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THE MEMPHIS DEPOT
TENNESSEE

ADMINISTRATIVE RECORD
COVER SHEET

AR File Number 99

File:
C.G. 190.300a

99 1 99

RESTORATION ADVISORY BOARD

Defense Depot
Memphis, Tennessee

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January 25, 1995

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RAB members

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Sue Estes
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TAB

Current Status of Restoration Process

Facility Description

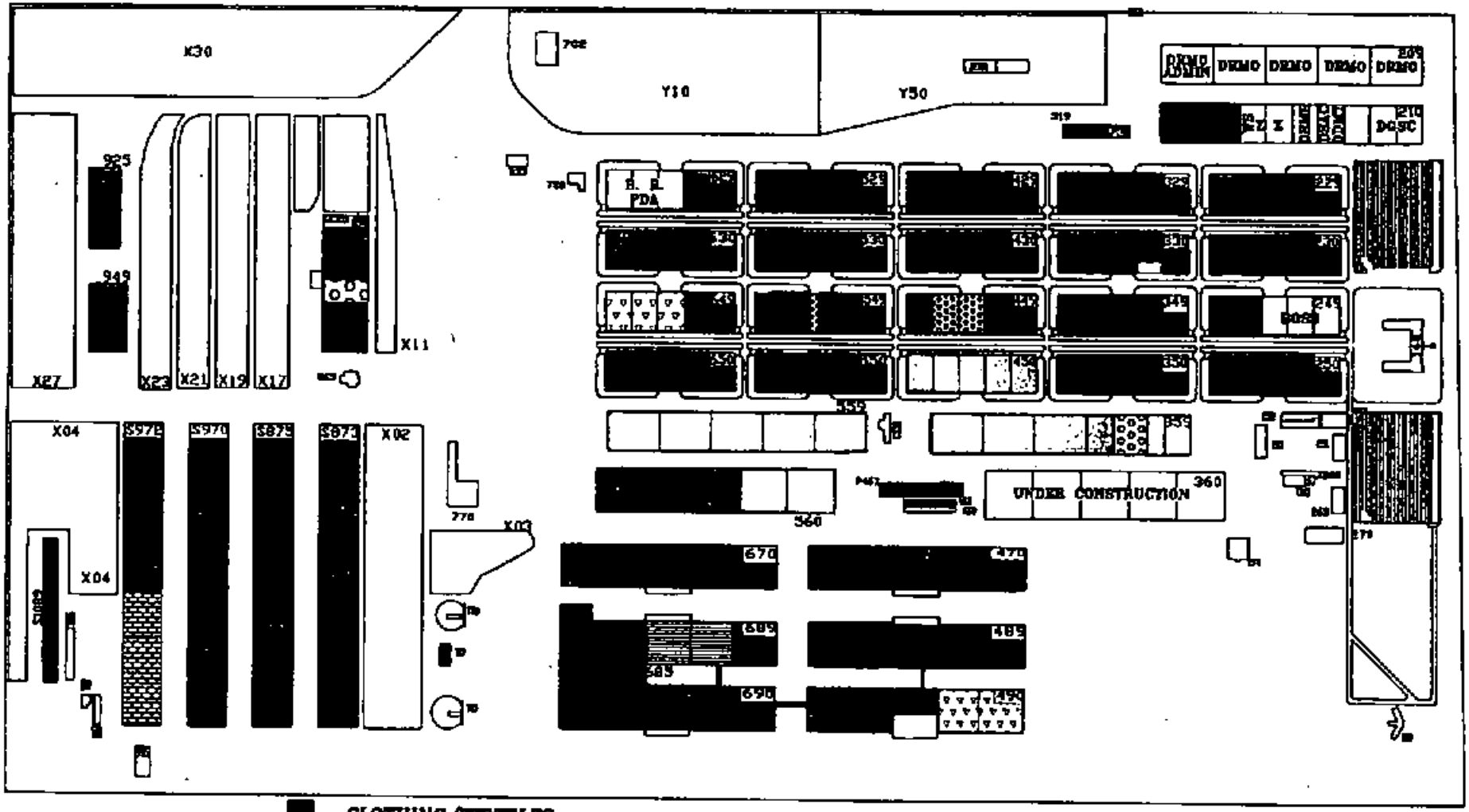
- Located in Memphis - 642 acres (One square mile)
- Located 4 miles from the business district 5 miles east of the Mississippi River and 1 mile NW of Memphis International Airport
- Comprised of:
  - 110 buildings
  - 26 miles of railroad
  - 28 miles of paved streets
  - 5.5 million sf of covered storage
  - 6.0 million sf of open storage space
- Mission: to receive, store, and ship items centrally managed by the DLA to all U.S. Military Entities

Facility Description Cont'd

- Major items include food, clothing, electronic equipment, petroleum products, construction materials, industrial supplies, and medical supplies
- 4+ million line items totaling 155,000 tons are received and shipped
- Inventory valued at >$903 million
- Facility employs 1,421 civilians and 16 military personnel with annual payroll of $14.3 million
- During WWII the Depot served as internment center for 800 POWs

STORAGE LOCATION

AS OF 30 JUNE 1995

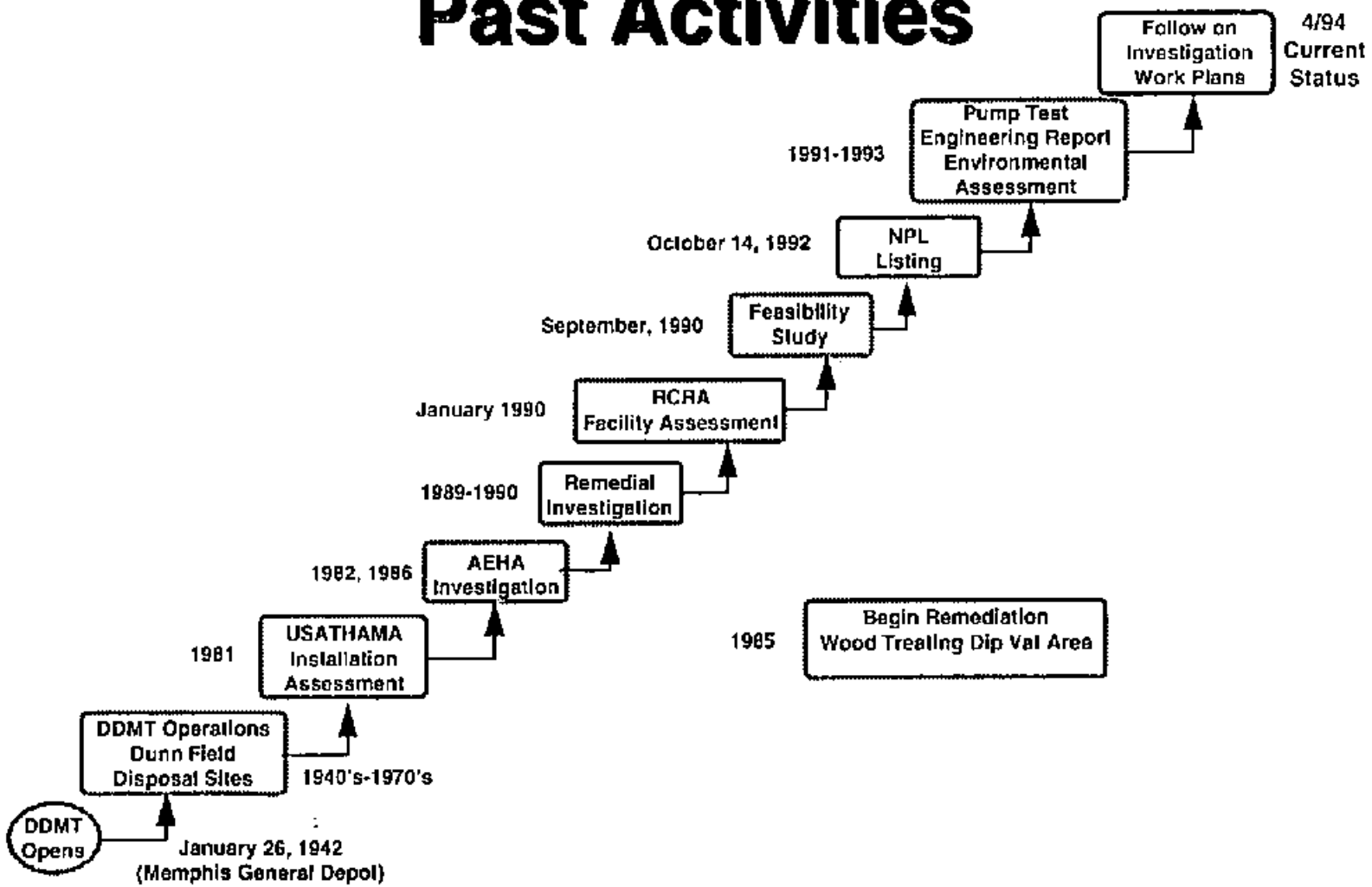


- **CLOTHING/TEXTILES**
- HAZARDOUS
- GENERAL SUPPLIES
- SUBSISTENCE
- BULK RECEIVING
- **TRANSPORTATION/RFCC**
- CENTRAL RECEIVING
- **CENTRAL PACK**
- **PACKING**
- **BOX SHOP & PACKING**

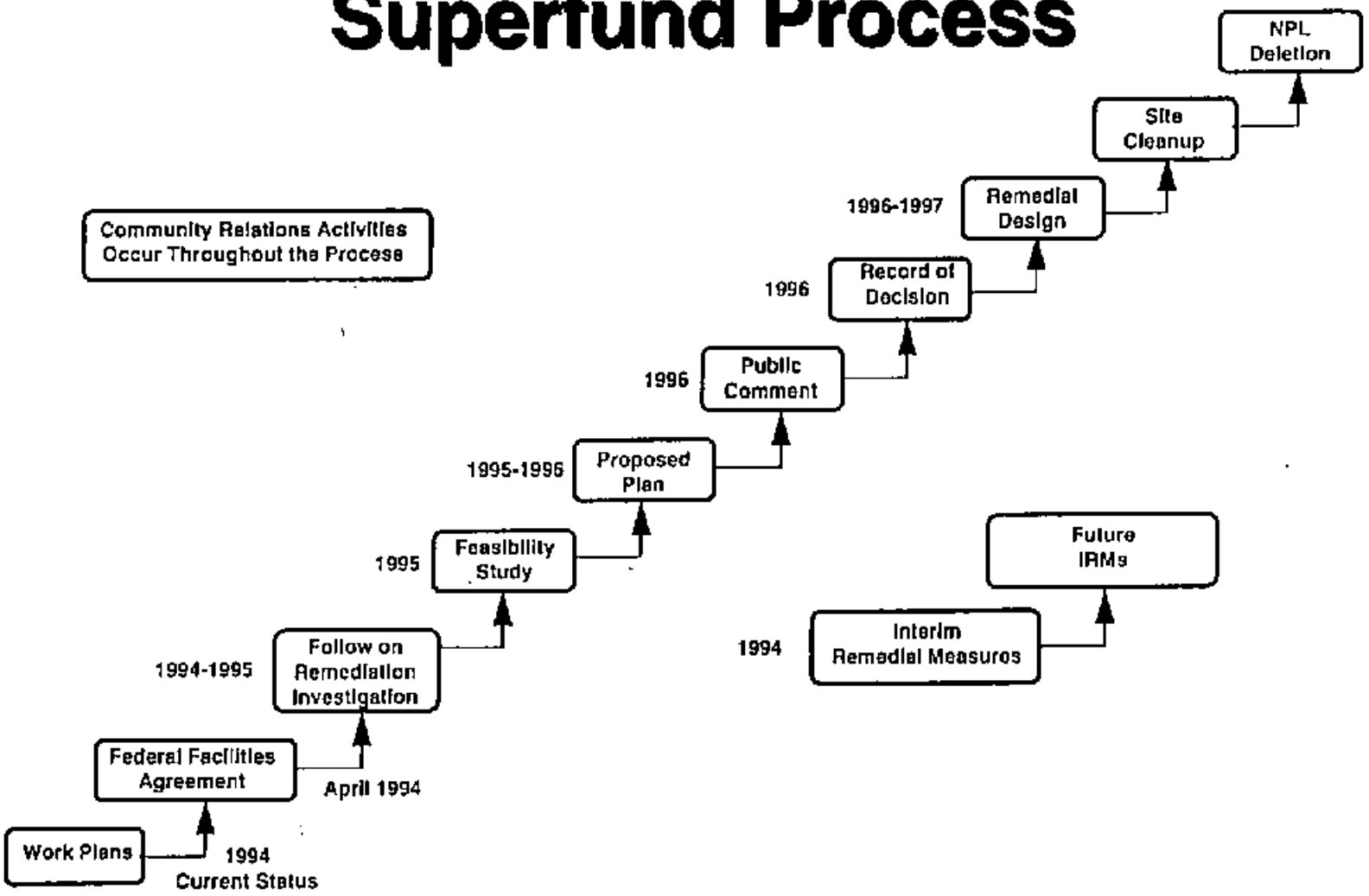
DEFENSE DEPOT MEMPHIS	
STORAGE LOCATION LAYOUT	

99

Defense Depot Memphis, Tennessee
Past Activities



Defense Depot Memphis, Tennessee
Superfund Process

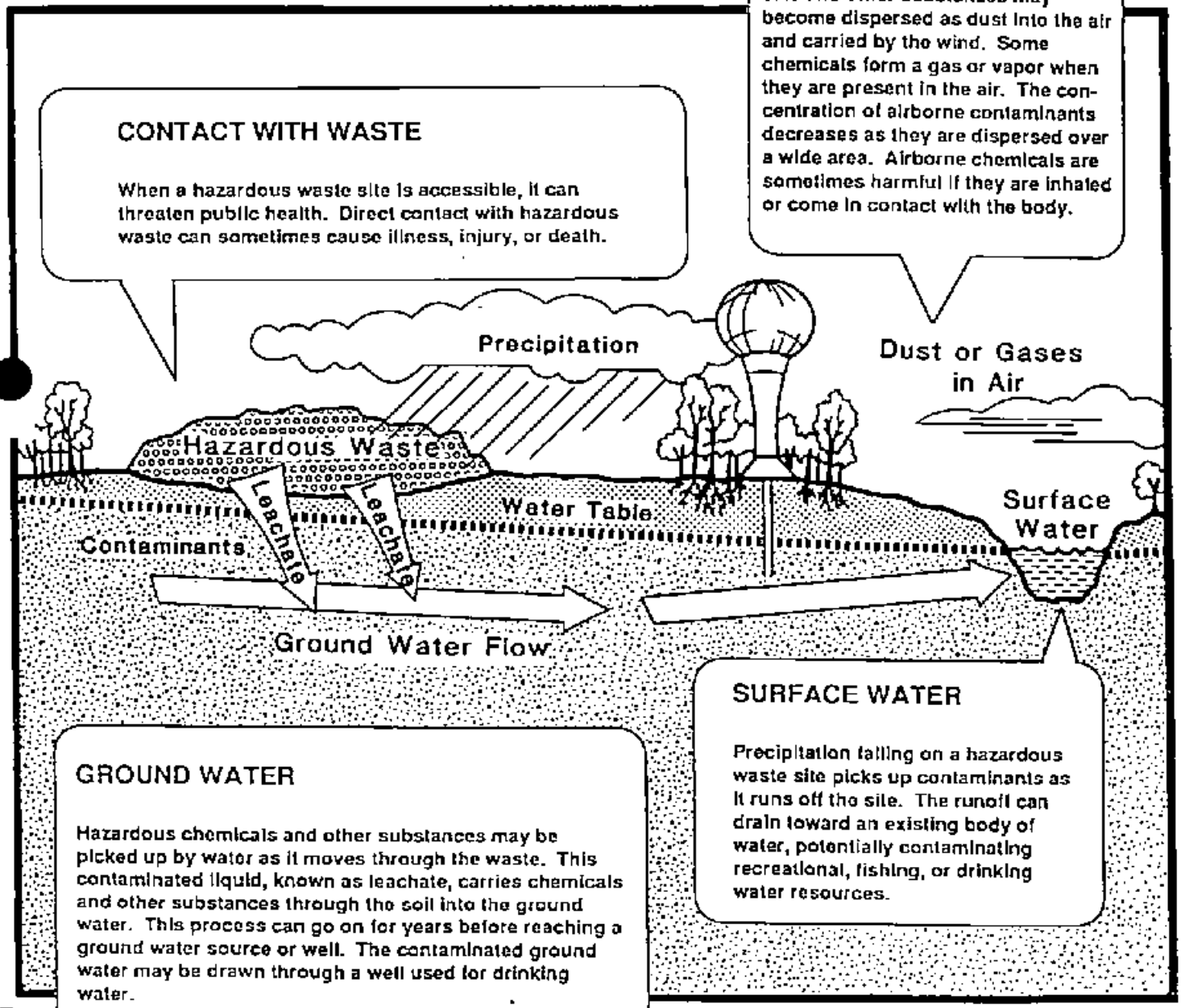


National Priorities List

- EPA's list of the most serious sites
- Possible long term remedial action required
- Trust fund available for remedial action
- Community relations
- Process includes:
  - Identification
  - Assessment
  - NPL Placement
  - RI/FS Investigation
  - Final Remedy
- NPL list based on Hazard Ranking System Score

Pathways of Contamination

There are several ways that hazardous waste sites may cause contamination problems in the surrounding community. The most common pathways are air, surface water, and ground water.



AIR

Small amounts of hazardous chemicals and other substances may become dispersed as dust into the air and carried by the wind. Some chemicals form a gas or vapor when they are present in the air. The concentration of airborne contaminants decreases as they are dispersed over a wide area. Airborne chemicals are sometimes harmful if they are inhaled or come in contact with the body.

CONTACT WITH WASTE

When a hazardous waste site is accessible, it can threaten public health. Direct contact with hazardous waste can sometimes cause illness, injury, or death.

SURFACE WATER

Precipitation falling on a hazardous waste site picks up contaminants as it runs off the site. The runoff can drain toward an existing body of water, potentially contaminating recreational, fishing, or drinking water resources.

GROUND WATER

Hazardous chemicals and other substances may be picked up by water as it moves through the waste. This contaminated liquid, known as leachate, carries chemicals and other substances through the soil into the ground water. This process can go on for years before reaching a ground water source or well. The contaminated ground water may be drawn through a well used for drinking water.

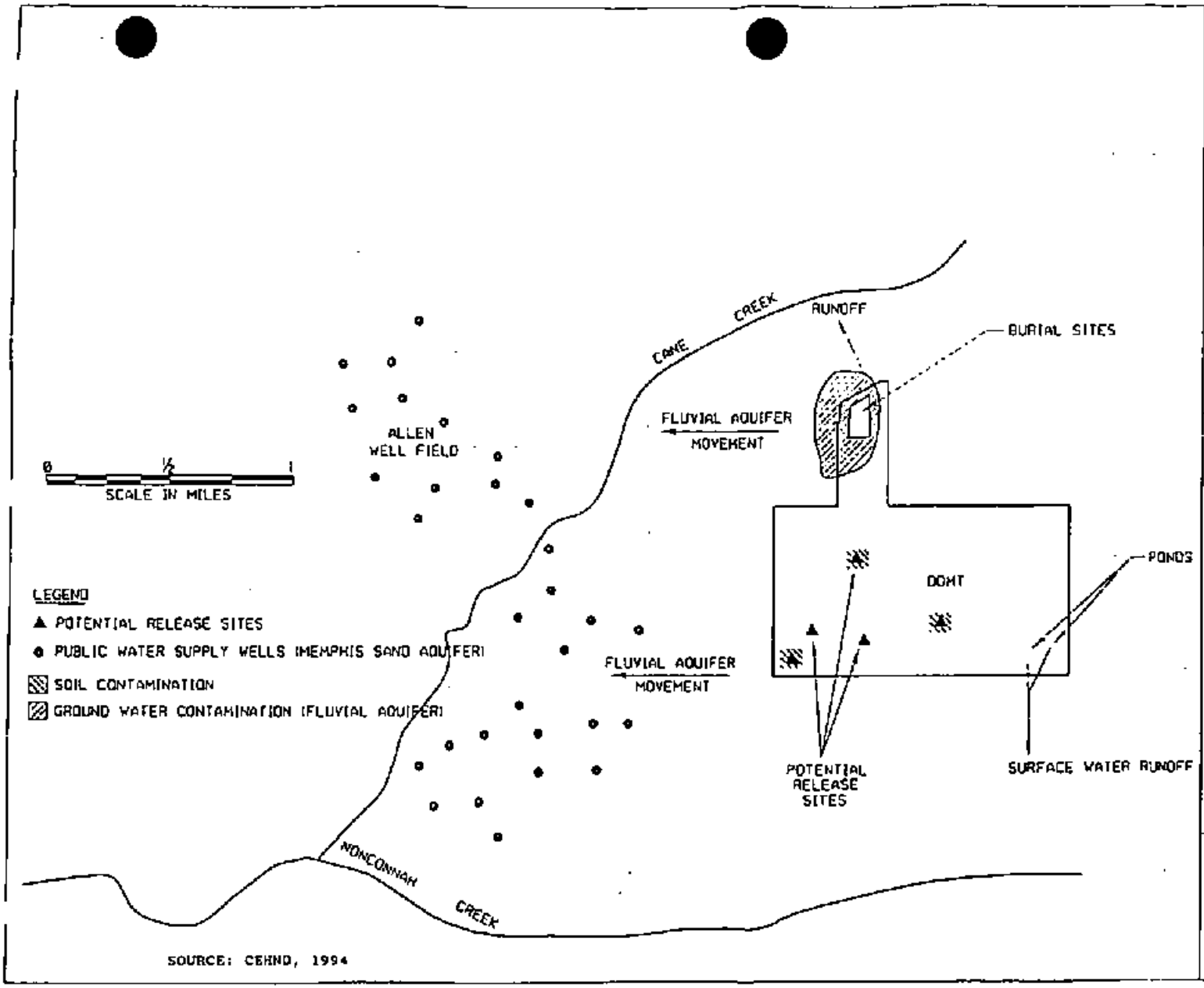


FIGURE: 3-5

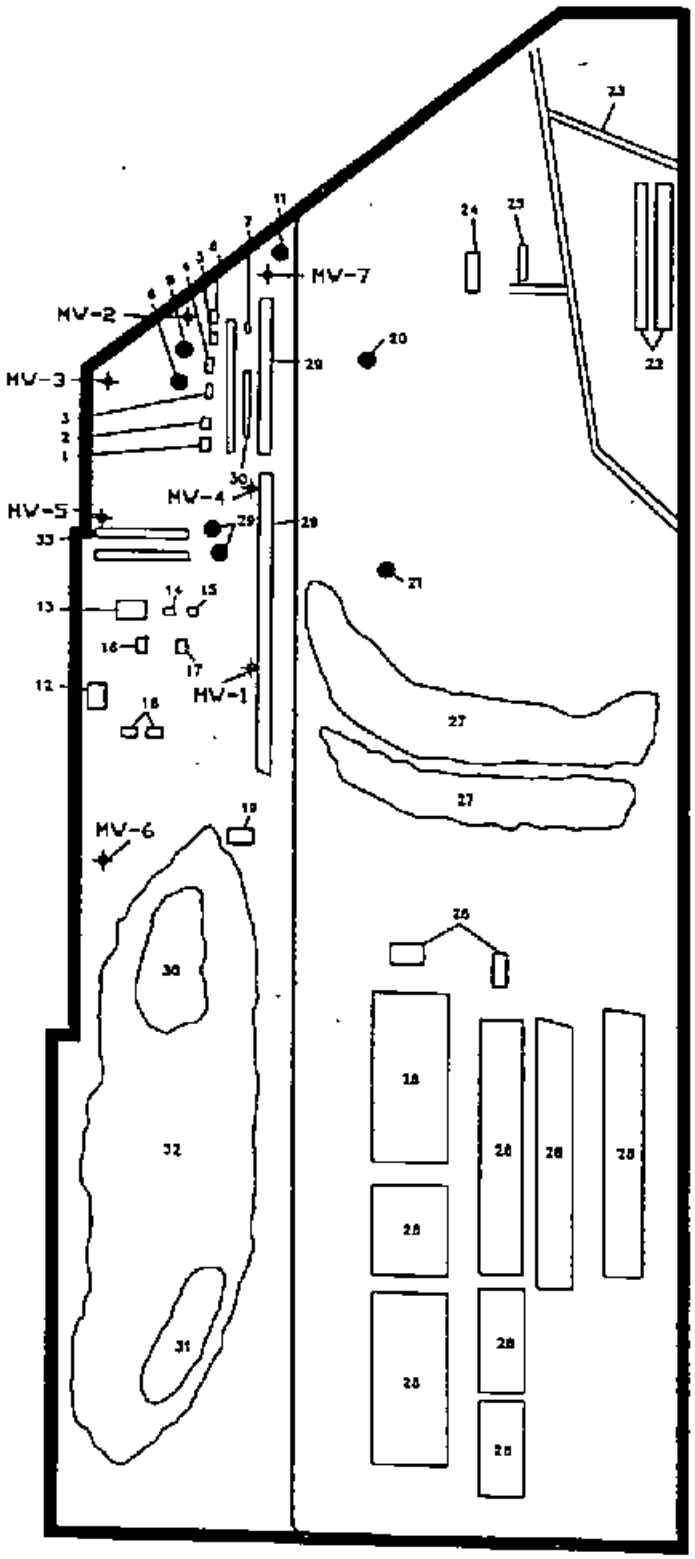
PLAN VIEW
CONCEPTUAL SITE MODEL

DEFENSE DISTRIBUTION DEPOT
MEMPHIS, TENNESSEE

DEFENSE LOGISTICS AGENCY

FIGURE 1-2

DUNN FIELD DISPOSAL & STORAGE SITES



NUMBERS CORRESPOND TO HAZARDOUS MATERIAL STORAGE OR DISPOSAL SITES LISTED ON TABLE 1-1.

LEGEND

✦ MONITORING WELLS INSTALLED BY AEHA

SCALE: 1"~350'

SOURCE: US ARMY ENVIRONMENTAL HYGIENE AGENCY, 1982. GEOHYDROLOGIC STUDY NO. 38-26-0195-83.

