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THE MEMPHIS DEPOT
TENNESSEE

ADMINISTRATIVE RECORD
COVER SHEET

AR File Number 157

Record of Decision

for Interim Remedial Action

of the

Groundwater at Dunn Field (OU-1)

at the

Defense Distribution Depot
Memphis, Tennessee

April 1996

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Acronyms

AEHA	U.S. Army Environmental Hygiene Agency
AOC	Area of Concern
AR	Administrative Record
ARAR	Applicable or relevant and appropriate requirement
BRA	Baseline risk assessment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	*Code of Federal Regulations*
CRP	Community Relations Plan
DDMT	Defense Depot Memphis, Tennessee
DLA	Defense Logistics Agency
DNAPL	Dense non-aqueous phase liquid
DOD	Department of Defense
EE/CA	Engineering evaluation/cost analysis
EPA	U.S. Environmental Protection Agency
gpm	Gallons per minute
IRA	Interim remedial action
MCL	Maximum contaminant level
MCLG	Maximum contaminant level goal
mgd	Million gallons per day
NCP	National Oil and Hazardous Pollution Contingency Plan
NGVD	National Geodetic Vertical Datum
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
O&M	Operations and maintenance
OU	Operable unit
PCB	Polychlorinated biphenyl
PCP	Pentachlorophenol
POTW	Publicly owned treatment works
PW	Present worth
RAB	Restoration Advisory Board
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RI/FS	Remedial investigation/feasibility study
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
SWMU	Solid waste management unit
TDEC	Tennessee Department of Environment and Conservation
USATHMA	U.S. Army Toxic and Hazardous Materials Agency
UV	Ultraviolet
VOC	Volatile organic compound

Executive Summary

This Record of Decision (ROD) presents the selected interim remedial action (IRA) for DDMT in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA). In 1992, after receiving a Hazard Ranking System (HRS) score of 58.06, DDMT was placed on the National Priorities List by the Environmental Protection Agency. The selected IRA provides for hydraulic control of a contaminant plume in groundwater beneath Dunn Field. Contaminants identified as those of potential concern include volatile organic compounds, such as solvents used for cleaning mechanical parts, and metals. It is not intended as a permanent solution; however, it is intended to be compatible with the final remedy.

DDMT and the involved regulatory agencies have been working to inform the community about activities involved with the site since 1992 through press releases, mailings, newspaper ads, and public meetings.

Eight alternatives, each consisting of groundwater extraction, groundwater treatment, and disposal components, were evaluated. The alternative chosen as the preferred alternative consists of extraction on/offsite and discharge to a publicly owned treatment works (POTW). This alternative assumes that pretreatment will not be necessary before treatment at the POTW. If, however, chemical analyses indicate that pretreatment is necessary, a pretreatment provision is part of the contingency remedy.

Part 1
Declaration for the Record of Decision
Interim Remedial Action of the Groundwater
at Dunn Field [Operable Unit (OU-1)]

1.1 Site Name and Location

Defense Depot Memphis, Tennessee (DDMT)
Memphis, Shelby County, Tennessee

1.2 Statement of Basis and Purpose

This decision document (Record of Decision [ROD]) presents the selected interim remedial action (IRA) for the DDMT site, Memphis, Tennessee, developed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), 42 U.S.C. Section 9601 *et seq.*, and to the extent practicable, the National Oil and Hazardous Pollution Contingency Plan (NCP) 40 *Code of Federal Regulations* (CFR) Part 300.The DDMT is the lead agency for the remedial investigation/feasibility study (RI/FS) process for the site. The U.S. Environmental Protection Agency (EPA) and the Tennessee Department of Environment and Conservation (TDEC) are the supporting regulatory agencies for the site. In accordance with 40 CFR 300.430, the regulatory agencies have provided input during this process. The regulatory agencies are provided with a draft IRA ROD for review and their comments are incorporated into the final document. The U.S. EPA and the State of Tennessee concur with the selected interim remedy.

1.3 Assessment of the Site

Actual or threatened releases of hazardous substances from the DDMT site, if not addressed by implementing the IRA selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, and the environment.

1.4 Description of Interim Remedial Action

This IRA provides for hydraulic control of a contaminant plume in groundwater beneath Dunn Field (also called OU-1). Because the contaminated Fluvial Aquifer poses a potential threat to the deeper Memphis Sand Aquifer, it is considered as a potential threat to human health and the environment. Thus, the groundwater IRA is designed to provide a quick, interim response measure that will help prevent the possible contamination of the area's drinking water supply. As a contingency remedy, the IRA also includes a provision for pretreatment if necessary. As described in the IRA Proposed Plan contained in the Administrative Record, follow-on activities include monitoring the groundwater plume and its response to the IRA. Once the plume has been fully characterized, subsequent action may be taken to provide long-term definitive protection, including remediation of source areas. To the extent possible, the interim action will not be inconsistent with, nor preclude implementation of, the expected final remedy. RI/FS activities at OU-2, OU-3, and OU-4 will address contamination found within the southwestern quadrant, southeastern watershed and golf course, and northern portions of the Main Installation, respectively.

This IRA addresses only Dunn Field. OU-2, OU-3, and OU-4 will be addressed in the remedial documents for those OUs.

The major components of the selected IRA for OU-1 include the following:

- Evaluation of aquifer characteristics which may include installation of a pump test well
- Installation of additional monitoring wells to locate the western edge of the groundwater plume
- Installation of recovery wells along the leading edge of the plume
- Obtaining discharge permit for disposal of recovered groundwater to the T. E. Maxson Wastewater Treatment Plant publicly owned treatment works (POTW) or municipal sewer system
- Operation of the system of recovery wells until the risk associated with the contaminants is reduced to acceptable levels or until the final remedy is in place
- Chemical analysis will be conducted to monitor the quality of the discharge in accordance with the city discharge permit requirements; the permit will include parameters to be monitored and frequency.

1.5 Declaration

This interim action is protective of human health and the environment, complies with federal and state requirements that are legally applicable or relevant and appropriate, and is cost-effective. This action is interim; it is not intended as a permanent or final remedy. However, it is intended to be compatible with the permanent solution. It is not intended to be the permanent solution, and uses alternative treatment technologies to the maximum extent practical for this interim response. Because this action does not constitute the final remedy for this OU, the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volumes as a principal element has not been entirely accommodated and will be addressed at the time of the final response action. Subsequent actions are planned to address fully the threats posed by the conditions at this OU. Because this remedy will result in hazardous substances remaining onsite above health-based levels, a review will be conducted to ensure that the remedy continues to provide adequate protection of human health and the environment within 5 years after the commencement of this remedial action. Because this is an interim action ROD, review of the remedy will be ongoing as DDMT continues to develop the final remedial action for OU-1.

Christine E. Kartman — April 9, 1996

CHRISTINE E. KARTMAN
Chief, Environmental Protection and Safety Office

Date

Part 2
Decision Summary

2.1 Site Location and Description

DDMT covers 642 acres of federal land in Memphis, Shelby County, Tennessee, in the extreme southwestern portion of the state. Approximately 5 miles east of the Mississippi River and just northeast of the Interstate 240–Interstate 55 junction, DDMT is in the south-central section of Memphis, approximately 4 miles southeast of the Central Business District and 1 mile northwest of Memphis International Airport. Airways Boulevard borders DDMT on the east and provides primary access to the installation. Dunn Avenue, Ball Road, and Perry Road serve as the northern, southern, and western boundaries, respectively. The installation is surrounded by mixed residential, commercial, and industrial areas. Figure 1 shows the installation's location within the Memphis area.

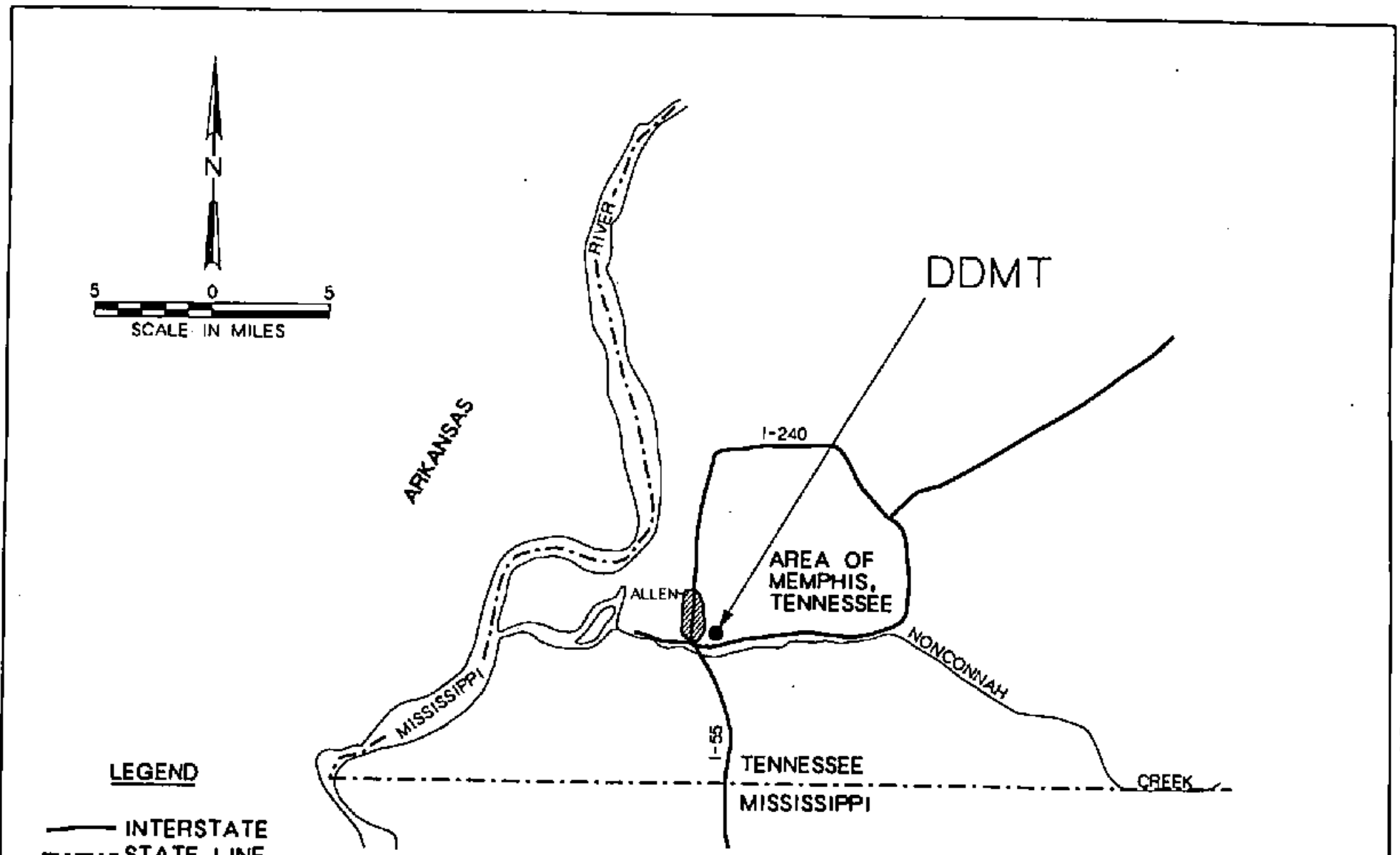
The Defense Logistics Agency (DLA), an agency of the Department of Defense (DOD), provides logistics support to military services. As a major field installation of the DLA, DDMT receives, warehouses, and distributes supplies common to all U.S. military services and some civil agencies located primarily in the southeastern United States, Puerto Rico, and Panama. Stocked items include food, clothing, electronic equipment, petroleum products, construction materials, and industrial, medical, and general supplies.

