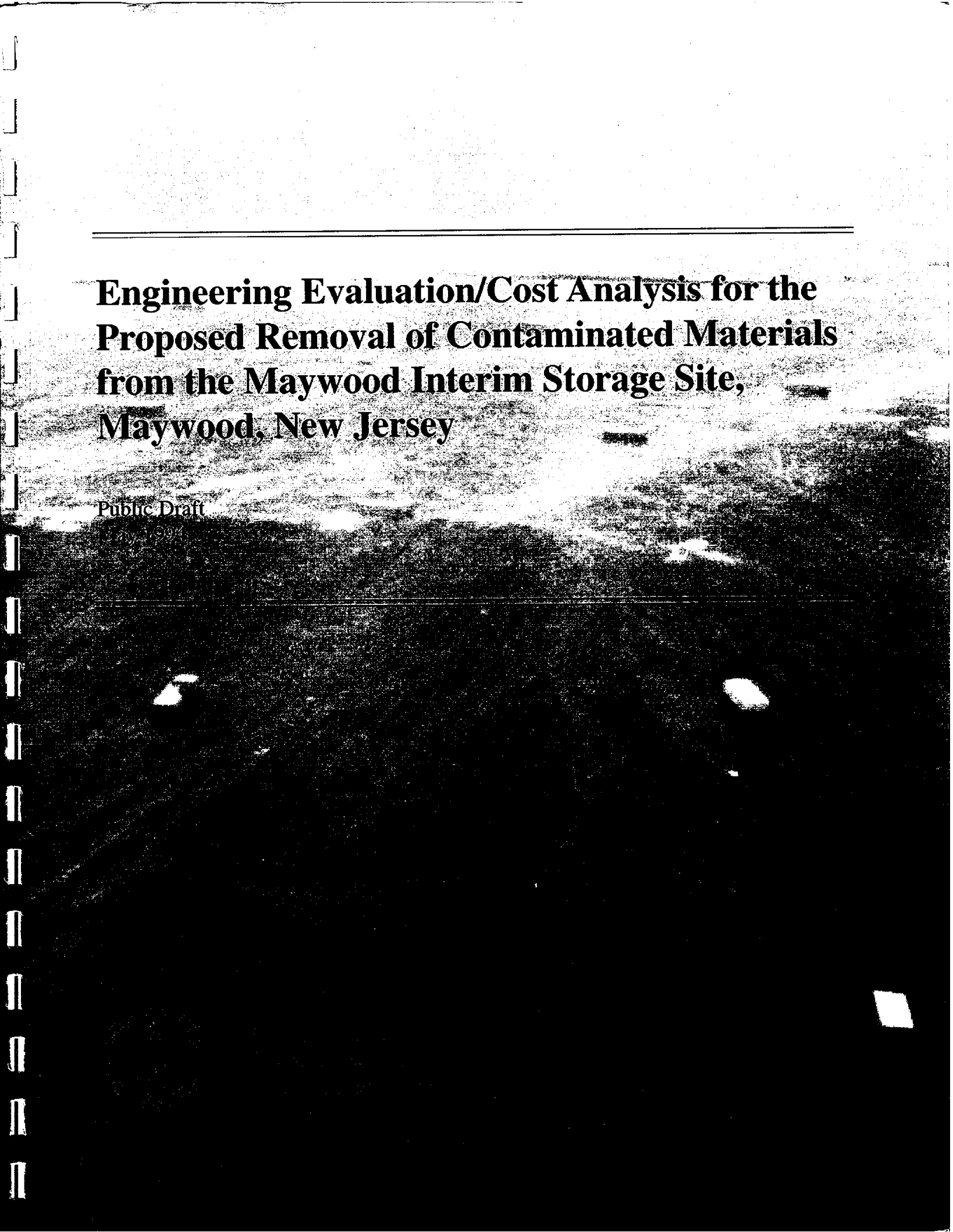
Other

Mr. Adam Strobel (4 copies)
Assistant to County Executive
Bergen County Administration Building
21 Main Street
Hackensack, NJ 07601

Engineering Evaluation/Cost Analysis for the Proposed Removal of Contaminated Materials from the Maywood Interim Storage Site, Maywood, New Jersey

Public Draft

May 1994



Engineering Evaluation/Cost Analysis for the Proposed Removal of Contaminated Materials from the Maywood Interim Storage Site, Maywood, New Jersey

Public Draft
May 1994

Prepared by

U.S. Department of Energy
Former Sites Restoration Division
Oak Ridge, Tennessee

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FOREWORD

This engineering evaluation/cost analysis (EE/CA) has been prepared in support of a proposed action to remove radioactively contaminated soils and debris from the Maywood Interim Storage Site (MISS) waste pile in Maywood, New Jersey. The MISS site and associated properties, collectively designated as the Maywood site, became contaminated as a result of thorium processing operations by the former Maywood Chemical Works. The waste storage pile at MISS contains approximately 35,000 yd^3 of contaminated materials removed from 25 vicinity properties between 1984 and 1986. The U.S. Department of Energy (DOE) is responsible for cleanup activities at the Maywood site under its Formerly Utilized Sites Remedial Action Program (FUSRAP), as defined in the Federal Facilities Agreement (FFA) between DOE and the U.S. Environmental Protection Agency (EPA) for the site.

Remedial actions at the Maywood site are being conducted in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA). In addition, DOE has chosen to integrate the values of the National Environmental Policy Act (NEPA), which assure that the socio-economic and potential cumulative impacts of a proposed action are considered as part of the decision-making process for that action. DOE is currently conducting a comprehensive remedial investigation/feasibility study-environmental impact statement (RI/FS-EIS) for remedial action at the Maywood site. The proposed early removal action evaluated in this EE/CA is consistent with the overall cleanup strategy for the site, and will not limit the choice of reasonable alternatives or prejudice the ultimate decision for which the RI/FS-EIS is being prepared. The removal of the waste storage pile will facilitate proposed future waste processing activities at the MISS property during final remediation of the Maywood site and ensure protection of human health and the environment.

ACRONYMS AND ABBREVIATIONS

AEA	Atomic Energy Act of 1954, as amended
AEC	U. S. Atomic Energy Commission
ALARA	as low as reasonably achievable
ANL	Argonne National Laboratory
ARAR	applicable or relevant and appropriate requirement
BNAE	base/neutral and acid extractable compounds
BNI	Bechtel National, Inc.
BRA	baseline risk assessment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended
CFR	Code of Federal Regulations
DCG	Derived Concentration Guide
DOE	U. S. Department of Energy
DOT	U. S. Department of Transportation
EE/CA	engineering evaluation/cost analysis
EIS	environmental impact statement
EPA	U. S. Environmental Protection Agency
FFA	Federal Facilities Agreement
FR	Federal Register
FS	feasibility study
FUSRAP	Formerly Utilized Sites Remedial Action Program
FY	fiscal year
MCL	maximum contaminant level
MCLG	maximum contaminant level goal
MCW	Maywood Chemical Works
MISS	Maywood Interim Storage Site
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NEPA	National Environmental Policy Act of 1969
NJDEPE	New Jersey Department of Environmental Protection and Energy
NPL	National Priorities List
NRC	U. S. Nuclear Regulatory Commission
ORNL	Oak Ridge National Laboratory
OSHA	Occupational Safety and Health Administration
OU	operable unit
PAH	polyaromatic hydrocarbon
PP	proposed plan
RCRA	Resource Conservation and Recovery Act, as amended
RESRAD	residual radioactivity computer code
RI	remedial investigation
RI/FS-EIS	remedial investigation/feasibility study-environmental impact statement
ROD	record of decision
SAIC	Science Applications International Corporation

SARA	Superfund Amendments and Reauthorization Act
TBC	to-be-considered (guidelines)
TC	toxicity characteristic
TCLP	toxicity characteristic leaching procedure
TPH	total petroleum hydrocarbons
VOC	volatile organic compound
WL	working level
11e(2)	Section 11e(2) of the Atomic Energy Act, defining byproduct material

UNITS OF MEASURE

ft	foot (feet)
ft^2	square foot (feet)
ft^3	cubic foot (feet)
g	gram(s)
hr	hour(s)
kg	kilogram(s)
μg	microgram(s)
m^2	square meter(s)
m^3	cubic meter(s)
mg	milligram(s)
mi	mile(s)
mR	milli-roentgen(s)
mrem	millirem(s)
pCi	picoCuries
yd^3	cubic yard(s)
mR	milli-roentgen(s)
μR	micro-roentgen(s)

1. SITE CHARACTERIZATION

1.1 SITE DESCRIPTION

The Maywood site consists of properties in the Boroughs of Maywood and Lodi and the Township of Rochelle Park, New Jersey, that were contaminated by operations for processing thorium, a radioactive element, at the Maywood Chemical Works (MCW). These operations occurred from the early 1900's through 1959. The three municipalities are located in a densely populated area of Bergen County in northeastern New Jersey, approximately 12 miles north-northwest of New York City and 13 miles northeast of Newark, New Jersey (Figure 1-1). The site is listed on the National Priorities List (NPL) as the Maywood Chemical Company.

Properties within the Maywood site include the Maywood Interim Storage Site (MISS) and other vicinity properties. These other properties include the Stepan Company property (formerly Maywood Chemical Works) and numerous residential, commercial, Federal, state, and municipal properties in Maywood, Rochelle Park, and Lodi, New Jersey (Figure 1-2). These properties are contaminated with the thorium-232, radium-226, and uranium-238 radioactive decay series as a result of thorium processing at MCW. Chemical contaminants are also known to be present on some of the properties.

The U.S. Department of Energy (DOE) was assigned responsibility for the Maywood site by Congress in 1984. DOE is conducting a study of possible cleanup actions for the site, called a remedial investigation/feasibility study-environmental impact statement (RI/FS-EIS), under the Formerly Utilized Sites Remedial Action Program (FUSRAP). FUSRAP was established in 1974 to identify and decontaminate or otherwise control sites where residual radioactive materials remain from the early years of the nation's atomic energy program and from commercial operations causing conditions that Congress has authorized DOE to remedy.

Congress assigned DOE the responsibility for cleaning up contamination at the site that resulted from thorium processing operations by the former Maywood Chemical Works. The U.S. Environmental Protection Agency (EPA) oversees the Maywood site cleanup. Each agency's responsibilities are described in a Federal Facilities Agreement (FFA) negotiated by DOE and EPA Region II. DOE is responsible primarily for addressing radioactive contamination and the contaminants that meet the definition of FUSRAP waste as described in the FFA. A separate RI/FS is being conducted by the Stepan Company, owner of the former MCW property, focusing on chemical contamination at the site. Although the DOE and Stepan Company RI/FS activities are being conducted independently, EPA has oversight over both actions; in consultation with DOE and the Stepan Company, EPA will ensure that sufficient coordination occurs between the parties to fully address the problems of the Maywood site.

To help in developing and evaluating remedial action alternatives, the Maywood site has been divided into five operable units (OUs) based on land use and the type of contaminated media (e.g., contaminated soils, contaminated buildings) of concern. The location of the properties making up these OUs is shown in Figure 1-2.

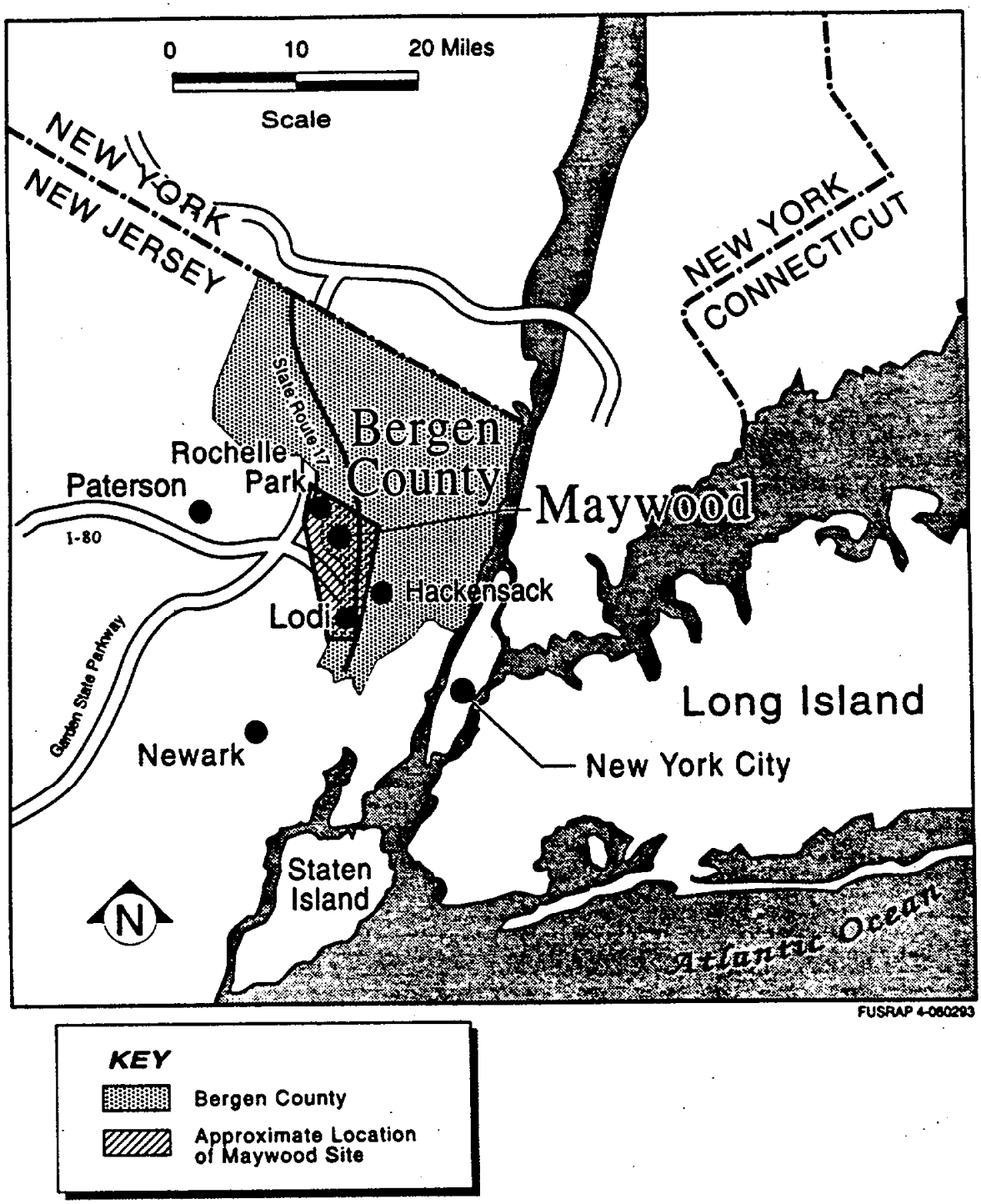

Figure 1-1. Location of the Maywood Site.