TABLE 1-1
DEFENSE DEPOT MEMPHIS TENNESSEE
DUNN FIELD SITES
SUMMARY OF HAZARDOUS MATERIAL USE, STORAGE, AND DISPOSAL SITES
SITE LOCATIONS ARE ILLUSTRATED ON FIGURE 1-1

MAP NO.	LOCATION	MATERIALS/WASTE	QUANTITY, DIMENSIONS OR SIZE	REMARKS
1	NW QUADRANT	MUSTARD AND LEWISITE	NINE TRAINING SETS	DISPOSED IN 1955
2	NW QUADRANT	AMMONIUM HYDROXIDE & GLACIAL ACETIC ACID	7 POUNDS SOLID, 1 GAL. LIQUID	DISPOSED IN 1955
3	NW QUADRANT	VARIOUS CHEMICAL; ORTHO-TOLIDINE DIHYDROCHLORIDE	3,000 QUARTS/5 CU.FT OTD	DISPOSED IN 1955
4	NW QUADRANT	POL AND PAINT	13-55 GAL. DRUMS	---
5	NW QUADRANT	POL AND THINNER	32-55 GAL. DRUMS	DISPOSED IN 1955
6	NW QUADRANT	METHYL BROMIDE	3 CUBIC FEET	DISPOSED IN 1955
7	NW QUADRANT	EYE OINTMENT	40,037 UNITS	DISPOSED IN 1955
8	NW QUADRANT	FUMING NITRIC ACID	1,700 BOTTLES	DISPOSED IN 1954
9	NW QUADRANT	METHYL BROMIDE	3,768 ONE-GALLON CANS	DISPOSED IN 1954
10	NW QUADRANT	ASHES AND METAL WASTE	UNCERTAIN	DISPOSED IN 1955 - (not shown on
11	NW QUADRANT	TRICHLOROACETIC ACID	1,433 ONE-OUNCE BOTTLES	DISPOSED IN 1965 figure)
12	NW QUADRANT	SULPHURIC AND HYDROCHLORIC ACIDS	30 PALLETS	DISPOSED IN 1967
13	NW QUADRANT	MIXED CHEMICAL & ACID, DETERGENT, ALUMINUM SULPHATE & SODIUM	32 CUBIC YARDS MIXED CHEMICALS & ACID, 8,100 POUNDS SOLIDS	---
14	NW QUADRANT	SODIUM	ONE PALLET	---
15	NW QUADRANT	SODIUM PHOSPHATE	ONE PALLET	DISPOSED IN 1968
16	NW QUADRANT	ACID	ONE PALLET	DISPOSED IN 1969
17	NW QUADRANT	HERBICIDE, MEDICAL SUPPLIES & CLEANING COMPOUND	UNCERTAIN	DISPOSED IN 1969
18	NW QUADRANT	ACID	UNCERTAIN	---
19	NW QUADRANT	HARDWARE (NUTS & BOLTS)	UNCERTAIN	---
20	NE QUADRANT	ASPHALT	UNCERTAIN	---
21	NE QUADRANT	SANITARY WASTE, CN CANISTERS, & SMOKE POTS	UNCERTAIN	UTILIZED FROM 1955-60
22	NE QUADRANT	KXCC-3 IMPREGNITE	UNCERTAIN	---
23	NE QUADRANT	DRAINAGE DITCHES	---	MAY HAVE REC'D RUNOFF FROM STORAGE & DISPOSAL AREAS
24	PISTOL RANGE	UNKNOWN	UNCERTAIN	LEACHATE OBSERVED APRIL, 1989
25	BUILDING 1184	PESTICIDES & HERBICIDES	UNCERTAIN	CURRENTLY IN USE
26	NE QUADRANT	DRAIN PIPE	UNCERTAIN	--- (not shown on figure)

- continued -

TABLE 4-1
DEFENSE DEPOT MEMPHIS TENNESSEE
DUNN FIELD SITES
SUMMARY OF HAZARDOUS MATERIAL USE, STORAGE, AND DISPOSAL SITES
SITE LOCATIONS ARE ILLUSTRATED ON FIGURE 4-1

MAP NO.	LOCATION	MATERIALS/WASTE	QUANTITY, DIMENSIONS OR SIZE	REMARKS
27	NE QUADRANT	BAUXITE	TWO SEMI-CONTAINED PILES	---
28	SE QUADRANT	FLUORSPAR	TEN BINS	---
29	NW QUADRANT	FOOD SUPPLIES	UNCERTAIN	---
30	SW QUADRANT	FOODS, BURNED CONSTRUCTION DEBRIS	UNCERTAIN	DISPOSED IN 1948
31	SW QUADRANT	VARIOUS COMBUSTIBLES	UNCERTAIN	UTILIZED IN 1946
32	SW QUADRANT	BAUXITE	ONE SEMI-CONTAINED PILE	UTILIZED FROM 1942-72
33	NW QUADRANT	SODIUM, SODIUM PHOSPHATE, ACID, CHLORINATED LIME & MEDICAL SUPPLIES	UNCERTAIN	DISPOSED IN 1970
74	NW QUADRANT	MIXED SOLID WASTE	UNCERTAIN	WASTE ZONE 3.5 TO 10 FEET BELOW GRADE, ENCOUNTERED AT WELL MW-10
75	NW QUADRANT	MUNICIPAL WASTE	UNCERTAIN	WASTE ZONE 6 TO 18 FEET BELOW GRADE, ENCOUNTERED AT WELL MW-12

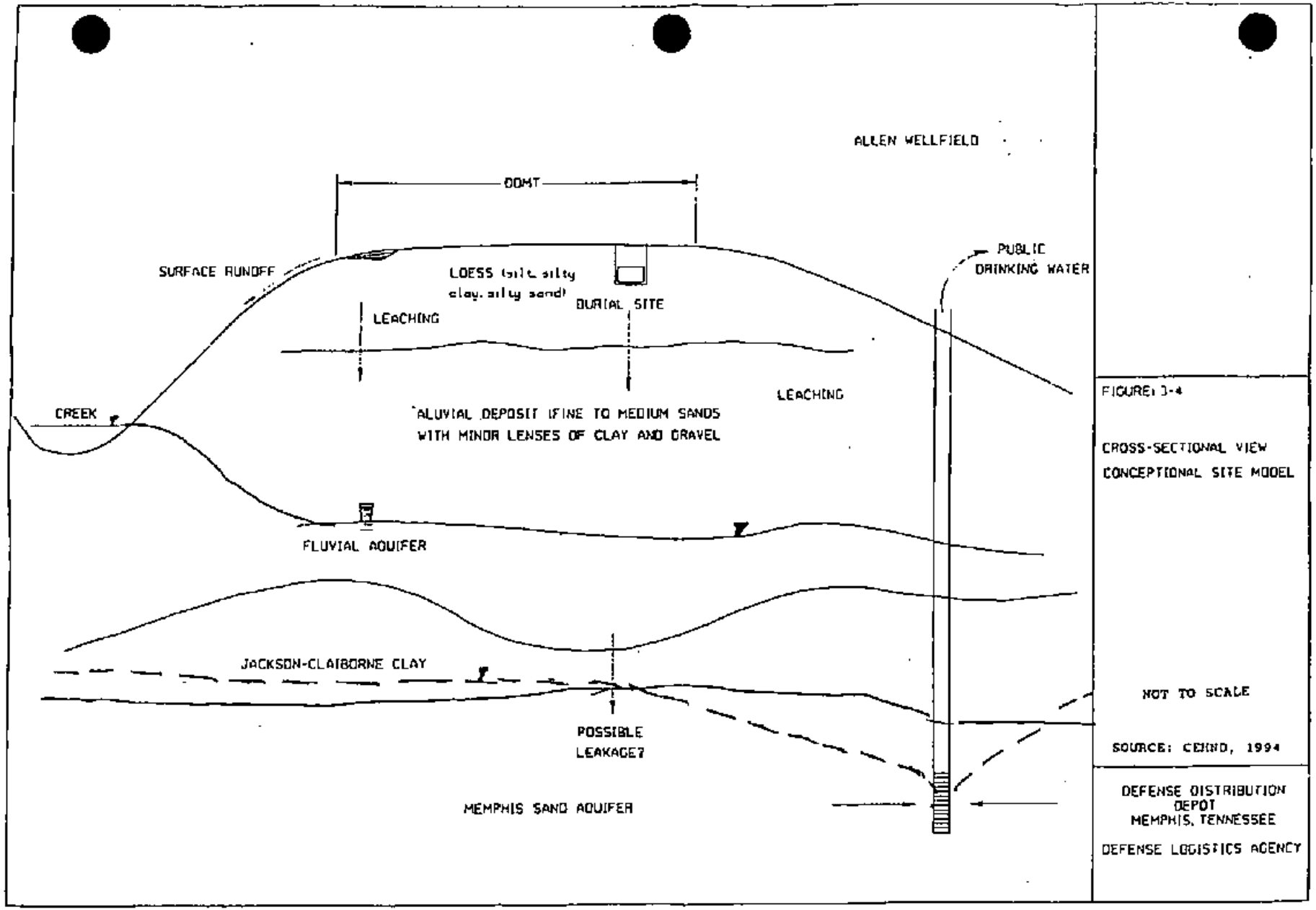


FIGURE 3-4

CROSS-SECTIONAL VIEW
CONCEPTIONAL SITE MODEL

NOT TO SCALE

SOURCE: CEHND, 1994

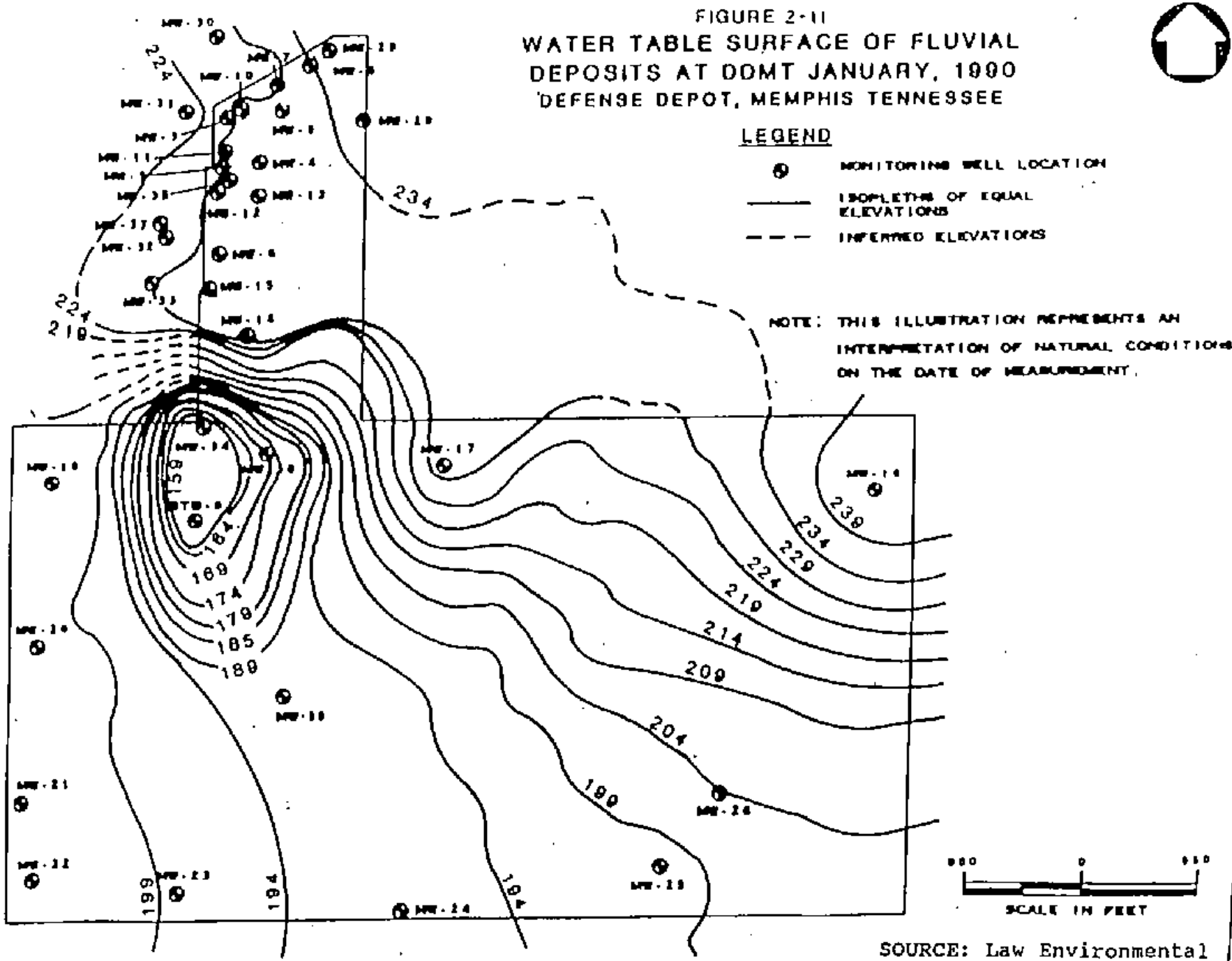
DEFENSE DISTRIBUTION DEPOT
MEMPHIS, TENNESSEE

DEFENSE LOGISTICS AGENCY

FIGURE 2-11

WATER TABLE SURFACE OF FLUVIAL DEPOSITS AT DOMT JANUARY, 1990

DEFENSE DEPOT, MEMPHIS TENNESSEE

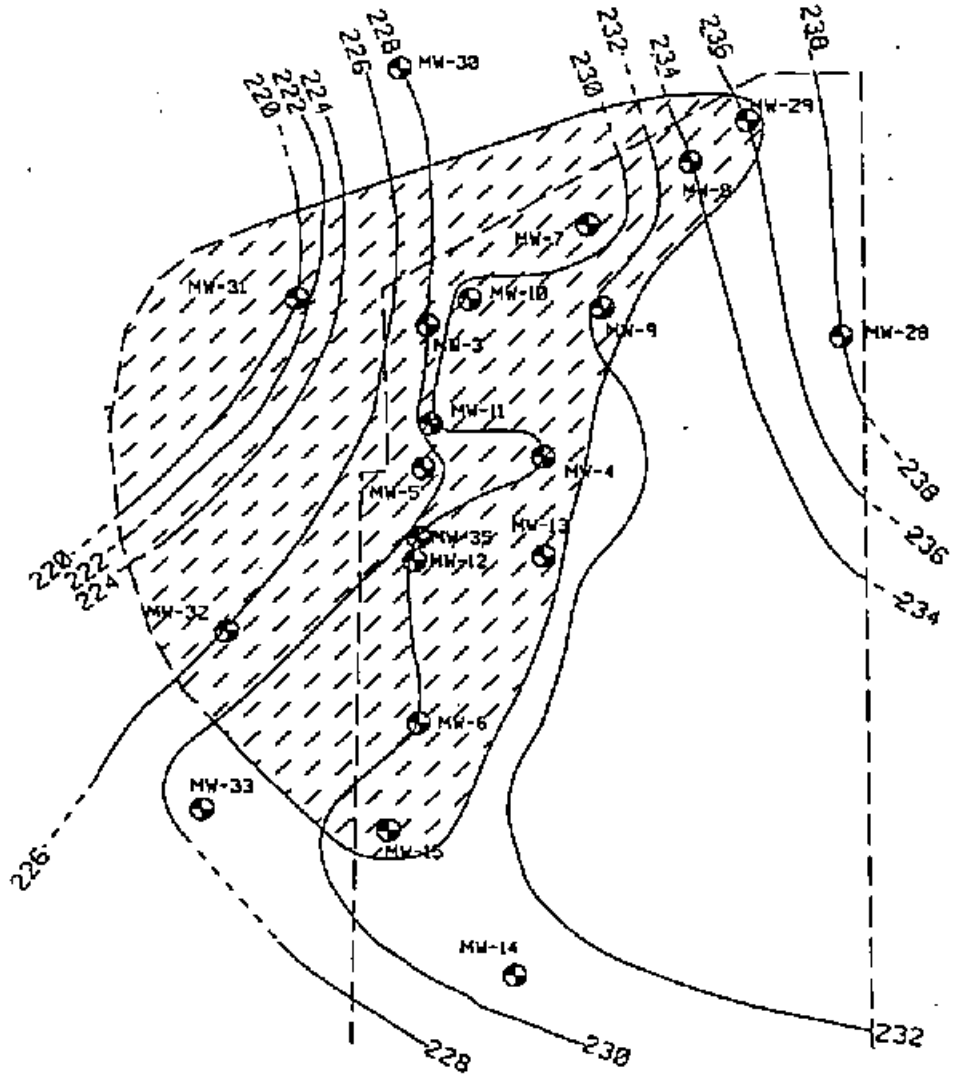


SOURCE: Law Environmental

FIGURE 3-3

WATER TABLE SURFACE OF FLUVIAL AQUIFER AT DUNN FIELD JANUARY, 1990

DEFENSE DEPOT MEMPHIS, TENNESSEE



** SHADED AREA REPRESENTS CHLORINATED VOLATILE ORGANIC CONTAMINATION OF GROUND WATER. EXTENT OF CONTAMINATION IS UNKNOWN AND ALL BOUNDARIES OF THE PLUME HAVE BEEN INFERRED.

NOTE: THIS ILLUSTRATION REPRESENTS AN INTERPRETATION OF NATURAL CONDITIONS ON THE DATE OF MEASUREMENT.

LEGEND

- MONITORING WELL LOCATION
- ISOPLETHS OF EQUAL ELEVATIONS
- INFERRED ELEVATIONS

375 0 375

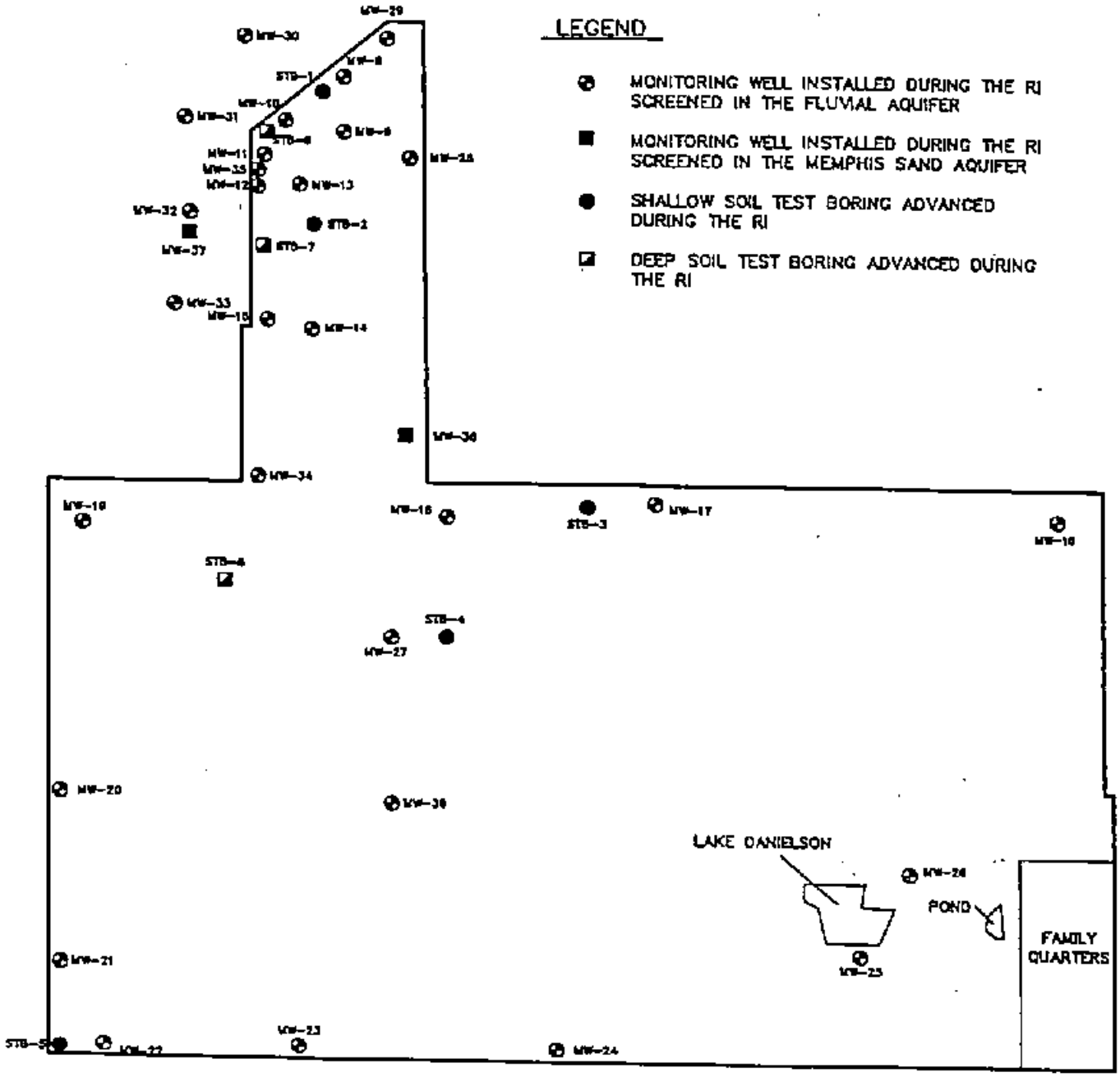
SCALE IN FEET

SOURCE: Law Environmental, 1990

FIGURE 1-3

RI MONITORING WELL AND SOIL TEST BORING LOCATIONS

DEFENSE DEPOT MEMPHIS, TENNESSEE



SCALE: 1" ~ 1000'

LAW ENVIRONMENTAL INC.
GOVERNMENT SERVICES DIVISION

Remedial Investigation Objectives

- Confirm presence or absence of contaminants at each site
- Evaluate concentrations of potential contaminants and direction of migration
- Evaluate lateral and vertical extent of contamination
- Evaluate routes of exposure and potential threats to public health and the environment
- Perform Feasibility Study to evaluate potential cleanup alternatives and recommend a cost effective solution

TABLE 4-1

DDMT RI/FS OBJECTIVES

Objective	RI Activity	FS Activity
Determine presence or absence of contaminants in each medium.	Confirm/establish presence or absence of contaminants at each source and in all pathways.	Evaluate applicability of no action alternative.
Determine types of contaminants.	Establish the "nature" of contaminants at each source and in pathways.	Evaluate the environmental and public health threat; identify applicable remedial technologies
Determine concentrations of contaminants.	Establish concentrations and concentration gradients.	Evaluate costs to achieve applicable or relevant and appropriate standards.
Determine the mechanism of contaminant release to pathways.	Establish mechanics of source/ pathway interfaces.	Evaluate the effectiveness of containment technologies.
Determine direction of transport.	Establish pathways and transport routes and identify potential receptors.	Identify most effective points in the pathway to control transport of contaminants.
Determine boundaries of sources and pathways.	Establish horizontal/vertical boundaries of sources and pathways of contamination.	Evaluate costs to achieve ARARs identify applicable remedial technologies.
Determine environmental and public health factors.	Establish routes of exposure and the environmental and public health threat.	Evaluate applicable standards or risk; identify applicable remedial technologies.
Determine source and pathway characteristics with respect to mitigation (bench studies).	Establish the range of contaminants and their concentrations.	Evaluate treatment schemes.

Source: *Data Quality Objectives for Remedial Response Activities - Development Process* (reference 75).

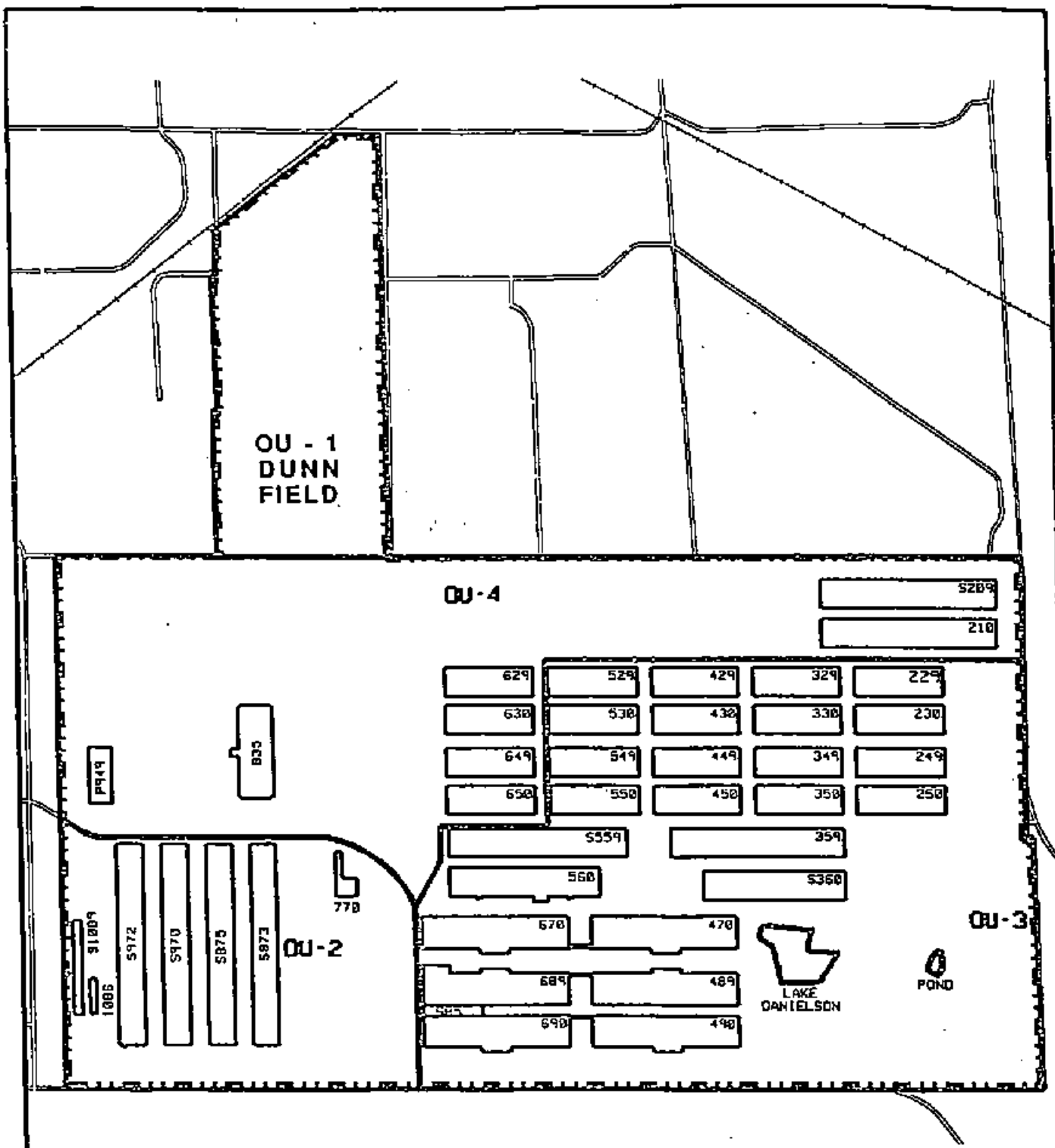


FIGURE 2-2

OPERABLE UNIT
LOCATIONS

SOURCE
ENGINEERING-SCIENCE
ST. LOUIS, MISSOURI

DEFENSE DISTRIBUTION
DEPOT
MEMPHIS, TENNESSEE

DEFENSE LOGISTICS AGENCY

United States
Environmental Protection
Agency

Office of
Solid Waste and
Emergency Response

Publication 9200.5-008C
November 1990

EPA

The Superfund Cleanup Process

99 25

Superfund's cleanup process is designed to control short- and long-term threats to public health and the environment from uncontrolled releases of hazardous substances. The program responds to hazardous waste emergencies wherever they occur; but only sites listed on the National Priorities List (NPL) are eligible for long-term cleanup under Superfund.

