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THE MEMPHIS DEPOT
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TECHNICAL MEMORANDUM CH2MHILL

Final Field Sampling Plan Addendum for Operable Unit 1 (OU-1)

TO: Tennessee Department of Environment and Conservation (TDEC)
EPA Region IV
Memphis Depot Caretaker
US Army Corps of Engineers, Huntsville

FROM: CH2M HILL

DATE: March 2, 1999

Purpose

The purpose of this Field Sampling Plan Addendum for Operable Unit 1 (OU-1) is to incorporate recently obtained data by modifying the appropriate sampling strategies presented in the Operable Unit 1 Field Sampling Plan (FSP) dated September 1995. Field sampling will occur as stated in the 1995 FSP except where modified by this addendum. Use this addendum in conjunction with the Operable Unit 1 Field Sampling Plan (September 1995), the Screening Sites Field Sampling Plan (the Generic Remedial Investigation/Feasibility Study Work Plan) (August 1995), the Hazardous and Toxic Waste Health and Safety Plan (August 1995) and the Generic Quality Assurance Project Plan (August 1995).

Introduction

As part of the Memphis Depot's environmental cleanup program, a Remedial Investigation/Feasibility Study (RI/FS) is being conducted at OU-1 of the former Defense Distribution Depot Memphis, Tennessee. OU-1 consists of surface and subsurface soil, sediment and intermittent surface water at Dunn Field, which is located adjacent to and north of the Depot's Main Installation. The RI/FS process at OU-1 shall provide sufficient information regarding the environmental impacts from former hazardous materials disposal activities to determine appropriate cleanup alternatives. See Figure 1 for the locations of disposal areas and other areas of concern.

Historical records and employee interviews regarding burial or surface disposal area and other areas of concern, such as the former pistol range, provided the basis for identifying locations to be investigated. During the 1980s and 1990s, groundwater monitoring wells were installed and groundwater as well as surface and subsurface soil were sampled to determine the environmental impact of past activities at Dunn Field. In 1995, the U.S. Environmental Protection Agency (EPA) and the Tennessee Department of Environment and Conservation (TDEC) approved a Generic RI/FS Field Sampling Plan for OU-1. The goal of the 1995 FSP was to fully characterize the environmental impacts from past disposal, to include identifying disposal areas and how far materials may have moved away from the disposal areas, in order to determine appropriate cleanup alternatives.

In 1998, additional information was gathered about the location of disposal areas and other areas of concern at Dunn Field. This information was developed from several sources: i) results from passive soil gas surveys conducted by CH2M HILL, Inc. to identify areas where the soil has been impacted by vapors from volatile organic compounds (VOCs) (see Figures 2 through 6) or from CWM products (see Figure 7); ii) results of surface soil and groundwater sampling investigations performed by OHM/IT Corporation during installation of the groundwater pumping system in Dunn Field; and iii) results from geophysical investigations using magnetic devices to locate metal objects performed by Parsons Engineering Science, Inc. (Parsons) to characterize suspected chemical warfare materiel (CWM) disposal areas (see Figures 8 and 9). The soil gas survey results also indicate disposal areas that may be impacting groundwater. During field sampling activities, the contractor will avoid areas where passive soil gas survey results indicate possible CWM products.

CH2M HILL reviewed this latest information, compared it to the historical information and produced this Field Sampling Plan Addendum for Operable Unit 1.

The Addendum presents a sampling plan for a more focused environmental characterization of surface soil, subsurface soil, sediment and intermittent surface water.

Methodology

The passive soil gas survey results indicated eight areas impacted by VOCs in the soil. The VOCs detected included 1,2 dichloroethane (1,2-DCE), chloroform ($CHCl_3$), tetrachloroethylene (PCE), carbon tetrachloride (CCl_4), and trichloroethylene (TCE). A possible CWM product, dimethyl disulfide, was also detected. No surface or subsurface sample activities will occur in the areas where this possible CWM product was disposed of.

The color contours on Figures 2 through 6 indicate VOC concentrations in the soil gas. "Low" blue contours represent concentrations up to one order of magnitude above the method detection limit, which is the lowest concentration the analytical process can detect. "Moderate" yellow contours represent concentrations between one and two orders of magnitude above the method detection limit. "High" red contours represent detections two orders of magnitude above the method detection limit.

The most significant change to the 1995 FSP provided in this Addendum involves consolidating individual disposal areas or areas of concern into eight larger sampling areas, Locations A through H. These sampling areas are based on the soil gas survey contours and anomalies detected through the geophysical investigations (See Table 1 and Figure 1). This Addendum also proposes additional surface soil sampling for pesticides in the western portion of Dunn Field.

Changes to Field or Laboratory Methods

EPA has introduced a change in the methods used for the collection and analysis of VOCs in soil. This Addendum modifies the 1995 FSP collection and analysis methods to incorporate EPA's change. EPA determined that previous sampling methods resulted in loss of VOCs during sampling (EPA, 1997). The introduced method will result in less loss of VOCs during sampling.

The 1995 FSP indicated that samples were to be analyzed by the traditional "purge and trap" procedures outlined in Update II to SW-846 (Method 5030A, Revision 1, 1992). However, on June 13, 1997, Method 5030B and Method 5035 were introduced in SW-846 Update III. This update removed the option to analyze soils/sediments by Method 5030 and replaced it with Method 5035, "Closed-System Purge-and-Trap and Extraction for Volatile Organics in Soil and Water Samples." Method 5035 offers the following sample collection options: field preserving with methanol or sodium bisulfite; or collecting in EnCore samplers and submitting to the laboratory for preservation within 48 hours. Surface soil, subsurface soil and sediment samples collected during the OU-1 RI will be collected in the EnCore samplers.

Revised OU-1 Site Sampling and Analysis Plan

A synopsis of the FSP Addendum for OU-1 is presented below. The attached figures present the passive soil gas survey and geophysical survey results, consolidated sampling areas (Locations A through H), and the sampling areas proposed in this Addendum.

Table 2 provides the sampling strategy and lists the proposed number and types of samples to be collected and the proposed suite of analyses. Several individual disposal areas or areas of concern at Dunn Field identified in the Depot's Federal Facilities Agreement and Site Management Plan as screening sites (Sites 21, 61, 71 and 73), CWM sites (Sites 1 and 24), or early removal sites (Sites 60 and 85) were not consolidated into the larger sampling areas (Locations A through H) and are to be investigated separately as outlined in the Screening Sites Field Sampling Plan (September 1995). Surface soil sampling and analysis for pesticides has been added to Sites 21, 60, and 85 as well as to the southeastern corner of Dunn Field. No other changes to the Screening Sites FSP are proposed for Site 21. The two suspected CWM disposal sites are not included in this Addendum, as they are included in the proposed CWM removal action currently in the Engineering Evaluation/Cost Analysis phase.