The installation contains approximately 110 buildings, 26 miles of railroad track, and 28 miles of paved streets. It has about 5.5 million square feet of covered storage space and approximately 6.0 million square feet of open storage space. The land and buildings are owned by the U.S. Army and leased by DLA. DDMT consists of two main sections: the Main Installation, which is intensely developed, and Dunn Field, an open storage area about 64 acres in size. A more detailed description of the OUs, whose current boundaries are shown in Figure 2, is found in Section 2.4.

2.2 Site History and Enforcement Activities

DDMT began operations in 1942 with the charge to inventory and supply materials for the U.S. Army. In 1964, its mission was expanded to serve as one of the principal distribution centers for a complete range of commodities.

Past activities at DDMT include a wide range of storage, distribution, and maintenance practices. Dunn Field (OU-1) has been used as a landfill area (northwestern quadrant), a storage area for mineral stockpiles (southwestern and southeastern areas), and a pistol range, and later as a pesticide storage area (northeastern area). Activities in the southwestern quadrant of the Main Installation (OU-2) have included hazardous material storage and recoupment (Building 873), sandblasting and painting activities (Buildings 1086 through 1089), and maintenance (Building 770). The southeastern portion of the Main Installation (OU-3) includes the bulk of the storage and distribution warehouses at DDMT. Other activities that are documented to have occurred in this area include the polychlorinated biphenyl (PCB) transformer storage (near Building 274), pesticide and



Source: Engineering-Science, 1993

FIGURE 1
DDMT LOCATION IN MEMPHIS METROPOLITAN AREA
Defense Depot Memphis, Tennessee

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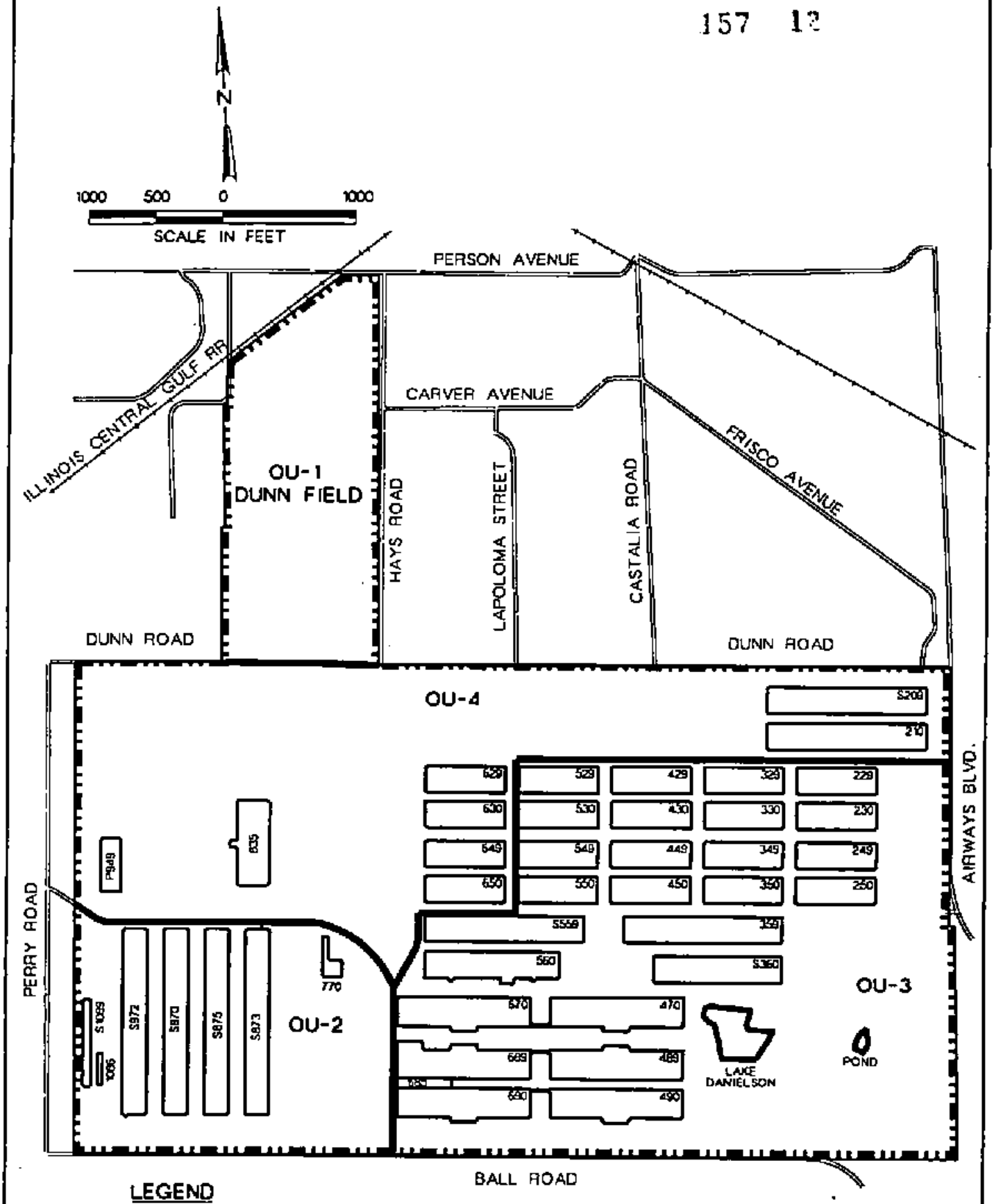

Source: Engineering-Science, 1993

FIGURE 2
OPERABLE UNIT LOCATIONS
Defense Depot Memphis, Tennessee

mwp-0023.dgn 09-MAY-1995

herbicide storage and use (several locations), and fire truck pump testing (Lake Danielson). The northern portion of the installation (OU-4) has a history of the following major activities: hazardous material storage (several locations), treatment of wood products with pentachlorophenol (PCP) (Building 737), and storage of items awaiting disposal (several locations).

Until 1970, army supplies, including hazardous and nonhazardous materials whose containers were damaged or shelf life expired, were occasionally burned or buried in a portion of Dunn Field. Wastes disposed of in this manner may have included oil and grease, paint, paint thinner, methyl bromide, pesticides, herbicides, and food supplies. Documentation indicates that most of the materials disposed of during this time period were buried in the northwestern portion of Dunn Field.

In 1981, the U.S. Army Toxic and Hazardous Materials Agency (USATHMA) prepared an installation assessment of hazardous materials disposal practices to assess potential sources of contamination. The burial sites at Dunn Field were identified and ranked as having the greatest potential for offsite migration of contaminants in groundwater.

In 1982, a hydrogeologic evaluation was conducted by the U.S. Army Environmental Hygiene Agency (AEHA) to determine groundwater quality beneath Dunn Field. Seven wells were installed in the northwestern quadrant of Dunn Field and analyzed for inorganic constituents. The results did not reflect any significant groundwater contamination from the past disposal operations.

A Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA) was performed in 1989 by A. T. Kearney to identify solid waste management units (SWMUs) and areas of concern (AOCs). To satisfy CERCLA requirements, an RI/FS was conducted in 1989 and concluded in 1990. The RI was conducted on a sitewide basis to confirm the presence or absence of contamination, to evaluate the extent and significance of detected contamination, and to provide a scientific foundation for cleanup alternatives. An RI Report was submitted to EPA in August 1990. A quantitative baseline risk assessment (BRA) was conducted as part of the RI and submitted along with the RI Report. The remedial alternatives are presented in a draft FS, which was submitted to EPA in September 1990. A final RI for the installation has not yet been accepted by either EPA or TDEC.

During the RI, monitoring wells were installed in the Fluvial Aquifer and Memphis Sand Aquifer. Several groundwater samples collected from monitoring wells around the installation contained levels above regulatory limits of volatile organic compounds (VOCs) and heavy metals. The results suggested that the groundwater contaminant plume was generally migrating to the west and northwest of Dunn Field. Later data (ESE 1994) indicates that there may be a west to southwest component. In 1992, the EPA placed DDMT on the National Priorities List (NPL).