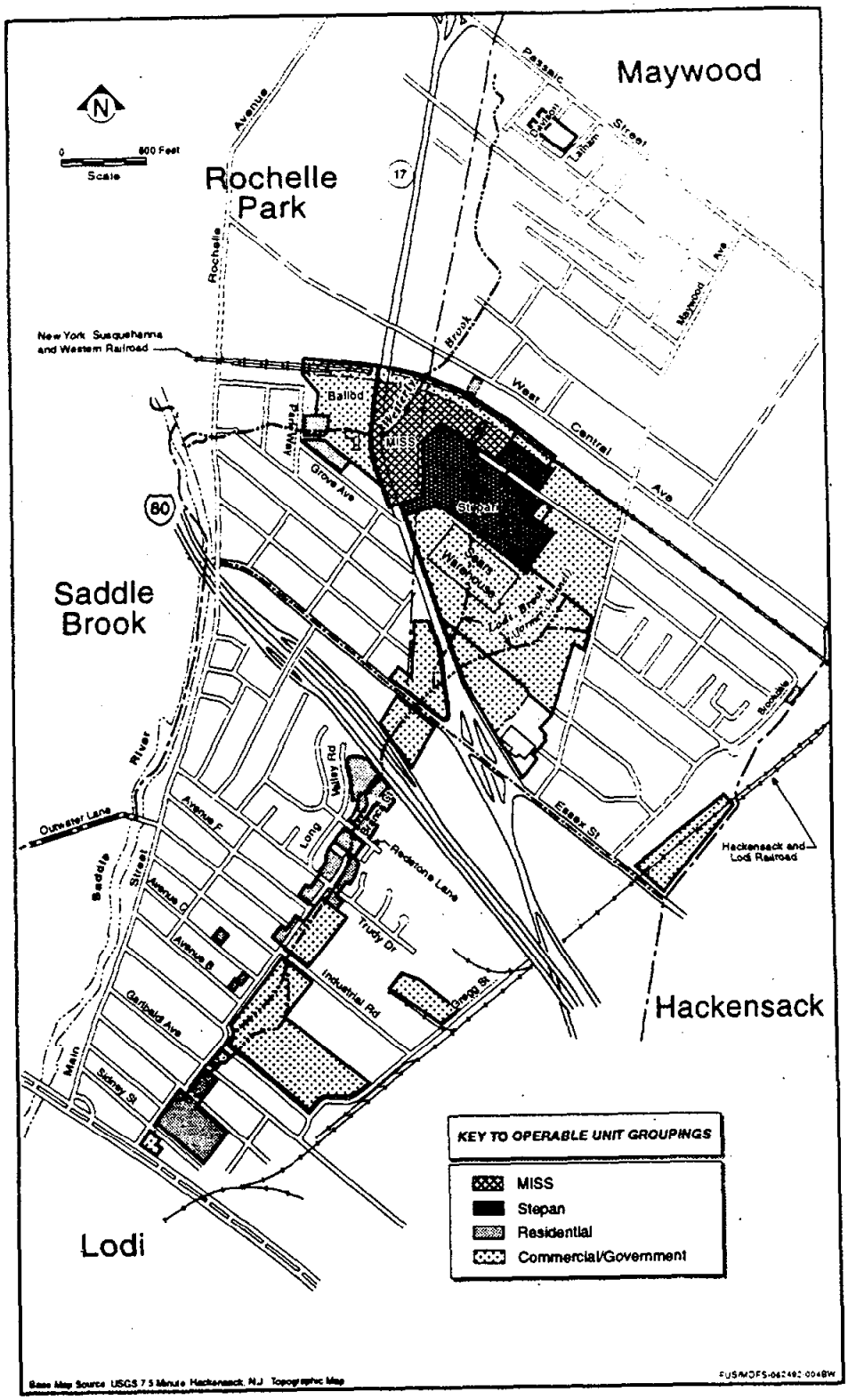

Figure 1-2. Map of the Maywood Site Operable Units.

The Maywood Interim Storage Site is an 11.7-acre property owned by DOE and located in the Borough of Maywood and the Township of Rochelle Park. The MISS property was previously part of a 30-acre property owned by the Stepan Company, and it was formerly part of the Maywood Chemical Works. DOE acquired the property from the Stepan Company in 1985. The property contains a waste storage pile, two buildings (Building 76 and a pumphouse), two partially buried structures, temporary office trailers, a reservoir, and two rail spurs. It is bordered on the west by State Route 17, on the north by a New York, Susquehanna, and Western Railroad line, and on the south and east by commercial and industrial properties. Residential properties are located north of the railroad line and within 300 yards to the north of the MISS property boundary. The waste storage pile at MISS occupies approximately 2 acres and contains about 35,000 yd^3 of contaminated soils and materials from previous cleanup actions conducted on vicinity properties at the Maywood site. A building at MISS (Building 76) also houses waste from previous cleanup actions and site investigations. Former waste retention ponds also are located at MISS. The property is enclosed by a chain-link fence and access is restricted within the fenced area. Figure 1-3 indicates principal features of the MISS property.

The Stepan Company, a pharmaceutical manufacturer, is located at 100 West Hunter Avenue in the Borough of Maywood, adjacent to MISS. The property covers 18.2 acres, approximately two-thirds of which contains buildings; some of these buildings are located in or near areas where the MCW thorium-processing operations occurred. Burial pits containing thorium-processing and other wastes are located on the site (see Figure 1-3). The property (excluding the main office and parking area) is enclosed by a chain-link fence and access is restricted within the fenced area.

Residential vicinity properties in the Boroughs of Maywood and Lodi and the Township of Rochelle Park contain radioactive contamination from thorium-processing operations. These properties were identified by DOE through surveys performed by Oak Ridge National Laboratory (ORNL). Nine residential properties in Rochelle Park on Grove Avenue and Park Way and eight residential properties in Maywood on Davison Avenue and Latham Street were completely decontaminated by DOE between 1984 and 1986. This decontamination was verified by ORNL and the properties were approved for use without radiological restriction. Eight residential properties in Lodi have also been decontaminated and have been independently verified as clean. One additional property in Lodi was partially remediated during previous removal actions. Of the remaining 32 contaminated residential properties to be dealt with by DOE, 30 are located in the Borough of Lodi and two are located in Maywood.

Commercial/government vicinity properties include 27 properties located in Maywood, Rochelle Park, and Lodi. Twenty commercial vicinity properties are part of the Maywood site. State and federally owned properties include areas in the right-of-way for Interstate 80, a State Route 17 embankment, and the New Jersey Vehicle Inspection Station. Four contaminated municipal properties in Lodi (three parks and a fire station), residential streets suspected to have contaminated soils below the surface, and contaminated sediments from Lodi Brook are also included in this OU. The majority of these properties were contaminated through the same processes as the residential properties — by movement of contaminated sediments along former

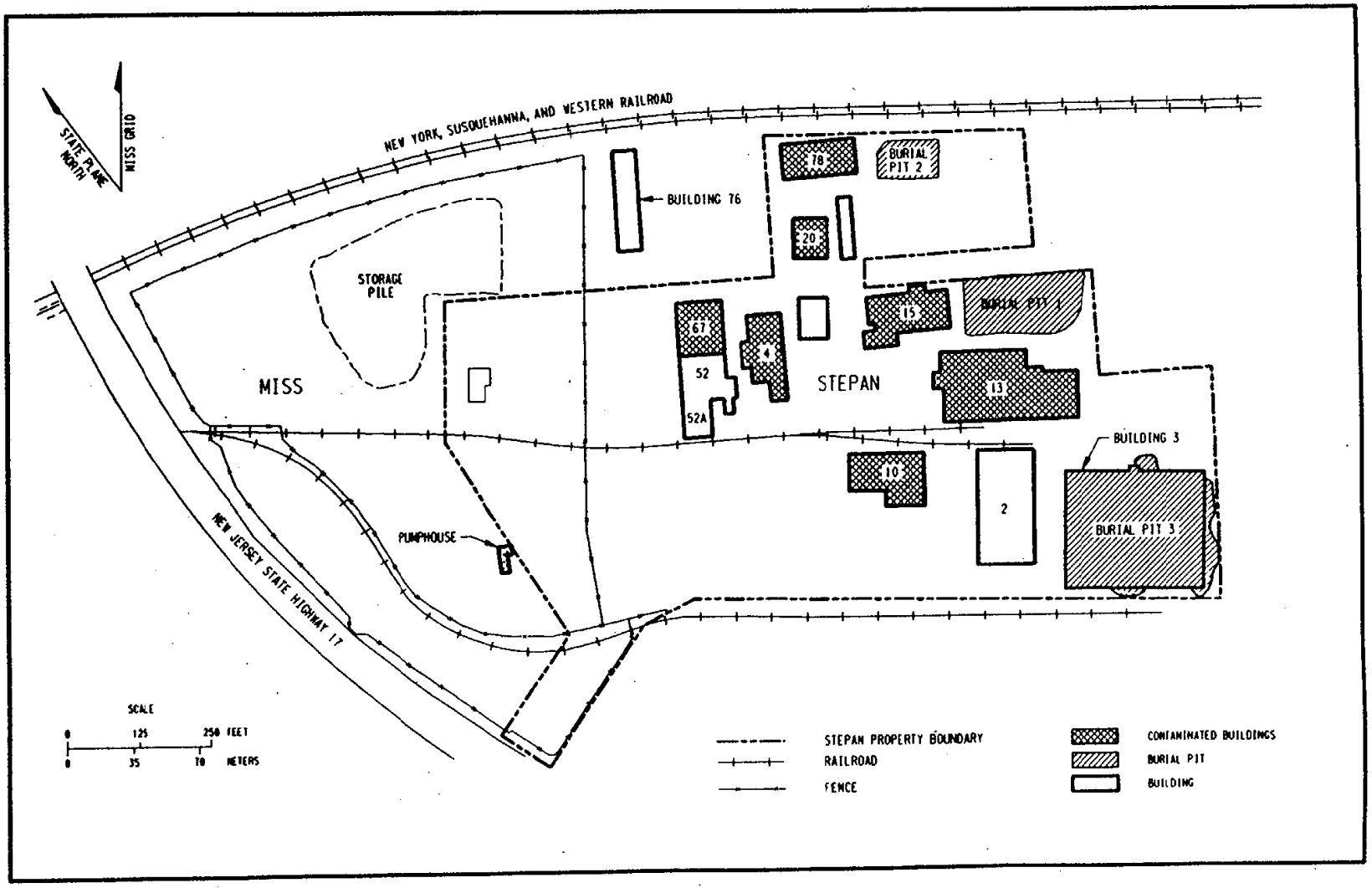

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Figure 1-3
Site Map of the Maywood Interim Storage Site and Adjacent Stepan Company Property

stream channels or use of contaminated material as fill and mulch. Three of these properties (Ballod, Sears and State Route 17) were once part of the former MCW property and were used, at least in part, for waste disposal. A portion of one property (Ballod) was remediated during a previous removal action.

Contaminated buildings and structures are located on the MISS and Stepan properties only. Radiologically contaminated buildings include the pumphouse at MISS and Buildings 4, 10, 13, 15, 20, 67, 78, and the guardhouse on the Stepan property (see Figure 1-3). The radiological contamination is generally localized in discrete areas within buildings; the contamination is fixed in place on building floors and surfaces and not easily removed by casual contact. The pumphouse at MISS is no longer in use; however, the contaminated buildings at Stepan are part of an active industrial complex. The contaminated buildings are all old buildings that existed during the time that MCW was processing thorium. No buildings on vicinity properties were found to be contaminated, other than one residence in Lodi that contained contaminated building materials from MCW. The contaminated portion of this building has been removed and reconstructed.

This engineering evaluation/cost analysis (EE/CA) has been prepared according to the requirements of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA). The primary purpose is to evaluate a proposed early removal action for the waste storage pile at MISS. This response action would deal with contaminated soils and debris generated during previous response actions at 25 vicinity properties at the Maywood site and placed in interim storage at MISS.

No significant near-term health threats are believed to be posed by the waste storage pile. However, DOE has determined that this early removal action (taking care of the waste pile before the remediation of the entire Maywood site) would facilitate future remedial activities at the site. It also would ensure the protection of human health and the environment. The proposed removal action is consistent with the remedial action strategy currently being planned for the Maywood site through the ongoing RI/FS-EIS process, and will not bias future actions at the site.

The RI/FS-EIS process will be completed before comprehensive remedial actions for the site will begin (ANL/BNI 1992). It is DOE's policy (DOE Order 5400.4, 1989) to integrate the values of the National Environmental Policy Act (NEPA) with the procedural and documentation requirements of CERCLA at sites for which it has responsibility. The RI/FS-EIS process will conclude with the publication of a document, called a record of decision (ROD), that will identify the selected remedy for the Maywood site.

Various removal actions have been or will be performed at the Maywood site before completion of the RI/FS-EIS process, in order to control actual or potential releases of contaminants into the environment. Removal actions completed previously are discussed in

Section 1.2. Management of the contaminated materials in the waste storage pile discussed in this EE/CA also would be conducted as a removal action.

1.2 SITE BACKGROUND

The Maywood Chemical Works was constructed in 1895. In 1916, the plant began extracting thorium and rare earths from monazite sands for use in manufacturing industrial products such as mantles for gas lanterns. The plant also produced a variety of other materials, including lithium compounds, detergents, alkaloids, and oils. The plant stopped accepting monazite sands for extraction of thorium in 1956, but it processed stockpiled materials until 1959. Based on available historical information and knowledge of the chemical processes involved, the chemicals identified as having been used in the thorium extraction process include sulfuric acid, nitric acid, ammonium hydroxide, and ammonium oxalate. Oxalic acid was also used at the site in the production of higher-grade thorium.

In the extraction process, waste in a slurry form was produced. Until 1932, the slurry was pumped to two earthen-diked areas west of the plant. At that time, the disposal areas were affected by the construction of State Route 17, which separated the diked areas from the plant and partially buried them. Waste retention ponds also were located throughout the area of MCW that is now MISS.

