File: 541.460.000n
C.H.

THE MEMPHIS DEPOT
TENNESSEE

ADMINISTRATIVE RECORD
COVER SHEET

AR File Number 809

809 1 File:
C.H. 541.460.000g

AR# 809

REMEDIAL ACTION WORK PLAN

Dunn Field Disposal Sites
Defense Depot Memphis, Tennessee

OCTOBER 15, 2004-REV.1

Defense Logistics Agency
Defense Depot Memphis, Tennessee

Contract F41624-03-D-8606
Task Order No. 0029

MACTEC Engineering and Consulting, Inc.

Air Force Center for Environmental Excellence

MACTEC

October 15, 2004

Mr. Jesse Perez
311th HSW/PKV
3300 Sidney Brooks
Brooks City Base, TX 78235-5112

Subject: Remedial Action Work Plan (Rev 1)
Dunn Field Disposal Sites
Defense Depot Memphis, Tennessee
MACTEC Project No. 6301-03-0015

Dear Mr. Perez:

MACTEC Engineering and Consulting, Inc. (MACTEC) is pleased to submit this Remedial Action Work Plan (RAWP) for the Dunn Field disposal sites at the Defense Depot Memphis, Tennessee (DDMT) in Memphis, Tennessee. This document has been prepared in accordance with our statement of work.

Contract No. F41624-03-D-8606
Task Order No. 0029
Item No. 0011
CDRL Sequence No. A007B

The activities proposed within this RAWP are consistent with the Final Remedial Design (CH2M Hill April 2004a) and the Final Dunn Field Record of Decision (CH2M Hill March 2004b). This RAWP provides descriptions of the tasks to be performed and a proposed schedule for completion. The field effort will include excavation and disposal of previously identified buried waste/debris and associated contaminated soil within 5 disposal areas at Dunn Field. This revision to the RAWP incorporates the "Response to Comments" submitted on July 22, 2004.

We appreciate the opportunity to assist you on this important project. If you have any questions regarding this submittal, please do not hesitate to contact us at 770-421-3400.

Sincerely,

MACTEC Engineering and Consulting, Inc.

Gregory J. Wrenn, P.E.
Senior Engineer

Thomas C. Holmes
Project Manager/Principal

cc: Michael A. Dobbs, DLA/DDSP
AFCEEMSCD

PREFACE

MACTEC Engineering and Consulting, Inc. (MACTEC) has prepared this Remedial Action Work Plan (RAWP) for previously identified disposal areas within Dunn Field, which is located across Dunn Avenue from the north-northwest portion of the Main Installation (MI) of the Memphis Depot (Depot) (formally known as the Defense Distribution Depot Memphis, Tennessee). This RAWP has been prepared for the Defense Logistics Agency (DLA) in conjunction with the Air Force Center for Environmental Excellence (AFCEE) under task order (TO) 29 under contract number F41624-03-D-8606. This document is intended to comply with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as well as to satisfy requirements outlined by the Base Realignment and Closure (BRAC) Act set forth by the BRAC Cleanup Team (BCT) for the Depot. The U. S. Environmental Protection Agency (EPA) Remedial Design/Remedial Action Handbook (EPA, 1995a) was used as guidance for the contents of this RAWP.

This RAWP, being Rev. 1 revised to reflect comments from EPA received May 24, 2004 and as described in the "Response to Comments" submitted on July 22, 2004, is consistent with the activities outlined in the Rev. 1 Dunn Field Disposal Sites Final Remedial Design (RD), (CH2M Hill, April 2004a) and the Final Dunn Field Record of Decision (ROD) (CH2M Hill, March 2004b). This RAWP provides detailed descriptions of the tasks to be performed and a proposed schedule for completion. The field effort will include excavation, transportation, and offsite disposal of buried receptacles and associated contaminated subsurface soil. Institutional controls intended to prohibit the future residential use of the Disposal Area are also part of the selected remedy.

Ms. Angela McMath is the Program Manager for the Defense Logistics Agency (DLA). Mr. Thomas Holmes is the Project Manager for Task Order 0029. Ms. Taura Nichols, Mr. Michael LaPrade and Mr. Greg Wrenn are the primary authors of this document.

The efforts of Mr. Jesse Perez from AFCEE and Michael Dobbs from DLA are greatly appreciated.

Thomas C. Holmes
Project Manager/Principal

Gregory J. Wrenn, P.E.
Senior Engineer

TABLE OF CONTENTS

LIST OF APPENDICES

LIST OF FIGURES

LIST OF ACRONYMS AND ABBREVIATIONS

AFCEE	Air Force Center for Environmental Excellence
ARAR	Applicable or Relevant and Appropriate Requirement
BCT	Base Clean-up Team
bgs	below ground surface
BRAC	Base Realignment and Closure
CCE	Construction Certifying Engineer
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CQAP	Construction Quality Assurance Plan
CRP	Community Relations Plan
CWM	chemical warfare material
CY	Cubic Yards
DDMT	Defense Depot Memphis Tennessee
Depot	Memphis Depot
DoD	Department of Defense
DLA	Defense Logistics Agency
DSERTS	Defense Sites Environmental Restoration Tracking System
EPA	U.S. Environmental Protection Agency
FS	Feasibility Study
HASP	Health and Safety Plan
I-L	Light Industrial
MACTEC	MACTEC Engineering and Consulting, Inc.
MI	Main Installation
MNA	Monitored Natural Attenuation
NPL	National Priorities List
PAH	polynuclear aromatic hydrocarbons
PMP	Project Management Plan
POL	petroleum/oil/lubricants
PSVP	Performance Standards Verification Plan
QA	Quality Assurance
QC	Quality Control

LIST OF ACRONYMS AND ABBREVIATIONS (Continued)

RA	Remedial Action
RAB	Restoration Advisory Board
RACR	Remedial Action Completion Report
RAOs	Remedial Action Objectives
RASAP	Remedial Action Sampling and Analysis Plan
RAWP	Remedial Action Work Plan
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RFA	RCRA Facility Assessment
RGOs	Remedial Goal Objectives
RI	Remedial Investigation
ROD	Record of Decision
SAP	Sampling and Analysis Plan
SOW	Scope of Work
SHSP	Site Specific Health and Safety Plan
SWMUs	Solid Waste Management Units
TBC	To Be Considered
TDEC	Tennessee Department of Environment and Conservation
TM	Technical Memorandum
TO	Task Order
VOCs	Volatile Organic Compounds
WMP	Waste Management Plan
WTPs	Work and Test Procedures
ZVI	Zero Valent Iron

1.0 INTRODUCTION

This Remedial Action Work Plan (RAWP) has been prepared by MACTEC Engineering & Consulting, Inc. (MACTEC) to describe the site-specific tasks necessary for Remedial Action (RA) associated with the disposal sites at the Dunn Field portion of the Memphis Depot (Depot) (formally known as the Defense Distribution Depot Memphis, Tennessee). MACTEC has prepared this document under contract with Defense Logistics Agency (DLA) in conjunction with the Air Force Center for Environmental Excellence (AFCEE) as part of Task Order 29 under contract number F41624-03-D-8606. This document is intended to comply with Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) guidance for remedial actions, as well as to satisfy requirements outlined by the Base Realignment and Closure (BRAC) Act, as well as requirements set forth by the BRAC Cleanup Team (BCT) for the Depot. The BCT, which is composed of representatives of the DLA, Tennessee Department of Environment and Conservation (TDEC), and the U.S. Environmental Protection Agency (EPA), will monitor the progress of remedial action and will review all documents prior to finalization. The lead agency for site activities at the Depot is the DLA. The regulatory oversight agencies are EPA Region 4 and TDEC. The DLA and the Department of Defense (DoD) will implement the selected response actions and will incur all associated costs. The Depot's EPA Identification Number is TN4210020570.

1.1 PROJECT OVERVIEW

This RAWP is intended to provide a detailed plan of action for the safe and efficient completion of the selected RA activities. The RAWP contains a comprehensive description of the work to be performed and the final construction schedule for completion of each major activity and submission of each deliverable. Specifically, the RAWP includes the following:

- A detailed description of the tasks to be performed and a description of the work products to be submitted to the BCT;
- A preliminary schedule for completion of activities and submission of deliverables;
- A project management plan;
- Information regarding the community relations support activities to be conducted prior to and during the anticipated RA as part of the approved Community Relations Plan. This includes assisting with Restoration Advisory Board (RAB) updates, as necessary.

Secondary documents developed in conjunction with this RAWP consist of the Project Management Plan (PMP), Waste Management Plan (WMP), and Construction Quality Assurance Plan (CQAP); these are included as appendices to this document. It should be noted that the protocols outlined in the Performance Standards Verification Plan (PSVP), prepared by CH2M Hill as part of the Final Dunn Field Disposal Sites Remedial Design (RD) (CH2M Hill, April 2004a), is being used as part of the CQAP and is included for reference. The Rev. 0 Health and Safety Plan – Main Installation and Dunn Field (HASP) and the Sampling and Analysis Plan (SAP) will be stand-alone documents for the remedial activities of the Memphis Depot. The Site Specific Health and Safety Plan (SHSP) will be developed as an addendum to the HASP. The Remedial Action Sampling and Analysis Plan (RASAP) was submitted on October 1, 2004. Relevant sections are included by reference in Appendix D of this document.

1.2 SITE HISTORY AND DESCRIPTION

The Memphis Depot, in southeastern Memphis, Tennessee (Figure 2-1 of the RD provided in Appendix A, Attachment 1), originated as a military facility in the early 1940s. Its initial mission and function was to provide stock control, material storage, and maintenance services for the U.S. Army (Memphis Depot Caretaker, 2003). In 1995, the Depot was placed on the list of DoD facilities to be closed under BRAC. Storage and distribution of material for all U.S. military services and some civil agencies continued until the Depot closed in September 1997.

The Depot is located approximately 5 miles east of the Mississippi River and just northeast of Interstate 240. The property consists of approximately 642 acres and includes two components: (1) the main installation (MI), which includes open storage areas, warehouses, military family housing, and outdoor recreational areas; and (2) Dunn Field, which includes former mineral storage and waste disposal areas. Dunn Field, comprising approximately 64 acres of undeveloped land, is bounded by the Illinois Central Gulf Railroad and Person Avenue to the north, Hays Road to the east, and Dunn Avenue to the south. Dunn Field is partially bounded to the west by: (1) Kyle Street; (2) a Memphis Light, Gas, and Water powerline corridor (which bisects Dunn Field); (3) undeveloped property; and (4) a light industrial/warehouse facility. All of Dunn Field (and the MI) is currently zoned as Light Industrial (I-L). Approximately two-thirds of the area is grassed, and the remaining area is covered with crushed rock and paved surfaces.

In 1990, EPA identified 24 Solid Waste Management Units (SWMUs) and one Area of Concern at Dunn Field during a Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA). During this same period, a Hazardous Ranking System Scoring Package for the facility was prepared and in 1992, the Depot was added to the National Priorities List (NPL) (57 Federal Register 47180 No. 199). For purposes of previous studies, Dunn Field was divided into three exposure areas: Northeast Open Area, Disposal Area, and Stockpile Area (Figure 2-3 of the RD provided in Appendix A, Attachment 1). Table 2-1 from the Final Dunn Field Record of Decision (ROD) (CH2M Hill, March 2004b) provided in Appendix A, Attachment 2 describes sites listed under the Defense Sites Environmental Restoration Tracking System (DSERTS) that are located within these areas.

Northeast Open Area – The Northeast Open Area (approximately 20 acres) consists of a grassy area with a number of interspersed mature trees in the northeast quadrant of Dunn Field. This area has been identified as future public open space (The Pathfinders *et al.*, 1997).

Disposal Area – The Disposal Area (approximately 14 acres) consists of former disposal pits and trenches in the northwestern quadrant of Dunn Field. The anticipated land use within this area is I-L (The Pathfinders *et al.* 1997).

Stockpile Area – The Stockpile Area (approximately 30 acres) encompasses the former bauxite and fluorspar storage and burial areas in the eastern and southwestern portions of Dunn Field. The anticipated land use within this area is also I-L (The Pathfinders *et al.*, 1997).

The results of the remedial investigation/feasibility study (RI/FS) activities for Dunn Field were reported by CH2M Hill in November 2002 and May 2003. Based on those results, plans for future remedial actions for the various areas at Dunn Field were outlined in the ROD. The selected remedy for addressing the debris and associated soils within selected disposal sites is excavation, transportation, and offsite disposal with institutional controls.

1.3 NATURE AND EXTENT OF CONTAMINATION

Historical information concerning the disposal sites is included in the Dunn Field RI (CH2M Hill, 2002) and FS (CH2M Hill, 2003a). Records indicate that chemical warfare material (CWM), chlorinated lime, super tropical bleach, and calcium hypochlorite, food stocks, paints/thinners, petroleum/oil/lubricants

(POL), acids, herbicides, mixed chemicals, and medical waste were reportedly destroyed or buried in pits and trenches at the Dunn Field disposal sites. From mid-2000 to mid-2001, UXB International, under contract with United States Army Engineering and Support Center, Huntsville, Alabama (USAESCH), conducted remedial measures to reduce or eliminate the potential CWM risk posed by these wastes. The CWM remedial actions at these sites are documented in the *Final Chemical Warfare Material Investigation/Removal Action Report* (UXB, 2001).

A design-related investigation was conducted in accordance with the *Disposal Sites Pre-Design Investigation Data Collection Plan Rev 2,* (CH2M Hill, 2003b) to supplement existing chemical and physical data on the 17 former disposal sites on Dunn Field previously identified by the BCT as Priority Level A and Level B based upon the quantity of material within each site, potential hazards of the material, and form of the material (solid versus liquid). Investigation results were presented in the *Disposal Sites Pre-Design Investigation Data Collection Plan Technical Memorandum Rev. 2,* (TM) (CH2M Hill, 2004c). This TM served as the basis for the RD by identifying the disposal sites that required further action. The RD was issued in April 2004.

1.4 REMEDIAL ACTION OBJECTIVES

The remedial action objectives (RAOs), medium-specific goals, were developed to reflect the anticipated future land use for Dunn Field in accordance with EPA Policy, *Land Use in the CERCLA Remedy Selection Process* (OSWER Directive No. 9355.7-04). The RAOs were developed during the RI phase and presented in the ROD. The development of the RAOs took into consideration the remedial goal objectives (RGOs) (permissible exposures to industrial workers and potential on-site residents assuming redevelopment of Dunn Field) and the clean up concentrations based upon the RGOs. The following are the RAOs as presented in the ROD:

Surface Soil at the Disposal Area:

- Limit use of the surface soil in the Disposal Area to activities consistent with I-L use and prevent residential use through land use controls.

The Disposal Sites at the Disposal Area and the Stockpile Area:

- Prevent groundwater impacts from a release of buried containerized hazardous liquids and the leaching of contaminants from buried hazardous solids;

- Prevent unacceptable risk of direct contact with buried hazardous liquid and/or solids due to intrusive activities during future land use or site development.

Subsurface Soil Impacted with VOCs at the Disposal Area:

- Prevent direct inhalation of indoor air vapors from subsurface soils in excess of industrial worker criteria.
- Reduce or eliminate further impacts to the shallow fluvial aquifer from the VOCs in the subsurface soil.

Groundwater at Dunn Field:

- Prevent human exposure to contaminated groundwater (i.e., exceeding protective target levels);
- Prevent further offsite migration of VOCs in groundwater in excess of protective target levels; and,
- Remediate fluvial aquifer groundwater to drinking water quality to be protective of the deeper Memphis aquifer.

This RAWP addresses only the Disposal Sites at Dunn Field. Separate RAWPs will be required for other remedial actions outlined in the ROD which include: use of soil vapor extraction to reduce VOC concentrations in subsurface soils; injection of zero-valent iron (ZVI) to treat chlorinated VOC (CVOCs) concentrations in the most contaminated part of the groundwater plume; and installation of a permeable reactive barrier (PRB) to remediate CVOCs within the offsite areas of the groundwater plume.

1.5 SCOPE OF WORK

A Statement of Work (SOW), Appendix D of the RD, is included herein as Appendix A, Attachment 3. The SOW describes the tasks necessary to excavate, characterize, transport, and dispose of buried debris and associated contaminated soils from the disposal sites at Dunn Field. In general, the scope of remedial activities can be divided into three parts: (1) Pre-Construction Activities, (2) Construction Activities, and (3) Post-Construction Activities, as described below.

Pre-Construction Activities

- Remedial Action Work Plan (RAWP)
- Site-Specific Health and Safety Plan (SHSP)
- Project Management Plan (PMP)

- Waste Management Plan (WMP)
- Construction Quality Assurance Plan (CQAP)
- Remedial Action Sampling and Analysis Plan (RASAP)
- Subcontractor Procurement
- Utilities survey
- Survey of disposal sites layout
- Pre-Construction Conference

Construction Activities

- Mobilization of all personnel, equipment, and supplies
- Site preparation
- Installation of temporary erosion and sediment controls
- Construction of decontamination facilities
- Excavation/removal, characterization, loading, transportation, and disposal of targeted materials at offsite hazardous and/or non-hazardous landfills
- Performance verification sampling
- Personnel and equipment decontamination
- Backfilling, compaction, and grading

Post-Construction Activities

- Site restoration
- Demobilization of all personnel, equipment, and supplies from site
- Remedial Action Completion Report (RACR) preparation
- Establishment of institutional controls
- Institutional control effectiveness monitoring
- Five-year Review

1.6 PROJECT ORGANIZATION AND RESPONSIBILITIES

For this project, MACTEC has assembled the necessary technical and administrative staff to meet the stated purpose and technical objectives of the work described in this RAWP. Details of the project organizational structure and project management procedures are provided in the PMP (Appendix B). MACTEC's technical staff will work under the direction of the MACTEC Project Manager, Mr. Thomas Holmes, Professional Geologist and Principal/Project Manager. The MACTEC Project Manager (PM) will provide technical coordination with the AFCEE Contracting Officer Representative (COR).

The AFCEE COR, Mr. Jesse Perez, is the primary AFCEE contact for this work and will oversee all contractual matters in consultation with DLA.

Other key MACTEC participants in this project include the Construction Certifying Engineer, Project Chemist, Site Superintendent, Field Engineer, Health and Safety Manager, and the field technicians. The PMP (Appendix B) provides a description of the proposed project assignments and responsibilities, a list of the individuals expected to serve in each capacity, and a brief synopsis of the participant's related experience. The PMP also provides a description of the management procedures to be followed during the course of this work.

2.0 IMPLEMENTATION OF REMEDIAL ACTION

2.1 PLANNING FOR REMEDIAL ACTION

MACTEC will perform administrative, contractual, and logistic activities before mobilizing personnel and equipment to the site. Requirements related to health and safety, permitting, access, supply delivery issues, underground utility surveys, vendor and subcontractor agreements will be addressed. Project deliverables are critical to the success of the project and will be prepared and submitted to the BCT for review and comment. This RAWP includes the PMP, WMP, and CQAP; the SHSP and the RASAP will be submitted separately. Following BCT concurrence on all deliverables, the remedial action activities will begin.

2.1.1 Permitting

As this site is under CERCLA authority, permits are not required from local or state entities; however, the substantive requirements of permits must be considered and incorporated within RA. CERCLA Section 121(d), specifies that remedial actions of hazardous substances must comply with requirement and standards under federal or more stringent state environmental laws and regulations that are applicable or relevant and appropriate to the hazardous substances or particular circumstances at a site or obtain a waiver. In accordance with 40 CFR.400(g), the DLA, TDEC, and EPA have identified the specific applicable or relevant and appropriate requirements (ARARs) and to be considered (TBC) elements for the selected remedy. The ARARs and TBCs, located in Table 2-23 and 2-24 of the ROD, are provided in Appendix A, Attachment 2 of this RAWP for ease of reference. The ARARs and TBCs address activities causing fugitive dust emissions and storm-water run-off; waste characterization; and storage, transportation and disposal of hazardous wastes.

2.1.2 Site-Specific Health and Safety Plan (SHSP)

Development of a SHSP is required to identify potential risks associated with remedial action construction activities. The SHSP is required to include a description of potential risks, responsible on-site personnel, site safety program(s) and procedures, contingency procedures, air monitoring plan(s), personnel monitoring, area and perimeter monitoring, spill prevention, control and countermeasures plan.

The SHSP for the construction and implementation phase of this remedial action will be prepared as a separate stand-alone document.

2.1.3 Project Management Plan (PMP)

The PMP is provided in Appendix B and describes the project organization and responsibilities. In addition, subcontractor procurement as well as the lines of communication for MACTEC and its subcontractors are outlined.

2.1.4 Waste Management Plan (WMP)

The WMP is provided in Appendix C and describes waste management during the excavation and disposal activities. This plan identifies the waste streams that will be generated during the remedial action and details plans for waste minimization and waste disposition.

2.1.5 Construction Quality Assurance Plan (CQAP)

The CQAP is provided in Appendix D and describes the RA activities to be performed and the associated quality assurance/quality control activities. The CQAP includes information regarding project meetings, construction activities and submittal requirements. The RASAP has been prepared as a stand-alone document and was submitted on October 1, 2004.

2.2 MOBILIZATION AND SITE PREPARATION

This task will consist of the mobilization of personnel, equipment and supplies to the work site and the establishment of temporary facilities, consisting primarily of an equipment decontamination area, supply staging area or trailer, portable sanitary facilities, and office trailer. This task includes all activities to prepare areas of the site for field operation. Site preparation activities at the site will include: identification/construction of access roads and security gates; surveying (utilities and disposal site layout), site clearing, and grading; and securing all required utilities, establishment of erosion control measures, and construction of decontamination facilities.

2.2.1 Pre-Construction Conference

A pre-construction conference will be held before initiating all construction activities and may include representatives of DLA, AFCEE, Depot Redevelopment Corporation (DRC), MACTEC, EPA, and TDEC. During the conference, the following issues will be addressed:

- The roles, relationships, and responsibilities of all parties involved in the remedial action will be defined;
- The methods for documenting and reporting inspection data will be reviewed;
- The methods for distributing and storing documents and reports will be reviewed;
- Work area security and safety protocol will be reviewed;
- The anticipated construction schedule will be reviewed;
- A site reconnaissance will be conducted to verify that the design criteria and the specifications presented in the contract documents are understood. The locations at which materials and equipment will be stored will be reviewed;
- The final CQAP will be reviewed;
- Scheduled meetings and briefings during construction will be established;
- Procedures to resolve disputes or misunderstandings during construction will be established;
- Review of endpoint activities and procedures for project completion will be conducted.

The pre-construction conference will be documented and will record information such as the names of people in attendance, the issues discussed, clarifications made, special instructions issued, etc.

2.2.2 Work Zones

MACTEC will establish the areas that will be used during RA construction activities and clearly identify work limits for them. The exclusion zone, contaminant reduction zone, and support zones will be established prior to construction. The various work areas, excavation, stockpiles, haul roads, etc., for site activities will be clearly marked and flagged.

2.2.3 Erosion and Storm Water Control and Maintenance

Erosion control measures will be implemented for excavation and stockpile areas. Silt fence, hay bales, site modification for ditches, and/or other devices will be used to control storm water and erosion as detailed in the Construction Specifications (Appendix D, Attachment 1) and Construction Drawings (Appendix A, Attachment 4). As needed, potable water will be sprayed on haul roads to limit dust. Storm water that collects within excavations or inside runoff diversion berms will be containerized, characterized, and disposed of in accordance with the project specifications.

2.3 SUMMARY OF PLANNED WORK

Soil and debris, including potential principal threat wastes (primarily drums and glass bottles) from Disposal Sites 3, 4.1, 10, 13, and 31 will be excavated and transported for off-site disposal. A general description of the planned work for each disposal site is presented below along with a reference to the applicable sheets of the construction drawings (Appendix A, Attachment 4) for each disposal site. The planned excavation activities including soil volume (without swell factor) for each area is listed below. Based upon review of previous investigations conducted at the Disposal Sites, excavation activities will be initiated in Level D Personal Protective Equipment (PPE) and not in Level B PPE as stated in the RD. The decision to upgrade to either Level C or Level B will be made by the Site Superintendent and the Health and Safety Officer based upon data obtained by air monitoring equipment.

- Disposal Site 3 (Sheet 2)
  - Excavation and disposal of 225 CY of soil and debris will be completed at Trenches 1 and 2 where glass bottles and drum(s) were encountered.
  - Excavation dimension: 30-foot by 20-foot by 10-foot deep.
  - Confirmation sampling.
  - Characterization of excavated soils for offsite disposal.
  - Backfill of excavation and site restoration.

- Disposal Site 4.1 (Sheet 2)
  - Excavation and disposal of 225 CY soil and debris will be completed at Trenches 1 and 2 where benzene, copper, and lead were detected above their respective RGs and drum(s) and other debris were encountered.
  - Excavation dimension: 30-foot by 20-foot by 10-foot deep.
  - Confirmation sampling.
  - Characterization of excavated soils for offsite disposal.
  - Backfill of excavation and site restoration.

- Disposal Site 10 (Sheet 2)

  - Excavation and disposal of approximately 610 CY of copper- and lead-contaminated soil and debris. A 40-foot by 55-foot excavation is divided into three sections:
  - Excavation 1 dimension: 20-foot by 55-foot by 6-foot deep excavation will encircle Trenches 3 and 4 where copper was detected above its RG and a flattened drum was encountered.
  - Excavation 2 dimension: 10-foot by 55-foot by 8-foot deep will encircle Trench 5 where lead was detected above its RG.
  - Excavation 3 dimension: 10-foot by 55-foot by 10-foot deep will encircle Trench 6 where lead was detected above its RG.
  - Confirmation sampling.
  - Characterization of excavated soils for offsite disposal. Lead-contaminated soil is anticipated to be hazardous.
  - Backfill of excavation and site restoration.

- Disposal Site 13 (Sheet 3)

  - Excavation and disposal of approximately 55 CY of soil and debris will be conducted at Trench 3 where bottles containing an unknown liquid were encountered.
  - Approximate excavation dimension: 15-foot by 10-foot by 10-foot deep.
  - Confirmation sampling.
  - Characterization of excavated soils for offsite disposal.
  - Backfill of excavation and site restoration.

- Disposal Site 31 (Sheet 4)

  - Excavation and disposal of approximately 1,175 CY of soil will be conducted on the northern end of the site where PAHs and copper were detected above their respective RGs. Two adjacent excavations will be completed
  - Excavation 1 dimension: 90-foot by 45-foot from 4 feet to 10 feet below ground surface (bgs) (PAH).
  - Excavation 2 dimension: 30-foot by 30-foot by 8-foot deep (PAH and copper).
  - Confirmation sampling.
  - Characterization of excavated soils for offsite disposal.
  - Backfill of excavation and site restoration.

2.4 PERFORMANCE VERIFICATON

Confirmation samples will be collected in accordance with the State of Michigan DEQ Verification of Soil Remediation Guidance Document (Michigan DEQ, April 1994). Confirmation samples will be analyzed to confirm within the excavation that the cleanup levels established in the ROD have been achieved. Additional sampling information is provided in the CQAP (Appendix D). The table below shows the estimated number of samples to be collected from each disposal site. Figures 2-1 through 2-3 show the proposed initial sampling points at each disposal site.

Table 2-1 – Confirmation Sampling Specifics

Disposal Site	COCs	Floor Area (ft^2)	Total Sidewall Area (ft^2)	Analyses	Comparison Criteria (mg/kg)	Number of Samples Floor	Number of Samples Side Wall
3	Bottles and Drums	600	1,000	TAL Metals by Method 6010B TCL SVOCs by Method 8270C	See Table 5-5 of RD (included as Attachment 2 of Appendix A) for Remedial Goals	3	6
4.1	Copper and Lead	600	1,000			3	6
10	Copper and Lead	2,200	3,240			5	9
13	Bottles	150	500			2	5
31	PAHs and Copper	5,850	3,060			7	9
Total		**9,400**	**8,800**			**20**	**35**

Note: In addition to the analyses identified above, each confirmation sample will be analyzed for corrosivity and reactivity via EPA Method SW-846 and for ignitability via EPA Method 1010.

The rationale for selection of the confirmation sample locations is described below, based on findings of the pre-design investigation (CH2M Hill 2004c).

2.4.1 Disposal Site 3

At Disposal Site 3, four trenches numbered 1-4 moving north to south, were excavated. The proposed excavation area is centered near trenches 1 and 2, where the majority of buried debris was encountered. In trench 3, broken glass and metallic debris was encountered in a burn pit at 2 feet below ground surface (bgs). Also, metallic debris was encountered at 6 feet bgs along with further evidence of the burn pit. For these reasons, it is proposed that a higher percentage of confirmation samples be collected at the southern portion of Disposal Site 3. The proposed confirmation sample locations are shown on Figure 2-1.

2.4.2 Disposal Site 4.1

At Disposal Site 4.1, four trenches numbered 1-4 moving north to south, were excavated. The proposed excavation area is centered near trenches 1 and 2, where the majority of buried debris was encountered. Analytical results for samples collected from these trenches indicate no exceedances except for benzene and copper in trench 1. Bottles, cans and 55-gallon drums were encountered in trenches 1 and 2 along with evidence of two burn pits. Evidence of burn pits/materials were encountered in the eastern end of trenches 3 and 4. For these reasons, it is proposed that a higher percentage of confirmation samples be collected at the southeastern portion and the northern portion of Disposal Site 4.1. The proposed confirmation sample locations are shown on Figure 2-1.

2.4.3 Disposal Site 10

At Disposal Site 10, seven trenches numbered 1-7 moving from the northwest to the southeast, were excavated. Burned debris was encountered in trenches 3 through 6, mainly within the upper 3 feet bgs. Debris such as metal, glass, wood, and concrete were encountered in trenches 1, 2, and 7. However, no burned material was found. Elevated concentrations of copper were encountered in trench 3 and 4, while elevated levels of lead were encountered in trench 5 and 6. Therefore, the proposed excavation area is centered near trenches 3 through 6. A higher percentage of confirmation sample locations will be located along the northeast and southwest walls of the excavation since the area covered by the burn pit(s) is better defined to the northwest and to the southeast by trenches 1, 2, and 7. The proposed confirmation sample locations are shown on Figure 2-1.

2.4.4 Disposal Site 13

At Disposal Site 13, three trenches numbered 1-3 moving from the east to the west, were excavated. No debris was encountered in trench 1. Lime, plastic bags, a can with white powder, a vial, and a measuring cup were encountered in trench 2. Refuse, cans, and bottles containing an unknown liquid were encountered in trench 3. The excavation for Disposal Site 13 centers along the southern end of trench 3. A higher percentage of confirmation samples will therefore be collected from the southern and western portions of the excavation. The proposed confirmation sample locations are shown on Figure 2-2.

2.4.5 Disposal Site 31

At Disposal Site 31, eight trenches numbered 1-8 moving from the northeast to the southwest, were excavated. Construction debris was encountered in trenches 1 to 3 with no evidence of burn pits. Burn pits were encountered in trenches 4 and 5. Again, construction debris and native soil were encountered in trenches 6 through 8. The proposed excavation area includes trenches 1 through 4. The proposed excavation area appears to be better defined to the north than in other directions. Therefore, a higher percentage of confirmation samples will be collected on the southern side of the excavation with a smaller percentage of samples to the east and west. A small amount of confirmation samples are proposed for the northern area of the excavation. The proposed confirmation sample locations are shown on Figure 2-3.

2.4.6 Sample Collection and Analysis

Collection procedures for confirmation samples are discussed in the RASAP which was submitted on October 1, 2004. The RASAP also details the analytical methods and WTPs that will be utilized.

2.5 WASTE CHARACTERIZATION SAMPLING

Samples will be collected from soil stockpiles and roll-off containers and analyzed for toxicity using the TCLP as well as for reactivity, corrosivity, and ignitability (RCI). A more detailed discussion of waste characterization sampling is included in the WMP in Appendix C.

2.6 WASTE TRANSPORTATION AND OFFSITE DISPOSAL

Material transportation and disposal efforts will be conducted in accordance with the procedures outlined in the WMP (Appendix C).

2.7 EXCAVATION BACKFILL AND SITE RESTORATION

Disturbed areas will be backfilled, graded, seeded, fertilized, and mulched to minimize erosion. Per Section 3.1.4 of the PSVP, backfill from on-site sources will be sampled at a frequency of once per 250 CY.

Backfill from off-site sources will be sampled at a frequency of once per 500 CY. See the PSVP (Appendix D, Attachment 2) for details of analyses to be performed. In general, analyses will consist of toxicity via TCLP and RCI. The areas will be compacted and graded smooth and uniform with the surrounding areas. Large stone, debris, and materials will be removed and, if necessary, disposed offsite. The grass mix will be installed per the specifications through the course of the project since the sites are widespread and will be completed at different times.

2.8 PRE-FINAL CONSTRUCTION INSPECTION

Upon preliminary completion of remedial actions, DLA will notify EPA/TDEC for the purpose of conducting a pre-final construction inspection. The schedule for the inspection will be set in the pre-construction meeting and updated as the RA progresses. Participants may include the Site Superintendent, CCE, and EPA/TDEC. The Pre-Final Inspection will include a walk-through of the project site to determine whether the construction is complete and consistent with the plans. Any outstanding items or deficiencies discovered during the inspection shall be noted and an itemized list prepared for follow-up prior to the final construction inspection. After inspections are complete and deficiencies, if any, have been properly addressed, preparation of the RACR will begin.

2.9 DEMOBILIZATION

After all excavation activities have been completed, and prior to demobilization, all excavation machinery and equipment will be decontaminated using a pressure washer. Decontamination water will be collected, sampled, and characterized. After characterization, the decontamination water will be disposed of accordingly. During demobilization, temporary facilities, utilities, and equipment will be removed from the site. Any debris or solid waste material generated during the remedial activities will be removed and disposed of properly. Cleanup and demobilization activities will not be considered complete until final approval is issued by the DLA.

3.0 CONSTRUCTION QUALITY ASSURANCE PLAN

The CQAP includes a description of the quality control organization, lines of authority, quality assurance personnel and resources, descriptions of observations and control testing to monitor the remedial action construction activities, schedule for inspections/submittals, and reporting procedures. The CQAP developed for this remedial action is included in Appendix D.

4.0 COMMUNITY RELATIONS

All community relations activities during the Remedial Action construction phase will be conducted in accordance with the Community Information Plan (CIP). The point of contact for community relations issues on this project will be MACTEC and its subcontractor, Frontline Corporate Communications, under the direction of the DLA Project Manager, as the lead agency. It is anticipated that the current community relations program will be maintained throughout the RA construction phase. As part of this program, information will be disseminated to the public regarding the RA work to be performed. The primary objectives of the community relations activities during the RA are to notify the most affected members of the community prior to initiation of construction and provide routine updates on progress.

The Restoration Advisory Board (RAB) will also be a key component in the community relations. The RAB was created by the Depot to promote increased public involvement and enable flow of information, concerns, and needs between the community and the Depot. At the Depot, the RAB includes representatives of the Memphis City Council; Shelby County Commission; the Memphis/Shelby County Health Department; Memphis Light, Gas and Water; EPA; TDEC; a local environmental group; concerned citizens; and the Depot. The RAB holds scheduled meetings, which the public is encouraged to attend, to discuss environmental restoration and reuse issues.

5.0 REPORTING REQUIREMENTS

The following section presents the anticipated reporting requirements during the execution of this project. Following completion of the remedial activities, MACTEC will initiate closeout activities. This stage of the project will include the final inspections as well as the preparation of the site closure reports.

5.1 REMEDIAL ACTION CONSTRUCTION SCHEDULE

The schedule of project milestones from the RD has been updated and is provided as Attachment 1 of the PMP Post ROD Schedule. The ROD was finalized on April 12, 2004. The initial revision to the master schedule was submitted to the BCT on May 4, 2004. The remedial action is currently scheduled to begin by December 4, 2004, with a pre-construction conference held approximately 2 weeks prior.

5.2 COORDINATION WITH EPA/TDEC

5.2.1 Onsite EPA/TDEC Representatives

The EPA and/or TDEC representatives may be present on-site continuously throughout the entire project or they may be present only during key events and inspections. The on-site observation by the regulatory agencies will be discussed by the BCT and finalized during the pre-construction meeting. The primary MACTEC contact for communications with the EPA and/or TDEC representatives will be the MACTEC Project Manager.

5.2.2 Submittals to EPA/TDEC

DLA is required to submit quarterly written progress reports as specified in the Federal Facilities Agreement (USEPA, 1995b) to identify and describe completed activities and activities scheduled to be taken. However, this project is not anticipated to require more than one quarter to complete. Therefore, following concurrence from the BCT, monthly progress reports for this activity will be submitted during the construction activity. The progress reports will include notification of work performed and anticipated delays. In addition, written notification of a significant new site condition or significant new information which may impact the schedule or require additional work will be submitted within five days of determination. Verbal notification of such conditions will be provided within 48 hours of such a finding. More detailed information regarding meetings is provided in the CQAP (Appendix D).

5.3 FINAL CONSTRUCTION INSPECTION AND REPORT

After completion of field activities, a Remedial Action Completion Report (RACR) will be prepared and submitted to the BCT. The RACR will contain the following information:

- Introduction
- Chronology of Events
- Description of construction activities with deviation from the RAWP noted
- Performance standards and cleanup goals met
- Description of the quality assurance/quality control procedures followed
- Certification from the CCE that the RA has been completed in accordance with the RAWP specifications and drawings
- Discussion of O&M requirements
- Summary of project costs

6.0 REFERENCES

CH2M Hill, 2002. Memphis Depot Dunn Field Remedial Investigation Report – Volumes I through III. Prepared for the Defense Logistics Agency and presented to U.S. Army Engineering and Support Center, Huntsville, Alabama. July 2002.

CH2M Hill, 2003a. Memphis Depot Dunn Field Feasibility Report – Final. Prepared for the U.S. Army Engineering and Support Center, Huntsville, Alabama. May 2003.

CH2M Hill, 2003b. Rev. 2 Disposal Sites Pre-Design Investigation Data Collection Plan. Prepared for the U.S. Army Engineering and Support Center, Huntsville, Alabama. August 2003.

CH2M Hill, 2004a. Rev. 1 Dunn Field Disposal Sites Final Remedial Design. Prepared for the U.S. Army Engineering and Support Center, Huntsville, Alabama. April 2004.

CH2M Hill, 2004b. Final Dunn Field Record of Decision. Prepared for the U.S. Army Engineering and Support Center, Huntsville, Alabama. March 2004.

CH2M Hill, 2004c. Rev. 2 Disposal Sites Pre-Design Investigation Data Collection Plan Technical Memorandum. Prepared for the U.S. Army Engineering and Support Center, Huntsville, Alabama. January 2004.

CH2M Hill, 2004d. Rev. 1 Memphis Depot, Main Installation Land Use Control Implementation Plan. Prepared for the U.S. Army Engineering and Support Center, Huntsville, Alabama. February 2004.

Memphis Depot Caretaker Division, Environmental Office. BRAC Cleanup Plan Version 7 (Final Report). The Memphis Depot (formally known as the Defense Distribution Depot, Memphis, Tennessee). 2003.

Michigan DEQ. Verification of Soil Remediation Guidance Document, Revision 1. Waste Management Division. April 1994.

Pathfinders et al., 1997. The Memphis Depot Redevelopment Plan. May 1997.

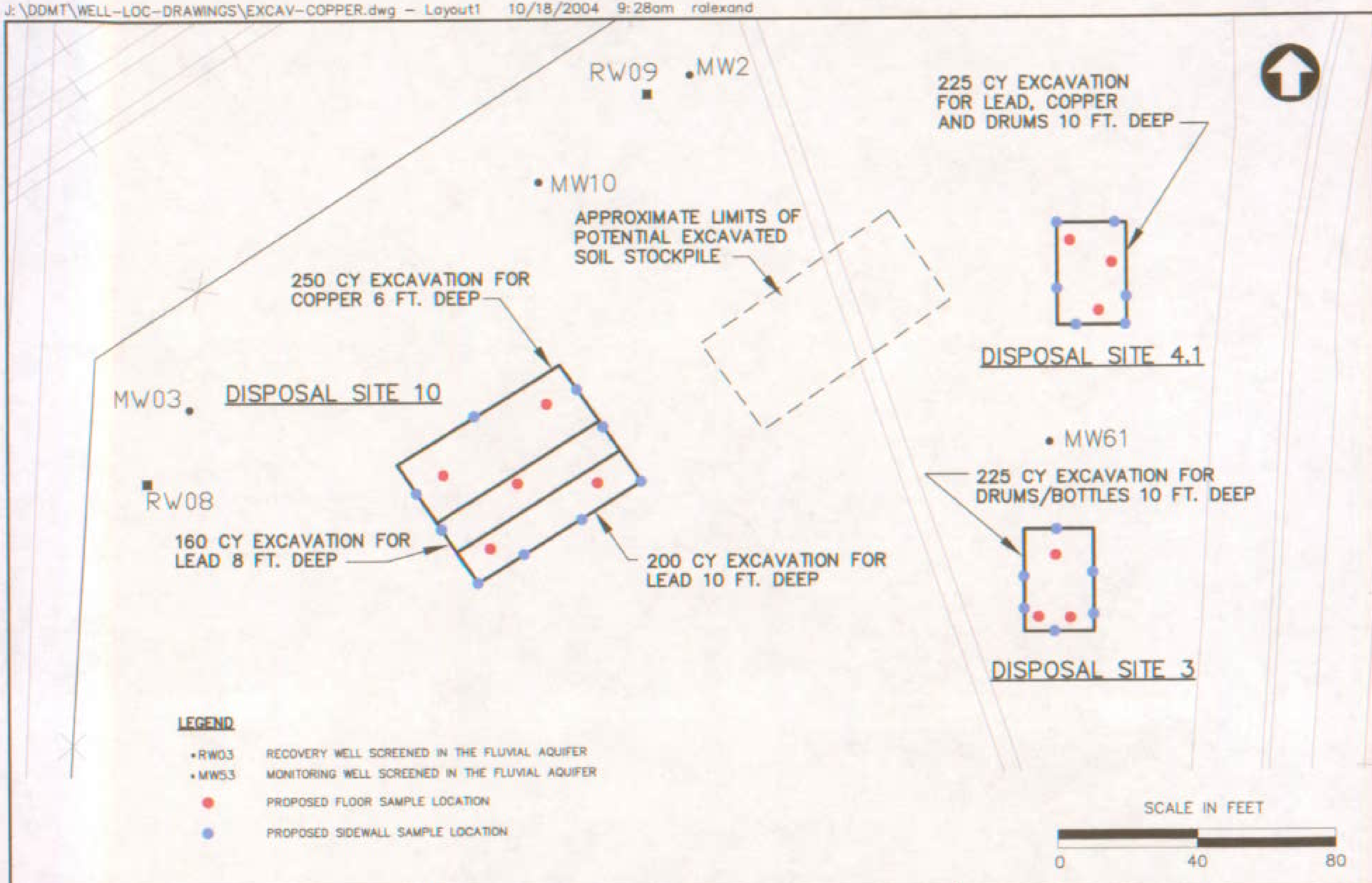
USEPA, 1995a. Remedial Design/Remedial Action Handbook. USEPA Office of Solid Waste and Emergency Response (OSWER) Publication 9355.0-04B/EPA540/R-95/059, June, 1995.