In 1993, an *Engineering Report–Removal Action for Groundwater* (Engineering Science), was prepared for DDMT. The intent of the report was to meet all requirements of the engineering evaluation/cost analysis (EE/CA) under CERCLA and the NCP for a non-time critical removal. The report evaluated a variety of technologies, previously presented in the 1990 RI/FS, that would treat contaminated groundwater in the Fluvial Aquifer to prevent possible human exposure.

This IRA represents the first step in the remediation of the contaminated groundwater beneath the northern portion of Dunn Field (OU-1). Additional actions will be necessary to provide long-term definitive protection for OU-1.

2.3 Highlights of Community Participation

DDMT, EPA, and TDEC have made significant efforts to inform interested parties and provide input on activities associated with the site. As part of its requirements under CERCLA, DDMT has been working with the community surrounding the site since 1992. In October 1992, press releases informing the community of the NPL listing of the site were released. The Information Repository located at the Memphis/Shelby County Public Library, 1850 Peabody Avenue, Memphis, Tennessee, was established in May 1993. Two other repositories are located at the Cherokee Branch Public Library and the Memphis-Shelby County Public Health Department. A draft final *Community Relations Plan* (CRP) was issued in April 1994 and has been placed in the information repositories. On May 24, 1993, at the request of the Memphis Mayor's office, DDMT had a meeting at Corey Junior High School to discuss the restoration effort and to provide a forum for the community to express its concerns about health issues. DDMT also led a public exhibition and discussion on the restoration process on August 10, 1993. In December 1994, DDMT, EPA, and TDEC held a public meeting to discuss the start of the RI/FS.

The FS, the Proposed Plan, and the Administrative Record (AR) for the OU-1 IRA were released to the public in November 1994. These documents were made available in the AR and maintained in the repositories and in the information repository at the site. The notice of availability of these documents and the AR was published in December 1994 in the *Silver Star News*, the *Tri-State Defender*, and the *Commercial Appeal*. A public comment period was held from December 4, 1994, to January 17, 1995. In addition, a public meeting was held on December 20, 1994. At this meeting, representatives from DDMT, EPA, and TDEC answered questions about problems at the site and the remedial alternatives under consideration, including the IRA. Responses to the comments received during this comment period are presented in the responsiveness summary in Part 3 of this document.

The Technical Review Committee, established in February 1994, was converted to a Restoration Advisory Board (RAB) in July 1994. The RAB consists of representatives from the Memphis area community and from the state and federal government, and meets on a monthly basis to discuss activities associated with DDMT. After each meeting, meeting minutes are distributed to board members.

In addition to the RAB, newsletters are prepared on a quarterly basis and disseminated to approximately 3,000 individuals. The mailing list of 3,000 was established from the response to an initial mailing to 20,000 individuals within a 1-mile radius of DDMT in October 1994, the response to newspaper advertisements, and from the existing DDMT mailing list. Factsheets are also completed and distributed whenever new or additional restoration activities occur at DDMT. A hotline (901-775-4569) was established in February 1994 to assist local citizens or other interested parties in obtaining information concerning the environmental restoration activities at the site.

2.4 Scope and Role of Operable Units

Because of the size of the installation (642 acres) and its complexity, DDMT, EPA and TDEC have organized the work at this site into the four OUs, which are discreet parts of an entire response action. Figure 2 shows the location and areal extent of the OUs.

Dunn Field, which is the only area on DDMT where burial of waste is known to have occurred, is designated OU-1. Substances found in OU-1 probably resulted from use of the area for landfill operations, mineral stockpiles, pistol range use, and pesticides storage.

The Main Installation is divided into three other OUs. OU-2, in the southwestern quadrant, is an area where maintenance and repair activities have occurred. Potential contamination of OU-2 may have resulted from spills or releases from the hazardous material storage and repouring area, or sandblasting and painting activities. OU-3 includes the Golf Course Pond, Lake Danielson, and former transformer and pesticide storage areas. Storage of PCBs and the use of pesticides and herbicides are potential sources of contamination for OU-3. OU-4, in the north-central area, is mainly characterized by the presence of the main hazardous materials storage building at DDMT. Principal contamination in OU-4 probably resulted from a wood treatment operation and hazardous material storage.

Because the contaminated groundwater beneath Dunn Field poses a potential threat to the drinking water aquifer, it is considered a possible threat to human health and the environment. Thus, the objective of the groundwater IRA is to provide a quick response measure that will help prevent the possible contamination of the area's drinking water supply. Follow-on activities include characterizing and monitoring the groundwater plume migration. Once the plume has been characterized, subsequent action may be taken to provide long-term definitive protection, including remediation of source areas. To the extent practicable, the interim action will be consistent with any planned future actions.

The IRA addresses contamination of groundwater beneath Dunn Field from past disposal practices at DDMT. The IRA represents the first step in the remediation of the contaminated groundwater beneath the northern portion of Dunn Field. The remainder of OU-1 and OUs-2, 3, and 4 will be evaluated later and will be addressed in future documents.

2.5 Summary of Site Characteristics

The major site characteristics presented in the RI/FS that are applicable to OU-1 are summarized below.

2.5.1 Physiography

DDMT is situated within the Gulf Coastal Plan subdivision of the Atlantic Coastal Plain Physiographic Province. The area is characterized by dissected loess-covered uplands and generally lacks distinct features.

Dunn Field lies just north of the Main Installation and Dunn Avenue, and consists of approximately 64 acres of undeveloped land. Most of Dunn Field is unpaved. About one-half of the area is grassed; the remaining area contains crushed rock and bauxite and fluorspar piles. Several large hardwood trees are present in the northeastern part of the field. The southwestern quadrant of the field is a grassed, gently sloping area. The southeastern quadrant is a level zone used for both covered and uncovered bulk materials storage (bauxite and fluorspar).

Dunn Field's topography is a level-to-gently rolling terrain which has been somewhat altered by past activities of heavy equipment operators. The land appears to slope to the west from the bauxite piles in the center of the field. An arc-shaped ridgeline separates the field's two northern quadrants. In the northeastern quadrant of the field, the areas surrounding the former pistol range (later used as a pesticide/herbicide storage shed [Building 1184]) and the former burn area are level and grassed. The northwestern quadrant of the field (the portion used for burial of waste materials) is a level-to-gently sloping grassed area. Surface elevations range from a low of 273 ft, National Geodetic Vertical Datum of 1929 (NGVD), at the north outfall/installation boundary fenceline to 315 ft NGVD in the field's approximate center. Maximum local relief is about 25 ft at the pistol range bullet stop.

Installation surface drainage is accomplished by overland flow to swales, ditches, concrete-lined channels, and an efficient storm drainage system. Most of DDMT is generally level with, or above, surrounding terrain; therefore, DDMT receives little or no runoff from adjacent areas. Most Dunn Field drainage is achieved by overland flow to the adjacent properties to the north and west. The northeastern quadrant drains east to a concrete-lined channel, or to adjacent properties to the north. The concrete-lined channel consists of two separate segments that join approximately 200 ft north of Building 1184.

Both channel segments convey adjacent residential neighborhood storm water through the northeastern quadrant of Dunn Field. The concrete-lined channel directs flow northward to Cane Creek, which drains into Nonconnah Creek at a point several miles southwest of DDMT. Nonconnah Creek drains into Lake McKellar, a Mississippi River tributary.

Runoff from the northwestern quadrant flows overland to a roadside ditch along Kyle Street (northwestern boundary of the installation). The remainder of the runoff flows overland to the west onto neighboring properties outside of DDMT.

2.5.2 Hydrogeology

The Dunn Field area of DDMT is covered by a loess deposit, which is a semi-cohesive windblown deposit of silt, silty sand, and silty clay. The loess is about 20 ft thick in the vicinity of Dunn Field and may occasionally reach 30 ft in thickness. Although the loess is not typically a water-bearing zone, seasonal perched groundwater may occur. The extent of this potential perched zone is unknown. There is no evidence that the loess produces water to wells in the DDMT vicinity. The loess is underlain by the Fluvial Deposits, the Jackson Formation/Upper Claiborne Group, and the Memphis Sand.

The Fluvial Deposits consist of a top layer of silty clay, silty sand, or clayey sand; a clean, fine to medium-grained sand; and a basal gravelly sand. The thickness of the Fluvial Deposits in Dunn Field ranges from 50 to 70 ft. This unit forms the shallow aquifer in the vicinity of Dunn Field and receives recharge from rainfall infiltration and lateral groundwater inflow. Discharge is toward the Mississippi River to the west and possibly by leakage into the underlying Memphis Sand Aquifer through the Jackson Formation/Upper Claiborne confining bed. Data collected from the site suggests that groundwater in the Fluvial Aquifer is moving generally toward the west in the Dunn Field area.

Below the Fluvial Deposits is the Jackson Formation and Upper Claiborne Group consisting of stiff gray or orange plastic, lean to fat lignitic clay, silt, and fine sand with minor lenses of lignite. This stratigraphic unit reaches thicknesses of approximately 80 ft and forms a regional confining bed separating the Fluvial Deposits and the underlying Memphis Sand Aquifer. Although no areas of hydraulic connection have been confirmed in the vicinity of DDMT to date, investigations are underway to verify the existence of a potential interconnection.

At Dunn Field, the top of the Memphis Sand Aquifer is about 160 ft below ground level along the western property line and approximately 140 ft below ground level along the eastern property line. The formation is composed of thin-bedded, white to brown or gray, very fine grained to gravelly, partially argillaceous and micaceous sand. The aquifer ranges in thickness from 500 to about 900 ft and is under confined conditions.

The Memphis Light, Gas, and Water Division operates eight well fields that extract water from the Memphis Sand for municipal supply. The Allen Well Field is located 1 to 2 miles west of DDMT. A potentiometric surface map, (Park 1990, plate 3) indicates that groundwater flow in the Memphis Sand Aquifer beneath DDMT is toward the West.