Six additional borings will be located in the field to better define the horizontal extent of contamination. The additional borings will be located based on the analytical data gathered from the borings described in this plan.

Location A—Asphalt Pad

Description:

The PCE, 1,2-DCE, TCE, $CHCl_3$, and CCl_4 area of impact encompasses Site 23 (Construction Debris and Food Burial Site), Site 24 (Former Burn Site/1946 Mustard Disposal Pit) and Site 63 (Fluorspar Storage). These sites are combined based on a review of the available historical information, geophysical survey, and passive soil gas survey.

Moderate to high soil gas concentrations associated with Site 24 may indicate that this is the mustard disposal pit, or it may indicate soil gas collecting under the asphalt pad. The asphalt pad may act as a cap limiting off-gassing to the atmosphere, concentrating VOCs under the pad. This area will be avoided during field sampling activities. The presence of

high to medium-level soil gas VOC concentrations associated with Site 23 could indicate high VOC concentrations in the disposal areas and soils.

Data Quality Objectives:

- Evaluate presence of VOCs in surface soil – confirm horizontal and vertical extent.
- Evaluate the nature of the materials contained in the disposal area.
- Data will support human health and ecological risk assessment of exposure to surface soil during construction activities.

Data Collection Strategy:

- Site 24 (Former Burn Site) investigation activities will not be performed under this work plan.
- Four borings will be located within the PCE, TCE, CCl_4, and 1,2-DCE soil gas contours. The soil gas concentration contours are generated on a location-wide basis and are not site-specific. The soil gas concentration contours were generated based on analytical data and did not take the historically generated disposal area location into consideration.
- Samples from one boring near the Site 23 disposal area will be analyzed for TCL/TAL to identify a broad range of potential contaminants. These samples will be collected at 0-1 feet (ft), the disposal pit zone at 10-12 ft (base of disposal pit is assumed to be 10-12 ft), and just below the disposal pit zone at 14-16 ft. In addition, a sample will be collected from 28-30 ft and held pending results from the 14-16 ft zone. The 14-16 ft samples will be analyzed first with 24-hour laboratory turnaround.
- Samples from the three other borings will be run for VOCs.
- All surface soil samples will be run for metals and pesticides.
- Three samples from one boring, located outside the CWM avoidance area associated with the Site 24 disposal area, will be analyzed for TCL/TAL to identify a broad range of potential contaminants.

Location B—Debris Site

Description:

The PCE, 1,2-DCE, TCE, and CCl_4 area of impact encompasses two sites: Site 22 (Hardware Burial Site) and Site 23 (Construction Debris and Food Burial Site) and a portion of Site 63 (Fluorspar Storage). These sites are combined based on a review of the available historical information, geophysical survey, and passive soil gas survey.

Moderate to high soil gas concentrations associated with this area may be indicative of high VOCs concentrations in the disposal areas and soils.

Data Quality Objectives:

- Evaluate presence of VOCs in surface soil – confirm horizontal and vertical extent.
- Evaluate the nature of the materials contained in the disposal area.
- Data will support human health and ecological risk assessment of exposure to surface soil during construction activities.

Data Collection Strategy:

- Five borings will be located within the PCE, TCE, CCl_4, 1,2-DCE, and $CHCl_3$ soil gas contours. The soil gas concentration contours are generated on a location-wide basis and are not site-specific.
- Samples from one boring inside the Site 23 disposal area will be analyzed for TCL/TAL.
- Samples from the four other borings will be analyzed for VOCs.
- Four surface soil samples will be analyzed for pesticides.
- All surface soil samples will be analyzed for metals.
- Three samples from one boring located within the Site 23 disposal area will be analyzed for TCL/TAL to identify a broad range of potential contaminants. The TCL/TAL samples within the disposal areas will be collected at 0-1 ft, the disposal pit zone (assumed to be 10-12 ft), and just below the disposal pit zone at 14-16 ft. In addition, a sample will be collected from 28-30 ft and held pending results from the 14-16 ft zone. The 14-16 ft samples will be analyzed first with 24-hour laboratory turnaround.

Location C—South Burial Site

Description:

The PCE, 1,2-DCE, TCE, $CHCl_3$, and CCl_4 soil gas area of impact encompasses Site 12 (Sulfuric and Hydrochloric Acid Burial Site), Site 12.1 (Sulfuric and Hydrochloric Acid Burial Site) and Site 14 (Municipal Waste Burial Site B). These sites are combined based on a review of the available historical information, geophysical survey and passive soil gas survey.

Moderate to high soil gas concentrations associated with this area may indicate VOCs in the disposal areas and soils.

Data Quality Objectives:

- Evaluate presence of VOCs in surface soil – confirm horizontal and vertical extent.
- Evaluate the nature of the materials contained in the disposal area.
- Data will support human health and ecological risk assessment of exposure to surface soil during construction activities.

Data Collection Strategy:

- Five borings will be located within the PCE, TCE, CCl_4, 1,2-DCE, and $CHCl_3$ soil gas contours. The soil gas concentration contours are generated on a location-wide basis and are not site-specific.
- Samples from one boring inside the disposal area will be analyzed for TCL/TAL.
- Samples from the four other borings will be run for VOCs.
- Four surface soil samples will be run for pesticides.
- All surface soil samples will be run for metals.
- Three samples from one boring located within the disposal area will be analyzed for TCL/TAL to identify a broad range of potential contaminants. The TCL/TAL samples within the waste disposal areas will be collected at 0-1 ft, the disposal pit zone (assumed to be 10-12 ft), and just below the disposal pit zone at 14-16 ft. In addition, a sample will be collected from 28-30 ft and held pending results from the 14-16 ft zone. The 14-16 ft samples will be analyzed first with 24-hour laboratory turnaround.

Location D—North Burial Site

Description:

The PCE, 1,2-DCE, TCE, $CHCl_3$ and CCl_4 soil gas area of impact encompasses Site 13 (Mixed Chemical Burial Site), Site 15 (Sodium Burial Sites), Site 15.1 (Sodium Phosphate Burial Site), Site 15.2 (14 Burial Pits: Sodium Phosphate, Na, Acid, Medical Supplies, and Chlorinated Lime), Site 16 (Unknown Acid Burial Site), Site 16.1 (Acid), and Site 17 (Mixed Chemical Burial Site C). These sites are combined based on a review of the available historical information, geophysical survey, and passive soil gas survey.