Some of the process wastes were removed and used as mulch and fill on nearby properties, thereby contaminating those properties with radioactive materials. Although the fill consisted primarily of tea and coca leaves from other MCW processes, these materials were apparently contaminated with the thorium-processing wastes. Other wastes moved off-site from the property through natural drainage of the former Lodi Brook. Most of the open stream channel in Lodi has been replaced by an enclosed storm drain system.

MCW received a radioactive materials license from the AEC in 1954. The property was sold to the Stepan Company in 1959, which received a license from the AEC in 1961. Although the Stepan Company never processed radioactive materials, the company agreed to carry out certain remedial measures in the former disposal area on the west side of State Route 17 (now known as the Ballod property). Stepan began to clean up the thorium processing wastes in 1963. From 1966 through 1968, Stepan removed residues and tailings from the Ballod property and reburied them on the Stepan property in three burial pits. After these actions were completed, AEC certified that the portion of the property west of State Route 17 could be used without radiological restrictions.

Radioactive contamination, however, was discovered in the northeast corner of the property in 1980. The discovery was made after a private citizen reported radioactive contamination near State Route 17 to the New Jersey Department of Environmental Protection and Energy (NJDEPE). A survey of the area (State Route 17, Ballod property, and Stepan property) conducted by NJDEPE identified the contaminants as thorium-232 and radium-226. The U.S. Nuclear Regulatory Commission (NRC) was notified of the results and conducted

additional surveys from November 1980 to January 1981. These surveys confirmed that there were high concentrations of thorium-232 in soil samples collected from both the Stepan and Ballod properties. NRC, therefore, requested a thorough survey of the area.

In January 1981, the EG&G Energy Measurements Group conducted an aerial radiological survey of the Stepan property and surrounding properties. The survey, which covered a 3.9-mi^2 area, indicated contamination not only on the Stepan and Ballod properties but also in areas to the north and south of the Ballod property. During February 1981, Oak Ridge National Laboratory (ORNL) performed a separate radiological ground survey of the Ballod property. Those results eventually led to designation of the property for remedial action under FUSRAP. In June 1981, another radiological survey of the Stepan and Ballod properties commissioned by the Stepan Company produced similar findings.

Through a provision of the Energy and Water Development Appropriations Act of 1984, Congress authorized DOE to conduct a decontamination research and development project at the Maywood site. The site was assigned to FUSRAP, and DOE negotiated access to a 11.7-acre portion of the Stepan property for use as an interim storage facility for contaminated materials that were to be removed from vicinity properties. This area is now known as MISS. In September 1985, ownership of MISS was transferred to DOE.

In late 1983, DOE began a program of surveys of properties in the vicinity of the former MCW plant. From 1984 to 1986, DOE completed removal actions at 25 residential properties, and partially remediated one additional residential property and one commercial property. The waste from these removal actions was placed in storage at MISS.

In July 1991, DOE conducted a time-critical removal action to decontaminate a residential property at 90 Avenue C in Lodi. This action was taken in response to radiological surveys which identified gamma exposure rates above DOE guidelines inside a portion of the building. The original owner of the residence was an employee of MCW, who apparently used discarded building and fill materials from MCW in the construction of an addition to the house. Contaminated soil and building materials generated during this removal action were packaged in appropriate containers and placed in Building 76 at MISS for storage.

The Maywood site was placed on the National Priorities List (NPL) by EPA on September 8, 1983. All remedial actions at the site conducted by DOE are being coordinated with EPA Region II under CERCLA. In addition, it is DOE policy to integrate the requirements of CERCLA with the values of NEPA for remedial action at sites for which it has responsibility. The RI/FS conducted under CERCLA is the primary process for ensuring that DOE remedial actions for the site meet environmental regulations. Under the integrated CERCLA/NEPA policy, the CERCLA process is supplemented, as appropriate, to include NEPA values.

The limits of DOE's responsibilities for the Maywood site are defined under a negotiated Federal Facilities Agreement between DOE and EPA Region II which became effective April 22, 1991. DOE is responsible for FUSRAP waste, which is specifically defined as:

- all contamination, both radiological and chemical, whether commingled or not, on MISS;

- all radiological contamination above DOE action levels related to past thorium processing at the MCW site occurring on any vicinity properties; and

- any chemical contamination on vicinity properties that would satisfy either of the following requirements:

  - the chemical contaminants are mixed or commingled with radiological contamination above DOE action levels; or

  - the chemical contaminants originated on MISS or were associated with the thorium processing activities at the MCW site which resulted in the radiological contamination.

Chemical contamination from MCW that is not on MISS (or that is not shown to be migrating from MISS), and not mixed with FUSRAP waste, is being investigated by the Stepan Company. This investigation is being conducted through an agreement signed by EPA and the Stepan Company in 1987 and an order signed by EPA in 1991.

The waste storage pile at MISS currently contains about 35,000 yd^3 of contaminated soil and debris removed from 25 vicinity properties between 1984 and 1986. It occupies approximately 2 acres with an average height of 18 ft. During construction, the ground surface was graded until level and rolled until firmly packed. A berm was constructed around the entire area, and a leachate collection system (a 6-inch layer of sand or fine soil) was installed and covered with an impermeable Hypalon liner. An additional 6-inch layer of sand was placed on top of the liner to drain any leachate that might form after the storage pile was completed. The bottom liner slopes toward two sumps for leachate collection. A 12-inch layer of fine-grained contaminated materials was placed over the upper sand layer to protect it and the liner during placement of the contaminated materials. After the removal action at the vicinity properties was completed, the pile was covered with a Hypalon cover, which was sealed to the bottom liner and further anchored using concrete blocks. In 1992, the cover was damaged by high wind; the damaged cover was promptly repaired and additional ballast was added to further secure the cover from future damage. DOE has maintained a comprehensive environmental monitoring program for air, surface water, sediment, and groundwater at MISS since 1984.

During the previous removal actions at the site, the public and local authorities were kept fully informed about the work being planned and conducted by DOE. This was accomplished through coordination with private property owners and local officials regarding logistics of the removal actions, as well as through local media coverage and by issuing public notifications (i.e., press releases). Formal access agreements were obtained with each affected property owner and the borough or township officials before the removal actions were conducted. Any

future response activities at the site also will be coordinated with the public and state and local officials according to the community relations plan for the site (BNI 1992).

1.3 ENVIRONMENTAL SETTING

Land Use and Demography. Land use in the vicinity of the Maywood site is a mixture of commercial, light industrial, and residential uses. MISS is zoned for light industrial use. There is no public access to MISS or to much of the Stepan property. According to the 1990 Census, the population of Maywood was 9,473, Lodi was 22,335, and Rochelle Park Township was 5,587. The population density in this area is approximately 10,000 people/mi^2.

Topography, Drainage, and Surface Water. The Maywood site is located in the glaciated section of the Piedmont Plateau of north-central New Jersey. The terrain is generally level, with minor highs and lows created by occasional shallow ditches and low mounds. Elevations range from 51 to 67 ft above mean sea level. The surface slopes gently to the west and is poorly drained.

The Maywood site lies within the Saddle River drainage basin. MISS is located approximately 0.5 mile east of the Saddle River, which is a tributary of the Passaic River, and approximately 1 mile west of the drainage divide of the Hackensack River basin. Rainwater runoff from most of MISS empties into the Saddle River through Westerly Brook, which flows under the property, under State Route 17 through a concrete culvert, and eventually empties into the Saddle River. Neither the Saddle River nor Westerly Brook is used as a source of potable water.

Another perennial stream on the Maywood site, Lodi Brook, begins as two branches on the Sears property. Most of the original stream channel has been replaced by an enclosed storm drain system. The former channel matches the distribution of contaminated materials in the Borough of Lodi. The western branch of Lodi Brook has been covered by the Sears warehouse and its parking lot. The easternmost branch drains the surface area outside the Sears fence and then flows underground for most of its route to the Saddle River. Some surface runoff from MISS may flow parallel to State Route 17 and drain into Lodi Brook. Recent surface water flow studies at MISS, however, have observed no measurable surface runoff from the MISS property. Lodi Brook empties into the Saddle River downstream of Westerly Brook's confluence with the Saddle River.

Geology/Soils. Bedrock underlying the Maywood site consists of igneous-derived sedimentary rock of lower Jurassic and upper Triassic age identified as the Passaic Formation. The Passaic Formation has alternating beds of reddish-brown sandstone, mudstone, and shale. It ranges from 5900 to 8000 ft in thickness. Unconsolidated materials of glacial origin (boulders, gravel, silt, and clay) are layered over the bedrock at the site and in many parts of the region. The composition and characteristics of these deposits vary within the area, including unstratified deposits of unsorted rock fragments ranging from clay-sized particles to boulders laid down directly by glaciers and stratified deposits of bedded, well-sorted materials deposited by

glacial meltwater into streams and lakes. Extensive agricultural and urban development has disturbed or destroyed much of the original deciduous soil horizon. Most of the current soil cover in the area may be classified as urban fill.

Hydrogeology/Groundwater. Groundwater in the Maywood area occurs in both the Passaic Formation and the unconsolidated glacial deposits. The Passaic Formation is a productive aquifer with sufficient capacity for public and industrial use. However, there is no known use of this groundwater for drinking water or domestic uses in the area of the Maywood site. Groundwater flows through weathered rock and secondary fracture openings in the Passaic Formation, forming a system of tabular aquifers and aquicludes. The water is moderately mineralized and ranges from moderately hard to very hard. The unconsolidated glacial deposits provide a more variable source of groundwater, with highly variable water quality. It ranges from soft to hard but is generally not mineralized.

Depth-to-groundwater is shallow and ranges from approximately 3 to 15 ft below ground surface. Water levels fluctuate in response to short- and long-term seasonal patterns of precipitation and evapotranspiration. Levels are generally lowest in May through September, with rising water levels beginning in late November through December. Groundwater recharge occurs primarily through percolation from precipitation. At the MISS and Ballod properties, groundwater flow is toward the west in both the bedrock and overburden aquifers. Average hydraulic gradients vary depending on the season and recent precipitation. Gradients are generally steeper on the MISS property, and decrease rapidly on the Ballod property.

Ecology. The Maywood site is located within the glaciated portion of the Appalachian Oak Forest Section of the Eastern Deciduous Forest Province. However, urban development has destroyed the forest habitat in the area. This has resulted in natural landscapes dominated by grasses and forbs, with scattered shrubs and trees. The landscaped commercial and residential properties contain plant species common to landscaped yards, such as grasses, shrubs and trees. No threatened or endangered species have been identified at the Maywood site. Local habitat limits animal life to commonly occurring species adapted to suburban and urban environments.

Aquatic habitats are limited to drainageways, small temporary ponds, Westerly and Lodi Brooks, and the Saddle River. Hydrophytic vegetation is apparent along the upper portions of Lodi Brook on the Sears property. A wetlands delineation, performed as part of the RI/FS that the Stepan Company is conducting, identified wetlands covering approximately 1.7 ha (4.1 acres) in this area. However, no wetlands are present on the MISS property (DOE 1994a).

Climate and Meteorology. The regional climate is humid, with a normal annual precipitation of about 42 inches and about 120 days of precipitation per year. The area receives approximately 30 inches of snow per year. Average monthly temperatures range from 0.4°C (31.3° F) in January to 24.9°C (76.8°F) in July. The prevailing winds are from the northwest during October to April and from the southwest during the remainder of the year.

Archeological and Historical Sites. None of the buildings at the Maywood site are currently listed in the National Register of Historic Places. Consultation with the New Jersey Historic Preservation Office during the RI/FS-EIS process has confirmed that no archeological, cultural, or historic resources could be seriously affected by site activities.

1.4 ANALYTICAL DATA

Detailed descriptions of the site characterization activities and results for the overall Maywood site are presented in the RI report (DOE 1992). Only information important to the MISS waste storage pile considered in this EE/CA is summarized in this section.

Radioactive Contaminants

Detailed characterization of the materials in the waste storage pile was conducted during 1990 and 1991 (BNI 1991). The sampling methods and approach were designed and agreed upon by DOE and NJDEPE (Atkin 1989, Kaup 1989). The pile was surveyed and marked with a 50-ft grid, and 37 boreholes were drilled at locations indicated in Figure 1-4. To the degree possible, boreholes were drilled at the intersections of grid lines. However, some adjustments were necessary because of field conditions such as poor recovery, auger refusal, and unsafe slope conditions. If difficulties prevented reaching the proposed borehole depth, the drilling attempt was repeated at a location nearby. Drilling depth at each location differed because of the variable height of the pile and the depth of the leachate collection system underneath. Immediately after each borehole was drilled, the disturbed area of the pile cover was repaired.

To the extent possible, each borehole was sampled continuously from top to bottom using a split-spoon sampler. For each borehole, a randomly selected portion of the material taken from each sampling interval [using alternating 2-ft and 4-ft sampling intervals] was homogenized and composited to produce a single sample representative of the entire depth of the borehole. The composite samples (a total of 30) were then properly packaged and shipped for analysis by gamma spectrometry for thorium-232, radium-226, and uranium-238. Average radionuclide concentrations were 18.1 pCi/g for thorium-232, 2.4 pCi/g for radium-226, and 17 pCi/g for uranium-238. The results for each individual borehole are presented in Table 1-1.

DOE guidelines (DOE 1990) have been established for allowable radionuclide concentrations in soil for radium (radium-226, radium-228) and thorium (thorium-232, thorium-230). These guidelines limit concentrations of these radionuclides in soil to 5 pCi/g above background concentrations averaged over the first 6-inch layer of soil below the ground surface, and 15 pCi/g above background averaged over any 6-inch layer below the surface layer. In each case, these limits are averaged over any area of 100 m^2. For the Maywood site, EPA has determined that these concentration limits may be used for properties with nonresidential land use; during cleanup actions at these nonresidential properties, DOE will also strive to meet a goal of 5 pCi/g for both surface and subsurface soils, where reasonably achievable. All residential properties will be remediated to 5 pCi/g above background for both surface and subsurface soils.