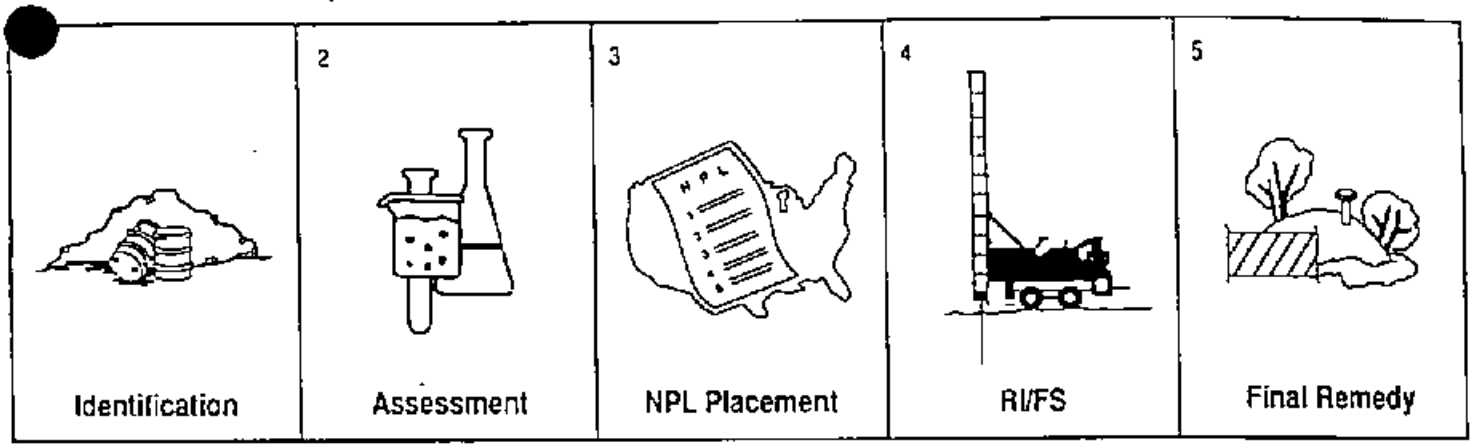
EPA uncovers potential hazardous waste problems through many sources including reports from States, communities, businesses, the U.S. Coast Guard, and citizen reports to the National Response Center's 24-hour hotline (800/424-8802). Most long-standing hazardous waste sites took years to develop. Cleaning them up to protect people and environments is also a lengthy and painstaking process.

How the Process Works

The major steps in the cleanup process are:

- Site discovery and investigation, usually by State officials.
- EPA evaluation of possible hazards posed by site contaminants and, if warranted, addition of the site to the NPL. Hazardous materials that pose imminent threats may be removed anytime during the cleanup process.
- Negotiations to encourage potentially responsible parties to pay for cleanup during each of the following steps.
- Detailed studies to assess what contaminants are present, how serious the contamination is, and what are the potential risks to the community. Studies are done to determine which cleanup methods may be most effective. This process can take 18 to 30 months and the average cost is about $1 million.
- After a public comment period on EPA's proposed cleanup plan, selection of a cleanup method to be used at the site.
- EPA then designs a site-specific cleanup that implements its plan. This takes about 12 to 18 months and costs an average of $1 million.
- Actual cleanup. Depending on the method used, this step may take from one to six years. Cleanup of groundwater is one of the most difficult problems found at Superfund sites. It may take decades to cleanse groundwater.

THE SUPERFUND PROCESS



The Comprehensive Environmental Response, Compensation and Liability Act (CERCLA, also known as Superfund) was enacted in December 1980. The new law established a program to investigate and correct actual and potential releases of hazardous substances at sites throughout the United States. In 1986, Congress reauthorized the law under the Superfund Amendments and Reauthorization Act (SARA), which increased the size of the fund from $1.6 billion to $8.5 billion. The program was again reauthorized in November 1990 in the amount of $5.1 billion dollars. U.S. EPA administers the Superfund program in cooperation with individual states.

The Superfund process involves several steps after a potential site is initially identified (1). After a preliminary inspection of the site is conducted by EPA or a state agency, the site is evaluated for its potential impact on human health and the environment (2). If the site poses a serious enough threat to the community, it is placed on the National Priorities List (NPL), a roster of the nation's worst hazardous waste sites (3).

Sometime after the site is placed on the NPL, EPA plans and conducts a remedial investigation and feasibility study (RI/FS) (4). the RI is a long term study to identify the nature and extent of contamination at the site. The FS evaluates remedial alternatives for site conditions.

If potentially responsible parties (PRPs) can be identified and are willing to cooperate with EPA, one or more of the PRPs may conduct the RI/FS. All work conducted by the PRPs is closely monitored by state and federal agencies. Monroe Auto is the PRP for this site.

After the public has had an opportunity to comment on the alternatives presented in the FS, EPA chooses the most appropriate alternative as a final remedy for the site. The chosen remedy is then designed and implemented (5).

At each site where a long term investigation and remedial action take place, EPA prepares a community relations plan to provide information about community concerns and present a plan to enhance communication between EPA and the local community throughout the duration of the project.

At any time during this process, EPA may conduct an emergency response action if the site becomes an immediate threat to public health or the environment.

SUPERFUND GLOSSARY 19

This glossary defines terms often used in Superfund publications. The definitions may have other meanings when used in a context other than hazardous waste management.

Administrative Order On Consent (AOC): A legal and enforceable agreement between EPA and the parties potentially responsible for site contamination. Under the terms of the Order, the *potentially responsible parties (PRPs)* agree to perform or pay for site studies or cleanups. It also describes the oversight rules, responsibilities and enforcement options that the government may exercise in the event of non-compliance by potentially responsible parties. This Order is signed by PRPs and the government; it does not require approval by a judge.

Administrative Record: The collection of documents which forms the basis for the selection of a response action at a Superfund site. EPA is required to establish an administrative record file for every Superfund site and make a copy available at or near the site. Often, it is the local library near a Superfund site that keeps the administrative record on file for public reference.

Artesian Well: A well made by drilling into the earth until water is reached which, from internal pressure, flows up like a fountain.

Aquifer: A water bearing stratum of permeable rock, sand, or gravel.

Backfill: To refill an excavated area with removed earth; or the material itself that is used to refill an excavated area.

Biodegradation: The technology that uses micro-organisms to degrade contaminants.

Borrow Pit: An excavated area where soil, sand, or gravel has been dug up for use elsewhere.

Cap: A layer of material, such as clay or a synthetic material, used to prevent rainwater from penetrating and spreading contaminated materials. The surface of the cap is generally mounded or sloped so water will drain off.

Carbon Adsorption: A treatment system in which contaminants are removed from ground water and surface water by forcing water through tanks containing activated carbon, a specially treated material that attracts and holds or retains contaminants.

Cell: In solid waste disposal, one of a series of holes in a *landfill* where waste is dumped, compacted, and covered with layers of dirt.

Chlorinated Hydrocarbons: These include a class of persistent, broad-spectrum insecticides that linger in the environment and accumulate in the food chain. Among them are DDT, aldrin, dieldrin, heptachlor, chlordane, lindane, endrine, mirex, hexachloride, and toxaphene. Other examples include TCE, used as industrial solvent.

Closure: The process by which a *landfill* stops accepting wastes and is shut down under Federal guidelines that ensure the public and the environment are protected.

Comment Period: Time provided for the public to review and comment on a proposed EPA action or rulemaking after it is published in the Federal Register.

Community Relations Plan (CRP): The formal plan of action used by EPA to inform and educate the public affected by a Superfund site. This plan addresses most of the avenues of communication to be used in a community, such as public open houses, fact sheets, workshops, and notices. It contains a list of interested citizens, citizens' groups, local *repositories*, Federal, State, and local officials. The CRP is a *CERCLA* requirement meant to address a community's needs and concerns. A copy of the Plan is part of the file with the *Administrative Record* in the local *repository*.

Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA): The Federal law that provides remedies for abandoned hazardous waste sites. CERCLA is commonly known as Superfund.

Consent Decree: A legal document, approved and issued by a judge, formalizing an agreement between EPA and the parties potentially responsible for site contamination. The decree describes cleanup actions that the *potentially responsible parties* are required to perform and/or the costs incurred by the government that the parties will reimburse, as well as the roles, responsibilities, and enforcement options that the government may exercise in the event of non-compliance by potentially responsible parties. If a settlement between EPA and a potentially responsible party includes cleanup actions, it must be in the form of a consent decree. A consent decree is subject to a public comment period.

Creosotes: Chemicals used in wood preserving operations and produced by distillation of tar, including polycyclic aromatic hydrocarbons and polynuclear aromatic hydrocarbons (see PAHs and PNAs). Contaminated sediments, soils, and surface water may cause skin ulcerations and cancer with prolonged exposure.

Dewater: To remove water from wastes, soils, or chemicals.

Evaporation Pond: A containment area where liquids are allowed to evaporate. In some cases a spraying mechanism is used to speed evaporation.

Feasibility Study (FS): 1. Analysis of the practicability of a proposal; e.g., a description and analysis of the potential cleanup alternatives for a site on the National Priorities List. The feasibility study usually recommends selection of a cost-effective alternative. It usually starts as soon as the *remedial investigation* is underway; together, they are commonly referred to as the "RI/FS." 2. In research, a small-scale investigation of a problem to ascertain whether or not a proposed research approach is likely to provide useful data.

Ground Water: The supply of fresh water found beneath the Earth's surface (usually in aquifers) which is often used for supplying wells and springs. Because ground water is a major source of drinking water, there is growing concern over areas where leaching agricultural or industrial pollutants or substances from leaking underground storage tanks are contaminating ground water.

Hazard Ranking System (HRS): The principal screening tool used by the EPA to evaluate risks to public health and the environment associated with abandoned or uncontrolled hazardous waste sites. The HRS calculates a score based on a formula which is the primary factor in deciding if the site should be on the National Priorities List, and if so, what ranking it should have in comparison to other sites on the list.

Hazardous Waste: By-products of society that can pose a substantial or potential hazard to human health or the environment when improperly managed. Possesses at least one of four characteristics (ignitability, corrosivity, reactivity, or toxicity), or appears on special EPA lists.

Health Assessment: An evaluation of data and information gathered on the release of hazardous substances into the environment to assess any current or future impact on public health.

Heavy Metals - Metallic elements with high atomic weights, e.g., mercury, chromium, cadmium, arsenic, and lead. They can damage living things at low concentrations and tend to accumulate in the food chain.

Hydrocarbons: Chemical compounds that consist entirely of carbon and hydrogen such as petroleum, natural gas, and coal.

Impoundment: A body of water or sludge confined by a dam, dike, floodgate, or other barrier.

Inorganic Chemicals/Compounds: Chemical substances of mineral origin, not of basically carbon structure. These include metals such as lead and cadmium.

In-situ Biodegradation/Bioremediation: Treatment of soil in place to encourage contaminants to break down. It involves aerating the soil and adding nutrients to promote growth of micro-organisms.

In-situ Stabilization: "in place" stabilization. Please refer to Stabilization.

In-situ Vitrification: A technology used to treat hazardous waste in soils in place. This process electrically melts the waste media at extremely high temperatures then allows it to cool, creating an extremely stable, insoluable, glass-like solid. The contaminants are destroyed or immobilized and the total volume of material is reduced.

Lagoon: A shallow pond where sunlight, bacterial action, and oxygen work to purify wastewater. Lagoons are typically used for the storage of wastewaters, sludges, liquid wastes, or spent nuclear fuel.

Landfarm: To apply waste to land and/or incorporate waste into the surface soil, such as fertilizer or soil conditioner. This practice is commonly used for disposal of composted wastes.

Landfill: A disposal facility where waste is placed in or on land.

GLOSSARY 21

Long-term Remedial Phase: Distinct, often incremental, steps that are taken to solve site pollution problems. Depending on the complexity, site cleanup activities can be separated into a number of these phases.

Migration: The movement of oil, gas, contaminants, water, or other liquids through porous and permeable rock.

Memorandum of Understanding (MOU): An interagency agreement defining which agency has a responsibility.

National Priorities List (NPL): EPA's list of the most serious uncontrolled or abandoned hazardous waste sites identified for possible long-term remedial action under Superfund. A site must be on the NPL to receive money from the Trust Fund (Superfund) for remedial action. The list is based primarily on the score a site receives from the Hazard Ranking System. EPA is required to update the NPL at least once a year.

Nonaqueous Phased Liquids (NAPLs): Liquid that does not mix with water.

Operable Unit: Term for each of a number of separate activities undertaken as part of a Superfund site cleanup. A typical operable unit would be the removal of drums and tanks from the surface of a site.

Operation and Maintenance: 1. Activities conducted at a site after a Superfund site action is completed to ensure that the action is effective and operating properly. 2. Actions taken after construction to assure that facilities constructed to treat waste water will be properly operated, maintained, and managed to achieve efficiency levels and prescribed effluent limitations in an optimum manner.

Organic Chemicals/Compounds: Animal or plant-produced substances containing mainly carbon, hydrogen, and oxygen, such as benzene and toluene.

Petrochemicals: Chemical substances produced from petroleum in refinery operations and as fuel oil residues. These include fluoranthene, chrysene, mineral spirits, and refined oils. Petrochemicals are the bases from which volatile organic compounds (VOCs), plastics, and many pesticides are made. These chemical substances are often toxic to humans and the environment.

Plume: A visible or measurable discharge of a contaminant from a given point of origin. It can be visible or thermal in water or visible in the air, such as a plume of smoke.

Polycyclic Aromatic Hydrocarbons or Polaromatic Hydrocarbons (PAHs): PAHs, such as pyrene, are groups of highly reactive organic compounds. They are a component of *creosotes* and can cause cancer.

Polychlorinated Biphenyls (PCBs): A group of toxic chemicals used for a variety of purposes including electrical applications, carbonless copy paper, adhesives, hydraulic fluids, microscope emersion oils, and caulking compounds. PCBs are also produced in certain combustion processes. PCBs are extremely persistent in the environment because they are very stable, non-reactive, and highly heat resistant. Chronic exposure to PCBs is believed to cause liver damage. It is also known to bioaccumulate in fatty tissues. PCB use and sale was banned in 1979 with the passage of the Toxic Substances Control Act.

Polynuclear Aromatic Hydrocarbons (PNAs): PNAs, such as naphthalene, and biphenyls, are a group of highly reactive organic compounds that are a common component of *creosotes*, which can be carcinogenic.

Potentially Responsible Parties (PRPs): Parties, including owners, who may have contributed to the contamination at a Superfund site and may be liable for costs of response actions. Parties are considered PRPs until they admit liability or a court makes a determination of liability. This means that PRPs may sign a *consent decree* or *administrative order on consent* to participate in site cleanup activity without admitting liability.

Record of Decision (ROD): A public document that explains which cleanup alternative(s) will be used at Superfund sites where Superfund pays for the cleanup. The Record of Decision is based on information and technical analyses generated during the *remedial investigation/feasibility study* and consideration of public comments and community concerns.

Remedial Action (RA): The actual construction or implementation phase of a Superfund site cleanup that follows remedial design.

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Remedial Design (RD): An engineering phase that follows the *remedial investigation/feasibility study* and includes development of engineering drawings and specifications for a site cleanup.

Remedial Investigation (RI): An in-depth study designed to gather the data necessary to determine the nature and extent of contamination at a Superfund site; establish criteria for cleaning up the site; identify preliminary alternatives for remedial actions; and support the technical and cost analyses of the alternatives. The remedial investigation is usually done with the *feasibility study*. Together they are usually referred to as the "RI/FS."

Remedial Project Manager (RPM): The EPA or state official responsible for overseeing remedial activity at a site.

Remedial Response: A long-term action that stops or substantially reduces a release or threatened release of hazardous substances that is serious, but does not pose an immediate threat to public health and/or the environment.

Removal Action: Short-term immediate actions taken to address releases of hazardous substances that require expedited response.

Repository: A facility where official Superfund documents are kept for public reference. Each Superfund site has at least one repository, usually the local library or other public facility.

Risk Assessment: The qualitative and quantitative evaluation performed in an effort to define the risk posed to human health and/or the environment by the presence or potential presence and/or use of specific pollutants.

Runoff: The discharge of water over land into surface water. It can carry pollutants from the air and land into receiving waters.

Sediment: The layer of soil, sand and minerals at the bottom of surface water, such as streams, lakes, and rivers that absorb contaminants.

Sludge: Semi-solid residues from industrial or water treatment processes that may be contaminated with hazardous materials.

Slurry Wall: Barriers used to contain the flow of contaminated ground water or subsurface liquid. Slurry walls are constructed by digging a trench around a contaminated area and filling the trench with a slurry of impermeable material that prevents water from passing through it. The ground water or contaminated liquids trapped within the area surrounded by the slurry wall can be exacted and treated.

Stabilization: The process of changing an active substance into inert, harmless material, or physical activities at a site that act to limit the further spread of contamination without actual reduction of toxicity.

Unilateral Administrative Order (UAO): A legally binding document issued by EPA directing the potentially responsible parties to perform site cleanups or studies (generally, EPA does not issue unilateral orders for site studies).

Volatile Organic Compounds (VOCs): VOCs are made as secondary *petrochemicals*. They include light alcohols, acetone, trichloroethylene, perchloroethylene, dichloroethylene, benzene, vinyl chloride, toluene, and methylene chloride. These potentially toxic chemicals are used as solvents, degreasers, paints, thinners, and fuels. Because of their volatile nature, they readily evaporate into the air, increasing the potential exposure to humans. Due to their low water solubility, environmental persistence, and widespread industrial use, they are commonly found in soil and ground water.

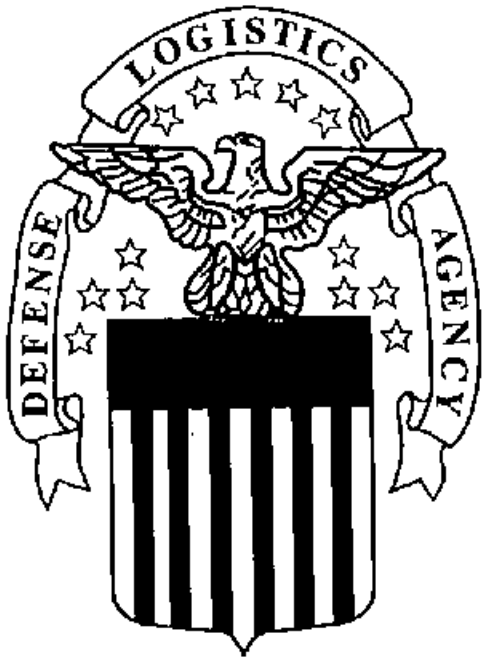
Wetland: An area that is regularly saturated by surface or ground water and, under normal circumstances, capable of supporting vegetation typically adapted for life in saturated soil conditions. Wetlands are critical to sustaining many species of fish and wildlife. Wetlands generally include swamps, marshes and bogs. Wetlands may be either coastal or inland. Coastal wetlands have salt or brackish (a mixture of salt and fresh) water, and most have tides, while inland wetlands are non-tidal and freshwater. Coastal wetlands are an intregal component of estuaries.

TAB

RAB Overview

DEFENSE DISTRIBUTION DEPOT
MEMPHIS, TENNESSEE

INSTALLATION RESTORATION BOARD ACTIVITIES



What Is a RAB

Restoration Advisory Board (RAB):

- Members provide individual advice to government decision makers
- Is NOT a decision-making body
- Is comprised of representatives from community AND government agencies
- All members are equal
- Member selection
  - community representatives: selection panel
  - government representatives: selected by agencies

Determining the Need for a RAB

The installation Commanding Officer (CO) has the responsibility to identify sufficient, sustained community interest in the cleanup program

- Use community involvement techniques to identify and solicit interest in a RAB
- If the community does not express interest in a RAB, document efforts taken to solicit interest and follow up with procedures to monitor community interest on an ongoing basis
  - prepare description of efforts taken, results, and plans for future efforts and attach to the Community Relations Plan

Mandatory Formation of a RAB

- When installation closure involves transfer of property to the community
- When 50 citizens petition for an advisory board
- When federal, state, or local government requests formation of an advisory board
- When the installation determines the need for an advisory board

Purpose of the RAB

- Act as a forum for the discussion and exchange of information regarding cleanup between the installation, regulatory agencies, and the community
- Provide an opportunity for stakeholders to participate in the cleanup process and provide input to decision makers
- Complement other community involvement initiatives

Rationale for a RAB

- Encourages dialogue between stakeholders
- Built on successful TRC model
- Fosters true partnership between the community and government agencies
  - shared chairmanship
  - equal member status
  - meetings open to the public

Size of a RAB

The number of RAB members should be large enough to reflect community diversity, yet small enough to be workable

- Recommend approximately 20 members

Who Should be Involved in Establishing a RAB

- DoD Installation
  - commanding officer
  - environmental coordinator
  - public affairs officer
- Community
  - interested organizations and individuals
- State
  - project manager
- EPA
  - project manager

Potential Members of the RAB

- Representatives of affected community interests and/or groups
- Interested individuals
- Installation
- EPA region (primarily NPL and BRAC installations)
- State environmental agency
- Other federal and state agencies (ATSDR, DOE, DOI, etc)
- Local government

Selecting Government Members

- Each organization selects one representative who has sufficient authority to implement the RAB mandate and who can dedicate the time necessary to fulfill responsibilities
- EPA region – usually the Remedial Program Manager
- State – the lead agency as established by Defense and State Memoranda of Agreement shall identify the appropriate representative
- Local Government – the local government shall identify the appropriate representatives

Selecting Community Members

CO will ensure that RAB membership mirrors the diverse interests within the community:

- Selection process must be unbiased and open
- Selection process must be conducted in cooperation with regulatory agencies and affected community members

Selection Process for the Community Members of the RAB

STEP ONE	STEP TWO	STEP THREE
IDENTIFY STAKEHOLDER INTERESTS WHO: Installation CO (in consultation with EPA and State) ■ characterize issues ■ establish procedures to periodically review interests	ORGANIZE A SELECTION PANEL WHO: Installation CO (in consultation with EPA and State) ■ Panelists should reflect a cross-section of stakeholder interests	NOMINATE RAB MEMBERS WHO: Selection Panel (composed of community members) ■ develop solicitation methodology/selection criteria ■ solicit nominations ■ review/evaluate candidates ■ recommend candidates

Step 1: Identify Stakeholder Interests

- Analyze data applications
- Characterize the community's diverse needs and interests

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Step 2: Organize a Selection Panel

- Panelists should represent a cross-section of the community:
  - local residents/community members, including traditionally underrepresented groups
  - current TRC members
  - installation residents/residents
  - local environmental groups/activists
  - business community
  - low income and minority groups
- Panelists should include both supporters and critics to generate broad input

Process for Establishing a Selection Panel

DoD policy and joint DoD and EPA guidelines state:

- there must be a selection panel
- the selection panel must reflect the diverse community interests
- the selection panel must be made up of community members only
- the selection panel will recommend a slate of RAB community members who represent diverse local interests

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Options for Establishing a Selection Panel

Installation CO (in consultation with EPA and state)

Organizes a selection panel of community members to nominate RAB members	Selects a neutral facilitator to establish the Selection Panel, which in turn nominates the RAB members	Organizes community representatives to choose the members of the Selection Panel, which in turn nominates the RAB members
Solicits volunteers to serve on the Selection Panel, which in turn nominates the RAB members	Has existing community members of the TRC serve as the Selection Panel, which in turn nominates the RAB members	Each agency nominates community members to serve on the Selection Panel, which in turn nominates the RAB members

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Step 3: Nominate RAB Members

The Selection Panel will:

- Select methods and criteria for soliciting and selecting candidates
- Solicit nominations from the community
- Review and evaluate candidates
- Recommend a slate of candidates for acceptance

Ensuring Balance and Diversity

- The CO, in consultation with EPA and state, shall accept the nominations of the Selection Panel unless he/she determines that the list is not balanced and diverse
- If candidates do not reflect the diverse community interests, the CO, in consultation with EPA and state, may request that the selection panel recommend an alternate list

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Converting a TRC to A RAB

- RABs are intended to meet the requirements of 10 USC 2705(c) for a TRC
- Where a TRC exists, the installation must determine whether its TRC meets the criteria for establishing a RAB
- The installation may expand its TRC to create a RAB by:
  - adding community co-chair
  - adding additional community representatives
  - making meetings open to the public
  - publishing meeting minutes
- As a general rule, TRC members should be given preference for a seat on the RAB

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Responsibilities of the RAB

- Provide advice to the installation and federal and state regulatory agencies
- Address important issues related to cleanup, such as scope of studies, cleanup levels, waste management, and remedial action alternatives.
- Review and evaluate documents
- Identify proposed project requirements
- Recommend priorities among sites or projects
- Conduct regular meetings, open to the public, at convenient times and locations

Selecting RAB Co-Chairs

Co-chairs will serve in equal partnership

- Installation Co-chair will be selected by the CO
  - must be empowered with the authority to implement RAB responsibilities
- Community Co-chair will be selected by the community members of the RAB

Responsibilities of the Installation Co-Chair

- Coordinate with the Community Co-chair to prepare and distribute an agenda prior to each RAB meeting
- Ensure that installation participates in an open and constructive manner
- Ensure that the RAB has the opportunity to provide input into the decision process
- Ensure that community issues and concerns related to cleanup are brought to the table
- Provide draft documents in a timely manner to the RAB for review and ensure that these documents are made available to the public
- Refer non-cleanup issues to appropriate installation officials for processing
- Report back to the installation
- Ensure that administrative support to the RAB is provided

Responsibilities of the Community Co-Chair

- Coordinate with the installation Co-chair to prepare and distribute an agenda prior to each RAB meeting
- Ensure that community members participate in an open and constructive manner
- Ensure that the RAB has the opportunity to provide input into the decision process
- Ensure that community issues and concerns related to cleanup are brought to the table
- Provide draft documents in a timely manner to the RAB for review and ensure that these documents are made available to the public
- Report back to the community

Responsibilities of the RAB Community Members

- Attend RAB meetings
- Advise and comment on cleanup issues to government decision makers
- Report back to the organization or community they represent
- Serve as a conduit for information flow to and from the community
- Review and provide comments on documents
- Serve in a voluntary capacity

Responsibilities of the State TDEC Member

- Attend RAB meetings
- Serve as an information, referral, and resource bank regarding installation cleanup
- Review and provide comments on documents
- Ensure that state environmental standards and regulatory issues are identified and addressed
- Facilitate resolution of environmental issues and constraints
- Assist in the education and training of RAB members

Responsibilities of the EPA Member

- Attend RAB meetings
- Serve as an information, referral, and resource bank regarding installation cleanup
- Review and provide comments on documents
- Ensure that state environmental standards and regulatory issues are identified and addressed
- Facilitate resolution of environmental issues and constraints
- Assist in the education and training of RAB members

Ingredients for a Successful RAB

- Open and forthright communication
- Understanding and trust
- Shared goals
- Willingness to forge partnerships

Establishing a RAB Mission Statement

- Agree on RAB scope
- Identify shared goals and objectives

Developing RAB Operating Procedures

- Establish membership policies
  - length of service
  - additions, replacements, and terminations
- Outline RAB operating principles
  - frequency and protocol of meetings
  - process for public review and comment
  - announcement of meetings
  - procedures for public participation and response to their questions and comments at RAB meetings

Administrative Tasks of the RAB

- Use and maintain a mailing list of stakeholders who wish to receive cleanup information
- Announce meetings in advance
- Develop an operating plan and meeting agenda
- Keep meeting minutes and make them available to the community

Installation Support to RABs

- Installation will provide administrative support to RABs, including:
  - information transfer (for example, meeting announcements and mailings)
  - meeting facilities
  - meeting materials
  - copying services
- Installation will provide experts to present and discuss technical information with the RAB
- DoD has not committed to providing funds directly to RABs for administrative or technical support