Moderate to high soil gas concentrations associated with this area may indicate VOCs in the disposal areas and soils.

Data Quality Objectives:

- Evaluate presence of VOCs in surface soil – confirm horizontal and vertical extent.
- Evaluate the nature of the materials contained in the disposal area.
- Data will support human health and ecological risk assessment of exposure to surface soil during construction activities.

Data Collection Strategy:

- Six borings will be located within the soil gas contours. The soil gas concentration contours are generated on a location-wide basis and are not site-specific.
- Samples from two borings inside the disposal area will be analyzed for TCL/TAL.
- Samples from the four other borings will be run for VOCs.

- Four surface soil samples will be analyzed for pesticides.
- All surface soil samples will be analyzed for metals.
- Three samples from one boring located within the disposal area will be analyzed for TCL/TAL to identify a broad range of potential contaminants. The TCL/TAL samples within the waste disposal areas will be collected at 0-1 ft, the disposal pit zone (assumed to be 10-12 ft), and just below the disposal pit zone at 14-16 ft. In addition, a sample will be collected from 28-30 ft and held pending results from the 14-16 ft zone. The 14-16 ft samples will be analyzed first with 24-hour laboratory turnaround.

Location E—Site 10 Area

Description:

The PCE, 1,2-DCE, TCE and $CHCl_3$ soil gas area of impact encompasses Site 7 (Nitric Acid Burial Site), Site 8 (Methylbromide Burial Site B), and Site 10 (Solid Waste Burial Site). These sites are combined based on a review of the available historical information, geophysical survey, and passive soil gas survey.

Moderate to high soil gas concentrations associated with this area may indicate VOCs in the disposal areas and soils. Soil samples collected during the installation of the groundwater recovery system indicate the presence of PCE in the soil at Location E.

Data Quality Objectives:

- Evaluate presence of VOCs in surface soil – confirm horizontal and vertical extent.
- Evaluate the nature of the materials contained in the disposal area.
- Data will support human health and ecological risk assessment of exposure to surface soil during construction activities.

Data Collection Strategy:

- Six borings will be located within the soil gas contours. The soil gas concentration contours are generated on a location-wide basis and are not site-specific.
- Samples from two borings inside the disposal area will be analyzed for TCL/TAL.
- Samples from the four other borings will be analyzed for VOCs.
- Three surface soil samples will be analyzed for pesticides.
- All surface soil samples will be analyzed for metals.
- Three samples from one boring located within the disposal area will be analyzed for TCL/TAL to identify a broad range of potential contaminants. The TCL/TAL samples within the disposal areas will be collected at 0-1 ft, the disposal pit zone (base of disposal pit zone is assumed to be 10-12 ft), and just below the disposal pit zone at 14-16 ft. In addition, a sample will be collected from 28-30 ft and held pending results from

the 14-16 ft zone. The 14-16 ft samples will be analyzed first with 24-hour laboratory turnaround.

Location F—POL Waste Sites

Description:

The PCE, 1,2-DCE, TCE, CCl_4 and $CHCl_3$ soil gas area of impact encompasses Site 2 (Ammonia Hydroxide Site), Site 3 (Mixed Chemical Burial Site), Site 4 (POL Burial Site), Site 4.1 (POL Burial Site), Site 5 (Methybromide Burial Site A) , Site 6 (Eye Ointment Burial Site), Site 9 (Ashes and Metal Burial Site), Site 11 (Trichloroacetic Acid Burial Site), Site 18 (Plane Crash Residue) and Site 86 (Food Supplies). These sites are combined based on a review of the available historical information, the geophysical survey and passive soil gas survey.

Moderate to high soil gas concentrations associated with this area may indicate VOCs in the disposal areas and soils.

Data Quality Objectives:

- Evaluate presence of VOCs in surface soil – confirm horizontal and vertical extent.
- Evaluate the nature of the materials contained in the disposal area.
- Data will support human health and ecological risk assessment of exposure to surface soil during construction activities.

Data Collection Strategy:

- Six borings will be located within the soil gas contours. The soil gas concentration contours are generated on a location-wide basis and are not site-specific.
- Samples from all six borings inside the disposal area will be analyzed for TCL/TAL.
- Three surface soil samples will be analyzed for pesticides.
- All surface soil samples will be analyzed for metals.
- Three samples from one boring located within the disposal area will be analyzed for TCL/TAL to identify a broad range of potential contaminants. The TCL/TAL samples within the disposal areas will be collected at 0-1 ft, the disposal pit zone (assumed to be 10-12 ft), and just below the disposal pit zone at 14-16 ft. In addition, a sample will be collected from 28-30 ft and held pending results from the 14-16 ft zone. The 14-16 ft samples will be analyzed first with 24-hour laboratory turnaround.

Location G—Asphalt Burial Site and Tear Gas Canister Burn Area

Location G encompasses Site 20 (Probable Asphalt Burial Site) and Site 19 (Tear Gas Burn Site). These sites are combined based on a review of the available historical information and data collected during the passive soil gas surveys.

A PCE plume encompasses these two sites and the former incinerator area identified by TEC aerial photographs. Low to moderate soil gas PCE concentrations imply surface soil contamination.

Data Quality Objectives:

- Evaluate presence of VOCs in surface soil – confirm horizontal and vertical extent.
- Data will support human health and ecological risk assessment of exposure to surface soil during construction activities.

Data Collection Strategy:

- Samples analyzed for VOCs.
- In addition, all surface soil samples will be analyzed for metals.
- Four surface soil samples will be analyzed for pesticides.
- Six samples located within the soil gas PCE contour to include the following: one sample in Site 20, one sample in Site 19, one sample in the incinerator area, and three in the northern eastern and western perimeter. The soil gas concentration contours are generated on a location-wide basis and are not site-specific.
- At Site 20, samples will be collected at the 0-1 ft and 8-10 ft intervals. The 8-10 ft interval samples will be collected to characterize the suspected disposal pit at that depth.
- At the other locations, samples will be collected at the 0-1 ft, 3-5 ft, and 8-10 ft intervals. The 0-1 ft and 3-5 ft samples will be analyzed first with 24-hour turnaround. The 8-10 ft samples will be analyzed if the 3-5 ft samples exceed worker exposure criteria. Groundwater transfer criteria will not be used as a vertical screening criteria because there is no observed transfer to groundwater in this area.
- The three perimeter samples are located to evaluate the extent of the PCE area of impact in the soil. Sample intervals are the same as discussed above.