2.5.3 Groundwater Contamination

Chemicals of potential concern identified in Dunn Field monitoring wells screened in the Fluvial Aquifer include the following:

Volatile Organic Compounds

Carbon tetrachloride	1,1-Dichloroethylene
1,2-Dichloroethylene	Tetrachloroethylene
1,1,2,2-Tetrachloroethane	Trichloroethylene

Metals

Arsenic	Barium
Chromium	Lead
Nickel	

The highest concentration of constituents detected in the groundwater samples collected from the Fluvial Aquifer wells are presented in Table 1. To date, constituents of concern in the Fluvial Aquifer have not been detected in Memphis Sand Aquifer groundwater samples in the vicinity of the site.

The constituents of concern found in the Fluvial Aquifer beneath Dunn Field occur at concentrations above the established maximum contaminant levels (MCLs) and maximum contaminant level goals (MCLGs). A comparison of MCLs and MCLGs with the data from the RI is presented in Table 1.

Over the course of 3 sampling efforts conducted at Dunn Field (1989, 1990, and 1992), volatile organics were detected above MCLs in 22 out of 35 Fluvial Aquifer groundwater samples. Metals concentrations above MCLs were detected in 25 out of 35 groundwater samples collected during this time period.

2.6 Summary of Site Risks

In 1990, as part of the RI/FS, a preliminary risk assessment was performed in accordance with EPA guidance available at that time. Potential exposure points for contaminated groundwater from Dunn Field were identified as the following:

- Ingestion of groundwater through the public water supply
- Contact with potable water during bathing
- Inhalation of vapors from VOCs in potable water during household use

Table 1
Comparison of Constituents to Standards
in Dunn Field Groundwater

Constituent	MCL (µg/L)	RI Phase I Highest Levels 1989 (µg/L)	RI Phase II Highest Levels 1990 (µg/L)
Volatile Organic Compounds			
1,1-Dichloroethene	7	130 (MW-10)	160 (MW-10)
1,2-Dichloroethene (total)	70	520[3] (MW-11)	510[3] (MW-12)
Tetrachloroethene	5	210 (MW-5)	240[3] (MW-10)
Trichloroethene	5	1,700[3] (MW-12)	5,100[3] (MW-12)
Carbon tetrachloride	5	77 (MW-6)	40 (MW-6)
Metals			
Arsenic	50	85 (MW-10)	210 (MW-14)
Barium	2,000[1]	3,740[4] (MW-14)	1,900 (MW-10
Chromium	50	1,240[4] (MW-7)	340 (MW-7)
Lead	15[2]	653[4] (MW-10)	1,000 (MW-10)
Nickel	100	602[4] (MW-7)	170 (MW-7 & 10)

Source: Environmental Science, Inc., 1993.

Notes:
[1]Maximum contaminant level goals (MCLGs)
[2]Action level
[3]Identified in the analysis from a secondary dilution factor
[4]Spiked sample recovery not within control limits

Abbreviations:
µg/L = Micrograms per liter
MW = Monitoring well

The transport medium and exposure pathway for the exposure scenarios identified above all relate to groundwater. Contaminants can potentially leach from materials associated with past disposal activities at Dunn Field. Several of these contaminants are already present in the Fluvial Aquifer as a result of dispersion and infiltration. The Fluvial Aquifer, which is not used as a potable water supply, potentially recharges the Memphis Sand Aquifer by leakage. This potential leakage could provide a pathway for contaminants to the deeper Memphis Sand Aquifer, the drinking water aquifer for the City of Memphis. A conceptual site model is shown in Figure 3.

The Allen Well Field, located approximately 1 mile south of Dunn Field, is one of eight pumping centers serving the Memphis area. With 35 wells, the Allen Well Field pumps roughly 21 million gallons a day (mgd) of potable water from the Memphis Sand Aquifer and accounts for approximately 15 percent of the water used within the Memphis area. Contamination of the Memphis Sand Aquifer caused by leakage from the contaminated Fluvial Aquifer could occur, thus directly affecting the Memphis water supply source.

Results of the preliminary risk assessment indicate that there is a potential public health risk associated with the Fluvial Aquifer groundwater. Actual or threatened releases of hazardous constituents from Dunn Field, if not addressed by the preferred IRA, may present a current or potential threat to public health, welfare, or the environment.

The principal goals of this groundwater IRA are to incrementally remove contaminants from the Fluvial Aquifer, to decrease risk by mitigating the spread of constituents toward the Allen Well Field, and to create a hydraulic barrier to prevent contamination in the Fluvial Aquifer at Dunn Field from reaching the Allen Well Field.

Although the IRA is not anticipated to achieve compliance with MCLs, it is consistent with the objective to protect the Memphis Sand Aquifer. Long-term operation of a groundwater removal system will help to achieve MCLs by incrementally removing contaminants.

The more specific findings of the BRA will be included in the final action ROD for OU-1, along with the ultimate cleanup objectives. No changes were made to the preferred alternative as presented in the Proposed Plan.

2.7 Description of Alternatives

Eight alternatives were evaluated for addressing the groundwater contamination beneath Dunn Field. These alternatives are listed in Table 2. Each of the alternatives consist of three elements—groundwater extraction, groundwater treatment, and disposal. Extraction option alternatives range from no action to installation of deep wells on- and offsite.

Treatment possibilities range from none to air stripping or ultraviolet (UV)/oxidation of metals. Groundwater disposal options range from none to discharge to surface drainage, discharge to the municipal sewer system, or reinjection into onsite wells. These alternatives are described in greater detail in the following paragraphs. Cost analyses provided are based on 1990 dollars and may represent a substantial cost increase by the time implementation begins.

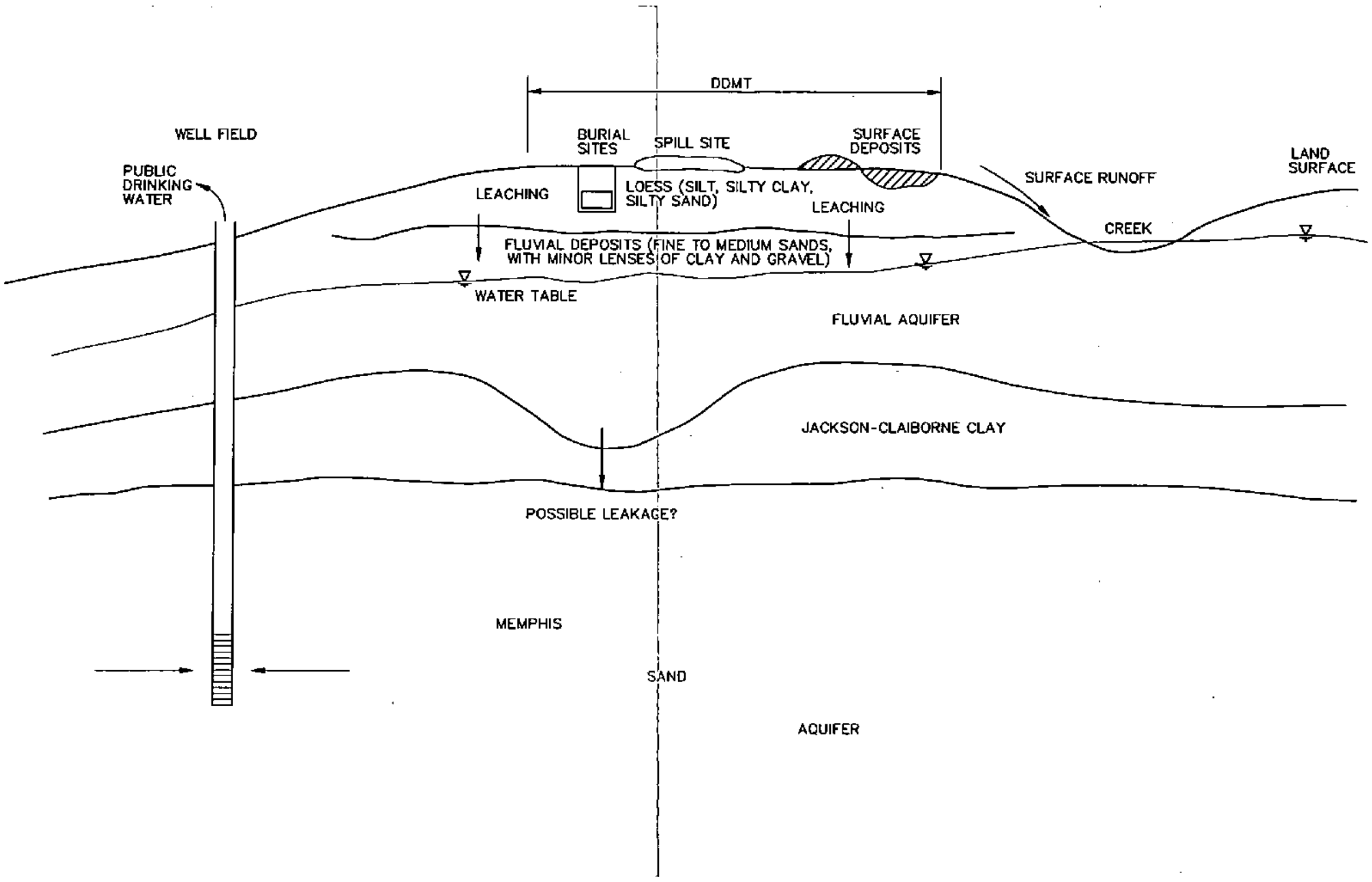
DDMT
WELL FIELD
BURIAL SITES
SPILL SITE
SURFACE DEPOSITS
LAND SURFACE
PUBLIC DRINKING WATER
LEACHING
LOESS (SILT, SILTY CLAY, SILTY SAND)
SURFACE RUNOFF
LEACHING
CREEK
FLUVIAL DEPOSITS (FINE TO MEDIUM SANDS, WITH MINOR LENSES OF CLAY AND GRAVEL)
WATER TABLE
FLUVIAL AQUIFER
JACKSON-CLAIBORNE CLAY
POSSIBLE LEAKAGE?
MEMPHIS
SAND
AQUIFER

Table 2
Alternatives for Interim Remediation

Alternative	Extraction	Treatment	Disposal
1	No Action	None	None
2	Wells onsite	Air stripping with metals removal if necessary	Municipal sewer
3	Wells on- and offsite	Air stripping with metals removal if necessary	Municipal sewer
4	Wells onsite	Air stripping with metals removal if necessary	Municipal sewer
5	Wells onsite	Air stripping with metals removal if necessary	Surface drainage
6	Wells onsite	Air stripping with metals removal if necessary	Surface drainage
7	Wells onsite	Air stripping with metals removal if necessary	Reinjection upgradient onsite
8 (preferred)	Wells on- and offsite	None	Municipal sewer

Alternative 8 is the preferred alternative.