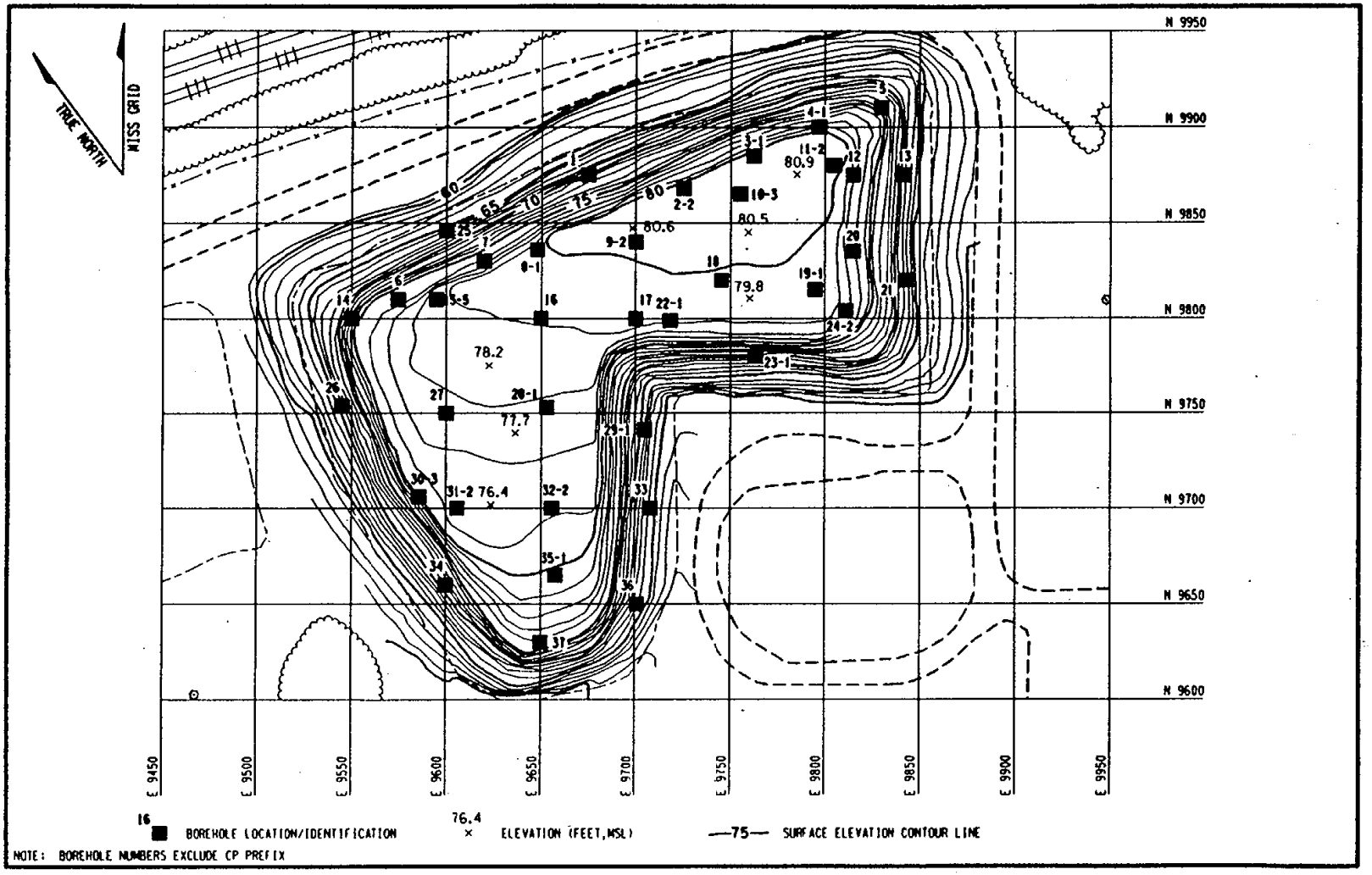

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Figure 1-4. MISS Waste Storage Pile Borehole Locations

Table 1-1. Radionuclide Concentrations in the MISS Storage Pile

Coordinates[a] East	Coordinates[a] North	Depth (ft)	Concentration (pCi/g ± 2 sigma) Uranium-238	Radium-226	Thorium-232
9550	9800	0.0 - 12.0	< 34.2	< 3.8	50.6 ± 10.6
9575	9705	0.0 - 9.1	< 24.6	4.5 ± 0.9	25.5 ± 6.7
9575	9820	0.0 - 12.0	< 11.8	1.9 ± 0.7	12.8 ± 4.8
9600	9660	0.0 - 8.0	< 21.1	2.5 ± 0.5	16.8 ± 2.4
9600	9700	0.0 - 8.0	< 9.0	2.0 ± 0.9	14.4 ± 3.2
9600	9750	0.0 - 8.0	< 12.4	2.6 ± 0.5	22.7 ± 6.1
9600	9800	0.0 - 12.0	< 13.2	2.0 ± 0.3	10.8 ± 1.7
9600	9846	0.0 - 4.0	< 17.1	2.7 ± 0.5	18.4 ± 4.1
9620	9830	0.0 - 12.0	< 16.4	1.7 ± 0.1	15.4 ± 0.9
9650	9630	0.0 - 12.0	< 14.3	2.5 ± 0.6	12.9 ± 0.3
9650	9665	0.0 - 13.0	< 14.3	4.1 ± 0.7	27.2 ± 7.8
9650	9700	0.0 - 14.0	< 8.6	1.8 ± 0.2	5.6 ± 1.4
9650	9800	0.0 - 15.0	< 8.3	1.4 ± 0.3	11.8 ± 3.4
9650	9850	0.0 - 12.0	< 9.9	2.0 ± 0.8	18.6 ± 4.5
9695	9650	0.0 - 4.0	< 26.3	4.3 ± 2.3	30.6 ± 4.2
9700	9750	0.0 - 4.0	< 9.6	< 0.9	6.4 ± 0.6
9700	9800	0.0 - 11.0	< 9.2	1.6 ± 0.3	14.4 ± 5.0
9700	9850	0.0 - 19.0	< 21.9	4.7 ± 0.8	34.1 ± 9.5
9708	9700	0.0 - 4.0	53.7 ± 28.1	4.9 ± 1.4	35.5 ± 8.3
9710	9785	0.0 - 14.5	< 8.3	1.8 ± 0.2	13.3 ± 3.3
9725	9880	0.0 - 10.5	< 16.2	1.4 ± 0.2	10.9 ± 1.3
9745	9820	0.0 - 14.0	< 15.3	2.8 ± 0.4	20.2 ± 0.6
9760	9885	0.0 - 12.0	< 19.7	1.8 ± 0.2	17.0 ± 2.8
9800	9815	0.0 - 14.0	< 8.2	1.7 ± 0.2	10.5 ± 3.0
9800	9900	0.0 - 8.0	< 10.8	1.2 ± 0.3	9.0 ± 2.2
9805	9870	0.0 - 8.0	< 11.3	< 1.4	15.2 ± 5.2
9820	9790	0.0 - 12.0	< 8.9	1.7 ± 0.1	16.3 ± 4.2
9825	9875	0.0 - 9.6	< 10.3	< 1.2	8.1 ± 1.4
9830	9910	0.0 - 8.5	< 15.2	1.4 ± 0.3	7.9 ± 1.2
9842	9875	0.0 - 4.0	< 14.8	4.2 ± 0.7	22.5 ± 5.1

[a]Sampling locations are shown in Figure 1-4.

For other radionuclides, DOE requires that soil concentration limits must be derived on a site-specific basis, such that the potential radiation dose to any member of the public would not exceed 100 mrem/year above background. The DOE guidelines also require that residual radionuclide concentrations and potential doses be reduced as low as reasonably achievable (ALARA). A site-specific guideline for total uranium of 100 pCi/g above background has been derived for the Maywood site (DOE 1994b).

DOE conducts an active environmental monitoring program at the Maywood site. Monitoring results for groundwater at MISS and nearby properties indicate that uranium, radium, and thorium concentrations are similar at upgradient and downgradient wells. Results from quarterly surface water (Westerly Brook) monitoring also indicate similar radionuclide concentrations at upstream and downstream sampling locations; all concentrations are below EPA maximum contaminant levels (MCLs) and DOE derived concentration guides (DCGs), and most concentrations are below analytical detection limits. Also, radionuclide concentrations in sediment samples from Westerly Brook are similar at upstream and downstream locations; no results exceed DOE guidelines for residual radioactive contamination in soils.

Air monitoring results indicate airborne radionuclide concentrations well below DOE and EPA standards for both radon and particulates. Also, the average radon flux rate at MISS is well below the DOE and EPA limits. The average exposure rates for external gamma radiation at MISS for 1992 are 47 mR/year above background for on-site locations and 281 mR/year above background for fenceline locations (BNI 1993). The exposure rates at the boundary locations are elevated primarily because of localized soil contamination in the northeastern corner of the property in the area of Building 76, the former thorium processing facility, and not directly related to the waste storage pile considered for the proposed removal action. A person continuously occupying this area of the fenceline could exceed the DOE primary radiation dose limit of 100 mrem/year above background for members of the public. However, the property immediately adjacent to the northeastern corner of MISS is an industrial facility located approximately 150 ft from the site boundary; the maximum dose to a hypothetical employee working in this facility is estimated to be approximately 0.6 mrem/year (BNI 1993).

Chemical Contaminants

Soil samples also were collected for analysis of chemical constituents from each borehole at the waste storage pile during the sampling program discussed above. For analysis of total petroleum hydrocarbons and volatile organics, samples were retrieved from the split-spoon sampler and were packaged and preserved before the composite sample was produced. The remaining contents were homogenized to ensure that they were representative of the composite sample. The composite sample was then properly packaged, preserved and shipped off-site for analysis. Based on knowledge of past processing operations, analytical parameters were selected to include toxicity characteristic (TC) metals, total polychlorinated biphenyls (PCBs), sulfide and cyanide reactivity, percent solids, and total petroleum hydrocarbons (TPH). Soil samples which exceeded 1,000 parts per million TPH were screened for EPA priority pollutant volatile organic compounds (VOCs) and base/neutral and acid extractable (BNAE) semivolatile organic

compounds. Ten percent of all discrete samples were analyzed for the following broad-screen parameters: TC volatile organics, corrosivity, TC BNAE semivolatile organics, TC pesticides, and TC herbicides.

The analytical results, as summarized in Table 1-2, indicated that the material in the waste storage pile is not a RCRA-hazardous waste. Concentrations of TC constituents (TCLP volatile organics, semivolatile organics, pesticides, herbicides, and metals) in the soil samples did not exceed the regulatory limits. Also RCRA limits for corrosivity and reactivity were not exceeded. The semivolatile organic compounds detected in the pile were polycyclic aromatic hydrocarbons (PAHs), which are commonly present as the result of incomplete burning of fossil fuels, garbage, or other organic substances. Because the Maywood site is in an industrial setting, the presence of PAHs is to be expected. The only VOC identified as exceeding detection limits in the soil samples was toluene, a common solvent and laboratory contaminant.

Several metals and volatile organic compounds were detected in groundwater and surface water at concentrations above existing or proposed MCLs or maximum contaminant level goals (MCLGs). The locations of the wells in which metals were detected in groundwater correlate with the detection of the same metals in nearby soil. The highest concentrations of VOCs in groundwater occur in wells located on the Stepan and Ballod properties, upstream and downstream of the MISS property, respectively. In surface water, metals were generally detected in similar concentrations in upstream and downstream sampling locations. Sediment samples collected from Westerly Brook at locations upstream and downstream from the Maywood site indicate similar concentrations of metals.

1.5 SITE CONDITIONS THAT JUSTIFY A REMOVAL ACTION

The threats posed by radioactively contaminated materials in the waste storage pile are of a non-time-critical nature, i.e., no immediate risk to human health or the environment currently exists at this property that would require emergency cleanup within 6 months. However, the conditions do meet criteria listed in Section 300.415(b)(2) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) for conducting certain cleanup efforts as removal actions because there is "potential exposure to nearby populations, animals, or the food chain from hazardous substances or pollutants or contaminants." Also, the proposed action meets the requirement of CERCLA Section 104 that any removal action should "... contribute to the efficient performance of any long-term remedial action with respect to the release or threatened release concerned." The early removal of the waste storage pile at MISS would facilitate any future waste processing and staging activities at the MISS property during final remediation of the Maywood site.

The results of sampling the waste storage pile indicate that the primary contaminant of concern is thorium-232. The available data, as summarized in Section 1.4, indicate that the contaminated materials in the waste storage pile exceed the cleanup guidelines for the site only for thorium-232. The cleanup guidelines established for the site, however, are not directly relevant to the proposed removal action, which would address the entire contents of the waste

Table 1-2. Concentrations of Chemical Constituents Detected in MISS Storage Pile

Analyte	Number of Samples Analyzed	Number of Samples Detected	Concentration(μg/kg) Min.	Concentration(μg/kg) Max.	Concentration(μg/kg) Avg.
Semivolatile Organics					
Anthracene	30	2	42	740	232
Benzo(a)anthracene	30	10	51	1,500	414
Benzo(a)pyrene	30	12	54	1,500	461
Benzo(b)fluoranthene	30	11	66	1,400	427
Benzo(g,h,i)perylene	30	6	99	650	315
Benzo(k)fluoranthene	30	10	65	1,500	424
Bis(2-ethylhexyl)-phthalate	30	2	100	1,300	327
Chrysene	30	12	60	1,400	443
Fluoranthrene	30	18	76	3,300	802
Indeno(1,2,3-cd)pyrene	30	6	69	1,400	353
Phenanthrene	30	11	57	2,400	528
Pyrene	30	15	0	2,600	596
Volatile Organics					
Toluene	28	11	1	3,000	704
			Concentration(mg/kg) Min.	Concentration(mg/kg) Max.	Concentration(mg/kg) Avg.
Total Petroleum Hydrocarbons	155	28	63	6,100	659

storage pile. Final remediation of the MISS property as well as the overall Maywood site would occur following completion of the RI/FS-EIS process. Potential radiological hazards from the contaminated soils are discussed in Section 4.1.1 of this report. To date, site investigations have not identified evidence of other contaminated media (for example, groundwater, surface water, or building surfaces) that warrant early removal actions.

2. REMOVAL ACTION OBJECTIVES

The waste storage pile at MISS has been engineered to contain the contaminated soil and debris, resulting from previous cleanups, in a manner that will protect human health and the environment. There is little potential for disturbance and spread of these materials, and no imminent risk to human health or the environment has been identified. While the contaminated materials in the waste storage pile pose no immediate risk to human health or the environment, the proposed removal action would further reduce the potential for human or environmental exposure by removing this contaminant source from the site, and facilitate the efficient performance of future cleanup actions for the overall Maywood site.