Location H—Drainage Culvert Discharge Area

The TCE, PCE and $CHCl_3$ soil gas area of impact is located west of Site 50 (Dunn Field Northeast Quadrant Drainage Ditch). This location is based on a review of the soil gas survey data and historical information.

Low to moderate soil gas concentrations imply surface soil contamination. The TCE and PCE soil gas concentrations are west of Site 50 and may not be associated with the drainage ditch.

Data Quality Objectives:

- Evaluate presence of VOCs in surface soil – confirm horizontal and vertical extent.
- Data will support human health and ecological risk assessment of exposure to surface soil during construction activities.

Data Collection Strategy:

- Three borings located within the soil gas contour. The soil gas concentration contours are generated on a location-wide basis and are not site-specific. Samples will be collected at the 0-1 ft and 8-10 ft intervals.
- All samples will be analyzed for VOCs.
- If debris is observed in the boring, then a sample will be pulled from that depth and analyzed for TCL/TAL to identify a broad range of potential contaminants.
- In addition to VOCs, all surface soil samples will be analyzed for metals and pesticides.
- Two Site 50 sediment and surface water samples will be collected where the drainage ditch enters Dunn Field along Hays Road, and two sediment and surface water samples will be collected where the drainage ditch exits Dunn Field along Person Avenue. These samples will be analyzed for semi-volatile organic compounds, pesticides and metals.

Sites 21, 60, and 85

Surface soil samples will be collected and analyzed for pesticides and metals. Soil from the pistol range will be sieved onsite to verify the presence of lead bullets.

Data Quality Objectives:

- Evaluate pesticides and metals in surface soil – confirm horizontal and vertical extent.
- Data will support human health and ecological risk assessment of exposure to surface soil during construction activities.

Data Collection Strategy:

- Six surface soil samples will be collected in the grassy area associated with each site.
- All samples will be analyzed for pesticides and metals.

Southeastern Corner of Dunn Field

Surface soil samples will be collected for pesticide and metals analysis.

Data Quality Objectives:

- Evaluate pesticide and metals contamination in surface soil – confirm horizontal and vertical extent.
- Data will support human health and ecological risk assessment of exposure to surface soil during construction activities.

Data Collection Strategy:

- Three surface soil samples will be collected in the grassy area near the fence and also between the former bauxite location and the fluorspar piles.
- All samples will be analyzed for pesticides and metals.

References

CH2M HILL, Inc., *Technical Memorandum, Passive Soil Gas Survey at Dunn Field.* Prepared for U.S. Army Engineering and Support Center Huntsville, Alabama, December 1, 1998.

CH2M HILL , Inc., *Screening Sites Field Sampling Plan.* Prepared for U.S. Army Engineering and Support Center Huntsville, Alabama, September, 1995.

CH2M HILL , Inc., *Operable Unit 1 Field Sampling Plan.* Prepared for U.S. Army Engineering and Support Center Huntsville, Alabama, March, 1995.

Parsons Engineering Science, Inc., *Geophysical Survey at Dunn Field.* Prepared for U.S. Army Engineering and Support Center Huntsville, Alabama, 1998.

U.S. Army Topographic Engineering Center. *Historical Environmental Aerial Photographic Analysis of the Main Depot Area South of Dunn Avenue.* Prepared for U.S. Army Engineering and Support Center Huntsville, Alabama. September, 1998.

TABLE 1
Site Group Descriptions and the Basis for Site Consolidation
Field Sampling Plan Addendum for Operable Unit 1
Defense Distribution Depot Memphis, Tennessee

New Consolidated Location ID	Old Site ID	Reason for Consolidation
Location A—Asphalt Pad	23, 63	TCE, CCl_4, 1,2-DCE, and PCE plume encompasses these sites and the geophysical survey could not identify individual disposal areas identified in the historical records.
Location B—Debris Site	22, 23	TCE, 1,2-DCE, and PCE plume encompasses these sites and the geophysical survey could not identify individual disposal areas identified in the historical records
Location C—South Burial Site	12, 12.1, 14	TCE, 1,2-DCE, and PCE plume encompasses these sites and the geophysical survey could not identify individual disposal areas identified in the historical records.
Location D—North Burial Site	13, 15, 15.1, 15.2, 16, 16 1, 17	TCE, 1,2-DCE, and PCE plume encompasses these sites and the geophysical survey could not identify individual disposal areas identified in the historical records.
Location E—Site 10 Area	7, 8, 10	TCE, 1,2-DCE, and PCE plume encompasses these three sites and the geophysical survey could not identify individual disposal areas identified in the historical records
Location F—POL Waste Site	2, 3, 4, 4.1, 5, 6, 9, 11, 18, 86	TCE, CCl_4, 1,2-DCE, and PCE plume encompasses these sites and the geophysical survey could not identify individual disposal areas.
Location G—Asphalt Burial Site and Tear Gas Canister Burn Area	19, 20, 62	PCE plume encompasses these three sites and the incinerator disposal area identified by TEC aerial photographs. Low-level soil gas implies surface soil contamination. Area of surface soil exposure is extended to encompass anticipated surface soil exposure within the Dunn Field Park Area. PCE contamination is west of Site 50 and may not be associated with the drainage ditch.
Location H—Perimeter TCE	50	TCE and PCE soil gas plume encompasses the end of the drainage ditch Low-level soil gas implies surface soil contamination.
Sites not consolidated	21, 60, 61, 71, 73, 85	Sites are isolated and not associated with soil gas VOC detections or geophysical anomalies.
CWM sites not consolidated	1, 24	The CWM sites have been investigated under a different work plan and will be remediated separately

Table 2

Proposed Sampling and Analysis
Field Sampling Plan Addendum for Operable Unit 1
Defense Distribution Depot Memphis, Tennessee