2.7.1 Alternative 1: No Action

Capital Costs: N/A
Annual O&M Costs: N/A
Present Worth (PW): N/A

The no action alternative is carried out through the screening process as required by the NCP. The no action alternative assumes no further action at the site and is used as a baseline to measure the other alternatives. Under this alternative, no action would be taken in terms of containment and treatment of the groundwater plume. Groundwater contamination would remain and continue to migrate.

2.7.2 Alternative 2: Extraction Onsite, Air Stripping, and Discharge to POTW

Capital Costs: $600,000
O&M: $270,000
PW: $6,000,000

The groundwater extraction system for Alternative 2 consists of eight wells located in Dunn Field. The wells would be located to extract groundwater from the most contaminated portion of the plume, according to existing data. The groundwater would be removed from the eight wells and stored in a holding tank.

The extracted groundwater would be pumped from the holding tank to an air stripping tower for removal of VOCs. The use of a carbon treatment system will be dependent on the concentration of VOCs in the air stream. Removal of heavy metals, if necessary, would be performed after VOC treatment. The treated groundwater would be released into the local sewer system, where it would be treated at the POTW.

2.7.3 Alternative 3: Extraction On/Offsite, Air Stripping, and Discharge to POTW (Contingent Alternative)

Capital Costs: $600,000
O&M: $230,000
PW: $5,200,000

The pumping and treatment system for Alternative 3 is similar to Alternative 2 except for the placement and pumping rate of the wells. Like Alternative 2, this alternative has eight extraction wells, but with different locations. Two of the wells are located west of Dunn Field, downgradient of the property boundary, with the remainder on DDMT property. Alternative 3 would provide greater capture of the contaminated groundwater offsite. The treatment and handling of the groundwater would be similar to Alternative 2.

2.7.4 Alternative 4: Extraction Onsite, UV/Oxidation, and Discharge to POTW

Capital Costs: $830,000
O&M: $300,000
PW: $6,900,000

The extraction well system would be identical to Alternative 2. The extracted groundwater would be treated by a UV/oxidation process using ultraviolet light, ozone, and hydrogen peroxide to break down the VOCs into carbon dioxide, water, and inorganic chlorides. Treatment for heavy metals, if needed, would follow UV/oxidation. The treated water would be discharged to the POTW.

2.7.5 Alternative 5: Onsite Extraction, Air Stripping, and Discharge to Surface Drainage Channel

Capital Costs: $470,000
O&M: $130,000
PW: $3,100,000

The extraction and treatment system of Alternative 5 is identical to Alternative 2. However, the treated water would be discharged into the existing surface water drainage system rather than to the POTW. Surface drainage channels exit from the northern and western boundaries of Dunn Field. Both of these channels terminate at Cane Creek, located north of Dunn Field. A National Pollutant Discharge Elimination System (NPDES) permit would be required before discharge would be allowed.

2.7.6 Alternative 6: Extraction Onsite, UV/Oxidation, and Discharge to Surface Drainage Channel

Capital Costs: $660,000
O&M: $160,000
PW: $3,900,000

Alternative 6 is similar to Alternative 4, except that the treated groundwater would be discharged into the surface water drainage system discussed in Alternative 5.

2.7.7 Alternative 7: Extraction Onsite, Air Stripping, and Reinjection to Onsite Wells

Capital Costs: $500,000
O&M: $150,000
PW: $3,500,000

Alternative 7 would extract groundwater from six wells on government property. The extracted water would be treated by air stripping (similar to the treatment method in Alternative 2), and treated for heavy metals, if needed. The treated water would be reinjected into the Fluvial Aquifer upgradient from the extraction wells at Dunn Field. Reinjection would be completed using four injection wells located on the eastern side of Dunn Field. Pumps and piping would have to be installed to transmit the water from the treatment site to the eastern side of Dunn Field.

2.7.8 Alternative 8: Extraction On/Offsite, and Discharge to POTW (Preferred Alternative)

Capital Costs: $500,000
O&M: $250,000
PW: $5,600,000

Alternative 8 is the preferred alternative and is a hybrid of Alternative 3. However, unlike Alternative 3, Alternative 8 places most of the groundwater recovery wells offsite along the leading edge of the plume. This placement will be more effective in protecting the Memphis Sand Aquifer from contaminants in the Fluvial Aquifer at OU-1. Additionally, this alternative does not assume that pretreatment before discharge will be required making it a less expensive alternative. However, this alternative uses the treatment component of Alternative 3 as a contingency should pretreatment be required.

Alternative 8 would be used to contain the contaminated groundwater by inducing a hydraulic barrier. The hydraulic barrier will be achieved by pumping the groundwater from the containment wells placed along the leading edge of the plume. The leading edge of the plume will be located as part of the RI activities planned for OU-1. Data gathered during the OU-1 RI will be used to locate the leading edge of the plume. Leading edge identification and containment of the plume will be achieved in the following manner:

- A groundwater recovery well will be installed onsite in the middle of the plume to establish aquifer characteristics.
- Additional monitoring wells will be installed to establish the western edge of the contaminant plume. The western edge will be established when samples from these wells are uncontaminated.
- After the aquifer characteristics are established and the leading edge of the plume is identified, additional groundwater recovery wells will be installed as appropriate to contain the plume. These wells are located along the leading edge of the plume and screened in the Fluvial Aquifer down to the confining clay layer of the Memphis Sand Aquifer.

The groundwater and the associated contamination will be captured by the recovery wells (see Figure 4). Calculations and modeling are performed to ensure that the zone of recovery from each well overlaps. The spacing and pumping rate of the wells will be such that the contamination should not move beyond the line of wells. Once the recovery wells are operating, the system will be checked frequently (by comparing field data with predicted model results) and any necessary adjustments made (including the installation of additional recovery wells, if needed) to verify that the plume is contained.

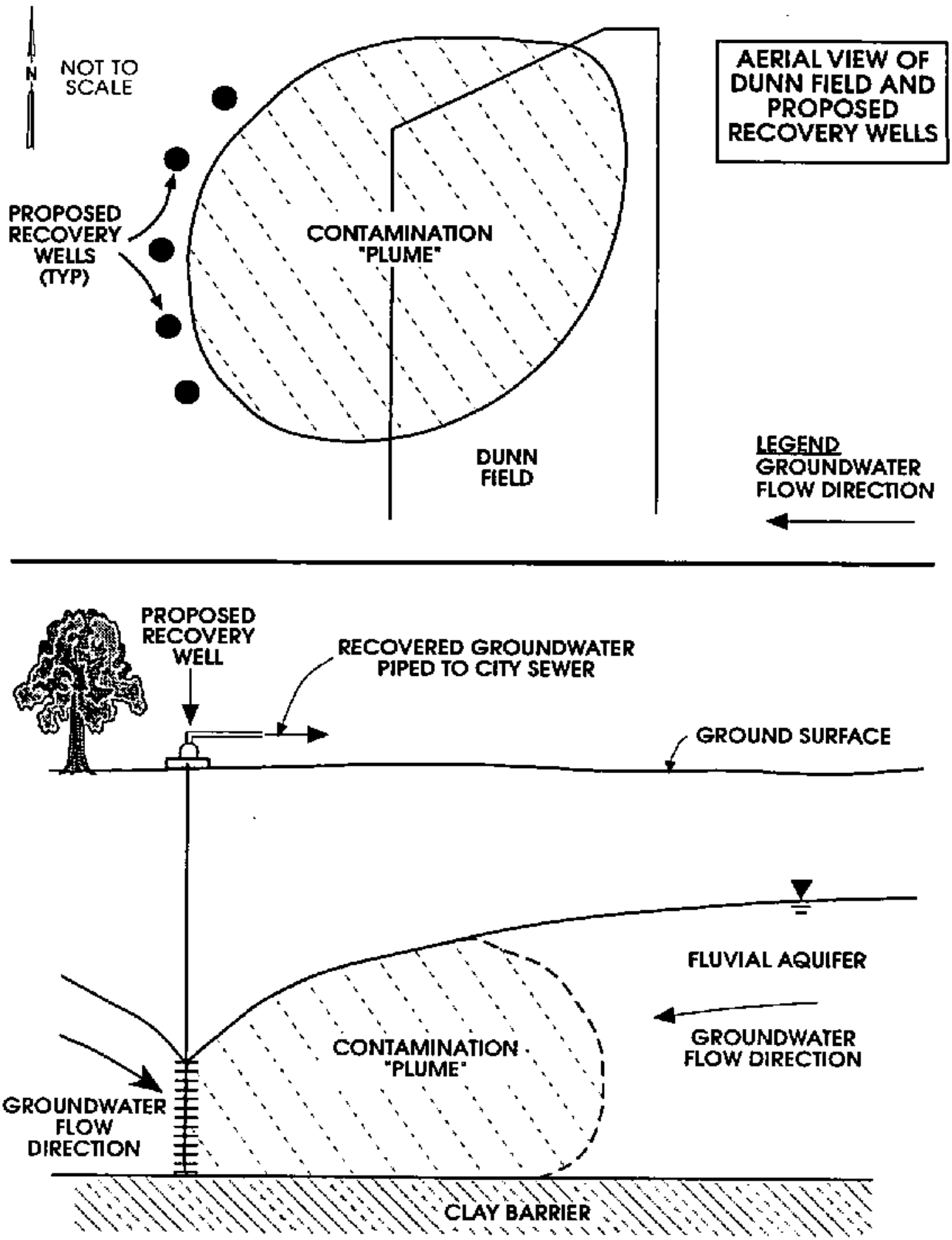

FIGURE 4
PROPOSED GROUNDWATER RECOVERY SYSTEM (OU-1)
Defense Depot Memphis, Tennessee

5-9-95 SRE70348.WP

DDMT will obtain a discharge permit to allow the groundwater pumped from the wells to be discharged into the municipal sewer system or POTW. The discharge permit will set maximum levels for groundwater constituent concentrations. If the extracted groundwater exceeds these limits, the treatment contained in Alternative 3 will be used. The cost of Alternative 8, without the use of a contingency treatment remedy, assumes that the groundwater will meet the City's permit limits and that no treatment will be needed.