USEPA, 1995b. Federal Facilities Agreement Between the USEPA, Region IV, TDEC, and the US DLA at the Defense Distribution Depot Memphis, Tennessee, Effective March 6, 1995.

UXB International. Final Chemical Warfare Material Investigations/Removal Report, 2001.

FIGURES

J:\DDMT\WELL-LOC-DRAWINGS\EXCAV-COPPER.dwg - Layout1 10/18/2004 9:28am ralexand



DEFENSE DISTRIBUTION DEPOT (MEMPHIS)

MACTEC Engineering and Consulting, Inc.
3200 TOWN POINT DRIVE, SUITE 100
KENNESAW, GEORGIA 30144 (770) 421-3400

EXCAVATION PLAN
DISPOSAL SITES 3, 4.1 AND 10

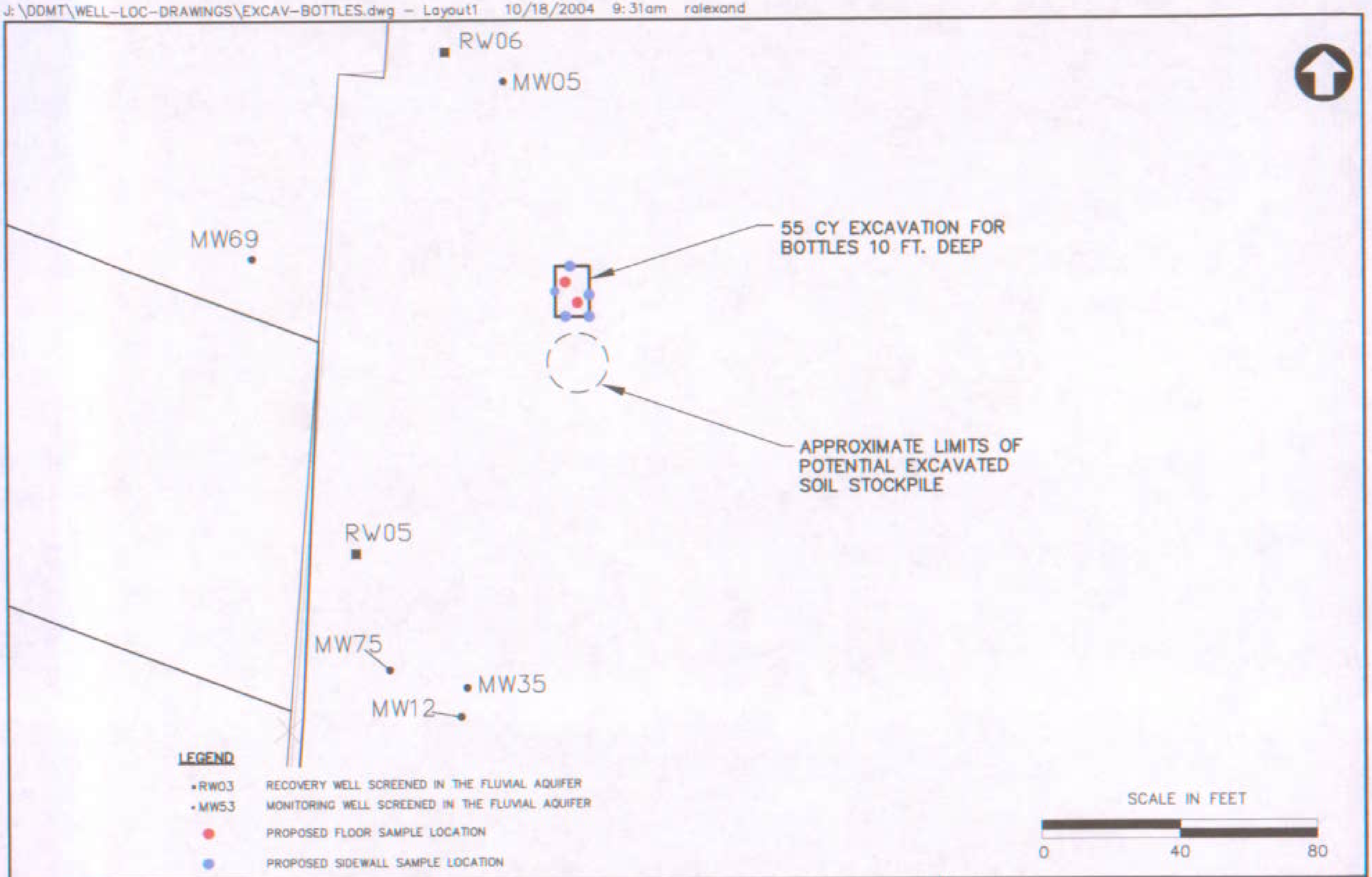
JOB NO. 6301-03-0015

FIGURE 2-1

PREPARED BY/DATE
CHECKED BY/DATE

809 31

J:\DDMT\WELL-LOC-DRAWINGS\EXCAV-BOTTLES.dwg - Layout1 10/18/2004 9:31am ralexand



DEFENSE DISTRIBUTION DEPOT (MEMPHIS)

MACTEC Engineering and Consulting, Inc.
3200 TOWN POINT DRIVE, SUITE 100
KENNESAW, GEORGIA 30144 (770) 421-3400

EXCAVATION PLAN
DISPOSAL SITE 13

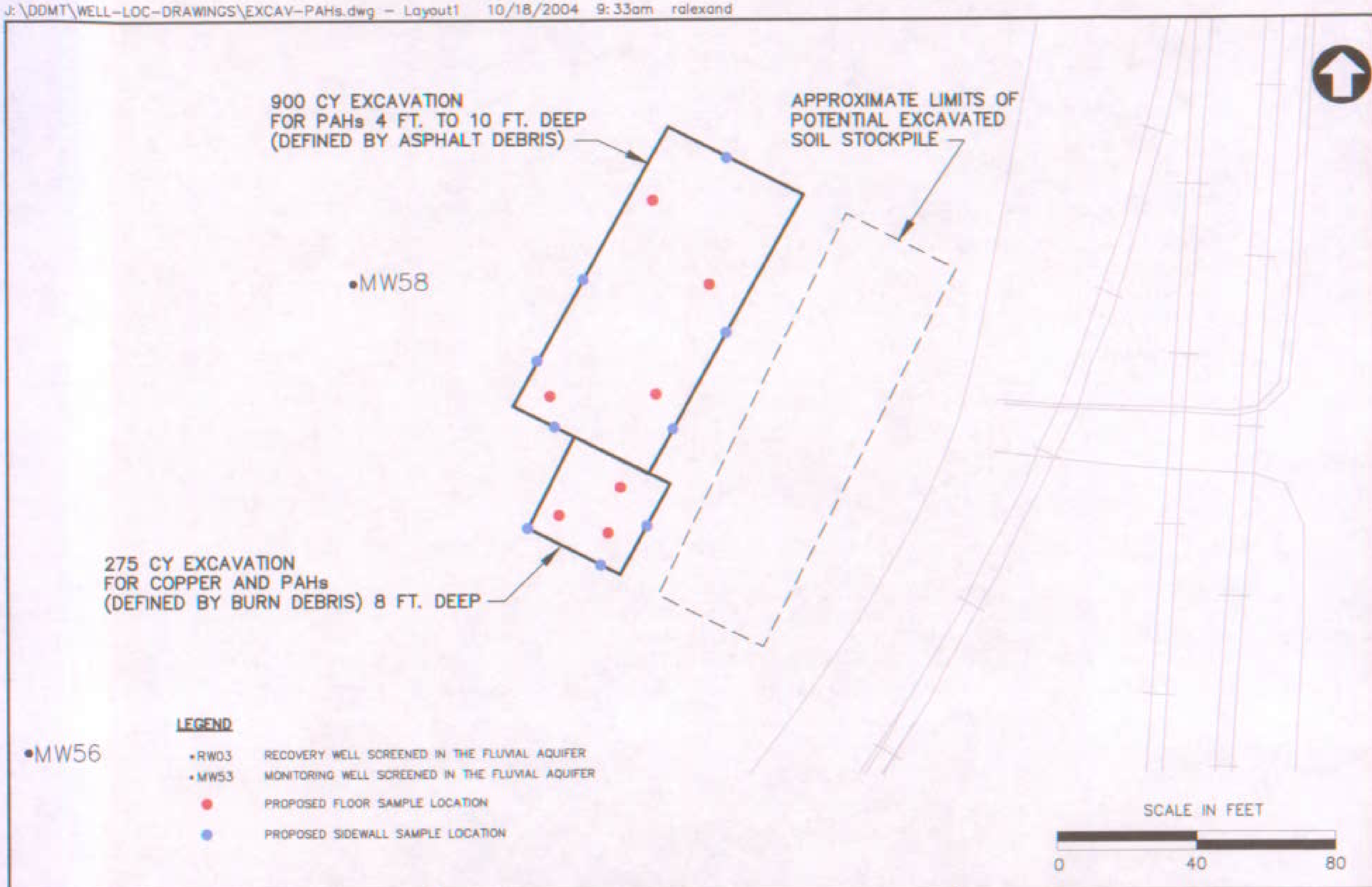
JOB NO. 6301-03-0015

FIGURE 2-2

PREPARED BY/DATE
CHECKED BY/DATE

809 32

J:\DDMT\WELL-LOC-DRAWINGS\EXCAV-PAHs.dwg - Layout1 10/18/2004 9:33am ralexand



DEFENSE DISTRIBUTION DEPOT
(MEMPHIS)

MACTEC
Engineering and Consulting, Inc.
3200 TOWN POINT DRIVE, SUITE 100
KENNESAW, GEORGIA 30144 (770) 421-3400

EXCAVATION PLAN
DISPOSAL SITE 31

JOB NO. 6301-03-0015

FIGURE 2-3

PREPARED BY/DATE
CHECKED BY/DATE

809 33

APPENDIX A

REFERENCE DOCUMENTATION

Attachment 1: Referenced Figures

Attachment 2: Referenced Tables

Attachment 3: Statement of Work (Inserted from Appendix D of the Rev. 1 Remedial Design Report, CH2M Hill, 2004a)

Attachment 4: Construction Drawings (Inserted from Appendix C of the Rev. 1 Remedial Design Report, CH2M Hill, 2004a)

Attachment 5: *Verification of Soil Remediation* Guidance Document (Michigan DEQ, April 1994)

Attachment 1: Referenced Figures

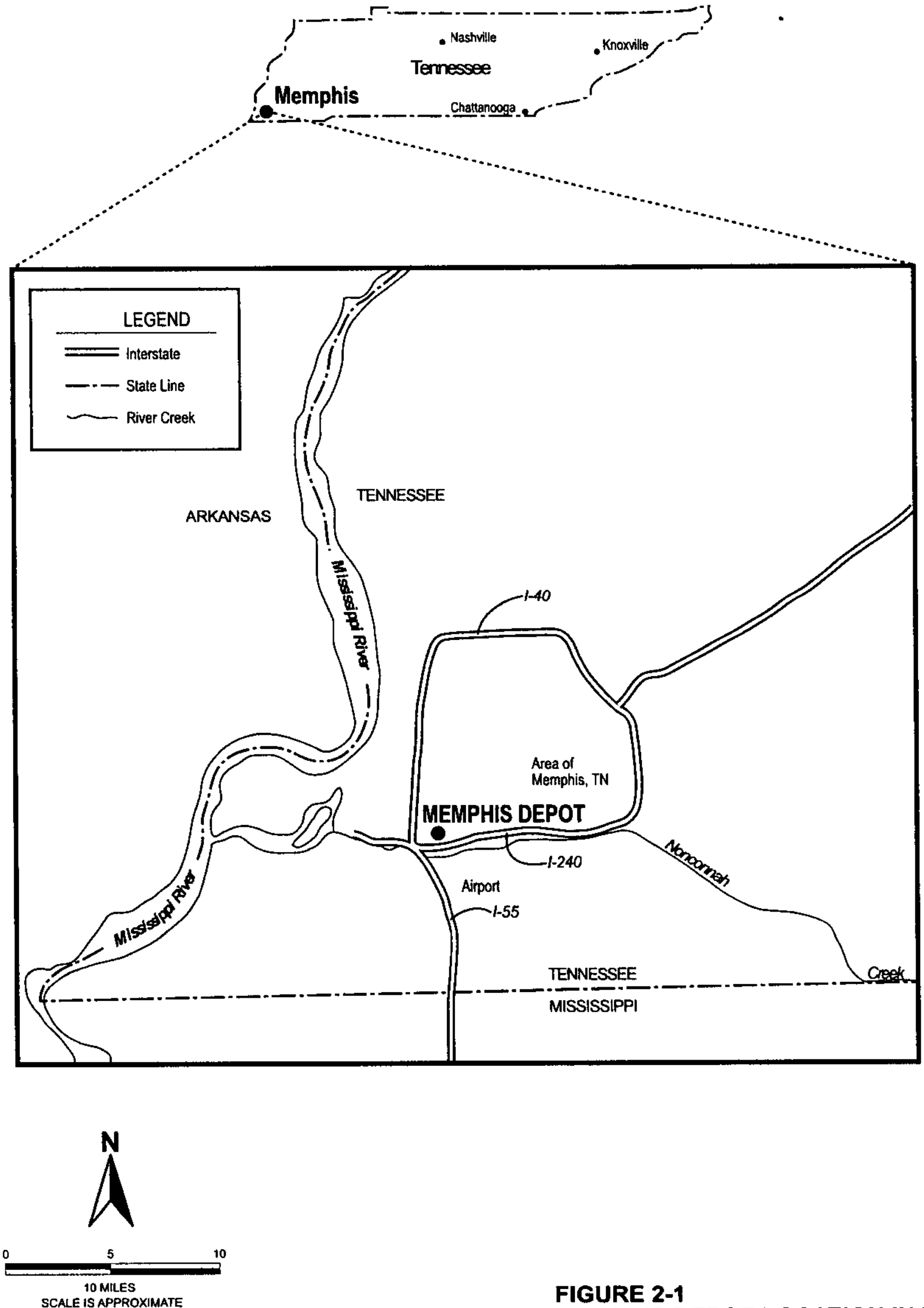
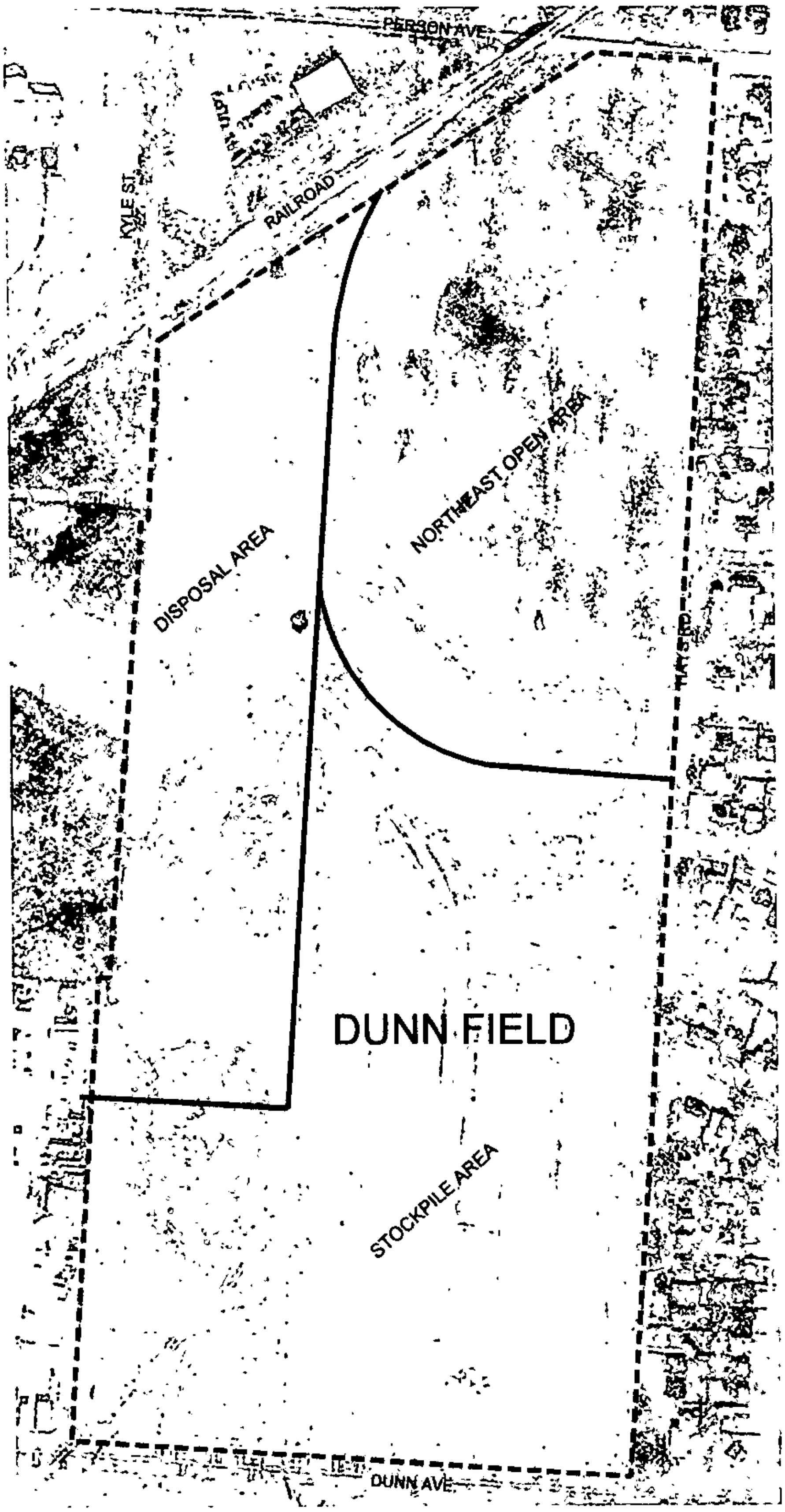


FIGURE 2-1
MEMPHIS DEPOT LOCATION IN THE MEMPHIS METROPOLITAN AREA
REV. 0 MEMPHIS DEPOT DUNN FIELD ROD



N

LEGEND

- DUNN FIELD PERIMETER
- AREA EXTENTS

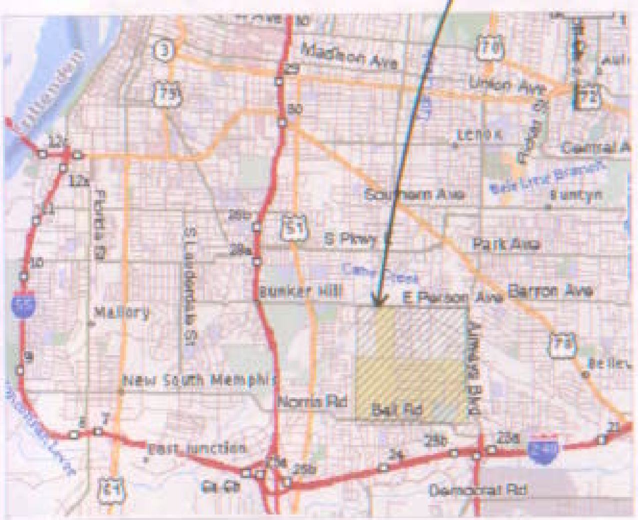
FIGURE 2-3
AREA DESIGNATIONS AT DUNN FIELD
Rev. 0 Memphis Depot Dunn Field ROD

CH2MHILL

MEMPHIS DEPOT DUNN FIELD
TENNESSEE
PREFINAL REMEDIAL DESIGN

CONTRACT NUMBER: DACA87-02-D-006
TASK ORDER: 006

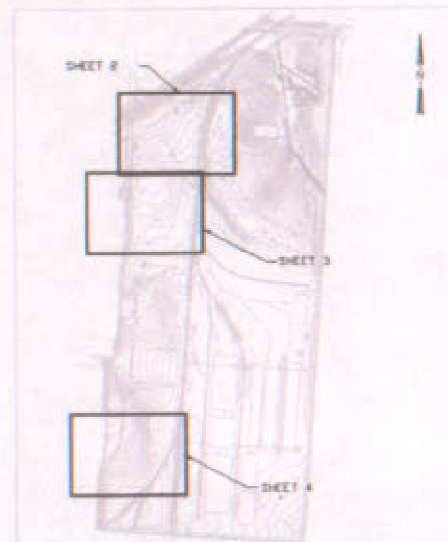
MEMPHIS DEPOT
DUNN FIELD



VICINITY MAP
NOT TO SCALE

INDEX

SHEET	TITLE
1	TITLE SHEET
2	EXCAVATION PLAN, DISPOSAL SITES 3, 4.1, 7, and 10
3	EXCAVATION PLAN, DISPOSAL SITE 13
4	EXCAVATION PLAN, DISPOSAL SITE CC-2 and 31



SITE LOCATION MAP
NOT TO SCALE

PRELIMINARY
NOT FOR CONSTRUCTION

VERIFY SCALE

CH2MHILL

MEMPHIS DEPOT DUNN FIELD
PREFINAL REMEDIAL DESIGN

TITLE SHEET

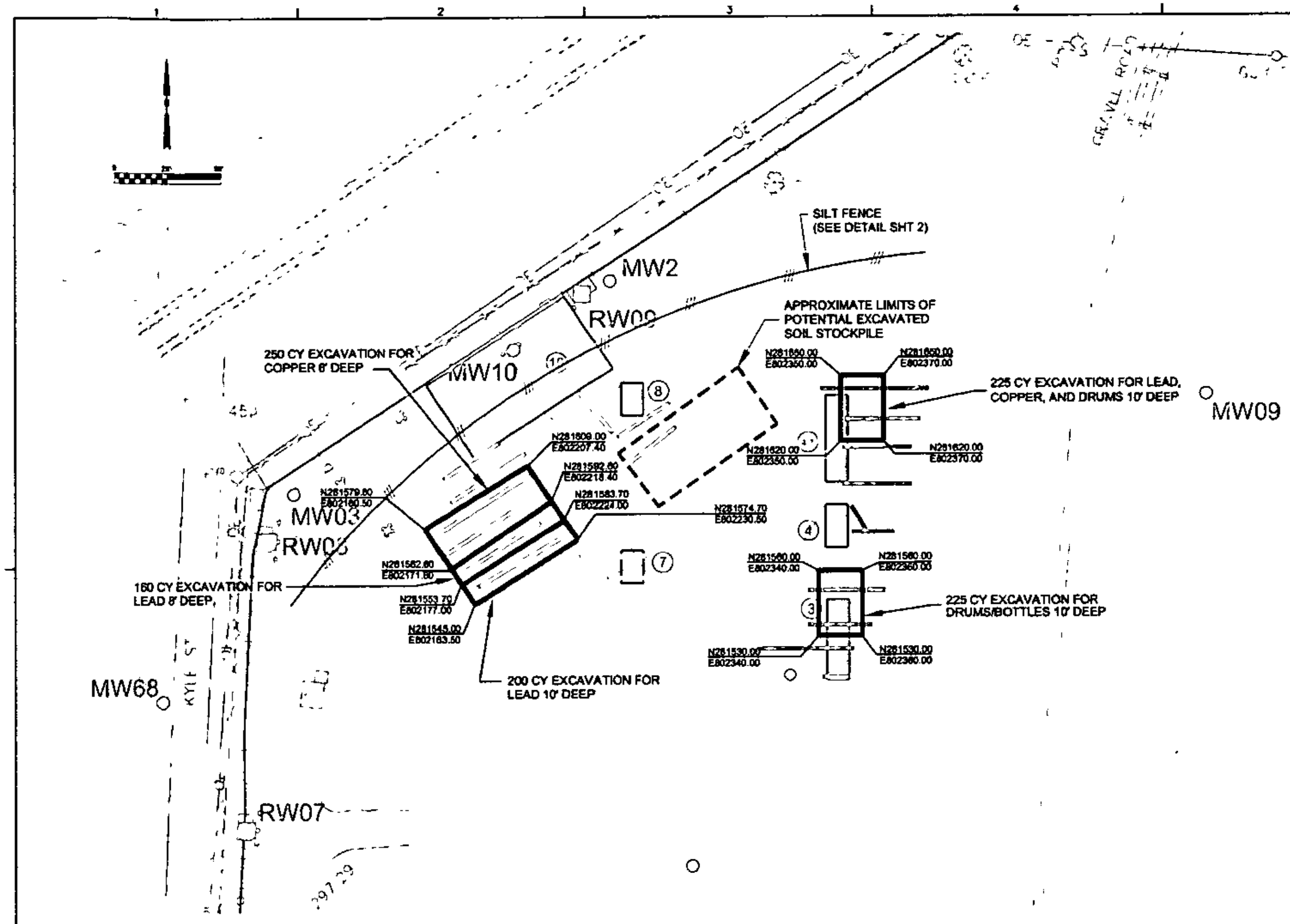
SHEET 1
DWG 1
DATE JANUARY 2004
PROJ 177556.RD.02

FILENAME: EXCAVATION PLAN PLOT DATE: 20-JAN-2004 PLOT TIME: 00:00:00

809

38

809 39

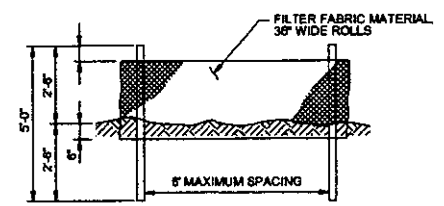


LEGEND:

- EXCAVATION AREA
- EXPLORATORY TRENCH
- POTENTIAL EXCAVATION AREA
- TEST PITS
- (8) DISPOSAL SITE 10
- ORIGINAL EXTIMATED EXTENT OF DISPOSAL SITE
- SILT FENCE

NOTES:

1. STAGING AREAS TO BE DETERMINED IN FIELD BY CONTRACTOR.
2. PROVIDE STORM WATER DIVERSIONS AS NEEDED TO MINIMIZE STORM WATER COLLECTION IN WORK AREAS.
3. EXCAVATE WITHIN LIMITS SHOWN. EXCAVATION SHALL REMAIN OPEN UNITL CONFIRMATION SAMPLING TO DETERMINE FINAL EXTENT OF EXCAVATION. PROVIDE APPROPRIATE BARRICADES WHILE EXCAVATIONS ARE OPEN.
4. PLACE LEAD-CONTAMINATED SOIL FROM DISPOSAL SITE 10 DIRECTLY INTO ROLL-OFF CONTAINERS FOR CHARACTERIZATION PRIOR TO OFFSITE DISPOSAL.
5. PLACE EXCAVATED SOIL IN STOCKPILES FOR FINAL CHARACTERIZATION PRIOR TO OFFSITE DISPOSAL.
LINE BOTTOM OF SOIL STOCKPILE WITH 20 MIL PVC LINER. COVER SOIL STOCKPILE WITH 10 MIL PVC LINER. SURROUND STOCKPILE WITH 12 INCHES OF CLEAN SOIL TO SECURE COVER AND DIVERT STORM WATER RUNOFF
6. BACKFILL EXCAVATIONS TO ORIGINAL GRADE.



NOTES:
1. BURY BOTTOM OF FILTER FABRIC 6" VERTICALLY BELOW FINISHED GRADE.
2. 2"x4" DOUGLAS FIR OR STEEL FENCE POSTS.
3. STITCHED LOOPS TO BE INSTALLED DOWNHILL SIDE OF SLOPE.
4. COMPACT ALL AREAS OF FILTER FABRIC TRENCH.

SILT FENCE DETAIL

PRELIMINARY

NOT FOR CONSTRUCTION

DSGN	M PERLMUTTER
DR	E GRIGGS
CHK	X
APVD	X

NO.	DATE	REVISION	BY	APVD

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"
IF NOT ONE INCH ON THIS SHEET ADJUST SCALES ACCORDINGLY

CH2MHILL

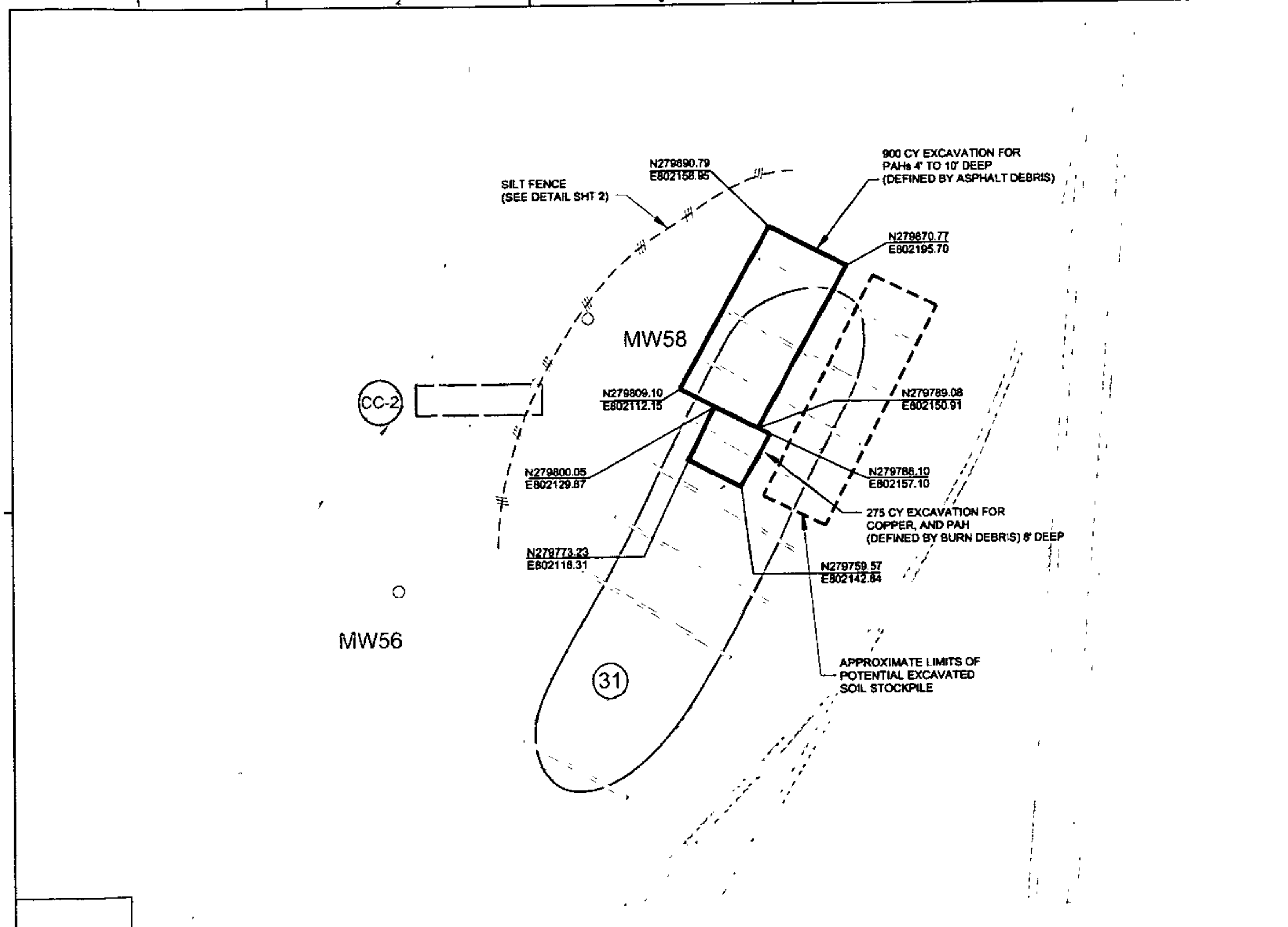
MEMPHIS DEPOT DUNN FIELD
PREFINAL REMEDIAL DESIGN

EXCAVATION PLAN
DISPOSAL SITES 3, 4 1 and 10

SHEET	2
DWG	2
DATE	JANUARY 2004
PROJ	177556.RD.02

FILENAME: EXCAVATOIN PLAN PLOT DATE: 27-JAN-2004 PLOT TIME: 00:00:00

REUSE OF DOCUMENTS: THIS DOCUMENT, AND THE IDEAS AND DESIGNS INCORPORATED HEREIN, AS AN INSTRUMENT OF PROFESSIONAL SERVICE, IS THE PROPERTY OF CH2M HILL AND IS NOT TO BE USED, IN WHOLE OR IN PART, FOR ANY OTHER PROJECT WITHOUT THE WRITTEN AUTHORIZATION OF CH2M HILL.



LEGEND:

- EXCAVATION AREA
- EXPLORATORY TRENCH
- POTENTIAL EXCAVATION AREA
- TEST PITS
- (8) DISPOSAL SITE 10
- ORIGINAL EXTIMATED EXTENT OF DISPOSAL SITE
- SILT FENCE

NOTES:

1. STAGING AREAS TO BE DETERMINED IN FIELD BY CONTRACTOR.
2. PROVIDE STORM WATER DIVERSIONS AS NEEDED TO MINIMIZE STORM WATER COLLECTION IN WORK AREAS
3. EXCAVATE WITHIN LIMITS SHOWN. EXCAVATION SHALL REMAIN OPEN UNITL CONFIRMATION SAMPLING TO DETERMINE FINAL EXTENT OF EXCAVATION PROVIDE APPROPRIATE BARRICADES WHILE EXCAVATIONS ARE OPEN
4. PLACE EXCAVATED SOIL IN STOCKPILES FOR FINAL CHARACTERIZATION PRIOR TO OFFSITE DISPOSAL.
   LINE BOTTOM OF SOIL STOCKPILE WITH 20 MIL PVC LINER. COVER SOIL STOCKPILE WITH 10 MIL PVC LINER. SURROUND STOCKPILE WITH 12 INCHES OF CLEAN SOIL TO SECURE COVER AND DIVERT STORM WATER RUNOFF.
5. BACKFILL EXCAVATIONS TO ORIGINAL GRADE.

PRELIMINARY
NOT FOR CONSTRUCTION

DSGN	M PERLMUTTER
DR	S GRIGGS
CHK	X
APVD	X

NO	DATE	REVISION	BY	APVD

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"
IF NOT ONE INCH ON THIS SHEET ADJUST SCALES ACCORDINGLY

CH2MHILL

MEMPHIS DEPOT DUNN FIELD
PREFINAL REMEDIAL DESIGN

EXCAVATION PLAN
DISPOSAL SITES 31

SHEET	4
DWG	4
DATE	JANUARY 2004
PROJ	177556.RD.02

FILENAME: EXCAVATON PLAN PLOT DATE: 20-JAN-2004 PLOT TIME: 00:00:00

Attachment 2: Referenced Tables

TABLE 2-1
List of Dunn Field (OU 1) Sites
Rev. 1 Dunn Field Record of Decision

INSTALLATION RESTORATION SITES NUMBER	DSERTS SITE NUMBER(a)	PRIORITY LEVEL(b)	SITE TYPE	SITE DESCRIPTION
Northeast Open Area				
19	19	C	SS	Former Tear Gas Canister Burn Site (c)
20	20	C	SS	Probable Asphalt Burial Site
21	21	C	SS	XXCC-3 Impregnite Burial Site (300,000 Pounds)
50	50	C	SS	Dunn Field Northeastern Quadrant Drainage Ditch
60	60	Remediated[1]	SS	Pistol Range Impact Area/Bullet Stop
62	62	C	SS	Bauxite Storage
85	85	Remediated[1]	RI	Old Pistol Range Building 1184/Temporary Pesticide Storage
Disposal Area				
1	1	Remediated[2]	CWM	Mustard and Lewisite Training Sets Burial Site (1955)
2	2	C	RI	Ammonia Hydroxide (7 Pounds) and Acetic Acid (1-Gallon) Burial Site (1955)
3	3	B	RI	Mixed Chemical Burial Site (Orthotouidine Dihydrochloride) (1955)
4	4	A	RI	POL Burial Site (13, 55-Gallon Drums of Oil, Grease and Paint)
4 1	90	A	RI	POL Burial Site (32, 55-Gallon Drums of Oil, Grease and Thinner)
5	5	C	RI	Methyl Bromide Burial Site A (3 Cubic Feet) (1955)
6	6	C	RI	40,037 Units of Eye Ointment Burial Site (1955)
7	7	A	RI	Nitric Acid Burial Site (1,700 Quart Bottles) (1954)
8	8	A	RI	Methyl Bromide Burial Site B (3,768 1-gallon cans) (1954)
9	9	C	RI	Ashes and Metal Burial Site (Burning Pit Refuse) (1955)
10	10	B	RI	Solid Waste Burial Site (Near MW-10) (Metal, Glass, Trash, etc.)
11	11	B	RI	Trichloroacetic Acid Burial Site (1,433, 1-ounce Bottles) (1965)
12 & 12.1	12	B	RI	Sulfuric Acid and Hydrochloric Acid Burial (1967)
13	13	A	RI	Mixed Chemical Burial (Acid, 900 Pounds; Unnamed Solids, 8,100 Pounds)
14	14	C	RI	Municipal Waste Burial Site B (Near MW-12) (Food, Paper Products)
15	15	B	RI	Sodium Burial Sites (1968)
15.1	91	B	RI	Sodium Phosphate Burial (1968)
15.2	92	B	RI	14 Burial Pits: Na2PO4, Sodium, Acid, Medical Supplies, and Chlorinated Lime
16	16	B	RI	Unknown Acid Burial Site (1969)
16.1	93	B	RI	Acid Burial Site
17	17	B	RI	Mixed Chemical Burial Site C (1969)
18	18	C	Proposed NFA	Plane Crash Residue
22	22	C	Proposed NFA	Hardware Burial Site (Nuts and Bolts)
23	23	C	Proposed NFA	Construction Debris and Food Burial Site
24-A	24	Remediated[2]	CWM	Bomb Casing Burial Site (29 Bomb Casings used to Transport Mustard Agent)
61	61	C	SS	Buried Drain Pipe
63	63	C	Proposed NFA	Aboveground Fluorspar Storage
64	64	C	Proposed NFA	Aboveground Bauxite Storage (1942 to 1972)
86	86	C	RI	Food Supplies
Stockpile Area (d)				
24-B	24	Remediated[2]	CWM	Neutralization Pit for the Contents of the 29 Bomb Casing used to Transport Mustard Agent
62	62	C	SS	Aboveground Bauxite Storage
63	63	C	Proposed NFA	Aboveground Fluorspar Storage
64	64	C	SS	Aboveground Bauxite Storage (1949 to 1972)
–	64(e)	B	–	CC-2 Impregnite Burial Site (86,100 Pounds in 1947)
–	64(e)	B	–	Installation Assessment Site 31. Burning and Disposal Site

Notes

[1] Remedial action for Sites 60/85 (CH2M HILL, 2002) was completed in early 2003 following the EE/CA and Action Memorandum.

[2] CWM remedial actions at sites are documented in the Final Chemical Warfare Material Investigation/Removal Action Report, dated December 2001 (UXB International, Inc).

SS:	Screening Site
RI.	Remedial Investigation
RA	Remedial Action
NFA:	No Further Action
CWM:	Chemical Warfare Materiel
Na2PO4.	Sodium Phosphate
POL.	Petroleum, Oil, and Lubricants
XXCC-3/CC-2:	Stabilized/Unstabilized Impregnite for Impregnating Clothing Used to Protect Personnel against the Action of Vesicant-Type Chemical Agents

(a) Defense Site Environmental Restoration Tracking System (DoD Database)

(b) Priority levels were established for Installation Restoration Sites Number/DSERT Site Number Areas where remedial action will be required with some investigatory effort to determine extent of area. Levels are as follows A - Highest Priority; B - Medium Priority; C - Lowest Priority (no RA likely). Designation is based on described quantity of material, potential hazard to human health and the environment, and form of material (solid or liquid) A pre-design investigation will be conducted at Priority Sites A and B. These sites are shaded in this table.

(c) According to the available information, burning in this area dated back to the 1940s and included chloroacetophenone (CN) canisters, fuses, and smokes, in addition to sanitary wastes Operations were conducted in pits and incorporated the weekly cleanup of residue and garbage in addition to material. The ash was then allegedly buried in the north end of Dunn Field.

(d) According to available information, USATHAMA (1982) Installation Assessment Site 31 is located in the southwest portion of Dunn Field This site was reportedly used for burning/disposal of smoke pots, CN (tear gas) grenades and souvenir ordnance, which included a 3.2 mortar round This area was covered by the bauxite storage pile (Site 64). Installation Site 31 was not designated as an IRP site or given a DSERTS site number However, the site is now included in DSERTS Site 64.

(e) According to an April 15, 2003 email from the Defense Logistics Agency - DDC (New Cumberland) to DDC (Memphis) and CEHNC, DSERTS Site 64 will include the CC-2 Impregnite Burial Site and Installation Assessment Site 31 as a result of the proximity of all three sites and because Site 64 encompasses both of the other two sites.