Site Consolidation Identification	Sites Consolidated	Sampling Objective	Number of Borings	Surface soil (0-1ft)	Sub-surface soil (>1-30 ft)	Sample Interval (ft)	Analyses					
							VOC	PPM Metal	TAL	TCL	Pest/ PCB	SVOC
A-Asphalt Pad	23, 63	-- Evaluate presence of volatile organic compounds in surface soil – confirm horizontal and vertical extent · Evaluate the nature of the materials contained in the disposal area -- Data will support human health and ecological risk assessment of exposure	4	4	8 (4 held)	0 0-1 0, waste, 14-16, 28-30	12 (4 held)	4	1	1	4 (SS)	1(SS) 1(Waste)
B-Debris Site	22, 23		5	5	10	0 0-1 0, waste, 14-16, 28-30	15 (5 held)	5	1	1	4 (SS)	1(SS) 1(Waste)
C-South Burial Site	12, 12 1, 14		5	5	10	0 0-1 0, waste, 14-16, 28-30	15 (5 held)	5	1	1	4 (SS)	1(SS) 1(Waste)
D-North Bunal Site	13, 15, 15 1, 15 2, 16, 16 1, 17		6	6	6(6held)	0 0-1 0, waste, 14-16, 28-30	18 (6 held)	6	2	2	4 (SS)	2 (SS) 2(Waste)
E-Site 10 Area	7, 8, 10		6	6	6(6held)	0 0-1 0, waste, 14-16, 28-30	18 (6 held)	6	2	2	3 (SS)	2 (SS) 2(Waste)
F-POL Waste Sites	2, 3, 4, 4 1, 5, 6, 9, 11, 18 86		6	6	6(6held)	0 0-1 0, waste, 14-16, 28-30	18 (6 held)	6	6	6	3 (SS)	6 (SS) 6 (Waste)
G-Asphalt Burial Site and Tear Gas Canister Burn Area	19, 20, 62		6	6	6(6held)	0 0-1 0, 3 0-5 0, 8 0-10	18 (6 held)	6	--	--	4 (SS)	--
H-Drainage Culvert Discharge Area	50		3	3	3	0 0-1 0, waste, 8 0-10	6 soil, 3 possible waste	3	--	--	3 (SS)	1(SS) 1(Waste)
			Surface Water	--	--	--	--	2	--	--	2	2
			Sediment	--	--	--	--	2	--	--	2	2
Pesticide Survey Areas	21, 60, 85	Data will support human health and ecological risk assessment of exposure to surface soil during construction activities	--	--	--	--	--	6	--	--	6(SS)	--
Southeast Corner of Dunn Field (Pesticide)	Bauxite and Flourspar Storage		--	--	--	--	--	3	--	--	3(SS)	--