2.8 Summary of the Comparative Analysis of Alternatives

This section of the interim ROD provides the basis for evaluating which alternative (a) meets the threshold criteria of overall protection of human health and the environment, EPA and TDEC approval, and compliance with applicable or relevant and appropriate requirements (ARARs); (b) provides the best balance with respect to effectiveness, reduction of toxicity, mobility, or volume through treatment, implementability, and cost; and (c) satisfies community acceptance.

Federal law requires that nine criteria be used for evaluating the anticipated performance of remedial actions. The nine criteria are described below, followed by an analysis of the degree to which each alternative satisfies the criteria:

1. Overall Protection of Human Health and Environment—Assesses degree to which alternative eliminates, reduces, or controls health and environmental threats through treatment, engineering methods, or institutional controls.

2. Compliance with ARARs—Assesses compliance with federal and state requirements.

3. Long-Term Effectiveness—Degree to which a remedy can maintain protection of health and the environment once cleanup goals have been met.

4. Reduction of Toxicity, Mobility, or Volume Through Treatment—Refers to expected performance of the treatment technologies to lessen harmful nature, movement, or amount of contaminants.

5. Short-Term Effectiveness—Length of time for remedy to achieve protection and potential effects of construction and implementation of a remedy.

6. Implementability—Refers to the technical feasibility and administrative ease of a remedy.

7. Cost—Weighing the benefits of a remedy against the cost of implementation.

8. State Acceptance—Consideration of the state's opinion of the preferred alternative.

9. Community Acceptance—Consideration of public comments about the preferred alternative and about the proposed plan.

These nine criteria can be categorized into three groups. The first and second categories are threshold criteria. The chosen alternative must meet the threshold criteria to be eligible for selection. The third, fourth, fifth, sixth, and seventh criteria are considered the primary balancing criteria. The final two criteria are termed the modifying criteria and are evaluated after issuance of the Proposed Plan for public review and comment.

2.8.1 Analysis

2.8.1.1 Threshold Criteria

Overall Protection of Human Health and Environment. The preferred interim action would contain the contamination plume and prevent it from migrating while removing a portion of the contaminated groundwater. Because the plume is believed to have migrated offsite, the preferred alternative must have extraction wells located offsite. The wells in Alternatives 2, 4, 5, 6, and 7 are located onsite and would not sufficiently contain the plume. This lack of containment would lead to further environmental effects and would be a continual threat to human health. Alternative 1 offers no protective measures for human health and the environment.

Alternatives 3 and 8 offer adequate degrees of protection by reducing and controlling the risks through removal and containment. Alternatives 1, 2, 4, 5, 6, and 7 are not options for this site because they do not adequately reduce the risks associated with the contaminated groundwater.

Compliance with ARARs. Under the preferred alternative, groundwater will be discharged to the POTW. Compliance issues are further discussed in Section 2.10.

2.8.1.2 Primary Balancing Criteria

Long-Term Effectiveness and Performance. Alternatives 3 and 8 should be effective in reducing long-term contaminated groundwater levels and associated health risks. Because of residual contamination, the size of the aquifer, and inherent complexities, it may not be possible to completely remediate the aquifer to its original condition using technology currently available. Additional actions will be necessary to provide long-term definitive protection for OU-1.

Reduction of Toxicity, Mobility, or Volume of the Contaminants through Treatment. The toxicity and volume of the contaminated groundwater would be reduced by the groundwater extraction in Alternatives 3 and 8. Mobility of the contamination plume would be restricted by the physical forces of the groundwater extraction. This hydraulic barrier should prevent lateral and vertical movement of the contaminated groundwater, thus reducing the threat to the Memphis Sand Aquifer.

Short-Term Effectiveness. Groundwater removal should contain the groundwater contamination plume fairly rapidly and help to reduce further lateral contamination migration. Implementing the preferred alternative would result in a reduction of the potential effects to nearby residents from contaminants at Dunn Field.

Implementability. The groundwater recovery systems will be relatively simple to implement. The technology and processes have been reliably demonstrated. Equipment and materials are readily available. However, as previously stated, the Fluvial Aquifer and the contaminated groundwater plume will have to be further characterized.

Cost. The cost analysis in Alternative 3 includes the cost of well installation and O&M cost of the air stripper. The capital costs are estimated at $600,000, O&M costs at $230,000 and present worth cost at $5,200,000.

The cost of Alternative 8 is based on the installation of eight recovery wells. This cost estimate assumes a quarterly sampling plan to ensure that the system is operating efficiently and that no prior treatment before discharge will be required. However, because of the uncertainties associated with groundwater recovery, additional wells may be required that would affect the estimated cost. Additionally, the cost of Alternative 8 does not include pretreatment costs. For Alternative 8, the capital costs are estimated at $500,000, O&M costs at $250,000 and present worth cost at $5,600,000.

2.8.1.3 Modifying Criteria

State Acceptance. DDMT has been actively working with TDEC throughout the cleanup process. TDEC supports this approach. However, information obtained during the RI may suggest other alternatives that would involve the concurrence of the state.

Community Acceptance. Community response to the alternatives is presented in the responsiveness summary, which addresses comments received during the public meeting and the public comment period.

2.9 Summary of Selected Remedy

Through consideration of the requirements of CERCLA, the NCP, the detailed analysis of alternatives and public and state comments, DDMT has selected an interim remedial action for OU-1. Of the eight alternatives reviewed, only two were considered viable

options. Because "no action" does not address or rectify the problem and Alternatives 2, 4, 5, 6, and 7 do not contain the contamination plume, they are not considered appropriate. The preferred alternative is Alternative 8, which is a hybrid of Alternative 3. However, Alternative 8 puts more emphasis on plume containment and does not assume that pretreatment before discharge will be required making it a less expensive alternative. The placement of groundwater recovery wells in Alternative 8 will be more effective in protecting the Memphis Sand Aquifer from contaminants in the shallow aquifer at OU-1.

If chemical analysis indicate that treatment is required before discharge, the treatment option contained in Alternative 3 (the contingency remedy) will be used. The preferred alternative for the IRA of the contaminated groundwater below Dunn Field is Alternative 8—on/offsite extraction and POTW disposal. The criteria used to determine whether the contingency remedy is implemented are the discharge limitations established in the City of Memphis' discharge permit.

On the basis of current information, this alternative appears to offer the most reasonable approach for the protection of the drinking water supply and containment of the plume. Currently, groundwater recovery is the only appropriate alternative to contain the plume. This alternative represents an interim action and is intended only to stabilize the site and to prevent further degradation. However, with the additional information that will be collected during the RI, other alternatives may become available. No conditions are currently foreseen where the interim action will be inconsistent with, or preclude implementation of, the final remedy.

The approach used to design and implement the preferred alternative will consist of the following:

- Establishing the conditions that are believed to exist on the basis of available information. Design will be based on expected conditions.
- Establishing, in advance, conditions that are reasonable deviations from the probable conditions.
- Implementing the base design and monitor conditions.
- Implementing contingent designs as warranted by monitoring.

This approach is referred to as the observational method. The approach recognizes and manages uncertainties inherent in groundwater remediation. Table 3 illustrates the planned approach for managing uncertainties associated with the implementation of this remedial action.

The observational method will be used during design and implementation and is not part of the selection process for the IRA alternative. If changes to the selected remedy are required, based on information obtained through the observational approach, then the public will be made aware of these changes either through a fact sheet, explanation of significant differences, or ROD Amendment.

Table 3
Observational Method for Dunn Field Groundwater Remediation

Probable Condition*	Reasonable Deviation*	Parameters to Observe	Contingency Plan
8 recovery wells needed	12 recovery wells needed	Capture zone extent. Observe water levels in monitoring wells.	Install additional wells.
Pump at 75 gpm	Pump at 125 gpm	Capture zone extent. Observe water levels in monitoring wells.	Pump at increased rate; provide adequate sewer capacity.
Groundwater meets City discharge limits	Limits not met	Permit parameters	Provide groundwater treatment.
Plume extends 600 ft west of Dunn Field	Plume extends 1,200 ft west of Dunn Field	Data from RI monitoring wells	Locate recovery wells at western extent of plume.

*Will be updated as additional information becomes available.
gpm—Gallons per minute

2.10 Statutory Determinations

DDMT, EPA, and TDEC concur that the extraction system (with the potential for pretreatment, if necessary) will satisfy the CERCLA § 121 (b) statutory requirements of: providing protection of human health and the environment, attaining applicable or relevant and appropriate requirements directly associated with this action, being cost-effective, using permanent solutions and alternative treatment technologies to the maximum extent practicable, and including a preference for treatment as a principal element.