Table 2-23
Chemical-specific ARARs and TBC Guidance
Rev. 2 Memphis Depot Dunn Field Record of Decision

Action/medium	Requirements	Prerequisite	Citation(s)
Restoration of groundwater to its designated use(s)	May not exceed MCLs and MCLGs above zero established under the Safe Drinking Water Act for public water systems	Presence of contaminants in ground water of the State designated as *General Use* as defined in TDEC 1200-4-3-.07(2)(b) - **relevant and appropriate**	TDEC 1200-5-1-.06 40 CFR 141 *et seq.*
	Except for naturally occurring levels, shall not contain constituents in excess of the concentrations listed in Table 1. *Inorganic Criteria for General Use Ground Water*		TDEC 1200-4-3-.08(2)(a)
	Except for naturally occurring levels, shall not contain constituents exceeding those in TDEC 1200-4-3-.03 except that the criteria for *Fish and Aquatic Life* and *Recreational Use* shall not apply		TDEC 1200-4-3-.08(2)(b)

ARAR = applicable or relevant and appropriate requirement
CFR = *Code of Federal Regulations*
TBC = to be considered
TCA = *Tennessee Code Annotated*
TDEC = Rules of the Tennessee Department of Environment and Conservation, Chapter as noted
MCLs = Maximum Contaminant Level
MCLG = Maximum Contaminant Level Goals

Table 2-24
Action-specific ARARs and TBC Guidance
Rev. 2 Memphis Depot Dunn Field Record of Decision

Action	Requirements	Prerequisite	Citation(s)
	General construction standards - all land-disturbing activities (i.e., excavation, trenching, clearing, etc.)		
Activities causing fugitive dust emissions	Shall take reasonable precautions to prevent particulate matter from becoming airborne; reasonable precautions shall include, but are not limited to, the following:	Fugitive emissions from demolition of existing buildings or structures, construction operations, grading of roads, or the clearing of land - **applicable**	TDEC 1200-3-8-.01(1)
	• use, where possible, of water or chemicals for control of dust; and		TDEC 1200-3-8-.01(1)(a)
	• application of asphalt, oil, water, or suitable chemicals on dirt roads, materials stock piles, and other surfaces which can create airborne dusts.		TDEC 1200-3-8-.01(1)(b)
	Shall not cause or allow fugitive dust to be emitted in such a manner as to exceed 5 minute/hour or 20 minute/day beyond property boundary lines on which emission originates.		TDEC 1200-3-8-.01(2)
Activities causing storm water runoff (e.g., clearing, grading, excavation)	Implement good construction management techniques (including sediment and erosion controls, vegetative controls, and structural controls) in accordance with the substantive requirements of *General Permit No. TNR10-0000 Appendix F,* to ensure that storm water discharge	Dewatering or storm water runoff discharges from land disturbed by construction activity - disturbance of ≥5 acres total - **applicable**; <5 acres - **relevant and appropriate**	TCA 69-3-108(j) TDEC 1200-4-10-.03(2)
	• does not violate water quality criteria as stated in TDEC 1200-4-3-.03 including but not limited to prevention of discharges that causes a condition in which visible solids, bottom deposits, or turbidity impairs the usefulness of waters of the state for any of the designated uses for that water body by TDEC 1200-4-4;	Storm water discharges from construction activities – **TBC**	*General Permit No TNR10-0000* Part III D.2.a
	• does not contain distinctly visible floating scum, oil, or other matter;		*General Permit No. TNR10-0000* Part III D.2.b
	• does not cause an objectionable color contrast in the receiving stream; and		*General Permit No. TNR10-0000* Part III D.2.c

Table 2-24 (cont'd)
Action-specific ARARs and TBC Guidance
Rev. 2 Memphis Depot Dunn Field Record of Decision

Action	Requirements	Prerequisite	Citation(s)
	• results in no materials in concentrations sufficient to be hazardous or otherwise detrimental to humans, livestock, wildlife, plant life, or fish and aquatic life in the receiving stream.		*General Permit No. TNR10-0000* Part III D.2.d
	Underground injection well construction and operation		
Injection of nutrients (or other treatments) into groundwater	Wells shall be designed, constructed, and operated in such a manner that does not present a hazard to existing or future use of groundwater and may not cause a violation of water quality standards.	Class V injection well for innovative or experimental technologies – **relevant and appropriate**	TDEC 1200-4-6-.14(1)(b) TDEC 1200-4-6-.14(7)(b) and (8)(a)
	Groundwater monitoring well installation and closure		
Installation and maintenance of groundwater monitoring well(s) and soil borings	All wells shall be constructed in a manner that will guard against contamination of the groundwater aquifers underlying Shelby County.	Construction, modification, and repair of groundwater monitoring well(s) and boreholes - **relevant and appropriate**	*Rules and Regulations of Wells in Shelby County* Section 6 and Section 7 *et. seq.*
Closure of groundwater monitoring well(s)	Well shall be completely filled and sealed in such a way as to prevent vertical movement of water from one aquifer to another.	Permanent plugging and abandonment of a well - **relevant and appropriate**	*Rules and Regulations of Wells in Shelby County* Section 9 *et. seq.*
	***SVE treatment system** - air emissions control*		
Emissions from SVE treatment system	Discharge of air contaminants must be in accordance with the appropriate provisions of Rules of the TDEC Chapter 1200-3 *et seq.*, any applicable measures of control strategy and provisions of the Tennessee Pollution Control Act.	Emissions of air pollutants from new air contaminant sources – **applicable**	TDEC 1200-3-9-.01(1)(d) Memphis Code 16-77
	Waste generation, characterization, segregation, and storage - primary remediation wastes (excavated contaminated soil, disposal pit materials) and secondary wastes (wastewaters, spent treatment media, etc.)		
Characterization of solid waste	Must determine if solid waste is hazardous waste or if waste is excluded under 40 CFR 261.4(b); and	Generation of solid waste as defined in 40 CFR 261.2 and which is not excluded under 40 CFR 261.4(a) - **applicable**	40 CFR 262.11(a) TDEC 1200-1-11-.03(1)(b)(1)
	Must determine if waste is listed under 40 CFR Part 261; or		40 CFR 262.11(b) TDEC 1200-1-11-.03(1)(b)(2)

809 45

Action	Requirements	Prerequisite	Citation(s)
	Must characterize waste by using prescribed testing methods or applying generator knowledge based on information regarding material or processes used.		40 CFR 262.11(c) TDEC 1200-1-11-.03(1)(b)(3)
	Must refer to Parts 261, 262, 264, 265, 266, 268, and 273 of Chapter 40 for possible exclusions or restrictions pertaining to management of the specific waste.	Generation of solid waste which is determined to be hazardous – **applicable**	40 CFR 262.11(d); TDEC 1200-1-11-.03(1)(b)(4)
Characterization of hazardous waste	Must obtain a detailed chemical and physical analysis on a representative sample of the waste(s), which at a minimum contains all the information that must be known to treat, store, or dispose of the waste in accordance with pertinent sections of 40 CFR 264 and 268.	Generation of RCRA-hazardous waste for storage, treatment or disposal - **applicable**	40 CFR 264.13(a)(1) TDEC 1200-1-11-.06(2)(d)(1)
	Must determine the underlying hazardous constituents [as defined in 40 CFR 268.2(i)] in the waste	Generation of RCRA characteristic hazardous waste (and is not D001 non-wastewaters treated by CMBST, RORGS, or POLYM of Section 268.42 Table 1) for storage, treatment or disposal – **applicable**	40 CFR 268.9(a) TDEC 1200-1-11-.10(1)(I)(1)
	Must determine if the waste is restricted from land disposal under 40 CFR 268 *et seq.* by testing in accordance with prescribed methods or use of generator knowledge of waste.		40 CFR 268.7 TDEC 1200-1-11-.10(1)(g)(1)(i)
	Must determine each EPA Hazardous Waste Number (Waste Code) to determine the applicable treatment standards under 40 CFR 268.40 *et. seq.*		40 CFR 268.9(a) TDEC 1200-1-11-.10(1)(I)(1)
Temporary storage of hazardous waste in containers	A generator may accumulate hazardous waste at the facility provided that:	Accumulation of RCRA hazardous waste on site as defined in 40 CFR 260.10 - **applicable**	40 CFR 262.34(a); TDEC 1200-1-11-.03(4)(e)
	• waste is placed in containers that comply with 40 CFR 265.171-173; and		40 CFR 262.34(a)(1)(i); TDEC 1200-1-11-.03(4)(e)(2)(ii)(I)
	• the date upon which accumulation begins is clearly marked and visible for inspection on each container;		40 CFR 262.34(a)(2); TDEC 1200-1-11-.03(4)(e)(2)(ii)

809 46

Table 2-24 (cont'd)
Action-specific ARARs and TBC Guidance
Rev 2 Memphis Depot Dunn Field Record of Decision

Action	Requirements	Prerequisite	Citation(s)
	• container is marked with the words "hazardous waste" or		40 CFR 264.34(a)(3) TDEC 1200-1-11-.03(4)(e)(2)(iv)
	• container may be marked with other words that identify the contents.	Accumulation of 55 gal. or less of RCRA hazardous waste at or near any point of generation - **applicable**	40 CFR 262.34(c)(1) TDEC 1200-1-11-.03(4)(e)(5)(i)(II)
Use and management of hazardous waste in containers	If container is not in good condition (e.g. severe rusting, structural defects) or if it begins to leak, must transfer waste into container in good condition.	Storage of RCRA hazardous waste in containers – **applicable**	40 CFR 265.171 TDEC 1200-1-11-.05(9)(b)
	Use container made or lined with materials compatible with waste to be stored so that the ability of the container is not impaired.		40 CFR 265.172 TDEC 1200-1-11-.05(9)(c)
	Keep containers closed during storage, except to add/remove waste.		40 CFR 265.173(a) TDEC 1200-1-11-.05(9)(d)(1)
	Open, handle and store containers in a manner that will not cause containers to rupture or leak.		40 CFR 265.173(b) TDEC 1200-1-11-.05(9)(d)(2)
Storage of hazardous waste in container area	Area must have a containment system designed and operated in accordance with 40 *CFR* 264.175(b).	Storage of RCRA-hazardous waste in containers with free liquids – **applicable**	40 CFR 264.175(a) TDEC 1200-1-11-.06(9)(f)(1)
	Area must be sloped or otherwise designed and operated to drain liquid from precipitation, or	Storage of RCRA-hazardous waste in containers that do not contain free liquids - **applicable**	40 CFR 264.175(c) TDEC 1200-1-11-.06(9)(f)(3)
	Containers must be elevated or otherwise protected from contact with accumulated liquid.		
	Treatment/disposal of wastes - primary and secondary wastes		
Disposal of RCRA-hazardous waste in a land-based unit	May be land disposed if it meets the requirements in the table "Treatment Standards for Hazardous Waste" at 40 CFR 268.40 before land disposal.	Land disposal, as defined in 40 CFR 268.2, of restricted RCRA waste - **applicable**	40 CFR 268.40(a) TDEC 1200-1-11-.10(3)(a)
	Must be treated according to the alternative treatment standards of 40 CFR 268.49(c) or according to the UTSs [specified in 40 CFR 268.48 Table UTS] applicable to the listed and/or characteristic waste contaminating the soil prior to land disposal.	Land disposal, as defined in 40 CFR 268.2, of restricted hazardous soils - **applicable**	40 CFR 268.49(b) TDEC 1200-1-11-.10(3)(j)(2)

Table 2-24 (cont'd)
Action-specific ARARs and TBC Guidance
Rev. 2 Memphis Depot Dunn Field Record of Decision

Action	Requirements	Prerequisite	Citation(s)
Disposal of RCRA wastewaters in an CWA wastewater treatment unit	Are not prohibited, unless the wastes are subject to a specified method of treatment other than DEACT in 40 CFR 268.40, or are D003 reactive cyanide.	Restricted RCRA characteristic hazardous wastewaters managed in a wastewater treatment system which is NPDES permitted - **applicable**	40 CFR 268.1(c)(4)(iv) TDEC 1200-1-11-.10(1)(a)(3)(iv)(IV)
		Transportation	
Transportation of hazardous materials	Shall be subject to and must comply with all applicable provisions of the HMTA and HMR at 49 CFR 171-180.	Any person who, under contract with a department or agency of the federal government, transports "in commerce," or causes to be transported or shipped, a hazardous material - **applicable**	49 CFR 171.1(c)
Transportation of hazardous waste off site	Must comply with the generator requirements of 40 CFR 262.20–23 for manifesting, Sect. 262.30 for packaging, Sect. 262.31 for labeling, Sect. 262.32 for marking, Sect. 262.33 for placarding and Sect. 262.40, 262.41(a) for record keeping requirements and Sect. 262.12 to obtain EPA ID number.	Off-site transportation of RCRA hazardous waste – **applicable**	40 CFR 262.10(h) TDEC 1200-1-11-.03(1)(a)(8)
	Must comply with the requirements of 40 CFR 263.11–263.31.	Transportation of hazardous waste within the United States requiring a manifest – **applicable**	40 CFR 263.10(a) TDEC 1200-1-11-.04(1)(a)(1)
	A transporter who meets all applicable requirements of 49 CFR 171–179 and the requirements of 40 CFR 263.11 and 263.31 will be deemed in compliance with 40 CFR 263.		
Management of treatability samples (*i.e.*, contaminated soils, wastewaters)	Are not subject to any requirements of 40 CFR Parts 261 through 263, nor are such samples included in the quantity determinations of 40 CFR 261.5 and 262.34(d) when:	Generation of samples of hazardous waste for purpose of conducting treatability studies as defined in 40 CFR 260.10 - **applicable**	40 CFR 261.4(e)(1) TDEC 1200-1-11-.02(1)(d)(5)(i)
	• The sample is being collected and prepared for transportation by the generator or sample collector;		40 CFR 261.4(e)(1)(i) TDEC 1200-1-11-.02(1)(d)(5)(i)(I)
	• The sample is being accumulated or stored by the generator or sample collector prior to transportation to a laboratory or testing facility; or		40 CFR 261.4(e)(1)(ii) TDEC 1200-1-11-.02(1)(d)(5)(i)(II)

809 48

Table 2-24 (cont'd)
Action-specific ARARs and TBC Guidance
Rev. 2 Memphis Depot Dunn Field Record of Decision

Action	Requirements	Prerequisite	Citation(s)
	• The sample is being transported to the laboratory or testing facility for purpose of conducting a treatability study.		40 CFR 261.4(e)(1)(iii) TDEC 1200-1-11-.02(1)(d)(5)(i)(III)
Transportation of hazardous waste on site	The generator manifesting requirements of 40 CFR 262.20–262.32(b) do not apply. Generator or transporter must comply with the requirements set forth in 40 CFR 263.30 and 263.31 in the event of a discharge of hazardous waste on a private or public right-of-way.	Transportation of hazardous wastes on a public or private right-of-way within or along the border of contiguous property under the control of the same person, even if such contiguous property is divided by a public or private right-of-way – **applicable**	40 CFR 262.20(f) TDEC 1200-1-11-.03(3)(a)(6)

ARAR = applicable or relevant and appropriate requirement
CFR = *Code of Federal Regulations*
CWA = Clean Water Act of 1972
NPDES = National Pollutant Discharge Elimination System
DEACT = deactivation
DOT = U.S. Department of Transportation
EPA = U.S. Environmental Protection Agency
RCRA = Resource Conservation and Recovery Act of 1976
HMR = Hazardous Materials Regulations
HMTA = Hazardous Materials Transportation Act
TBC = to be considered
TCA = *Tennessee Code Annotated*
TDEC = Rules of the Tennessee Department of Environment and Conservation, Chapter as noted
UTS = Universal Treatment Standard

Table 3-2

Transport and Disposal and Quality Assurance/Quality Control Samples

Rev. 0 Memphis Depot Dunn Field Disposal Sites Prefinal Remedial Design

Sample Point	Matrix	Sampling Frequency	Approx. Sample No.	Sampling Method	Sampling Equipment	Prelim TAT/ Final TAT	Data Package Reqmnt	Required Analysis	Analytical Methods	Holding Time	Sample Preservation	Containers
Stockpiles or Roll-Offs	Soil	Every 250 CY or once per DS	15	Prepared in Field	Hand-auger device prior to compositing (except for VOCs)	4 days/7 days	CLP-like full package	TCLP VOCs	1311/8260B	14 day TCLP extr; 14 day analysis	Cool to 4°C	(4) 8oz WM glass
								TCLP SVOCs	1311/8270C	14 day TCLP extr; 7 day extr; 40 day analysis	Cool to 4°C	
								TCLP Pesticides	1311/8081A	14 day TCLP extr; 7 day extr; 40 day analysis	Cool to 4°C	
								TCLP Herbicides	1311/8151A	14 day TCLP extr; 7 day extr; 40 day analysis	Cool to 4°C	
								TCLP Metals	1311/6010B7470A	6 month TCLP extr; 6 month analysis Hg: 28 day TCLP extr; 28 day analysis	Cool to 4°C	
								Reactivity (Reactive Cyanide & Reactive Sulfide)	SW7.3.3.2 & SW7.3.4.2	ASAP	Cool to 4°C	
								Corrosivity	9045C	ASAP	Cool to 4°C	
								Ignitability	1010/1030	ASAP	Cool to 4°C	
Drums and Bottles	liquid waste	Every 10 containers or once per DS	5	EPA SOP	COLIWASA or other appropriate	4 days/7 days	CLP-like full package	TCL VOCs	8260B	14 days	HCl pH< 2; Cool to 4°C	(4) 8oz WM glass
								TCL SVOCs	8270C	14 day extr; 40 day analysis	Cool to 4°C	
								TCL Pesticides	8081A	14 day extr; 40 day analysis	Cool to 4°C	
								TCL PCBs	8082	14 day extr; 40 day analysis	Cool to 4°C	
								Herbicides	8151A	14 day extr; 40 day analysis	Cool to 4°C	
								TAL Metals	6010B/7471A	6 months; Hg = 28 days	HNO_3 pH< 2; Cool to 4°C	
								Reactivity (Reactive Cyanide & Reactive Sulfide)	SW7.3.3.2 & SW7.3.4.2	ASAP	Cool to 4°C	
								Corrosivity	9045C	ASAP	Cool to 4°C	
								Ignitability	1010/1030	ASAP	Cool to 4°C	
Equipment Rinsate Blank	Water	1 per set of field-cleaned equipment (10%)	10% or at least one per day of sampling	Prepared in Field	Analyte-free water, SS funnel	7 days/14 days	CLP-like full package	TCL VOCs	8260B	14 days	HCl pH< 2; Cool to 4°C	(2) 40 mL vials
								TCL SVOCs	8270C	14 day extr; 40 day analysis	Cool to 4°C	(1) Liter amber glass
								TCL Pesticides	8081A	14 day extr; 40 day analysis	Cool to 4°C	(1) Liter amber glass
								TCL PCBs	8082	14 day extr; 40 day analysis	Cool to 4°C	(1) Liter amber glass
								Herbicides	8151A	14 day extr; 40 day analysis	Cool to 4°C	(1) Liter amber glass
								TAL Metals	6010B/7471A	6 months, Hg = 28 days	HNO_3 pH< 2; Cool to 4°C	(1) 500 mL HDPE
Trip Blank	Water	Once	6	Prepared by Lab	N/A	7 days/14 days	CLP-like full package	TCL VOCs	8260B	14 days	HCl pH< 2; Cool to 4°C	(2) 40 mL vials
*MSDS***	Soil	1 per 20 samples	4	Prepared in Field	Same Equipment for Soil Samples	7 days/14 days	CLP-like full package	Selected by Personnel in Field	Appropriate Method	Corresponds to Method	Appropriate Measures	Appropriate Containers
Duplicates	Soil	1 per 10 samples	12	Prepared in Field	Same Equipment for Soil Samples	7 days/14 days	CLP-like full package	TCL VOCs	5035/8260B	14 days	HCl pH< 2; Cool to 4°C	(2) 40 mL vials
								TCL SVOCs	8270C	14 day extr; 40 day analysis	Cool to 4°C	(1) Liter amber glass
								TCL Pesticides	8081A	14 day extr; 40 day analysis	Cool to 4°C	(1) Liter amber glass
								TCL PCBs	8082	14 day extr; 40 day analysis	Cool to 4°C	(1) Liter amber glass
								Herbicides	8151A	14 day extr; 40 day analysis	Cool to 4°C	(1) Liter amber glass
								TAL Metals	6010B/7471A	6 months, Hg = 28 days	HNO_3 pH< 2; Cool to 4°C	(1) 500 mL HDPE

Notes:

**Matrix Spike(MS)/MS Duplicate Samples (MSDS) samples will be supplied to the laboratory as an extra bottle containing the sample and the analysis will be the responsibility of the laboratory.

TAT = Turnaround time

CLP = EPA Contract Laboratory Program quality assurance control procedures

SS= Stainless steel

TCL/TAL = Target Compound List/Target Analyte List

VOCs = Volatile organic compounds

SVOCs = Semi-volatile organic compounds

C = degrees celcius

ml = milliliter

TABLE 5-3
Disposal Site Compliance Samples
Rev. 1 Memphis Depot Dunn Field Final Remedial Design

Disposal Site	COCs	Floor Area (ft^2)	Total Sidewall Area (ft^2)	Number of Samples	
				Floor	Side Wall
3	(bottles and drums)	600	1,000	3	6
4.1	Copper, and lead	600	1,000	3	6
10	Copper and lead .	2,200	3,240	5	9
13	(bottles)	150	500	2	5
31	PAHs and copper	5,850	3,060	7	9
Total		**9,400**	**8,800**	**20**	**35**

TABLE 5-4
Action-specific ARARs and TBC Guidance
Rev. 1 Memphis Depot Dunn Field Final Remedial Design

Action	Requirements	Prerequisite	Citation(s)
General construction standards - all land-disturbing activities (i.e., excavation, trenching, clearing, etc.)			
Activities causing fugitive dust emissions	Shall take reasonable precautions to prevent particulate matter from becoming airborne; reasonable precautions shall include, but are not limited to, the following:	Fugitive emissions from demolition of existing buildings or structures, construction operations, grading of roads, or the clearing of land – **applicable**	TDEC 1200-3-8-.01(1)
	• use, where possible, of water or chemicals for control of dust; and		TDEC 1200-3-8-.01(1)(a)
	• application of asphalt, oil, water, or suitable chemicals on dirt roads, materials stock piles, and other surfaces which can create airborne dusts		TDEC 1200-3-8-.01(1)(b)
	• Shall not cause or allow fugitive dust to be emitted in such a manner as to exceed 5 minute/hour or 20 minute/day beyond property boundary lines on which emission originates.		TDEC 1200-3-8-.01(2)
Activities causing storm water runoff (e.g., clearing, grading, excavation)	Implement good construction management techniques (including sediment and erosion controls, vegetative controls, and structural controls) in accordance with the substantive requirements of *General Permit No. TNR10-0000 Appendix F*, to ensure that storm water discharge	Dewatering or storm water runoff discharges from land disturbed by construction activity - disturbance of ≥5 acres total - **applicable**; <5 acres - **relevant and appropriate**	TCA 69-3-108(j) TDEC 1200-4-10-.03(2)
	• does not violate water quality criteria as stated in TDEC 1200-4-3-.03 including but not limited to prevention of discharges that causes a condition in which visible solids, bottom deposits, or turbidity impairs the usefulness of waters of the state for any of the designated uses for that water body by TDEC 1200-4-4	Storm water discharges from construction activities – **TBC**	*General Permit No. TNR10-0000* Part III D.2.a
	• does not contain distinctly visible floating scum, oil, or other matter;		*General Permit No. TNR10-0000* Part III D.2.b
	• does not cause an objectionable color contrast in the receiving stream; and		*General Permit No. TNR10-0000* Part III D.2.c

809 52

TABLE 5-4
Action-specific ARARs and TBC Guidance
Rev. 1 Memphis Depot Dunn Field Final Remedial Design

Action	Requirements	Prerequisite	Citation(s)
	• results in no materials in concentrations sufficient to be hazardous or otherwise detrimental to humans, livestock, wildlife, plant life, or fish and aquatic life in the receiving stream	Storm water discharges from construction activities – **TBC**	*General Permit No. TNR10-0000* Part III D.2.d
Waste generation, characterization, segregation, and storage - primary wastes (excavated contaminated soil, disposal pit materials) and secondary wastes (wastewaters, spent treatment media, etc.)			
Characterization of solid waste	Must determine if solid waste is hazardous waste or if waste is excluded under 40 CFR 261.4(b); and	Generation of solid waste as defined in 40 CFR 261.2 and which is not excluded under 40 CFR 261.4(a) - **applicable**	40 CFR 262.11(a) TDEC 1200-1-11-.03(1)(b)(1)
	Must determine if waste is listed under 40 CFR Part 261; or		40 CFR 262.11(b) TDEC 1200-1-11-.03(1)(b)(2)
	Must characterize waste by using prescribed testing methods or applying generator knowledge based on information regarding material or processes used		40 CFR 262.11(c) TDEC 1200-1-11-.03(1)(b)(3)
	Must refer to Parts 261, 262, 264, 265, 266, 268, and 273 of Chapter 40 for possible exclusions or restrictions pertaining to management of the specific waste	Generation of solid waste which is determined to be hazardous – **applicable**	40 CFR 262.11(d); TDEC 1200-1-11-.03(1)(b)(4)
Characterization of hazardous waste	Must obtain a detailed chemical and physical analysis on a representative sample of the waste(s), which at a minimum contains all the information that must be known to treat, store, or dispose of the waste in accordance with pertinent sections of 40 CFR 264 and 268	Generation of RCRA-hazardous waste for storage, treatment or disposal - **applicable**	40 CFR 264.13(a)(1) TDEC 1200-1-11-.06(2)(d)(1)
	Must determine the underlying hazardous constituents [as defined in 40 CFR 268.2(i)] in the waste	Generation of RCRA characteristic hazardous waste (and is not D001 non-wastewaters treated by CMBST, RORGS, or POLYM of Section 268.42 Table 1) for storage, treatment or disposal – **applicable**	40 CFR 268.9(a) TDEC 1200-1-11-.10(1)(l)(1)

809 53

TABLE 5-4
Action-specific ARARs and TBC Guidance
Rev. 1 Memphis Depot Dunn Field Final Remedial Design

Action	Requirements	Prerequisite	Citation(s)
Characterization of hazardous waste *(continued)*	Must determine if the waste is restricted from land disposal under 40 CFR 268 *et seq.* by testing in accordance with prescribed methods or use of generator knowledge of waste	Generation of RCRA characteristic hazardous waste (and is not D001 non-wastewaters treated by CMBST, RORGS, or POLYM of Section 268.42 Table 1) for storage, treatment or disposal – **applicable**	40 CFR 268.7 TDEC 1200-1-11-.10(1)(g)(1)(i)
	Must determine each EPA Hazardous Waste Number (Waste Code) to determine the applicable treatment standards under 40 CFR 268.40 *et. seq.*		40 CFR 268.9(a) TDEC 1200-1-11-.10(1)(l)(1)
Temporary storage of hazardous waste in containers	A generator may accumulate hazardous waste at the facility provided that:	Accumulation of RCRA hazardous waste on site as defined in 40 CFR 260.10 - **applicable**	40 CFR 262.34(a); TDEC 1200-1-11-.03(4)(e)
	• waste is placed in containers that comply with 40 CFR 265.171-173; and		40 CFR 262.34(a)(1)(i); TDEC 1200-1-11-.03(4)(e)(2)(ii)(I)
	• the date upon which accumulation begins is clearly marked and visible for inspection on each container		40 CFR 262.34(a)(2); TDEC 1200-1-11-.03(4)(e)(2)(ii)
	• container is marked with the words "hazardous waste" or		40 CFR 264.34(a)(3) TDEC 1200-1-11-.03(4)(e)(2)(iv)
	• container may be marked with other words that identify the contents	Accumulation of 55 gal. or less of RCRA hazardous waste at or near any point of generation - **applicable**	40 CFR 262.34(c)(1) TDEC 1200-1-11-.03(4)(e)(5)(i)(II)
Use and management of hazardous waste in containers	If container is not in good condition (e.g. severe rusting, structural defects) or if it begins to leak, must transfer waste into container in good condition	Storage of RCRA hazardous waste in containers – **applicable**	40 CFR 265.171 TDEC 1200-1-11-.05(9)(b)
	Use container made or lined with materials compatible with waste to be stored so that the ability of the container is not impaired		40 CFR 265.172 TDEC 1200-1-11-.05(9)(c)

809 54

TABLE 5-4
Action-specific ARARs and TBC Guidance
Rev. 1 Memphis Depot Dunn Field Final Remedial Design

Action	Requirements	Prerequisite	Citation(s)
Use and management of hazardous waste in containers	Keep containers closed during storage, except to add/remove waste	Storage of RCRA hazardous waste in containers – **applicable**	40 CFR 265.173(a) TDEC 1200-1-11-.05(9)(d)(1)
(continued)	Open, handle and store containers in a manner that will not cause containers to rupture or leak		40 CFR 265.173(b) TDEC 1200-1-11-.05(9)(d)(2)
Storage of hazardous waste in container area	Area must have a containment system designed and operated in accordance with 40 *CFR* 264.175(b)	Storage of RCRA-hazardous waste in containers with free liquids – **applicable**	40 CFR 264.175(a) TDEC 1200-1-11-.06(9)(f)(1)
	Area must be sloped or otherwise designed and operated to drain liquid from precipitation, or Containers must be elevated or otherwise protected from contact with accumulated liquid	Storage of RCRA-hazardous waste in containers that do not contain free liquids - **applicable**	40 CFR 264.175(c) TDEC 1200-1-11-.06(9)(f)(3)
Treatment/disposal of wastes - primary and secondary wastes			
Disposal of RCRA-hazardous waste in a land-based unit	May be land disposed if it meets the requirements in the table "Treatment Standards for Hazardous Waste" at 40 CFR 268.40 before land disposal	Land disposal, as defined in 40 CFR 268.2, of restricted RCRA waste - **applicable**	40 CFR 268.40(a) TDEC 1200-1-11-.10(3)(a)
	Must be treated according to the alternative treatment standards of 40 CFR 268.49(c) or according to the UTSs [specified in 40 CFR 268.48 Table UTS] applicable to the listed and/or characteristic waste contaminating the soil prior to land disposal	Land disposal, as defined in 40 CFR 268.2, of restricted hazardous soils - **applicable**	40 CFR 268.49(b) TDEC 1200-1-11-.10(3)(j)(2)
Disposal of RCRA wastewaters in an CWA wastewater treatment unit	Are not prohibited, unless the wastes are subject to a specified method of treatment other than DEACT in 40 CFR 268.40, or are D003 reactive cyanide	Restricted RCRA characteristic hazardous wastewaters managed in a wastewater treatment system which is NPDES permitted - **applicable**	40 CFR 268.1(c)(4)(iv) TDEC 1200-1-11-.10(1)(a)(3)(iv)(IV)
Transportation			

TABLE 5-4
Action-specific ARARs and TBC Guidance
Rev. 1 Memphis Depot Dunn Field Final Remedial Design

Action	Requirements	Prerequisite	Citation(s)
Transportation of hazardous materials	Shall be subject to and must comply with all applicable provisions of the HMTA and HMR at 49 CFR 171-180	Any person who, under contract with a department or agency of the federal government, transports "in commerce," or causes to be transported or shipped, a hazardous material - **applicable**	49 CFR 171.1(c)
Transportation of hazardous waste off site	Must comply with the generator requirements of 40 CFR 262.20–23 for manifesting, Sect. 262.30 for packaging, Sect. 262.31 for labeling, Sect. 262.32 for marking, Sect. 262.33 for placarding and Sect. 262.40, 262.41(a) for record keeping requirements and Sect. 262.12 to obtain EPA ID number	Off-site transportation of RCRA hazardous waste – **applicable**	40 CFR 262.10(h) TDEC 1200-1-11-.03(1)(a)(8)
	Must comply with the requirements of 40 CFR 263.11–263.31	Transportation of hazardous waste within the United States requiring a manifest – **applicable**	40 CFR 263.10(a) TDEC 1200-1-11-.04(1)(a)(1)
	A transporter who meets all applicable requirements of 49 CFR 171–179 and the requirements of 40 CFR 263.11 and 263.31 will be deemed in compliance with 40 CFR 263		
Management of treatability samples (*i.e.*, contaminated soils, wastewater)	Are not subject to any requirements of 40 CFR Parts 261 through 263, nor are such samples included in the quantity determinations of 40 CFR 261.5 and 262.34(d) when:	Generation of samples of hazardous waste for purpose of conducting treatability studies as defined in 40 CFR 260.10 - **applicable**	40 CFR 261.4(e)(1) TDEC 1200-1-11-.02(1)(d)(5)(i)
	• The sample is being collected and prepared for transportation by the generator or sample collector;		40 CFR 261.4(e)(1)(i) TDEC 1200-1-11-.02(1)(d)(5)(i)(I)
	• The sample is being accumulated or stored by the generator or sample collector prior to transportation to a laboratory or testing facility; or		40 CFR 261.4(e)(1)(ii) TDEC 1200-1-11-.02(1)(d)(5)(i)(II)
	• The sample is being transported to the laboratory or testing facility for purpose of conducting a treatability study		40 CFR 261.4(e)(1)(iii) TDEC 1200-1-11-.02(1)(d)(5)(i)(III)

TABLE 5-4
Action-specific ARARs and TBC Guidance
Rev. 1 Memphis Depot Dunn Field Final Remedial Design

Action	Requirements	Prerequisite	Citation(s)
Transportation of hazardous waste on site	The generator manifesting requirements of 40 CFR 262.20–262.32(b) do not apply. Generator or transporter must comply with the requirements set forth in 40 CFR 263.30 and 263.31 in the event of a discharge of hazardous waste on a private or public right-of-way	Transportation of hazardous wastes on a public or private right-of-way within or along the border of contiguous property under the control of the same person, even if such contiguous property is divided by a public or private right-of-way – **applicable**	40 CFR 262.20(f) TDEC 1200-1-11-.03(3)(a)(6)

ARAR = applicable or relevant and appropriate requirement
CFR = *Code of Federal Regulations*
CWA = Clean Water Act of 1972
NPDES = National Pollutant Discharge Elimination System
DEACT = deactivation
DOT = U.S. Department of Transportation
EPA = U.S. Environmental Protection Agency
RCRA = Resource Conservation and Recovery Act of 1976
HMR = Hazardous Materials Regulations
HMTA = Hazardous Materials Transportation Act
TBC = to be considered
TCA = *Tennessee Code Annotated*
TDEC = Rules of the Tennessee Department of Environment and Conservation, Chapter as noted
UTS = Universal Treatment Standard

809 57

TABLE 5-5
Remedial Goal Summary
Rev. 1 Memphis Depot Dunn Field Final Remedial Design

Potential Chemicals in the Disposal Sites[1]	Chemical Class	Soil Remediation Goal (mg/kg)	Basis for Remediation Goal[2, 6]	Basis of Risk[3]
Acetone	VOC	16	SSL	gw
Aluminum	Inorganic	100,000	DE	max
Antimony	Inorganic	7	BKND	—
Arsenic	Inorganic	29	SSL	gw
Barium	Inorganic	1,600	SSL	gw
Benzene	VOC	0.03	SSL	gw
Beryllium	Inorganic	19,000	DE	ca
Bis(2-ethylhexyl)phthalate (DEHP)	SVOC	1,231	DE	ca
Bromomethane (Methyl bromide)	VOC	0.2	SSL	gw
Butyl benzyl phthalate	SVOC	100,000	DE	max
Cadmium	Inorganic	451	DE	gw
Carbazole	SVOC	862	DE	ca
Chlordane	Pesticide	64.6	DE	ca
Chlorobenzene	VOC	1	SSL	gw
Chloromethane	VOC	0.082	SSL*	gw
Chromium	Inorganic	4,483	DE	ca
Cobalt	Inorganic	661	SSL*	gw
Copper	Inorganic	669	SSL*	gw
DDD	Pesticide	99.5	DE	ca
DDE	Pesticide	70.2	DE	ca
DDT	Pesticide	70.2	DE	ca
Dibutyl phthalate	SVOC	61,561	DE	nc
1,2-Dichlorobenzene	VOC	17	SSL	gw
1,3-Dichlorobenzene	VOC	0.36	SSL*	gw
1,4-Dichlorobenzene	VOC	2	SSL	gw
1,1-Dichloroethane	VOC	23	SSL	gw
2,4-Dichlorophenol	SVOC	1	SSL	gw
Dieldrin	Pesticide	1.08	DE	ca
Diethyl phthalate	SVOC	1,285	SSL*	gw
Dimethyl phthalate	SVOC	3,309	SSL*	gw

TABLE 5-5
Remedial Goal Summary
Rev. 1 Memphis Depot Dunn Field Final Remedial Design

Potential Chemicals in the Disposal Sites[1]	Chemical Class	Soil Remediation Goal (mg/kg)	Basis for Remediation Goal[2, 6]	Basis of Risk[3]
di-n-Octyl phthalate	SVOC	24,624	DE	nc
Endosulfan	Pesticide	3,694	DE	nc
Endrin	Pesticide	185	DE	nc
Ethylbenzene	VOC	13	SSL	gw
HCH (alpha)	Pesticide	3.59	DE	ca
HCH (beta)	Pesticide	12.6	DE	ca
HCH (gamma) Lindane	Pesticide	17.4	DE	ca
Heptachlor	Pesticide	3.83	DE	ca
Heptachlor epoxide	Pesticide	8	DE	ca
Hexachlorobenzene	SVOC/Pesticide	10.7	DE	ca
Lead[4]	Inorganic	1,536	DE	nc
Manganese	Inorganic	1,540	BKND	—
Mercury	Inorganic	307	DE	nc
Methoxychlor	Pesticide	3,078	DE	nc
2-Methylaniline (o-toluidine)	SVOC	0.04	SSL*	gw
Methyl Ethyl Ketone	VOC	8.55	SSL*	gw
Nickel	Inorganic	20,439	DE	nc
Pentachlorophenol	SVOC/Pesticide	27[7]	Site-specific[7]	gw
Phenol	SVOC	100	SSL	gw
Polychlorinated Biphenyls (PCBs)				
Aroclor 1016	PCB	37.2	DE	nc
Aroclor 1221	PCB	7.44	DE	ca
Aroclor 1232	PCB	7.44	DE	ca
Aroclor 1242	PCB	7.44	DE	ca
Aroclor 1248	PCB	7.44	DE	ca
Aroclor 1254	PCB	7.44	DE	ca
Aroclor 1260	PCB	7.44	DE	ca
Polynuclear Aromatic Hydrocarbons (PAHs)				
Acenaphthene	PAH	29,219	DE	ca
Anthracene	PAH	100,000	DE	max

TABLE 5-5
Remedial Goal Summary
Rev. 1 Memphis Depot Dunn Field Final Remedial Design

Potential Chemicals in the Disposal Sites[1]	Chemical Class	Soil Remediation Goal (mg/kg)	Basis for Remediation Goal[2,6]	Basis of Risk[3]
Benz[a]anthracene	PAH	21.1	DE	ca
Benzo[b]fluoranthene	PAH	21.1	DE	ca
Benzo[k]fluoranthene	PAH	211	DE	ca
Benzo[a]pyrene	PAH	2.11	DE	ca
Chrysene	PAH	2,110	DE	ca
Dibenz[ah]anthracene	PAH	2.11	DE	ca
Fluoranthene	PAH	22,000	DE	nc
Fluorene	PAH	26,281	DE	nc
Indeno[1,2,3-cd]pyrene	PAH	21.1	DE	ca
Naphthalene	PAH	188	DE	nc
Pyrene	PAH	29,126	DE	nc
Selenium	Inorganic	5	SSL	gw
Silver	Inorganic	34	SSL	gw
Styrene	VOC	4	SSL	gw
2,3,4,6-Tetrachlorophenol	SVOC	18,468	DE	nc
Thallium	Inorganic	67.5	DE	nc
Toluene	VOC	12	SSL	gw
Toxaphene	Pesticideicide	15.7	DE	ca
Trichloroacetic Acid[5]	VOC/Pesticide	1.2	SSL	gw
1,1,1-Trichloroethane	VOC	2	SSL	gw
2,4,5-Trichlorophenol	SVOC	270	SSL	gw
2,4,6-Trichlorophenol	SVOC	0.2	SSL	gw
1,2,3-Trimethylbenzene[5]	VOC	0.3	SSL	gw
1,2,4-Trimethybenzene	VOC	1.26	SSL*	gw
1,3,5-Trimethylbenzene	VOC	1.24	SSL*	gw
Vanadium	Inorganic	7,154	DE	nc
Xylenes	VOC	210	SSL	gw
Zinc	Inorganic	100,000	DE	max

Notes:

1. See Table 2-21B of the ROD for Site-Specific Cleanup Goals for specific VOCs in subsurface soil. The RGs in Table 2-21B are SSLs to be protective of groundwater. These compounds will be addressed via SVE.