Sampling Locations

Addendum to the OU-1 Field Sampling Plan

Defense Distribution Depot

Memphis, Tennessee

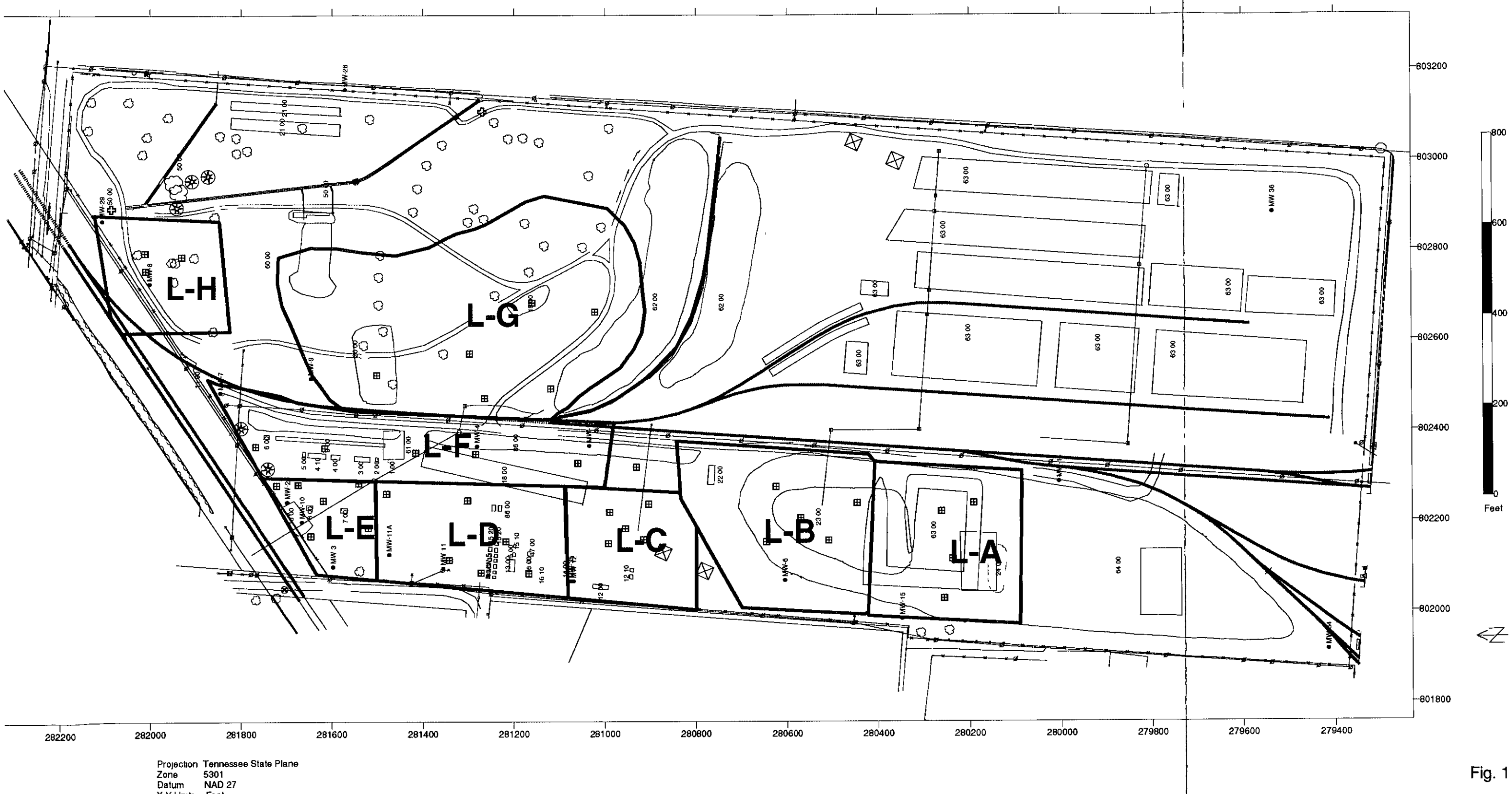


Fig. 1

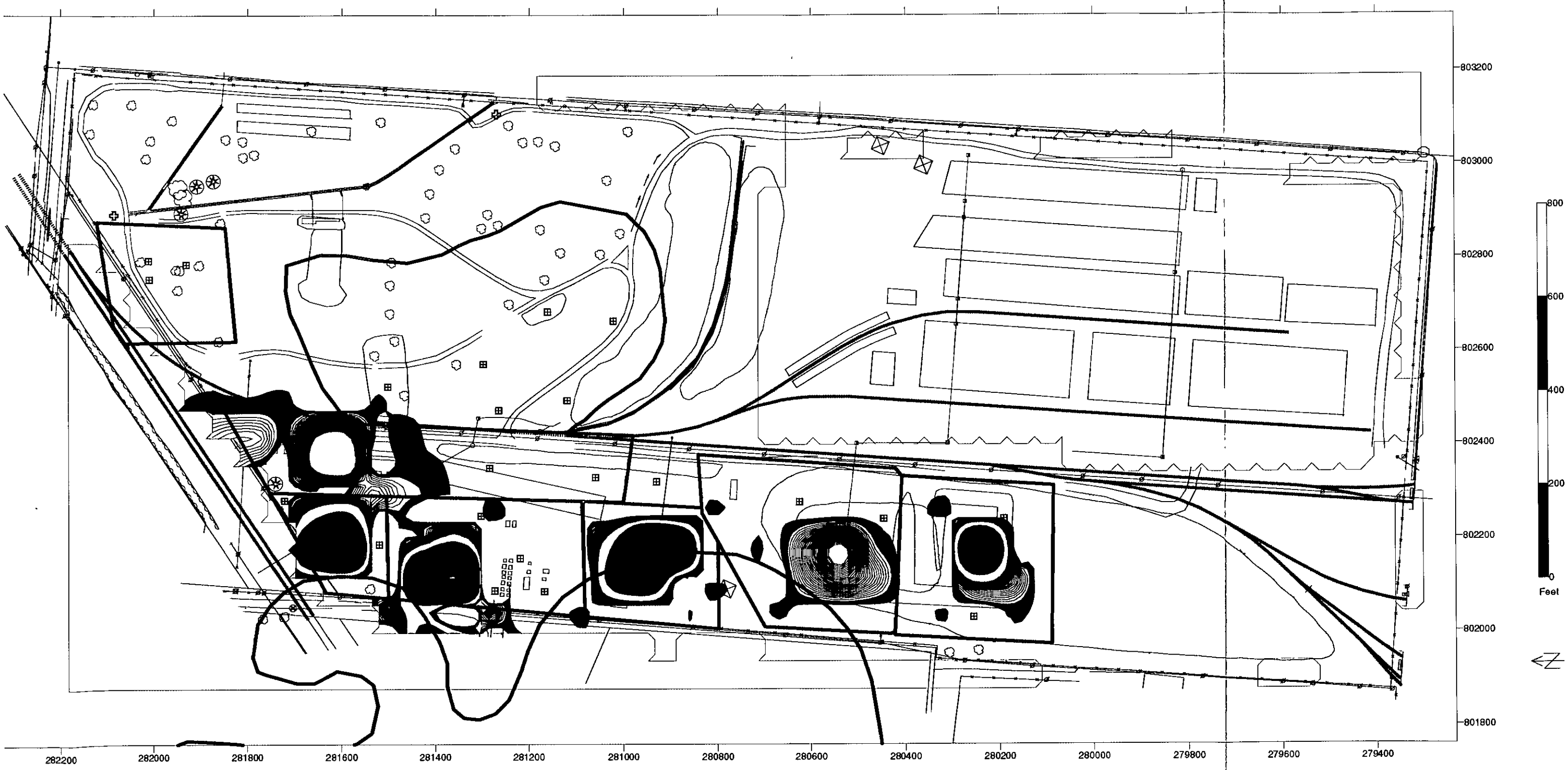
Passive Soil Gas Survey

Addendum to the OU-1 Field Sampling Plan

Defense Distribution Depot

Memphis, Tennessee

1,2-DCE Total



Projection Tennessee State Plane
Zone 5301
Datum NAD 27
X,Y Units Feet

Fig. 2

Passive Soil Gas Survey

Addendum to the OU-1 Field Sampling Plan

Defense Distribution Depot

Memphis, Tennessee

PCE

Passive Soil Gas Concentration Contours

- High (> 3 0 ug)
- Moderate (0 3 - 3 0 ug)
- Low (0 03 - 0 3 ug)

- Extent of PCE in Fluvial Aquifer
- Suspected Disposal Sites
- Site Consolidation Locations
- Boring Locations
- Sediment / Surface Water Sample Locations

803200
803000
802800
802600
802400
802200
802000
801800

282200 282000 281800 281600 281400 281200 281000 280800 280600 280400 280200 280000 279800 279600 279400