The intent of the proposed removal action is to relocate the contaminated materials to an appropriately licensed disposal facility. Soil treatment may be proposed by DOE to reduce the volume of waste for disposal, depending on the timing, availability, and effectiveness of the necessary equipment. Specifically, implementation of the proposed removal action would allow DOE to remove, transport, and dispose of contaminated materials from the waste storage pile to facilitate site-wide cleanup measures. The specific objectives are defined in Sections 2.1 through 2.4 in terms of statutory limits, scope and purpose of the proposed action, schedule, and compliance with regulatory requirements.

2.1 STATUTORY LIMITS

Authority for responding to releases or threats of releases from a contaminated site is addressed in Section 104 of CERCLA. Executive Order 12580 delegates to DOE the response authority for DOE sites. Under CERCLA Section 104(b), DOE is authorized to undertake such investigations, surveys, testing, or other data gathering deemed necessary to identify the existence, extent, and nature of the contaminants present at the Maywood site, including the extent of threats to human health and the environment. In addition, DOE is authorized to undertake planning, engineering, and other studies and investigations appropriate to directing response actions to prevent, limit, or mitigate potential risks associated with the site. Removal actions which are appropriate prior to implementation of the final remedial action for the site may be authorized by DOE, as necessary, in accordance with the FFA.

2.2 SCOPE AND PURPOSE

The scope of the proposed removal action can be broadly defined as management of radioactively contaminated materials in the waste storage pile at the Maywood Interim Storage Site. The primary purpose of the proposed action is to facilitate preparation of the MISS property for later waste treatment and staging activities during the final remediation of the Maywood site. The action also would ensure the protection of human health and the environment. All activities would be conducted in a way to minimize the potential risks to on-site personnel performing the removal action. The timely and complete removal of these materials from the waste storage pile would contribute to the efficient performance of comprehensive remedial actions being planned for the overall Maywood site.

2.3 SCHEDULE

The proposed removal action for the contaminated materials at the MISS waste storage pile is scheduled to begin in October 1994. The removal action is estimated to require approximately two years and therefore is scheduled for completion by the end of Fiscal Year (FY) 1996, assuming sufficient funding is available. If sufficient budgetary resources are not allocated to DOE during this period, the period for completion of the action could be extended. Site preparation and mobilization activities in support of the proposed removal action will begin prior to October 1994. The schedule includes development of detailed work plans and health and safety plans, development of appropriate decontamination facilities, removal of the contaminated materials from the waste storage pile, on-site processing as required, transportation of the contaminated materials for off-site disposal, and restabilizing the disturbed area until final remediation of the MISS property. It is anticipated that activity will be suspended during the winter months due to inclement weather conditions.

2.4 COMPLIANCE WITH REGULATORY REQUIREMENTS

The proposed removal action will be carried out according to all environmental laws and requirements that are determined to be applicable or relevant and appropriate requirements (ARARs) to the maximum extent practicable. This includes federal laws as well as more stringent state standards. In addition to ARARs, "to-be-considered" guidelines (TBCs) may play a role in the selection and implementation of a preferred alternative; TBCs include standards identified in specific departmental orders, etc., which are not promulgated by law but may be significant for the proposed action. A preliminary compilation of potential ARARs and TBCs for the proposed removal action for the waste storage pile is presented in Appendix A. The final compilation of ARARs for the overall Maywood site will be published in the FS for the site (DOE 1994a). The preliminary identification of potential ARARs and TBCs for the proposed removal action is based on the nature of the contamination (primarily soil contaminated with thorium-232), the nature of the proposed removal action, and the location of the site.

In accordance with CERCLA and the NCP, an alternative that does not meet an ARAR may be selected if one of several waiver conditions is met. One of these conditions is that the action is an interim measure and will become part of a total remedial action that will attain the requirement. This condition applies directly to the proposed removal action because this action is only part of the overall remedial action for the Maywood site. Moreover, compliance with ARARs may not be required for removal actions even when none of the specific waiver conditions is satisfied, based on consideration of factors such as the urgency of the situation and the scope of the removal action to be conducted.

Nevertheless, the proposed removal action will be conducted to comply with the substantive requirements of all ARARs to the maximum extent practicable. DOE will comply with all pertinent environmental requirements to ensure the protection of human health and the environment during implementation of the proposed action. Appropriate standards from the

Occupational Safety and Health Act (OSHA) and other employee protection laws and guidelines also will be followed to protect workers during implementation.

3. REMOVAL ACTION TECHNOLOGIES AND ALTERNATIVES

This section summarizes the procedures and rationale used to identify alternatives for conducting the proposed removal action. It will consider relevant technologies that could be implemented to achieve the remedial action objectives specified previously. This process is consistent with the NCP and EPA guidance regarding removal actions. Because of the nature of the contaminated materials in the waste storage pile at MISS, the number of practical and suitable technologies that can be applied is limited. The technologies considered in selecting removal action alternatives include those identified in the NCP [40 CFR 300.415(d)], along with experience and information gained as a result of planning and implementing removal actions at similar sites.

3.1 TECHNOLOGY IDENTIFICATION AND SCREENING

Technologies potentially applicable to the proposed removal action have been screened and evaluated on the basis of site-specific conditions of the waste storage pile. The objective of the proposed removal action is to facilitate preparation of the MISS property for subsequent waste treatment and staging activities during the final remediation of the Maywood site and to ensure protection of human health and the environment. While the contaminated materials in the MISS pile are not considered to present an immediate risk to human health or the environment, the proposed removal action would further reduce the potential for exposure to humans or the environment.

General response actions that may apply to the remediation and management of radiologically contaminated sites include institutional controls, containment, removal, treatment, interim storage, and disposal. Several of these technologies, however, are not applicable to the proposed removal action considered in this EE/CA. Institutional controls, containment, and interim storage technologies are already implemented at the current waste storage pile, and are considered here only as a part of the no-action alternative.

Alternatives for the proposed removal action were identified by considering applicable technologies within each general response action category, according to the guidelines of the NCP [40 CFR 300.430(e)]. The potential technologies were screened with regard to effectiveness, implementability, and cost. The identification and screening of the technologies that may apply to the proposed action are discussed below and key considerations are summarized in Table 3-1.

Institutional Controls

Institutional controls are measures that prevent or minimize public exposure by limiting access or use of contaminated areas. They may include physical barriers (such as fences), use or deed restrictions, and environmental monitoring. Such controls are not effective in reducing the toxicity, mobility, or volume of contaminants, but they may reduce the potential for exposures to contaminated materials. The NCP specifies that institutional controls may not be

TABLE 3-1. Summary of General Response Technology Screening

Technology	Evaluation Result	Comments
Institutional Controls		
Use or deed restrictions	Not Applicable (Current DOE ownership maintained under all alternatives)	Limits on-site exposure to contaminants, but not effective in controlling the source or migration of contaminants; may be effective when used in conjunction with other technologies. The MISS property is currently owned by DOE, and DOE ownership and control would be maintained under all alternatives. No new actions are associated with the proposed removal action.
Access restrictions	Not Applicable (Current access restrictions maintained under all alternatives)	Limits on-site exposure to contaminants, but not effective in controlling the source or migration of contaminants; may be effective when used in conjunction with other technologies. Access restrictions are currently in place at MISS and will be maintained pending final remediation of the property.
Monitoring	Retained	Provides data for assessing control measures; may be effective when used in conjunction with other technologies. An extensive environmental monitoring program is in place at MISS and will be maintained pending final remediation of the property. Comprehensive environmental and personnel monitoring would be implemented throughout the proposed removal action.
Containment		
In-situ (capping)	Rejected (Current containment system retained in No-Action Alternative)	Can reduce contaminant mobility and mitigate potential exposures; contaminant toxicity and volume would not be reduced. The current liner/cover at the waste storage pile provides containment of the contaminated materials. Capping is not considered practicable as an interim measure for the waste storage pile due to potential incompatibility with future remediation measures for the MISS property, particularly for underlying contaminated soils.
Removal		
Excavation	Retained	Easy to implement, using conventional earth-moving equipment. Requires storage or disposal facility for excavated wastes and access restrictions during excavation.
Decontamination/ Demolition	Not Applicable	No contaminated structures are associated with the waste storage pile.

TABLE 3-1 (Continued)

Technology	Evaluation Result	Comments
<u>Treatment</u>		
Chemical/Physical Treatment	Retained	Treatment (soil washing) is retained for detailed evaluation for the proposed removal action, pending the results of a treatability study planned for 1994.
<u>Interim Storage</u>		
Existing on-site facility	Retained (No-Action only)	The contaminated materials considered in this EE/CA are currently in interim storage at MISS. Can effectively protect human health and the environment in the short term by reducing contaminant mobility and limiting exposures while a permanent remedy is developed.
Off-site	Rejected	Relocation of the contaminated materials to a temporary off-site storage location would provide no significant benefit over the existing waste storage pile at a considerable expense. No suitable off-site interim storage facility is currently available and development of a new facility would be prohibitively expensive and time-consuming.
<u>Disposal</u>		
On-site	Rejected	Permanent disposal of the Maywood site wastes will be fully evaluated in the FS for the site. No on-site disposal alternative is available for the proposed removal action and would be inappropriate due to the potential for biasing waste management evaluations in the RI/FS-EIS.
Off-site	Retained	Off-site commercial disposal facilities are currently licensed to accept 11e(2) byproduct material such as the MISS wastes. Off-site disposal at an existing DOE disposal facility is also plausible, but no such facility is currently in agreement to accept the Maywood site wastes. Siting of new disposal facilities is not considered to be a viable option within the time frame of the proposed removal action.

used as a substitute for active response measures as the sole remedy unless active measures are determined not to be practicable. Costs associated with institutional controls are generally low.

Institutional controls are currently in place at MISS and are considered generally effective in limiting potential exposure to the contaminated materials in the waste storage pile over the near term. The MISS property is owned by DOE, and institutional controls (access restrictions and environmental monitoring) will be maintained at this property at least until final remediation of the Maywood site is completed. Institutional controls, therefore, are considered as a component of the no-action alternative for the purposes of this analysis, although typically a "no-action alternative" assumes no active measures to control exposures. No new long-term institutional control measures would be associated with the proposed removal action. However, a comprehensive environmental and personnel monitoring program and additional access restrictions of the immediate work area would be implemented during the construction, processing, and restoration activities.

Containment

Containment technologies are designed to keep contaminated materials at their current locations. The purpose of containment is to reduce contaminant mobility and the potential for contaminants to move off-site. Containment technologies, in and of themselves, do not typically reduce the toxicity or volume of contaminants, but they may be effective in reducing contaminant mobility. Costs associated with containment technologies are considered moderate.

The current waste storage pile at MISS provides containment through encapsulation of the contaminated materials within the impermeable Hypalon liner and cover material. More permanent containment technologies, particularly capping, are considered impractical as an interim measure for the waste storage pile considered here because of potential interferences with ultimate remediation of the MISS property. Therefore, capping is eliminated from further consideration, and containment is considered here only as a component of the no-action alternative (i.e., continuation of the current containment system for the waste storage pile is considered as a component of the no-action alternative for the purposes of this analysis, although typically a "no-action alternative" assumes no active measures to control exposures or releases).

Removal

Removal of contaminated materials from a site can effectively reduce contaminant mobility and potential exposure. Contaminated soil and debris may be removed from the MISS waste pile using conventional earth-moving equipment such as backhoes, bulldozers, scrapers, and front end loaders. These technologies are reliable, can be easily and economically implemented with standard construction procedures and conventional equipment, and have been used extensively to control radioactive contamination similar to that associated with the waste storage pile. Removal technology is retained as a possible component of the action alternatives.

Treatment

Treatment includes a wide range of technologies, only a limited number of which are applicable to radioactively contaminated materials. Radioactive waste treatment technologies can be categorized as (1) those that remove the radioactive material from the waste matrix, and (2) those that change the form of the waste, thereby reducing the toxicity, mobility, or volume of the contaminants.

Treatment technologies identified as potentially applicable for the Maywood site are being fully evaluated in the FS for the site (DOE 1994a), including treatability studies for technologies that appear particularly promising. A treatability study is scheduled to be conducted at the site during 1994 to help evaluate soil washing technology for volume reduction of Maywood soils. Soil washing treatment technology is retained for further consideration for the proposed removal action. Treatment costs are considered moderate to high.

Removal of the MISS waste storage pile also would facilitate implementation of selected treatment technologies for the overall site remediation by providing an appropriate staging and processing area. Also, treatment of materials removed from the waste storage pile would provide additional data for optimizing the treatment process for site-specific conditions and production-scale materials management of all process streams.

Interim Storage

Interim storage involves the temporary placement of contaminated materials in a manner that effectively protects human health and the environment until the final treatment or disposal of the materials can be determined. Interim storage can be achieved by placing the contaminated materials in an existing engineered facility or in a newly constructed facility. Costs range from low, if existing storage capacity is available, to moderately high, if construction of a new facility is required.

The contaminated materials considered in this EE/CA are currently in interim storage at MISS. Since the contaminated materials would remain in the waste storage pile if no removal action were conducted, continued interim storage at MISS is retained as a component of the no-action alternative. Interim storage in a newly constructed facility is eliminated from further consideration on the basis of cost, implementation time, and lack of significant benefit.

Disposal

Disposal involves the permanent placement of contaminated materials in a manner that reduces contaminant mobility and protects human health and the environment for the long term. This technology can effectively reduce contaminant mobility and the potential for human exposure.

Alternatives for ultimate disposal of wastes from the overall Maywood site are being fully evaluated in the FS for the site (DOE 1994a). The disposal considerations for the proposed removal action are independent of the remedial action decisions regarding disposal for the overall Maywood site, and will not bias that process. Important differences in the two evaluations include the smaller volume of waste considered for disposal and the much shorter time frame desired for the proposed removal action. Thus, some potential disposal alternatives with lengthy time requirements (such as siting and developing a new facility, either on-site or off-site) may be appropriate for the site-wide disposal evaluation but would not be appropriate for the proposed removal action. The only disposal option considered available within the desired time frame, and which is therefore retained for further consideration in this analysis, is a licensed commercial disposal facility. Commercial disposal is currently available for the wastes from the waste storage pile, which are classified as 11e(2) byproduct material, at the Envirocare facility at Clive, Utah. Disposal costs, including transportation to the disposal facility, are considered moderate to high.