2.10.1 Protection of Human Health and the Environment

Although the groundwater within the contaminated plume is not currently used as a source of drinking water for the local residents, under future or other potential exposure scenarios it presents a potential threat to human health and the environment. The interim

action remedy initiates protection of human health under the exposure scenarios through mitigation of the spread of the plume and removing a portion of the contaminated groundwater until a final action is determined. The remedy also provides protection to the environment by providing the option of treatment of the extracted groundwater before discharge, and effective management of all residual wastes generated during implementation of the action.

The final cleanup levels for the groundwater are not addressed in this interim action record of decision (ROD) because such goals are beyond the limited scope of this action. The final cleanup levels will be addressed by the final remedial action ROD for the site.

2.10.2 Compliance with ARARs

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 was passed by Congress and signed into law on December 11, 1980 (Public Law 96-510). The act was intended to provide for "liability, compensation, cleanup, and emergency response for hazardous substances released into the environment and the cleanup of inactive waste disposal sites." The Superfund Amendments and Reauthorization Act (SARA), adopted on October 17, 1986 (Public Law 99-499), did not substantially alter the original structure of CERCLA, but provided extensive amendments to it. In particular, § 121 of CERCLA specifies that remedial actions for cleanup of hazardous substances must comply with requirements or standards under federal or more stringent state environmental laws that are applicable or relevant and appropriate to the hazardous substances or particular circumstances at a site.

A listing of applicable or relevant and appropriate requirements (ARARs) (chemical-specific, location-specific, and action-specific) are provided in Tables 4, 5, and 6 of this document. Discharge to the publicly owned treatment works (POTW) will be subject to both the substantive and administrative requirements of the national pretreatment program and all applicable state and local pretreatment regulations (Tables 4, 5, and 6). Should treatment be required prior to discharge to the POTW, Alternative 3 will be implemented as a contingency to provide groundwater treatment.

Alternative 3 uses an air stripper for the removal of volatile organic compounds (VOCs) from the extracted groundwater. Air stripping is a viable treatment process for removal of VOCs from water and will be used if treatment for VOCs is required.

2.10.2.1 Chemical-specific ARARs

The principal contaminants of concern in the groundwater plume west of Dunn Field are presented in Table 1. Chemical-specific ARARs are shown in Table 4.

The City of Memphis Sewer Use Ordinance (March 1993) establishes maximum effluent standards for discharge of wastewater into the municipal sewerage system (Table 7). Daily average maximum and instantaneous maximum concentrations are provided for

Table 4
Preliminary Identification of Potential Chemical-specific ARARs for DDMT

Actions*	Requirement	Prerequisites	Citation	ARAR	Comments
Discharge to POTW*	Treatment of pollutants that could pass through the POTW without treatment, interfere with POTW operation, or contaminate POTW sludge is required.		40 CFR 403.5 See Table 6	Applicable	If any liquid is discharged to a POTW, these requirements are applicable. In accordance with guidance, a discharge permit may be required even for an onsite discharge, because permitting is the only substantive control mechanism available to a POTW.
	Specific prohibitions preclude the discharge of pollutants to POTWs that: • Create a fire or explosion hazard in the POTW • Are corrosive (pH < 5.0) • Obstruct flow resulting in interference • Are discharged at a flow rate and/or concentration that will result in interference • Increase the temperature of wastewater entering the treatment plant that would result in interference, but in no case raise the POTW influent temperature above 104°F (40°C) Discharge must comply with the local POTW pretreatment program, including POTW-specific pollutants, spill prevention program requirements, and reporting and monitoring requirements.		40 CFR 403.5 and local POTW regulations		Categorical standards have not been promulgated for CERCLA sites, so discharge standards must be determined on a case-by-case basis, depending on the characteristics of the waste stream and the receiving POTW. Some municipalities may have published standards for non-categorical, non-domestic discharges. Changes in the composition of the waste stream due to pretreatment process changes or the addition of new waste streams may require renegotiation of the permit conditions. Local (City of Memphis) requirements for discharge to a POTW are summarized in Table 6 for the constituents of concern shown in Table 1. DDMT is applying for a City discharge permit.
	RCRA permit-by-rule requirements must be complied with for discharges of RCRA hazardous wastes to POTWs by truck, rail, or dedicated pipe.		40 CFR 270.60 Permits-by-rule		

Notes:

*These regulations apply regardless of whether the remedial action discharges into the sewer or trucks the waste to an inlet to the sewage conveyance system located "upstream" of the POTW.

Table 5
Preliminary Identification of Potential Location-specific ARARs at DDMT

	Location	Requirement	Prerequisite(s)	Citation	ARAR	Comments
1.	Within 61 meters (200 feet) of a fault displaced in Holocene time	New treatment, storage, or disposal of hazardous waste prohibited.	RCRA hazardous waste; treatment, storage, or disposal	40 CFR 264.18(a)	Not ARAR	Shelby County is not listed in 40 CFR 264, Appendix VI, as being seismically active.
2.	Area affecting stream or river	Action to protect fish or wildlife.	Diversion, channeling, or other activity that modifies a stream or river and affects fish or wildlife	Fish and Wildlife Coordination Act (16 USC 661 et seq.); 40 CFR 6.302	Not ARAR	The Fish and Wildlife Coordination Act requires consultation with the Department of Fish and Wildlife before taking any action that would alter a body of water of the United States.
3.	Memphis/Shelby County	Ozone, carbon monoxide, and lead air pollutants for Memphis/Shelby County have been designated a non-attainment area.		State of TN Air Code		Memphis-Shelby County Health Department has adopted Tennessee Air Code.
4.	Within 100-year floodplain.	Facility must be designed, constructed, operated, and maintained to avoid washout.	RCRA hazardous waste; PCB treatment, storage, or disposal	40 CFR 264.18(b); 40 CFR 761.75	Not ARAR	Surface elevations at DDMT (276 to 316 feet NGVD) exceed the average Mississippi River alluvial valley flood levels of 185 to 230 feet NGVD. The Flood Insurance Rate maps, published by Federal Emergency Management Agency and revised August 19, 1985, indicate that DDMT is not within the 100- or 500-year floodplain, but is in Zone C – "Areas of Minimal Flooding."
5.	Wetlands	Action to minimize the destruction, loss, or degradation of wetlands Action to prohibit discharge of dredged or fill material into wetland without permit	Wetlands as defined by Executive Order 11990 Section 7	Executive Order 11990, Protection of Wetlands (40 CFR 6, Appendix A) Clean Water Act Section 404; 40 CFR Parts 230, 231	Not ARAR Not ARAR	

Table 6
Preliminary Identification of Potential Action-specific ARARs for DDMT

Actions[a]	Requirement	Prerequisites	Citation	ARAR	Comments
Air Stripping	Design system to provide odor-free operation.		CAA Section 101[b]	Applicable	Odor regulations are intended to limit nuisance conditions from air pollution emissions.
	Obtain Memphis/Shelby County Health Department construction/operating permit.	Emission requirements for groundwater treatment systems are handled individually.	TCA 1200-3-9(1)(a)	Applicable	Each construction-operating permit is based on "Best Available Control Technology."
	Estimate total VOC emissions.		1990 CAAA Section 302(g) TCA 1200-3-9(11)(b)14.(ii)	Applicable	Any source emitting more than 100 tpy VOCs is classified as major and requires agency review and a potential permit.
	File an Air Pollution Emission Notice (APEN) with the State to include estimation of emission rates for each pollutant expected.	Groundwater contains regulated air pollutants.	40 CFR 52[b]	Applicable	State will have particular interest in emissions for compounds on its hazardous, toxic, or odorous list. Preliminary meeting with State prior to filing APEN is recommended in the regulation. Meeting would identify additional issues of concern to the State.
	Include with filed APEN the following: • Modeled impact analysis of source emissions • Provide a Best Available Control Technology (BACT) review for the source operation	This additional work and information is normally applicable to sources meeting the "major" source criteria and/or to sources proposed for nonattainment areas.	40 CFR 52[b]	Relevant and Appropriate	State may identify further requirements for permit issuance after first review. These provisions follow the federal Prevention of Significant Deterioration (PSD) framework with some modifications. Additional requirements could include ambient monitoring and emission control equipment design revisions to match Lowest Achievable Emission Requirements (LAER). While a permit is not required for an onsite CERCLA action, the substantive requirements identified during the permitting process are applicable.
	Predict toal emissions of volatile organic compounds (VOCs) to demonstrate that emissions do not exceed 450 lb/hr, 3,000 lb/day, 10 gal./day, or allowable emission levels from similar sources using Reasonably Available Control Technology (RACT).	Source operation must be in an ozone nonattainment area.	40 CFR 52[b]	Applicable	The control technology review for this regulation (RACT) could coincide with the BACT review suggested under the PSD program.
	Verify that emissions of VOCs do not exceed levels expected from sources in compliance with hazardous air pollution regulations.		40 CFR 61[b]	Relevant and Appropriate	Any source emitting the regulated compound(s) is subject to these regulations. However, some of the specific regulations further restrict the scope of applicability.

Table 6
Preliminary Identification of Potential Action-specific ARARs for DDMT

Actions*	Requirement	Prerequisites	Citation	ARAR	Comments
Air Stripping	Estimate HAP emissions.	Groundwater contains HAPs.	Title III, 1990 CAAA Section 112 TCA 1200-3-9(11)(b)14.(i)	Applicable	If hazardous air pollutants (HAPs) are greater than a major rate, air permit and/or application of Maximum Available Control Technology (MACT) may be required. HAPs exceed 25 tpy aggregate HAPs or 10 tpy for a single HAP.
Groundwater Cleanup	Maximum contaminant level goals (MCLGs), established under SDWA, that are set at concentrations above zero shall be attained if relevant and appropriate to the circumstances of the release. Where MCLGs for a contaminant have been set at a concentration of zero, the MCLs for that contaminant shall be attained. Groundwater standards established under RCRA shall be attained if relevant and appropriate to circumstances of the release.	Groundwater is a current or potential source of drinking water. No MCLG or maximum contaminant level (MCL) has been established for contaminant of concern. Cleanup value for lead in groundwater used for drinking is not an MCL, but is established as an action level.	40 CFR 300.430 of NCP 40 CFR 264.94 USEPA memo dated June 21, 1990, from Henry Longest to Patrick Tobin	Relevant and Appropriate	Tennessee adopted guidelines equivalent to federal guidelines. The interim remedial action will not address groundwater cleanup ARARs. The final remedial action will. Memo recommended a final action level for lead of 15 ppb.
Groundwater Withdrawal	Water withdrawal registration is required for wells or systems that pump more than 50,000 gallons per day.		Water Withdrawal Registration Act of 1963 – Chapter 8 – Water Resources Div., Section 69-8-105	Relevant and Appropriate	Total flow from all recovery wells may be up to 1 mgd.