800
600
400
200
0
Feet

N

Projection Tennessee State Plane
Zone 5301
Datum NAD 27
X,Y Units Feet

Fig. 3

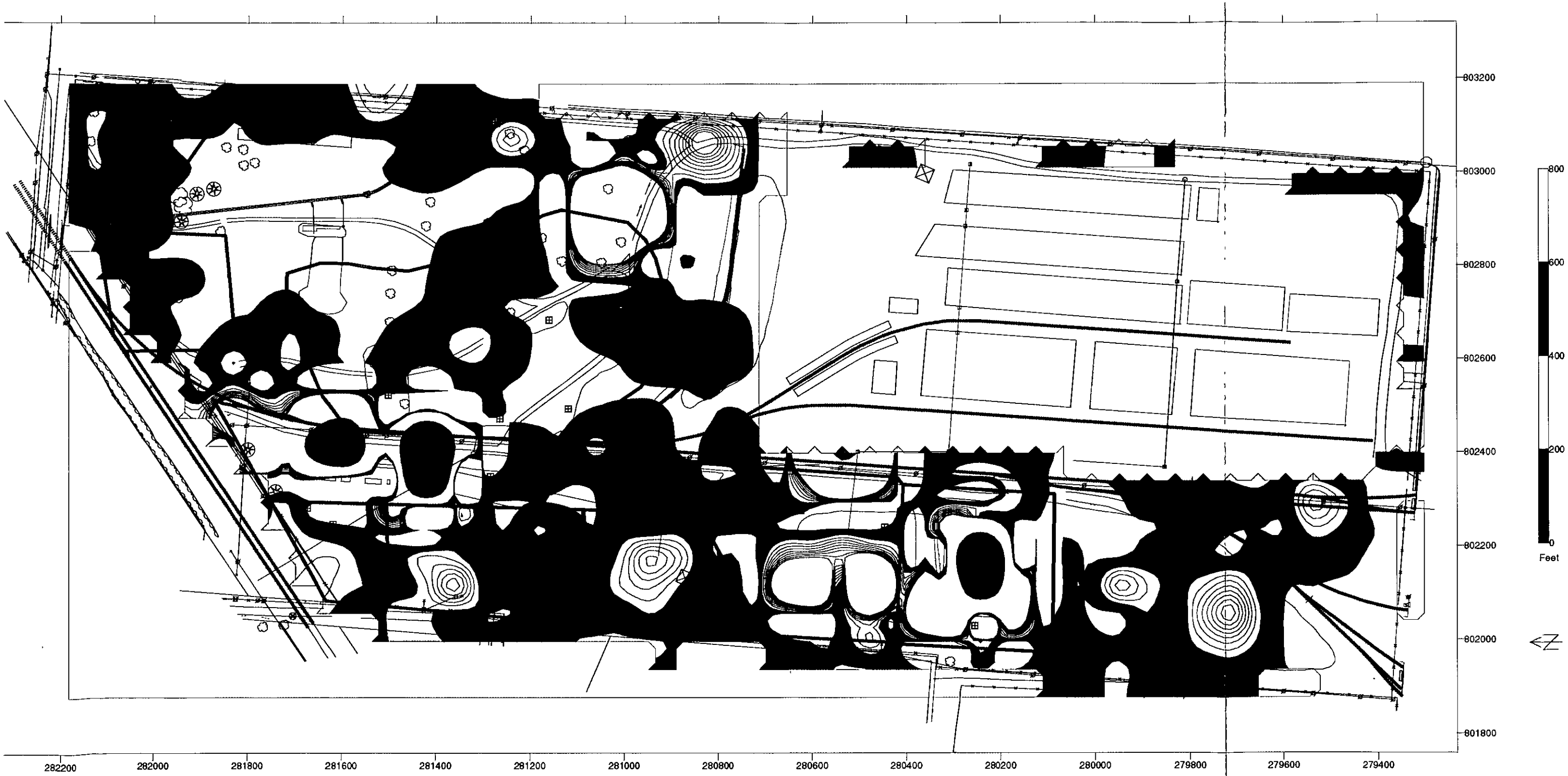
Passive Soil Gas Survey

Addendum to the OU-1 Field Sampling Plan

Defense Distribution Depot

Memphis, Tennessee

$CHCl_3$



Projection Tennessee State Plane
Zone 5301
Datum NAD 27
X,Y Units Feet

Fig. 4

Passive Soil Gas Survey

Addendum to the OU-1 Field Sampling Plan

Defense Distribution Depot

Memphis, Tennessee

TCE

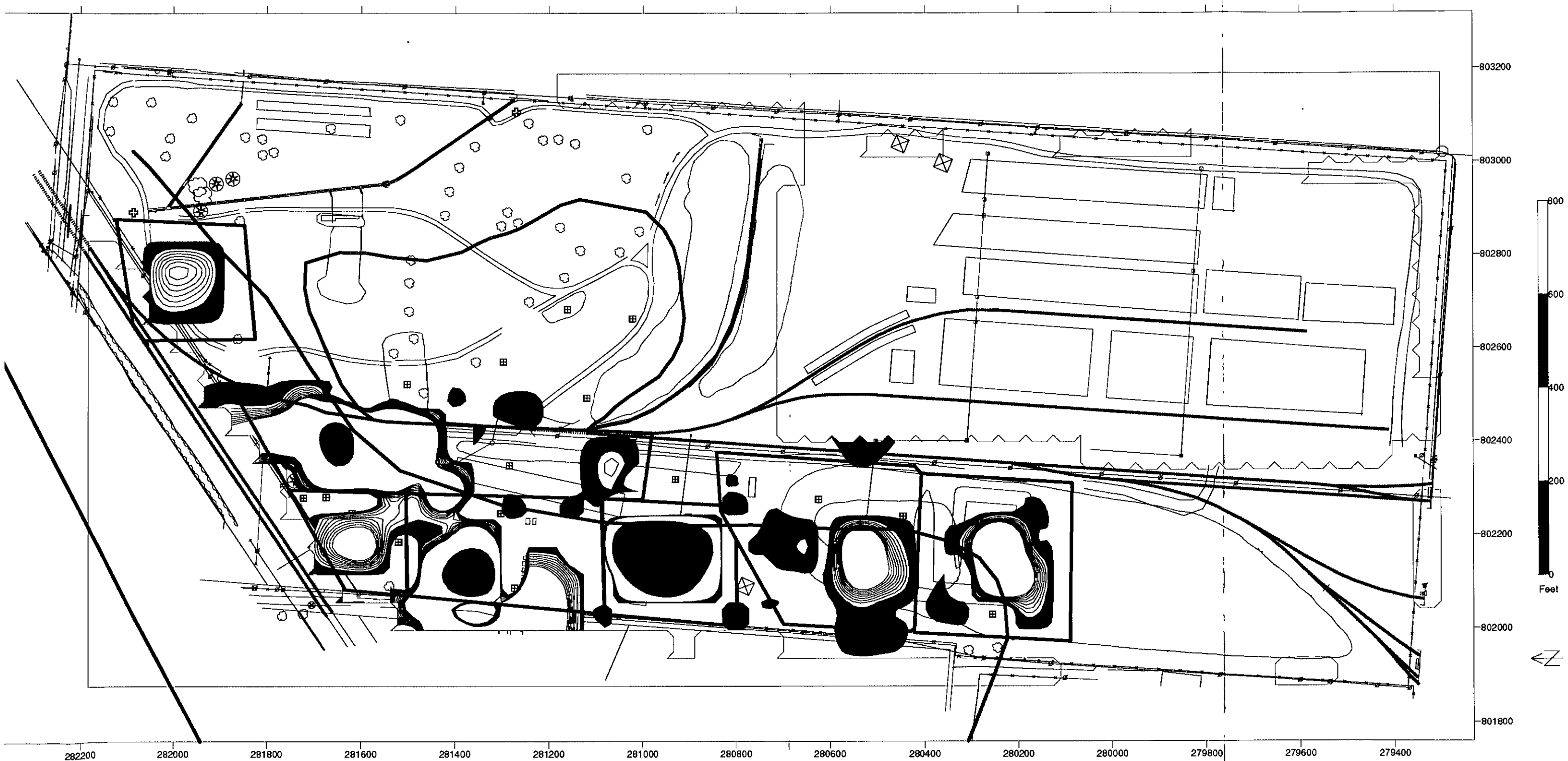


Fig. 5

Passive Soil Gas Survey

Addendum to the OU-1 Field Sampling Plan

Defense Distribution Depot

Memphis, Tennessee

CCl_4

Passive Soil Gas Concentration Contours

- High (>2 0 ug)
- Moderate (0 2 - 2 0 ug)
- Low (0 02 - 0 2 ug)