TABLE 5-5
Remedial Goal Summary
Rev. 1 Memphis Depot Dunn Field Final Remedial Design

Potential Chemicals in the Disposal Sites[1]	Chemical Class	Soil Remediation Goal (mg/kg)	Basis for Remediation Goal[2, 6]	Basis of Risk[3]

Notes (continued):

2. Soil RGs were determined by screening potential chemicals through a decision tree process. This process is described in Figure 2-15 and Table 2-21D of the ROD. The basis for the RGs are listed as follows:
   - BKND = Background Value in Soil as Listed in Tables 3-8 and 3-9 of the DF RI, Rev. 2 (CH2M HILL, July 2002)
   - DE = Industrial Soil Direct Contact Exposure Pathway PRG; assumes a risk of 1 x 10^{-5} and hazard index (HI) of 1 (EPA Region 9 PRGs Table, October 2002)
   - SSL = Default Soil Screening Level for the Migration to Groundwater Pathway; assumes a default dilution attenuation factor of 20 for source area up to 0.5 acre (EPA Region 9 PRGs Table, October 2002)
   - SSL* = Soil Screening Level calculated using default values and Equation 10 of the Soil Screening Guidance: User's Guide (EPA, July 1996). The chemical-specific target soil leachate concentration is based on the Tap Water PRG (EPA Region 9 PRGs Table, October 2002) and a DAF of 20 for source area up to 0.5 acre.
3. Basis of Risk References are as follows:
   - ca = carcinogen (Target Cancer Risk of 1 x 10^{-5})
   - max = non-risk based ceiling limit concentration of 10^{+5} mg/kg for inorganic or semivolatile chemicals
   - nc = noncarcinogen (Target Hazard Index of 1)
   - sat = soil saturation limit for volatiles
4. Established Dunn Field Industrial Cleanup Goal for Lead
5. No EPA Region 9 PRG Established. Remediation Cleanup Goal referenced per Chapter 62-777, State of Florida Administrative Code
6. To be conservative, solubility values for inorganics assume that they're in a soluble ionic form(e.g., Al^{+3}).
7. Based on the January 2004 BCT meeting F&T modeling was performed to determine if potential PCP contamination in disposal sites pose a threat to groundwater. The objectives for the F&T modeling were to determine the PCP source concentration that would leach into the water table below the PCP MCL (1 µg/L). Based on the MULTIMED model results, with limited biodegradation, PCP in soil leachate should attenuate below the MCL of 1 µg/L before reaching the water table at source concentrations much greater than the default SSL for PCP (0.03 mg/kg). Therefore, an alternative RG of 27 mg/kg is recommended for PCP in subsurface soil for disposal sites located at Dunn Field. The alternative RG will be protective of groundwater at the disposal sites. The modeling results are based on a realistic maximum exposure scenario with slow biodegradation and conservative recharge. The alternative RG is lower than the industrial direct contact risk PRG for PCP of 90 mg/kg (excess lifetime cancer risk of $1x10^{-5}$).
   - *References: (1) Results of a Fate and Transport Model for PCP Contamination at Dunn Field Disposal Sites (CH2MHILL, Feb 2004); (2) Results of a Soil Investigation at the Former PCP Dip Vat and Underground PCP Storage Tank Sites, Main Installation, Memphis Depot (CH2MHILL, Jan 2004)*

DAF = dilution attenuation factor
F&T = fate and transport
mg/kg = milligrams per kilogram
PAH = polynuclear aromatic hydrocarbons
PCB = polychlorinated biphenyls
PRG = preliminary remedial goal
VOC = volatile organic compound
SVOC = semi-volatile organic compound

Attachment 3: Statement of Work

(Inserted from Appendix D of the Rev. 1 Remedial Design Report, CH2M Hill, 2004a)

Statement of Work

1.0 Introduction

This Statement of Work (SOW) describes the tasks necessary to excavate, characterize, transport, and dispose contaminated soils from the disposal sites at Dunn Field, which is across Dunn Avenue from the north-northwest portion of the Main Installation (MI) of the Memphis Depot (the Depot) (formerly known as the Defense Distribution Depot Memphis, Tennessee). The SOW has been prepared for the U.S. Army Corps of Engineers (USACE) - Huntsville Center as part of Task Order 6 under contract number DACA87-02-D-0006.

1.1 Site Background

The Memphis Depot (Depot), which is located in southeastern Memphis, Tennessee, originated as a military facility in the early 1940s. Its initial mission and function was to provide stock control, materiel storage, and maintenance services for the U.S. Army (Memphis Depot Caretaker, 1998). In 1995, the Depot was placed on the list of Department of Defense (DoD) facilities to be closed under the Base Realignment and Closure (BRAC). Storage and distribution of materiel for all U.S. military services and some civil agencies continued until the Depot closed in September 1997.

The Depot is located approximately 5 miles east of the Mississippi River and just northeast of Interstate 240. The property consists of approximately 642 acres and includes two components: the MI, with includes open storage areas, warehouses, military family housing, and outdoor recreational areas; and Dunn Field, which includes former mineral storage and waste disposal areas.

Dunn Field, comprising approximately 64 acres of undeveloped land, is bounded by the Illinois Central Gulf Railroad and Person Avenue to the north, Hays Road to the east, and Dunn Avenue to the south. Dunn Field is partially bounded to the west by: (1) Kyle Street; (2) a Memphis Light, Gas, and Water (MLGW) powerline corridor (which bisects Dunn Field); (3) undeveloped property; and (4) a light industrial/warehouse facility (Figure 2-2). All of DunnField (and the MI) is currently zoned as Light Industrial (I-L).

Approximately two-thirds of the area is grassed, and the remaining area is covered with crushed rock and paved surfaces. Dunn Field was used for bulk mineral storage (bauxite and fluorspar) and waste disposal.

2.0 Scope of Work

The scope of work for this project includes the following activities:

- Submittal and review/acceptance of the following:
  - Work Plan
  - Site-Specific Health and Safety Plan (SSHASP)

  - Waste Management Plan
  - Sampling and Analysis Plan, including Quality Assurance/Quality Control (QA/QC) Plan

- Mobilization of all personnel, equipment, and supplies
- Site preparation including installation of temporary erosion and sediment controls
- Excavation/removal, transportation, and disposal of targeted materials at offsite hazardous and/or non-hazardous landfills
- Backfilling, compaction, and grading
- Solid waste management, characterization and disposal
- Liquid waste management, characterization, and disposal
- Site restoration
- Final decontamination and demobilization

Soil and debris from Disposal Sites 3, 4.1, 10, 13, and 31 will be excavated and transported for offsite disposal. Remedial tasks for each site are summarized below.

Disposal Site 3

- Excavation and disposal of 225 CY of soil and debris (glass bottles and crushed drums). Excavation dimension: 30-foot by 20-foot by 10-foot deep.
- Characterization of excavated soils for offsite disposal.
- Backfill of excavation and site restoration.

Disposal Site 4.1

- Excavation and disposal of 225 CY of copper- and lead-contaminated soil and debris. Excavation dimension: 30-foot by 20-foot by 10-foot deep.
- Characterization of excavated soils for offsite disposal.
- Backfill of excavation and site restoration.

Disposal Site 10

- Excavation and disposal of 610 CY of copper- and lead-contaminated soil and debris. A 40-foot by 55-foot excavation is divided into three sections:
  - Excavation 1 dimension: 20-foot by 55-foot by 6-foot deep (copper).
  - Excavation 2 dimension: 10-foot by 55-foot by 8-foot deep (lead).
  - Excavation 3 dimension: 10-foot by 55-foot by 10-foot deep (lead).
- Characterization of excavated soils for offsite disposal. Lead-contaminated is anticipated to be hazardous.
- Backfill of excavation and site restoration.

Disposal Site 13

- Excavation and disposal of 55 of soil and debris (glass bottles). Approximate excavation dimension: 15-foot by 10-foot by 10-foot deep.
- Characterization of excavated soils for offsite disposal.
- Backfill of excavation and site restoration.

Disposal Site 31

- Excavation and disposal of 1,175 CY of polynuclear aromatic hydrocarbon (PAH)- and copper-contaminated soil and debris.
  - — Excavation 1 dimension: 90-foot by 45-foot from 4 feet to 10 feet below ground surface (bgs) (PAH).
  - — Excavation 2 dimension: 60-foot by 30-foot by 8-foot deep (PAH and copper).
- Characterization of excavated soils for offsite disposal.
- Backfill of excavation and site restoration.

3.0 Project Schedule

Subcontractor shall provide whatever resources necessary to complete the SOW within the timeframe presented in the final project schedule. The proposed site operations are 7:00 AM to 5:00 PM Monday through Saturday.

It is anticipated that mobilization to the site will begin within 10 days from notice to proceed. This information shall be provided in the form of a project schedule using critical path method (CPM) logic.

Depending on the magnitude of adverse weather and its potential impact to the project schedule, time lost during the scheduled workweek may be made up on an accelerated schedule at the discretion of the Project Manager.

4.0 Technical Specifications

4.1 Safety

Subcontractor's personnel shall abide by the applicable OSHA guidelines 29 CFR 1910 for general personal safety around operating heavy equipment. Required safety equipment shall be used at all times during work onsite. Subcontractor shall provide all required personal safety equipment for Subcontractors employees including, but not limited to, gloves, hearing protection, safety glasses, hard hats, steel-toed boots, and air-supplied respirators (if required) and appropriate hazardous waste level protection.

4.2 Mobilization

Subcontractor shall mobilize all resources necessary to efficiently and completely perform the scope of work. The resources include, but are not limited to, personnel, equipment, materials, supplies, lower-tier subcontractors, and support facilities (e.g., project support trailer, decontamination facilities, waste containment facilities, material and equipment storage, cellular phones, water, portable sanitary facilities, etc.) to support the work activities at the site. An onsite staging/lay down area will be designated by MACTEC Engineering and Consulting, Inc. (MACTEC).

4.3 Site Preparation

Site preparation activities shall include installation of warning signs, removal of surficial debris, and preparation for the SOW to be performed.

4.3.1 Erosion and Storm Water Control and Maintenance

Erosion control measures shall be implemented for excavation and stockpile areas. Silt fence, hay bales, site modification for ditches, and/or other devices shall be used to control storm water and erosion as detailed in the project specifications and drawings. As needed, water spray on haul roads shall be used to prevent dust clouds from hampering and hindering site traffic.

4.3.2 Utility Survey

A utility survey of the area shall be completed by the Subcontractor 1 week prior to the beginning of work. Documentation of the survey (including water, electricity, natural gas, telephone, or other utility lines) and its results shall be provided to MACTEC, authorizing work to proceed at the site. Any utilities identified adjacent to the work area shall be clearly marked and identified. Once work begins, the progress of excavation conducted with heavy equipment shall be continuously monitored for evidence of subsurface obstructions.

4.4 Contaminated Material Excavation

Each of the contaminated soil or buried material locations shall be marked in the field from the coordinates shown on the construction drawings and then excavated. The need for additional excavation will be evaluated based on confirmatory sampling results.

A tracked excavator will be used to remove the contaminated soil, which shall be managed as follows:

- Soil with hazardous characteristics (i.e., potential D008 waste from Disposal Site 10; see Construction Drawing Sheet 2) shall be directly loaded into roll-off containers (suitable for hazardous waste) before final characterization and ultimate disposal at a Subtitle C landfill.
- Soil (and debris) that is currently characterized as non-hazardous based on the results of the pre-design investigation shall be stockpiled on 20-mil polyvinyl chloride (PVC) liners surrounded by a clean soil berm and covered with another 10-mil liner. The stockpiled soil shall be loaded onto trucks and transported to an appropriate disposal facility when it has been characterized and manifested.

The excavations are expected to be approximately 5 to 10 feet deep, and will remain open until confirmation sampling is performed. Side-wall shoring or sloping (via step-downs) may be required to stabilize the open excavations, which shall be encircled with protective fence and flagging to prevent unauthorized personnel from inadvertently entering the excavations.

Once the proposed limit of excavation is reached, confirmation soil samples shall be collected from the sides and floors by MACTEC to determine if additional excavation will be required. Samples shall be analyzed on rush basis to minimize open excavation time.

Soil Stockpiles

Soil anticipated to be non-hazardous shall be excavated from each Disposal Site and stockpiled nearby. A section of 20-mil PVC liner shall be placed adjacent to the excavation in an area that has been cleared of material that might puncture the liner. Depending on the site configuration and size, the excavator shall place the targeted soil directly onto the liner or onto a truck that transports the soil to the nearby stockpile area. A 10-mil cover shall be placed atop the stockpile when all of the targeted soil has been excavated or at the end of a work day. Equipment shall be used to form a clean soil berm around the stockpile to help secure the top liner and to divert storm water runoff .

Hazardous materials shall be stored in water-tight roll-off containers. An impermeable cover shall be placed over the units to prevent precipitation from contacting the stored material. The units shall be located on the project site at locations approved by MACTEC.

Dewatering

The Subcontractor shall maintain appropriate means to collect and remove standing water in the excavations and stockpiles during excavation, sampling, and backfill operations. Standing water may be allowed to remain in the excavations between period of excavation and backfill of approved by MACTEC. All water from active excavations shall be collected and disposed of in accordance with Section 4.6.

4.5 Waste Characterization Sampling

4.5.1 Soil

Representative sample(s) from the stockpiled excavated soil shall be obtained by the Subcontractor to characterize the soil for offsite transport and disposal. The samples shall be analyzed using EPA SW-846 procedures and Level III QA/QC protocols by a Navy-, Air Force Center for Environmental Excellence (AFCEE)-, or U.S. Army Corps of Engineers - Missouri River District (USACE-MRD) -approved laboratory (on a rush turnaround time) for the following analytical methods:

Parameter	Method (SW-846)
TCLP Volatiles	1311/8260B
TCLP Semivolatiles	1311/8270C
TCLP Pesticides	1311/8081A
TCLP Herbicides	1311/8151
TCLP Pesticides	1311/8082
TCLP Metals	1311/6010B/7471
Reactivity, corrosivity, ignitability (RCI)	1010 or 1020A, 9040B, chapter 7.3
TCLP = toxicity characteristic leachate procedure	

Additional analytical parameters may be required by the disposal facility for characterization purposes and shall be included in Subcontractor's bid.

4.5.2 Liquid Waste Characterization

The Subcontractor shall collect representative samples for waste characterization by collecting equal amounts of waste from no more than ten containers (drums or bottles) of similar material using a COLIWASA, or other appropriate sampling apparatus (see Attachment A). An equal amount of liquid waste shall be taken from each container and deposited in a non-reactive container (e.g. Pyrex). The sample shall be thoroughly mixed in the container and divided into the sampling containers. Decontaminated sampling equipment shall be used for each composite sample.

Sample(s) shall be analyzed at a Navy, AFCEE, or USACE-MRD -approved laboratory for the following parameters using EPA SW-846 procedures and Level III QA/QC protocols (7 day TAT):

Parameter	Method (SW-846)
Volatiles	8260B
Semivolatiles	8270C
Pesticides	8081A
Herbicides	8151
Pesticides	8082
Metals	6010B/7471
Reactivity, corrosivity, ignitability (RCI)	1010 or 1020A, 9040B, chapter 7.3

Additional analytical parameters may be required by the disposal facility for characterization purposes and shall be included in Subcontractor's bid.

4.5.3 Water

The Subcontractor shall sample containerized liquids (i.e., any contact water from the excavations, decontamination fluids, etc.) for waste characterization. One representative sample from each container shall be collected and analyzed at a Navy, AFCEE, or USACE-MRD–approved laboratory for the following parameters using EPA SW-846 procedures and Level III QA/QC protocols:

Parameter	Method (SW-846)
TCL Volatiles	8260B
TCL Semivolatiles	8270C
TCL Pesticides	8081A
Herbicides	8151A
TCL Pesticides	8082
TAL Metals	6010B/7470A
TCL/TAL = target compound list/target analyte list	

Additional analytical parameters may be required by the disposal facility for characterization purposes and shall be included in Subcontractor's bid.

4.6 Contaminated Material Transportation and Offsite Disposal

Prior to offsite disposal of any waste, the Subcontractor shall generate a waste approval package for each waste stream including the following to be provided to the generator for signature:

- Waste profile identifying the Defense Distribution Center as the generator of the waste
- Analytical summary table(s) applicable to the waste (based on pre-design investigation data and further onsite characterization)
- Letter of approval from the proposed waste disposal facility to accept the waste
- Land Disposal Restriction (LDR) notifications/certifications (for hazardous wastes only)
- A completed sample manifest

Upon receipt of notice to proceed, the Subcontractor shall load and transport all waste and/or contaminated materials to a permitted disposal facility in compliance with applicable state solid waste or hazardous waste disposal requirements and in good standing with Federal, State and Local regulatory agencies. Certificates of destruction/disposal and weigh tickets from State-certified scales shall be provided for this activity. Copies of facility signed manifests shall also be provided to document soil disposal.

4.7 Backfill and Compaction

Borrow material used onsite will come from a clean site identified by the Subcontractor. The locations(s) of the off-site backfill source(s) shall be the responsibility of the Subcontractor. The Subcontractor shall provide the name, address, contact individual, and telephone and facsimile numbers of the source(s). A certificate of clean soil shall be submitted prior to bringing the soil into the site.

The excavations shall be backfilled with the borrow material in horizontal lifts of uniform thickness, in a manner that avoids segregation; each lift shall be machine compacted to an unyielding surface prior to placing succeeding lifts. The compacted fill shall be capable of supporting loaded dump trucks without formation of ruts or depressions. The backfilled sites shall be graded and shaped to establish approximate original grades and positive surface drainage.

4.8 Site Restoration

Disturbed areas will be seeded, fertilized, and mulched to minimize erosion. The areas will be graded smooth and uniform with the surrounding areas. Large stone, debris, and materials will be removed and if necessary disposed offsite. The grass mix will be installed per the specifications through the course of the project, since the sites are widespread and will be completed at various times.

4.9 Final Decontamination and Demobilization

The Subcontractor shall perform a final cleanup of all areas impacted by its activities to the satisfaction of MACTEC. Personnel and equipment shall be decontaminated prior to leaving the area to avoid the possibility of inadvertently spreading contamination. Equipment shall be properly decontaminated to remove all contamination that may be adhering to the equipment components as a result of the interim remedial action. The Subcontractor, solely at the Subcontractor's expense, will restore any cross-contamination of Dunn Field property or public thoroughfare. All debris and rinsate generated by the treatment activities shall be properly containerized, sampled, analyzed, and disposed offsite as specified in this SOW. Decontamination of personnel and equipment shall be performed in accordance with the Site Health and Safety Plan and the applicable provisions of 29 CFR 1910.120.

Following approval from MACTEC, all personnel, equipment, temporary facilities and utilities shall be demobilized from the site. In addition, any remaining debris or other wastes generated during the work shall be removed and properly disposed.

4.10 Project Submittals

MACTEC's Site Supervisor will be responsible for preparing a field activity summary, which describes the work performed, and estimated quantities of contaminated materials removed each day. The Subcontractor shall cooperate with and provide information as necessary in support of preparing this report. To this end, the Subcontractor shall complete the applicable portions of MACTEC Quality Control Report and MACTEC Production Report. These reports shall be submitted to MACTEC by 9:00 AM Central time the following business day. In addition, the subcontractor will be required to submit copies of all analytical results and chain of custody forms to MACTEC. Copies of shipping manifests and profile forms for waste disposal will also be submitted to MACTEC. Additional submittals during the work have been previously identified in this SOW.

The Subcontractor is required to submit a schedule of values as outlined the Subcontract Agreement.

MACTEC payment to the Subcontractor will be dependent upon weekly submission and, MACTEC acceptance, of certified payroll reports.

Within 15 calendar days following Subcontractor's demobilization, the Subcontractor shall submit to MACTEC a Final Report, which shall include the following, as a minimum:

- Field notes
- Daily logs
- Photographs (minimum of twenty 4"x 5", including description)
- Site map
- A chronology of significant events that occurred during the project
- Analytical results
- Documentation of proper transport and disposal of all materials
- Problems encountered
- Sample Log
- Transportation and Disposal Log
- Recommendations and Conclusions

This Final Report shall be submitted for MACTEC's review.

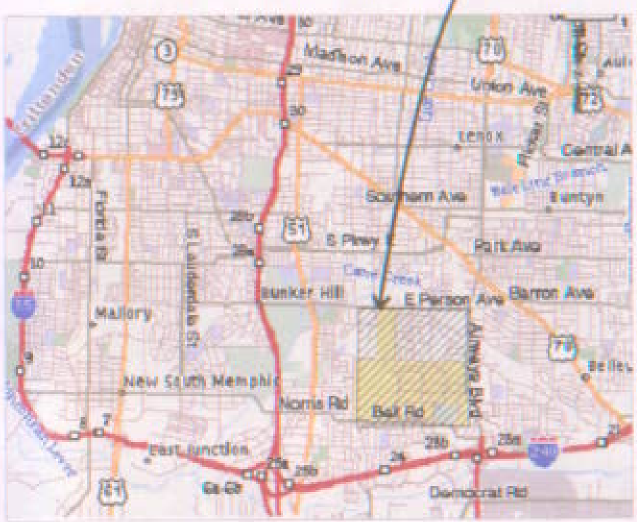
Attachment 4: Construction Drawings

(Inserted from Appendix C of the Rev. 1 Remedial Design Report, CH2M Hill, 2004a)

MEMPHIS DEPOT DUNN FIELD
TENNESSEE
PREFINAL REMEDIAL DESIGN

CONTRACT NUMBER: DACA87-02-D-006
TASK ORDER: 006

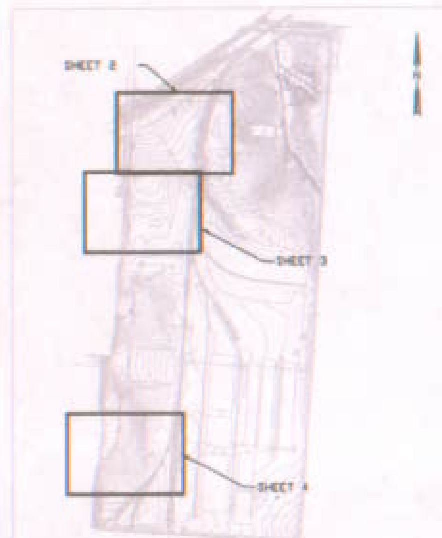
MEMPHIS DEPOT DUNN FIELD



VICINITY MAP
NOT TO SCALE

INDEX

SHEET	TITLE
1	TITLE SHEET
2	EXCAVATION PLAN, DISPOSAL SITES 3, 4.1, 7, and 10
3	EXCAVATION PLAN, DISPOSAL SITE 13
4	EXCAVATION PLAN, DISPOSAL SITE CC-2 and 31



SITE LOCATION MAP
NOT TO SCALE

PRELIMINARY
NOT FOR CONSTRUCTION

CH2MHILL

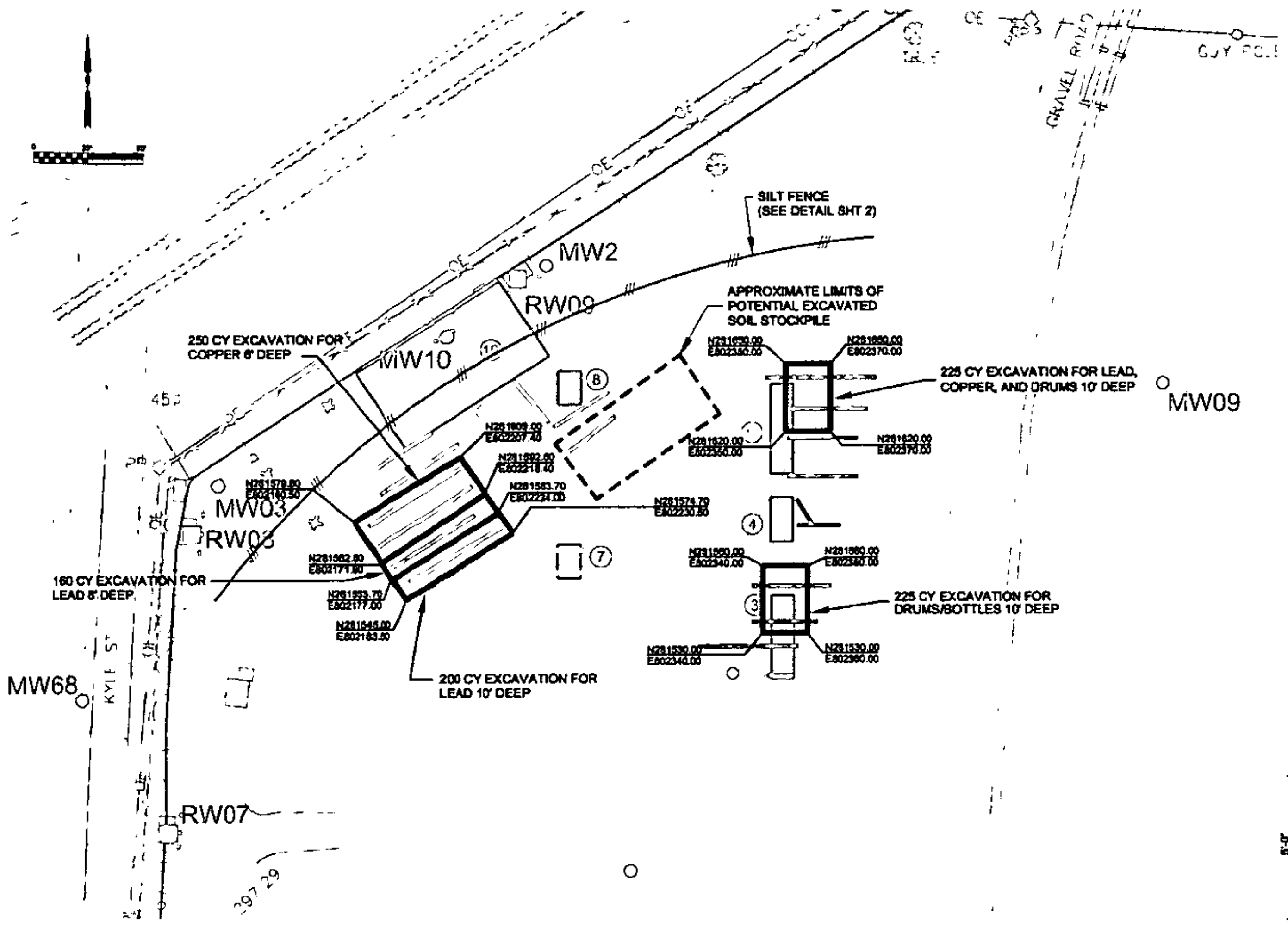
MEMPHIS DEPOT DUNN FIELD
PREFINAL REMEDIAL DESIGN

TITLE SHEET

SHEET 1
DWG 1
DATE JANUARY 2004
PROJ 177566.RD.02

FILENAME: EXCAVATION PLAN PLOT DATE: 20-JAN-2004

809 72

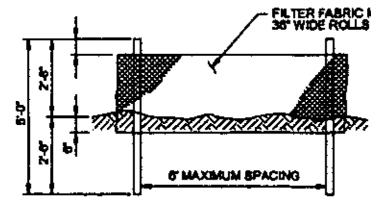


LEGEND:

- EXCAVATION AREA
- EXPLORATORY TRENCH
- POTENTIAL EXCAVATION AREA
- TEST PITS
- DISPOSAL SITE 10
- ORIGINAL EXTIMATED EXTENT OF DISPOSAL SITE
- SILT FENCE

NOTES:

1. STAGING AREAS TO BE DETERMINED IN FIELD BY CONTRACTOR.
2. PROVIDE STORM WATER DIVERSIONS AS NEEDED TO MINIMIZE STORM WATER COLLECTION IN WORK AREAS.
3. EXCAVATE WITHIN LIMITS SHOWN. EXCAVATION SHALL REMAIN OPEN UNTIL CONFIRMATION SAMPLING TO DETERMINE FINAL EXTENT OF EXCAVATION. PROVIDE APPROPRIATE BARRICADES WHILE EXCAVATIONS ARE OPEN.
4. PLACE LEAD-CONTAMINATED SOIL FROM DISPOSAL SITE 10 DIRECTLY INTO ROLL-OFF CONTAINERS FOR CHARACTERIZATION PRIOR TO OFFSITE DISPOSAL.
5. PLACE EXCAVATED SOIL IN STOCKPILES FOR FINAL CHARACTERIZATION PRIOR TO OFFSITE DISPOSAL.
   LINE BOTTOM OF SOIL STOCKPILE WITH 20 MIL PVC LINER. COVER SOIL STOCKPILE WITH 10 MIL PVC LINER. SURROUND STOCKPILE WITH 12 INCHES OF CLEAN SOIL TO SECURE COVER AND DIVERT STORM WATER RUNOFF.
6. BACKFILL EXCAVATIONS TO ORIGINAL GRADE.



NOTES:
1. BURY BOTTOM OF FILTER FABRIC 6" VERTICALLY BELOW FINISHED GRADE.
2. 2"x4" DOUGLAS FIR OR STEEL FENCE POSTS.
3. STITCHED LOOPS TO BE INSTALLED DOWNHILL SIDE OF SLOPE.
4. COMPACT ALL AREAS OF FILTER FABRIC TRENCH.

SILT FENCE DETAIL

PRELIMINARY
NOT FOR CONSTRUCTION

DSGN	M PERLMUTTER
DR	E GRIGGS
CHK	X
APVD	X

NO.	DATE	REVISION	BY	APVD

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

CH2MHILL

MEMPHIS DEPOT DUNN FIELD
PREFINAL REMEDIAL DESIGN

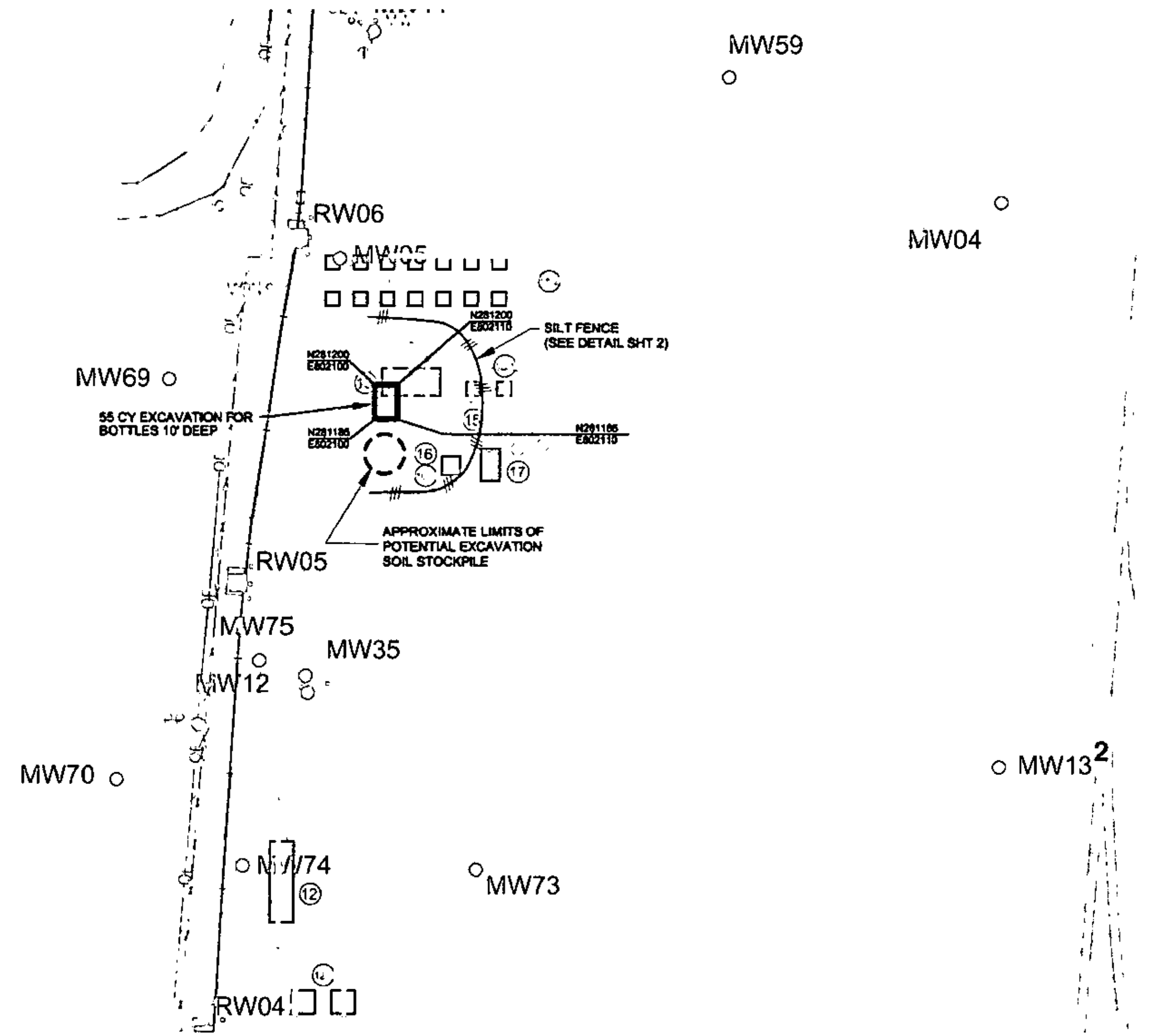
EXCAVATION PLAN
DISPOSAL SITES 3, 4.1 and 10

SHEET	2
DWG	2
DATE	JANUARY 2004
PROJ	177536.RD.02

FILENAME: EXCAVATOIN PLAN PLOT DATE: 27-JAN-2004 PLOT TIME: 00:00:00

CAD\PROJECTS\148071 DDMT\EM-61_2004

809 74



LEGEND:

- EXCAVATION AREA
- EXPLORATORY TRENCH
- POTENTIAL EXCAVATION AREA
- TEST PITS
- (8) DISPOSAL SITE 10
- ORIGINAL EXTIMATED EXTENT OF DISPOSAL SITE
- SILT FENCE

NOTES:

1. STAGING AREAS TO BE DETERMINED IN FIELD BY CONTRACTOR.
2. PROVIDE STORM WATER DIVERSIONS AS NEEDED TO MINIMIZE STORM WATER COLLECTION IN WORK AREAS.
3. EXCAVATE WITHIN LIMITS SHOWN. EXCAVATION SHALL REMAIN OPEN UNTIL CONFIRMATION SAMPLING TO DETERMINE FINAL EXTENT OF EXCAVATION. PROVIDE APPROPRIATE BARRICADES WHILE EXCAVATIONS ARE OPEN.
4. PLACE EXCAVATED SOIL IN STOCKPILES FOR FINAL CHARACTERIZATION PRIOR TO OFFSITE DISPOSAL. LINE BOTTOM OF SOIL STOCKPILE WITH 20 MIL PVC LINER. COVER SOIL STOCKPILE WITH 10 MIL PVC LINER. SURROUND STOCKPILE WITH 12 INCHES OF CLEAN SOIL TO SECURE COVER AND DIVERT STORM WATER RUNOFF.
5. BACKFILL EXCAVATIONS TO ORIGINAL GRADE.

PRELIMINARY
NOT FOR CONSTRUCTION

DSGN	M PERLMUTTER
DR	S BROOKS
CHK	X
APVD	X

NO	DATE	REVISION	BY	APVD

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

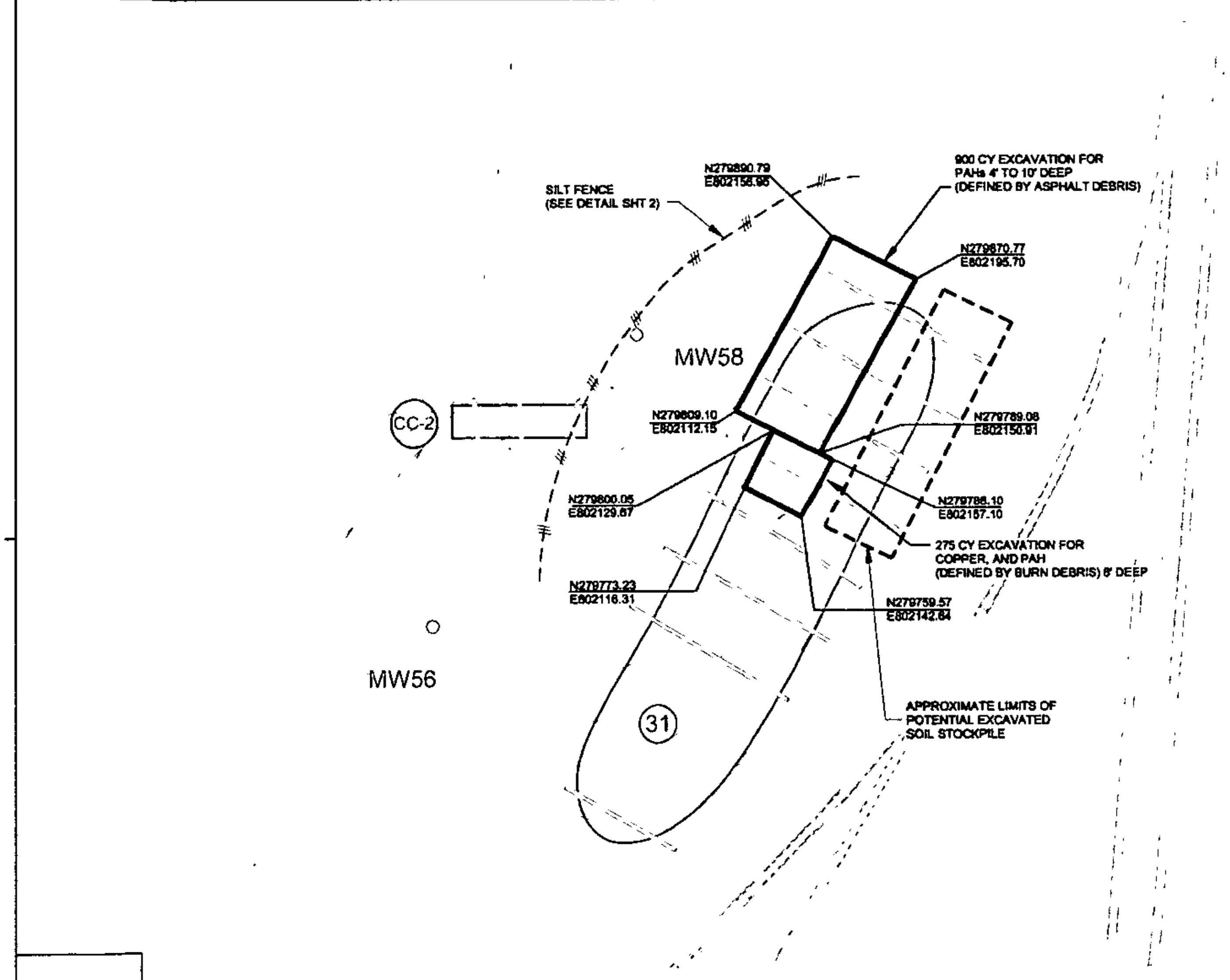
CH2MHILL

MEMPHIS DEPOT DUNN FIELD
PREFINAL REMEDIAL DESIGN

EXCAVATION PLAN
DISPOSAL SITE 13

SHEET	3
DWG	3
DATE	JANUARY 2004
PROJ	177856.RD.02

FILENAME: EXCAVATOIN PLAN PLOT DATE: 20-JAN-2004 PLOT TIME: 00:00:00



LEGEND:

- EXCAVATION AREA
- EXPLORATORY TRENCH
- POTENTIAL EXCAVATION AREA
- TEST PITS
- (8) DISPOSAL SITE 10
- ORIGINAL EXTIMATED EXTENT OF DISPOSAL SITE
- SILT FENCE

NOTES:

1. STAGING AREAS TO BE DETERMINED IN FIELD BY CONTRACTOR.
2. PROVIDE STORM WATER DIVERSIONS AS NEEDED TO MINIMIZE STORM WATER COLLECTION IN WORK AREAS.
3. EXCAVATE WITHIN LIMITS SHOWN. EXCAVATION SHALL REMAIN OPEN UNITL CONFIRMATION SAMPLING TO DETERMINE FINAL EXTENT OF EXCAVATION. PROVIDE APPROPRIATE BARRICADES WHILE EXCAVATIONS ARE OPEN.
4. PLACE EXCAVATED SOIL IN STOCKPILES FOR FINAL CHARACTERIZATION PRIOR TO OFFSITE DISPOSAL. LINE BOTTOM OF SOIL STOCKPILE WITH 20 MIL PVC LINER. COVER SOIL STOCKPILE WITH 10 MIL PVC LINER. SURROUND STOCKPILE WITH 12 INCHES OF CLEAN SOIL TO SECURE COVER AND DIVERT STORM WATER RUNOFF.
5. BACKFILL EXCAVATIONS TO ORIGINAL GRADE.

PRELIMINARY
NOT FOR CONSTRUCTION

DSGN M PERLMUTTER
DR S ORIGGS
CHK X
APVD X

NO. | DATE | REVISION | BY | APVD

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

CH2MHILL

MEMPHIS DEPOT DUNN FIELD
PREFINAL REMEDIAL DESIGN

EXCAVATION PLAN
DISPOSAL SITES 31

SHEET 4
DWG 4
DATE JANUARY 2004
PROJ 177586.RD.02

FILENAME: EXCAVATOIN PLAN PLOT DATE: 20-JAN-2004 PLOT TIME: 00:00:00

Attachment 5: *Verification of Soil Remediation* Guidance Document

(Michigan DEQ, April 1994)

809 77

GUIDANCE DOCUMENT

VERIFICATION OF SOIL REMEDIATION

ENVIRONMENTAL RESPONSE DIVISION

WASTE MANAGEMENT DIVISION

APRIL 1994, Revision 1

TABLE OF CONTENTS–DNR GUIDANCE DOCUMENT VERIFICATION OF SOIL REMEDIATION

TABLE OF CONTENTS--DNR GUIDANCE DOCUMENT
VERIFICATION OF SOIL REMEDIATION

ATTACHMENTS--DNR GUIDANCE DOCUMENT
VERIFICATION OF SOIL REMEDIATION

MICHIGAN DEPARTMENT OF NATURAL RESOURCES

GUIDANCE DOCUMENT FOR VERIFICATION OF SOIL REMEDIATION

EXECUTIVE SUMMARY

The document provides guidance for sampling soils to verify that soil contamination has been remediated to Type A or Type B criteria in accordance with Act 307 P.A. 1982, as amended. This document is not designed to either guide investigations to determine whether a release has occurred or the nature and extent of an identified release, nor to guide due diligence by a potential property owner. Issuance of this guidance document does not invalidate remedial action plans (RAPS) or clean-ups previously conducted and approved by the DNR.

Soil sampling and analyses to verify that site remediation is complete can result in two basic errors.

- Declaring a site clean when it is contaminated
- Declaring a site contaminated when it is clean

A soil sampling plan submitted to the DNR must minimize these errors. The guidance document presents acceptable methods for verifying soil remediation. It contains guidance on soil sampling protocols and documentation necessary to characterize and verify cleanup of contaminated soils. The document provides recommended procedures for establishing soil background concentrations, sampling grids, chemical constituent evaluations, statistical comparisons, verifying excavation and in-situ and ex-situ remedies, evaluating treated soils, and soil characterization. The recommended procedures are **not *absolutes***. Other methods are available to verify soil remediation. The Department of Natural Resources will evaluate other sampling and statistical strategies on a case-by-case basis.

The guidance document is divided into two parts:

> **Part 1** contains guidance for small site cleanup verification (less than 10,890 square feet--<.25 acre). It is a "biased" sampling strategy recommending soil sampling from areas most likely to contain contamination.
>
> **Part 2** contains guidance for soil characterization and cleanup verification of medium and large sites (greater than 10,890 square feet-->.25 acre). It is a statistical random sampling strategy that minimizes biases in sampling.

Both sampling strategies require discrete soil samples. Compositing samples for cleanup verification is not accepted without prior DNR approval.

The guidance document contains verification checklists and reporting sections. The reporting sections should be carefully followed in reporting sampling rationale.

> **Reader's Note:** Questions regarding this guidance document should be directed to Department staff you are currently working with for your project or site.