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SUMMARY AND CONCLUSIONS

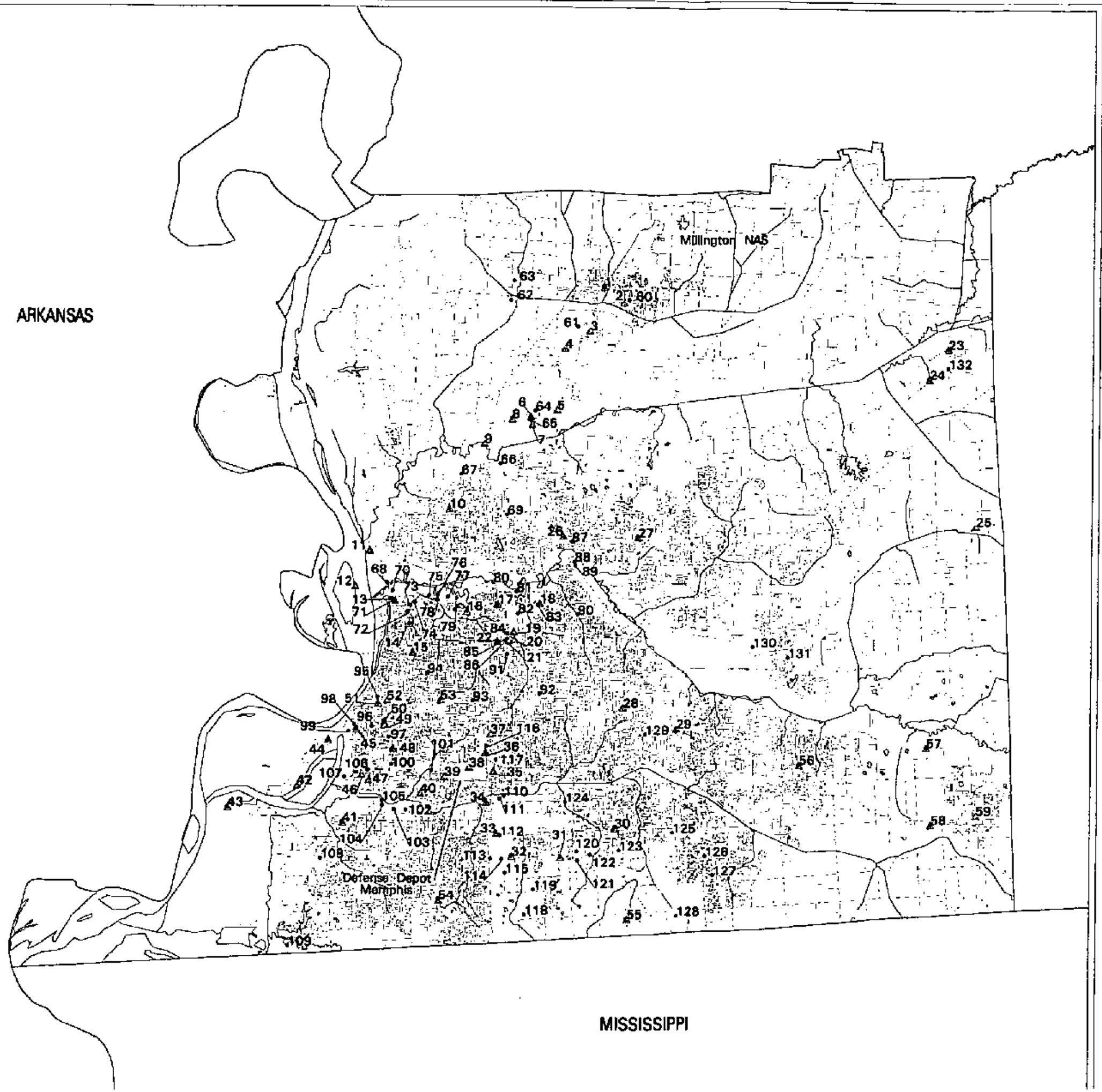
- DoD policy and joint DoD and EPA guidelines call for increased community participation in the cleanup process
- RABs are key elements which assist installation responsiveness to community concerns
- Result will be more responsive cleanups that address the diverse needs of the community

TAB

Executive Summaries Fact Sheets

Shelby County

CERCLA & RCRA Sites



- CERCLA Sites
- RCRA Sites

Data sources:
Roads and streams from US Census Bureau TIGER
Military Bases from Interstate maps
County boundaries from USGS 1:100,000 DLGs
CERCLA and RCRA data from EPA

MILES
5 0 5 10 20

Albers Equal Area Projection

CERCLA SITES IN SHELBY COUNTY, TENNESSEE

1	BENJESTOWN RD LDFL-SITE B
1	BENJESTOWN LDFL-SITE A
1	OLD FRAYSER DUMP
1	BENJESTOWN RD LDFL-SITE E
1	BENJESTOWN RD LDFL-SITE C
1	BROWNING-FERRIS OF MEMPHIS INC.
1	BENJESTOWN RD LDFL-SITE D
6	SCA CHEMICALS SERVS INC/TENN DIV
8	CHROMIUM MINING & SMELTING CORP
10	METRO SEWAGE TRMT
10	EPIC NES-29
10	ARCADIAN MEMPHIS PLANT
10	INTERNATIONAL HARVESTER-EPIC #73
10	HOLLYWOOD SITE/I-240
10	SHIRVANIA CHEMICAL
10	EPIC NES-1
10	FRAYSER SITE/ W OF PERSHING POINT APTS
10	NILOK CHEMICAL CO
10	SES-6
10	COSCIA DRIVE PESTICIDES SITE
13	MEMPHIS TRUMBULL ASPHALT
13	KRAFT INC-HUMKO PRODUCTS DIVISION
13	SOUTHERN CONTAINER CORP
13	HUSKY INDUSTRIES
14	KIMBERLY-CLARK CORP
15	PNB CORP
15	SOUTH TIN COMPRESS CO
16	BUCKMAN LABORATORIES INC
17	PRECISION MOTOR SHOP
17	MEMPHIS BOARD OF EDUCATION
17	TEX INDUSTRIES
17	PERES STREET DUMP
17	EPIC NES-28
17	PRECISION MOTOR WORKS INC
17	NEL-2
17	QUAKER OATS CO
22	CAPLEVILLE LANDFILL
22	ESTECH GENERAL CHEMICALS CORP
22	RALSTON PURINA (NEL-14)
22	BUCKEYE CELLULOSE CO S PLT
22	#3 BRUNSWICK QUADRANGLE
22	COLLINS STREET DRUM
22	BLUE OPEN FIELD
22	PROCTOR & GAMBLE CELLULOSE
23	ARLINGTON BLENDING & PACKAGING CO.
24	SANYMETAL PRODUCTS INC
26	CENTRAL HARDWARE
26	EPIC NES-8
27	HOWELLS PRIVATE DUMP
27	EPIC SITE NES-6
27	EPIC NES-10
27	EPIC NES-11

27	NES-31
27	NES-20
27	EPIC NES-12
28	SEL-10
28	SEL-18
29	AUTO JUNKYARD (EPIC NES-21)
30	MALL OF MEMPHIS
30	EXTRACTION SITE
30	BROWNING-FERRIS INDS
30	GENERAL MOTORS PARTS DIV
30	SINCLAIR & VALENTINE CO
30	FARRISVIEW DUMP
30	SOUTH EAST BLUE-21 SEL-21
30	INGELS INC
30	EASLEY EQUIPT/TRI-STATE TRANSIT COS
30	83A
30	SES-5
30	SES-4
30	ST.LOUIS-SAN FRANCISCO RAIL YARD
30	JAY WILEY IMPORTS SES-17
30	RAINES ROAD DRUM SITE
30	SES-9
30	DELTA FOREMOST CHEMICAL SEL-10
30	SITE #20 RED
31	BURKE-HALL COMPANY
32	SUN CHEMICAL CORP-GPI DIV
33	ESB INC
34	MEMPHIS AIRPORT DE-ICER TANK
36	OLD ESTECH GENERAL CHEMICALS INC
36	RALSTON PURINA (CHOW PLT) SEL-4
36	CHARLIE BROWN BODY SHOP & SALES
41	REFINED METALS CORP
41	HORN LAKE ROAD PAILS SITE
41	CONTINENTAL WAREHOUSES INC
41	SINCLAIR & VALENTINE CO
41	AARON STEEL SALVAGE CO INC
41	LAZAROV PRIVATE DUMP
41	ILLINOIS CENTRAL GULF RR/INTERMODEL DEPT
41	MEMPHIS PUBLIC WORKS/BROOKS RD DUMP
41	ST LOUIS-SAN FRAN-RAIL YARDS
43	MEMPHIS T E MAXSON WWTP
45	GENERAL ELEC CO MEMPHIS LAMP PLT
47	ASHLAND CHEMICAL CO
47	AIR PRODUCTS & CHEMICALS INC.
48	BURKE-HALL/LAUDERDALE
48	ELVIS PRESLEY BLVD 1-240 LANDFILL
50	WALLS PROPERTY LANDFILL
50	EPIC #57
50	#5 MILLINGTON QUADRANGLE
50	#2 BRUNSWICK QUADRANGLE
50	#4 MILLINGTON QUADRANGLE
50	#1 BRUNSWICK QUADRANGLE
51	#6 MILLINGTON
51	J & L DRUM CO/ EPIC # 35

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53	SOUTHERN CENTRAL CO
54	NEL-6
54	EPIC # 8 NORTH
54	27-RED OPEN DUMP SES-27
55	BROWNING-FERRIS INDS OF MEMPHIS INC
56	L & N LAGOON
56	EPIC NES-27
56	EPIC
56	SHELBY CNTY PENAL FARM LDFL
56	WALKER JIM
56	NES-37
57	CBI NUCLEAR CO A JOINT VENTURE
58	CARRIER AIR CONDITIONING CO
60	USN NAVAL AIR STA MEMPHIS
61	PULVAIR CORP
62	MILLINGTON LDFL
63	CHICKASAW ORDINANCE WKS
64	GULF & WESTERN TAYLOR FORGE
65	EARTH INDUSTRIES WASTE MGMT ENVIROPLEX
66	DUPONT EI DE NEMOURS & CO INC
67	FOGELMAN DUMP
68	PERKINS PROPERTY
69	AMERICAN READY MIX
70	OLD NORTH MEMPHIS CITY DUMP
71	OLD NORTH MEMPHIS CITY DUMP
72	OLD OSMOSE CHEMICAL
73	MAGNETIC ELECTRONICS CO
74	FIRESTONE TIRE & RUBBER CO
75	EPIC #67
76	EPIC #68
76	MEMPHIS PUBLIC WORKS/BELLVUE DUMP
76	BELLEVUE AVE LDFL
77	EPIC #71
77	WOLF RIVER N WATKINS STREET SITE
78	CYPRESS CREEK
79	ALLEN READY-MIX CONCRETE CO
80	NORTH HOLLYWOOD DUMP
81	MEMPHIS CONTAINER CO
82	VELSICOL CHEMICAL CORP
83	ESB INC
84	MR. COMPLETE USED AUTO PARTS
85	NES-36
86	DIESEL RECONDITIONING CO
87	NES-7
88	EPIC NES-17
89	EPIC NES 18
90	NES-25
91	CREOTOX CHEMICAL PRODUCTS CO.
92	COCA COLA BOTTLING CO SES 1
93	FENCED IN LOT (OLD POWER STATION)-SEL-1
94	WEAKLEY SUBDIVISION
95	674 MAIN STREET DRUM
96	EARTH INDUSTRIES WASTE MGMT INC
97	W & R DRUMS SITE

98	UNOCAL CHEMICALS
98	UNOCAL CHEMICALS
99	FORD MOTOR CO/MEMPHIS ASSEMBLY PLANT
100	REXHAM CORP
101	VERTUT
102	TULANE RD SITE (FIELD BEHIND TULANE RD)
103	#25
104	BIGGS LANDFILL
105	SITE #26
106	DREXEL CHEMICAL CO
107	MAPCO PETROLEUM
108	LAROCHE INDUSTRIES
109	SIXTY ONE INDUSTRIAL PARK
110	DEMOCRAT RD LANDFILL
111	MEMPHIS GARBAGE TRUCK YARD & LANDFILL
112	MEMPHIS ARPT STORAGE AREA-SEL-9
113	18 RED OPEN DUMP
114	MEMPHIS ARPT FUEL FARMS-SEL-12
115	RED MEMPHIS AIRPORT #25
116	GOULD INC
117	MEMPHIS FURNITURE MFG CO-SEL 5
118	EXTRACTION AREA
119	JACKSON PIT DUMP
120	IDEAL CHEMICALS & SUPPLY CO SEL-13
121	BADDOUR WAREHOUSE
122	FIRE STATION #50-SEL-14
123	15 RED OPEN FIELD
124	SES-13
125	RIDGEWAY ESTATES/HUD AREA
126	WEST CHYSLER MOTOR CO
126	JOE SCHLITZ SEL-17
127	RIDGEWAY ESTATE/HUD
128	EAST HOLMES ROAD DUMP
129	FEDERAL COMPRESS
130	EPIC #2 HUNTERS HOLLOW/HUD
131	HUNTERS HOLLOW/HUD
132	DOUGLAS ROAD DUMP

RCRA SITES IN SHELBY COUNTY, TENNESSE

1	SOUTH CENTRAL BELL MGTNTN 89302RS
2	NAVAL AIR STATION MEMPHIS
3	PULVAIR CORP
4	BROWNING FERRIS IND OF MEMPHIS
5	TAYLOR FORGE INTERNATIONAL, INC.
6	CWM CHEMICAL SERVICES INC
7	LAIDLAW ENVIRONMENTAL SERVICES (GS) INC
8	CHROMIUM MINING & SMELTING CORPORATION
9	E I DUPONT DE NEMOURS & CO INC
10	UNION CARBIDE CORPORATION, LINDE DIVISION
10	INTERNATIONAL HARVESTER CO FOUNDRY
10	JIMMY T WOOD, INC.
10	NILOK CHEMICALS, INC.
10	ARCADIAN FERTILIZER, LP
11	INTERNATIONAL HARVESTER CO
12	MEMPHIS NORTH WWTP
13	GENERAL ELECTRIC CO APPARATUS SERV
13	CUSTOM SOLVENTS & THINNERS, INC.
13	MID-AMERICA RECYCLING CORP.
13	SOUTHERN CONTAINER CORPORATION
13	CONWOOD CORPORATION
13	GENERAL ELECTRIC CO ICES
13	MAGNETIC ELECTRIC COMPANY
13	OWENS-CORNING FIBERGLASS INC
14	KIMBERLY-CLARK CORPORATION
15	BRUNNER, INC.
15	ALPHA THERAPEUTIC CORPORATION
16	BUCKMAN LABORATORIES INC
17	MEMPHIS CONTAINER CO. HOLLYWOOD STATION
17	UNION CARBIDE
17	ENENCO, INC.
17	NORTON CO* (FORMERLY EBS INC.)
18	EXIDE CORPORATION
19	BUCKEYE CELLULOSE CORPORATION
20	VELSICOL CHEMICAL
21	DIESEL RECON COMPANY
22	OWENS-ILLINOIS MEMPHIS BOX PLANT
23	M A INDUSTRIES
23	BELL-GLOVER PROPERTIES
24	SANYMETAL PRODUCTS CO INC
25	CERTAINTEED CORPORATION PIPE & PLASTIC G
26	METHODIST HOSPITAL-NORTH
26	ALL-STATE TERMITE & PEST CONTROL CO.
27	FEDERAL CORRECTIONAL INSTITUTION
28	SHERWIN WILLIAMS CO
29	SUNOCO SERVICE CENTER
29	TRANSPORT CONSULTANTS AND COMPANY

30	BASF WYANDOTTE CORP
30	TRUGREEN/CHEMLAWN
30	BRYCE CORPORATION
30	GENERAL MOTORS WAREHOUSING & DISTRIBUTIO
30	SOUTH CENTRAL - MMPHTNOA
30	SUNOCO SERVICE STATION
30	ROBINSON FREIGHT LINES
30	VAN WATERS & ROGERS, MEMPHIS
30	FRIPP FIBRE TENN INC
30	PRODUCTION FINISHES INTERNATIONAL INC
30	INGELS INC
30	FLINTINK CORPORATION
30	SHIRLO, INC.
30	164TH TACTICAL AIRLIFT GROUP, TN AIR
30	REBEL MOTOR FREIGHT INC
30	SHERWIN WILLIAMS CO
30	BAXTER HEALTHCARE, INTL.
30	S C JOHNSON & SON INC
30	CLEO INC
31	BURK-HALL COMPANY
32	SUN CHEMICAL CORP-GPI DIVISION
33	YUASA-EXIDE INC
34	CROWN ZELLER BACH CORP.
34	FRUEHAUF CORPORATION
35	ENPAK INC.
36	DIRECT MOTOR EXPRESS
36	TENSION ENVELOPE CORP
36	SCHERING-PLOUGH HEALTH CARE PRODUCTS
36	KELLOGG USA INC.
36	MOBILE PROCESS TECHNOLOGY CO
37	THE COCHRAN CORP
38	DEFENSE DISTRIBUTION REGION CENTRAL
39	REXHAM CORPORATION
40	AMERICAN RESOURCE RECOVERY CORP
41	LAROCHE INDUSTRIES, INC.
41	CONTINENTAL WAREHOUSES INC
41	CENTRAL SOYA CO. INC.
41	SUNOCO SERVICE STATION
41	BASF WYANDOTTE CORP/CHICKASAW WHSE CO
41	TRAMELL CROW DISTRIBURION CORP
41	SHERWIN WILLIAMS CO
41	PATTERSON WAREHOUSES INC
41	SUNOCO SERVICE STATION
41	SOUTHWESTERN TRANSPORTATION
41	STANDARD BRAKE SHOE AND FOUNDRY CO
41	DIXICO INCORPORATED
41	PULLMAN TRAILMOBILE 360 W MALLORY AVE
42	ASHLAND CHEMICAL INC.
43	MEMPHIS T E MAXSON WWTP

44	FLEET TRANSPORT CO.
44	SONOCO PRODUCTS CO (PRESIDENTS ISLAND)
44	MID-AMERICAN INDUSTRIES, INC.
44	MANFREDI MOTOR TRANSIT COMPANY
44	THE WESTERN TAR PRODUCTS CORPORATION
44	WESTERN COMMERCIAL MEMPHIS TERMINAL
44	GREAT DANE TRAILERS TENNESSEE INC
44	ERGON, INC.-MEMPHIS TERMINAL
44	CRODA INKS CORPORATION
44	WHARTON TRANSPORT CORP
44	AMOCO OIL COMPANY
44	THOMPSON-HAYWARD CHEMICAL*
44	BLOCK DRUG COMPANY, INC.
44	FL INDUSTRIES INC SUMMIT INSULATOR PLANT
44	CIBA-GEIGY CORPORATION
44	UNION TEXAS PETROLEUM
44	MEMPHIS WIRE & IRON WORKS INC
45	GENERAL ELECTRIC CO-MEMPHIS LAMP PLANT
46	REFINED METALS
47	DREXEL CHEMICAL COMPANY
48	EXXON COMPANY USA - MEMPHIS TERMINAL
48	BEMIS CO INC
48	LOUIS DREYFUS ENERGY MEMPHIS TERMINAL
48	BYRD REMANUFACTURING, INC.
48	FARRELL CALHOUN INC
48	AMERICAN COMMERCIAL LIQUID TERMINAL
48	UNION CHEMICALS DIVISION, UNION OIL CO.
48	APEX OIL COMPANY
48	SIGNAL CAPITAL CO. DBA SCSA INC.
48	MERCK SHARP & DOHME MEMPHIS BRANCH
48	UNARCO COMMERCIAL PRODUCTS
49	NICKEY WAREHOUSES, INC.
50	MEMPHIS FURNITURE CO
50	ST JUDE CHILDRENS RESEARCH HOSPITAL
50	STABRITE CLEANING SYSTEMS
50	MEMPHIS PUBLISHING CO
50	GORDONS TRANSPORTER, INC.
50	BRYCE CORPORATION
50	WITCO CORPORATION
51	UNITED COATINGS INC.
52	JEHL COOPERAGE CO
53	MEMPHIS SHELBY COUNTY HEALTH DEPT
53	METHODIST HOSPITAL-CENTRAL
53	DATA COM SOUTHERN
54	METHODIST HOSPITAL-SOUTH
54	NELSON PROCESS COLOR
54	ARROWHEAD SERVICES
54	COORS BREWING CO
54	POSTON WAREHOUSES INC

54 SMITH & NEPHEW RICHARDS, INC.
54 VERTUT BLENDING & PACKAGING
54 UNIVERSITY OF TENNESSEE DEPARTMENT OF PA
54 CENTURY INKS CORP SLEIGHT & HELLMUTH
55 BROWNING-FERRIS INDUSTRIES OF TN SOUTH S
56 JOSTENS INC
56 WALKER JIM
57 CBI NA-CON, INC.
58 CARRIER AIR CONDITION CO
59 HART FURNITURE MANUFACTURING CO
59 PIPER PRECISION DIES INC
59 NATIONAL CAN CORPORATION
59 WONDER /CBS TOYS

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Proposed Groundwater Action Plan
Defense Depot Memphis, Tennessee

Introduction

In 1992, the Environmental Protection Agency (EPA) placed the Defense Depot Memphis, Tennessee on the National Priorities List (NPL). A sitewide Remedial Investigation/ Feasibility Study (RI/FS) is being planned. An **Interim Remedial Action** (IRA) is planned for contaminated water beneath Dunn Field to stabilize the site until a permanent remedial action is identified.

This **proposed plan** identifies the preferred option for the IRA for the contaminated groundwater beneath Dunn Field at DDMT. In addition to identifying the preferred IRA, the proposed plan identifies other remedial options in detail. It solicits public review and comments, and provides information on how the public can be involved in the remedy selection process.

The proposed plan is issued by the DDMT, the lead agency for the cleanup operation. The EPA, along with the Tennessee Department of Environment and Conservation (TDEC), are the lead regulatory agencies for the site. A public comment period will be held, during which the public will have the opportunity to comment on this proposed plan. After the public comments have been received, they will be reviewed by the EPA, TDEC, and DDMT before a response action for the site is selected or approved. Terms in **bold** print are defined in a glossary at the end of the proposed plan.

This proposed plan is prepared by DDMT to comply with section 117(a) of **the Comprehensive Environmental Response, Compensation, and Liability Act** (CERCLA) as part of DDMT's public participation responsibility. Additional information and studies on this site can be found in the Administrative Record. The public is encouraged to review these documents to get a comprehensive understanding of the site and the activities that have been and may be conducted at DDMT.

The Administrative Record and an Information **Repository** for the DDMT site can be found at the following locations:

Public Information

The Memphis/Shelby County Public Library
Main Branch–Government and Law Section
1850 Peabody Avenue
Memphis, TN 38104-4025
(901) 725-8877

HOURS:
Monday-Thursday 9-9
Friday and Saturday 9-6
Sunday 1-5

Cherokee Public Library
3300 Sharp Avenue
Memphis, TN 38111-3758
(901) 743-3655

HOURS:
Monday and Tuesday 10-7
Wednesday and Thursday 12-6
Saturday 12-6
Closed Friday and Sunday

The Memphis/Shelby County Public Health Department
Pollution Control Division
814 Jefferson Avenue
Memphis, TN 38106
(901) 576-7741

HOURS:
Monday-Friday 8-4:30

For Further Information

To request further information, call (901) 775-4569 or write to:

Defense Distribution Depot Memphis
Environmental Protection and Safety Office, DDMT-DE
2163 Airways Blvd.
Memphis, TN 38114-5210

Send written comments before the close of the comment period or address questions to:

Ms. Christine Kartman
Defense Distribution Depot Memphis
Environmental Protection and Safety Office, DDMT-DE
2163 Airways Blvd.
Memphis, TN 38114-5210
Comment Hotline (901) 775-4569
Fax: (901) 775-4372

ATTENTION!

Public Comment Period

Date: December 1, 1994 to January 4, 1995

Purpose: to comment on the DDMT

Groundwater Action Plan

Site Background

The Depot, established in 1942, was previously a cotton farm. On January 26, 1942, the facility opened as the Army General Supply Depot. In 1962, the Defense Logistics Agency (DLA) assumed command of the Depot with a primary mission of the receipt, storage, and

shipment of a variety of stock items such as clothing, medicines, construction supplies, and potentially dangerous materials (such as bulk quantities of household cleaners). Between 1954 and 1970, solid waste and chemicals were buried in the facility's landfill area, known as Dunn Field. In 1981, DLA began evaluating its past management of hazardous waste at DLA installations around the world.

Because of the size of DDMT (642 acres) and the site's complexity, it has been broken down into the following four manageable **Operable Units** (OUs), as agreed to by DDMT, EPA, and TDEC:

- OU-1: Dunn Field
- OU-2: Southwest quadrant, main installation
- OU-3: Southeast watershed and golf course, main installation
- OU-4: North area, main installation

This proposed plan addresses the contaminated groundwater beneath the northern portion of OU-1. The remainder of OU-1 and OUs 2, 3, and 4 will be addressed in future documents.

The IRA represents the first step in the remediation of the contaminated groundwater beneath the northern portion of OU-1. The remainder of OU-1 and OUs 2, 3, and 4 will be evaluated later. Additional actions will be necessary to provide long-term definitive protection for OU-1. The location of Dunn Field and its associated OUs are shown in Figure 1.