- Suspected Disposal Sites
- Site Consolidation Locations
- Boring Locations
- Sediment / Surface Water Sample Locations

803200
803000
802800
802600
802400
802200
802000
801800

282200 282000 281800 281600 281400 281200 281000 280800 280600 280400 280200 280000 279800 279600 279400

800
600
400
200
0
Feet

Projection Tennessee State Plane
Zone 5301
Datum NAD 27
X,Y Units Feet

Fig. 6

Passive Soil Gas Survey

Addendum to the OU-1 Field Sampling Plan

Defense Distribution Depot

Memphis, Tennessee

Dimethyl Disulfide

Passive Soil Gas Concentration Contours

Low (0 01 - 0 1 ug)

Suspected Disposal Sites

Site Consolidation Locations

Boring Locations

Sediment / Surface Water Sample Locations

803200
803000
802800
802600
802400
802200
802000
801800

282200 282000 281800 281600 281400 281200 281000 280800 280600 280400 280200 280000 279800 279600 279400

800
600
400
200
0
Feet

Projection Tennessee State Plane
Zone 5301
Datum NAD 27
X,Y Units Feet

Fig.7

EM-31 Terrain Conductivity Survey - Apparent Conductivity

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Defense Distribution Depot

Memphis, Tennessee

Suspected Burial Sites

Site Consolidation Locations

20 24 28 32 36 40 44 48 52 56 60 64 68 72 76 80

White areas indicate
off scale negative readings

Readings in milliSiemens
per Meter

803200
803000
802800
802600
802400
802200
802000
801800

282200 282000 281800 281600 281400 281200 281000 280800 280600 280400 280200 280000 279800 279600 279400

800
600
400
200
0
Feet

Projection Tennessee State Plane
Zone 5301
Datum NAD 27
X,Y Units Feet

Fig. 8

Magnetometer Survey - Magnetic Gradient

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Memphis, Tennessee

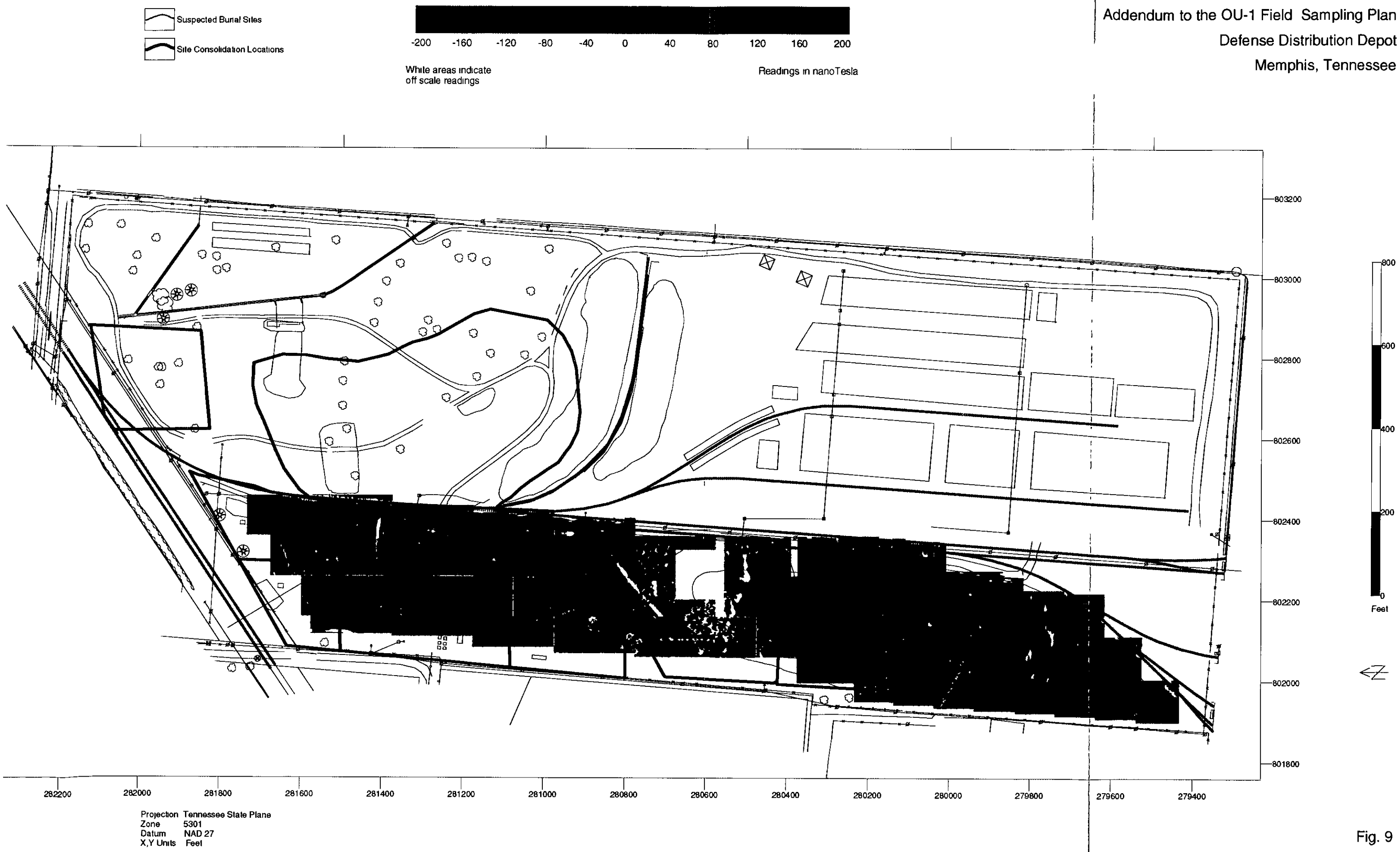

Fig. 9

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ADMINISTRATIVE RECORD

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