3.2 IDENTIFICATION OF PRELIMINARY ALTERNATIVES

The preliminary screening of potentially applicable technologies resulted in identification of the following technologies as potential components of removal action alternatives: removal of contaminated materials from the waste storage pile, treatment to reduce the volume of contaminated materials, and disposal at a licensed commercial facility. The screened technologies have been grouped into the following preliminary alternatives for the proposed action:

- Alternative 1: No action, with continuation of current interim storage, containment, environmental monitoring, and institutional controls. Remedial action for the waste storage pile would be delayed until the record of decision (ROD) for the Maywood site is issued.

- Alternative 2: Expedited removal of the contaminated materials from the waste storage pile, followed by transport of the wastes for off-site commercial disposal. This alternative includes access restrictions and increased environmental and personnel monitoring during implementation of restoration activities.

- Alternative 3: Expedited removal of the contaminated materials from the waste storage pile, and treatment using soil washing technology to reduce the volume of waste requiring off-site disposal. The concentrated treatment residues would be transported off-site for commercial disposal, while the decontaminated soil (with residual concentrations of thorium-232 and radium-226 in soil below 15 pCi/g) would be stored on-site for use as subsurface backfill during implementation of the final remedial action for the Maywood site. This alternative includes access restrictions and increased environmental and personnel monitoring during construction and restoration activities.

4. EVALUATION OF ALTERNATIVES

The proposed removal action is an early action with regard to the overall remedial action planned for the Maywood site. The primary purpose of this removal action is to facilitate preparation of the Maywood Interim Storage Site for waste treatment and staging activities during the final remediation of the site. The action also will ensure protection of human health and the environment. The alternatives identified in Section 3.2 are evaluated below with respect to effectiveness, implementability, and cost.

4.1 EFFECTIVENESS

The effectiveness of an alternative is defined by its ability to protect human health and the environment from risks associated with the contamination in both the short term and the long term. Measures of effectiveness include (1) reduction of potential risks to human health and the environment; (2) compliance with regulatory requirements; (3) timeliness; and (4) reduction of contaminant toxicity, mobility, and volume through treatment.

4.1.1 Potential Health Impacts

Under Alternative 1, no action would be taken until a final decision is made regarding remediation of the overall Maywood site, including management of all site-related wastes. This alternative involves no immediate change in current exposures to radioactive materials at the site. An analysis of the baseline radiation exposure from current conditions at the waste storage pile (Alternative 1) is provided in the Baseline Risk Assessment (BRA) for the Maywood site (DOE 1993). The BRA analysis predicts a potential radiation dose of 114 to 142 mrem/year to workers at the MISS property and 3 to 24 mrem/year to transients at MISS. However, these estimates assume loss of institutional control at the MISS property and represent reasonable worst case conditions. DOE maintains an employee monitoring program for workers at the site, which indicates that current radiation exposures are less than 1 mrem/year above background.

Under Alternative 2, approximately 35,000 yd^3 of contaminated soil and debris would be removed and transported off-site for disposal. Under Alternative 3, the contaminated materials removed from the waste storage pile first would be treated to reduce the volume of soil requiring off-site disposal. Under both Alternatives 2 and 3, potential risks to human health and the environment at MISS would be reduced in the long term, because the contaminated materials would be removed from their present interim storage location and placed in an engineered facility designed for permanent disposal.

Worker Radiation Dose and Health Risk. Potential worker exposures would increase in the short term during the removal action period for Alternatives 2 and 3. The primary exposure pathways would include inhalation of contaminated dust and external gamma radiation. All activities associated with the implementation of Alternatives 2 and 3 would be conducted according to the site-specific health and safety plan to protect workers and the public. The potential radiation doses to workers conducting the removal action would be kept as low as

reasonably achievable (ALARA) by strict compliance with environmental, safety, and health protection guidelines and appropriate engineering practices for radiation protection.

The potential radiation dose to workers implementing the proposed removal action alternatives was estimated using the RESRAD computer code (Gilbert et al., 1989). For the purpose of this evaluation, radionuclide concentrations in contaminated soils were assumed to be 18.1 pCi/g for thorium-232 and progeny, 17 pCi/g for uranium-238 and progeny, 2.4 pCi/g for radium-226 and progeny, and 0.85 pCi/g for uranium-235 and progeny (assumed to be 5% of uranium-238 concentration based on typical isotopic distribution), based on available characterization data (BNI 1991). Potential exposure pathways considered in this evaluation included external gamma exposure, inhalation of contaminated dust and radon gas, and incidental ingestion of contaminated soil. It was assumed that the hypothetical worker receiving the maximum exposure would spend a maximum of 1500 hours per year (8 hours/day x 5 days/week x 9 months/year) in the contaminated area. It was assumed that the remedial action worker would have a breathing rate of 1.2 m^3/hour, and would be exposed to an airborne particulate concentration of 200 $\mu g/m^3$, of which 30% would be respirable. The worker was also assumed to ingest contaminated soil at a rate of 480 mg/day as a result of incidental hand-to-mouth contact.

For Alternative 2, the maximum radiation dose to the hypothetical worker from exposure to site contaminants during the removal action was estimated at 82 mrem/year (75 mrem/year from external gamma exposure, 5 mrem/year from inhalation of contaminated dust, and 2 mrem/year from incidental soil ingestion). This estimate is well below the DOE limit of 5,000 mrem/year for occupational exposure (10 CFR 835; DOE Order 5480.11, 1988) and slightly below the 100 mrem/year limit for the public (DOE Order 5400.5, 1990). This radiation dose would result in an incremental lifetime cancer risk of approximately 3×10^{-5} (i.e., the risk of getting cancer resulting from this radiation exposure over the remainder of the worker's lifetime would be approximately 3 in 100,000).

Exposure conditions for Alternative 3 were assumed to be the same as those for Alternative 2. The estimated radiation dose to the hypothetical maximally exposed worker is 82 mrem/year, and the excess cancer risk is estimated to be approximately 3×10^{-5}.

These dose estimates to the hypothetical worker experiencing the maximum exposure are based on very conservative exposure assumptions. They do not take into account mitigative measures (such as dust suppression, respiratory protection, protective clothing) which would be used during the proposed removal action. The potential radiation doses to workers performing the removal action would be kept as low as reasonably achievable (ALARA) by standard health physics practices and by strict compliance with DOE environmental, safety, and health protection guidelines. Mitigative measures would be implemented to minimize the amount of airborne contamination. Workers also would wear respiratory protection equipment, if necessary, to reduce the likelihood of inhaling contaminated particulates, and lapel air monitors would be worn to verify the safety of the working environment. A comprehensive personnel dosimetry program would be implemented to monitor all radiation exposures and doses to workers throughout the

removal action. Therefore, actual exposures and risks would be significantly lower than the estimates presented above.

General Public Radiation Dose and Health Risk. During construction, processing, and transportation activities associated with Alternatives 2 and 3, a resident or employee at a nearby property could receive a radiation dose above normal background exposure. The primary exposure pathway for the off-site public would be inhalation of contaminated dust. The dose to the off-site receptor from external gamma radiation would be negligible because the external gamma exposure rate decreases rapidly with distance from the source. The occurrence of any spillage during transport is expected to be minimal, and, because of the nature of the cargo (soil), any spillage could easily be cleaned up and retrieved for disposal. Thus, the potential for radiation exposure of the general public resulting from spillage would be minimal. Under either Alternative 2 or 3, wastes would be transported to the off-site disposal facility by rail, using the on-site rail spur; no off-site transport of contaminated materials by truck and no significant increase in local traffic is anticipated.

The radiation dose to the maximally exposed member of the public, therefore, would be bounded by the inhalation dose to the removal action worker discussed previously. The maximum incremental radiation dose to the general public from implementation of the proposed removal action is estimated to be less than 5 mrem/year for Alternatives 2 and 3. This dose is very small relative to the dose received from background sources of radiation. It is also well below the dose limit of 100 mrem/year specified by DOE (DOE Order 5400.5, 1990) for the public and the pathway-specific limit of 10 mrem/year for airborne releases (40 CFR 61). The lifetime incremental cancer risk resulting from this radiation exposure is estimated to be approximately 4×10^{-7} (4 in 10,000,000). Appropriate health physics practices and engineering measures (e.g., wetting the soil) would be employed during all excavation, processing, transportation, and disposal activities to minimize airborne releases of radioactivity and protect the public from unnecessary exposure.

While Alternative 2 would not directly reduce the volume or toxicity of contaminants, it would reduce contaminant mobility through improved containment in a permanent disposal facility. It would further reduce the potential for exposure of the public to contaminated materials in the waste storage pile. Alternative 3 would reduce the volume of contaminated soil through treatment, as well as reducing contaminant mobility through improved containment in a permanent disposal facility.

The commercial disposal facility which would receive the contaminated materials removed from the MISS waste storage pile operates under license to the Nuclear Regulatory Commission and the State of Utah. License conditions provide for the protection of public and worker health and the environment.

4.1.2 Potential Environmental Impacts

Soils and Water Resources. Under Alternative 1, no direct impacts to soils would occur. Alternatives 2 and 3 also would be expected to have no long-term impacts on soil or water resources. However, some minor impacts could occur during the removal of the soils from the waste storage pile, as disturbed areas would be more likely to experience wind and water erosion. These temporary effects could be minimized by decreasing the area disturbed at any time during excavation operations, and by employing good engineering practices (such as sediment barriers to minimize the amount of sediment leaving the work area, and containment of surface runoff during storms).

Air Quality. Alternative 1 would result in no incremental impacts on air quality. Environmental monitoring activities at the site indicate no significant adverse air impacts from normal site operations (BNI 1993). Resuspension and dispersion of contaminated particulates during construction, processing, and transportation activities under Alternatives 2 and 3 could impact local air quality during the short term. These impacts, however, would be eliminated after the removal action was completed. The potential for dust generation while implementing the removal action would be minimized by implementing good engineering practices (such as wetting and/or covering exposed surfaces, as appropriate, during the action period). Monitoring of ambient concentrations of airborne particulates and radon would be conducted throughout the removal action to ensure compliance with requirements to protect workers and the public.

Ecological Resources. Implementation of Alternative 1 would result in no physical changes to existing habitats and associated biota. Alternatives 2 and 3 also would not be expected to harm plants or wildlife. The waste storage pile directly affected by the proposed removal action is an engineered storage cell; it is actively maintained to discourage intrusion by wildlife, and therefore provides no significant habitat. Animals inhabiting the MISS property and adjacent areas within sight or range of hearing of the construction or waste transportation operations might be temporarily disturbed or displaced. However, the MISS property does not provide substantial wildlife habitats because of its urban nature. As a result, few animal species inhabit the property. Vegetation near the waste storage pile would be disturbed during the excavation activities. However, the existing plant species are neither unique nor restricted in distribution, and disturbed habitats could be readily revegetated. Because the MISS property supports only a few common species, the proposed removal action would have no significant harmful effect on plants or wildlife. Removal of the contaminated materials from the waste storage pile would reduce the potential for uncontrolled spread of contamination by plants or wildlife.

Threatened or endangered species would be unaffected by implementing any of the alternatives. Critical habitats for listed species are not present at the MISS property, and no threatened or endangered species are known to inhabit the site.

Wetlands and Floodplains. It is DOE's policy to avoid adverse impacts on floodplains and wetlands to the extent possible (10 CFR 1022). Any remedial actions at the Maywood site

will be carried out in compliance with Executive Order 11988, Floodplain Management, and Executive Order 1190, Protection of Wetlands, where applicable. However, the MISS waste storage pile addressed by this EE/CA is not located within 100-year floodplain or wetlands areas, so these requirements would not apply. No wetlands would be impacted by the proposed removal action alternatives.

Cultural Resources. No archaeological sites or historic structures listed in the National Register of Historic Places would be affected by implementing any of the alternatives.

4.1.3 Compliance with Regulatory Requirements

The proposed removal action is an interim measure which would become part of the comprehensive remedial action for the Maywood site that will attain all applicable or relevant and appropriate requirements. Under all alternatives, surface and subsurface soils at the MISS property that exceed contaminant-specific ARARs would remain, awaiting final remediation of the property. However, under Alternatives 2 and 3, contaminated soils and debris from the MISS waste storage pile would be removed and relocated to a permanent disposal facility. Alternatives 2 and 3 would be conducted in a manner that would follow pertinent environmental requirements and protect human health and the environment during implementation of the removal action. Appropriate OSHA standards and other employee protection laws and guidelines also would be followed to ensure worker protection during implementation, and compliance with all action-specific and location-specific ARARs.

4.1.4 Timeliness

Alternative 2 is expected to be potentially more favorable than Alternative 3 with respect to timeliness, due to uncertainties at this time associated with applying soil washing technology to the Maywood soils. This criterion may be better evaluated following treatability studies that are scheduled to be completed in 1994. The only practical constraint on the speed with which Alternative 2 could be implemented is the availability of funding resources. Under Alternative 1, no action would be taken at the waste storage pile before the comprehensive remediation of the overall Maywood site. Alternative 1, therefore, is the least timely of the alternatives considered.

4.1.5 Reduction of Contaminant Toxicity, Mobility, and Volume Through Treatment

Section 121 of CERCLA specifies a statutory preference for remedial actions that use treatment technologies that permanently and significantly reduce the toxicity, mobility, or volume of the hazardous substances as a principal element. Because of the nature of the primary contaminant of concern in the MISS waste storage pile (thorium-232 and its associated decay products), treatment for reduction of toxicity is not feasible. Therefore, only treatment to reduce contaminant mobility and/or volume may be considered. Among the alternatives considered here, only Alternative 3 includes treatment as a principal element to reduce contaminant volume. Under Alternative 3, physical separation techniques would be used to separate the radioactive

contaminants from the uncontaminated soil fraction. The decontaminated soil would be used on-site as subsurface backfill during implementation of the final remedial action, while the treatment residuals, with the concentrated radioactive contaminants, would be transported for disposal at an off-site commercial disposal facility. Neither Alternative 1 nor Alternative 2 include a treatment component.

4.2 IMPLEMENTABILITY

The implementability of an alternative is defined by its technical feasibility, availability, and administrative feasibility. Technical feasibility refers to the ability to construct, operate, maintain, replace, and monitor an alternative's technical components. The demonstrated performance of technical components is also considered, as are potential constraints associated with the site environment. Availability of services and materials refers to the resources required to implement specific components of an alternative and the ability to obtain them. Administrative feasibility addresses the acceptability of an alternative by other agencies, and how well it satisfies specific project requirements (such as budget, schedule, and efficient performance of the overall remedial action planned for the site).