DNR--GUIDANCE DOCUMENT, PART 1

SMALL SITE SOIL CLEANUP VERIFICATION (LESS THAN 10,890 SQUARE FEET)

Part 1 of this document is a guide for a biased sampling strategy to verify that soil contamination has been remediated at sites no greater than 0.25 acres (small sites). Soil sampling and analyses to verify that a site remediation is complete can result in two basic errors.

- Declaring a site clean when it is contaminated

- Declaring a site contaminated when it is clean

A soil sampling plan submitted to the DNR must minimize these errors. Part 1 presents a biased sampling method of verifying soil remediation at small sites. The biased sampling approach specified in this guidance recommends soil sampling from areas most likely to still exceed cleanup criteria. The location of the soil sample points relies on a site specific analysis of the released or contaminant distribution and the soil types encountered. The remediation is verified using a point by point comparison of sample values with the appropriate cleanup criteria. If the cleanup criteria are exceeded at any sampled point, the biased sampling methodology may require additional remediation at that point until the criteria are met. Verification of cleanup utilizing the biased approach should generally require fewer samples to demonstrate attainment than by using the unbiased approach. DNR will evaluate other sampling and statistical strategies on a case-by-case basis.

Any biased sampling plan, whether presented in the guidance document or some other geostatistical approach, requires professional judgment. Therefore, documentation and the rationale used to select sample locations are extremely important. The report section (page 9) of this guidance document should be carefully followed.

Compositing samples for verifying soil remediation is not acceptable without prior DNR approval. When verifying a soil remediation is complete, contaminant concentrations will be low. Compositing may result in the contaminant concentrations not being representative of what remains in the soil. If concentrations are low, compositing may dilute the concentrations of a contaminant to below its threshold detection limit. Additionally, if contamination is indicated in a composited sample, the location of the contamination remains unknown.

Part 1 is divided into five main sections: Verifying Excavation Remedies, Verifying In-Situ and Ex-Situ Soil Remedies, Sample Analysis, Background Soil Samples, and Reports. The excavation and in-situ remediations require different strategies for verification. Guidance is presented for statistically determining background concentrations of compounds/contaminants. Guidance for reporting all appropriate information is presented to facilitate remediation approval.

VERIFYING EXCAVATION REMEDIES

Verifying that contaminated soil is remediated by means of excavation requires samples from the excavation bottom and sidewalls. Tables and formulas presented provide the minimum number of samples necessary to verify cleanup for various size excavations. The biased approach specified in this guidance recommends soil sampling from areas most likely to still exceed cleanup criteria. The location of the sample collection points relies on site specific analysis of the release or contaminant distribution and the soil types encountered in the excavation. The minimum number of excavation floor and sidewall samples required to demonstrate verification using a point by point comparison with the cleanup criteria are specified. If the cleanup criteria are exceeded at any point, this verification methodology may require additional excavation at that point until the criteria are attained.

Sampling and analyzing the locations most likely to have contaminants can minimize the number of samples needed to verify remediation is complete. Since professional judgment and site specific knowledge are required for selecting sampling locations, the rationale used to select these locations must be documented in the verification report.

SAMPLE LOCATIONS

Using a biased sampling approach, samples must be collected where they will most likely encounter contamination which could exceed the cleanup criteria. This will minimize the number of samples needed to verify a site is remediated. A sampling strategy that uses bias to choose sample locations is recommended. While it is inappropriate for this guidance document to dictate exact locations for sample collection in this strategy, site specific information (e.g., the location of leaks in an underground storage tank or its piping) from the remedial investigation concerning the release and soil conditions should be used along with professional judgment and the general guidance provided here to select appropriate soil sampling locations.

EXAMPLE: It would be incorrect to sample the north side of an excavation pit as extensively as the south side when the leak was confirmed on the south side of the tank.

Because a site must be remediated to a certain degree before approval can be considered, an analysis of data generated by a prior investigation should yield information for the verification analysis. The field personnel present during remediation should be sufficiently familiar with the conditions on-site to implement an appropriate verification strategy. A soil verification strategy should incorporate all pertinent biases of a site which may include, but are not limited to, those listed below.

- preferential pathways of contaminant migration
- source areas
- stained soils
- other site specific "clues" (e.g., fractures in clays)
- changes in soil characteristics (e.g., sand/clay interfaces)
- soil types and characteristics

NUMBER OF SAMPLES

The following tables are used to determine the minimum number of samples necessary from the floor and sidewalls of an excavation no greater than 0.25 acres using a biased sampling approach. If the area of the excavation floor exceeds 10,890 square feet, use Part 2 of this guidance document. A site may have an appropriate number of samples collected for verification, but, if the samples are not collected from the appropriate locations (discussed previously) and adequately reported, remediation may not be considered adequate. All sample locations must be accurately located, described, and reported. It should be noted that "excavation" as used here refers only to that area excavated for remediation purposes and being verified to meet Type A/Type B cleanup criteria.

Number of Excavation Floor Samples

Determine the minimum number of excavation floor samples from the table below.

TABLE 1
EXCAVATION FLOOR SAMPLES

Area of Floor (sq ft)	*Number of Samples*
< 500	2
500 < 1,000	3
1,000 < 1,500	4
1,500 < 2,500	5
2,500 < 4,000	6
4,000 < 6,000	7
6,000 < 8,500	8
8,500 <10,890	9

Number of Excavation Sidewall Samples

Sidewall samples are required to verify that the horizontal extent of contamination has been remediated. Use Table 2 to determine the minimum number of required sidewall samples. In no case is less than one sample on each sidewall (i.e., four) acceptable. In the case of irregularly shaped excavations, where four walls are not readily discernible, divide the total wall area into four segments of approximately equal size. Sidewall samples should be located in accordance with "biases" outlined earlier in Part 1.

TABLE 2

EXCAVATION SIDEWALL SAMPLES

Total Area of Sidewalls (sq ft)	*Number of Samples*
< 500	4
500 < 1,000	5
1,000 < 1,500	6
1,500 < 2,000	7
2,000 < 3,000	8
3,000 < 4,000	9
> 4,000	1 sample per 45 lineal feet of sidewall

VERIFYING IN-SITU AND EX-SITU SOIL REMEDIES

The effectiveness of in-situ soil remedies must be verified by three-dimensional random soil sampling. Refer to Attachment 2 for approved statistical sampling strategies. Certain ex-situ remedies, such as bio-piles or above-ground vapor extraction, may be amenable to statistical sampling strategies or batch sampling. Any proposed sampling strategy for in-situ or ex-situ remedies should be pre-approved by the DNR.

SAMPLE ANALYSIS

All test methods and associated target detection levels for cleanup verification must be consistent with those specified in MERA Operational Memorandum #6. Also, MERA Operational Memorandum #13 may be reviewed to evaluate appropriate QA/QC procedures. Generally, constituents in soil will be measured on a total, dry weight basis.

BACKGROUND SOIL SAMPLES

ESTABLISHING SOIL BACKGROUND

Establishing soil background, as required by Act 307 PA 1982, as amended, Michigan Environmental Response Act (MERA), can be accomplished by utilizing Operational Memorandum #15 or using the following guidance.

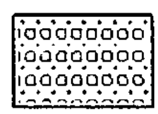
Background should be established as appropriate for site specific waste constituents, specific chemicals used in various processes, facility operations, or remedial investigation results. Sample analyses may include metals, organic constituents, or other site specific waste constituents. Analyses should be in accordance with MERA Operational Memorandum #6

Many factors can play a part in the background concentrations of a chemical in soil.

EXAMPLE: The geologic origin (e.g., the parent rock) of glacial drift may have been high in copper, lead, or other metals that may be potential contaminants. Additionally, the hydrogeologic situation can alter the quantity of these elements. Groundwater recharge areas (e.g., highlands) are frequently leached of metals while groundwater discharge areas (e.g., swamps, floodplain) are the recipients of leached metals. Thus, sites in low areas will usually have higher background concentrations than upland areas. Other conditions, such as precipitation and atmospheric fallout from widely dispersed human and natural activities, also affect soil concentrations.

A minimum of four samples must be used to establish "background" in soils. This will help account for natural constituent occurrences and inherent variability within each distinctive soil horizon. Background samples must be collected in an area which has not been impacted by environmental contamination from the site and representative of natural background conditions. Based on waste type, contaminant mobility, operation practices, and soil type (sand, silty sand, clay), an estimate of contamination depth should be made and background samples taken at comparable depths for the particular soil type. Multiple soil horizons should have "background" established separately (e.g., minimum of four samples per each soil unit).

EXAMPLE:

	Ground Surface	
Brown medium-coarse SAND		4 samples
Lt. brown silty fine SAND		4 samples
Gray silty CLAY w/trace of fine-med sand		4 samples

STATISTICAL ANALYSIS FOR ESTABLISHING BACKGROUND CONCENTRATIONS

The recommended statistical method for establishing background concentrations at small sites is (1) establishing the upper limit of background concentration of a constituent at the mean plus 3 standard deviations or (2) other statistical methods submitted to DNR for approval.

1. *Mean Plus 3 Standard Deviation Approach*

Calculate the "upper limit" of background concentration by using the following 5 step process.

A. Calculate the background mean ($\overline{X_b}$) by dividing the sum of the total background readings by the total number of background readings:

$$\overline{X_b} = \frac{X_1 + X_2 + \ldots X_n}{n}$$

B. Calculate the background variance (S_b^2) by taking the sum of the squares of each reading minus the mean and dividing by the degrees of freedom (the total number of background samples minus one):

$$S_b^2 = \frac{(X_1 - \overline{X}_b)^2 + (X_2 - \overline{X}_b)^2 + \ldots + (X_n - \overline{X}_b)^2}{n-1}$$

NOTE: Any sample populations less than ($n<30$ samples) must use n - 1 for degrees of freedom

C. Calculate the background standard deviation (S_b) by taking the square root of the variance:

$$Sb = \sqrt{S_b^2}$$

D. The Coefficient of Variation Test (CV) where

$$CV = \frac{S_b}{\overline{X}_b}$$

is used to evaluate data distribution. The background data should generally have a CV of less than 0.5 for granular soils, less than 0.75 for cohesive soils, or an explanation accounting for higher CV values. The maximum recommended CV is 1. If the data distribution exceeds a CV of 1.0, then a thorough evaluation will need to be made to account for this variability (e.g., lab QA/QC, typographical errors, soil classification, sample location, data not normally distributed, etc.). If the CV exceeds 1.0 and there is sufficient evidence to suggest a data point does not accurately represent background conditions or if QA/QC problems exist which invalidate that data point, the outlier data may be dropped or additional samples collected and analyzed to ensure a sufficient representative data population (n) is achieved. A high concentration in and of itself is not sufficient justification to exclude the data point.

E. Use the $\overline{X_b}$ + 3*S_b of "background" data as the maximum allowable limit or upper limit. Where 3*S_b equals three times the standard deviation and $\overline{X_b}$ equals the background mean (this statistical method only requires one sample per station). Compare each sample point to the calculated maximum allowable limit or upper limit analyzed from background data.

EXAMPLE: Four sand samples from a site were analyzed for background concentrations for lead. Concentrations of lead from the sample analyses returned from the lab were 56, 25, 18, and 35 ppb. Now, the investigator wants to examine the data set to discover whether the 56 ppb sample is an outlier:

$$\overline{X}_b\ mean = \frac{56+25+18+35}{4} = 33.5$$

$$S_b^2 = \frac{[56-33.5]^2+[25-33.5]^2+[18-33.5]^2+[35-33.5]^2}{3} = 273.67$$

$$S_b = (standard\ deviation) = \sqrt{S_b^2} = 16.5$$

$$CV = \frac{16.5}{33.5} = 0.49$$

Because 0.49 is less than 0.5, no further evaluation of the background data set is necessary.

Therefore, the background upper limit value for this site is:

$$background\ upper\ limit = \overline{X}_b + (3*S_b) = 33.5 + (3*16.5) = 83.0\ ppb$$

If a value is found to be an outlier which is not representative of background conditions, it may be replaced by another sample that is not an outlier to maintain at least four samples for background determination.

2. *Other statistical procedures for establishing background.* Refer to a statistical reference book or US EPA's Interim Final Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities (April 1989) and Addendum (July 1992).

PROCEDURES FOR NON-DETECT VALUES

The following provides some guidelines in incorporating non-detectable sample results into the procedure to calculate background concentrations.

1. If less than 50% of the background data is below the detection limit (DL), use ½ of the detection limit as the value.

2. If more than 50% of the background data is below the detection limit, use one of the following procedures.

   - Alternate "0" and the detection limit (DL) resulting in a net value of of the detection limit with a variance.

EXAMPLE:	Actual Value	Substitute Value
	<DL	DL
	<DL	0
	<DL	DL
	<DL	0

   - The Continuity Correction procedure with the t-test, Cohen's method, or other approved methods.

REPORT FOR SMALL SITE VERIFICATION

Soil cleanup verification reports for small sites must identify the number and location of samples and justify the sample location selected (why and how). The verification report must include the following.

1. MAP(s) and CROSS SECTIONS

   Provide a scaled map of the floor and walls of an excavation (the vertical and horizontal area treated for in-situ remediations) with sample locations identified. The cross section should depict the stratigraphy, fractures, soil types, discolorations, unusual characteristics, odor, etc.

2. SAMPLE LOCATION RATIONALE

   A. Background sample locations
   B. Verification sample locations
   C. Sample depths
   D. Sample collection procedures
   E. Describe biases and rationale used for collecting each sample (e.g., clay fractures, discolored soil, location of leak in tank)

3. DATA ANALYSES

   A. Analytical parameters
   B. Analytical methods used
   C. Method detection limits
   D. Laboratory Quality Assurance/Quality Control

4. STATISTICAL ANALYSES

   A. Calculation of background concentrations
   B. Coefficient of variance calculations
   C. Lab results
   D. Narrative explanation of background concentrations

DNR--GUIDANCE DOCUMENT, PART 2

MEDIUM AND LARGE SITE SOIL CLEANUP VERIFICATION (GREATER THAN 10,890 SQUARE FEET)

Part 2 describes statistical random sampling strategies to verify the remediation of medium and large sites greater than 0.25 acres in size. The strategies employ the use of gridding to facilitate the unbiased selection of sampling points and accepted statistical tools for evaluating the resultant data. The strategies provide a 95% confidence level of determining any hot spot concentrations on a site. It contains guidance on sampling protocol and necessary documentation for clean closures. Part 2 also discusses how to establish grid intervals, set grids, sample grids, statistically evaluate the data, use grids to guide additional remedial activities, disposal options, reporting, and a certification checklist. It also provides guidance on the sampling of ex-situ remedial processes (e.g., thermal desorption).

The term `clean closure' means that the site has been restored to either Type A or Type B levels. Type A is defined in Act 307 P.A. 1982, as amended, which references nondetect or background levels. Type B is defined in Act 307 P.A. 1982, as amended, which references riskbased or background levels. Waste, soil, other environmental media, and/or debris removed should be classified as hazardous or non-hazardous to determine disposal options and handling requirements (i.e., solid waste under Act 641 P.A. 1978, as amended; hazardous waste under Act 64 P.A. 1979, as amended; land ban restrictions under 40 CFR Part 268).

All cleanup verification evaluations must consider the spatial arrangements of sample values (patterned vs totally random) and the impacts on the present and future uses of the site. Because Type B cleanups are based on residual risk, the distribution of that risk, now and in the future, must be determined. These procedures are not *absolutes*. Other sampling approaches may be developed and submitted for DNR approval.

Three of the statistical sampling strategies most commonly used for evaluating remedial sites and wastes are described in Attachment 2. For further discussion on sampling strategies and sample collection methods, see "Test Methods for Evaluating Solid Waste," SW-846 Volume II: Field Methods, November 1986, Third Edition, US EPA.

Compositing samples for verifying soil remediation is not acceptable without prior DNR approval. When verifying a soil remediation is complete, contaminant concentrations will be low. Compositing may result in the contaminant concentrations not being representative of what remains in the soil. If concentrations are low, compositing may dilute the concentrations of a contaminant to below its threshold detection limit. Additionally, if contamination is indicated in a composited sample, the location of the contamination remains unknown.

ESTABLISHING GRID INTERVALS

When obtaining samples to verify that soil or wastes have been adequately remediated, it is important to insure that the analytical results obtained will provide an accurate representation of the entire area or volume under consideration. The location and number of samples to be taken at a particular remediation site depends on many factors: the level of confidence desired, the spatial and temporal variability of the media to be sampled, and the costs involved. An important objective in any sampling program is to obtain the most accurate data possible while minimizing the associated costs. One method to accomplish this goal is to use statistically valid sampling strategies. The appropriate sample number can be estimated and the sampling locations can be chosen without bias.

Such strategies employ the use of gridding to facilitate the unbiased selection of sampling points and accepted statistical tools for evaluating the resultant data. Statistical theory allows for the sampling of a subset of the grid points to achieve a reliable characterization of the entire remedial area or waste. Subsections describe ways to use sampling grids and statistical tools to evaluate areas of remediation.

The following equations and tables provide a simple basis to establish a grid system to facilitate unbiased selection of sampling points and sample coverage proportional to the area being verified.

1. *Basic Strategies.* A grid system should be established over the area being remediated. Grid point representation should be proportional to the size of the area. For excavation, both the sidewalls and bottom areas would be included in the determination of the area size. It is recommended that one of the following equations be used to determine grid intervals for stationing:

small site: see Part 1

medium site: $$\frac{\sqrt{A/\pi}}{4} = GI$$

large site: $$\sqrt{\frac{A\pi}{SF}} = GI$$

WHERE:

A = area to be grid (square feet)
GI = grid interval
SF = Site Factor, length of area to be grid (unitless)
π = 3.14159

It appears that there are logical size ranges of sites to which the grid equations apply:

A) small: up to 0.25 acre

B) medium: 0.25 3.0 acres

C) large: 3.0 acres and greater

To simplify this application, use the following chart based on an average size range of sites (1 acre = 43,560 square feet). The approximate grid ranges are provided as a quick check on numbers generated for specific sites using the above formulas.

*Site Acreage**	*Square Feet**	*~Grid Interval Ranges*
up to 0.25 (small)	up to 10,890	See Part 1
0.25-3.00 (medium)	10,890-130,680	15-50 feet
3.0 and over (large)	130,680 +	30 feet plus

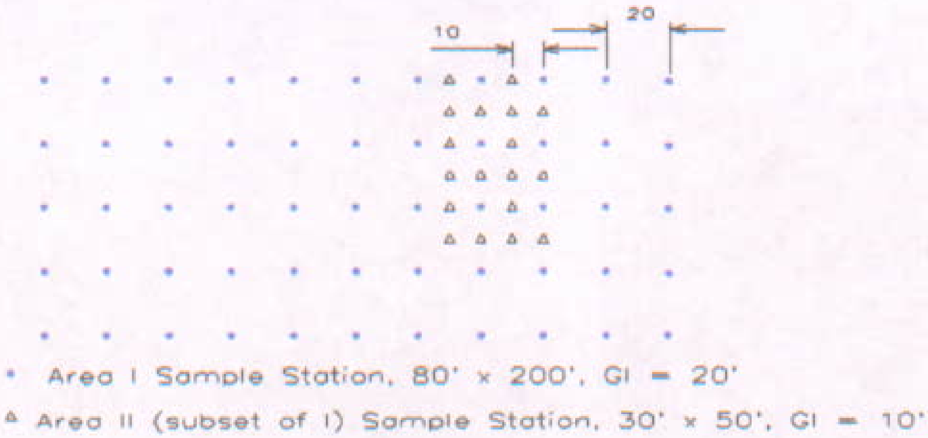
* Site acreage, square footage, is total area of sidewalls and base of excavation.

2. *Setting the Grid.* After the grid interval is calculated, it is recommended that a scaled grid overlay be made to superimpose on a map of the remediated area (this area includes both sidewalls and base). Some specified point (usually the southwest corner) should be designated as the 0,0 coordinate. The grid can then be adjusted to maximize sampling coverage. Some grid adjustment may be necessary for unusually shaped areas. Grid adjustment may also be needed to accommodate a minimum of at least one sample from each sidewall. Proposals for different grid strategies may be submitted for DNR review and approval on a case-by-case basis.

3. ***Variations on Basic Strategy.***

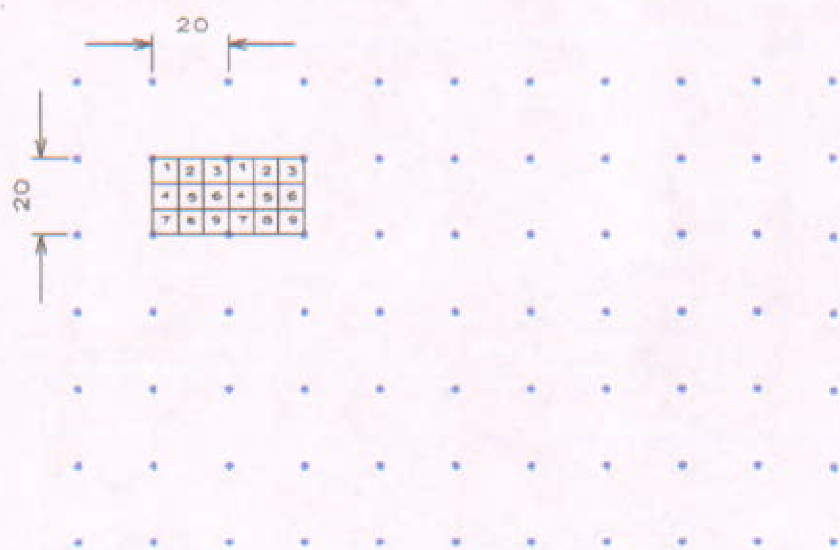
A. Subgridding. It may be warranted to apply grids with different intervals within the remediated area so that a proportional sampling can be focused on suspect areas (such as sumps, tank leak areas, etc.).

EXAMPLE:



B. Further Randomization. Sites that may have a patterned distribution of waste or contamination due to time sequence of filling, production sequences, or physical site conditions (i.e., furrows) may require a further randomization of sampling. In such cases, the following grid cell sampling format may be selected instead of at grid point stations. Each grid cell to be sampled must be divided into nine equal sized "subcells." Next, a random number table is used to select in which of the subcells the sample will be taken. The random number table is used again to select which subcell for the next cell and so on.

EXAMPLE:



Area = 120' x 200', GI = 20'

In the example above, a sampling grid has been set up with grid point stations 20 feet apart using the appropriate formula. Two cells which have been selected at random have been divided into nine subcells each. Subcell #4 was chosen randomly in one cell and subcell #2 in the other cell. This process is continued for all of the cells selected at random for sampling. Samples are then taken in each randomly chosen subcell.

C. Three dimensional gridding: In-Situ and Ex-Situ Remediations.

In-situ and ex-situ remediations involving soils and/or wastes with a significant vertical component should be evaluated in three dimensions (volume evaluation). Examples of such remediations would be in-situ soil vapor extraction or ex-situ bioremediation involving several cubic feet of soil and/or waste. A grid is superimposed on the remediation area as described in the previous sections and a vertical component is added at each node. The vertical sampling increments would be site specific and require prior approval from the DNR. Refer to Attachment 1 "Guide to Sample Bias" for additional guidance on vertical sampling increments.

SAMPLING OF GRID

Sampling of grids may include all of the grid stations or a phased subset of the total stations. The subset of grid stations is created by assigning coordinates to all the nodes and randomly selecting nodes using a random number generator or a random number table (refer to Attachment 2). A minimum of 12 samples or 25%, whichever is larger, of the total grid stations should be sampled and analyzed initially to allow a large enough data pool for statistical analysis. It is advisable that extra samples also be taken and kept under proper chain of custody and storage procedures at the time of initial sampling. If the statistical analysis indicates that more samples are needed, an additional sample trip to the field may have been avoided. A method for calculating the sample size requirements is presented in Attachment 2 (Lamda relationship).

ESTABLISHING SOIL BACKGROUND

Establishing soil background, as required by Act 307 PA 1982, as amended, Michigan Environmental Response Act (MERA), can be accomplished by utilizing Operational Memorandum #15 or using the following guidance.

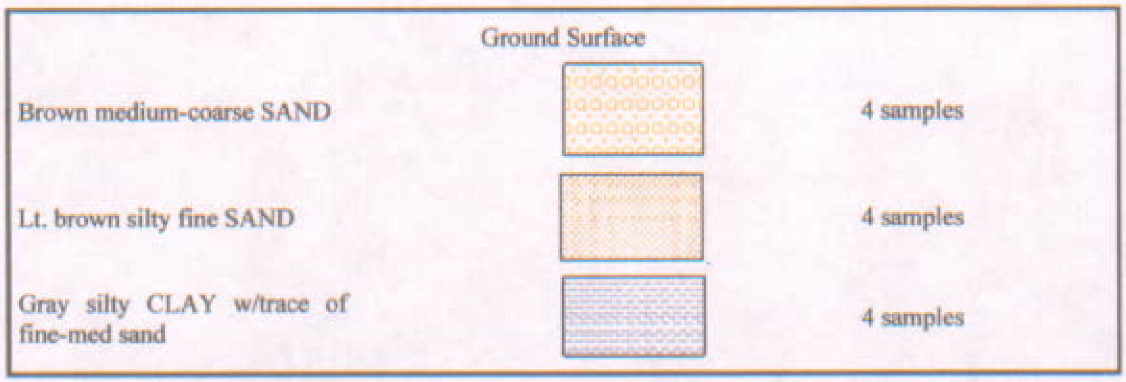
Background should be established for site specific waste constituents, specific chemicals used in various processes, facility operations, or remedial investigation results. Sample analyses may include metals, organic constituents, or other site specific waste constituents. Analyses should be in accordance with Act 307 P.A. 1982, as amended.

Many factors can play a part in the background concentrations of a chemical in soil.

EXAMPLE: The geologic origin (e.g., the parent rock) of glacial drift may have been high in copper, lead, or other metals that may be potential contaminants. Additionally, the hydrogeologic situation can alter the quantity of these elements. Groundwater recharge areas (e.g., highlands) are frequently leached of metals while groundwater discharge areas (e.g., swamps, floodplain) are the recipients of leached metals. Thus, sites in low areas will usually have higher background concentrations than upland areas. Other conditions, such as precipitation and atmospheric fallout from widely dispersed human and natural activities, also affect soil concentrations.

A minimum of four samples must be used to establish "background" in soils. This will help account for natural constituent occurrences and inherent variability within each distinctive soil horizon. Background samples must be collected in an area which has not been impacted by environmental contamination from the site and representative of natural background conditions. Based on waste type, contaminant mobility, operation practices, and soil type (sand, silty sand, clay), an estimate of contamination depth should be made and background samples taken at comparable depths for the particular soil type. Multiple soil horizons should have "background" established separately (e.g., minimum of four samples per each soil unit).

EXAMPLE:



STATISTICAL ANALYSIS FOR ESTABLISHING
BACKGROUND CONCENTRATIONS

The recommended statistical method(s) for establishing background concentrations at medium and large sites are (1) establishing the upper limit of background concentration of a constituent at the mean plus 3 standard deviations, (2) tolerance limit, (3) t-tests, and (4) other statistical methods submitted to the DNR for approval.

1. *Mean Plus 3 Standard Deviation Approach*

   Calculate the "upper limit" of background concentration by using the following 5 step process.

   A. Calculate the background mean (X_b) by dividing the sum of the total background readings by the total number of background readings:

   $$\overline{X_b} = \frac{X_1 + X_2 + ... X_n}{n}$$

   B. Calculate the background variance (S_b^2) by taking the sum of the squares of each reading minus the mean and dividing by the degrees of freedom (the total number of background samples minus one):

$$S_b^2 = \frac{(X_1 - \overline{X}_b)^2 + (X_2 - \overline{X}_b)^2 + ... + (X_n - \overline{X}_b)^2}{n-1}$$

NOTE: Any sample populations less than (n<30 samples) must use n - 1 for degrees of freedom

C. Calculate the background standard deviation (S_b) by taking the square root of the variance:

$$Sb = \sqrt{S_b^2}$$

D. The Coefficient of Variation Test (CV) where

$$CV = \frac{S_b}{\overline{X}_b}$$

is used to evaluate data distribution. The background data should generally have a CV of less than 0.5 for granular soils, less than 0.75 for cohesive soils, or an explanation accounting for higher CV values. The maximum recommended CV is 1. If the data distribution exceeds a CV of 1.0, then a thorough evaluation will need to be made to account for this variability (e.g., lab QA/QC, typographical errors, soil classification, sample location, data not normally distributed, etc.). If the CV exceeds 1.0 and there is sufficient evidence to suggest a data point does not accurately represent background conditions or if QA/QC problems exist which invalidate that data point, the outlier data may be dropped or additional samples collected and analyzed to ensure a sufficient representative data population (n) is achieved. A high concentration in and of itself is not sufficient justification to exclude the data point.

E. Use the $\overline{X_b}$ + 3*S_b of "background" data as the maximum allowable limit or upper limit. Where 3*S_b equals three times the standard deviation and $\overline{X_b}$ equals the background mean (this statistical method only requires one sample per station). Compare each sample point to the calculated maximum allowable limit or upper limit analyzed from background data.

EXAMPLE: Four sand samples from a site were analyzed for background concentrations for lead. Concentrations of lead from the sample analyses returned from the lab were 56, 25, 18, and 35 ppb. Now, the investigator wants to examine the data set to discover whether the 56 ppb sample is an outlier:

$$\overline{X}_b\ mean = \frac{56+25+18+35}{4} = 33.5$$

$$S_b^2 = \frac{[56-33.5]^2+[25-33.5]^2+[18-33.5]^2+[35-33.5]^2}{3} = 273.67$$

$$S_b = \textit{(standard deviation)} = \sqrt{S_b^2} = 16.5$$

$$CV = \frac{16.5}{33.5} = 0.49$$

Because 0.49 is less than 0.5, no further evaluation of the background data set is necessary.

Therefore, the background upper limit value for this site is:

$$\textit{background upper limit} = \overline{X}_b + (3{*}S_b) = 33.5 + (3 * 16.5) = 83.0\ ppb$$

If a value is found to be an outlier which is not representative of background conditions, it may be replaced by another sample that is not an outlier to maintain at least four samples for background determination.

2. *Tolerance Limit.* This statistical procedure is a fairly sensitive program for environmental purposes. It minimizes false positive and is simple to perform. A minimum background data base of n=8 (optimum n=16) is needed for this method. Other suggested criteria follow:

A. The Coefficient of Variation Test (CV) to evaluate data distribution. See this Guidance Document, Part 2, Statistical Analysis for Establishing Background Concentrations, #1.D. (the Coefficient of Variation Test....).

B. Using the mean ($\overline{X}_b$) and standard deviation (S_b), construct the onesided upper tolerance limit (TL) by taking the mean plus a tolerance coefficient (K) at the 95% probability level for a 95% coverage (for K values, see Attachment 3) times the standard deviation as follows:

$$TL = \overline{X}_b + KS_b$$

3. *ttests.* Any ttest should be "approved" by DNR prior to use since there are a number of variations. The Gosset Student ttest (1908) or Cochran's Approximation to the Behren'sFisher Student's ttest as referenced in the 40 CFR Part 264, Appendix IV, are recommended. Note that these statistical comparison methods require that two or more discrete samples be taken at each sampling station.

4. *Other statistical procedures for establishing background.* Refer to a statistical reference book or US EPA's Interim Final Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities (April 1989) and Addendum (July 1992).

PROCEDURES FOR NON-DETECT VALUES

The following provides some guidelines in incorporating non-detectable sample results into the procedure to calculate background concentrations.

5. If less than 50% of the background data is below the detection limit (DL), use ½ of the detection limit as the value.

6. If more than 50% of the background data is below the detection limit, use one of the following procedures.

   - Alternate "0" and the detection limit (DL) resulting in a net value of ½ of the detection limit, with a variance.

EXAMPLE:	Actual Value	Substitute Value
	<DL	DL
	<DL	0
	<DL	DL
	<DL	0

   - The Continuity Correction procedure with the t-test, Cohen's method, or other approved methods.

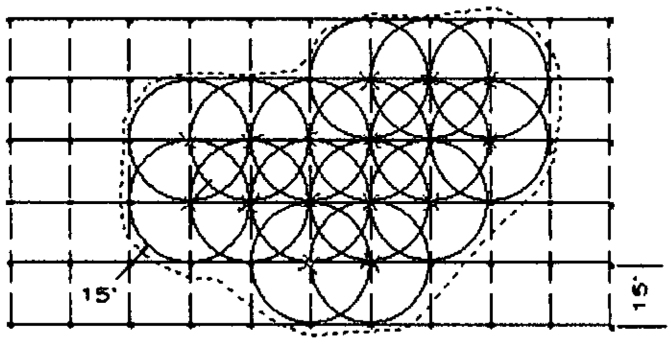
STATISTICAL EVALUATION OF DATA

A detailed description of an acceptable approach for evaluating the data generated by statistically based random sampling strategies such as those described in the foregoing sections is provided in Attachment 2 (page 29). The 95% upper confidence limit (UCL) of the mean is calculated for each constituent of concern and compared to the regulatory threshold (RT) (i.e., cleanup criterion; e.g., Type A or B). If the UCL is less than the RT and an adequate number of samples have been collected and spatially evaluated, the remediation is deemed complete. Attachment 2 also provides a step wise procedure for determining whether an adequate number of samples have been collected, based on the analytical data derived from the initial and subsequent rounds of samples. All evaluations must consider the spatial correlation of sample values (e.g., highest concentrations in the same area), present and future uses of the site, residual risk, and distribution of that risk now and in the future. Other acceptable methods for UCL and sample size calculations can be found in US EPA SW-846, Third Edition, Section 9.1.1.3.

GRID APPROACH TO ADDITIONAL REMEDIATION

1. *TwoDimensional Node Sampling Excavation Grid.* Verification sampling as described above will at times indicate that remediation is incomplete. Excavation of contaminated areas should be based on the established grid system interval (as recommended in this Guidance Document, Part 2). Where a subset of grid points has indicated that the entire area exceeds the cleanup, the nodes adjacent to the sampled nodes that are causing the exceedance should be sampled, and this process repeated until the "Hot spots" requiring removal have been defined. The radius of excavation around the contaminated sample point(s) is equal to the grid interval (GI=r). Excavation depth is to the deepest point of contamination or to the depth where acceptable levels are anticipated. After excavation, the impacted point(s) must be resampled at their new elevations to verify that the area meets the selected cleanup criteria. If continued contamination is detected, the excavation format is repeated until a satisfactory result is obtained.

EXAMPLE:



GL = 150
A = 11,250
GI = 14.9

· Sample Station
x Contaminated Station
r = GI = 15 feet

Remediation of contaminated soil by excavation will be in accordance with Act 307 P.A. 1982, as amended. The proposed remedial action plan must be approved by the DNR.

2. *Two-Dimensional Subcell Sampling Excavation Grid.* Use this Guidance Document, Part 2. The radius of excavation around a contaminated point may need to be adjusted to greater than the GI distance. This adjustment is due to the variable distances between sampling points.

3. *ThreeDimensional Cleanup Verification.* If sampling and statistical analysis using this Guidance Document indicate that Act 307 cleanup criteria have not been met, additional remediation will be required. The sampling protocol and strategies described in Attachment 2 and in SW-846, Third Edition, Volume II, Part III, Chapter 9, are acceptable. All sampling strategies, detection levels, and sampling pathways must be in accordance with Act 307 P.A. 1982, as amended. If any portion of the soil mass in question appears to be causing the material to fail, it may be identified through hot spot sampling and selectively removed. Subsequent sampling must be done to confirm that the remaining material meets Act 307 P.A. 1982, as amended.

4. *Batch Sampling for exsitu treatment processes.* If exsitu treatment processes of contaminated soil or waste is used in the remediation, a sampling program for the process stream needs to be developed. The basis of this program is to get representative samples over time versus a spatial approach (Attachment 2, Sampling Process Streams).

DISPOSAL OPTIONS

Soils remediated to Act 307 P.A. 1982, as amended, standards (Type A and/or Type B) are no longer considered a waste per Act 64 P.A. of 1979, as amended, and RCRA regulations. Disposal of excavated waste, soil, other environmental media, and/or debris must be in accordance with all applicable Federal, State, and local regulations.

REPORT FOR MEDIUM AND LARGE SITES VERIFICATION

Soil cleanup verification reports for medium and large sites must identify the number and location of samples and justify the sample location selected (why and how). The verification report must include the following.

1. MAP(S) AND CROSS SECTIONS
   Provide a scaled map of the floor and walls of the excavation (the vertical and horizontal area treated for in-situ remediations) with sample grid and sample locations identified. Appropriate cross section should depict the stratigraphy, fractures, soil types, and final depth and elevations of the excavation.

2. SAMPLE LOCATION RATIONALE
   a. Properly labeled and easily identified sampling grid stations (map) including background stations
   b. Sample Depths
   c. Sample Collection Procedures
   d. Results of all tests to determine clean closure (charts, tables, lab sheets, field notes, well logs, boring logs)

3. DATA ANALYSES
   a. Analytical parameters
   b. Analytical methods used
   c. Method detection limits
   d. Laboratory Quality Assurance/Quality Control

4. STATISTICAL ANALYSES
   a. Explanation and calculation of background concentrations
   b. Statistical comparisons on sampling results compared to background (this should include full computations on background and statistical analysis)
   c. Lab results

5. Additional information to support closure (e.g., residual risks, spatial correlation of sample values, present and future land uses).

RCRA CLEAN CLOSURE CERTIFICATION CHECKLIST

Attachment 4 is a guide that indicates the information that a facility should provide to certify that their activities meet the conditions for a clean closure under the Act 64/RCRA regulations.

ATTACHMENT 1

GUIDE TO SAMPLE BIAS

Many factors can play a part in the concentrations of contaminants. The following contains some of the factors impacting chemical concentrations and locations.

CHEMICAL TRANSFORMATIONS

Many organic chemicals may undergo aerobic and anaerobic degradation. A description of these processes is beyond the scope of this document. The subject is approached here, however, to be sure that samplers are aware that the chemical(s) spilled may not be the only chemical(s) in the soil after a transformation has occurred. These occurrences should be documented in the remedial investigation. The full scan of chemicals from the remedial investigation requiring cleanup should be analyzed when doing a closure. Analyses should be done for all chemicals that have been identified as breakdown products of the chemicals found on-site.

The professional literature contains many articles on this subject (Cline and Brown, 1989; Borden and Bedient, 1987; Wilson and Wilson, 1985). The interested reader is directed to these articles.

Organic Carbon Content of Soil
The organic carbon content of soils is a key factor in the ability of any soil to adsorb contaminants. For a variety of reasons (Lindsay, 1979), an increase in organic carbon content leads to an increase in the adsorption of several classes of chemicals.

> Where to sample: Areas of the excavation that appear to have excess organic carbon (e.g. peat, muck, darker soils) should be preferentially sampled.

Medium Sand or Larger Grains
Medium to larger grain size sand has from 20 to 40 percent porosity. Most sands in Michigan are composed of quartz, limestone, and small amounts of metamorphic rock fragments. These soils have a low capacity for adsorbing metals or hydrophilic (soluble) organic chemicals. Hydrophobic (insoluble) organic chemicals with low molecular weight will adsorb to this soil in small amounts. Hydrophobic chemicals with high molecular weight will adsorb in moderate amounts (Cline & Brown, 1989). These soils have a low capacity to hold contaminants in the grain interstices due to low capillary action. Contaminants that are held in these soils adhere to the grains themselves in dry soils and are forced into the smaller pore spaces in wet soils (Schwille, 1988).

> Where to sample: Samples should be placed at regular intervals along the base and sidewalls of the excavation being sure that samples are located where the source was removed. In these soils, the capillary force is low enough to ignore its effects in transporting contaminants lateral to gravity. Therefore, sidewall samples should be located near the excavation floor. This is especially true for low surface tension products such as gasoline.
>
> The limestone sand grains can act as a buffer to contaminants that cause pH changes (e.g., steel mill pickling acids). For these types of contaminants, the sampler should be on the lookout for intra-granular precipitates. These can appear as grain surface staining or make the soil appear clumpy or aggregated. Soils containing precipitates should be sampled.

Fine Sand and Silt
These soils have strong capillary action due to the small inter-granular distances. A determination of the fluid surface tension of the spilled product is helpful. High surface tension aids in the ability of a substance to overcome gravity by capillary action. As before, higher molecular weight products can be expected to adsorb to the grains to a greater degree. This allows a product to move lateral to gravity and, to a degree, upward from the leak location. Low surface tension products, such as TCE (trichloroethene), are more likely to go straight down than oils in these kinds of soils. However, the hydraulic head (i.e., the amount of product in the original spill) must be substantial to force a dense non-aqueous phase liquid through a media with a hydraulic conductivity less than 1 x 10^{-3} cm/sec (Schwille, 1988).

Where to sample: Interfaces between fine sand layers with larger grains above should be sampled. When high surface tension contaminants are suspected, silt layers should be sampled.

Clays
Clay soils are very different from the sands and silts. Clays possess a net negative charge. This causes heavy metal cations (e.g., Cr^{+6}, Cd^{+2}, Pb^{+2}) to adsorb to the clay surface. In fact, this is true for any positive ionizable substance. Clays also have a much greater secondary porosity than primary (primary porosity is the space between the soil particles; secondary porosity is the space between fractures, bedding planes, and soil structures). As a result, spills in clay soils tend to follow preferred pathways. Clays will often show signs of shrinkage cracks or fractures that will allow contaminants to migrate in what would otherwise be considered a "tight" soil in a lab analysis of permeability. Signs of fracturing include "patterned" mottling. This is where the Fe (and also Mn) will be oxidized to a red, yellow, or reddish brown color along the crack while the matrix remains the reduced blue/gray color (Lindsay, 1979).

Where to sample: It is very important to take clay soil samples from fractures. The fractures are the avenue of travel for contaminants in clay soils. Clay soils may also have sand lenses which should always be sampled. Sand lenses in clays tend to collect fluids. As such, they may harbor contaminants.

Bedrock
Excavations in bedrock present difficult problems. Unlike clay, some bedrock formations have substantial primary porosity as well as secondary porosity. In Michigan, these are sandstones, conglomerates, and brecciated/coarse grained limestones. Examples of bedrock in Michigan with low primary porosity are fine grained limestones, shale, and crystalline metamorphic rocks (e.g., gneiss). If the sampler is unaware of the type of bedrock that is in an excavation, a geologist must be consulted.