Notes:

*Action alternatives from ROD keyword index.
[b]All of the Clean Air Act ARARs that have been established by the federal government are covered by matching state regulations. The state has the authority to manage these programs through the approval of its implementation plans (40 CFR 52, Subpart G). As of January 1996, the Tennessee SIP is complete, with EPA action pending.

Table 7
Maximum Effluent Standards for Discharge of Waste into the Municipal Sewerage System

Constituent	Daily Average[1] Maximum Concentration mg/L	Instantaneous Maximum Concentration mg/L
Metals		
Arsenic	1.0	2.0
Barium		
Chromium (hexavalent)	1.0	2.0
Chromium (total)	5.0	10.0
Lead[2]		
Nickel	5.0	10.0
Volatile Organic Compounds		
1,1-Dichloroethene[3]		
1,2-Dichloroethene (total)[3]		
Tetrachloroethene[4]		
Trichloroethene[3]		
Carbon tetrachloride[3]		

Source: City of Memphis, Sewer Use Ordinance, March 1993

Notes:
[1]Based on 24-hour flow-proportionate composite sample
[2]Cadmium, mercury, and lead discharges are severely restricted due to limitations placed on the disposal of sewage sludge containing cadmium, mercury, and/or lead. Actual allowable discharge concentrations for these constituents will be determined on a case-by-case basis.
[3]No person shall discharge wastewater containing any of the materials listed herein into the municipal sewer system or shall have any connection to the municipal sewer system without obtaining written permission from the Approving Authority.
[4]This parameter is not included in City of Memphis Sewer Use Ordinance.

arsenic, chromium, lead, and nickel. With the exception of tetrachloroethene, the remaining VOCs in Table 1 and barium cannot be discharged without written permission from the approving authority. Tetrachloroethene is not included in the City of Memphis' ordinance. The final permit for city discharge will be negotiated as part of this action.

2.10.2.2 Location-specific ARARs

Location-specific requirements "set restrictions upon the concentration of hazardous substances or the conduct of activities solely because they are in special locations" (53 Fed. Reg. 51394). Table 5 lists location-specific ARARs that might be pertinent to this remedial action.

2.10.2.3 Action-specific ARARs

Performance, design, or other action-specific requirements set controls or restrictions on particular kinds of activities related to the management of hazardous waste (52 Fed. Reg. 32496). Selection of a particular remedial action at a site will invoke the appropriate action-specific ARARs that may specify particular performance standards or technologies, as well as specific environmental levels for discharged or residual chemicals. Federal and state regulations appear in Table 6 and are summarized below.

Well Construction. State of Tennessee requirements for water production well construction are promulgated under Tennessee Code Annotated (TCA) Section 70-2307 Chapter 400-2-2: however, these requirements do not apply under the exemptions stated in TCA Section 68-46, Chapter 1200-4-9.01(b) whereby wells otherwise regulated by the State, in this case through CERCLA, are not considered water production wells. However, the Memphis and Shelby County Health Department Pollution Control Section has promulgated requirements and regulations in the *Rules and Regulations of Wells in Shelby County*. Specific requirements include use of a driller licensed in Tennessee and specific well siting and construction requirements.

Pumping. Under the Water Withdrawal Registration Act of 1963, Chapter 8—Water Resources Division, Section 69-8-105 requires that any person withdrawing 50,000 or more gallons per day (gpd) of water from any source register with the division of water resources. A permit is not required. On the basis of an anticipated pumping rate that may reach 1 million gpd for the recovery well system, it is anticipated that registration will be required.

The action-specific ARARs for direct discharge of treatment system effluent are shown in Table 6. DDMT is applying for a City discharge permit. Discharge limits will be specified in the permit.

2.10.3 Cost-Effectiveness

The interim action remedy uses a commercially tested technology that affords a high level of effectiveness proportional to its costs so that the remedy represents reasonable value. This action will use a relatively inexpensive technology to mitigate the spread of the

contaminated groundwater. This limited scale containment operation should reduce the cost of the overall remediation of the groundwater by retarding the migration of the contaminant plume.

2.10.4 Use of Permanent Solutions and Alternative Treatment Technologies

The interim action is designed to minimize the possibility of contamination of the area's drinking water supply. This is not the final action planned for the groundwater contamination. Follow-on activities include monitoring the groundwater plume and its response to the IRA. Once the plume has been fully characterized, subsequent action may be taken to provide long-term definitive protection, including remediation of source areas. To the extent possible, the interim action will not be inconsistent with, nor preclude implementation of, the expected final remedy.

2.10.5 Preference for Treatment as a Principal Element

This interim action satisfies the statutory preference for treatment of the discharged effluent (through, at a minimum, treatment at the POTW) as a principal element of the containment system. If necessary, onsite treatment will be performed if needed to meet permit criteria.

2.11 References

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Part 3
Responsiveness Summary

All the alternatives have been discussed with the community surrounding DDMT via the Restoration Advisory Board (RAB) and Town Hall Meetings. The community wants DDMT to initiate interim actions to stop the flow of contaminated groundwater until a more permanent solution can be determined. The community also wants any interim actions to be as cost-effective as possible. The RAB agreed with DDMT that Alternative 8 best fulfills the community's desires by stopping the flow of contamination in an economical fashion.

The following responses are to comments received at the Proposed Interim Remedial Action public hearing held December 20, 1994. DDMT received no other comments regarding the Interim Remedial Action during the public comment period.

1. **Comments Received from Roosevelt Sanders Jr., 2592 Fontaine Road, Memphis, TN 38106**

It is my suggestion that proposed remedial action should include a larger area of testing. The land south of DDMT, at one time, was used as a dump. A record check should be done to determine whether DDMT has ever used that area for dumping purposes. My father told me, in 1964 (when I moved in that area), that the homes were built on top of a dump.

It seems to me that the IRA is using the Band-aid approach to what could possibly be a serious problem.

DDMT RESPONSE: The Installation Services records were checked and no records of any dumping in this landfill were found. Long-time employees of DDMT, who are familiar with the disposal activities throughout its operational history, were interviewed concerning their knowledge of any DDMT use of the land to the south of its boundaries for dumping purposes. None of the employees had any knowledge of DDMT disposing of any materials south of DDMT. Specifically, Mr. Ulysses Truitt, who worked at DDMT for more than 30 years, indicated with certainty that no materials were disposed of in the area south of DDMT. Historically, DDMT disposed of materials either onsite or in permitted landfills operated by the City of Memphis.

As part of the remedial investigation, monitoring wells are proposed to be installed south of DDMT to determine if any offsite sources are contributing to the contamination under DDMT. These monitoring wells may also intercept any contaminants that might be migrating from the dump reported to be south of DDMT.

The Interim Remedial Action (IRA) was not designed to address dumping that was reported south of DDMT in the 1960s. Rather, the IRA was intended as an interim action to address contamination that appears to be migrating west of Dunn Field. This action will be consistent with the final remedy, and is intended to meet the objective of protecting the Memphis Sand Aquifer. The focus of the IRA is on Dunn Field and contamination migrating to the west of the Field, not on a landfill reported to be south of DDMT. By implementing a groundwater IRA, contaminants will be incrementally removed from the Fluvial Aquifer and will be

contained to mitigate migration toward the Allen Well Field. The IRA will be implemented expeditiously and will continue to operate until a final remedy is in place.

Concerns about any material that may have been disposed of at the landfill south of Alcy Road are valid, but are misdirected at DDMT because it was not a contributor. However, Mr. Sanders may direct his concerns to the Tennessee Department of Environment and Conservation (TDEC). That agency is concerned with contamination resulting from past landfill practices. It is recommended that staff in TDEC's Memphis and Nashville offices be contacted, starting with the Divisions of Superfund and Solid Waste.

2. **Comment Received from Dorothy Brooks, 1802 Wendy Drive, Memphis TN 38114**

I live in the Nob Hill Subdivision, south of Alcy Road. I understand that our subdivision was built on landfill. Therefore, anything and all kinds of materials were probably dumped there.

Because of the large number of health problems that have occurred and are occurring, the residents should be informed of the type of dangers that could possibly be present.

I am again requesting that the soil/water in the above stated community be tested.

DDMT RESPONSE: Ms. Brooks' concerns are valid, but are misdirected toward DDMT, since it does not have the authority or jurisdiction to make an initial investigation of a landfill that is not on DoD property. Because, to the best of its knowledge, DDMT has not disposed of any material in the landfill to the south of its boundaries, it is not currently involved in investigating any alleged contamination resulting from past disposal practices at this site. However, it is recommended that Ms. Brooks convey her concerns to other responsible agencies. TDEC may have a permit file on the old landfill. That file may either be in the field office in Memphis or in the central office in Nashville. The permit file should contain an indication of the types of materials that the landfill was permitted to receive, and may contain some inspection reports.

Other agencies that may provide assistance include the Environmental Protection Agency (EPA), Region IV, in Atlanta, Georgia; the City of Memphis; the Memphis and Shelby County Health Department; Memphis Light Gas and Water (MLGW); and the Memphis State University Groundwater Institute. Each of those agencies has specific areas of authority, jurisdiction, and resources.

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