Previous Studies

Several studies have been conducted at DDMT, as follows:

- Army Environmental Hygiene Agency (AEHA) Reports, 1982 and 1986
- U.S. Army Toxic and Hazardous Materials Management Agency (USATHAMA) Installation Assessment, 1981
- Summary Report On-site Remedial Activities at the Defense Depot Memphis, OH Materials Company, 1986
- **Remedial Investigation** (RI), Law Environmental, 1990
- **Feasibility Study** (FS), Law Environmental, 1990
- Pump Test, Engineering Science, 1991
- Focused Feasibility Study: Dunn Field, Engineering Science, July 1994

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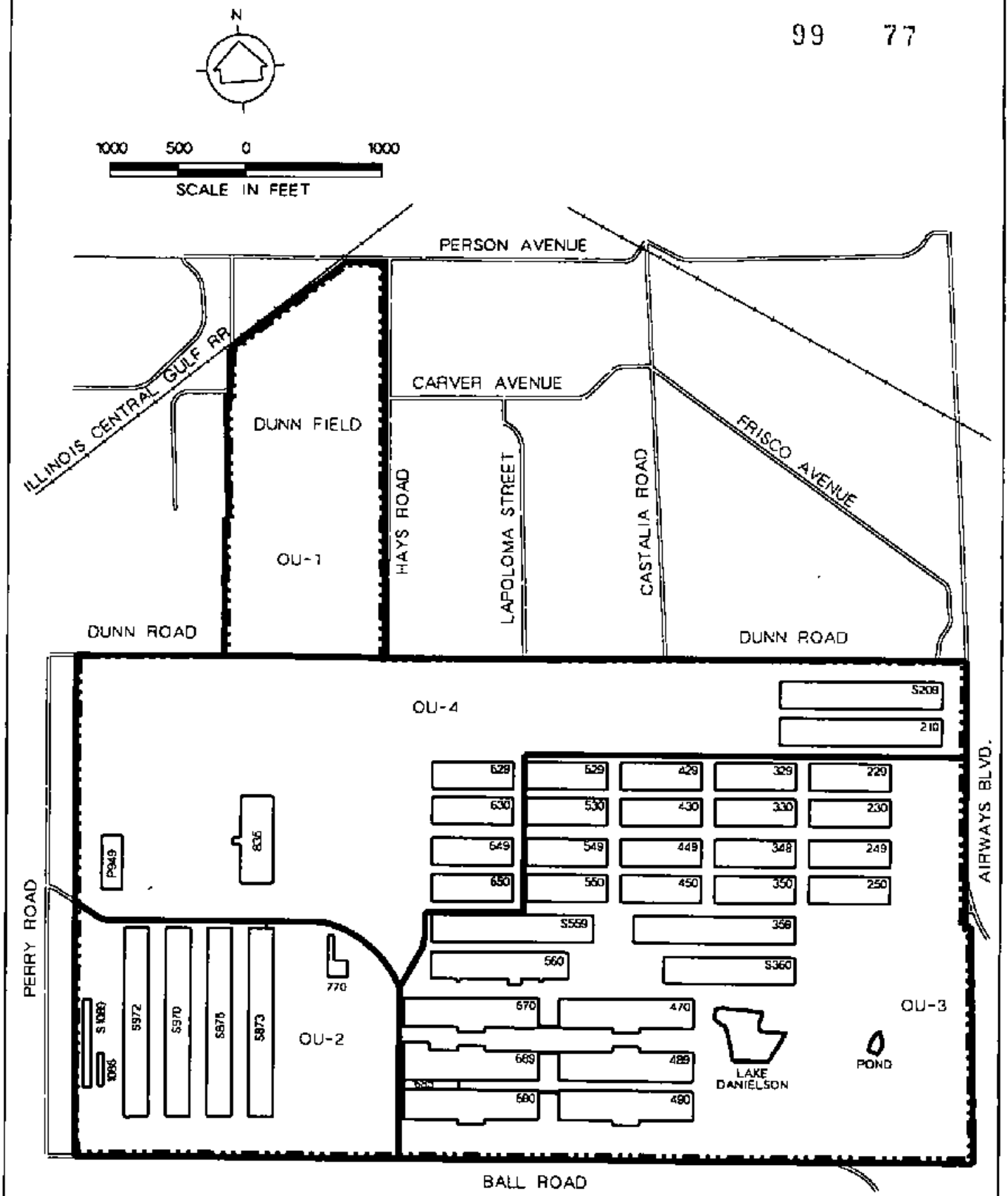


FIGURE 1
OPERABLE UNIT LOCATIONS
Defense Depot-Memphis, Tennessee

CH2M HILL

DDM-0008.DGN

- Environmental Assessment Removal Action for Groundwater, Engineering Science, 1993

- Groundwater Monitoring, Environmental Science and Engineering (ESE), 1993

The RI implemented by Law Environmental 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.

During the groundwater investigation phase of the RI, monitoring wells were installed in the Fluvial Aquifer and Memphis Sand Aquifer beneath Dunn Field. These wells and existing wells were sampled and analyzed to determine the presence and extent of contamination in the groundwater. The results indicated that elevated levels of **volatile organic compounds** (VOCs) and **heavy metals** were present and that the contamination appears to be migrating to the west of Dunn Field.

Contaminants in the Fluvial Aquifer include solvents such as trichloroethylene (TCE). TCE in its concentrated form is a Dense Nonaqueous Phase Liquid (DNAPL). The source of solvent contaminants may have been a release of solvent in DNAPL form that migrated downward. If DNAPL is present beneath Dunn Field, it would represent a possible continuing source of groundwater contamination. DNAPL solvent has not been found in previous investigations. An objective of the RI currently being planned is to locate the source of the solvents (as well as other contaminants) and to evaluate the presence and extent of any DNAPLs. Specific future remedial action alternatives will be evaluated for contaminant sources and DNAPL cleanup during the RI/FS process.

The FS prepared by Law Environmental evaluated various cleanup alternatives for DDMT. The document discussed remedial action alternatives for three areas of DDMT: Dunn Field groundwater, surface soils, and Lake Danielson/Golf Course Pond. Because the proposed plan only addresses contaminated groundwater in Dunn Field, this proposed plan will be limited to that topic.

The objective of Engineering Science's *Focussed Feasibility Study: Dunn Field* for the removal of groundwater was to evaluate treatment alternatives for the contaminated groundwater beneath Dunn Field on an interim basis to below EPA and TDEC action levels in an effort to mitigate offsite migration of contaminants. Engineering Science developed the following seven alternatives to remediate the contaminated groundwater below Dunn Field:

- No action

- Extract groundwater using pumping wells located within Dunn Field and treat using **air stripper** techniques, followed by disposal into the municipal sewer system or Publicly Owned Treatment Works (POTW). Treat for heavy metals as required.

- Extract groundwater using pumping wells located within Dunn Field and off government property, treat using air stripping techniques, followed by disposal in the municipal sewer system or POTW. Treat heavy metals as required.

- Extract groundwater using pumping wells located within Dunn Field and treat using **ultraviolet (UV)/oxidation** techniques, followed by disposal into the municipal sewer system or POTW. Treat for heavy metals as required.

- Extract groundwater using pumping wells located within Dunn Field and treat using air stripper techniques, followed by disposal into surface drainage. Treat for heavy metals as required.

- Extract groundwater using pumping wells located within Dunn Field and treat using UV/oxidation techniques, followed by disposal into surface drainage. Treat for heavy metals as required.

- Extract groundwater using pumping wells located within Dunn Field and treat using air stripping techniques, followed by reinjection into the Fluvial Aquifer. Treat for heavy metals as required.

The alternatives were evaluated by Engineering Science using selection criteria (discussed in the "Evaluation of the Alternatives" section of this document). Engineering Science tentatively selected a preferred alternative, in which the groundwater is extracted onsite and treated using air stripping, followed by discharge to surface water drainage.

The environmental assessment conducted by Engineering Science evaluated the possible effects of the preferred alternative. The effects (positive and negative) of this action include the following:

- Control of groundwater contaminants beneath Dunn Field
- Reduction of future volumes of contaminated groundwater
- Indirect protection of the Memphis Sand Aquifer
- Short-term increase in noise levels from operation of construction equipment
- Release of low levels of VOCs into the atmosphere
- Increased noise levels from the operation of the water treatment system
- Release of metals to surface water
- Meeting National Pollutant Discharge Elimination System (NPDES) permit requirements

Currently available information on groundwater quality and discussions with the City of Memphis indicate that treatment may not be required to meet city discharge requirements. However, treatment will be provided if needed to meet permit limits.

Engineering Science's assessment found no significant adverse effect on the environment as the result of the construction and operation of the proposed action.

In 1992, the EPA placed DDMT on the National Priorities List (NPL) primarily because of the potential for contamination from Dunn Field to reach the Memphis Sand Aquifer, from which the City of Memphis draws its drinking water. The NPL is EPA's list of hazardous waste sites identified for possible long-term remedial action under the Superfund. RIs must be conducted for all sites that are placed on the NPL.

Scope and Role of Response Action

Data collected in the previously mentioned documents indicated the presence of VOCs and heavy metals in the Fluvial Aquifer. Because the contaminated Fluvial Aquifer poses a threat to the deeper Memphis Sand Aquifer, it is considered as a potential 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 monitoring the groundwater plume migration and response to the IRA. Once the plume has been characterized, subsequent action may be taken to provide long-term definitive protection including remediation of source areas and potential DNAPL. To the extent possible, the interim action will not be inconsistent with, nor preclude implementation of, the expected final remedy.

Summary of Site Risks

In 1990, as part of the RI/FS, Law Environmental performed a qualitative and a quantitative risk assessment based on EPA's risk assessment guidance in effect at that time. Information from this effort was included in the *Focussed Feasibility Study: Dunn Field* (Engineering Science, July 1994).

Potential exposure points for contaminated groundwater from Dunn Field were identified as follows:

- 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

The transport medium and exposure pathway for the exposure scenarios identified above are identified in the Preliminary Risk Assessment as follows:

- Leaching from materials from past disposal activities at Dunn Field.
- Contaminants from leaching are present in the Fluvial Aquifer as a result of dispersion and infiltration.
- The Fluvial Aquifer potentially recharges the Memphis Sand Aquifer by leakage through what is otherwise considered a regional confining clay that separates

the two aquifers. Potential future contamination resulting from this leakage could provide a pathway for contaminants to the deeper Memphis Sand Aquifer.

- Allen Well Field, located approximately 1 mile south of Dunn Field, is one of six pumping centers serving the Memphis area. With 35 wells, Allen Well Field pumps approximately 21 million gallons a day (mgd) of potable water from the Memphis Sand Aquifer and accounts for approximately 15 percent of the water used by the Memphis area. Contamination of the Memphis Sand Aquifer could affect this water supply source.

Maximum Contaminant Levels (MCLs) for groundwater have been established by the Safe Drinking Water Act. Ten of the groundwater contaminants present in the Dunn Field area exceed the MCLs. Table 1 lists the contaminants that have been found in the groundwater beneath Dunn Field above their respective MCLs.

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 substances from Dunn Field, if not addressed by the preferred alternative or one of the other active measures considered, may present a current or potential threat to public health, welfare, or the environment.

The preferred alternative must increase the overall protection of human health and the environment. By implementing a groundwater IRA, contaminants 1) will be incrementally removed from the Fluvial Aquifer; 2) will be contained to mitigate migration toward the Allen Well Field; and 3) will have a reduced likelihood of creating a potential exposure pathway as identified in the Preliminary Risk Assessment.

Although this option will not immediately 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 reducing the concentration of contaminants.

DDMT is taking a proactive approach for responding to the risks associated with the site. The following is a summary of alternatives that have been evaluated and analyzed. DDMT is seeking to implement the preferred alternative (Alternative 8) to accelerate the schedule for cleanup.

Summary of Alternatives

The alternatives that have been evaluated for the IRA are listed in Table 2.

Table 1
Maximum Concentration of
Contaminants Found in Dunn Field Groundwater

Constituent	MCL (µg/L)	Highest Level Detected During Law's RI (µg/L)/(location)
Volatile Organic Compounds		
1,1-Dichloroethylene	7	160 (MW-10)
1,2-Dichloroethylene (total)	70	520 (MW-11)
tetrachloroethylene	5	240 (MW-10)
trichloroethylene	5	5,100 (MW-12)
carbon tetrachloride	5	77 (MW-6)
Metals		
arsenic	50	210 (MW-14)
barium	2000	3,740 (MW-14)
chromium	100	1,240 (MW-7)
lead	15[1]	1,000 (MW-10)
nickel	100	602 (MW-7)

Source: Engineering Science, July 1994. *Focussed Feasibility Study: Dunn Field.*

Notes:
[1]Action Level

Abbreviations:
MCL–Maximum Contaminant Level
µg/L–Micrograms per liter
MW–Monitoring well

Table 2
Alternatives for Interim Remediation

Alternative	Extraction	Treatment	Disposal
1	No Action	none	none
2	Deep wells onsite	air stripping metals option	municipal sewer
3	Deep wells on- and offsite	air stripping metals option	municipal sewer
4	Deep wells onsite	UV/oxidation metals option	municipal sewer
5	Deep wells onsite	air stripping metals options	surface drainage
6	Deep wells onsite	UV/oxidation metals option	surface drainage
7	Deep wells onsite	air stripping metals option	reinjection upgradient onsite
8 (preferred)	Deep wells on- and offsite	none	municipal sewer

Alternative 8 is the preferred alternative.

Alternative 1: No Action

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

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.

Alternative 2: Extraction Onsite, Air Stripping, 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 based on 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. On the basis of the concentration of VOCs in the air stripper exhaust, a carbon treatment system may also be necessary. 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.

Alternative 3: Extraction On/Offsite, Air Stripping, POTW

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 contamination groundwater offsite of Dunn Field. The treatment and handling of the groundwater would be similar to Alternative 2.

Alternative 4: Extraction Onsite, UV/Oxidation, 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.

Alternative 5: Onsite Extraction, Air Stripping, Surface Discharge

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 north and west boundaries of Dunn Field. Both of these channels terminate at Crane Creek, located north of Dunn Field. A NPDES permit would be required before discharge would be allowed.

Alternative 6: Extraction Onsite, UV/Oxidation, Surface Drainage

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.

Alternative 7: Extraction Onsite, Air Stripping, Reinjection

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 treatment 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 east side of Dunn Field.

Alternative 8: Extraction On/Offsite, 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 shallow aquifer at OU-1. Additionally, this alternative does not assume that pretreatment before discharge will be required.

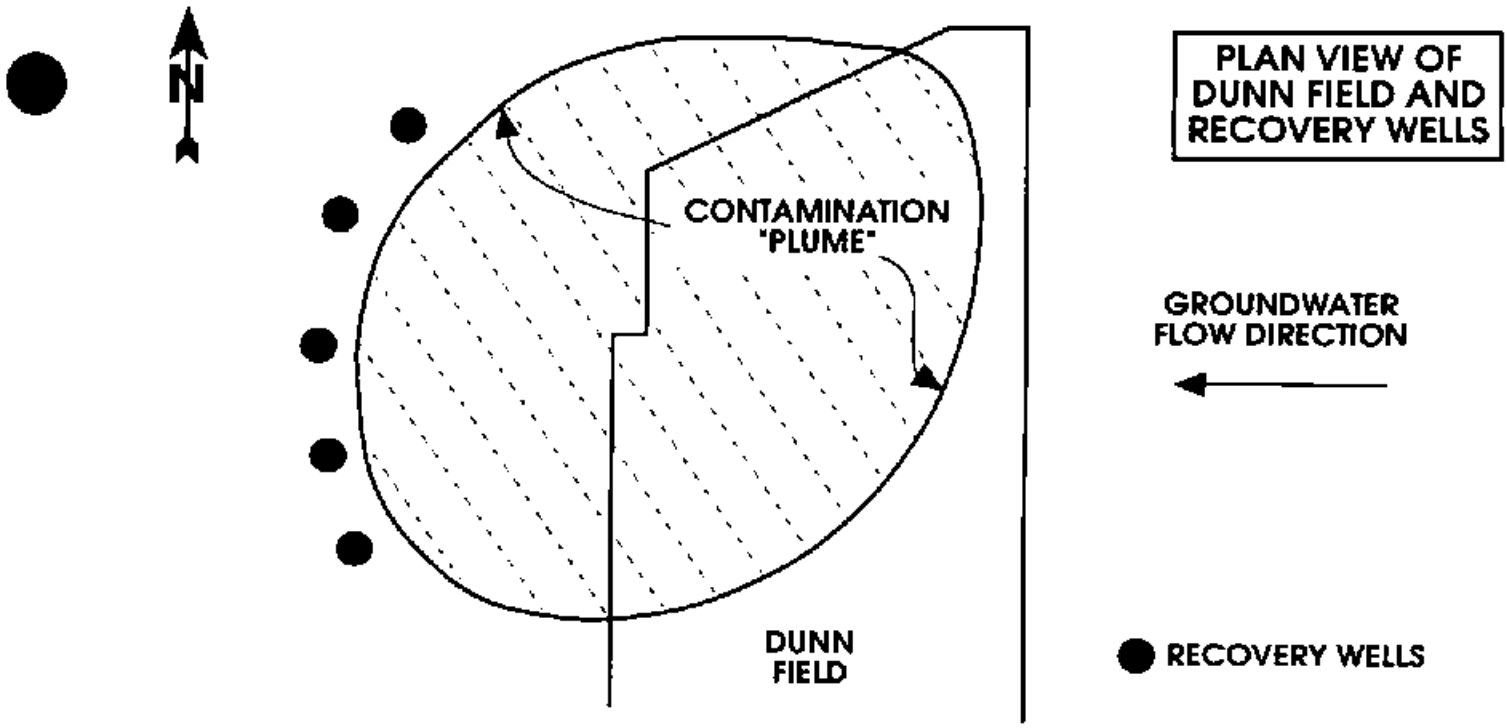
Alternative 8 would be used to contain the contaminated groundwater by inducing a hydraulic barrier. The hydraulic barrier will be achieved by pumping the groundwater from the containment wells placed along the leading edge of the plume. The leading edge of the plume will be located as part of the RI activities or IRA design activities planned for OU-1. Data gathered during the OU-1 RI will be used to develop the remedial design of the proposed IRA. 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 determine aquifer characteristics.
- Additional monitoring wells will be installed to determine the western edge of the contaminant plume.
- Once the aquifer characteristics are determined and the leading edge of the plume is identified, additional groundwater recovery wells, which are located along the leading edge of the plume screened to the confining clay layer of the Memphis Sand Aquifer, will be installed as appropriate to contain the plume.

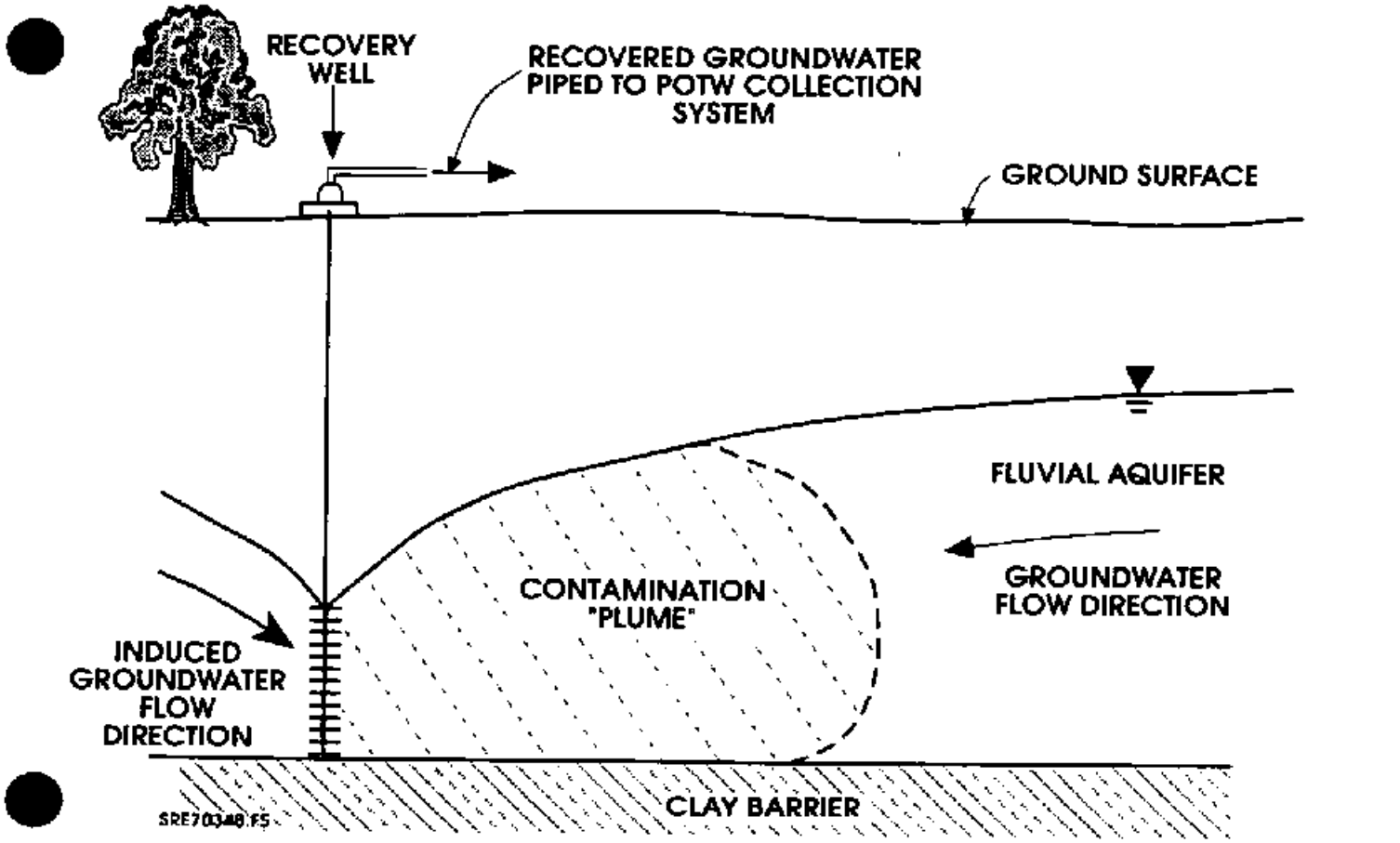
The groundwater and the associated contamination will be captured by the recovery wells (see Figure 2). The spacing and pumping rate of the wells will be such that the contamination should not move beyond the line of wells. Once the recovery wells are operating, the system will be checked frequently and any necessary adjustments made (including the installation of additional recovery wells if needed) to verify that the plume is contained.

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, treatment before discharge will be evaluated. A treatment analysis will be conducted after the system is operating to compare treatment and surface discharge versus sewer discharge to evaluate which option is cost-effective. The cost of Alternative 8 assumes that the groundwater will meet the City's permit limits and that no treatment will be needed.

FIGURE 2



PLAN VIEW



SECTION

Cost Estimates

Cost information is preliminary and is provided for making relative comparisons among different alternatives. Costs are based on information available at the time the estimate was made and are considered to be order of magnitude. These are estimates made without detailed engineering data. Estimates of this type are generally expected to be accurate within plus 50 percent and minus 30 percent. These costs do not represent government estimates for procurement.

Cost information will be evaluated further during design and implementation of the IRA. Costs presented for Alternatives 2 through 7 are taken from the *Focussed Feasibility Study: Dunn Field* by Engineering Science. These costs are based on preliminary assumptions that will be verified during RI and IRA design activities. Present worth calculations in the Engineering Science report were revised to use a 30-year period of operation and a 2.8 percent discount rate.

Implementation Time

Implementation time for each of the alternatives is approximately the same. Scheduled activities include three phases–preconstruction, construction, and operations. Activities within each phase and approximate duration are as follows:

Phase	Approximate Duration	Activities
Preconstruction	8-12 months	• Respond to public comments on the proposed plan. • Select the IRA remedy • Prepare a Record of Decision • Permit application • Obtain property access • Perform RI to locate the western extent of the plume • Perform a pump test to determine aquifer characteristics. • Complete the Remedial Design for the IRA • Construction Contractor Procurement
Construction	3 to 6 months	• Install groundwater recovery wells and discharge piping
Operations	Indefinite	• The system of recovery wells will be operated until the risk associated with the contaminants is reduced to acceptable levels or until the final remedy is in place.

Evaluation of the Alternatives

This section evaluates the alternatives for the nine criteria set forth by the EPA. The criteria are as follows:

- 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.
- Compliance with **Applicable or Relevant and Appropriate Requirements (ARARs)**–Assesses compliance with federal/state requirements.
- Long-Term Effectiveness–Degree to which a remedy can maintain protection of health and environment once cleanup goals have been met.
- 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.
- Short-Term Effectiveness–Length of time for remedy to achieve protection and potential effects of construction and implementation of a remedy.
- Implementability–Refers to the technical feasibility and administrative ease of a remedy.
- Cost–Weighing the benefits of a remedy against the cost of implementation.
- State Acceptance–Consideration of the State's opinion of the preferred alternative.
- Community Acceptance–Consideration of public comments on the preferred alternative and the proposed plan.

Analysis

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. All of 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. Discharge to the POTW will be subject to both the substantive and administrative requirements of the national pretreatment program and all applicable state and local pretreatment regulations. Discharge to the POTW will only continue as long as the POTW is in compliance with EPA's offsite policy. Should treatment be required, Alternative 3 will be implemented as a contingency to provide groundwater treatment.

Alternative 3 uses an air stripper for the removal of VOCs from the extracted groundwater. Air stripping is a viable treatment process for removal of VOCs from water. If pretreatment before discharge is required to meet the specified limits of the discharge permit, treatment alternatives will be evaluated to determine the most effective method, taking into account operation costs, capital costs, disposal costs, and potential regulatory concerns such as air permits.

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 inherit 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 reduce further lateral contamination migration. Implementing this alternative would result in a reduction of potential effects to nearby residents from contaminants at Dunn Field.

Implementablity. 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 was conducted by Engineering Science and included the cost of well installation and operation and maintenance cost of the air stripper.

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.

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. The community will have an opportunity to comment on this alternative, and these comments will affect the proposed plan of action.

Selection of the Preferred Alternative

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. 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 the remedy process yields information indicating that treatment before discharge is required, a more comprehensive evaluation and cost analysis of pretreatment options will be performed. The preferred alternative for the IRA of the contaminated groundwater below Dunn Field is Alternative 8–on/offsite extraction and POTW disposal. Alternative 3, to provide groundwater treatment if needed, is a contingency remedy.

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 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.

Observational Approach

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

- Establishing the conditions that are believed to exist based on available information. Design will be based on expected conditions.
- Establish, in advance, conditions that are reasonable deviations from the probable conditions.
- Implement the base design and monitor conditions.
- Implement 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 on this project.

The observational method will be used during design and implementation and is not part of the selection process for the interim remedial action alternative.

Community Participation

Alternative 8 is the preferred alternative. However, changes to the preferred alternative, or a change from the preferred alternative to another alternative, may be made if public comments or additional data indicate that such a change would result in a more appropriate solution.

The public is encouraged to actively participate in the selection process of this proposed plan and any other actions that may or will be conducted at DDMT.

Send written comments before the close of the comment period or address questions to:

Ms. Christine Kartman
Defense Distribution Depot Memphis
Environmental Protection and Safety Office, DDMT-DE
2163 Airways Blvd.
Memphis, TN 38114-5210
Comment Hotline (901) 775-4569
Fax: (901) 775-4372

ATTENTION!

Public Comment Period

Date: December 1, 1994 to January 4, 1995

Purpose: to comment on the DDMT

Groundwater Action Plan

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 feet west of Dunn field	Plume extends 1,200 feet 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			

The public's comments will be reviewed by the EPA, TDEC, and DDMT and incorporated into the **Record of Decision** (ROD). Additionally, DDMT selected a **Restoration Advisory Board** (RAB), consisting of representatives from the Memphis area community, and from the state and federal government, to discuss the ongoing restoration activities at DDMT. The RAB meets monthly and encourages public participation.

Glossary of Terms

Air Stripping–The transfer of gas (volatiles) from liquid to air by the agitation of the air-water interface.

Applicable or Relevant and Appropriate Requirements (ARARs)–Any federal or state regulation or law (such as the Clean Water Act) that is and can be federally and state enforceable.

Aquifer–A saturated permeable geologic unit that can transmit significant quantities of water under normal hydraulic gradients.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)–Superfund law that provides for identification and cleanup of hazardous materials released over the land and into the air, waterways, and groundwater.

Feasibility Study (FS)–A study that evaluates cleanup alternatives for a site based on information gathered during a concurrently conducted remedial investigation of the site.

Heavy Metals–Metallic elements with high atomic weights, such as antimony, arsenic, barium, cadmium, chromium, copper, lead, mercury, nickel, selenium, or zinc. They can damage living things at low concentrations and tend to accumulate in the food web.

Hydrocarbons–Chemical compounds that consist entirely of carbon and hydrogen.

Interim Remedial Action–The actual construction or implementation phase of a site cleanup. Follows remedial design and is also known as Remedial Action.

Maximum Contaminant Levels (MCLs)–The maximum permissible level (concentration) of a contaminant in water that is delivered to any user of a public water system.