Where to sample: Excavations in areas of bedrock with significant primary porosity must be sampled in both the fractures and the matrix. Bedrock without primary porosity should have sampling predominantly in the fractures as in the clay situation. Weathered zones in bedrock will hold contaminants better than unweathered zones. This is due to the increased number of adsorption sites available in weathered rock.

ATTACHMENT 2

SAMPLING PROTOCOL FOR CHARACTERIZING WASTE/TREATMENT LEVELS:

STRATEGIES FOR EVALUATING TREATED SOILS AND WASTE MATERIALS

When obtaining samples to characterize a treated soil or waste material, it is important to insure that the analytical results obtained will provide an accurate estimation of the nature of the entire area/volume under consideration. The location and number of samples to be taken at a particular site depend on many factors: the degree of accuracy desired, the spatial and temporal variability of the media to be sampled, and the costs involved. An important objective in any sampling program is to obtain the most accurate data possible while minimizing the associated costs. One method to accomplish this goal is to use statistically valid sampling strategies. The appropriate sample number can be estimated and the sampling locations can be chosen without bias.

Attachment 2 provides information on the methods used to obtain accurate data while minimizing the costs. The attachments include a discussion of three statistical sampling strategies and methods to determine the appropriate grid size for the area under investigation. If several areas on a site are under investigation, it may be advisable to grid them separately. This is especially true if information does not exist to indicate that the areas contain similar constituents or that they were placed at the same time period.

Information is also supplied on the statistical evaluation of the resultant analytical data. A minimum of 12 samples or 25%, whichever is greater, of the total grid stations should be sampled and analyzed initially to allow a large enough data pool for the statistical analysis. Extra samples should be taken and kept under proper chain of custody and handling procedures at the time of initial sampling. If the statistical analysis indicates that two or three more samples are needed, an additional trip to the field may not be necessary. This may also avoid the need to reestablish the grid pattern at a later date.

For further discussion on sampling strategies and sample collection methods, see "Test Methods for Evaluating Solid Waste," SW846 Volume II: Field Methods, November 1986, Third Edition, US EPA.

STATISTICAL SAMPLING STRATEGIES

Statistical sampling strategies can often produce increased data accuracy while eliminating sampler bias. Random sampling is based on the theory of random chance probabilities in order to choose the most representative sample. Knowledge of the waste distribution is not necessary. The error in data accuracy of a random sampling scheme can be objectively measured since the probability of choosing each sampling point is known. A random numbers table (attached) or a random numbers generator should be used to select the sampling locations eliminating bias by the sample collector.

Several statistical sampling strategies are available to produce an unbiased, representative sampling program. The principles behind three of these and the situations for which they are best suited are provided below. To achieve true random sampling, composite sampling is not acceptable.

1. *Simple Random* is a method that requires little or no prior knowledge of material distribution. It relies on random chance probability theory--where each sampling location has an equal and known probability of being selected. In this way, sampling error can be accurately estimated. Usually, the area of interest is sectioned into a two or three dimensional grid pattern and random coordinates are chosen for sampling.

2. *Systematic random* is an extension of simple random sampling that may produce a more efficient sampling survey. It can be more efficient by reducing the sampling error while maintaining the sample number, or by reducing the number of samples needed to achieve a specified sampling error, or by reducing the cost of collection. This method also requires little or no knowledge about the waste distribution, but bias and imprecision can be introduced if unseen trends or cycles exist. Two methods used to select sample locations under this method follow.

   A) randomly selecting a transect or transects and sampling at preselected intervals

   B) preselecting both the transect or transects and the sampling interval and starting from a randomly selected point.

3. *Stratified random sampling* requires some knowledge about the waste distribution. When stratification is known or suspected, sampling efficiency can be improved by dividing the material into strata that are more homogeneous than the total area. Simple random sampling techniques can then be used to sample each stratum independently. Each stratum is divided into a grid pattern and the sampling points are selected randomly. If the area is vertically stratified, the sampling points in each stratum are selected randomly and then selected depths are sampled. If the area is horizontally stratified, the sampling points within each stratum are selected randomly, but the total depth is sampled. An analysis of variance (ANOVA) should be done on the analytical results to determine if the strata differ significantly. This is done to assure that the use of stratified random sampling was statistically valid. When the volume of the strata differ or the number of samples within each strata differs, the results must be weighed appropriately to avoid bias.

809 106

RANDOM NUMBERS TABLE

HOW TO USE THE RANDOM NUMBERS TABLE

1. Determine the number of samples you need to take. Identify the number of digits necessary to cover the sample population (e.g., for a sample population of 55, two digits are necessary to cover the selected grid stations 01 through 55).

2. Using the random numbers table, choose any number as a starting point.

3. From this starting point number, go in any direction and continue in the same direction and pattern sequence until you have selected the predetermined number of samples with no repetitions. Numbers larger than the population size are ineligible (e.g., numbers greater than 55 in the example are ineligible).

Line/Col.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
1	10480	15011	01536	02011	81647	91646	69179	14194	62590	36207	20969	99570	91291	90700
2	22368	46573	25595	85393	30995	89198	27982	53402	93965	34095	52666	19174	39615	99505
3	24130	48360	22527	97265	76393	64809	15179	24830	49340	32081	30680	19655	63348	58629
4	42167	93093	06243	61680	07856	16376	39440	53537	71341	57004	00849	74917	97758	16379
5	37570	39975	81837	16656	06121	91782	60468	81305	49684	60672	14110	06927	01263	54613
6	77921	06907	11008	42751	27756	53498	18602	70659	90655	15053	21916	81825	44394	42880
7	99562	72905	56420	69994	98872	31016	71194	18738	44013	48840	63213	21069	10634	12952
8	96301	91977	05463	07972	18876	20922	94595	56869	69014	60045	18425	84903	42508	32307
9	89579	14342	63661	10281	17453	18103	57740	84378	25331	12566	58678	44947	05585	56941
10	85475	36857	43342	53988	53060	59533	38867	62300	08158	17983	16439	11458	18593	64952
11	28918	69578	88231	33276	70997	79936	56865	05859	90106	31595	01547	85590	91610	78188
12	63553	40961	48235	03427	49626	69445	18663	72695	52180	20847	12234	90511	33703	90322
13	09429	93969	52636	92737	88974	33488	36320	17617	30015	08272	84115	27156	30613	74952
14	10365	61129	87529	85689	48237	52267	67689	93394	01511	26358	85104	20285	29975	89868
15	07119	97336	71048	08178	77233	13916	47564	81056	97735	85977	29372	74461	28551	90707
16	51085	12765	51821	51259	77452	16308	60756	92144	49442	53900	70960	63990	75601	40719
17	02368	21382	52404	60268	89368	19885	55322	44819	01188	65255	64835	44919	05944	55157
18	01011	54092	33362	94904	31273	04146	18594	29852	71585	85030	51132	01915	92747	64951
19	52162	53916	46369	58586	23216	14513	83149	98736	23495	64350	94738	17752	35156	35749
20	07056	97628	33787	09998	42698	06691	76988	13602	51851	46104	88916	19509	25625	58104
21	48663	91245	85828	14346	09172	30168	90229	04734	59193	22178	30421	61666	99904	32812
22	54164	58492	22421	74103	47070	25306	76468	26384	58151	06646	21524	15227	96909	44592
23	32639	32363	05597	24200	13363	38005	94342	28728	35806	06912	17012	64161	18296	22851
24	29334	27001	87637	87308	58731	00256	45834	15398	46557	41135	10367	07684	36188	18510
25	02488	33062	28834	07351	19731	92420	60952	61280	50001	67658	32586	86679	50720	94953

Line/Col.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
26	81525	72295	04839	96423	24878	82651	66566	14778	76797	14780	13300	87074	79666	95725
27	29676	20591	68086	26432	46901	20849	89768	81536	86645	12659	92259	57102	80428	25280
28	00742	57392	39064	66432	84673	40027	32832	61362	98947	96067	64760	64584	96096	98253
29	05366	04213	25669	26422	44407	44048	37937	63904	45766	66134	75470	66520	34693	90449
30	91921	26418	64117	94305	26766	25940	39972	22209	71500	64568	91402	42416	07844	69618
31	00582	04711	87917	77341	42206	35126	74087	99547	81817	42607	43808	76655	62028	76630
32	00725	69884	62797	56170	86324	88072	76222	36086	84637	93161	76038	65855	77919	88006
33	69011	65797	95876	55293	18988	27354	26575	08625	40801	59920	29841	80150	12777	48501
34	25976	57948	29888	88604	67917	48708	18912	82271	65424	69774	33611	54262	85963	03547
35	09763	83473	73577	12908	30883	18317	28290	35797	05998	41688	34952	37888	38917	88050
36	91567	42595	27958	30134	04024	86385	29880	99730	55536	84855	29080	09250	79656	73211
37	17955	56349	90999	49127	20044	59931	06115	20542	18059	02008	73708	83517	36103	42791
38	46503	18584	18845	49618	02304	51038	20655	58727	28168	15475	56942	53389	20562	87338
39	92157	89634	94824	78171	84610	82834	09922	25417	44137	48413	25555	21246	35509	20468
40	14577	62765	35605	81263	39667	47358	56873	56307	61607	49518	89656	20103	77490	18062
41	98427	07523	33362	64270	01638	92477	66969	98420	04880	45585	46565	04102	46880	45709
42	34914	63976	88720	82765	34476	17032	87589	40836	32427	70002	70663	88863	77775	69348
43	70060	28277	39475	46473	23219	53416	94970	25832	69975	94884	19661	72828	00102	66794
44	53976	54914	06990	67245	68350	82948	11398	42878	80287	88267	47363	46634	06541	97809
45	76072	29515	40980	07391	58745	25774	22987	80059	39911	96189	41151	14222	60697	59583
46	90725	52210	83974	29992	65831	38857	50490	83765	55657	14361	31720	57375	56228	41546
47	64364	67412	33339	31926	14883	24413	59744	92351	97473	89286	35931	04110	23726	51900
48	08962	00358	31662	25388	61642	34072	81249	35648	56891	69352	48373	45578	78547	81788
49	95012	68379	93526	70765	10593	04542	76463	54328	02349	17247	28865	14777	62730	92277
50	15664	10493	20492	38391	91132	21999	59516	81652	27195	48223	46751	22923	32261	85653
51	16408	81899	04153	53381	79401	21438	83035	92350	36693	31238	59649	91754	72772	02338
52	18629	81953	05520	91962	04739	13092	97662	24822	94730	06496	35090	04822	86772	98289
53	73115	35101	47498	87637	99016	71060	88824	71013	18735	20286	23153	72924	35165	43040
54	57491	16703	23167	49323	45021	33132	12544	41035	80780	45393	44812	12515	98931	91202
55	30405	83946	23792	14422	15059	45799	22716	19792	09983	74353	68668	30429	70735	25499
56	16631	35006	85900	98275	32388	52390	16815	69298	82732	38480	73817	32523	41961	44437
57	96773	20206	42559	78985	05300	22164	24369	54224	35083	19687	11052	91491	60383	19746
58	38935	64202	14349	82674	66523	44133	00697	35552	35970	19124	63318	29686	03387	59846
59	31624	76384	17403	53363	44167	64486	64758	75366	76554	31601	12614	33072	60332	92325
60	78919	19474	23632	27889	47914	02584	37680	20801	72152	39339	34806	08930	85001	87820
61	03931	33309	57047	74211	63445	17361	62825	39908	05607	91284	68833	25570	38818	46920
62	74426	33278	43972	10119	89917	15665	52872	73823	73144	88662	88970	74492	51805	99378
63	09066	00903	20795	95452	92648	45454	09552	88815	16553	51125	79375	97596	16296	66092
64	42238	12426	87025	14267	20979	04508	64535	31355	86064	29472	47689	05974	52468	16834
65	16153	08002	26504	41744	81959	65642	74240	56302	00033	67107	77510	70625	28725	34191
66	21457	40742	29820	96783	29400	21840	15035	34537	33310	06116	95240	15957	16572	06004
67	21581	57802	02050	89728	17937	37621	47075	42080	97403	48626	68995	43805	33386	21597
68	55612	78095	83197	33732	05810	24813	86902	60397	16489	03264	88525	42786	05269	92532
69	44657	66999	99324	51281	84463	60563	79312	93454	68876	25471	93911	25650	12682	73572
70	91340	84979	46949	81973	37949	61023	43997	15263	80644	43942	89203	71795	99533	50501
71	91227	21199	31935	27022	84067	05462	35216	14486	29891	68607	41867	14951	91696	85063
72	50001	38140	66321	19924	72163	09538	12151	06878	91903	18749	34405	56087	82790	70923
73	65390	05224	72958	28609	81406	39147	25549	48542	42627	45233	57202	94617	23772	07896
74	27504	96131	83944	41575	10573	08619	64482	73923	36152	05184	94142	25299	84387	34925
75	37169	94851	39117	89632	00959	16487	65536	49071	39782	17095	02330	74301	00275	48280
76	11508	70225	51111	38351	19444	66499	71945	05422	13442	78675	84081	66938	93654	59894
77	37449	30362	06694	54690	04052	53115	62757	95348	78662	11163	81651	50245	34971	52924
78	46515	70331	85922	38329	57015	15765	97161	17869	45349	61796	66345	81073	49106	79860
79	30986	81223	42416	58353	21532	30502	32305	86482	05174	07901	54339	58861	74818	46942
80	63798	64995	46583	09765	44160	78128	83991	42865	92520	83531	80377	35909	81250	54238
81	82486	84846	99254	67632	43218	50076	21361	64816	51202	88124	41870	52689	51275	83556
82	21885	32906	92431	09060	64297	51674	64126	62570	26123	05155	59194	52799	28225	85762
83	60336	98782	07408	53458	13564	59089	26445	29789	85205	41001	12535	12133	14645	23541
84	43937	46891	24010	25560	86355	33941	25786	54990	71899	15475	95434	98227	21824	19585
85	97656	63175	89303	16275	07100	92063	21942	18611	47348	20203	18534	03862	78095	50136
86	03299	01221	05418	38982	55758	92237	26759	86367	21216	98442	08303	56613	91511	75928
87	79626	06486	03574	17668	07785	76020	79924	25651	83325	88428	85076	72811	22717	50585
88	85636	68335	47539	03129	65651	11977	02510	26113	99447	68645	34327	15152	55230	93448
89	18039	14367	61337	06177	12143	46609	32989	74014	64708	00533	35398	58408	13261	47908
90	08362	15656	60627	36478	65648	16764	53412	09013	07832	41574	17639	82163	60859	75367
91	79556	29068	04142	16268	15387	12856	66227	38358	22478	73373	88732	09443	82558	05250
92	92608	82674	27072	32534	17075	27698	98204	63863	11951	34648	88022	56148	34925	57031
93	23982	25835	40055	67006	12293	02753	14827	22235	35071	99704	37543	11601	35503	85171
94	09915	96306	05908	97901	28395	14186	00821	80703	70426	75647	76310	88717	37890	40129
95	50937	33300	26695	62247	69927	76123	50842	43834	86654	70959	79725	93872	28117	19233
96	42488	78077	69882	61657	34136	79180	97526	43092	04098	73571	80799	76536	71255	64239
97	46764	86273	63003	93017	31204	36692	40202	35275	57306	55543	53203	18098	47625	88684
98	03237	45430	55417	63282	90816	17349	88298	90183	36600	78406	06216	95787	42579	90730
99	86591	81482	52667	61583	14972	90053	89534	76036	49199	43716	97548	04379	46370	28672
100	38534	01715	94964	87288	65680	43772	39560	12918	86537	62738	19636	51132	25739	56947

Line/Col.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
101	13284	16834	74151	92027	24670	36665	00770	22878	02179	51602	07270	76517	97275	45960
102	21224	00370	30420	03883	96648	89428	41583	17564	27395	63904	41548	49197	82277	24120
103	99052	47887	81085	64933	66279	80432	65793	83287	34142	13241	30590	97760	35848	91983
104	00199	50993	98603	38452	87890	94624	69721	57484	67501	77638	44331	11257	71131	11059
105	60578	06483	28733	37867	07936	98710	98539	27186	31237	80612	44488	97819	70401	95419
106	91240	18312	17441	01929	18163	69201	31211	54288	39296	37318	65724	90401	79017	62077
107	97458	14229	12063	59611	32249	90466	33216	19358	02591	54263	88449	01912	07436	50813
108	35249	38646	34475	72417	60514	69257	12489	51924	86871	92446	36607	11458	30440	52639
109	38980	46600	11759	11900	46743	27860	77940	39298	97838	95145	32378	68038	89351	37005
110	10750	52745	38749	87365	58959	53731	89295	59062	39404	13198	59960	70408	29812	83126
111	36247	27850	73958	20673	37800	63835	71051	84724	52492	22342	78071	17456	96104	18327
112	70994	66986	99744	72438	01174	42159	11392	20724	54322	36923	70009	23233	65438	59685
113	99638	94702	11463	18148	81386	80431	90628	52506	02016	85151	88598	47821	00265	82525
114	72055	15774	43857	99805	10419	76939	25993	03544	21560	83471	43989	90770	22965	44247
115	24038	65541	85788	55835	38835	59399	13790	35112	01324	39520	76210	22467	83275	32286
116	74976	14631	35908	28221	39470	91548	12854	30166	09073	75887	36782	00268	97121	57676
117	35553	71628	70189	26436	63407	91178	90348	55359	80392	41012	36270	77786	89578	21059
118	35676	12797	51434	82976	42010	26344	92920	92155	58807	54644	58581	95331	78629	73344
119	74815	67523	72985	23183	02446	63594	98924	20633	58842	85961	07648	70164	34994	67662
120	45246	88048	65173	50989	91060	89894	36063	32819	68559	99221	49475	50558	34698	71800
121	76509	47069	86378	41797	11910	49672	88575	97966	32466	10083	54728	81972	58975	30761
122	19689	90332	04315	21358	97248	11188	39062	63312	52496	07349	79178	33692	57352	72862
123	42751	35318	97513	61537	54955	08159	00337	80778	27507	95478	21252	12746	37554	97775
124	11946	22681	45045	13964	57517	59419	58045	44067	58716	58840	45557	96345	33271	53464
125	96518	48688	20996	11090	48396	57177	83867	86464	14342	21545	46717	72364	86954	55580

SAMPLING GRIDS

1. A grid system should be established over the specified area (sidewalls and base). Grid point representation should be proportioned to the size of the area. It is recommended that one of the following equations be used to determine grid intervals for stationing.

$$\text{small site: } \frac{\sqrt{A/\pi}}{2} = GI$$

$$\text{medium site: } \frac{\sqrt{A/\pi}}{4} = GI$$

$$\text{large site: } \sqrt{\frac{A\pi}{SF}} = GI$$

where: A = area to be grid (square feet)
GI = grid interval
SF = Site Factor, length of area to be grid (unitless)
π = 3.14159

It appears that there are logical size ranges of sites to which the grid equations apply:

A) small: up to 0.25 acre

B) medium: 0.25 3.0 acres

C) large: 3.0 acres and greater

To simplify this application, use the following chart based on an average size range of sites (1 acre = 43,560 square feet). The approximate grid ranges are provided as a quick check on numbers generated for specific sites using the above formulas.

*Site Acreage**	*Square Feet**	*~Grid Interval Ranges*
up to 0.25 (small)	up to 10,890	See Part 1
0.25-3.00 (medium)	10,890-130,680	15-50 feet
3.0 and over (large)	130,680 +	30 feet plus

* Site acreage, square footage, is total area of sidewalls and base of excavation.

2. After the grid interval is calculated, it is recommended that a scaled grid overlay be made to superimpose on a map of the remediated area (this area includes both sidewalls and base). Some specified point (usually the southwest corner) should be designated as the 0,0 coordinate. The grid can then be adjusted to maximize sampling coverage. Some grid adjustment may be necessary for unusually shaped areas.

STATISTICAL EVALUATION
WASTE/TREATMENT CHARACTERIZATION SAMPLINGS

Following is a step by step description of the approach used to calculate confidence limits based on the analytical data derived from the preliminary samples.

1. Calculate a preliminary estimate of the mean, $\overline{X}$

$$\overline{X} = \frac{\sum_{i=1}^{n} X_i}{n}$$

where: n = number of measurements
X = variable concentration
X_i = individual measurements

2. Calculate a preliminary estimate of the variance (S^2) and the standard deviation (S). Standard deviation is a function of both sampling variability and measurement variability.

$$S^2 = \frac{\sum_{i=1}^{n} X_i^2 - \frac{(\sum_{i=1}^{n} X_i)^2}{n}}{n-1}$$

$$S = \sqrt{S^2}$$

3. Calculate the standard error of the mean (S_x). Standard error is inversely proportional to the square root of the number of samples (increasing n from 4 to 16 reduces S_x by 50%).

$$S_x = \frac{S}{\sqrt{n}}$$

4. Since the concern is only whether the upper limit of a confidence interval is below or above the regulatory threshold, the lower confidence limit (LCL) need not be considered. The upper confidence limit (UCL) can be calculated using the onetailed (onesided) t values with n1 degrees of freedom derived from a table of the Student's t distribution. Where only small sized statistical samples are involved ($n<30$), the normal or Gaussian distribution is not accurate, and the t distribution must be used.

5. The 95% UCL is calculated by using the following formula and substituting the values determined above plus the appropriate t value obtained from the t table.

$$\text{UCL} = \overline{X} + [t_{0.95}(n-1)]S_x$$

The term in brackets indicates a one-tailed t-test at n-1 degrees of freedom. See the t-distribution table in Attachment 2.

The UCL number resulting from this formula will indicate with a 95% probability that it is either above or below the regulatory threshold (RT) developed for the constituent being subjected to the test. If a compound does not have a specified RT, then the UCL is compared to whatever concentration is of concern (i.e., a clean up level, action level, etc). Other confidence levels can be used, based on the specific sampling situation.

If the preliminary data indicate that more samples are needed to make a hazard determination, the Lambda relationship should be used. A step by step approach to calculating the appropriate sample size follows:

1. The appropriate number of samples to be collected can be estimated by use of the Lambda (λ) relationship and then consulting a table of values and their corresponding sample size number.

$$\lambda = \frac{RT - \overline{X}}{S}$$

The lower the calculated value, the more samples are required to maintain a certain level of confidence. Also, as $\overline{X}$ approaches RT, λ becomes smaller, and therefore a greater sample size is indicated for a certain level of confidence.

2. To obtain the appropriate sample size from the table of values, use the single sided value for to test at the desired significance level (for 5%, = 0.05).

3. Randomly collect any additional samples that may be needed using the same grid and random numbers sequence as the first sampling. All field and laboratory procedures should be kept as consistent as possible to lower the amount of variability in the data.

4. Use all data values to calculate new $\overline{X}$, S, and S_x.

5. If the new $\overline{X} \geq$ RT, then the contaminant is present at an unacceptable concentration and the study would be complete.

6. If $\overline{X}$ < RT and $\overline{X}$ > S^2, calculate C (the criterion for determining if contamination is present at hazardous concentration). If $\overline{X} = S^2$ or $\overline{X} < S^2$, the data must be transformed prior to calculating C.

Using the new data, C is calculated by the formula:

$$C = \frac{RT - \overline{X}}{S_x}$$

7. Compare the calculated C value to the twotailed t value for the level of significance desired. The two-tailed t-value is used because both the possibility that C is > t or that C is $\leq$ t must be checked.

   Use $t_{0.95}$ and df (degrees of freedom) = n-1.

8. If C > t value, the contaminant is present at unacceptable concentrations and the study would be over. If C < t value, reestimate the total number of additional samples to be collected by deriving a new Lambda. Use the newly calculated values of X and S.

9. If this new number of samples is not more than 20% greater than the last set collected, there is little chance that additional samples would decrease Sx and result in the material being considered unacceptable. Therefore, the study would be complete.

EXAMPLE

CALCULATION OF CONFIDENCE LIMITS AND LAMDA CALCULATION

Problem 1: *STATISTICAL SAMPLING*

A metal plating factory has been discharging process wastewaters into a large nearby swampy area for several years. This swampy area drains into a small river. The discharged wastewaters are known to be contaminated with very low levels of cadmium and chromium (i.e., the levels in the wastewater are below the facilities NPDES permit limitations). However, it has been suspected that the sediments in this swampy area may contain high levels of cadmium and chromium. Three preliminary sediment samples were taken with a Ponar dredge and analyzed to determine whether or not these sediments were contaminated with hazardous levels of these two metals. In 40 CFR 261.24, it states that a waste is hazardous under the characteristic of EP toxicity if it contains cadmium at a level $\geq$1.0 mg/l or chromium at a level $\geq$5.0 mg/l. The analysis of the three preliminary samples indicated a mean cadmium concentration of 0.37 mg/l (3 samples at 0.25, 0.51, and 0.35 mg/l) and a mean chromium concentration of 4.66 mg/l (3 samples at 4.93, 4.21, and 4.84 mg/l). Based on this analytical data, the cadmium level is well below the regulatory threshold (RT), but the chromium level closely approaches its RT. Because large legal or monetary losses may be incurred if the sediments are declared hazardous, the analytical data must be sound and a high degree of confidence is necessary in any decision made.

QUESTIONS: Given the above scenario, answer the following questions and calculate the appropriate answers.

1. Based on the chromium data supplied

    Calculate S^2, S, Sx

    Calculate the 95% UCL

    With what degree of confidence can it be stated that the chromium concentration does not exceed the RT?

2. If more samples are deemed necessary, determine how many

    Calculate the Lambda value

    Calculate the appropriate number of additional samples using $\alpha = 0.05$ and $\beta = 0.05$

PROBLEM 1 ANSWER SHEET
Given three samples with chromium concentrations of 4.93, 4.21, and 4.84 mg/l and

$$\overline{X} = 4.66\ mg/l$$

(1a) Calculate S^2

$$S^2 = \frac{\sum_{i=1}^{n} X_i^2 - \frac{(\sum_{i=1}^{n} X_i)^2}{n}}{n-1}$$

$$= \frac{4.93^2 + 4.21^2 + 4.84^2 - (4.93 + 4.21 + 4.84)^2 / 3}{2}$$

$$= 0.15$$

Calculate S

$$S = \sqrt{S} = \sqrt{0.15} = 0.39$$

Calculate S_x

$$S_x = \frac{S}{\sqrt{n}} = \frac{0.39}{\sqrt{3}} = 0.23$$

(1b) Calculate the 95% UCL

$$\text{UCL} = \overline{X} + [t_{0.95}(n-1)]S_x$$

$$= 4.66 + (2.920)*(0.23)$$

$$= 5.33$$

(1c)

$$90\%\ \text{UCL} = \overline{X} + [t_{0.90}(n-1)]S_x$$

$$= 4.66 + (1.886)*(0.23)$$

$$= 5.09$$

$$80\%\ \text{UCL} = \overline{X} + [t_{0.80}(n-1)]S_x$$

$$= 4.66 + (1.061)*(0.23)$$

$$= 4.90$$

The preceding two calculations indicate that it can be stated with somewhere between 80% and 90% confidence that the chromium concentration does not exceed the RT. This degree of confidence may not be sufficient to meet the needs of the sampling plan. Therefore, more samples may need to be taken.

2a. Calculate the Lambda value

$$\lambda = \frac{RT - \overline{X}}{S} = \frac{5.0 - 4.66}{0.39} = 0.87$$

2b. Calculate the number of additional samples

Using Attachment 2, Number of Observations for t Test of Mean, page 36 of this Guidance Document, using a single-sided test with alpha=0.05 and ß=0.05, approximately 15 to 17 total samples need to be collected. Therefore, based on the three preliminary samples that were collected, an additional 13 samples need to be taken.

Cumulative t Distribution

one-tailed		0.550	0.750	0.080	0.900	0.950	0.975	0.990	0.995
two-tailed		0.100	0.500	0.600	0.800	0.900	0.950	0.980	0.990
					p				
	1	0.158	1.000	1.376	3.078	6.314	12.706	31.821	63.657
	2	0.142	0.816	1.061	1.886	2.920	4.303	6.925	9.925
	3	0.137	0.765	0.978	1.638	2.353	3.182	4.541	5.841
	4	0.134	0.741	0.941	1.533	2.132	2.776	3.747	4.604
	5	0.132	0.727	0.920	1.476	2.015	2.571	3.365	4.032
	6	0.131	0.718	0.906	1.440	1.943	2.447	3.143	3.707
	7	0.130	0.711	0.896	1.415	1.895	2.365	2.998	3.499
	8	0.130	0.706	0.889	1.397	1.860	2.306	2.896	3.355
	9	0.129	0.703	0.883	1.383	1.833	2.262	2.821	3.250
	10	0.129	0.700	0.879	1.372	1.812	2.228	2.764	3.169
	11	0.129	0.697	0.876	1.363	1.796	2.201	2.718	3.106
	12	0.128	0.695	0.873	1.356	1.782	2.179	2.681	3.055
	13	0.128	0.694	0.870	1.350	1.771	2.160	2.650	3.012
	14	0.128	0.692	0.868	1.345	1.761	2.145	2.624	2.977
	15	0.128	0.691	0.866	1.341	1.753	2.131	2.602	2.947
	16	0.128	0.690	0.865	1.337	1.746	2.120	2.583	2.921
	17	0.128	0.689	0.863	1.333	1.740	2.110	2.567	2.898
	18	0.127	0.688	0.862	1.330	1.734	2.101	2.552	2.878
df	19	0.127	0.688	0.861	1.328	1.729	2.093	2.539	2.861
(n-1)	20	0.127	0.687	0.860	1.325	1.725	2.086	2.528	2.845
	21	0.127	0.686	0.859	1.323	1.721	2.080	2.518	2.831
	22	0.127	0.686	0.858	1.321	1.717	2.074	2.508	2.819
	23	0.127	0.685	0.858	1.319	1.714	2.069	2.500	2.807
	24	0.127	0.685	0.857	1.318	1.711	2.064	2.492	2.797
	25	0.127	0.684	0.856	1.316	1.708	2.060	2.485	2.787
	26	0.127	0.684	0.856	1.315	1.706	2.056	2.479	2.779
	27	0.127	0.684	0.855	1.314	1.703	2.052	2.473	2.771
	28	0.127	0.683	0.855	1.313	1.701	2.048	2.467	2.763
	29	0.127	0.683	0.854	1.311	1.699	2.045	2.462	2.756
	30	0.127	0.683	0.854	1.310	1.697	2.042	2.457	2.750
	40	0.126	0.681	0.851	1.303	1.684	2.021	2.423	2.704
	60	0.126	0.679	0.848	1.296	1.671	2.000	2.390	2.660
	120	0.126	0.677	0.845	1.289	1.658	1.980	2.358	2.617
		0.126	0.674	0.842	1.282	1.645	1.960	2.326	2.576

NOTE: For one-tailed distributions $\alpha/2 = 1\text{-}p$
For two-tailed distributions $\alpha = 1\text{-}p$

NUMBER OF OBSERVATIONS FOR t TEST OF MEAN
Level for t Test

Single-sided	α=0.005	α=0.01	α=0.025	α=0.05
Double-sided	α=0.01	α=0.02	α=0.05	α=0.1

λ	ß=0.01	0.05	0.1	0.2	0.5	0.01	0.05	0.1	0.2	0.5	0.01	0.05	0.1	0.2	0.5	0.01	0.05	0.1	0.2	0.5
0.05																				
0.10																				
0.15																				122
0.20										139					99					70
0.25					110					90				128	64			139	101	45
0.30				134	78				115	63			119	90	45		122	97	71	32
0.35			125	99	58			109	85	47		109	88	67	34		90	72	52	24
0.40		115	97	77	45		101	85	66	37	117	84	68	51	26	101	70	55	40	19
0.45		92	77	62	37	110	81	68	53	30	93	67	54	41	21	80	55	44	33	15
0.50	100	75	63	51	30	90	66	55	43	25	76	54	44	34	18	65	45	36	27	13
0.55	83	63	53	42	26	75	55	46	36	21	63	45	37	28	15	54	38	30	22	11
0.60	71	53	45	36	22	63	47	39	31	18	53	38	32	24	13	46	32	26	19	9
0.65	61	46	39	31	20	55	41	34	27	16	46	33	27	21	12	39	28	22	17	8
0.70	53	40	34	28	17	47	35	30	24	14	40	29	24	19	10	34	24	19	15	8
0.75	47	36	30	25	16	42	31	27	21	13	35	26	21	16	9	30	21	17	13	7
0.80	41	32	27	22	14	37	28	24	19	12	31	22	19	15	9	27	19	15	12	6
0.85	37	29	24	20	13	33	25	21	17	11	28	21	17	13	8	24	17	14	11	6
0.90	34	26	22	18	12	29	23	19	16	10	25	19	16	12	7	21	15	13	10	5
0.95	31	24	20	17	11	27	21	18	14	9	23	17	14	11	7	19	14	11	9	5
1.00	28	22	19	16	10	25	19	16	13	9	21	16	13	10	6	18	13	11	8	5
1.1	24	19	16	14	9	21	16	14	12	8	18	13	11	9	6	15	11	9	7	
1.2	21	16	14	12	8	18	14	12	10	7	15	12	10	8	5	13	10	8	6	
1.3	18	15	13	11	8	16	13	11	9	6	14	10	9	7		11	8	7	6	
1.4	16	13	12	10	8	14	11	10	9	6	12	9	8	7		10	8	7	5	
1.5	15	12	11	9	7	13	10	9	8	6	11	8	7	6		9	7	6		
1.6	13	11	10	8	6	12	10	9	7	5	10	8	7	6		8	6	6		
1.7	12	10	9	8	6	11	9	8	7		9	7	6	5		8	6	5		
1.8	12	10	9	8	6	10	8	7	7		8	7	6			7	6			
1.9	11	9	8	7	6	10	8	7	6		8	6	6			7	5			
2.0	10	8	8	7	5	9	7	7	6		7	6	5			6				
2.1	10	8	7	7		8	7	6	6		7	6				6				
2.2	9	8	7	6		8	7	6	5		7	6				6				
2.3	9	7	7	6		8	6	6			6	5				5				
2.4	8	7	7	6		7	6	6			6									
2.5	8	7	6	6		7	6	6			6									
3.0	7	6	6	5		6	5	5			5									
3.5	6	5	5			5														
4.0	6																			

99% confidence

95% confidence

809 117

SAMPLING PROCESS STREAMS

Although sampling is generally thought to occur on a pile of material or over an area of treated soil, other schemes are possible. The most common instance is when the material is to be sampled at the point of generation. This is the preferred method, since it is most representative of the material under study. The lack of exposure to elements that might cause chemical degradation and/or leaching will result in material most indicative of actual conditions.

A sampling point along the material conveyor that can be fairly easily and safely reached should be chosen. It should be in an area where the entire belt can be accessed for sampling. Under this scenario, a temporal, rather than a spatial, approach needs to be used.

Time stratum should be established over the course of the process day. Ideally, the entire active time of the line should be included in the sampling scheme. Once time strata are chosen, the random numbers table can be used to establish sampling times. For a four hour period, a point somewhere on the table would be chosen and every number greater than 0 but less than 240 would be selected until the number of samples for that strata were obtained. The number would relate to time in minutes. This would be added to the starting time for that strata to determine the time of sampling.

If the time strata chosen are of unequal lengths, the number of samples chosen from any one strata should reflect the percentage contribution that strata makes to the time frame as a whole. For example, if for a 24 hour operating time, strata 1 is 4 hours and strata 2 is 8 hours, strata 2 should have twice as many samples as strata 1.

When the appropriate sampling time arrives, the material from the conveyor belt point that had been identified would be removed. This material should be well mixed and a subsample taken for inclusion in the jar for lab analysis. An example of the use of this protocol is attached.

RANDOM TIME WASTE SAMPLING EXAMPLE

	Sampling Point	Random Minute	Time
Stratum #1			
6:00 to 8:00 hours	1	28	6:28
	2	62	7:02
	3	99	7:39
	4	112	7:52
Stratum #2			
8:00 to 20:00 hours	1	11	8:11
	2	107	9:47
	3	156	10:36
	4	173	10:53
	5	296	12:56
	6	313	13:13
	7	398	14:38
	8	497	16:17
	9	555	17:15
	10	600	18:00
	11	637	18:37
	12	706	19:46
Stratum #3			
20:00 to 22:00 hours	1	13	20:13
	2	52	20:52
	3	88	21:28
	4	108	21:48
Stratum #4			
8:00 to 20:00 hours	1	48	22:48
	2	113	23:53
	3	153	24:33
	4	189	1:09
	5	290	2:49
	7	314	3:14
	8	474	5:44

ATTACHMENT 3
TOLERANCE FACTORS (*K*)
TOLERANCE FACTORS (*K*) FOR ONE-SIDED NORMAL TOLERANCE INTERVALS WITH PROBABILITY LEVEL (CONFIDENCE FACTOR) Y = 0.95 AND COVERAGE P = 95%

n	*K*	n	*K*
3	7.655	75	1.972
4	5.145	100	1.924
5	4.202	125	1.891
6	3.707	150	1.868
7	3.399	175	1.850
8	3.188	200	1.836
9	3.031	225	1.824
10	2.911	250	1.814
11	2.815	275	1.806
12	2.736	300	1.799
13	2.670	325	1.792
14	2.614	350	1.787
15	2.566	375	1.782
16	2.523	400	1.777
17	2.486	425	1.773
18	2.453	450	1.769
19	2.423	475	1.766
20	2.396	500	1.763
21	2.371	525	1.760
22	2.350	550	1.757
23	2.329	575	1.754
24	2.309	600	1.752
25	2.292	625	1.750
30	2.220	650	1.748
35	2.166	675	1.746
40	2.126	700	1.744
45	2.092	725	1.742
50	2.065	750	1.740
55	2.036	775	1.739
60	2.017	800	1.737
65	2.000	825	0.736
70	1.986	850	1.734
		875	1.733
		900	1.732
		925	1.731
		950	1.729
		975	1.728
		1000	1.727

SOURCE: FOR SAMPLE SIZES < 50: Lieberman, Gerald F. 1958. "Tables for One-sided Statistical Tolerance Limits." Industrial Quality Control. Vol. XIV, No. 10.

FOR SAMPLE SIZES > 50: K values were calculated from large sample approximation.

NTIS Document PB-89-151-047

ATTACHMENT 4

WASTE MANAGEMENT DIVISION'S

CLEAN CLOSURE CERTIFICATION CHECKLIST

This checklist was developed to review RCRA clean closures. Due to direct reference to 40 CFR, Part 264, Subpart G, by Act 64, Rule 613; Act 64 closures should also be evaluated by this checklist.

Documentation supporting the owners/operators and the independent registered professional engineer's certification can be requested under 40 CFR, 264.115 and 265.115 (as of October 29, 1986). The owner/operator must submit at least four copies of certification documentation.

The checklist identifies items recommended to properly evaluate a closure certification. These items are not "absolutes." Other information or substitutions may be provided which technically justify and certify a "clean closure."

This checklist can be used for land disposal, storage, and treatment facilities. Several of the items would not be required for storage and/or treatment facilities where testing was minimal. Items 1 through 5 would be required for all closures. Items 6 through 11 would be optional for storage and/or treatment facilities, dependent on extent of testing required. Land disposal facilities would require all items listed.

1. Manifests (or some type of manifest/waste removal summary) of where and how much waste was shipped.

2. Certification statement is needed by the owner/operator AND an independent registered engineer. All independent registered professional engineer certificates must have an original stamp on at least one copy.

3. Summary of decontamination procedures (pressure wash, Steam clean, etc.) and how the resultant waste water was disposed.

4. Summary analysis (include conditions of haul roads, time table, soil and groundwater results, weather conditions, runoff controls, equipment decontamination, etc.).

5. Results of all tests used to determine clean closure (charts, tables, lab sheets).

6. Statistical comparisons on sampling results compared to cleanup criteria (this should include full computations on background and statistical analysis).

7. Sampling and analysis procedures (specify references).

8. Final depth and elevations of excavations of wastes and soils.

9. Properly labeled and easily identified sampling locations and grid stations (map) including background stations.

10. Groundwater data (and statistical evaluation) used to determine if groundwater degradation has occurred (usually four sets of replicate analysis compared to sampling event after closure activities). Monitor well construction details and sampling and analysis procedures may be required if documentation is not in the file.

11. Summary of final restoration of excavated area...
information on fill material used and/or future land use outline. If clean closure cannot be achieved (e.g., contaminated soils to water table and groundwater results show contamination). This summary item should be used to address the need for any post closure program and/or corrective action.

12. A copy of all field notes pertaining to these closure activities.

13. A copy of the approved closure plan and letter of closure plan approval.

CITED REFERENCES

Borden, R.C., Bedient, P.B., In-Situ Measurement of Adsorption and Biotransformation at a Hazardous Waste Site, Water Resources Bulletin, 23 (4), pp. 629-636, 1987

Cline, P.V., Brown S., Site Specific Evaluation of Contaminant Fate: Test Applications and Limitations, Superfund '89, Hazardous Materials Control Research Institute, Silver Springs, MD, 1989

Davis, J.C., Statistics and Data Analysis in Geology, 2nd ed., John Wiley and Sons, New York, 1986

Gilbert, R.O., Statistical Methods for Environmental Pollution Monitoring. Van Nostrand, New York, 1987

Lindsay, W.L., Chemical Equilibria In Soils, John Wiley and Sons, New York, 1979

Schwille, F., Dense Non-Aqueous Phase Liquids In Porous and Fractured Media-Model Experiments, Lewis Publishers, Boca Raton, LA, 1988

US EPA, Office of Policy, Planning, and Evaluation, Methods for Evaluating the Attainment of Cleanup Standards, Volume 1: Soils and Solid Media, EPA 230/02-89-042, Washington D.C., 1989

US EPA, Office of Solid Waste Management Division, Test Methods for Evaluating Solid Waste, SW-846 Volume II: Field Methods, US EPA, November 1986, Third Edition

US EPA, Office of Solid Waste Management Division, Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Interim final Guidance, EPA, Washington D.C., April 1989.

US EPA, Office of Solid Waste Management Division, Statistical Analysis of Groundwater Monitoring data at RCRA Facilities, Addendum to Interim Final Guidance, EPA, Washington D.C., June 1992.