4.2.1 Technical Feasibility

Technical feasibility does not apply to Alternative 1, the no-action alternative. The components of Alternative 2 are technically feasible and have been implemented for similar actions. Excavation of the contaminated materials from the waste storage pile is technically feasible using readily available equipment. Its performance has been demonstrated during past removal actions at the Maywood site and other sites. Monitoring and maintenance activities would be continued at MISS following excavation of the waste storage pile, awaiting final remediation of the MISS property. A comprehensive environmental monitoring program is currently in place for MISS and will be continued until the final remediation of the property is completed. The current monitoring system is sufficient to meet the objective of protecting human health and the environment.

In addition to those components discussed under Alternative 2, Alternative 3 also includes a physical treatment process to reduce waste volume. The proposed treatment technology is similar to that used extensively in the mineral mining industry and is considered to be technically feasible. The performance of the treatment technology for processing contaminated soil from the waste storage pile will be evaluated through a treatability study during 1994.

Commercial disposal of the waste materials removed from the MISS pile is technically feasible. Commercial disposal of 11e(2) wastes is currently available at the Envirocare facility in Clive, Utah. This facility and all commercial radioactive waste disposal facilities are required to maintain comprehensive environmental monitoring and occupational health physics programs as a license condition.

4.2.2 Availability of Services and Materials

Availability does not apply to Alternative 1, the no-action alternative. The services and materials required to implement Alternatives 2 and 3 are readily available.

4.2.3 Administrative Feasibility

Administrative feasibility considerations include the potential of a proposed action to achieve response objectives and to satisfy state and local concerns. These concerns include permitting and interagency cooperation, public and occupational safety, transportation factors, impacts on land use and values, compliance with policies and requirements, and public acceptance. The NCP specifies that a formal community relations plan be developed to provide information to the public and to obtain public comment. A site-specific community relations plan has been developed for the Maywood site (BNI 1992).

State and local authorities and citizens have indicated a strong preference for removal of the MISS waste storage pile. Since Alternatives 2 and 3 achieve this objective, they are expected to have favorable administrative feasibility. Alternative 1 would not address these concerns. Short-term negative impacts on the community would include traffic and noise associated with removal, treatment, and transportation of the contaminated materials under Alternatives 2 and 3; these impacts would be minimized by conducting all activities according to pertinent regulatory requirements, by using good engineering practices, and through an active community relations program.

No administrative feasibility issues are anticipated with respect to commercial disposal of the waste. The waste volume associated with this proposed removal action would be a small fraction of the total waste capacity of the commercial disposal facility.

Removal activities conducted under Alternatives 2 and 3 would be conducted only with the approval of the affected local authorities. All response activities at the Maywood site are coordinated with EPA Region II and state and local government authorities. Active communications would be maintained with the public, local media, EPA, and state and local officials, as specified in the community relations plan for the site (BNI 1992).

4.3 COST

The costs of alternatives are considered only in a comparative manner to determine if the cost of one alternative is much greater than that of another alternative of similar effectiveness. General estimates of potential costs for each alternative can be compared to permit a screening according to relative costs. Funds from DOE, not from EPA's Superfund, would be used to implement the proposed removal action. Because the proposed action would be completed within a short time, present value considerations would not appreciably affect cost estimates; cost estimates for this analysis assume no discount or escalation.

For Alternative 1 (No Action), no direct incremental costs would be incurred. This alternative would only defer the costs associated with remediation of the waste storage pile until the ultimate remediation of the overall Maywood site. However, it is estimated that the total cost for remediation of the waste storage pile might be somewhat lower if conducted during the comprehensive remediation of the overall Maywood site.

The total cost of implementing Alternative 2 is estimated at approximately $ 20,000,000. This estimate includes all direct and indirect costs, including subcontracts, engineering, environmental health and safety support, procurement, overhead, and contingencies. The cost estimates for waste transportation ($121/yd^3) and disposal ($216/yd^3) are specific to the Envirocare facility in Clive, Utah, based on current estimates. A volume of 35,000 yd^3 of contaminated materials from the MISS waste storage pile is assumed to be transported for off-site disposal. Transportation and disposal costs contribute approximately 60% of the total costs for Alternative 2.

The total cost for Alternative 3 is estimated to be approximately $ 12,300,000. This estimate includes all direct and indirect costs, including subcontracts, engineering, environmental health and safety support, procurement, overhead, and contingencies. The cost estimate for soil treatment assumes that 35,000 yd^3 of contaminated soil is processed at a unit cost of $108/yd^3, and that the treatment process reduces the volume of waste requiring off-site disposal by 80%. Cost estimates for waste transportation ($121/yd^3) and disposal ($216/yd^3) are based on off-site disposal at the Envirocare facility in Clive, Utah. Soil treatment is the primary cost element for Alternative 3, contributing 30% of the total costs, while off-site transportation and disposal of the treatment residuals contributes approximately 20%.

Cost elements common to Alternatives 2 and 3 include improvements to the on-site rail spur and other site preparation activities, mobilization and demobilization expenses, medical monitoring, training, engineering and health and safety support, excavation of 35,000 yd^3 of contaminated materials from the MISS waste storage pile, restoration of the disturbed area, subcontract costs (such as analytical laboratory and civil survey costs), contingencies, and program management costs.

4.4 COMPARATIVE SUMMARY

The three alternatives for managing the waste storage pile were compared on the basis of effectiveness, implementability, and cost. This comparison is summarized in Table 4-1.

Alternative 1 would provide the least effectiveness, since it would provide no improvement in the control of contaminated materials; however, it also has the lowest cost. Alternatives 2 and 3 would be more effective in providing permanent control of contaminated materials from the waste storage pile, and facilitating preparation of the MISS property for waste treatment and staging operations during the final site-wide remediation. Alternatives 2 and 3 use technically feasible methods for the removal of contaminated materials from the MISS waste storage pile. The technical feasibility of the soil treatment process proposed under Alternative

TABLE 4-1. Comparative Analysis of Removal Action Alternatives

Alternative	Effectiveness	Implementability	Cost
Alternative 1: No action	No immediate change in impacts on human health and the environment.	Technical Feasibility and Availability not applicable. Administrative Feasibility is unfavorable, since this alternative does not achieve response objectives or satisfy state and local concerns.	No direct cost.
Alternative 2: Expedited removal of contaminated material from MISS waste pile and off-site commercial disposal	Eliminates long-term impacts to human health and the environment from contaminants in the waste storage pile; minor short-term impacts during the removal action can be effectively mitigated. Facilitates preparation of the MISS site for waste treatment and/or staging activities associated with final remediation.	Technical Feasibility would be straightforward, using readily available equipment and standard engineering practices. Administrative Feasibility is expected to be satisfactory, as this alternative achieves response objectives and satisfies state and local concerns.	$ 20,000,000
Alternative 3: Expedited removal of contaminated material from MISS waste pile, treatment by soil washing for volume reduction, on-site storage of decontaminated soils, and off-site commercial disposal of treatment residuals	Eliminates long-term impacts to human health and the environment from contaminants in the waste storage pile; minor short-term impacts during the removal action can be effectively mitigated. Facilitates preparation of the MISS site for waste treatment and/or staging activities associated with final remediation.	Technical Feasibility of soil washing for the Maywood site is still being evaluated. Services and materials are readily available. Administrative Feasibility is expected to be satisfactory, as this alternative achieves response objectives and satisfies state and local concerns.	$ 12,300,000

3 is still being evaluated. Commercial disposal of the waste generated from this removal action is technically feasible and currently available. The action alternatives would have near-term costs for excavation, treatment (Alternative 3 only), and transportation of the contaminated materials to the off-site disposal facility. Alternative 3 potentially has lower costs than Alternative 2. Alternative 3 also satisfies the statutory preference for reduction of waste volume by treatment.

Because the excavation, treatment, and disposal activities would be implemented according to all regulatory requirements and good engineering practices, these activities are not expected to meet serious institutional obstacles. The potential short-term environmental consequences associated with Alternatives 2 and 3 from the temporary disturbance of the pile can be minimized by using good engineering practices during the action period. The long-term environmental consequences associated with these alternatives would be beneficial, because the relocation of the radioactive materials from the waste storage pile to a permanent disposal facility would reduce the risk of exposure.

4.5 IDENTIFICATION OF THE PROPOSED ALTERNATIVE

Based on an evaluation of the three alternatives for the proposed removal action, Alternative 3 (i.e., excavation of contaminated materials, and treatment by soil washing, with on-site storage of decontaminated soil and transport of the contaminated residuals to an off-site commercial disposal facility) has the potential to best satisfy the evaluation criteria. However, evaluation of the technical feasibility of the treatment technology for the MISS waste has not been completed. Due to these uncertainties in the performance of the treatment technology, Alternative 2 will be selected pending the completion of additional treatability testing. Under Alternative 2, the contaminated materials in the waste storage pile would be excavated and transported to an off-site commercial disposal facility. This alternative would present no unacceptable risk to public health and the environment, and can be implemented in a timely, straightforward, and cost-effective manner.

Alternative 2 has been tentatively selected over Alternative 3 due to its more favorable technical feasibility, pending further evaluation of the proposed soil washing technology for Maywood soils. A treatability study will be conducted during 1994 to evaluate whether the soil washing technology can reliably achieve significant reduction in the volume of waste requiring off-site disposal at a favorable cost. If the results of this study are favorable, DOE will propose modifying the remedy to include treatment by soil washing and transportation of the concentrated treatment residuals to an off-site commercial disposal facility.

The proposed removal action is consistent with CERCLA, which requires that interim actions contribute to the extent practicable to the efficient performance of any anticipated final remedy. The removal action would also satisfy the conditions for interim actions under NEPA while an EIS is in progress. The analysis presented in this EE/CA demonstrates that the proposed action can be implemented in a manner that protects human health and the environment. The proposed removal action is consistent with the overall cleanup strategy for

the Maywood site, and will not limit the choice of reasonable alternatives or prejudice the ultimate decision for which the RI/FS-EIS is being prepared. Furthermore, it will facilitate preparation of the MISS property for any future waste staging and treatment activities during the comprehensive remediation of the site.

5. PROPOSED ACTION

Under the proposed removal action, contaminated soil and debris in the waste storage pile will be removed and transported to an off-site commercial disposal facility. The environment at MISS will be monitored throughout the removal action to ensure that all pertinent requirements are met. Appropriate measures will be employed to reduce potential adverse impacts on the environment and minimize health risks (see Table 5-1).

Conventional earth-moving equipment will be used to remove contaminated soil and debris from the waste storage pile. Wastes will be packaged and shipped according to the waste acceptance criteria of the disposal facility as well as DOE and U.S. Department of Transportation (DOT) requirements. Wastes will be transported from the MISS property to the disposal facility by rail in bulk form. Excavated materials will be placed in dump trucks for transport to the on-site rail spur. Plastic sheeting will be used to prevent the spread of contamination and to facilitate collection of any spilled soil. The exteriors of all vehicles will be surveyed for radioactive contamination before leaving the MISS property, and any vehicles exceeding applicable contamination guidelines will be decontaminated before being released from the site. Transportation routes will be established, and an emergency response plan will be developed and coordinated with appropriate local fire and police departments. The excavated materials are not considered to be radioactive under transportation guidelines because the activity concentrations are expected to be well below 2,000 pCi/g, the lower limit established by the DOT for defining radioactive materials.

Samples will be collected from the excavated wastes for analysis to assure compliance with the waste acceptance criteria of the disposal facility. Following removal of the waste storage pile, the excavated area will be stabilized with an appropriate vegetation cover, until final remediation of the site.

In summary, the proposed removal action will include the following activities:

(1) Preparation of a detailed work plan and health and safety plan.

(2) Preparation of appropriate decontamination facilities to clean equipment and tools used in excavation and transport activities.

(3) Excavation of contaminated materials from the waste storage pile.

(4) Analysis of samples of the excavated materials to confirm compliance with regulatory requirements and waste acceptance criteria of the disposal facility.

(5) Loading of excavated materials into railcars for transport to the off-site commercial disposal facility.

(6) Rail transport to the off-site commercial disposal facility for permanent disposal.

Table 5-1. Major Mitigative Measures for the Proposed Action

Mitigative Measure	Features
Dust Control	Dust suppressants (e.g., water sprays, foam application) will be used during all activities having the potential for generating significant quantities of airborne particulates.
Worker Protection	An operational environmental safety and health plan will be developed for the proposed removal action. Respiratory protection equipment and other appropriate personnel protective equipment will be used, as necessary. All workers will wear protective clothing and will pass through an access control point for radiological scanning prior to leaving the site. A comprehensive radiation monitoring and personnel dosimetry program will be implemented.
Environmental Monitoring	Gamma radiation levels and airborne contaminant concentrations (particulates and radon) will be monitored in the general work area and at the site perimeter to protect both workers and the general public. Surface water runoff from exposed areas will also be monitored. Appropriate responses, such as increasing engineering controls, will be taken if measured contaminant levels approached project administrative control limits. Contaminant releases to air and surface water off-site will be minimized by implementing appropriate engineering controls.
Equipment Inspection	Equipment used for excavation, processing, and transportation of contaminated materials will be routinely inspected during operations. Equipment will be decontaminated, as necessary, to prevent inadvertent spreading of contamination into uncontrolled areas.
Run-on/run-off Controls	Surface water run-on will be controlled by temporary berms or other diversion structures. Migration of contaminants through run-off will be mitigated by sediment filters or siltation fences.
Access Restrictions	Access to work areas will be restricted, and current access controls at MISS will be maintained. All workers will pass through an access control point for radiation scans to prevent radioactive materials from leaving the site.

(7) Site restoration activities as necessary to restabilize the excavated area pending final remediation of the MISS property.

(8) Environmental monitoring will be implemented throughout the removal action to ensure compliance with all pertinent requirements. Appropriate mitigative measures will be used to reduce potential adverse environmental impacts and health risks (Table 5-1).

Following the completion of the treatability study of the proposed soil washing technology for Maywood soils, to be conducted during 1994, DOE will reevaluate this proposed alternative. If the results indicate that the soil washing technology can reliably achieve significant reduction in the volume of waste requiring off-site disposal at a favorable cost, DOE may propose modifying the remedy to include treatment. In this event, the following activities will be added to those listed above:

(3a) Treatment of contaminated soils using physical separation (soil washing) technology to reduce the volume of contaminated soil requiring off-site disposal. Decontaminated soil (soils with residual concentrations of thorium-232 and radium-226 below 15 pCi/g) will be stored on-site for use as subsurface backfill during implementation of the final remedial action for the Maywood site. Treatment residuals with the concentrated radioactive contaminants (soils with residual concentrations of thorium-232 and radium-226 above 15 pCi/g) will be loaded onto railcars (activity 5 listed above) for transport to the off-site commercial disposal facility for permanent disposal (activity 6 listed above).