Observational Method–Traditionally applied in geotechnical engineering, the observational method incorporates several key elements applicable to hazardous waste site remediation including: (1) remedial design based on most probable site conditions; (2) identification of reasonable deviations from those conditions; (3) identification of parameters to observe so as to detect deviations during remediation; and (4) preparation of contingency plans for each potential deviation.

Operable Unit–Discrete parts of an entire response action.

Pesticides–Chemicals used to destroy insects or pests.

Physio-Chemical Process–The use of physical and chemical means for treating a specific media (most commonly water).

POTW–Publicly Owned Treatment Works, the City's Wastewater Treatment Plant.

Plume–A visible or measurable discharge of a contaminant from a given point of origin.

Present Worth–Value of project reduced to today's cost for equal comparison. Present worth computations use a 30-year planning period with a 2.8 percent discount rate (real interest rate).

Proposed Plan–One of several decision documents involved in Superfund's remedial process. The document provides a brief summary of all the alternatives studied in a site's RI/FS and highlights key factors that led to the identification of the preferred alternative for a site.

Record of Decision (ROD)–One of several public decision documents involved in Superfund's remedial process. This document certifies that the remedy complies with CERCLA, outlines the technical goals of the remedy, provides background information on the site, summarizes the analysis of alternatives, and explains the rationale for the remedy selected.

Repository–A facility where official Superfund documents are kept for public reference.

Remedial Investigation (RI)–An investigation that assess the extent and nature of the contamination and the potential risks associated with the contamination. Typically, an RI is conducted concurrently with a feasibility study.

Restoration Advisory Board (RAB)–A board of Memphis area community members, federal employees, and state employees selected by DDMT's technical advisory board to represent the public and community interests and concerns.

Slurry Wall–Barriers used to contain the flow of contaminated groundwater.

Ultraviolet (UV)/Oxidation–The use of ultraviolet light to supply the energy needed to remove hydrogen or electrons.

Volatile Organic Compounds (VOCs)–Potentially toxic volatile chemicals used as solvents, degreasers, paint thinners, and fuels.

FACT SHEET
FEDERAL FACILITY AGREEMENT
DEFENSE DEPOT MEMPHIS
MEMPHIS, TENNESSEE
DECEMBER, 1994

This fact sheet is designed to assist residents and local officials in understanding the Federal Facility Agreement (FFA) and how it pertains to the Depot's Environmental Restoration Program.

INTRODUCTION

The FFA is designed to assure that the Depot conducts the work necessary to ensure that the environmental impacts associated with past and present activities at the site are thoroughly investigated in accordance with the Environmental Protection Agency and Tennessee Department of Environment and Conservation, and all provisions of the Comprehensive Environmental Response, Compensation, and Liability Act (CERLA), the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), the Resource Conservation and Recovery Act (RCRA), and applicable Tennessee State Law.

DESCRIPTION OF AGREEMENT

The FFA is a legal and binding document between all parties to clearly define the process that will be followed to complete the restoration of the facility. The agreement includes a list of affected parties, enforceability, facility descriptions, findings of facts, background information, and other technical details. The document also includes terminology, a summary of existing studies and reports, and the Site Management Plan (SMP). The SMP describes the operable units to be investigated and proposed schedules for work completion. These schedules are enforceable and binding to ensure progress toward restoration. Negotiation on this agreement began in February 1992 and has involved months of negotiation between the Depot, EPA, and TDEC so that all parties would feel their regulations were given appropriate consideration.

WHY SIGN A FFA?

The FFA is designed to encourage cooperation, exchange of information and participation between the Depot, EPA and TDEC. The agreement is designed to identify the appropriate response actions necessary to protect public health, welfare, and the environment of the local community. Agreements are usually signed when there has been a release or a potential release of hazardous substances, pollutants, contaminants, solid wastes, hazardous wastes, hazardous materials from the Facility.

WHY IS THE DEPOT SIGNING THE FFA?

The Depot poses a potential threat of releasing hazardous materials into the groundwater of the Memphis Sands Aquifer. Although testing has not shown any hazardous substances in this aquifer, the potential for exposure does exist, therefore the need exists for cleanup of the facility. The Depot is signing the agreement to assure that the cleanup occurs in a timely manner, as well as in appropriate response to EPA Regulations, and Tennessee State laws. The Depot is making this commitment to ensure that the public health and welfare is protected against any contamination that might occur.

HOW DOES THIS AGREEMENT AFFECT YOU?

As a member of the local community the FFA will assure you that the Depot is expediting the cleanup/restoration process. The Depot in accordance with FFA will continue to solicit community comments and interaction on each of the proposed restoration activities. The FFA will assure you that the potential for contamination is removed from your community.

WHERE TO REVIEW THE FFA

Copies of the FFA have been placed in the following information repositories for public review and comment:

Memphis Shelby County
Library Main Branch
1850 Peabody
Memphis, TN
(901) 725-8877

Cherokee Branch
Public Library
3300 Sharpe Avenue
Memphis, TN
(901) 743-3655

Memphis/Shelby County
Health Department
Pollution Control
814 Jefferson Avenue
Memphis, TN
(901) 576-7775

HOW TO COMMENT ON THE FFA:

Comments will be accepted until January 4, 1995, please send written comments on the FFA to:

Mr. Jon D. Johnston, Chief
Federal Facilities Branch
United States Environmental Protection Agency
Region IV
345 Courtland Street NE
Atlanta, GA 30365

FACT SHEET
INTERIM REMEDIAL ACTION
DEFENSE DISTRIBUTION DEPOT
MEMPHIS, TENNESSEE
DECEMBER 1994

99 99

The objective of the Interim Remedial Action (IRA) is to insure protection of the Memphis drinking water supply. The IRA will prevent further movement of groundwater contamination in the shallow layer of water beneath the ground's surface known as the Fluvial Aquifer.

HOW DID THE GROUNDWATER CONTAMINATION OCCUR?

It appears that contamination may have been caused by past burial activities at Dunn Field. That is the Depot property located just north of Dunn Road. The burials took place primarily from the 1950's through the 1970's when burying waste was common practice. Items buried included products that had reached expiration such as medical items, food and hazardous materials. Construction debris was also buried there.

WHAT IS THE IRA?

The IRA will consist of a series of small wells located along the leading edge of the contaminated plume. Some of these wells could be located off Depot property. Groundwater will be pumped from the recovery wells, preventing any further movement of the plume in the Fluvial Aquifer. The groundwater pumped from the wells will be filtered if necessary to remove contaminants to an approved level acceptable for disposal into the city of Memphis sanitary sewer system.

The IRA will be conducted in phases because of the uncertainty surrounding the distance the groundwater contamination plume has migrated at the Depot. Initially, one well will be installed to determine how to space and how much to pump the future wells. Additional wells will be installed and sampled to determine how far the plume has migrated.

FINAL RESULTS OF THE IRA

The IRA will create a barrier to contain the contaminated groundwater so that it can not migrate farther into the groundwater until a permanent solution is reached.

WHERE TO REVIEW THE IRA

Copies of the IRA have been placed in the following information repositories for public review and comment:

Memphis Shelby County
Library Main Branch
1850 Peabody
Memphis, TN
(901) 725-8877

Cherokee Branch
Public Library
3300 Sharpe Avenue
Memphis, TN
(901) 743-3655

Memphis/Shelby County
Health Department
Pollution Control
814 Jefferson Avenue
Memphis, TN
(901) 576-7775

HOW TO COMMENT ON THE IRA:

Comments will be accepted until January 17, 1995, please send written comments on the IRA to:

Ms. Christine Kartman
Defense Distribution Depot Memphis
Environmental Protection and Safety Office, DDMT-DE
2163 Airways Blvd.
Memphis, TN 38114-5210

Defense Distribution Depot Memphis Tennessee
Fact Sheet
July 1994

This fact sheet is part of a series designed to inform residents and local officials of the Depot's ongoing installation restoration program.

INTRODUCTION

In 1980, Congress passed the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) which provided the mandate to cleanup abandoned or former hazardous waste sites. Congress made the U.S. Environmental Protection Agency (EPA) the lead agency in implementing CERCLA. Facilities which pose a potential risk to the health of people or the environment are placed on the National Priorities List (NPL) and regulated under CERCLA.

WHERE IS THE DEFENSE DISTRIBUTION DEPOT?

The Defense Distribution Depot (DDMT) covers 642 acres of federal land located in a mixed residential, commercial, and industrial land use area one mile north of the Memphis International Airport in south central Memphis. The facility is bordered on the north by Dunn Avenue, Perry Road on the west, Ball Road on the south, and Airways Boulevard on the east.

WHAT IS THE HISTORY OF THE DEPOT?

The Depot was established in 1942 and was previously a cotton farm. In 1962 the Defense Logistics Agency assumed command of the Depot with a primary mission of the receipt, storage, and shipment of a variety of stock items such as clothing, medicines, construction supplies, and hazardous materials (i.e.bulk quantities of household cleaners). Between 1954 and 1970 solid waste and chemicals were buried in the facilities landfill area, known as Dunn Field. In 1981, DLA began evaluating their past management of hazardous waste at DLA Installations around the world. In 1988, the Depot began an investigation at their facility to test for soil and groundwater contamination. In 1992, the EPA placed the Depot on the NPL because of the potential for contamination from Dunn Field to reach the Memphis Sand Aquifer, where Memphis draws its drinking water.

CLEANUP PROCESS

To understand the CERCLA process, it is necessary to understand the cleanup program. Under this program, EPA takes long-term actions to stop or greatly reduce releases of hazardous substances that are serious but not immediately life threatening. Interim cleanup actions are emergency actions necessary to stop releases of hazardous substances that pose an immediate threat to human health and the environment. They may be taken at any point in the process.

The cleanup process begins with a preliminary assessment/site investigation (PA/SI). This is conducted to determine whether the facility poses a significant enough hazard to warrant

further study and investigation. The facility is then ranked using the Hazard Ranking System (HRS), a numerical ranking system used to identify the facility's potential hazard to the environment and public health. A facility's HRS score determines their placement on the NPL. When a facility is added to the NPL, a remedial investigation (RI) is conducted to assess the extent and nature of the contamination and the potential risks. A feasibility study (FS) is then prepared to evaluate various cleanup alternatives. Following a public comment period on the preferred alternative and the draft FS report, the facility, with concurrence from the EPA and the State, chooses a specific cleanup plan and outlines its selection in a Record of Decision (ROD).

Once the remedial design (RD) is completed, the cleanup work, or remedial action (RA), can begin. After RD/RA activities have been completed, the facility is monitored to ensure the effectiveness of the response. Certain measures may require ongoing operation or periodic maintenance.

PRELIMINARY FINDINGS

In 1988, a preliminary Remedial Investigation/Feasibility Study (RI/FS) was conducted to test the soil and groundwater. The initial investigation was completed in 1990. The testing found the following:

- Low levels of volatile organic chemicals (i.e. degreasers and paint removers), heavy metals and pesticides in the sediment at the bottom of the fire reservoir and the golf course pond
- Soil samples taken at former chemical spill sites showed volatile organic chemicals, hydrocarbons and pesticides
- The groundwater monitoring wells indicated low levels of volatile organic chemicals and heavy metals in the upper aquifer, the Fluvial Aquifer
- The potential risk to human health is the contamination of the Memphis Sand Aquifer; however, the testing has found no contamination there.
- Surface water testing indicated little or no risk existed from exposure because the surface water is not used for drinking water or recreation.

DDMT'S RESTORATION PROGRESS REPORT

* July 1993 - began designing an Interim Remedial Action for the groundwater under Dunn Field.

* November 1993 - began planning for the follow on RI/FS to determine the full extent of contamination as well as recommend appropriate cleanup actions. The follow-on RI/FS testing and reporting should be completed by late 1995.

* February 1994 - DDMT established a Technical Review Committee (TRC).

* June 1994 - DDMT established a Restoration Advisory Board using the TRC as the selection committee.

FUTURE PLANS

- Signing of Federal Facility Agreement.
- Completion of restoration workplans for the facility.
- The cleanup program will continue at DDMT until the facility is completely restored.

PUBLIC INFORMATION

Public information repositories have been established for public access to fact sheets, press releases, and reports regarding site investigations, studies, and other activities. The information contained in the repositories is also available in the Environmental Office at DDMT. The repositories are located at:

The Memphis/Shelby County Public Library
Main Branch - Government and Law Section
1850 Peabody Avenue
Memphis, TN 38104-4025
(901) 725-8877

Cherokee Public Library
3300 Sharp Avenue
Memphis, TN 38111-3758
(901) 743-3655

The Memphis/Shelby County Public Health Department
Pollution Control Division
814 Jefferson Avenue
Memphis, TN 38106
(901)-576-7741

FOR FURTHER INFORMATION

To request further information, call (901) 775-4379 or write to:
Defense Distribution Depot Memphis
Environmental Protection and Safety Office, DDMT-DE
2163 Airways Blvd.
Memphis, TN 38114-5210

Defense Distribution Depot Memphis, Tennessee
Dunn Field Groundwater Removal Action
Fact Sheet
July 1994

- The objective of the Groundwater Removal Action is to prevent further movement of groundwater contamination in a shallow layer of water beneath the ground's surface known as an aquifer. The contamination of this aquifer, the Fluvial Aquifer, appears to have been caused by past burial activities at Dunn Field.

- The removal action will consist of a series of small wells located along the leading edge of the contaminant plume. The wells could be located off DDMT property. Groundwater will be pumped from the recovery wells, preventing any further movement of the plume in the Fluvial Aquifer.

- Groundwater pumped from the wells will be filtered to remove contaminants to a level considered acceptable for disposal into the sanitary sewer system. The City of Memphis must first approve the disposal which is based on the level of remaining contamination in the water.

- The removal action will be conducted in phases because of the uncertainty surrounding the distance the groundwater contamination plume has migrated from DDMT and the nature of the Fluvial Aquifer itself.

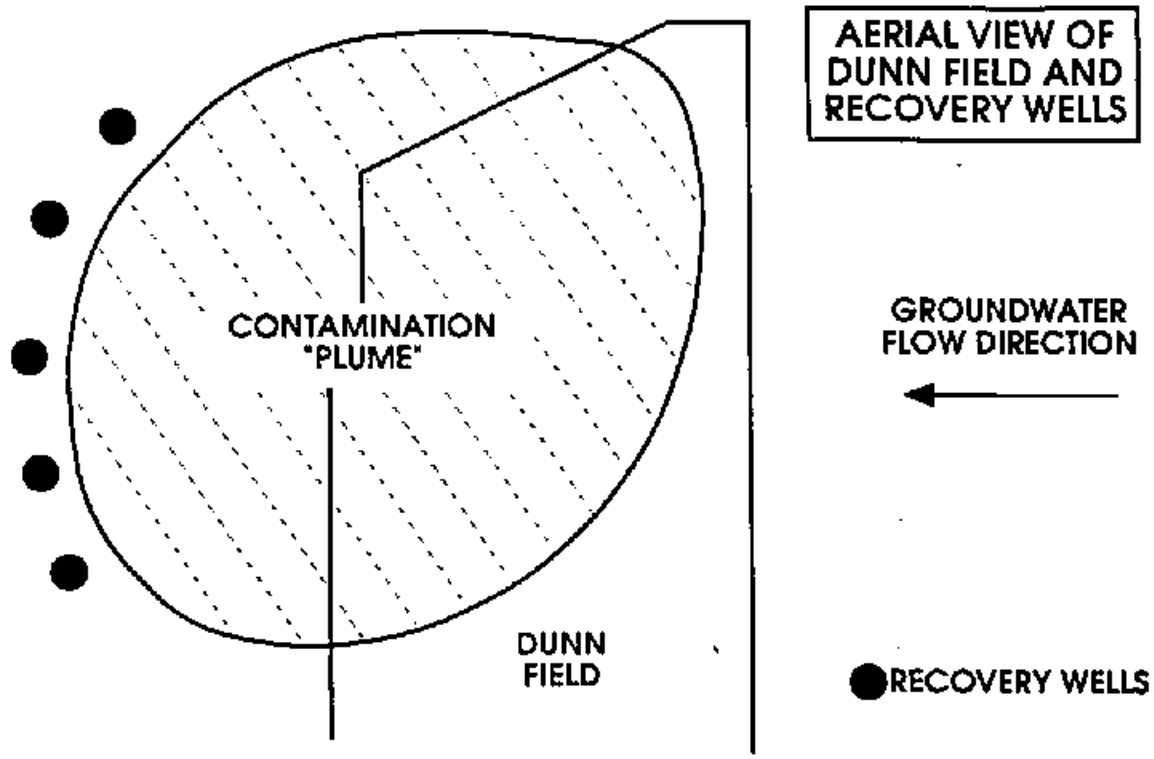
- Initially, one well will be installed in the Fluvial Aquifer to determine how to space and how much to pump the wells.

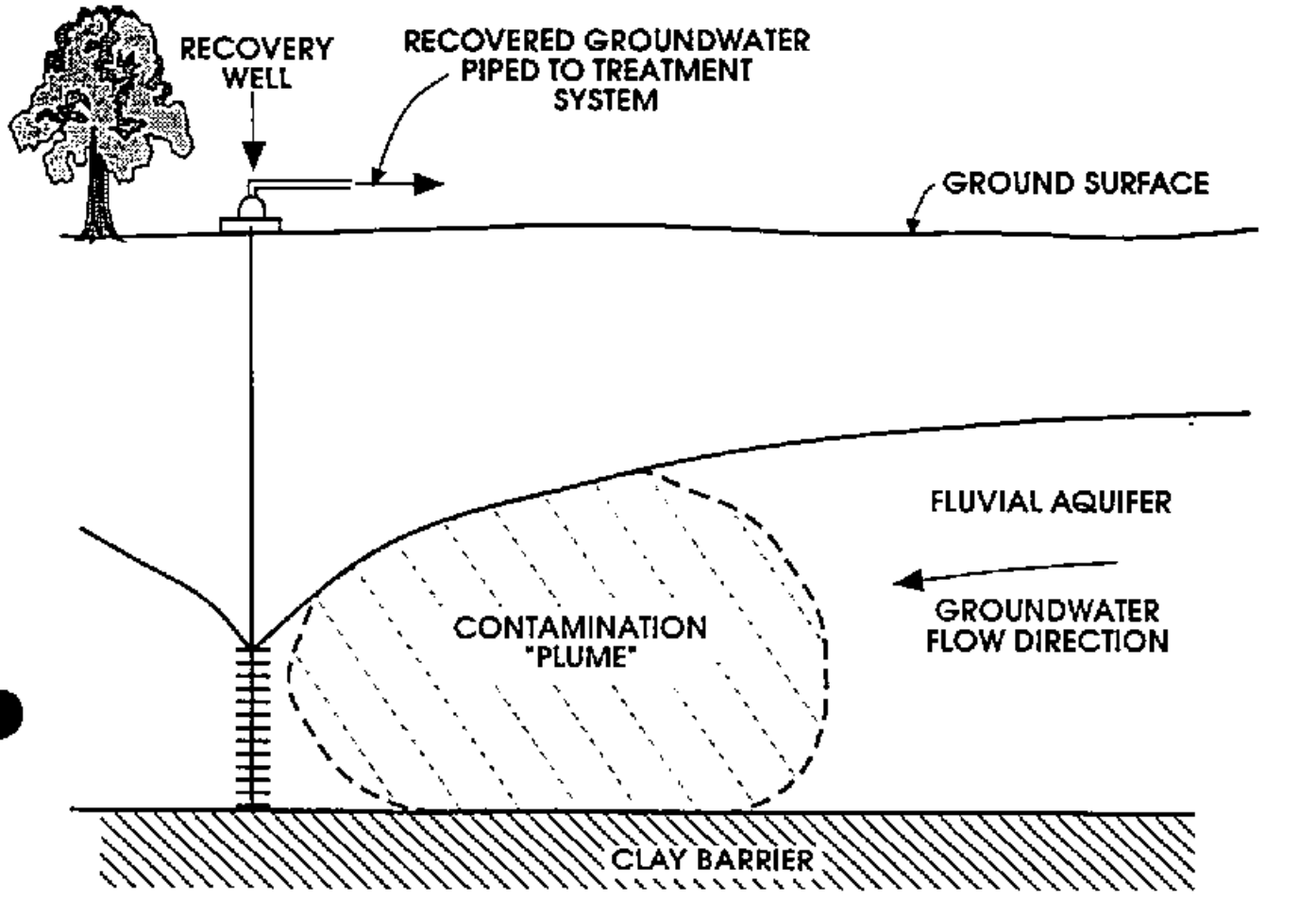
- At the same time, more wells will be installed and sampled to the west of Dunn Field to determine how far the contamination has moved from DDMT.

- After more is known about the Fluvial Aquifer and the contamination plume, and the public has an opportunity to comment on the proposed plan, a line of wells will be installed along the leading edge of the plume.

- The spacing and pumping rate of the wells will be such that no contamination can move beyond the line of wells. Groundwater and associated contamination will be "captured" by the wells.

- After the system begins operating it will be checked frequently, making any necessary changes, to be sure the wells are preventing any further movement of the plume.


AERIAL VIEW OF DUNN FIELD AND RECOVERY WELLS
CONTAMINATION "PLUME"
GROUNDWATER FLOW DIRECTION
DUNN FIELD
RECOVERY WELLS


RECOVERY WELL
RECOVERED GROUNDWATER PIPED TO TREATMENT SYSTEM
GROUND SURFACE
FLUVIAL AQUIFER
GROUNDWATER FLOW DIRECTION
CONTAMINATION "PLUME"
CLAY BARRIER

EXECUTIVE SUMMARY
Defense Depot Memphis, Tennessee
Generic Remedial Investigation/
Feasibility Study Work Plan
U.S. Army Corps of Engineers-Huntsville Division
December 1993

INTRODUCTION

In October 1992, the Defense Depot Memphis, Tennessee (DDMT), was placed on the National Priorities List (NPL) by the Environmental Protection Agency (EPA). Therefore, the Depot must fulfill requirements under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and National Contingency Plan (NCP). A Remedial Investigation/Feasibility Study (RI/FS) must be prepared to determine the nature and extent of contamination, evaluate the risk to human health and the environment, and to screen potential cleanup actions. The RI/FS Work Plan was prepared to show how the investigation and study would be accomplished.

DESCRIPTION OF WORK PLAN

The Work Plan includes a facility description, background information, findings of previous studies, and potential ways contamination may have reached and affected people. Preliminary information on potential applicable or relevant and appropriate requirements (ARARs) and preliminary cleanup goals are presented. A Quality Assurance Project Plan (QAPP) and a Health and Safety Plan (HASP) have been prepared. The QAPP describes general sampling procedures and quality assurance/quality control (QA/QC) procedures to be used so that the quality and quantity of the information is adequate to determine the nature and extent of the contamination. The HASP was prepared to provide procedures for the safety and health of facility personnel and the general public during the investigation at the Depot. Included in the HASP are the assignment of responsibilities, employee training requirements, medical surveillance requirements, and a list of substances with possible routes of exposure and symptoms of acute exposure.

In order to look at the installation in steps, the Depot is divided into four Operable Units (OUs). Dunn Field is designated OU-1. The main installation is divided into three areas: the southwestern quadrant, OU-2; the southeast lakes and golf course area, OU-3; and the north central area, OU-4. Substances found in OU-1 probably resulted from use of the area for landfill operations, mineral stockpiles, pistol range use, and pesticide storage. Potential contamination of OU-2 could have resulted from spills or releases from the hazardous material storage and repouring area, sandblasting and painting activities, or both. Storage of polychlorinated biphenyls (PCBs) and the use of pesticides and herbicides are potential sources of contamination for OU-3. Principal contamination in OU-4 probably resulted from a wood treatment operation and hazardous material storage.

Information from previous investigations, plans, and procedures which applies to all OUs are discussed in the Generic RI/FS Work Plan. OU-specific plans are discussed in Field Sampling Plans (FSPs) for each OU. Additionally, a separate FSP for screening sites is being prepared. Screening sites are those sites where additional information is needed to determine whether they warrant RI/FS or No Further Action.

PREVIOUS STUDIES

Soil

Previous studies indicated that soil contamination at the Depot included the following substances:

OU-1 pesticides and polynuclear aromatic hydrocarbons (PAH)
OU-2 PAHs, metals, pesticides and PCBs
OU-3 PAHs and metals
OU-4 PAHs, pesticides, metals and volatile organic compounds (VOCs)

Two potential pathways of exposure due to past waste disposal and material storage practices at OU-1 include possible groundwater contamination and surface water runoff. The primary concern is the possibility of groundwater contamination. OU-1 is located above a shallow aquifer, the Fluvial Aquifer. Although this aquifer is thought to be separated by a clay layer from the deeper Memphis Sand Aquifer, which serves as the drinking water supply for the Memphis metropolitan area, interconnections between the two aquifers could possibly allow contamination to reach the Memphis Sand Aquifer.

Groundwater

Groundwater beneath Dunn Field (OU-1) contained the following contaminants:

- VOCs
- chlorinated compounds
- metals including chromium, lead, and mercury
- other less widespread potential contaminants included arsenic and barium

Groundwater monitoring results from the main installation failed to detect any consistent pattern of contamination, and the levels of contamination were much lower than those found at OU-1. Again, the primary concern is the potential risk to human health from the possible contamination of the Memphis Sand Aquifer.

Surface water

Surface water analysis from all OUs indicated that little or no risk existed from exposure because the surface water is not used for drinking water or recreation. Metals and pesticides were present but not in large enough quantities to pose an immediate health risk.

Sediment

Sediment collected from Lake Danielson and the golf course pond contained pesticides and PAHs, but again human exposure potential is low.

HEALTH RISKS

Based on a preliminary assessment of the potential health risks from contaminants in soil, groundwater, surface water, and sediments revealed that the primary concern was chlorinated organic compounds contained in the Fluvial Aquifer, which could affect the Memphis Sand Aquifer. Of secondary concern are hazardous constituents found in relatively high concentrations in some areas of the soil. Contamination of surface water and sediments have no apparent public health effect because of limited exposure opportunities.

CLEANUP ACTIONS

Cleanup actions will be based on the contaminants, future land use, potential exposure levels, regulations, and site conditions. The objective of groundwater remediation will be to stop the migration of contaminants and eliminate the contamination that threatens the Memphis Sand Aquifer.

The objectives of the soil remediation will be to prevent the possibility of ingestion, limit surface water runoff, and prevent migration of contaminants to the groundwater. The objectives of the surface water cleanup are to protect aquatic life and mitigate surface water contamination during peak storms.

The ultimate goal of the RI/FS is to select cost-effective, cleanup actions that minimize threats and provide protection for public health and the environment. To accomplish this, the nature and extent of the release of hazardous substances to the Fluvial Aquifer must be identified, the source of release must be determined, and proposed cleanup actions must be evaluated. The following table provides a list of the RI/FS objectives and the activities necessary to achieve those objectives.