Wilson, J.T., Wilson B.H., Biotransformation of Trichloroethylene in Soil, Applied Environmental Microbiology, 49:242-243, 1985

WMD, DNR, Draft Guidance, How Clean is Clean, May 1988

ASTM STP-540, Sampling Standards and Homogeneity, Kennedy/Woodruff, Baltimore MD, 1973

ASTM STP-845, Statistics in the Environmental Sciences, Gentz/London editors, Baltimore MD, 1986

Underwood, E.E., Quantitative Stereology. Addison-Wesley, Reading Massachusetts, 1970

APPENDIX B

PROJECT MANAGEMENT PLAN

TABLE OF CONTENTS

LIST OF ATTACHMENTS

LIST OF FIGURES

LIST OF ACRONYMS AND ABBREVIATIONS

AFCEE	Air Force Center for Environmental Excellence
BCT	BRAC Cleanup Team
BRAC	Base Re-alignment and Closure
CCE	Certifying Construction Engineer
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CQAP	Construction Quality Assurance Plan
COR	Contracting Officer Representative
DDMT	Defense Depot Memphis Tennessee
Depot	Memphis Depot
DLA	Defense Logistics Agency
DRC	Depot Redevelopment Corporation
H&S	Health and Safety
PE	Professional Engineer
PM	Project Manager
PMP	Project Management Plan
POC	Point of Contact
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance / Quality Control
RA	Remedial Action
RACR	Remedial Action Completion Report
RASAP	Remedial Action Sampling and Analysis Plan
RAWP	Remedial Action Work Plan
RCRA	Resource Conservation and Recovery Act
ROD	Record of Decision
TDEC	Tennessee Department of Environment and Conservation
USEPA	United States Environmental Protection Agency

B.1.0 PROJECT MANAGEMENT PLAN

This appendix to the Remedial Action Work Plan (RAWP) presents the Project Management Plan (PMP). The purpose of this PMP is to clearly establish the project organization and responsibilities, including the responsibility of MACTEC as remedial action contractor for the Dunn Field Disposal Sites excavation activities. In addition, the project organization and lines of communication in relation to MACTEC and their subsequent subcontractors will be established.

B.1.1 PROJECT RESPONSIBILITY AND AUTHORITY

The organization chart for the RA is shown on Figure B-1. The project organization is divided into two main groups consisting of the project team and the field team. The project team consists primarily of management personnel. The CCE will be on-site periodically during the Remedial Action (RA) construction to monitor progress; attend meetings; resolve disputes, as needed; and ensure that the work is implemented in accordance with the RAWP. The field team will consist of the personnel on-site during the RA activities. The field team will include a designated QA representative, reporting directly to the CCE, to be on-site during the construction activities. The general responsibilities and reporting requirements for each team member are described in the following sections. MACTEC will be self-performing the excavation activities, as a subcontractor to Laguna Construction Company (Laguna). Laguna will provide assistance in contractual-related matters during RA construction.

B.1.1.1 Project Team

Base Realignment and Closure (BRAC) Clean-up Team (BCT) Members. The BCT team members consist of the Defense Logistics Agency (DLA), United States Environmental Protection Agency, and the Tennessee Department of Environment and Conservation (TDEC). The BCT will monitor the progress of the RA and are required to review all documents prior to issuance. The BCT will be involved in all steps of the RA activities and will be included in all lines of communication including progress updates, schedules, and status of work.

Defense Logistics Agency (DLA) Project Manager (PM). The DLA PM, Mr. Michael Dobbs, is responsible for project funding and implementing the responsibilities identified in the Federal Facilities Agreement (USEPA, 1995).

Air Force Center for Environmental Excellence (AFCEE) Contracting Officer Representative (COR). AFCEE is the primary contract holder for the work at the Depot. The AFCEE COR, Mr. Jesse Perez, will oversee all contractual matters in consultation with the MACTEC PM and DLA.

DRC Facilities Manager. The DRC facilities manager, Mr. G.C. Glance, will interface with the MACTEC PM and Site Superintendent and coordinate construction activities with Depot Redevelopment Corporation (DRC).

Laguna Construction Company. Laguna is the prime construction contractor responsible for the RA activities at the Dunn Field disposal sites. Laguna will subcontract the RA work to MACTEC. Laguna will have a representative on site during the RA implementation for oversight purposes and will maintain authority and responsibility for RA implementation.

MACTEC PM. MACTEC will be the primary RA contractor for activities at DDMT. The MACTEC PM, Mr. Thomas Holmes, will provide technical coordination with the AFCEE PM and the DLA PM. Mr. Holmes or his representative, will monitor the remedial action ensuring deliverables meet the AFCEE's requirements. In addition, he will provide progress reports to the AFCEE and DLA, and manage contractual and administrative requirements as well as schedules and budgets for the project. As MACTEC's PM, he will ensure that the project meets the technical requirements of the TO. Mr. Holmes is a Project Manager at MACTEC and a registered PG with over 20 years regulatory and consulting experience.

MACTEC Construction Certifying Engineer (CCE). The MACTEC CCE, Mr. Greg Wrenn, PE, will coordinate technical activities, prepare the RAWP, assist with procurement, prepare submittals, and provide guidance to the site superintendent and field engineer during the RA construction activities. The CCE's primary responsibilities are to ensure that the work is performed in accordance with the Construction Specifications and Construction Drawings (Appendix A, Attachment 4 of the RAWP), to ensure QA requirements outlined in the CQAP are fulfilled, and to ensure appropriate documentation of the RA activities. The CCE will report progress and project delays to the MACTEC PM and will coordinate and monitor the quality assurance requirements of the project. Mr. Wrenn is a Senior Engineer with over 11 years of experience in contaminant assessment and remediation design and implementation.

MACTEC Health and Safety (H&S) Manager. The H&S Manager, Mr. Emmet Curtis, will support the Site Superintendent in ensuring that all work activities are performed in a safe manner and in

Air Force Center for Environmental Excellence (AFCEE) Contracting Officer Representative (COR). AFCEE is the primary contract holder for the work at the Depot. The AFCEE COR, Mr. Jesse Perez, will oversee all contractual matters in consultation with the MACTEC PM and DLA.

DRC Facilities Manager. The DRC facilities manager, Mr. G.C. Glance, will interface with the MACTEC PM and Site Superintendent and coordinate construction activities with Depot Redevelopment Corporation (DRC).

Laguna Construction Company. Laguna is the prime construction contractor responsible for the RA activities at the Dunn Field disposal sites. Laguna will subcontract the RA work to MACTEC. Laguna will have a representative on site during the RA implementation for oversight purposes and will maintain authority and responsibility for RA implementation.

MACTEC PM. MACTEC will be the primary RA contractor for activities at DDMT. The MACTEC PM, Mr. Thomas Holmes, will provide technical coordination with the AFCEE PM and the DLA PM. Mr. Holmes or his representative, will monitor the remedial action ensuring deliverables meet the AFCEE's requirements. In addition, he will provide progress reports to the AFCEE and DLA, and manage contractual and administrative requirements as well as schedules and budgets for the project. As MACTEC's PM, he will ensure that the project meets the technical requirements of the TO. Mr. Holmes is a Project Manager at MACTEC and a registered PG with over 20 years regulatory and consulting experience.

MACTEC Construction Certifying Engineer (CCE). The MACTEC CCE, Mr. Greg Wrenn, PE, will coordinate technical activities, prepare the RAWP, assist with procurement, prepare submittals, and provide guidance to the site superintendent and field engineer during the RA construction activities. The CCE's primary responsibilities are to ensure that the work is performed in accordance with the Technical Specifications and Construction Drawings (Appendix A, Attachment 4 of the RAWP), to ensure QA requirements outlined in the CQAP are fulfilled, and to ensure appropriate documentation of the RA activities. The CCE will report progress and project delays to the MACTEC PM and will coordinate and monitor the quality assurance requirements of the project. Mr. Wrenn is a Senior Engineer with over 11 years of experience in contaminant assessment and remediation design and implementation.

MACTEC Health and Safety (H&S) Manager. The H&S Manager, Mr. Emmet Curtis, will support the Site Superintendent in ensuring that all work activities are performed in a safe manner and in accordance with the Site Specific Health and Safety Plan. Functionally, the H&S officer will provide H&S information related to the RA construction to MACTEC's H&S Manager. Mr. Curtis has eleven years of experience in health and safety programs, environmental chemistry, and risk assessment.

MACTEC Project Chemist - The Project Chemist, Ms. Jessica Vickers, is responsible for oversight of the preparation and implementation of the field sampling, sample preservation, sample chain-of-custody, and sample shipping activities. Ms. Vickers performs or supervises data evaluation on analytical laboratory data and helps prepare technical reports. She specializes in laboratory coordination, developing sampling plans, evaluating analytical data, and reporting. Ms. Vickers has over 13 years of laboratory and environmental consulting experience.

B.1.1.2 Field Team

MACTEC Site Superintendent. The Site Superintendent, Mr. Lane Smith, will be responsible for implementing the RA construction activities. The Site Superintendent will have overall responsibility for all construction activities related to the RA and will control day-to-day construction tasks, direct the equipment operators and field technicians, and be the primary point of contact for the waste management and transportation subcontractor. He will also be responsible for preparing field activity summaries, which describes the work performed, and estimated quantities of contaminated materials removed on a daily basis. He will be supported by the CCE and the H&S Manager. Mr. Smith has 17 years of environmental construction, remediation, and project management experience.

MACTEC Field Engineer. The Field Engineer, Mr. Michael LaPrade, will be the primary on-site representative for the CCE and the H&S Manager. His primary duties will consist of construction oversight, field documentation, sample collection, quality assurance, and health and safety monitoring. Mr. LaPrade has seven years of environmental engineering and consulting experience.

MACTEC Field Technicians/Equipment Operators - The work team performs on-site tasks as directed by the Site Superintendent and Field Engineer. The tasks include, but are not limited to, soil excavation, stockpile construction, sampling as part of the performance monitoring of the excavation areas, sampling of generated waste for characterization and disposal, and air monitoring.

B.1.1.3 Subcontractors

MACTEC intends to self-perform excavation activities and use subcontractors for off-site laboratory analysis, surveying, and waste management services. Subcontractors will be evaluated on technical capabilities and their capacity to perform the required work and will be procured in accordance with procedures outlined in the Federal Acquisition Regulations. A brief summary of each subcontractor's technical responsibilities is provided below.

- Transportation and Disposal – The selected subcontractor (subcontractor) will transport contaminated material from five disposal sites at Dunn Field. Subcontractor will be responsible for determining haul routes, preparing transportation plans, and transporting the waste generated during the excavation activities to approved facilities for disposal in accordance with local, state, and federal regulations. Currently, it is anticipated that a portion of the excavated material (soil, drums, buried containers, etc) will be managed as hazardous waste and a portion will be managed as non-hazardous.
- Laboratory Analytical –The laboratory will be responsible for providing sample shipping containers, chain-of-custody documents, chemical analysis and reporting and laboratory QA/QC.
- Surveying – Prior to the commencement of excavation, representatives of Allen and Hoshall, a Registered Professional Land Surveyor licensed in the State of Tennessee, will be used to locate and set temporary benchmarks around the disposal sites and other key points to control and guide the work in accordance with the project specifications and drawings. Data must be maintained electronically for import into computer assisted drawing programs and must be referenced to the state plane coordinate system.

B.1.2 ADMINISTRATIVE PROCEDURES

This section describes administrative procedures to be followed during the RA. These procedures include maintaining communications and records, monitoring budgets and schedules, maintaining internal quality control, and reporting.

B.1.2.1 Communication

Clearly defined lines of communication are necessary to avoid confusion, duplication of effort, and misunderstandings among project personnel. The primary line of communication will be from the

AFCEE COR and DLA PM to the MACTEC PM to the MACTEC RA Engineer to the Site Superintendent and then to the rest of the field personnel. Issues such as scope of work, schedule, budget, meetings, and reports shall initially be discussed internally with the MACTEC PM and externally only with the DLA and AFCEE PM. Currently, the DDMT project team disseminates information using pre-established points of contact (POC) within each organization. The POCs then distribute the information to the organization's team members.

B.1.2.2 Maintenance of Records

A central file has been established during earlier stages of the project and will continue to be maintained so that all documents pertaining to the work can be referenced as necessary. Separate sections are maintained for correspondence, memos, confirmation summaries, invoices, subcontracts, technical data, and reports and a number of subcategories under these main headings. Personnel working on the project are required to forward copies of project documents to the central files. In addition, original field log books and data sheets such as geologic logs, well construction diagrams, well development logs, and sampling forms shall be placed in the central files.

Field personnel will be responsible for documentation of fieldwork. Field data shall be recorded in indelible ink and legibly written. Errors will be crossed out, initialed, and dated. No documents shall be discarded or destroyed. The guidelines describe what information should be recorded in site logbooks, field logbooks, equipment logbooks, data forms, chain-of-custody forms, materials certificates, and records of variance. These records shall be completed by field personnel and maintained in the field office. At the end of fieldwork, records shall be transferred to the central files for use during data evaluation and report preparation.

Following project completion, copies of all project records including correspondence, memorandums, trip reports, confirmation notices, sampling plans, test results, submittals, photographs and any other records or documents generated as a result of the project will be retained in MACTEC's central files.

B.1.2.3 Internal Quality Control

MACTEC has developed a Remedial Action Sampling and Analysis Plan (RASAP), including a Quality Assurance Project Plan (QAPP) for DDMT. The QAPP will be followed to ensure that quality is maintained on the project. The QAPP is based on the AFCEE "Guidance for Contract Deliverables

Appendix C: Quality Assurance Project Plan" (AFCEE, 2001). The RASAP was submitted to the BCT for review on October 1, 2004. Remedial action will not be implemented until the RASAP is approved by the BCT.

In addition to regulatory guidance documents, MACTEC has its own internal quality control procedures as outlined in MACTEC's Quality Assurance Manual. Policy and procedures for work control, design control, testing, reporting and auditing are provided in the manual. Internal audits of special field activities will be conducted and documented. It is the responsibility of the Chief Engineer, Mr. David Share, PE, to develop and schedule audits. The Program Manager is responsible for implementing any corrective actions required.

Overall technical quality of the project will be assured through the engagement of the MACTEC Principal. The Program Principal, Mr. Thomas Holmes will review technical progress of the work on a periodic basis and submit written comments. This process allows input by more experienced senior staff on every MACTEC project. At least two reviews are required, one near the beginning (Work Plan stage) and one near the end (reporting stage) of the project. Comments by the Principal will be implemented or an explanation will be provided by the CCE.

B.1.2.4 Reporting

The MACTEC Program Manager will use written progress reports, telecommunications, and direct personal communication with the AFCEE COR and the DLA PM. This will help ensure that project objectives are met and that the project is kept on schedule and within the budget.

For the implementation of this remedial action, monthly progress reports will address work performed during the period, problems encountered, and work planned for the next month. This will be issued via e-mail to DLA, AFCEE, United States Environmental Protection Agency (USEPA), TDEC, and other organizations through the established POC.

Telecommunications and meetings between the AFCEE and MACTEC Program PMs will be used for exchange of information on field progress, review of preliminary data, project status, and identification of problems with possible solutions.

Once the appropriate field activities are completed, MACTEC will begin preparation of the Remedial Action Completion Report (RACR). The internal draft report will be submitted to AFCEE and DLA for review. Review comments will be incorporated into the Draft Final Report, which will then undergo regulatory reviews and comments. Comments received will be incorporated, as required, into the Final RACR.

B.1.3 RA SCHEDULE

The schedule of project milestones (Figure 4-2 of the RD) has been revised based on the current master schedule and is provided as Attachment 1 of the PMP. Milestones falling on weekends or federal holidays were shifted to the next normal business day. The project schedule will be updated as needed and will be included within the weekly reports.

B.2.0 REFERENCES

AFCEE, 2001. Guidance for Contract Deliverables Appendix C: Quality Assurance Project Plan, Version 3.1. HQ Air Force Center for Environmental Excellence Technical Services Quality Assurance Program. August 2001.

CH2M Hill, 2004a. Rev. 1 Dunn Field Disposal Sites Final Remedial Design. Prepared for the U.S. Army Engineering and Support Center, Huntsville, Alabama. April 2004.

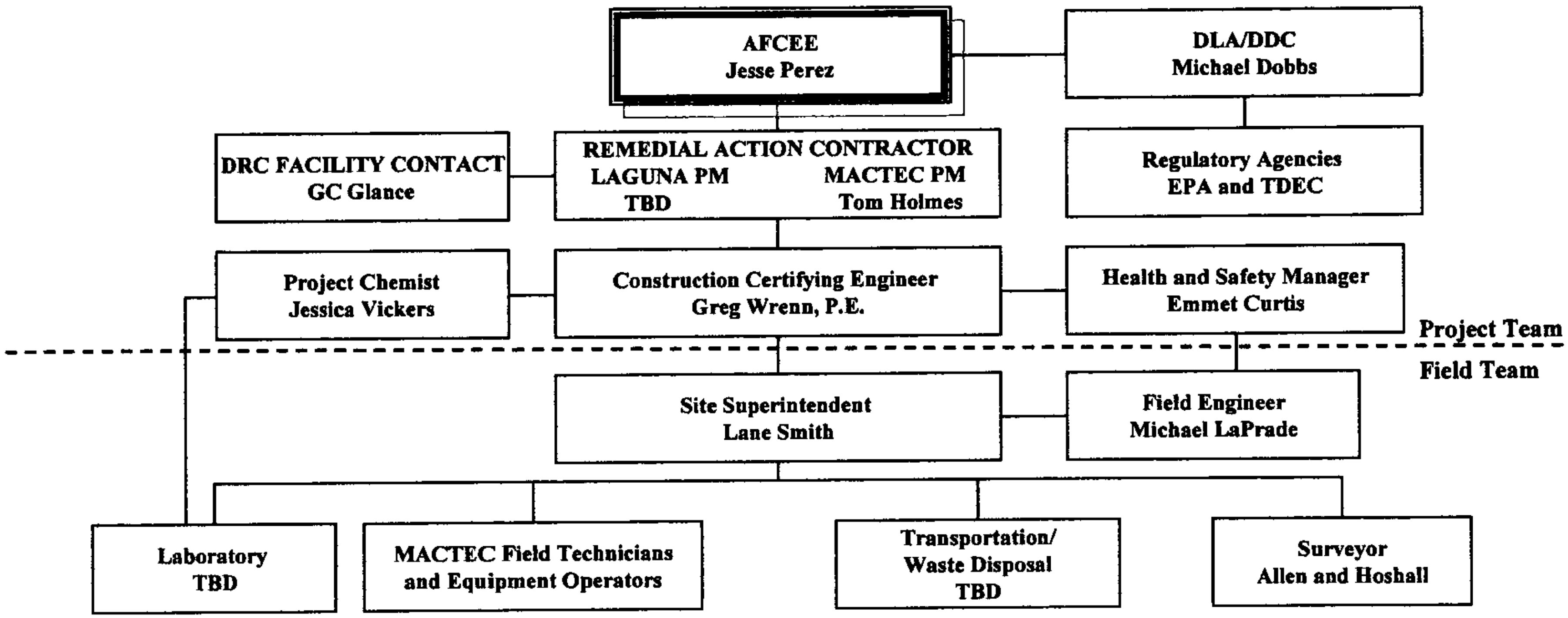
USACE, 1998. Monitoring Well Design, Installation and Documentation at Hazardous, Toxic, and Radioactive Waste Sites, EM1110-1-4000, November 1998.

USEPA, 1995. Federal Facilities Agreement Between the USEPA Region IV, TDEC, and the US DLA at the Defense Distribution Depot Memphis, Tennessee. Effective March 6, 1995.

FIGURE

FIGURE B-1

Memphis Depot
Remedial Action Project Management and Field Team



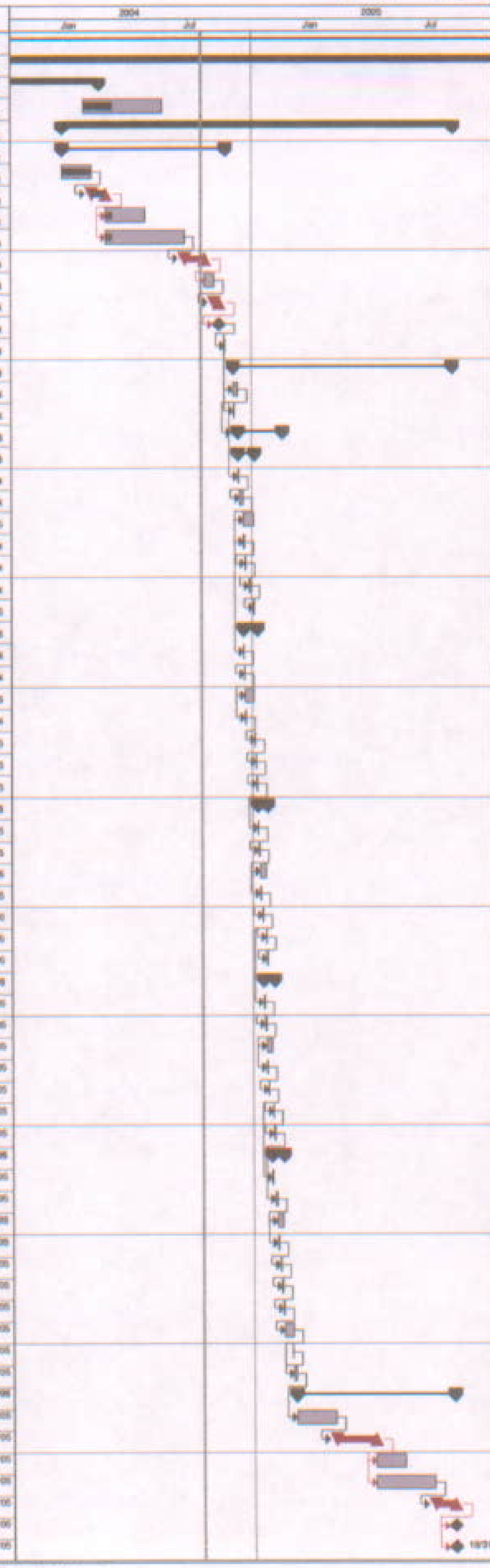
PREPARED/DATE: MPL 9/30/04
CHECKED/DATE: GJW 10/1/04

030015.03

ATTACHMENT 1

SCHEDULE OF PROJECT MILESTONES

ID	BCT Item	%	Task Name	Duration	Start	Finish
145		25%	DUNN FIELD	7454 d	10/18/01	3/15/22
280		8%	Dunn Field Remedial Design (RD)/Remedial Action Construction (RA-C)	1459 d	12/3/03	11/21/07
281		100%	Dunn Field Disposal Sites Remedial Design	184 d	12/3/03	8/14/04
288		37%	Dunn Field Disposal Sites RA Contracting Actions	120 d	4/21/04	8/18/04
289		12%	Dunn Field Disposal Sites Remedial Action	861 d	3/20/04	10/31/05
290		29%	Dunn Field Disposal Sites Remedial Action Work Plan	247 d	3/20/04	11/21/04
291		100%	Prepare & Submit Rev. 0 Disposal Sites RA Work Plan to BCT	45 d	3/20/04	5/3/04
292	BCT	100%	BCT Review & Submit Comments on Rev. 0 RA Work Plan	21 d	5/4/04	5/24/04
293		17%	Respond to BCT Comments on Rev. 0 RA Work Plan	60 d	5/25/04	7/23/04
294		8%	Prepare & Submit Rev. 1 RA Work Plan	120 d	5/25/04	9/21/04
295	BCT	0%	BCT Review of Rev. 1 RA Work Plan	30 d	9/22/04	10/21/04
296		0%	Prepare & Submit Rev. 2 RA Work Plan	15 d	10/22/04	11/5/04
297	BCT	0%	BCT Approval of the Rev. 2 Dunn Field Disposal Sites RA Work Plan	7 d	11/6/04	11/12/04
298		0%	Rev. 2 (Final) Dunn Field Disposal Sites RA Work Plan	0 d	11/12/04	11/12/04
299		0%	Pre-Construction Conference	1 d	11/21/04	11/21/04
300		0%	Dunn Field Disposal Sites Remedial Action Implementation	333 d	12/4/04	10/31/05
301		0%	Mobilization / Site Preparation	7 d	12/4/04	12/10/04
302	BCT	0%	Notice of RA Implementation	1 d	12/5/04	12/5/04
303	Field	0%	Dunn Field Disposal Sites RA Construction (RA-C)	67 d	12/11/04	2/15/05
304		0%	DS 31	25 d	12/11/04	1/4/05
305		0%	Site Preparation	2 d	12/11/04	12/12/04
306		0%	Excavation	6 d	12/13/04	12/18/04
307		0%	Waste Characterization	16 d	12/19/04	1/3/05
308		0%	Compliance Sampling/Analysis	2 d	12/19/04	12/20/04
309		0%	Backfilling	2 d	12/21/04	12/22/04
310		0%	Loading	3 d	12/27/04	12/29/04
311		0%	Site Restoration	2 d	1/3/05	1/4/05
312		0%	DS 13	21 d	12/19/04	1/8/05
313		0%	Site Excavation	1 d	12/19/04	12/19/04
314		0%	Excavation	1 d	12/20/04	12/20/04
315		0%	Waste Characterization	14 d	12/21/04	1/3/05
316		0%	Compliance Sampling/Analysis	2 d	12/21/04	12/22/04
317		0%	Backfilling	1 d	1/5/05	1/5/05
318		0%	Loading	1 d	1/6/05	1/6/05
319		0%	Site Restoration	2 d	1/7/05	1/8/05
320		0%	DS 4.1	15 d	1/9/05	1/23/05
321		0%	Site Preparation	1 d	1/9/05	1/9/05
322		0%	Excavation	2 d	1/10/05	1/11/05
323		0%	Waste Characterization	9 d	1/12/05	1/20/05
324		0%	Compliance Sampling/Analysis	2 d	1/12/05	1/13/05
325		0%	Backfilling	1 d	1/16/05	1/16/05
326		0%	Loading	1 d	1/21/05	1/21/05
327		0%	Site Restoration	2 d	1/22/05	1/23/05
328		0%	DS 3	17 d	1/17/05	2/2/05
329		0%	Site Preparation	2 d	1/17/05	1/18/05
330		0%	Excavation	2 d	1/19/05	1/20/05
331		0%	Waste Characterization	9 d	1/21/05	1/29/05
332		0%	Compliance Sampling/Analysis	2 d	1/21/05	1/22/05
333		0%	Backfilling	1 d	1/24/05	1/24/05
334		0%	Loading	1 d	1/31/05	1/31/05
335		0%	Site Restoration	2 d	2/1/05	2/2/05
336		0%	DS 10	18 d	1/29/05	2/15/05
337		0%	Site Preparation	2 d	1/29/05	1/30/05
338		0%	Excavation	3 d	2/3/05	2/5/05
339		0%	Waste Characterization	9 d	2/6/05	2/14/05
340		0%	Compliance Sampling/Analysis	2 d	2/6/05	2/7/05
341		0%	Backfilling	2 d	2/10/05	2/11/05
342		0%	Loading	2 d	2/12/05	2/13/05
343		0%	Site Restoration	2 d	2/14/05	2/15/05
344		0%	Additional Excavation(s) (where necessary)	14 d	2/16/05	3/1/05
345		0%	Prep-Final Construction Inspection	1 d	2/28/05	2/28/05
346		0%	Demobilization	4 d	3/2/05	3/5/05
347		0%	Dunn Field Disposal Sites RA Completion Report	240 d	3/6/05	10/31/05
348		0%	Prepare & Submit Rev. 0 Disposal Sites RA Completion Report to BCT	60 d	3/6/05	5/4/05
349	BCT	0%	BCT Rerw & Submit Comments on Rev. 0 Disposal Sites RA Completion Rpt	60 d	5/5/05	7/3/05
350		0%	Respond to BCT Comments on Rev. 0 Disposal Sites RA Completion Report	45 d	7/4/05	8/17/05
351		0%	Prepare & Submit Rev. 1 Disposal Sites RA Completion Report	90 d	7/4/05	10/1/05
352	BCT	0%	BCT Review of Rev. 1 Disposal Sites RA Completion Report w/ Concurrence	30 d	10/2/05	10/31/05
353	EPA	0%	EPA Approval of the Final Dunn Field Disposal Sites RA Completion Report	0 d	10/31/05	10/31/05
354		0%	Remedy in Place/Response Complete	0 d	10/31/05	10/31/05



Project: Memphis Depot Main Installation/Dunn Field Master Schedule
Date: Revised: 08/18/04
Updated: 07/12/04

Task		Summary		External Milestone	
Progress		Project Summary		External Milestone	
Milestone		BCT Review		Deadline	

APPENDIX C

WASTE MANAGEMENT PLAN

TABLE OF CONTENTS

LIST OF ATTACHMENTS

LIST OF ACRONYMS AND ABBREVIATIONS

AFCEE	Air Force Center for Environmental Excellence
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CQAP	Construction Quality Assurance Plan
CRP	Community Relations Plan
DLA	Defense Logistics Agency
LDR	Land Disposal Restrictions
MACTEC	MACTEC Engineering and Consulting, Inc.
PPE	Personal Protective Equipment
PSVP	Performance Standards Verification Plan
QAPP	Quality Assurance Project Plan
RASAP	Remedial Action Sampling and Analysis Plan
RAWP	Remedial Action Work Plan
RCRA	Resource Conservation and Recovery Act
ROD	Record of Decision
TAL	Target Analyte List
TCLP	Toxicity Characteristic Leaching Procedure
USEPA	U.S. Environmental Protection Agency
VOCs	Volatile Organic Compounds
WAC	Waste Acceptance Criteria
WMP	Waste Management Plan

C.1.0 INTRODUCTION

This Waste Management Plan (WMP) has been prepared by MACTEC Engineering & Consulting, Inc. (MACTEC) to describe the management activities for waste materials associated with the Remedial Action for Dunn Field Disposal Sites. This WMP has been prepared for the Air Force Center for Environmental Excellence (AFCEE) in conjunction with the Defense Logistics Agency (DLA) under task order (TO) 29 under contract number F41624-03-D-8606. This plan identifies the waste streams that will be generated during the implementation of the remedial action and details plans for waste minimization, management, and disposition.

C.1.1 PURPOSE AND OBJECTIVES

This WMP is intended to provide a management and planning tool for identifying, managing and disposing of the waste streams generated from the excavation activities associated with five disposal sites located within Dunn Field. The primary objective of this WMP is to provide for proper identification of the waste types that are generated during implementation of the remedial actions and present a general strategy for managing them in compliance with applicable regulations. This plan addresses the waste characterization strategy; requirements for waste storage, labeling, packaging and transportation, and treatment, if required; and designates facilities for ultimate disposal of the waste. This plan also identifies required records and reports and discusses strategies for minimizing waste during remediation activities.

C.2.0 WASTE IDENTIFICATION

Material to be excavated from the Dunn Field disposal sites is anticipated to consist of possible principal threat wastes (glass bottles and 55-gallon drums at Disposal Sites 3, 4.1 and 13) and associated contaminated soil. Soil containing foreign debris (glass or metal containers, wood, construction debris) may also be encountered. Some of the soil and disposed materials to be excavated (i.e., generated) may exhibit a Resource Conservation and Recovery Act (RCRA) hazardous characteristic and would require special handling, treatment and disposal at an offsite RCRA hazardous waste facility. Other waste materials that may be encountered or generated as part of the remediation activities include minor accumulations of miscellaneous solid waste such as sampling supplies and personnel protective equipment (PPE), and liquid wastes from dewatering and decontamination activities. Table C-2-1 identifies the volume of soil that is anticipated to be excavated from each of the five disposal sites. Other major waste types expected to be generated as a result of remediation activities are liquid wastes from dewatering and decontamination activities, liquid wastes from bottles and/or drums, and other miscellaneous solid waste. All wastes generated will be appropriately segregated, sampled and characterized per the Work and Test Procedures located in Appendix B of the RASAP, and properly disposed.

C.3.0 GENERAL REQUIREMENTS

Waste types resulting from remediation activities may include contaminated soil, foreign debris, PPE, and buried receptacles such as glass bottles and 55-gallon drums. These waste types will be managed in accordance with this WMP.

C.3.1 WASTE MINIMIZATION AND SEGREGATION

Wherever possible, waste minimization strategies will be employed during implementation of the remedy. Waste minimization for this project will be accomplished through design and planning to ensure efficient operations that will not generate unnecessary waste. As part of the pre-mobilization briefing, emphasis will be placed on waste reduction, and personnel will be encouraged to improve methods for minimizing waste generation. Waste minimization practices include, but are not limited to, the following:

- Sequencing the work such that the time excavations remain open is minimized, thus limiting the potential for stormwater entering the excavation (that may then have to be handled as a liquid waste)
- Employing runoff controls to limit stormwater from entering excavations
- Monitoring that the extent of the excavations does not exceed the project specifications except as indicated by field observation or analytical results that would dictate more extensive excavation is required
- Monitoring that waste containers are packed adequately with minimal void spaces
- Using disposable items when the decontamination process would generate a waste stream that would be more costly to characterize and dispose of
- Reusing items when practical
- Segregating contaminated from uncontaminated waste

C.3.2 CHARACTERIZATION STRATEGY

Waste generated during RA activities will be characterized using approved sampling and analytical information (both existing and new). As outlined above, preliminary classifications have been made of anticipated waste types based on existing characterization data. Prior to ultimate disposal, waste shall be further characterized to ensure compliance with applicable disposal facilities waste acceptance criteria (WAC). Sampling of the waste for waste profile completion purposes and/or new waste characterization purposes will be performed in accordance with the approach outlined in the RASAP and Performance

Standards Verification Plan (PSVP) (Appendix E of the RD) provided as Attachment 2 to the CQAP. Appropriate and required documentation of waste characterization will be completed in compliance with the applicable WAC.

C.3.2.1 Waste Characterization Sampling

Samples will be collected from soil stockpiles and roll-off containers and analyzed for toxicity according to TCLP via EPA Method 1311 as well as reactivity, corrosivity and ignitability in accordance with the CQAP. Composite samples will be collected for every 250 cubic yards of excavated soil or at least one per disposal area. Liquid waste will be analyzed for VOCs, SVOCs, pesticides, PCBs, herbicides, TAL metals, and RCI in accordance with the PSVP.

C.3.3 WASTE MANAGEMENT AND DISPOSITION

Waste generated as a result of the RA activities may include hazardous and non-hazardous waste. The waste contains various types of contaminants, such as volatile organic compounds (VOCs), copper, lead and polynuclear aromatic hydrocarbons. Typically most of the generated waste will be sent to a Subtitle D disposal facility. Out of the 2,290 cubic yards of waste anticipated to be generated, approximately 360 cubic yards of waste are anticipated to be disposed of as hazardous waste at a Subtitle C disposal facility. A number of Subtitle C and Subtitle D disposal facilities have been identified. These disposal facilities are listed below. Each of these facilities is authorized to accept CERCLA waste. Qualifications for each facility and a haul route to each facility are included as Attachment 1 and Attachment 3, respectively to this appendix. Pending regulatory approval of each disposal facility, the final selection of which Subtitle C and Subtitle D facility to utilize will be based upon analysis of disposal and transportation costs. After selection of the disposal facility and waste hauler, the transportation route will be determined and submitted for approval.

<u>*Subtitle C Disposal Facilities*</u>

- Chemical Waste Management – Emelle, AL – approximately 230 miles from site
- Chemical Waste Management – Sulphur, LA – approximately 500 miles from site
- Michigan Disposal Waste Treatment Plant – Belleville, MI – approximately 750 miles from site

<u>*Subtitle D Disposal Facilities*</u>

- BFI – South Shelby Landfill – Memphis, TN – approximately 20 miles from site
- Tunica Landfill – Robinsonville, MS – approximately 30 miles from site

Three potential waste haulers have also been identified and are listed below. Each hauler has submitted their DOT permit which authorizes their company to transport hazardous waste. These permits are included as Attachment 2 to this appendix.

Waste Haulers

- US Bulk Transport, Inc. – Erie, PA
- Greenleaf Treatment Services – Macon, GA
- Robbie D. Wood, Inc. – Dolomite, AL

The Toxicity Characteristic Leaching Procedure (TCLP) test, along with tests for reactivity, corrosivity, and ignitability, will be conducted on representative remediation/secondary waste samples to determine whether it is considered RCRA characteristic hazardous waste. All RCRA hazardous waste will be managed in accordance with all applicable regulations, including those related to temporary storage of waste in containers and transportation offsite.

Movement of hazardous remediation waste that contains RCRA-restricted waste for offsite disposal will trigger the RCRA Land Disposal Restrictions (LDRs). These wastes must meet the specified treatment standards at 40 CFR 268 et.seq. prior to disposal in a RCRA Subtitle C hazardous waste landfill. Any remediation wastes that are transferred offsite or transported in commerce along public right-of-ways must also meet the applicable or relevant and appropriate transportation requirements (Table 5-4 of RD which is included in Appendix A of this document). These include packaging, labeling, marking, manifesting, and placarding requirements for hazardous materials. In addition, CERCLA Section 121(d)(3) provides that the offsite transfer of any hazardous substance, pollutant, or contaminant generated during CERCLA response actions be sent to a treatment, storage, or disposal facility that is in compliance with applicable federal and state laws and has been approved by EPA for acceptance of CERCLA waste [see also the 'Off-Site Rule' at 40 CFR 300.440 et. seq.]. Accordingly, MACTEC has verified that the disposal facilities listed above are authorized for receipt of CERCLA wastes and have obtained written evidence of valid EPA Off-site Rule approval (40 CFR 300.440) from the disposal facility. This documentation is included in Attachment 1 and will be included in the Remedial Action Completion Report.

It is anticipated that water wastes generated during the excavation activities will be containerized, solids will be allowed to settle out, samples will be collected, and results will be compared to existing permitted limits from the City of Memphis Public Works Department. Water meeting City requirements will be discharged to the sanitary sewer system. Although not anticipated, if off-site disposal of liquid wastes, including liquid wastes from dewatering activities, decontamination activities, or other liquid wastes resulting from the excavation activities, is required, a supplemental WMP for this waste stream will be submitted for BCT approval.

C.3.3.1 Management of Non-Hazardous Waste

Excavated soil anticipated to be non-hazardous will be stockpiled near its point of origin. A section of 20-mil PVC liner will be placed adjacent to the excavation in an area that has been cleared of material that might puncture the liner. Depending on the site configuration and size, the excavator will place the targeted soil directly onto the liner or onto a truck that transports the soil to the nearby stockpile area. A 10-mil cover will be placed atop the stockpile when all of the targeted soil has been excavated or at the end of a workday. A clean soil berm will be placed around the stockpile to help secure the top liner and to divert storm water runoff. Following placement in the stockpile, the excavated materials will be sampled as outlined in the Work and Test Procedures included in the Remedial Action Sampling and Analysis Plan. Following characterization, the stockpiled soil will be loaded onto trucks and transported to an appropriate disposal facility with proper manifest. In general, minor amounts of inert solid debris excavated with the soil will not be segregated prior to disposal, but will be profiled and disposed of with the associated soil. However debris containing liquids may require over-packing and additional sampling for characterization prior to disposal. The USEPA has developed guidance for the excavation and sampling of containerized wastes. Wastes identified to contain liquids will be handled in general accordance with the USEPA SOP 2009, 11/16/94. The site superintendent will direct the on-site activities involving the handling of debris along with the required sampling.

C.3.3.2 Management of Hazardous Waste

Materials anticipated to be hazardous (i.e., D008 soil from Disposal Site 10) will be placed directly into water-tight roll-off containers. An impermeable cover will be placed over the units to prevent precipitation from contacting the stored material. When encountered, principal threat wastes (glass bottles and 55-gallon drums) will be over-packed if necessary. Each waste stream will then be appropriately sampled and characterized. If characterization results from these waste streams confirm the presence of hazardous material, it will be disposed of at a permitted Subtitle C landfill.

C.3.3.3 Contaminated Material Transportation and Offsite Disposal

Prior to offsite disposal of any waste, the RA contractor will prepare a waste approval package for each waste stream, including the following information to be provided to the generator (Memphis Defense Depot).

- Waste profile identifying the Memphis Defense Depot as the generator of the waste
- Analytical summary table(s) applicable to the waste (based on pre-design investigation data and further onsite characterization)
- Letter of approval from the proposed waste disposal facility to accept the waste
- Land disposal restriction (LDR) notifications/certifications (for hazardous wastes only)
- A completed waste manifest for signature

All waste and/or contaminated materials will be loaded and transported to a permitted disposal facility that is in compliance with applicable state solid waste or hazardous waste disposal requirements and in good standing with federal, state and local regulatory agencies. Certificates of destruction/disposal and weigh tickets from State-certified scales will be provided for this activity. Copies of manifests signed by the disposal facility will be obtained to document soil disposal.

C.4.0 REFERENCES

CH2M Hill, 2004a. Rev. 1 Dunn Field Disposal Sites Final Remedial Design. Prepared for the U.S. Army Engineering and Support Center, Huntsville, Alabama. April 2004.

CH2M Hill, 2004b. Rev. 2 Dunn Field Record of Decision. Prepared for the U.S. Army Engineering and Support Center, Huntsville, Alabama. February, 2004.

Michigan DEQ. Verification of Soil Remediation Guidance Document, Revision 1. Waste Management Division. April 1994.

TABLE

TABLE C-2-1

REMEDIAL VOLUMES SUMMARY AND DISPOSAL LOCATIONS
WASTE MANAGEMENT PLAN
MEMPHIS DEPOT
MEMPHIS, TENNESSEE

Area	Remedy	Rationale	Affected Volume Estimate (CY[2])	Disposal Location
3	ETD[1]	Evidence of principal threat wastes (glass bottles and crushed drums) in T1, T2, and T3.	225	Subtitle D
4.1	ETD	Evidence of principal threat wastes (drums) in T1and T2; and benzene and copper exceedances in T1.	225	Subtitle D
10[3]	ETD	Copper exceedances in T3 and T4.	250	Subtitle D
10[3]	ETD	Lead exceedances T5 and T6.	360	**Subtitle C**
13	ETD	Evidence of principal threat wastes (glass bottles) in T3.	55	Subtitle D
31	ETD	PAH exceedances in Trenches 1, 2, and 3 – excavation defined by asphalt-containing debris.	900	Subtitle D
31	ETD	Copper and PAH exceedances in Trench 4 – excavation defined by delineation of burn pit.	275	Subtitle D
Total			2,290	

Notes:
[1]ETD Excavation, transportation and disposal

[2]CY = Cubic yard; Affected volume is based upon dimensions of proposed excavation; Swell factor volumes for disposal are not included.