Other activities will remain the same as listed above.

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7. LIST OF CONTRIBUTORS

This EE/CA has been prepared by the U.S. Department of Energy with contractual assistance from Argonne National Laboratory (ANL), Bechtel National, Inc. (BNI), and Science Applications International Corporation (SAIC). The following individuals contributed to the preparation of this report.

Name	Education/Experience	Contribution
ANL D. E. Dunning	M.S., Environmental Engineering, 18 years experience in radiological and environmental assessment	Proposed action and alternatives, site characterization, comparative analysis
BNI M. E. Redmon	B.S., 7 years experience in site remediation and project management	Cost estimation, technical review
SAIC T. Patterson	M.B.A. Management, B.S. Construction Engineering, 10 years experience in engineering and construction project management	Technical review, coordination with FS-EIS
DOE S. M. Cange	M.S. Environmental Engineering, 10 years experience in environmental restoration	Technical review

APPENDIX A

Regulatory Requirements Potentially Applicable to the Proposed Action

TABLE A-1. Potential Contaminant-Specific Requirements

Potential ARAR	Description of Requirement	Preliminary Determination	Comments
Clean Air Act, as amended; National Primary and Secondary Ambient Air Quality Standards (42 USC 7401-7671, 40 CFR 50)	Establishes National Primary and Secondary Ambient Air Quality Standards for certain pollutants, including total particulate matter.	Potentially applicable	Excavation equipment exhaust and fugitive dust could potentially contribute to air quality deterioration.
Ambient Air Quality Surveillance (40 CFR 58, 58 FR 8452)	Requires enhanced monitoring of ozone and its precursors. States must include photo-chemical assessment monitoring in their State Implementation Plans for serious to extreme ozone non-attainment areas.	Potentially applicable	New Jersey is classified as a severe ozone non-attainment area.
National Emission Standards for Hazardous Air Pollutants (42 USC 7401-7671, 40 CFR 61)	Emissions of radionuclides from any DOE facility to the ambient air shall not exceed levels that would result in an effective dose equivalent of 10 mrem/year.	Potentially applicable	These requirements are considered pertinent for the protection of the public during implementation of the proposed action.
Federal Water Pollution Control Act, Clean Water Act (33 USC 1251-1387): Water Quality Standards (40 CFR 131), National Pollutant Discharge Elimination System (40 CFR 122-125)	Establishes water quality standards for surface waters and pretreatment standards for waste waters released to publicly-owned treatment works (POTWs).	Potentially applicable	Any wastewater resulting from the proposed action will be managed in accordance with the NPDES process.
Radiation Protection for Occupational Workers (10 CFR Part 835)	Specifies occupational radiation protection standards and program requirements for DOE and DOE contractor operations; includes basic dose limits of 5000 mrem/year for radiation workers and 100 mrem/year for the public, and derived air concentration limits for radionuclides in air; requires all radiation exposure to be reduced ALARA.	Potentially applicable	These requirements, originally specified in DOE Order 5480.11, have been codified at 10 CFR Part 835.

Table A-1. Potential Contaminant-Specific Requirements (Cont'd)

Potential ARAR	Description of Requirement	Preliminary Determination	Comments
Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings (42 USC 2022, 40 CFR 192)	Specifies that concentrations of Ra-226 or Ra-228 in soil averaged over any 100 m^2 area may not exceed background by more than 5 pCi/g in the top 15 cm of soil or 15 pCi/g in any 15-cm layer below the surface layer; within any habitable structure, gamma radiation exposure may not exceed 20 μR/hr above background, and radon decay product concentrations may not exceed 0.03 WL and should not exceed 0.02 WL where reasonably achievable; annual dose equivalent to the public from planned releases to the environment from sources other than radon may not exceed 25 mrem to the whole body, 75 mrem to the thyroid, and 25 mrem to any other organ.	Potentially relevant and appropriate	Since the site is not a designated mill tailings site, these requirements are not strictly applicable; however, they are considered relevant and appropriate because of the similar nature of contaminants and site conditions.
Radiation Protection of the Public and the Environment (DOE Order 5400.5)	Specifies that concentrations of Ra-226, Ra-228, Th-230, or Th-232 in soil averaged over any 100 m^2 area may not exceed background by more than 5 pCi/g in the top 15 cm of soil or 15 pCi/g in any 15-cm layer below the surface layer. Radiation exposure to any member of the public from DOE operations may not exceed 100 mrem/year effective dose equivalent above background for continuous exposure and may not exceed 500 mrem/year in any single year; further, all radiation exposures must be reduced to levels as low as reasonably achievable (ALARA). Concentrations of radionuclides in air in uncontrolled areas may not exceed specified Derived Concentration Guides.	To be considered	Although not promulgated standards, the DOE Order requirements are derived from such standards and they constitute requirements for protection of the public with which the proposed action will comply. This DOE Order is now a proposed rule to be codified at 10 CFR 834 (58 FR 16268), which would be potentially applicable upon final promulgation.
Occupational Safety and Health Act, General Industry Standards (29 USC 651-678, 29 CFR 1910)	Specifies health and safety standards for hazardous waste operations, including limits for exposure to noise, ionizing radiation and certain hazardous materials, including radionuclides.	To be considered	Since these requirements are part of an employee protection law rather than an environmental protection law, with which CERCLA response actions should comply, they are not subject to the ARAR process. However, they constitute requirements for worker protection with which the proposed action will comply.

TABLE A-2. Potential Action-Specific Requirements

Potential ARAR	Description of Requirement	Preliminary Determination	Comments
Radiation Protection for Occupational Workers (10 CFR Part 835)	Specifies occupational radiation protection standards and program requirements for DOE and DOE contractor operations; requires all radiation exposure to be reduced ALARA.	Potentially applicable	These requirements, originally specified in DOE Order 5480.11, have been codified at 10 CFR Part 835.
Hazardous Materials Transportation Act, as amended by the Hazardous Materials Transportation Uniform Safety Act (49 USC 1801-1819, 49 CFR 171-174, 177)	Establishes the requirements for transportation of hazardous (including radioactive) materials, including classification, packaging, labeling, marking, shipping and placarding requirements.	Potentially applicable	Applicable to transportation of radioactive materials off-site. It is anticipated that all wastes generated during the proposed removal action will contain radioactivity concentrations below 2000 pCi/g, the threshold subject to classification as radioactive material under these transportation regulations.
New Jersey State Hazardous Materials Transportation Regulations (Title 7, New Jersey Admin. Code)	Establishes the requirements for transportation of hazardous (including radioactive) materials. Materials regulated by the Atomic Energy Act and hazardous chemicals may not be transported through the state of New Jersey without prior written approval by all authorities having jurisdiction in such matters and by the New Jersey Department of Environmental Protection.	Potentially applicable	Applicable to transportation of radioactive materials off-site. The State of New Jersey has not officially adopted the Federal Hazardous Materials Transportation Regulations, although for the most part the Federal regulations have been incorporated into the New Jersey regulations.
Uranium Mill Tailings Radiation Control Act (42 USC 2022, 40 CFR 192)	Establishes requirements for control of residual radioactive material at uranium and thorium processing or depository sites, and during site restoration, including performance criteria for control measures for contaminated soils, buildings, and groundwater, and waste management.	Potentially relevant and appropriate	Since the Maywood site is not a designated mill tailings site, these requirements are not strictly applicable; however, they are considered relevant and appropriate because of the similar nature of the contaminants and site conditions.
Occupational Safety and Health Act (29 USC 651-678): General Industry Standards (29 CFR 1910); and Safety and Health Standards (29 CFR 1926)	Establishes health and safety standards for workers at hazardous waste operations, including requirements for worker training, development of emergency response and safety and health plans, and the type of safety equipment and procedures to be followed for hazardous waste site operations.	To be considered	Since these requirements are part of an employee protection law rather than an environmental protection law, with which CERCLA response actions should comply, they are not subject to the ARAR process. However, they constitute requirements for worker protection with which the proposed action will comply. All workers involved with the proposed removal action will have completed all required training, appropriate safety equipment will be available on-site for use as needed, and all safety procedures will be strictly followed.

Table A-2. Potential Action-Specific Requirements (Cont'd)

Potential ARAR	Description of Requirement	Preliminary Determination	Comments
Radiation Protection of the Public and the Environment (DOE Order 5400.5)	Radiation exposure to any member of the public from DOE operations may not exceed 100 mrem/year effective dose equivalent above background for continuous exposure and may not exceed 500 mrem/year in any single year; further, all radiation exposures must be reduced to levels as low as reasonably achievable (ALARA).	To be considered	Although not promulgated standards, these requirements are derived from such standards and they constitute requirements for protection of the public with which the proposed action will comply. These requirements have been issued as a proposed rule to be codified at 10 CFR Part 834 (58 FR 16268), and would be potentially applicable upon final promulgation.
Radioactive Waste Management (DOE Order 5820.2A)	Specifies requirements for managing DOE radioactive waste. Radiation exposure to any member of the public resulting from management of DOE radioactive waste may not exceed 25 mrem/year effective dose equivalent.	To be considered	Although not promulgated standards, these requirements are derived from such standards and they constitute requirements for protection of the public with which the proposed action will comply.
Safety Requirements for the *Packaging and Transportation* of Hazardous Materials, Hazardous Substances and Hazardous Wastes (DOE Order 5480.3)	Establishes requirements for the packaging and *transportation of hazardous materials, hazardous* substances, and hazardous wastes. Includes package standards, operating procedures, quality assurance and testing requirements.	To be considered	Although not promulgated standards, these requirements are derived from such standards and they constitute requirements for protection of the public with which the proposed action will comply.
Environmental Protection, Safety, and Health Protection Standards (DOE Order 5480.4)	Establishes requirements for the application of mandatory environmental protections, safety, and health (ES&H) standards applicable to all DOE and DOE contractor operations.	To be considered	Although not promulgated standards, these requirements are derived from such standards and they constitute requirements for protection of the public with which the proposed action will comply.

TABLE A-3. Potential Location-Specific Requirements

Potential ARAR	Description of Requirement	Preliminary Determination	Comments
National Historic Preservation Act, as amended (16 USC 470, 40 CFR 6.301(b), 36 CFR 800)	The effect of any federally assisted undertaking must be taken into account for and district, site, building, structure, or object that is included or eligible for inclusion in the National Register of Historic Places.	No	No such properties are known to exist in the area affected by the proposed action, so no adverse impacts to such properties is expected; however, if these resources were affected, the requirement would be applicable.
Archeological and Historical Preservation Act (16 USC 469, 40 CFR 6.301(c))	Prehistorical, historical, and archeological data that might be destroyed as a result of a federal, federally assisted, or federally licensed activity or program must be preserved.	No	No adverse impacts to such data is expected to result from the proposed action; however, if these data were affected, the requirements would be applicable.
Historic Sites, Buildings, Objects, and Antiquities Act (16 USC 461-469, 40 CFR 6.301(a))	Requires federal agencies to consider the existence and location of landmarks on the National Registry of Natural Landmarks to avoid undesirable impacts on each landmark.	No	No such resources are known to exist in the area affected by the proposed action, so no adverse impacts to such resources are expected; however, if these resources were affected, the requirement would be applicable.
Fish and Wildlife Coordination Act (16 USC 661-668, 40 CFR 6.302(g), 50 CFR 27)	Requires consultation when federal department or agency proposes or authorizes any modification of any stream or other water body, and adequate provision for protection of fish and wildlife resources. Lists actions prohibited in areas belonging to National Wildlife Refuge System.	No	Proposed action does not impact any stream or other water body. Site is not in the National Wildlife Refuge System.
Endangered Species Act (16 USC 1531-1544, 50 CFR 17.402, 40 CFR 6.302(h))	Federal agencies must ensure that any action authorized, funded, or carried out by the agency is not likely to jeopardize the continued existence of any threatened or endangered species or destroy or adversely modify any critical habitat.	No	No critical habitat exists in the affected area, and no adverse impacts on threatened or endangered species are expected to result from the proposed action.
Clean Water Act, Dredge or Fill Requirements (33 USC 1251-1387, 40 CFR 230-231, 33 CFR 320-330)	Requires permits for discharge of dredged or fill material into waters of the United States, including wetlands.	No	No jurisdictional wetlands are present in the area affected by the proposed action.
Floodplain Management (Executive Order 11988, 40 CFR 6.302(b))	Federal agencies must avoid, to the maximum extent possible, any adverse impacts associated with direct and indirect development of a floodplain.	No	The area affected by the proposed action is not in a 100-year floodplain.
Protection of Wetlands (Executive Order 11990, 40 CFR 6.302(a))	Federal agencies must avoid, to the maximum extent possible, any adverse impacts associated with the destruction or loss of wetlands and the support of new construction in wetlands if a practicable alternative exists.	No	No jurisdictional wetlands are present in the area affected by the proposed action.

Table A-3. Potential Location-Specific Requirements (Cont'd)

Potential ARAR	Description of Requirement	Preliminary Determination	Comments
New Jersey Wetlands Act, and New Jersey Freshwater Wetlands Protection Act (N.J. Admin Code Title 7)	Establishes requirements for protection of the state's wetlands and for protection of the state's freshwater wetlands, respectively.	No	No jurisdictional wetlands are present in the area affected by the proposed action.
Wilderness Act (16 USC 1131; 50 CFR 35.1)	Administers federally owned wilderness areas to avoid impacts.	No	No wilderness area exists on-site or adjacent to the area affected by the proposed action.
National Wildlife Refuge System (16 USC 668, 50 CFR 27)	Restricts activities within a National Wildlife Refuge	No	No National Wildlife Refuge area exists on-site or adjacent to the area affected by the proposed action.
Scenic Rivers Act (16 USC 1271, 40 CFR 6.302(e))	Prohibits adverse impacts on a scenic river.	No	No scenic river exists on-site or adjacent to the area affected by the proposed action.
Coastal Zone Management Act (16 USC 1451)	Requires that activities within coastal zone be conducted in accordance with state-approved management program.	No	Affected area is not located in the coastal zone.