TAB

Repository Information

INFORMATION REPOSITORIES

MEMPHIS/SHELBY COUNTY PUBLIC LIBRARY
Main Branch
Government and Law Section
1850 Peabody
Memphis, TN 38104-4025
(901)725-8877

CHEROKEE BRANCH PUBLIC LIBRARY
3300 Sharp Avenue
Memphis, TN 38111-3758
(901)743-3655

MEMPHIS/SHELBY COUNTY HEALTH DEPARTMENT
Pollution Control Division
814 Jefferson Avenue
Memphis, TN 38106
(901)320-3901

DOCUMENTS AT INFORMATION REPOSITORIES 99 110
October 1994

1. "Installation Assessment of Defense Depot Memphis, Tennessee Report No. 191", U.S. Army Toxic and Hazardous Materials Agency, March 1981

2. "Summary Report, On-Site Remedial Activities at the Defense Depot Memphis", O.H. Materials Company, February 24, 1986

3. "Remedial Investigation Final Report", Law Environmental, Inc., August 1990

4. "Feasibility Study Final Report", Law Environmental, Inc., September 1990

5. "Final Pump Test Work Plan"; Engineering-Science, Inc., July 1992

6. "Pumping Test Technical Memorandum", Engineering Science, Inc., November 1992

7. "Draft Final Community Relations Plan", Defense Distribution Depot Memphis, Tennessee, April 1994

8. "Generic Remedial Investigation/Feasibility Study Workplan", U.S. Army Corps of Engineers, December 1993

9. "Operable Unit 1 Field Sampling Plan", U.S. Army Corps of Engineers, December 1993

10. "Operable Unit 2 Field Sampling Plan", U.S. Army Corps of Engineers, February 1994

11. "Operable Unit 3 Field Sampling Plan", U.S. Army Corps of Engineers, March 1994

12. "Operable Unit 4 Field Sampling Plan", U.S. Army Corps of Engineers, May 1994

13. "Screening Sites Field Sampling Plan", U.S. Army Corps of Engineers, April 1994

14. "Health and Safety Plan", U.S. Army Corps of Engineers, December 1993

15. "Generic Quality Assurance Plan", U.S. Army Corps of Engineers, December 1993

16. "No Further Action Draft", U.S. Army Corps of Engineers and CH2M Hill, September 1994

17. "Electromagnetic and Magnetic Surveys at Dunn Field, Defense Depot Memphis, Tennessee", Janet Simms, March 1994

18. "Superfund Technical Assistanct Grant (TAG) Handbook", U.S. Environmental Protection Agency, April 1990

19. "Groundwater Monitoring Results Report for Defense Depot Memphis, Tennessee", Volumes 1 through 9, Environmental Science & Engineering Inc., January 1994

20. "Restoration Advisory Board Public Involvement Information, Defense Depot Memphis, Tennessee". Loose-leaf notebook containing copies of past meeting minutes.

21. "High Resolution Seismic Reflection Survey to Image the Top and Bottom of a Shallow Clay Layer at the Memphis Defense Depot, Memphis, Tennessee", Kansas Geological Survey, June 1994

TAB

Acronyms List

ACRONYMS LIST

ARAR	Applicable or Relevant and Appropriate Requirements
ATSDR	Agency for Toxic Substances & Disease Registry
BACT	Best Available Control Technology (Air)
BAT	Best Availabe Technology (Water)
CAA	Clean Air Act
CEQ	Council on Environmental Quality
CERCLA/ Superfund	Comprehensive Environmental Response, Compensation, and Liability Act, as amended
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
CFC	Chlorofluorocarbon
CFR	Code of Federal Regulations
CRP	Community Relations Plan
CWA	Clean Water Act
DDMT	Defense Distribution Depot Memphis, Tennessee
DERA	Defense Environmental Restoration Account
DERP	Defense Environmental Restoration Program
DLA	Defense Logistics Agency
DOD	Department of Defense
DOT	Department of Transportation
DRMO	Defense Reutilization & Marketing Office

DRMS	Defense Reutilization & Marketing Service
EA	Environmental Assessment;
EHS	Extremely Hazardous Substance
EIS	Environmental Impact Statement
EO	Executive Order
EPA	Environmental Protection Agency
EPCRA	Emergency Planning & Community Right-to-Know Act
ESA	Endangered Species Act
FFCA	Federal Facilities Compliance Agreement
FFA	Federal Facilities Agreement
FOIA	Freedom of Information Act
FONSI	Finding of No Significant Impact
FS	Feasibility Study
FSP	Field Sampling Plan
HASP	Health and Safety Plan
HMIS	Hazardous Materials Information System
HMTA	Hazardous Materials Transportation Act
HRS	Hazardous Ranking System
IAG	Interagency Agreement
IRP	Installation Restoration Program
LAER	Lowest Achievable Emission Rate
LEPC	Local Emergency Planning Committee

MCL	Maximum Contaminant Level
MCLGs	Maximum Contaminant Level Goals
MSDS	Material Safety Data Sheet
NAAQS	National Ambient Air Quality Standards
NCP	National Contingency Plan
NEPA	National Environmental Policy Act
NESHAPs	National Emissions Standards for Hazardous Air Pollutants
NIOSH	National Institute of Occupational Safety and Health
NOD	Notice of Deficiency
NOTI	Notice of Technical Inadequacy
NOV	Notice of Violation
NPDES	National Pollutant Discharge Elimination System
NPDWS	National Primary Drinking Water Standards
NPL	National Priorities List
OSHA	Occupational Safety and Health Administration Occupational Safety and Health Act of 1970
OSWER	Office of Solid Waste and Emergency Response
OUs	Operational Units
PA	Preliminary Assessment
PCBs	polychlorinated biphenyls
PEL	Permissible Exposure Limit
PHSA	Public Health Service Act
POTW	Publicly Owned Treatment Works

PPA	Pollution Prevention Act of 1990
PPB	Parts Per Billion
PPM	Parts Per Million
PRP	Potentially Responsible Party
QA/QC	Quality Assurance/Quality Control
QAPP	Qaulity Assurance Project Plan
RA	Remedial Action
RAB	Restoration Advisory Board
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RI/FS	Remedial Investigation/Feasibility Study
RoD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act of 1986
SDWA	Safe Drinking Water Act of 1974, as amended.
SI	Site Investigation
SPCCP	Spill Prevention Control and Countermeasure Plan
SWDA	Solid Waste Disposal Act
SWMU	Solid Waste Management Unit
TCA	Trichloroethane
TCE	Trichloroethylene
TCLP	Toxicity Characteristic Leaching Procedure. This test is used to determine whether a waste has a hazardous characteristic.
TDEC	The Tennessee Department of Environment and Conservation

TRC	Technical Review Committee
TRI	Toxic Release Inventory
TSCA	Toxic Substance Control Act
TSD Facility	A treatment, storage or disposal facility for hazardous waste
TSS	Total Suspended Solids
UST	Underground Storage Tank
VOC	Volatile Organic Compounds

TAB

Status Reports

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APPENDIX B

GENERIC WORKPLANS SCHEDULE

DESCRIPTION	No. of DAYS	START DATE	FINISH DATE
Draft Generic Health and Safety Plan	90	12-Oct-93	9-Jan-94
Draft Generic Quality Assurance Project Plan	89	13-Oct-93	9-Jan-94
Draft Generic RI/FS Workplan	89	13-Oct-93	9-Jan-94
Regulatory Agencies' Review	249	10-Jan-94	15-Sep-94
DLA Responds to Regulators' Comments	60	16-Sep-94	14-Nov-94
Incorporate Comments & Submit Draft Final Generic Workplans (3)	120	16-Sep-94	13-Jan-95
Regulatory Agencies' Review	30	14-Jan-95	12-Feb-95
Final Plans Approved	35	14-Jan-95	17-Feb-95

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OPERABLE UNIT 1 SCHEDULE

DESCRIPTION	No. of DAYS	START DATE	FINISH DATE
Draft OU-1 Field Sampling Plan (FSP)	90	12-Oct-93	9-Jan-94
Regulatory Agencies' Review	264	10-Jan-94	30-Sep-94
DLA Responds to Regulators' Comments	60	1-Oct-94	29-Nov-94
Incorporate Comments & Submit Draft Final OU-1 FSP	120	1-Oct-94	28-Jan-95
Regulatory Agencies' Review	30	29-Jan-95	27-Feb-95
Final OU-1 FSP Approved	35	29-Jan-95	4-Mar-95
Field Work (Incl Upgrading Screening Sites)	200	5-Mar-95	20-Sep-95
Data Validation	30	21-Sep-95	20-Oct-95
Draft Remedial Investigation (RI) Report	60	21-Oct-95	19-Dec-95
Regulatory Agencies' Review	60	20-Dec-95	17-Feb-96
DLA Responds to Regulators' Comments	60	18-Feb-96	17-Apr-96
Incorporate Comments & Submit Draft Final RI Report	120	18-Feb-96	18-Jun-96
Regulatory Agencies' Review	30	17-Jun-96	16-Jul-96
Final RI Report Approved	35	17-Jun-96	21-Jul-96
Draft Feasibility Study (FS)	60	18-Apr-96	16-Jun-96
Regulatory Agencies' Review	60	17-Jun-96	15-Aug-96
DLA Responds to Regulators' Comments	60	16-Aug-96	14-Oct-96
Incorporate Comments & Submit Draft Final FS	120	16-Aug-96	13-Dec-96
Regulatory Agencies' Review	30	14-Dec-96	12-Jan-97
Final RI Report Approved	35	14-Dec-96	17-Jan-97
Draft Proposed Remedial Action Plan (PRAP)	60	15-Oct-96	13-Dec-96
Regulatory Agencies' Review	60	14-Dec-96	11-Feb-97
DLA Responds to Regulators' Comments	60	12-Feb-97	12-Apr-97
Incorporate Comments & Submit Draft Final PRAP	120	12-Feb-97	11-Jun-97
Regulatory Agencies' Review	30	12-Jun-97	11-Jul-97
Final PRAP Report Approved	35	12-Jun-97	18-Jul-97
Prepare Public Notice	32	12-Jun-97	13-Jul-97
Publish Public Notice	7	14-Jul-97	20-Jul-97
Public Comment Period	30	21-Jul-97	19-Aug-97
Public Meeting	1	31-Jul-97	31-Jul-97
Prepare Public Responsiveness Summary	30	1-Aug-97	30-Aug-97
Draft Record of Decision (ROD)	60	13-Apr-97	11-Jun-97
Regulatory Agencies' Review	60	12-Jun-97	10-Aug-97
DLA Responds to Regulators' Comments	60	11-Aug-97	9-Oct-97
Incorporate Comments & Submit Draft Final ROD	120	11-Aug-97	8-Dec-97
Regulatory Agencies' Review	30	9-Dec-97	7-Jan-98
Final ROD Approved and Signed	35	9-Dec-97	12-Jan-98

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OPERABLE UNIT 2 SCHEDULE

DESCRIPTION	No. of DAYS	START DATE	FINISH DATE
Draft OU-2 Feild Sampling Plan (FSP)	60	12-Dec-93	8-Feb-94
Regulatory Agencies' Review	236	10-Feb-94	3-Oct-94
DLA Responds to Regulators' Comments	60	4-Oct-94	2-Dec-94
Incorporate Comments & Submit Draft Final OU-2 FSP	120	4-Oct-94	31-Jan-95
Regulatory Agencies' Review	30	1-Feb-95	2-Mar-95
Final OU-2 FSP Approved	35	1-Feb-95	7-Mar-95
Fleld Work (Incl Upgrading Screening Sites)	200	8-Mar-95	23-Sep-95
Data Validation	30	24-Sep-95	23-Oct-95
Draft Remedial Investigation (RI) Report	60	24-Oct-95	22-Dec-95
Regulatory Agencies' Review	60	23-Dec-95	20-Feb-96
DLA Responds to Regulators' Comments	60	21-Feb-96	20-Apr-96
Incorporate Comments & Submit Draft Final RI Report	120	21-Feb-96	19-Jun-96
Regulatory Agencies' Review	30	20-Jun-96	19-Jul-96
Final RI Report Approved	35	20-Jun-96	24-Jul-96
Draft Feasibility Study (FS)	60	21-Apr-96	19-Jun-96
Regulatory Agencies' Review	60	20-Jun-96	18-Aug-96
DLA Responds to Regulators' Comments	60	19-Aug-96	17-Oct-96
Incorporate Comments & Submit Draft Final FS	120	19-Aug-96	18-Dec-96
Regulatory Agencies' Review	30	17-Dec-96	15-Jan-97
Final RI Report Approved	35	17-Dec-96	20-Jan-97
Draft Proposed Remedial Action Plan (PRAP)	60	18-Oct-96	16-Dec-96
Regulatory Agencies' Review	60	17-Dec-96	14-Feb-97
DLA Responds to Regulators' Comments	60	15-Feb-97	15-Apr-97
Incorporate Comments & Submit Draft Final PRAP	120	15-Feb-97	14-Jun-97
Regulatory Agencies' Review	30	15-Jun-97	14-Jul-97
Final PRAP Report Approved	35	15-Jun-97	19-Jul-97
Prepare Public Notice	32	15-Jun-97	16-Jul-97
Publish Public Notice	7	17-Jul-97	23-Jul-97
Public Comment Period	30	24-Jul-97	22-Aug-97
Public Meeting	1	3-Aug-97	3-Aug-97
Prepare Public Responsiveness Summary	30	4-Aug-97	2-Sep-97
Draft Record of Decision (ROD)	60	16-Apr-97	14-Jun-97
Regulatory Agencies' Review	60	15-Jun-97	13-Aug-97
DLA Responds to Regulators' Comments	60	14-Aug-97	12-Oct-97
Incorporate Comments & Submit Draft Final ROD	120	14-Aug-97	11-Dec-97
Regulatory Agencies' Review	30	12-Dec-97	10-Jan-98
Final ROD Approved and Signed	35	12-Dec-97	15-Jan-98

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OPERABLE UNIT 3 SCHEDULE

DESCRIPTION	No. of DAYS	START DATE	FINISH DATE
Draft OU-3 Feild Sampling Plan (FSP)	60	13-Jan-94	13-Mar-94
Regulatory Agencies' Review	215	14-Mar-94	14-Oct-94
DLA Responds to Regulators' Comments	60	15-Oct-94	13-Dec-94
Incorporate Comments & Submit Draft Final OU-3 FSP	120	15-Oct-94	11-Feb-95
Regulatory Agencies' Review	30	12-Feb-95	13-Mar-95
Final OU-3 FSP Approved	35	12-Feb-95	18-Mar-95
Field Work (Incl Upgrading Screening Sites)	200	19-Mar-95	4-Oct-95
Data Validation	30	5-Oct-95	3-Nov-95
Draft Remedial Investigation (RI) Report	60	4-Nov-95	2-Jan-96
Regulatory Agencies' Review	60	3-Jan-96	2-Mar-96
DLA Responds to Regulators' Comments	60	3-Mar-96	1-May-96
Incorporate Comments & Submit Draft Final RI Report	120	3-Mar-96	30-Jun-96
Regulatory Agencies' Review	30	1-Jul-96	30-Jul-96
Final RI Report Approved	35	1-Jul-96	4-Aug-96
Draft Feasibility Study (FS)	60	2-May-96	30-Jun-96
Regulatory Agencies' Review	60	1-Jul-96	29-Aug-96
DLA Responds to Regulators' Comments	60	30-Aug-96	28-Oct-96
Incorporate Comments & Submit Draft Final FS	120	30-Aug-96	27-Dec-96
Regulatory Agencies' Review	30	28-Dec-96	26-Jan-97
Final RI Report Approved	35	28-Dec-96	31-Jan-97
Draft Proposed Remedial Action Plan (PRAP)	60	29-Oct-96	27-Dec-96
Regulatory Agencies' Review	60	28-Dec-96	25-Feb-97
DLA Responds to Regulators' Comments	60	26-Feb-97	26-Apr-97
Incorporate Comments & Submit Draft Final PRAP	120	26-Feb-97	25-Jun-97
Regulatory Agencies' Review	30	26-Jun-97	25-Jul-97
Final PRAP Report Approved	35	26-Jun-97	30-Jul-97
Prepare Public Notice	32	26-Jun-97	27-Jul-97
Publish Public Notice	7	28-Jul-97	3-Aug-97
Public Comment Period	30	4-Aug-97	2-Sep-97
Public Meeting	1	14-Aug-97	14-Aug-97
Prepare Public Responsiveness Summary	30	15-Aug-97	13-Sep-97
Draft Record of Decision (ROD)	60	27-Apr-97	25-Jun-97
Regulatory Agencies' Review	60	26-Jun-97	24-Aug-97
DLA Responds to Regulators' Comments	60	25-Aug-97	23-Oct-97
Incorporate Comments & Submit Draft Final ROD	120	25-Aug-97	22-Dec-97
Regulatory Agencies' Review	30	23-Dec-97	21-Jan-98
Final ROD Approved and Signed	35	23-Dec-97	26-Jan-98

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OPERABLE UNIT 4 SCHEDULE

DESCRIPTION	No. of DAYS	START DATE	FINISH DATE
Draft OU-4 Field Sampling Plan (FSP)	60	13-Feb-94	6-May-94
Regulatory Agencies' Review	173	9-May-94	28-Oct-94
DLA Responds to Regulators' Comments	60	29-Oct-94	27-Dec-94
Incorporate Comments & Submit Draft Final OU-4 FSP	120	29-Oct-94	25-Feb-95
Regulatory Agencies' Review	30	26-Feb-95	27-Mar-95
Final OU-4 FSP Approved	35	26-Feb-95	1-Apr-95
Field Work (Incl Upgrading Screening Sites)	200	2-Apr-95	18-Oct-95
Data Validation	30	19-Oct-95	17-Nov-95
Draft Remedial Investigation (RI) Report	60	18-Nov-95	16-Jan-96
Regulatory Agencies' Review	60	17-Jan-96	16-Mar-96
DLA Responds to Regulators' Comments	60	17-Mar-96	15-May-96
Incorporate Comments & Submit Draft Final RI Report	120	17-Mar-96	14-Jul-96
Regulatory Agencies' Review	30	15-Jul-96	13-Aug-96
Final RI Report Approved	35	15-Jul-96	18-Aug-96
Draft Feasibility Study (FS)	60	16-May-96	14-Jul-96
Regulatory Agencies' Review	60	15-Jul-96	12-Sep-96
DLA Responds to Regulators' Comments	60	13-Sep-96	11-Nov-96
Incorporate Comments & Submit Draft Final FS	120	13-Sep-96	10-Jan-97
Regulatory Agencies' Review	30	11-Jan-97	9-Feb-97
Final RI Report Approved	35	11-Jan-97	14-Feb-97
Draft Proposed Remedial Action Plan (PRAP)	60	12-Nov-96	10-Jan-97
Regulatory Agencies' Review	60	11-Jan-97	11-Mar-97
DLA Responds to Regulators' Comments	60	12-Mar-97	10-May-97
Incorporate Comments & Submit Draft Final PRAP	120	12-Mar-97	9-Jul-97
Regulatory Agencies' Review	30	10-Jul-97	8-Aug-97
Final PRAP Report Approved	35	10-Jul-97	13-Aug-97
Prepare Public Notice	40	10-Jul-97	18-Aug-97
Publish Public Notice	7	19-Aug-97	25-Aug-97
Public Comment Period	30	26-Aug-97	24-Sep-97
Public Meeting	1	5-Sep-97	5-Sep-97
Prepare Public Responsiveness Summary	30	6-Sep-97	5-Oct-97
Draft Record of Decision (ROD)	60	11-May-97	9-Jul-97
Regulatory Agencies' Review	60	10-Jul-97	7-Sep-97
DLA Responds to Regulators' Comments	60	8-Sep-97	6-Nov-97
Incorporate Comments & Submit Draft Final ROD	120	8-Sep-97	5-Jan-98
Regulatory Agencies' Review	30	6-Jan-98	4-Feb-98
Final ROD Approved and Signed	35	6-Jan-98	9-Feb-98

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APPENDIX B

SCREENING SITES SCHEDULE

DESCRIPTION	No. of DAYS	START DATE	FINISH DATE
Draft Screening Sites Feild Sampling Plans (FSP)	172	12-Oct-93	1-Apr-94
Regulatory Agencies' Review	228	2-Apr-84	15-Nov-94
DLA Responds to Regulators' Comments	60	16-Nov-94	14-Jan-95
Incorporate Comments & Submit Draft Final FSPs	120	16-Nov-94	15-Mar-95
Regulatory Agencies' Review	30	16-Mar-95	14-Apr-95
Final Screening Sites Sampling Plan Approved	35	16-Mar-95	19-Apr-95
Field Work	200	20-Apr-95	5-Nov-95
Data Validation	30	6-Nov-95	5-Dec-95
Draft Screening Sites Results Report	60	6-Dec-95	3-Feb-96
Regulatory Agencies' Review	60	4-Feb-96	3-Apr-96
DLA Responds to Regulators' Comments	60	4-Apr-96	2-Jun-96
Incorporate Comments & Submit Draft Final Report	120	4-Apr-96	1-Aug-96
Regulatory Agencies' Review	30	2-Aug-96	31-Aug-96
Final Report Approved	35	2-Aug-96	5-Sep-96
EPA-TDEC-DLA Meeting to Upgrade/Downgrade Sites	15	6-Sep-96	20-Sep-96
Draft Workplan Addendum	60	21-Sep-96	19-Nov-96
Regulatory Agencies' Review	60	20-Nov-96	18-Jan-97
DLA Responds to Regulators' Comments	60	19-Jan-97	19-Mar-97
Incorporate Comments & Submit Draft Final Workplan	120	19-Jan-97	18-May-97
Regulatory Agencies' Review	30	18-May-97	17-Jun-97
Final Screening Sites Sampling Plan Approved	35	19-May-97	22-Jun-97
Field Work at Upgraded Sites	60	23-Jun-97	21-Aug-97

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Proposed Groundwater Action Plan
Defense Depot Memphis, Tennessee

Introduction

This **proposed plan** identifies the preferred option for the **interim remedial action** (IRA) for the contaminated groundwater beneath Dunn Field at the Defense Depot Memphis, Tennessee (DDMT). This document is issued by the DDMT. The Environmental Protection Agency (EPA) is considered the lead regulatory agency for the site. The Tennessee Department of Environment and Conservation (TDEC) will assume the support role and will aid the EPA in this response action. There will be a public comment period in which the public will have the opportunity to comment on this proposed plan. After the public comments have been received, they will be reviewed by the EPA, TDEC, and DDMT before a response action for the site is selected or approved. Terms in **bold** print are defined in a glossary at the end of the proposed plan.

Under section 117(a) of **the Comprehensive Environmental Response, Compensation, and Recovery Act** (CERCLA), this proposed plan is part of DDMT's public participation responsibility. Additional information and studies on this site can be found in the administrative record. The public is encouraged to review these documents to get a comprehensive understanding of the site and the activities that have been and may be conducted at DDMT.

The Administrative Record and an Information **Repository** for the DDMT site can be found at the following locations:

PUBLIC INFORMATION

The Memphis/Shelby County Public Library
Main Branch–Government and Law Section
1850 Peabody Avenue
Memphis, TN 38104-4025
(901) 725-8877

HOURS:
Monday-Thursday 9-9
Friday and Saturday 9-6
Sunday 1-5

Cherokee Public Library
3300 Sharp Avenue
Memphis, TN 38111-3758
(901) 743-3655

HOURS:
Monday and Tuesday 10-7
Wednesday and Thursday 12-6
Saturday 12-6
Closed Friday and Sunday

The Memphis/Shelby County Public Health Department
Pollution Control Division
814 Jefferson Avenue
Memphis, TN 38106

HOURS:
Monday-Friday 8-4:30

(901) 576-7741

FOR FURTHER INFORMATION

To request further information, call (901) 775-4569 or write to:
Defense Distribution Depot Memphis
Environmental Protection and Safety Office, DDMT-DE
2163 Airways Blvd.
Memphis, TN 38114-5210

Send written comments before the close of the comment period or address questions to:

Ms. Christine Kartman
Defense Distribution Depot Memphis
Environmental Protection and Safety Office, DDMT-DE
2163 Airways Blvd.
Mempis, TN 38114-5210
Comment Hotline (901) 775-4569
Fax: (901) 775-4372

ATTENTION!

Public Comment Period

Date: November 9 to December 8, 1994

Purpose: to comment on the DDMT

Groundwater Action Plan

Site Background

The Depot, established in 1942, was previously a cotton farm. In 1962, the Defense Logistics Agency (DLA) assumed command of the Depot with a primary mission of the receipt, storage, and shipment of a variety of stock items such as clothing, medicines, construction supplies, and hazardous materials (such as bulk quantities of household cleaners). Between 1954 and 1970, solid waste and chemicals were buried in the facility's landfill area, known as Dunn Field. In 1981, DLA began evaluating its past management of hazardous waste at DLA installations around the world. In 1988, the Depot began an investigation at the facility to test for soil and groundwater contamination.

Before the Proposed Plan, numerous technical studies were conducted on DDMT. Four of the more comprehensive studies conducted were as follows:

- **Remedial Investigation** (RI), Law Environmental, 1990
- **Feasibility Study** (FS), Law Environmental, 1990

- Engineering Report Removal Action for Groundwater, Engineering Science, 1993
- Environmental Assessment Removal Action for Groundwater, Engineering Science, 1993

The RI conducted by Law Environmental was conducted to assess the extent and nature of the contamination and the potential risks. The results of the investigation are as follows:

- **Volatile organic compounds** (VOCs), **heavy metals,** and pesticides were found in the sediment at the bottom of the reservoir and the golf course pond.
- Soil samples taken at former chemical spill sites showed volatile organic chemicals, **hydrocarbons,** and pesticides.
- The groundwater monitoring wells indicated that volatile organic chemicals and heavy metals were present in the shallow **aquifer**, the Fluvial Aquifer.
- The potential risk to human health is from possible future contamination of the deeper Memphis Sands Aquifer. To date, no contamination has been found.
- Risks to human health and environment resulting from exposure to surface water was evaluated to be minimal..

Law Environmental's FS was conducted concurrently with its RI and was prepared to evaluate various cleanup alternatives for DDMT. The document discussed remedial action alternatives for three areas of DDMT: Dunn Field groundwater, surface soils, and Lake Danielson/Golf Course Pond. This proposed plan addresses the contaminated groundwater beneath Dunn Field.

The FS evaluated six general response actions for the contaminated groundwater beneath Dunn Field. The six actions are as follows:

- No action*–No remedial measures taken.
- Institutional control*–Limiting access to the contaminated aquifer.
- **Plume** containment–Containment of the contaminated plume with a series of groundwater extracting wells, injection wells, or **slurry walls**.
- Source containment*–Removal of the source or capping to prevent surface water infiltration.
- Pump and treat technologies*–Removal of the contaminated groundwater and treatment of it with a **physio-chemical** process.

- In-situ treatment–Remediating the groundwater without removing it from the ground.

Of the six, four* were selected for a more detailed analysis. Law suggested that the most feasible alternative would be to pump and treat the groundwater, but stated that more information would be required to choose the most effective alternative.

The objective of Engineering Science's Engineering Report for the Removal of Groundwater was to mitigate offsite migration of contaminants and to treat, on an interim basis, groundwater contaminated with VOCs and metals below EPA and TDEC action levels. On the basis of that assumption, Engineering Science developed the following seven alternatives to achieve the extraction and treatment of the contaminated groundwater below Dunn Field:

- No action
- Extract groundwater using pumping wells located within Dunn Field and treat using **air stripper** techniques, followed by disposal into the municipal sewer system. Treat for metals as required. .
- Extract groundwater using pumping wells located within Dunn Field and off government property, treat using air stripping techniques, and follow by disposal in the municipal sewer system. Treat metals as required.
- Extract groundwater using pumping wells located within Dunn Field and treat using **ultraviolet (UV)/oxidation** techniques, followed by disposal into the municipal sewer system. Treat for metals as required.
- Extract groundwater using pumping wells located within Dunn Field and treat using air stripper techniques, followed by disposal into surface drainage. Treat for metals as required.
- Extract groundwater using pumping wells located within Dunn Field and treat using UV/oxidation techniques, followed by disposal into surface drainage. Treat for metals as required.
- Extract groundwater using pumping wells located within Dunn Field and treat using air stripping techniques, followed by reinjection into the Fluvial Aquifer. Treat for metals as required.

The alternatives were evaluated by Engineering Science using selection criteria (discussed in the "Evaluation of the Alternatives" section of this document). The alternative in which the water is extracted onsite and treated using air stripping, followed by discharge to surface water drainage, was selected.

The environmental assessment conducted by Engineering Science evaluated the possible effects of the selected alternative. The effects (positive and negative) of this action include the

following:

- Control of groundwater contaminants beneath Dunn Field
- Reduction of future volumes of contaminated groundwater
- Indirect protection of the Memphis Sands Aquifer
- Short-term noise from operation of construction equipment
- Release of low levels of VOCs into the atmosphere
- Increased noise levels from the operation of the water treatment system

Engineering Science's assessment found no significant adverse effect on the environment as the result of the construction and operation of the proposed action.

In 1992, the EPA placed DDMT on the National Priorities List (NPL) because of the potential for contamination from Dunn Field to reach the Memphis Sands Aquifer, from which Memphis draws its drinking water. The NPL is EPA's list of hazardous waste sites identified for possible long-term remedial action under Superfund. Once a site is placed on the NPL, a RI must be conducted regardless of previous studies. An additional RI for DDMT is planned and will be used to help characterize the Fluvial Aquifer, the extent of groundwater contamination, and the extent of soil contamination, and to identify any other possible contamination sources.

Scope and Role of Response Action

Because of the size of DDMT (642 acres) and the complexity of the site, it has been broken down into four manageable units called **operable units** (OUs), as follows:

- OU-1: Dunn Field
- OU-2: Southwest quadrant, main installation
- OU-3: Southeast watershed and golf course, main installation
- OU-4: North area, main installation

This proposed plan addresses the contaminated groundwater beneath the northern portion of OU-1. The remainder of OU-1 and OUs 2, 3, and 4 will be addressed in future documents.

Data collected in the previously mentioned documents detected VOCs and heavy metals in the Fluvial Aquifer. Because the contaminated Fluvial Aquifer poses a threat to the deeper Memphis Sands Aquifer, the area's drinking water supply, it is considered the site's principal threat and a possible threat to human health and the environment. Thus, the objective of the groundwater removal IRM is to prevent further movement of the contaminated groundwater in the Fluvial Aquifer and to prevent the possible contamination of the area's drinking water supply.

Summary of Site Risks

A Preliminary Risk Assessment was conducted by Engineering-Science, Inc., as part of an Engineering Report Removal Action for Groundwater at Dunn Field. The date of the Engineering Report is August 1993. No additional risk assessments have been conducted at the facility since then.

Potential exposure points for the Dunn Field groundwater contamination were identified as follows:

- 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

The transport medium and exposure pathway for the exposure scenarios identified above are identified in the Preliminary Risk Assessment as follows:

- Leaching occurs from materials historically disposed.
- Contaminants from leaching are present in the fluvial aquifer as a result of dispersion and infiltration.
- The Fluvial Aquifer potentially recharges the Memphis Sand aquifer by leakage through interconnecting windows in the clay confining layer that separates the two aquifers.
- The Memphis Sand Aquifer is pumped at the Allen Well Field to provide potable water for the City of Memphis, thus resulting in possible exposure.

Maximum Contaminant Levels (MCLs) for groundwater have been established by the Clean Water Act, EPA, and TDEC. Ten of the groundwater contaminants present in the Dunn Field area exceed the MCLs.

Results of the Preliminary Risk Assessment indicate that there is a potential public health risk associated with the Fluvial Aquifer groundwater. Implementing the preferred alternative will increase the overall protection of human health and the environment. By implementing a groundwater removal action, contaminants 1) will be incrementally removed from the Fluvial Aquifer; 2) will be contained to prevent migration toward the Allen Well Field; and 3) will have a reduced likelihood of creating a potential exposure pathway as identified in the Preliminary Risk Assessment.

Although this option will not immediately 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..

Summary of Alternatives

The alternatives regarding the contaminated groundwater that have been evaluated for the IRA are presented below. The alternatives for the interim remediation include the following:

- Alternative 1: No action
- Alternative 2: Institutional control
- Alternative 3: Groundwater IRA

The interim remedial alternatives for Dunn Field are discussed below.

Alternative 1: No Action

Capital Costs: $0
Annual Operation and Maintenance Costs (O&M): $0
Present Worth (PW): $0
Months to Implement: none

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 of the groundwater plume.

Alternative 2: Institutional Control

Capital Costs: $0
Annual (O&M) Costs: $200,000 to 100,000
PW: $2,200,000
Months to Implement: none

The Institutional Control alternative would consist of continued monitoring (sample and analysis) of the existing onsite and offsite groundwater monitoring wells. The well monitoring would be periodic and would comply with the appropriate regulatory agencies. A restriction on the drilling and removal of the Fluvial Aquifer water supply from the contaminated area would be implemented.

Alternative 3: Groundwater IRA

Capital Costs: $500,000
Annual (O&M) Costs: $250,000
PW: $5,560,000
Months to Implement: 8 months upon approval

The third interim remedial action employs the groundwater removal action plan. This alternative could be used to contain the contaminated groundwater by inducing a hydraulic barrier. The hydraulic barrier could be achieved by pumping the groundwater from a series of

"containment" recovery wells placed along the leading edge of the plume. The spacing and pumping rate of the wells will be such that no contamination can move beyond the line of wells. The groundwater and the associated contamination will be captured by the wells (see Figure 1). Once the recovery wells are operating, the system will be checked frequently and any necessary changes will be made to verify that the plume is contained. The groundwater pumped from the wells will be disposed into the sanitary sewer system. However, to adequately implement the groundwater action plan, the Fluvial Aquifer must be further characterized to determine groundwater pumping rates, the number of recovery wells, and well spacing.

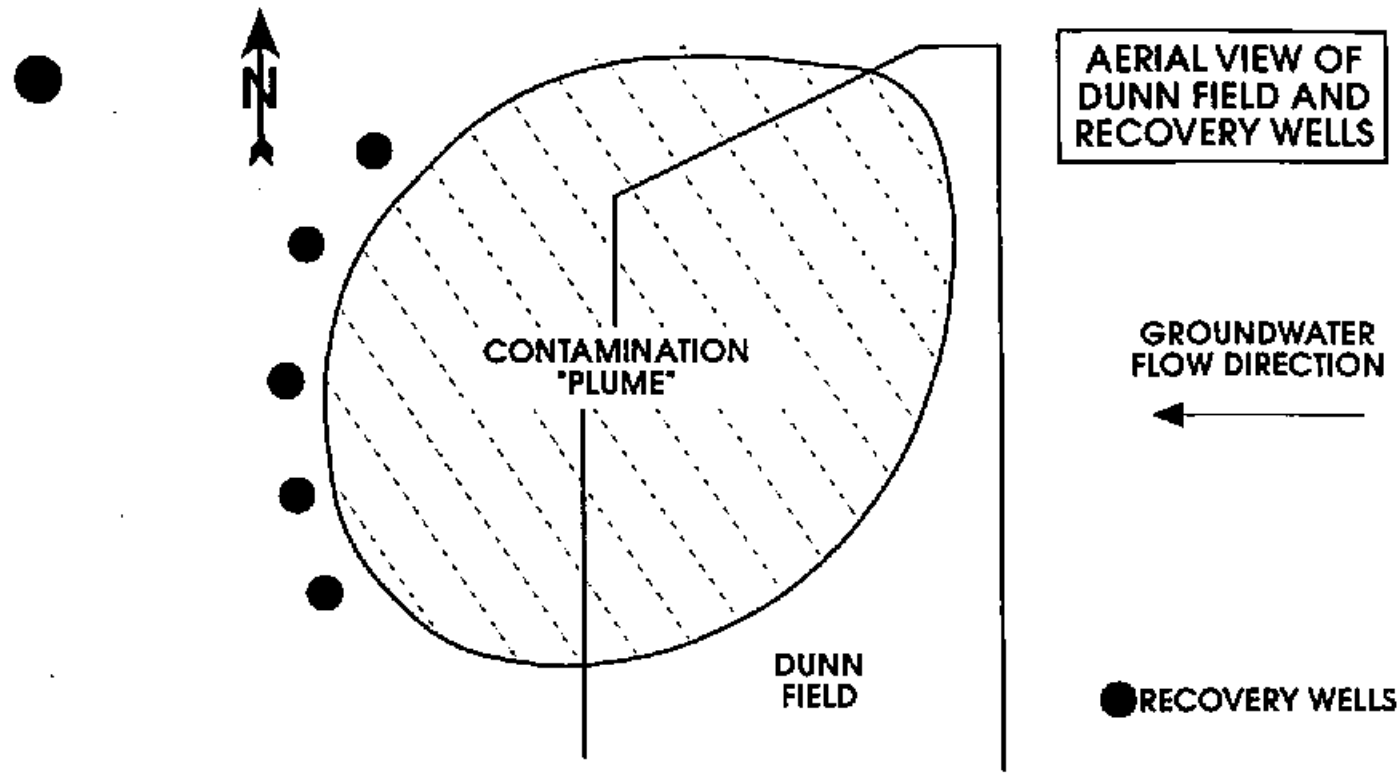
One of the objectives of the planned RI will be to characterize the aquifer and the contamination plume. This will be accomplished by installing a shallow recovery well in the Fluvial Aquifer. The well will be used to recover groundwater from the center of the plume; this groundwater will provide aquifer characteristic data that will help to determine how to space and pump the wells. Additionally, monitoring wells will be installed and sampled to locate the western extent of the plume.

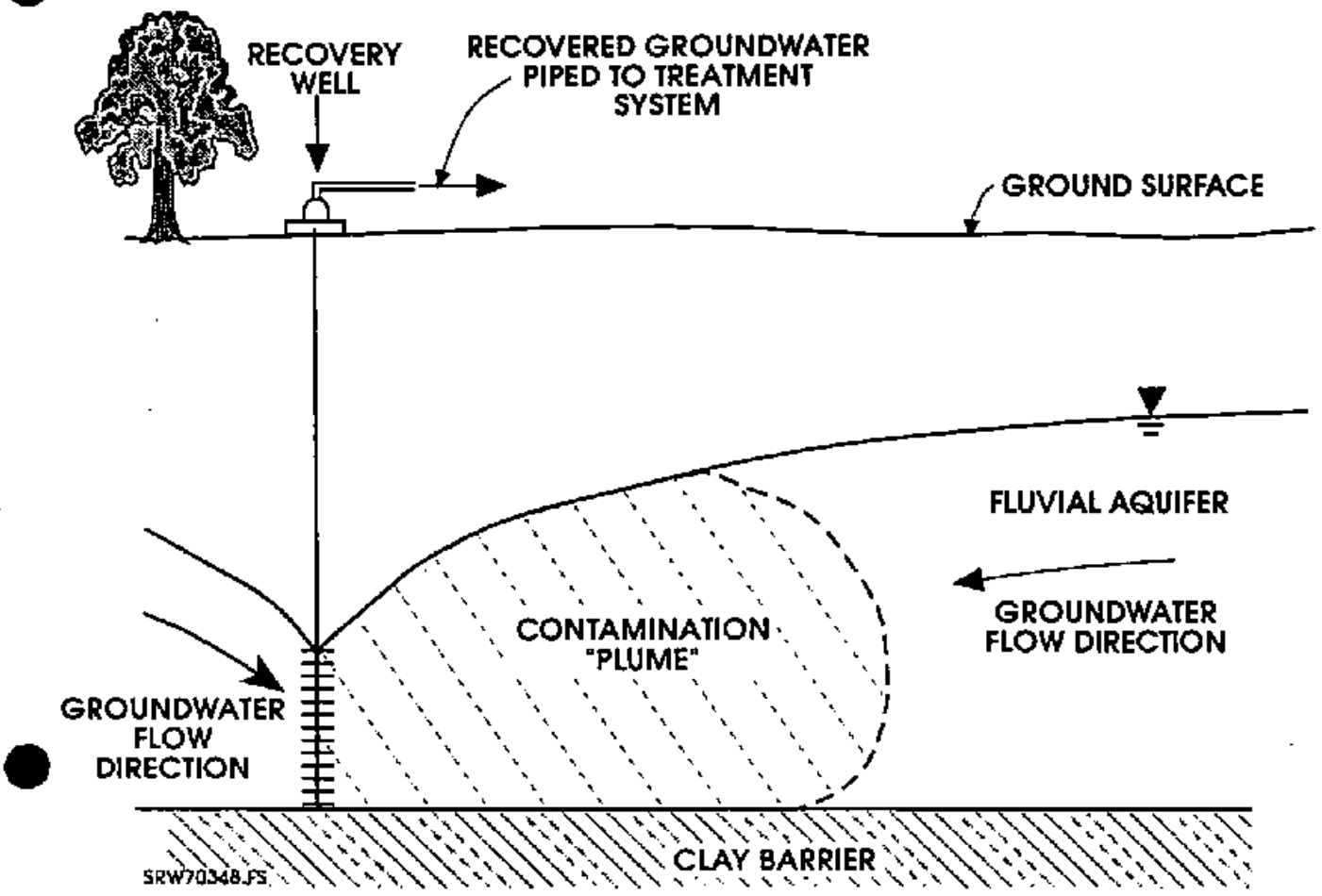
Evaluation of the Alternatives

This section profiles the performance of the alternatives against the nine criteria set forth by the EPA. The criteria are as follows:

- 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.
- Compliance with **Applicable or Relevant and Appropriate Requirements (ARARs)** – Assesses compliance with federal/state requirements.
- Long-Term Effectiveness–Degree to which a remedy can maintain protection of health and environment once cleanup goals have been met.
- 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.
- Short-Term Effectiveness–Length of time for remedy to achieve protection and potential effect of construction and implementation of a remedy.
- Implementablity–Refers to the technical feasibility and administrative ease of a remedy.
- Cost–Weighing the benefits of a remedy against the cost of implementation.

FIGURE 1


N
CONTAMINATION "PLUME"
DUNN FIELD
AERIAL VIEW OF DUNN FIELD AND RECOVERY WELLS
GROUNDWATER FLOW DIRECTION
RECOVERY WELLS


RECOVERY WELL
RECOVERED GROUNDWATER PIPED TO TREATMENT SYSTEM
GROUND SURFACE
FLUVIAL AQUIFER
GROUNDWATER FLOW DIRECTION
CONTAMINATION "PLUME"
GROUNDWATER FLOW DIRECTION
CLAY BARRIER
SRW70348.PS

- State Acceptance–Consideration of the State's opinion of the preferred alternative.

- Community Acceptance–Consideration of public comments on the preferred alternative and the proposed plan.

Analysis

Overall Protection. Only one of the alternatives evaluated would offer an adequate degree of protection to human health and the environment by reducing and controlling the risks through removal and containment. The preferred interim action would contain the contamination plume and prevent it from migrating offsite while removing a portion of the contaminated groundwater.

Institutional control protects human health in terms of preventing the consumption of the groundwater, but does not prevent further environmental impact. Additionally, the "no action" alternative offers no protective measures for human health and the environment. For these reasons, Alternatives 1 and 2 are not considered options for this site.

Compliance with ARARs. The groundwater that is removed during pumping will be discharged into the city's sanitary sewer system. The level of contamination of the groundwater is such that it can be easily removed by the City's Publicly Owned Treatment Works (POTW) and should comply with local, state, and federal guidelines. However, if prior treatment before discharge is required, alternatives and their associated costs will be evaluated.

Long-term Effectiveness and Performance. Alternative 3 should be effective in reducing long-term contaminated groundwater levels and associated health risks. Because of residual contamination, the size of the aquifer, and inherit complexities, it may not be possible to completely remediate the aquifer to its original condition using technology currently available.

Reduction of toxicity, mobility, or volume of the contaminants through treatment. The groundwater that would be removed will be discharged into the sanitary sewer system, where it will be treated at the POTW. The toxicity and volume of the contaminated groundwater would be reduced by this removal process. Mobility of the contamination plume would be contained by the physical forces of the groundwater extraction. This hydraulic barrier would prevent lateral movement of the contaminated groundwater.

Short-term effectiveness. Groundwater removal will contain the groundwater contamination plume fairly rapidly. The groundwater recovery system would prevent further lateral contamination migration.

Implementablity. The groundwater recovery system 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 of Alternative 3 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.

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 require the approval of the state.

Community acceptance. The community will have an opportunity to comment on this alternative, and these comments will affect the proposed plan of action.

Summary of the Preferred Alternative

Of the three alternatives reviewed, only one was considered as an option. Because "no action" does not address or rectify the problem and "institutional control" does not protect the environment, they are not considered appropriate. The preferred alternative for the IRA of the contaminated groundwater below Dunn Field is Alternative 3–Groundwater IRA. 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. At this time, groundwater recovery is the only appropriate alternative. However, with the additional information that will be collected in the RI, other alternatives may become available.

Community Participation

The public is encouraged to actively participate in the selection process of this proposed plan and any other actions that may or will be conducted at DDMT. The public may do so by sending their comments to the address listed in the Introduction during the public comment period (November 9 through December 8, 1994). The public's comments will be reviewed by the EPA, TDEC, and DDMT and incorporated into the **Record of Decision** (ROD). Additionally, DDMT selected a **Restoration Advisory Board** (RAB), consisting of representatives from the Memphis area community, and from the state and federal government, to discuss the ongoing restoration activities at DDMT. The RAB meets monthly and encourages public participation.

Glossary of Terms

Air Stripping–The transfer of gas (volatiles) from liquid to air by the agitation of the air-water interface.

Applicable or Relevant and Appropriate Requirements (ARARs)–Any federal or state regulation or law (such as the Clean Water Act) that is and can be federally and state enforceable.

Aquifer–A saturated permeable geologic unit that can transmit significant quantities of water under normal hydraulic gradients.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)–Superfund law that provides for identification and cleanup of hazardous materials released over the land and into the air, waterways, and groundwater.

Feasibility Study (FS)–A study that evaluates cleanup alternatives for a site based on information gathered during a concurrently conducted remedial investigation of the site.

Heavy Metals–Metallic elements with high atomic weights, such as antimony, arsenic, barium, cadmium, chromium, copper, lead, mercury, nickel, selenium, or zinc. They can damage living things at low concentrations and tend to accumulate in the food web.

Hydrocarbons–Chemical compounds that consist entirely of carbon and hydrogen.

Interim Remedial Action–The actual construction or implementation phase of a site cleanup. Follows remedial design and is also known as Remedial Action.

Maximum Contaminant Levels (MCLs)–The maximum permissible level (concentration) of a contaminant in water that is delivered to any user of a public water system.

Operable Unit–Discrete parts of an entire response action.

Physio-Chemical Process–The use of physical and chemical means for treating a specific media (most commonly water).

Plume–A visible or measurable discharge of a contaminant from a given point of origin.

Present Worth–Value of project reduced to today's cost for equal comparison. Present worth computations use a 30-year planning period with a 2.8 percent discount rate (real interest rate).

Proposed Plan–One of several decision documents involved in Superfund's remedial process. The document provides a brief summary of all the alternatives studied in a site's RI/FS and highlights key factors that led to the identification of the preferred alternative for a site.

Record of Decision (ROD)–One of several public decision documents involved in Superfund's remedial process. This document certifies that the remedy complies with CERCLA, outlines the technical goals of the remedy, provides background information on the site, summarizes the analysis of alternatives, and explains the rationale for the remedy selected.

Repository–A facility where official Superfund documents are kept for public reference.

Remedial Investigation (RI)–An investigation that assess the extent and nature of the contamination and the potential risks associated with the contamination. Typically, an RI is conducted concurrently with a feasibility study.

Restoration Advisory Board (RAB)–A board of Memphis area community members, federal employees, and state employees selected by DDMT's technical advisory board to represent the public and community interests and concerns.

Slurry Wall–Barriers used to contain the flow of contaminated groundwater.

Ultraviolet (UV)/Oxidation–The use of ultraviolet light to supply the energy needed to remove hydrogen or electrons.

Volatile Organic Compounds (VOCs)–Potentially toxic volatile chemicals used as solvents, degreasers, paints, thinners, and fuels.

REMOVAL ACTIONS

Objectives: 1. Begin Cleanup of Selected Sites
2. Reduce Program Costs

Approach: Evaluate sites using preestablished criteria to select sites for removal action.

Evaluation Criteria:

Risk Management - Remove sites that have greater risk (i.e. probable sources of groundwater contamination) Sites with lesser risk may also be removed.

Implementable - Can the removal be readily accomplished?

Adequate Data - Do we have adequate data of information to establish a probable condition and reasonable deviations?

Cost - Is the removal action cost effective? Is adequate funding available? Balance costs of the traditional remediation process (investigate, evaluate alternatives, design and implement selected alternative) with costs of removal.

Consistency with the final remedy - The removal action must be consistent with the long-term remedy. Final remedy selection is currently unknown. Source removal for offsite treatment or disposal may only be part of the overall remedy for some sites. It will likely be consistent with the final remedy regardless of what final remedy is selected.

Short Term Effectiveness - Protection of community and site workers during removal actions, environmental impacts, time until removal action objectives are achieved.

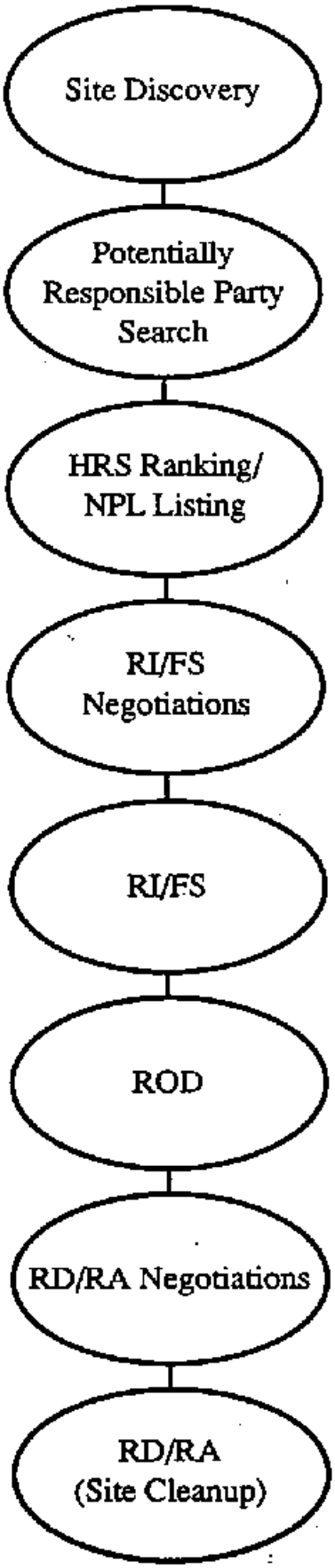
Long Term Effectiveness - Magnitude of residual risk (additional cleanup may be needed after the removal depending on the levels of remaining contaminants), Removal actions are permanent. However, additional cleanup may still be needed.

Community Acceptance - A public comment period is required to evaluate community acceptance.

Observational Approach: (See Terms)

1. Identify the probable condition
2. Establish reasonable deviations and contingency plans
3. Observe through onsite sampling and analysis during construction to identify when removal objectives are achieved or whether a deviation exists that requires implementing a contingency plan.

Superfund Remedial/Enforcement Process
(May Occur Prior To or During the Remedial Process)



TAB

RAB Charter

Restoration Advisory Board Charter
for the Defense Depot Memphis Tennessee

In order to establish a group which will facilitate communication and coordination among its members, this Restoration Advisory Board (RAB) Charter (hereinafter referred to as the Charter) is to recognize and agree that by mutual consent and cooperation, its members will help identify the best possible solutions to existing potential environmental problems at Defense Distribution Depot Memphis Tennessee (hereinafter referred to as the Depot) for the purpose of protecting public health, welfare, and the environment. These parties are hereinafter referred to as the RAB members.

I. Basis and Authority for Charter

The basis and authority for this Charter is the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, particularly Section 120(a), 120(f), and 121(f) and 10 United States Code 2705, enacted by Section 211 of the SARA, Executive Order 12580, Federal Advisory Committee Management Program, DODD 5105.4, and DLA Environmental Manual 6050.1.

II. Structure of the RAB

A. The RAB shall consist of representatives of the Depot, the Environmental Protection Agency (EPA), the Tennessee Department of Environment and Conservation (TDEC), Memphis Light, Gas and Water Company (MLG&W), Shelby County and Memphis City Mayor's Office, Shelby County Commission, Memphis City Council, Memphis/Shelby County Health Department, local environmental organizations, as well as community members who are widely representative of certain groups or concerns relevant to the Depot.

B. The RAB will have co-chairs who will serve in equal partnership. The Installation Co-Chair will be selected by the commanding officer. The Community Co-Chair will be selected by the RAB members.

C. The RAB shall generally meet at the Depot on a calendar quarterly basis. More frequent meetings may be called by the Chair at the request of any member of the organization. It is essential that all committee members or representatives be present at each RAB meeting.

D. Members will serve without compensation. All expenses relating to travel and review inputs will be borne by the individual.

E. The Installation Co-Chair shall be responsible for recording the minutes of the meetings and for disseminating a synopsis of these minutes to committee members within 14 calendar days after the meetings.

F. Technical data, remedial investigation workplans, remedial investigation reports, feasibility study reports, removal action workplans, and other documents relating to the Depot's

Installation Restoration Program shall be made available to committee members. Members are encouraged to submit written comments to the Installation Co-Chair.

III. Function of the RAB and Role of RAB Members

A. The RAB will serve as an advisory board; and will not be considered a decision-making body. The primary function of the RAB will be to provide high quality and timely public participation in decisions regarding environmental restoration and other related activities at the Depot.

B. RAB members shall specifically review and comment on the assumptions, methodologies, and conclusions presented in the Depot's Remedial Investigation/Feasibility Study (RI/FS) and Remedial Design/Remedial Action (RD/RA) data including workplans, reports, studies, and proposed response actions. They shall recommend changes to these documents based on their knowledge of the surrounding community, environmental science, cleanup techniques, and the Depot's past and present restoration activities. All member representatives are responsible for ensuring that their input reflects the position of their respective parent organizations. RAB members are encouraged to participate in all Depot community relations activities and public meetings.

IV. Effective Date, Flexibility, and Modification

A. The effective date of the Charter shall be the date of the last member's signature.

B. The Charter may be amended by the mutual consent of 2/3 majority of the members. Such amendments must be in writing and signed by all members.

C. The RAB is anticipated to hold meetings during a period of several years. In the event any representative withdraws from the RAB, she/he will notify the RAB installation chair. Replacement representatives must first be approved by the RAB.

V. Termination

The provisions of this Charter shall be satisfied and considered complete when 2/3 majority of the members agree in writing to terminate the RAB.

FINAL PAGE

ADMINISTRATIVE RECORD

FINAL PAGE

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ADMINISTRATIVE RECORD

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