[3]The RD indicates that VOCs were detected at Disposal Site 10 at concentrations that may affect excavated material handling and disposal options. The RD estimated approximately 10% of the excavated volume at Disposal Site 10 will be disposed of as hazardous waste because of elevated VOC concentrations in the area. The waste will be profiled and disposed in the appropriate disposal facility.

Source: Rev 1 Disposal Sites Remedial Design (CH2M Hill, April 2004)

Attachment 1

Disposal Site Qualifications

Chemical Waste Management

Sulphur, LA

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS, TX 75202-2733

JUL 26 2002

Ms. Gretchel Grout
Chemical Waste Management, Inc.
7170 John Brannon Road
Sulfur, LA 70665

Dear Ms. Grout:

This letter is in response to your request of July 24, 2002, for the affirmation that the CERCLA Off-site determination of acceptability is still in effect for the Chemical Waste Management facility in Sulphur, Louisiana (EPA ID #LAD000777201).

The acceptability determination for the receipt of CERCLA waste was issued 8/23/94. Chemical Waste Management (CWM) remains acceptable for the receipt of CERCLA waste under the U.S. Environmental Protection Agency (EPA) Procedures for Planning and Implementing Off-site Response Actions (40 CFR 300.440) until EPA notifies CWM otherwise in writing.

If you have any questions regarding this letter, please contact Ron Shannon of my staff at (214) 665-2282.

Sincerely yours,

Carol D. Peters-Wagnon

Carol D. Peters-Wagnon, Chief
ALONM Section
Hazardous Waste Enforcement Branch

Doc Cont # 201
RECEIVED
JUL 26 2002
proof CWM-LCH has full CERCLA status ggpaul 7.26

CHEMICAL WASTE MANAGEMENT - LAKE CHARLES
A WASTE MANAGEMENT COMPANY

7170 John Brannon Road
Sulphur, LA 70665
(318) 583-2169

August 4, 2004

Michael LaPrade
Mactec
3200 Town Point Dr., Ste 100
Kennesaw, GA 30144

Dear Mr. LaPrade:

Please reference 40 CFR Parts 260, 261, and 262 when making a waste determination.

Acceptance at Chemical Waste Management will depend on the waste that you have. For instance if you were to have lead contaminated waste, with the waste code of only D008, we would need TCLP analytical.

Sincerely,

Chemical Waste Management

Lisa McComb

Lisa McComb
Industrial Account Representative

WASTE MANAGEMENT

cc: Ken Anderson
Chuck Grant
Gretchel Grout
Diane Sheridon

ENVIRONMENTAL PERMITS
LAKE CHARLES
(Revision Date: 03-04)

LaDEQ	RCRA Part II.-(Non-HSWA)	Treatment, storage, and disposal.	04-26-96 (Effective 05-30-96)	05-30-2006	LAD000777201 -OP-1
LaDEQ	RCRA Part B-(HSWA)	Solid Waste Management Units. RFI Study complete and submitted to Region VI. No further actions needed by CWM.	10-27-89	N/A - Superceded by RCRA Permit when LaDEQ granted HSWA authority	LAD000777201
LaDEQ	10-Day Transfer Facility	Authorization to operate a 10-Day Transfer Facility adjacent to CWM-Lake Charles TSD. (Renewal application is required to be submitted annually.)	03-30-00	01-23-04	LA0000147272
US EPA Region VI	TSCA Storage	Storage - PCB Wastes. Terminated at the request of CWM; PCB storage authorized in Container Management Unit in accordance with 40 CFR 761.65(d)(6)	06-20-97	Terminated 10/23/02	LAD000777201
LaDEQ	LPDES	Formerly NPDES; LDEQ adopted July 14, 1998 after NPDES authority granted	06-23-95 (effective 11-01-95)	11-01-2000	LA0054828
LaDEQ	LPDES Renewal Application	Application submitted 04-26-00; addendum submitted 08-22-00	Not yet issued	N/A	LA0054828
LaDEQ	Air	Latest LaDEQ Air Permit issued on 08-19-02 to include modified emission limits for Bio-Treatment and Benzene NESHAP.	08-15-02	08-15-07	0520-00081-06
US Dept. of Agriculture	Application and Permit to Move Soil	Treatment and disposal of soil at Lake Charles from other regions or countries.	12-31-97	12-31-07	S-59800
LaDEQ	Radioactive Material License	Permits Radioactive sources for laboratory instruments and Moisture/Density Measurement.	04-04-97	05-31-06	LA-4187-L01
US Federal Communications Commission	Radio License (consolidated)	Permits operation of site two way radio systems	02-16-99	08-30-04	WPCB336

809 157

WASTE MANAGEMENT

ENVIRONMENTAL PERMITS
LAKE CHARLES
(Revision Date: 03-04)

Louisiana Department of Natural Resources	NOW Authorization	Allows management of Non-Hazardous Oilfield Waste (NOW)	05-05-98	N/A	Order No. 98-01 CFA
LaDEQ	RCRA Permit Modification	Authorization to Bioremediate Hazardous and Non-hazardous Waste	06-16-98 (Biopiles) 08-31-98 (Containers)	N/A	N/A
LaDEQ	NOW w/NORM Authorization	Allows management of NOW/ E&P w/NORM up to 150 piC/g	10-13-98	N/A	N/A
LaDEQ	NORM Authorization	Extends 150 piC/g limit to include all receipts, not just NOW/E&P	07-27-00	N/A	N/A
LaDEQ	Stormwater Permit	Stormwater permit for 10 acre soil stockpile area	10-01-99	10-01-04	LAR100000
JS D.O.T.	Hazardous Waste Transporter	Permits transportation of Hazardous Waste in the United States	04-30-03	06-30-06	032403550003LN
TNRCC	Hazardous Waste Transporter	Permits transportation of Hazardous Waste in the State of Texas	09-01-95	Evergreen	83925
Texas Department of Health	Asbestos Transporter	Permits transportation of Asbestos in the State of Texas	03-05-02	03-03-04	40-0184

Michigan Disposal Waste Treatment Plant

Belleville, MI

809 160

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

NOV 0 6 1992

REPLY TO THE ATTENTION OF:

HRE-8J

Mr. David Lusk
Michigan Disposal Inc.
1349 Huron
Ypsilanti, Michigan 48197

Re: Off-site Policy Compliance
Michigan Disposal Inc.
MID 000 724 831

Dear Mr. Lusk:

The United States Environmental Protection Agency previously informed you in a letter dated September 22, 1992, that your facility was not acceptable to receive waste from response actions taken under the Comprehensive Environmental Response, Compensation & Liability Act (CERCLA) due to relevant violations of the Resource Conservation and Recovery Act (RCRA).

The purpose of this letter is to notify you that the deficiencies under 40 CFR 264.173(a), 268.7(a)(7), and 268.7(b)(4)&(5) have been resolved. We want to inform you that your facility is acceptable to receive CERCLA (Superfund) waste.

If you have any questions, please call Gertrud Matuschkovitz in the RCRA Enforcement Branch at (312) 353-7921.

Sincerely yours,

William E. Muno, Acting Director
For Waste Management Division

cc: Ben Okwumabua, MDNR
Michael Busse, MDNR

FILE COPY

THE
ENVIRONMENTAL QUALITY
COMPANY

January 5, 1999

Re: Offsite Policy Compliance
Michigan Disposal Waste Treatment Plant
MID 000 724 831

To whom it may concern:

The purpose of this letter is to clarify the notification letter from William E. Muno of the United States Environmental Protection Agency Region 5, dated November 06, 1992, addressed to Mr. David Lusk of Michigan Disposal, Inc. As stated in the letter Michigan Disposal, Inc is certified to accept CERCLA (Superfund) waste.

Since the 1992 letter, Michigan Disposal, Inc. has changed it's name to Michigan Disposal Waste Treatment Plant. The address and EPA Identification number remain the same.

The status of our ability to accept CERCLA waste remains unchanged as of January 05, 1999.

Sincerely,
EQ-The Environmental Quality Company

Jennifer Baker

Jennifer Baker
Regulatory Affair Manager

cc: G. Photsios

THE ENVIRONMENTAL QUALITY COMPANY

August 6, 2004

Mactec Engineering and Consulting
3200 Town Park Drive
Kennesaw, GA 30144

RE: **Lead Soil in Memphis, TN**

Dear Michael LaPrade:

On behalf of The Environmental Quality Company (EQ), we are pleased to offer our intent to properly manage D008 contaminated soil waste. The intent is contingent upon approval at Michigan Disposal Inc., EQ's hazardous waste treatment facility.

Michigan Disposal has the proper permits to accept the aforementioned waste. However, the acceptance is contingent upon the submittal of a completed Waste Characterization Report and certified analytical or sample.

As a general guideline, EQ will require a 5-point composite sample per 200 tons of waste. The limitations for treatment are dependent upon many factors. In general, the upper limit is approximately 500 mg/L TCLP. If the material were greater than that limit, we would need a sample to do a treatability study.

EQ Treatment and Disposal facilities also offer indemnification as well as copies of all permits, insurance certificates and any other information upon request.

Facility Information:

Name:	**Michigan Disposal, Inc.**
Address:	**49350 North I-94 Service Drive** **Belleville, Michigan 48111**
USEPA ID #:	**MID000724831**

If you have any further comments or questions please feel free to call me at (800) 592-5489.

Sincerely,

Tracy Eckel

Tracy Eckel
EQ – Resource Coordinator

Chemical Waste Management

Emelle, AL

WM.
WASTE MANAGEMENT

WASTE MANAGEMENT
Emelle Treatment Facility
Highway 17 N. Mile Marker 163
P.O. Box 55
Emelle, AL 35459
(205) 652-9721

DATE: October 13, 2004

TO: Customer Service

FROM: Rodger Henson RHenson
Market Area Manager

RE: CERCLA Status at the Emelle Facility

CERCLA status is more or less self-implementing and the way the "off-site policy" works there is no single document or permit that allows a commercial TSD to receive CERCLA wastes. The "off-site policy" automatically grants CERCLA status to facilities which meet certain requirements (ie.; no releases, no relevant violations and inspections). Therefore, there is no documentation received from the agencies unless CERCLA status is lost or temporarily suspended.

The Emelle Facility does meet the criteria outlined in the policy, has not lost CERCLA status, does routinely receive CERCLA wastes and is an approved facility under the "off-site policy". There is, however no single document that I can provide you which states this approval.

809 165

From everyday collection to environmental protection, Think Green.™ Think Wast

- Home
- Contact Us
- Services
- Community
- Related Links
- Request Info.
- Pay Your Bill

WM News

- Felago, Trevathan named to new positions
- Q2 Earnings Announced

CWM - Emelle - AL

About Waste Management

Waste Management, Inc. is its industry provider of comprehensive waste mana Headquartered in Houston, Texas, we p of life in many communities, providing approximately 25 million residential an commercial customers in North Americ

THE CWM - EMELLE ALABAMA FACILITY West Alabama, about five miles north o Emelle in Sumter County. This 2800-ac located atop a geologic phenomenon known as the Selma Chalk Formation, a homogenous and essentially impermeable formation. Approximately 700 feet with a permeability of 1x10-7 cm/sec isolates the facility from the nearest gro producing aquifer. The thickness and extremely low permeability of this geolo provide a natural environmental protection that exceeds regulatory requireme cells are constructed with double synthetic liners and leachate collection syste rain water. Design and construction of the disposal cells ensure that the envir protected. CWM Emelle has a RCRA Part B permit from the Alabama Departme Environmental Management with authority from EPA Region IV. TSCA disposal issued by EPA Region IV.

In addition the facility offers:

1. TSCA landfill (PCB), including PCB landfill and PCB equipment servicin
2. RCRA landfill, including treatment, solidification, decharacterization, ar
3. Debris management, including macroencapsulation and microencapsul
4. Storage and transshipment of waste for recycling, fuels blending, and

Continuing to make a difference

Waste Management is strongly committed to the safe and responsible manage and the highest quality of service. We are responsive to the concerns of our ci diligently to ensure regulatory compliance and protection of the public's health resources.

EPA # ALD-000-622-464

From everyday collection to environmental protection, Think Green.℠ Think Waste

- Home
- Contact Us
- Services
- Community
- Related Links
- Request Info.
- Pay Your Bill

CWM - Emelle - AL

Contact Us

Street Address
Office:
Highway 17 North
Milemarker 163
Emelle, AL 35459 Map It!
USA
Phone: (800) 652-5755
Fax: (205) 652-8289

Mailing Address
Office:
P.O. Box 55
Emelle, AL 35459
USA

Billing
Hours:
7:30 am - 4:00 pm
Monday - Friday
Closed on: New Years Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, and Christmas Day

Kathye Howard
Billing Clerk
Office: (205) 652-8037
Fax: (205) 652-8289
khoward@wm.com

Collection
Hours:
7:30 am - 4:00 pm
Monday - Friday
Closed on: New Years Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, and Christmas Day

Gina Holmes
Collections Clerk
Office: (205) 565-8040
Fax: (205) 652-8289
gholmes@wm.com

Customer Service
Please contact Customer Service for all sales, disposal, and customer questions.
Hours:
7:30 am - 4:30 pm
Monday - Friday
Closed on: New Years Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, and Christmas Day

Customer Service
Office: (800) 652-5755
Fax: (205) 652-8289
kknox@wm.com

Dispatch

Transportation Scheduling (Rolloffs, Tankers, Flatbeds, Vans, and Dumps)

Hours:
7:30 am - 4:00 pm
Closed on: New Years Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, and Christmas Day

John Griffith
Trans. Coordinator
Office: (205) 652-8338
Fax: (205) 652-8289
jgriffith@wm.com

Environmental

Hours:
7:30 am - 4:00pm
Closed on: New Years Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, and Christmas Day

Vanessa Watkins
Approvals Supervisor
Office: (205) 652-8442
Fax: (205) 652-8013
vwatkins@wm.com

Teresa Williams
Environmental Supv.
Office: (205) 652-8140
Fax: (205) 652-8143
twilliams@wm.com

Human Resources

Hours:
7:30 am - 4:30pm
Closed on: New Years Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, and Christmas Day

Brenda Harper
Human Resources Mgr.
Office: (205) 652-8006
Fax: (205) 652-8012
bharper@wm.com

Safety

Hours:
7:30am - 4:00pm
Closed on: New Years Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, and Christmas Day

Brenda Harper
Human Resources Mgr.
Office: (205) 652-8006
Fax: (205) 652-8012
bharper@wm.com

Sales

Contact Customer Service for all sales issues.

Hours:
Monday - Friday 7:30 AM - 4:30 PM
After hours and weekend receiving may be arranged for large event jobs.
Closed on: New Years Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, and Christmas Day

Customer Service
Office: (800) 652-5755
Fax: (205) 652-8289
kknox@wm.com

Tunica Landfill

Robinsonville, MS

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
100 ALABAMA STREET, S.W.
ATLANTA, GEORGIA 30303-3104

SEP 01 1998

4WD-RCRA

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Mr. David Kraus
Trash Hunters of Tunica
6035 Bowdre Road
Robinsonville, MS 38664

SUBJ: CERCLA Off-site Rule: Affirmative Determination of Acceptability for Tunica County Landfill, Tunica County, Robinsonville, Mississippi, Solid Waste Permit Number SW-0720010459

Dear Mr. Kraus:

The U.S. Environmental Protection Agency, Region 4 (EPA) has made an affirmative determination of acceptability for the receipt of non-hazardous CERCLA off-site waste at the Subtitle D lined section of **Tunica County Landfill**, Tunica County, Robinsonville, Mississippi, Solid Waste Permit Number SW-0720010459. Pursuant to 40 C.F.R. § 300.440(a)(4), EPA has completed an initial assessment of Tunica County Landfill, and finds that the Subtitle D lined cell at Tunica County Landfill is acceptable for the receipt of non-hazardous off-site waste. Such off-site waste is defined as those wastes generated as a result of activities authorized pursuant to, or funded by, the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

On September 22, 1993, EPA amended the National Oil and Hazardous Substances Pollution Contingency Plan, 40 C.F.R. Part 300, by adding Section 300.440, now known as the Off-site Rule. The rule implements and codifies the requirements contained in CERCLA Section 121(d)(3), and incorporates many provisions of the November 13, 1987, OSWER Directive (No. 9834.11), known as the Off-site Policy. The Off-site Rule establishes the criteria and procedures for determining if facilities are acceptable for the off-site receipt of CERCLA waste, and outlines the actions affected by the standard.

The Off-site Rule requires that prior to a facility's initial receipt of CERCLA waste, EPA shall determine if there are relevant releases or relevant violations at the facility. EPA believes that affirmative determinations of "compliance" and "control of releases" are necessary before a facility may be deemed acceptable for the receipt of CERCLA wastes.

This affirmative determination of Tunica County Landfill is based on information provided by representatives of the Mississippi Department of Environmental Quality (MDEQ). On July 10, 1998 MDEQ conducted an inspection to determine the Tunica County Landfill's compliance with the applicable state regulations and effective operating permits. The results of the inspection indicate that the Subtitle D lined cell at Tunica County Landfill is currently in compliance with applicable environmental standards. Based on communication with MDEQ personnel, the U.S. EPA Regional Office has no information indicating any environmentally significant release of hazardous substances from the Subtitle D lined receiving unit. Therefore, effective upon receipt of this letter Tunica County Landfill is acceptable to receive non-hazardous CERCLA off-site waste at the Subtitle D lined cell of the facility described above. EPA would like to make it clear that the affirmative determination of acceptability is for the Subtitle D lined cell only. Should any new information affecting this determination develop, EPA reserves its right to revisit this decision.

Please note that this determination does not supersede the requirements of Subtitle C of the Resource Conservation and Recovery Act for CERCLA wastes which are also hazardous.

The CERCLA off-site status for Tunica County Landfill is acceptable for Subtitle D solid waste and will remain so until EPA notifies you otherwise. However, please note that the CERCLA off-site status for a facility is dynamic in nature and is subject to change. If you have any questions concerning this matter, please contact Jack Cowart, of my staff, at (404) 562-8007.

Sincerely yours,

Richard D. Green, Director
Waste Management Division

enclosure

cc: David Lee, MDEQ, w/enclosure
Billy Warden, MDEQ

WM. WASTE MANAGEMENT

THE TUNICA LANDFILL
6035 Bowdre Road
Tunica Resorts, MS 38664
(662) 363-2282
(662) 363-0170 Fax

August 4, 2004

Mr. Michael Laprade
MacTec
3200 Town Point Drive
Kennesah, GA 30144

Dear Mr. Laprade,

Waste Management of Tunica Landfill is pleased to be considered as a disposal option for your project at the Memphis Defense Depot.

In accordance to our solid waste permit, special waste streams must be profiled, which consists of analytical testing and other waste characterization information, and approved by an approvals chemist from Waste Management and in some cases the Mississippi Department of Environmental Quality.

The necessary analytical testing requirements are based upon waste type and source. These testing requirements are set forth by Federal and State Regulations and will be communicated once a Waste Management Profile has been submitted.

We look forward to working with you on your project and have enclosed a copy of this facility' CECLRA approval and The Tunica Landfill Audit Package for your files.

If you should require any additional, information please feel free to contact me.

Respectfully Submitted,

Jeffrey H. Papasan
District Manager
The Tunica Landfill, a Waste Management Company

South Shelby Landfill

Millington, TN

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
100 ALABAMA STREET, S.W.
ATLANTA, GEORGIA 30303-3104

August 19, 1997

4WD-RCRA

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Mr. James E. Fleming
BFI South Shelby Landfill
5494 Malone Road
Memphis, TN 38118

SUBJ: CERCLA Off-site Rule: Affirmative Determination of Acceptability for BFI South Shelby Landfill Shelby County, Memphis, Tennessee, Tennessee Department of Environment & Conservation Solid Waste Permit Number SNL 79-106-0135.

Dear Mr. Fleming:

The U.S. Environmental Protection Agency, (EPA), Region 4 has made an affirmative determination of acceptability for the receipt of non-hazardous CERCLA off-site waste at the Subtitle D lined section of **BFI South Shelby Landfill (BFI-South Shelby)**, Memphis, Tennessee, Tennessee Department of Environmental & Conservation Solid Waste Permit Number 79-106-0135 Pursuant to 40 C.F.R. § 300.440(a)(4), EPA has completed an initial assessment of BFI-South Shelby, and finds that the Subtitle D lined cell at BFI-South Shelby is acceptable for the receipt of non-hazardous off-site waste. Such off-site waste is defined as those wastes generated as a result of activities authorized pursuant to, or funded by, the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

On September 22, 1993, EPA amended the National Oil and Hazardous Substances Pollution Contingency Plan, 40 C.F.R. Part 300, by adding Section 300.440, now known as the Off-site Rule. The rule implements and codifies the requirements contained in CERCLA Section 121(d)(3), and incorporates many provisions of the November 13, 1987, OSWER Directive (No. 9834.11), known as the Off-site Policy. The Off-site Rule establishes the criteria and procedures for determining if facilities are acceptable for the off-site receipt of CERCLA waste, and outlines the actions affected by the standard.

The Off-site Rule requires that prior to a facility's initial receipt of CERCLA waste, EPA shall determine if there are relevant releases or relevant violations at the facility. EPA believes that affirmative determinations of "compliance" and "control of releases" are necessary before a facility may be deemed acceptable for the receipt of CERCLA wastes.

This affirmative determination of BFI-South Shelby is based on information provided by representatives of the Tennessee Department of Environment & Conservation (TDEC). On May 14, 1997, TDEC conducted an inspection to determine BFI-South Shelby's compliance with the applicable state regulations and effective operating permits. The results of the inspection indicate that the Subtitle D lined cell at BFI-South Shelby is currently in compliance with applicable environmental standards. Based on communication with TDEC personnel, the U.S. EPA Regional Office has no information indicating any environmentally significant release of hazardous substances from the Subtitle D lined receiving unit. Therefore, effective upon receipt of this letter BFI-South Shelby is acceptable to receive non-hazardous CERCLA off-site waste at the Subtitle D lined cell of the facility described above. EPA would like to make it clear that the affirmative determination of acceptability is for the Subtitle D lined cell only. Should any new information affecting this determination develop, EPA reserves its right to revisit this decision.

Please note that this determination does not supersede the requirements of Subtitle C of the Resource Conservation and Recovery Act for CERCLA wastes which are also hazardous.

The CERCLA off-site status for BFI-South Shelby is acceptable for Subtitle D solid waste and will remain so until EPA notifies you otherwise. However, please note that the CERCLA off-site status for a facility is dynamic in nature and is subject to change. If you have any questions concerning this matter, please contact Houston Gilliand Jr., of my staff, at (404) 562-8617.

Sincerely yours,

Richard D. Green
Acting Director
Waste Management Division

Enclosure

cc: Mark Thomas, TDEC, w/enclosure
Tom Tiesler, TDEC

State of Tennessee
Department of Environment
and Conservation
Division of Solid Waste Management

Solid Waste Management Program
401 Church Street
5th Floor L & C Tower
Nashville, Tennessee 37243-1535
615-532-0780

REGISTRATION AUTHORIZING SOLID WASTE DISPOSAL ACTIVITIES IN TENNESSEE

Registration Number: **SNL 79-0135 EXT**

Date Issued: December 9, 1999

Issued to: BFI Waste Systems of North America, Inc., for a facility located in south Shelby County, Tennessee

Activities Authorized: Construction, operation, closure and post closure care of a Class I Landfill in accordance with the approved operation manual and engineering plans

By my signature this registration is issued in compliance with the provisions of the Tennessee Solid Waste Disposal Act (Tennessee Code Annotated, Section 68-211-101, et seq.), and applicable regulations developed pursuant to this law and in effect; and in accordance with the conditions and other terms set forth in this registration document and attached Registration Conditions.

Mike Apple, Director
Division of Solid Waste Management

JMA/DBM/mjs PER1

BFI®

August 6, 2004

Mactec
Michael LaPrade
3200 Town Point Drive
Suite 100
Kennesaw, Georgia 30144
VIA FACSIMILE: (770) 421-3486

Re: South Shelby Landfill

Dear Mr. LaPrade,

As per our telephone conservation Thursday BFI South Shelby Landfill can accept the non-hazardous contaminated soil and debris from the Defense Depot in Memphis. Please note the material must pass TCLP testing and the results will be required to accompany a BFI waste profile that will be review by BFI corporate waste approval group prior to shipping. A State of Tennessee approval letter will also be required. Once the proper approvals are in place a BFI manifest (provided at no charge) will be required with each load.

Attached please find the following:

- CERCLA approval
- Permit ID
- Landfill Fact Sheet

If you have any questions or require additional information please do not hesitate to call me at (901) 872-7258.

Thank you,

Shana S. Fristick

Shana S. Fristick
Special Waste Consultant
BFI Memphis Landfills

Attachment 2

Waste Hauler Qualifications

US Bulk Transport, Inc.

Erie, PA

UNITED STATES OF AMERICA
DEPARTMENT OF TRANSPORTATION
RESEARCH AND SPECIAL PROGRAMS ADMINISTRATION

HAZARDOUS MATERIALS
CERTIFICATE OF REGISTRATION
FOR REGISTRATION YEAR 2004-2007

Registrant: U S BULK TRANSPORT INC
GARY GOODELLE
205 PENNBRIAR DRIVE
ERIE, PA 16509-0000

This certifies that the registrant is registered with the U.S. Department of Transportation as required by 49 CRF Part 107, Subpart G.

This certificate is issued under the authority of 49 U.S. C. 5108. It is unlawful to alter or falsify this document.

Reg. No: 061104 001 009MO Issued: 06/11/04 Expires: 06/30/07

Record Keeping Requirements for the Registration Program

The following must be maintained at the principal place of business for a period of three years from the date of issuance of this Certificate of Registration:

(1) A copy of the registration statement filed with RSPA; and
(2) This Certificate of Registration

Each person subject to the registration requirement must furnish that person's Certificate of Registration (or a copy) and all other records and information pertaining to the information contained in the registration statement to an authorized representative or special agent of the U. S. Department of Transportation upon request.

Each motor carrier (private or for-hire) and each vessel operator subject to the registration requirement must keep a copy of the current Certificate of Registration or another document bearing the registration number identified as the "U.S. DOT Hazmat Reg. No." in each truck and truck tractor or vessel (trailers and semi-trailers not included) used to transport hazardous materials subject to the registration requirement. The Certificate of Registration or document bearing the registration number must be made available, upon request, to enforcement personnel.

For information, contact the Hazardous Materials Registration Manager, DHM-60 Research and Special Programs Administration, U.S. Department of Transportation, 400 Seventh Street, SW, Washington, DC 20590, telephone (202) 366-4109.

Greenleaf Treatment Services

Macon, GA

UNITED STATES OF AMERICA
DEPARTMENT OF TRANSPORTATION
RESEARCH AND SPECIAL PROGRAMS ADMINISTRATION

HAZARDOUS MATERIALS CERTIFICATE OF REGISTRATION FOR REGISTRATION YEAR 2004-2005

Registrant: GREENLEAF TREATMENT SERVICES
DANIEL NULF
100 WASTE RESEARCH DR
MACON, GA 31206-0000

This certifies that the registrant is registered with the U.S. Department of Transportation as required by 49 CRF Part 107, Subpart G.

This certificate is issued under the authority of 49 U.S.C. 5108. It is unlawful to alter or falsify this document.

Reg. No: 050504 001 001M Issued: 05/05/04 Expires: 06/30/05

Record Keeping Requirements for the Registration Program

The following must be maintained at the principal place of business for a period of three years from the date of issuance of this Certificate of Registration:

(1) A copy of the registration statement filed with RSPA; and
(2) This Certificate of Registration

Each person subject to the registration requirement must furnish that person's Certificate of Registration (or a copy) and all other records and information pertaining to the information contained in the registration statement to an authorized representative or special agent of the U. S. Department of Transportation upon request.

Each motor carrier (private or for-hire) and each vessel operator subject to the registration requirement must keep a copy of the current Certificate of Registration or another document bearing the registration number identified as the "U.S. DOT Hazmat Reg. No." in each truck and truck tractor or vessel (trailers and semi-trailers not included) used to transport hazardous materials subject to the registration requirement. The Certificate of Registration or document bearing the registration number must be made available, upon request, to enforcement personnel.

For information, contact the Hazardous Materials Registration Manager, DHM-60 Research and Special Programs Administration, U.S. Department of Transportation, 400 Seventh Street, SW. Washington, DC 20590, telephone (202) 366-4109.

Robbie D. Wood, Inc.

Dolomite, AL

UNITED STATES OF AMERICA
DEPARTMENT OF TRANSPORTATION
RESEARCH AND SPECIAL PROGRAMS ADMINISTRATION

HAZARDOUS MATERIALS CERTIFICATE OF REGISTRATION FOR REGISTRATION YEAR 2003-2006

Registrant: ROBBIE D WOOD INC.
Attn: Robert D. Wood, Jr.
P.O. Box 125
Dolomite, AL 35061

This certifies that the registrant is registered with the U.S. Department of Transportation as required by 49 CFR Part 107, Subpart G.

This certificate is issued under the authority of 49 U.S.C. 5108. It is unlawful to alter or falsify this document.

Reg. No: 051603 008 042LN **Issued:** 05/19/03 **Expires:** 06/30/06

Record keeping Requirements for the Registration Program

The following must be maintained at the principal place of business for a period of three years from the date of issuance of this Certificate of Registration:

(1) A copy of the registration statement filed with RSPA; and
(2) This Certificate of Registration

Each person subject to the registration requirement must furnish that person's Certificate of Registration (or a copy) and all other records and information pertaining to the information contained in the registration statement to an authorized representative or special agent of the U. S. Department of Transportation upon request.

Each motor carrier (private or for-hire) and each vessel operator subject to the registration requirement must keep a copy of the current Certificate of Registration or another document bearing the registration number identified as the "U.S. DOT Hazmat Reg. No." in each truck and truck tractor or vessel (trailers and semi-trailers not included) used to transport hazardous materials subject to the registration requirement. The Certificate of Registration or document bearing the registration number must be made available, upon request, to enforcement personnel.

For information, contact the Hazardous Materials Registration Manager, DHM-60 Research and Special Programs Administration, U.S. Department of Transportation, 400 Seventh Street, SW, Washington, DC 20590, telephone (202) 366-4109.

Attachment 3

Waste Haul Routes

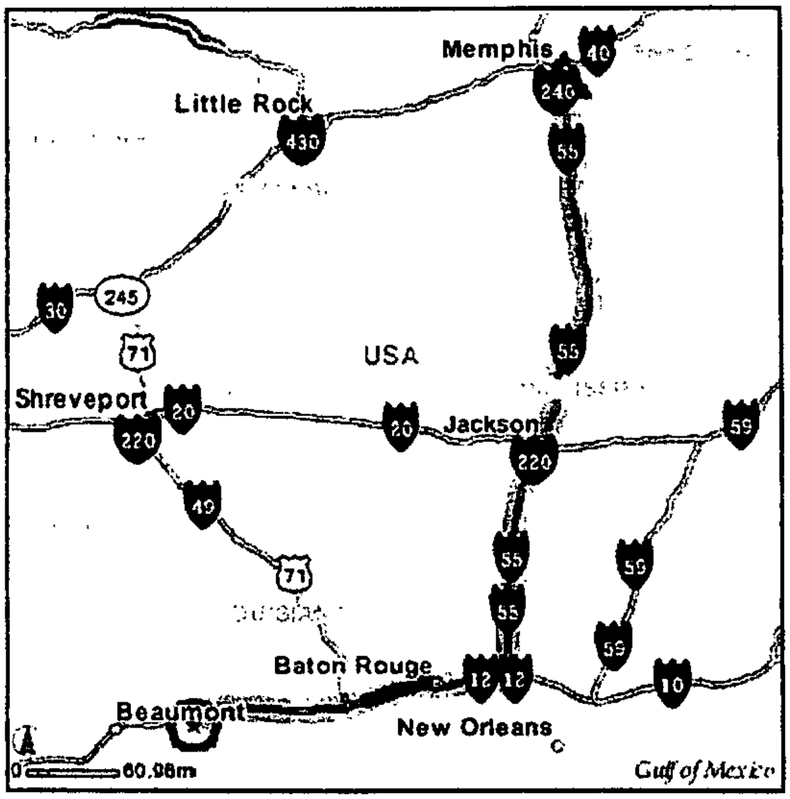
Chemical Waste Management

Sulphur, LA

809 186

Maps & Directions Lake Charles Facility

MAP: Overview



From :	2029 Troyer Avenue, Memphis, Tennessee
To :	7170 John Brannon Road, Sulphur, Louisiana
Total Distance	: 521.9 miles (839.9km)
Total Est. Time	: 8 hrs., 15mins.

LEGEND

Trip Route
Scenic Byway
Detour/Construction
Toll
Controlled Access
Primary
Secondary
Local
Unpaved
Trail
Tunnel
Interstate
TransCanadian Hwy
US Highway
State/Provincial Route
Rest Area

Starting Point
Stopover Point
Destination
Mapped Location
AAA Office
CAA Office
City
Event Location

Restaurant
Attraction
Lodging
Campground
AAA Approved Auto Repair
Show Your Card & Save

Interchange /Exit Number
Available this Exit:
g Gas
f Food
l Lodging
F AAA Approved Food
L AAA Approved Lodging

City names in red have AAA recommended lodging and/or dining facilities listed in the TourBook

DIRECTIONS:

2029 Troyer Avenue, Memphis, Tennessee to 7170 John Brannon Road, Sulphur, Louisiana
Distance: 521.9 miles (839.9 km)

1. Start out heading EAST on TROYER AVENUE towards LLOYD STREET. Drive for 0.2 miles.
2. Turn RIGHT onto LLOYD STREET. Drive for 0.1 miles.
3. Turn LEFT onto MEMPHIS DEPOT PARKWAY. Drive for 0.2 miles.
4. Turn RIGHT onto AIRWAYS BOULEVARD. Drive for 0.5 miles.
5. Go STRAIGHT to get on I-240 W. Drive for 2.2 miles.
6. Go STRAIGHT on I-55 N. Drive for 0.3 miles.
7. Take exit number 25A to get on I-240 S towards I-55 S / JACKSON MISS. Drive for 0.3 miles.
8. Go STRAIGHT on 25A. Drive for 0.2 miles.
9. Go STRAIGHT on I-55 S. Drive for 201.9 miles.
10. Take I-20 W towards I-55 S / I-20 W / MCCOMB / VICKSBURG. Drive for 1.9 miles.
11. Take exit number 44 to get on I-55 S towards I-55 S / US-51 S. Drive for 127.9 miles.
12. Take exit number 29B to get on I-12 W towards BATON ROUGE. Drive for 37.4 miles.
13. Take I-10 W. Drive for 4.5 miles.
14. Stay STRAIGHT on I-10 W heading towards LAFAYETTE. Drive for 134.3 miles.

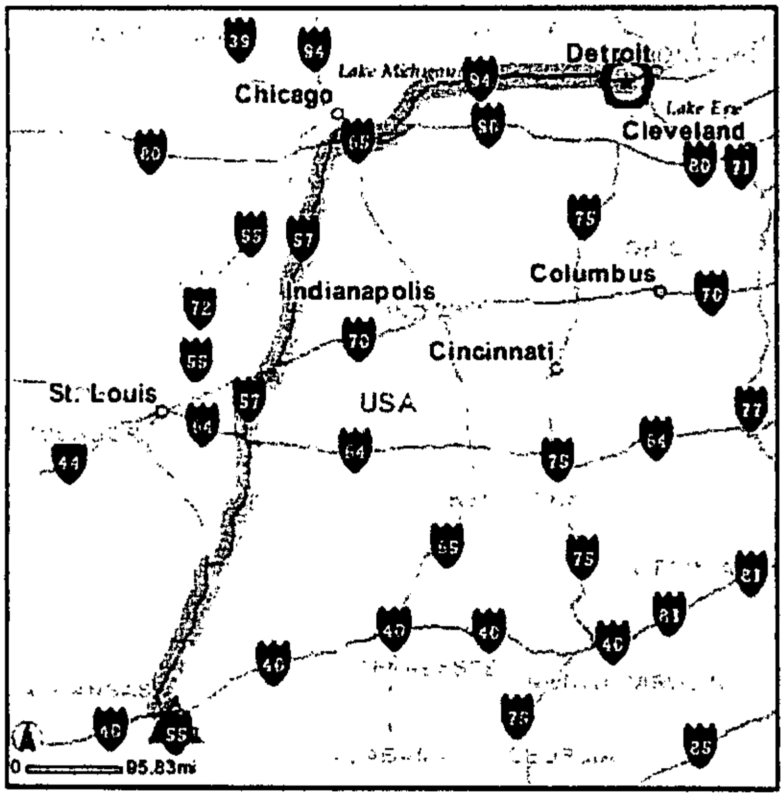
15. Take exit number 20 towards LA-27 / CAMERON / SULPHUR. Drive for 0.2 miles.
16. Keep LEFT at the fork towards LA-27 S. Drive for 5.4 miles.
17. Turn RIGHT onto LA-108 W. Drive for 2 miles.
18. Turn LEFT onto JOHN BRANNON ROAD.
19. Drive for 1.5 miles to reach the destination.

Michigan Disposal Waste Treatment Plant

Belleville, MI

Maps & Directions Michigan Disposal Waste Treatment Plant

MAP: Overview



From :	2029 Troyer Avenue, Memphis, Tennessee
To :	Belleville, Michigan
Total Distance	: 763.3 miles (1228.4km)
Total Est. Time	: 11 hrs., 4mins.

LEGEND

Trip Route
Scenic Byway
Detour/Construction
Toll
Controlled Access
Primary
Secondary
Local
Unpaved
Trail
Tunnel
Interstate
TransCanadian Hwy
US Highway
State/Provincial Route
Rest Area

Starting Point
Stopover Point
Destination
Mapped Location
AAA Office
CAA Office
City
Event Location

Restaurant
Attraction
Lodging
Campground
AAA Approved Auto Repair
Show Your Card & Save

Interchange /Exit Number
Available this Exit:
g Gas
f Food
l Lodging
F AAA Approved Food
L AAA Approved Lodging

City names in red have AAA recommended lodging and/or dining facilities listed in the TourBook

These directions are provided solely as a guideline. No representation is made or warranty given as to their content, route practicability or efficiency. User assumes all risk of use. AAA and its suppliers assume no responsibility for any loss or delay from use.

DIRECTIONS:

2029 Troyer Avenue, Memphis, Tennessee to Belleville, Michigan
Distance: 763.3 miles (1228.4 km)

1. Start out heading EAST on TROYER AVENUE towards LLOYD STREET. Drive for 0.2 miles.
2. Turn RIGHT onto LLOYD STREET. Drive for 0.1 miles.
3. Turn LEFT onto MEMPHIS DEPOT PARKWAY. Drive for 0.2 miles.
4. Turn RIGHT onto AIRWAYS BOULEVARD. Drive for 0.5 miles.
5. Go STRAIGHT to get on I-240 W. Drive for 2.2 miles.
6. Go STRAIGHT on I-55 N. Drive for 6 miles.
7. Stay STRAIGHT on I-55 N heading towards I-55 N / US-61 N / ST LOUIS / LITTLE ROCK. Drive for 7.8 miles.
8. Stay SLIGHT RIGHT on I-55 N heading towards BLYTHEVILLE / JONESBORO. Drive for 130.8 miles.
9. Take exit number 66A to get on I-57 N towards I-57 N / US-60 E / CHICAGO. Drive for 366 miles.
10. Take exit number 345A to get on I-80 E towards INDIANA / I-294. Drive for 26.8 miles.
11. Go STRAIGHT on I-94 E. Drive for 218.5 miles.
12. Take exit number 190 towards BELLEVILLE RD / BELLEVILLE. Drive for 0.4 miles.
13. Turn RIGHT to get on BELLEVILLE ROAD heading SOUTH. Drive for 0.8 miles.
14. Go STRAIGHT on MAIN STREET.

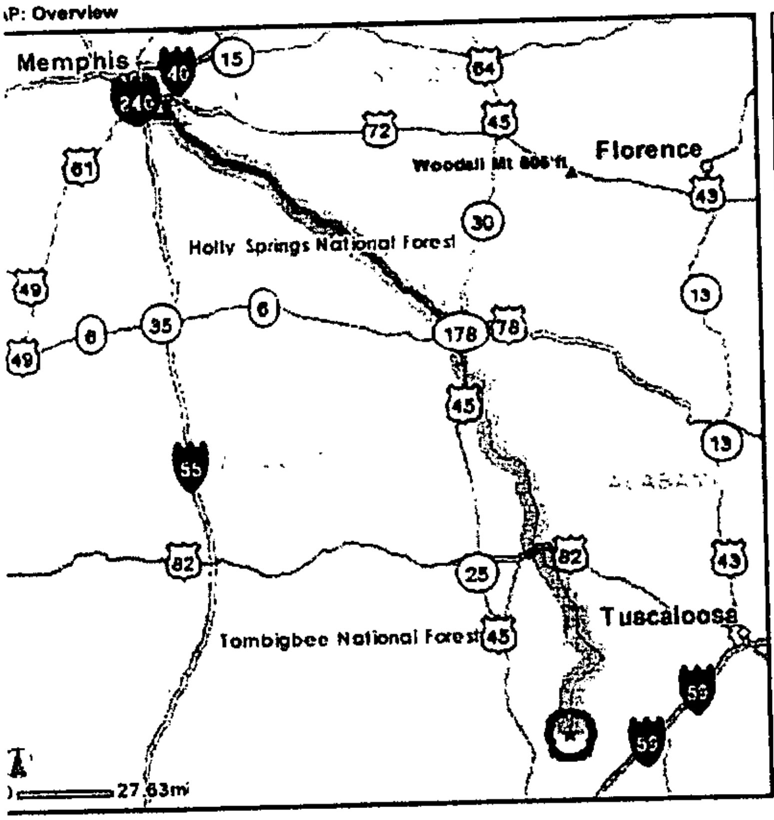
15. Drive for 0.5 miles to reach the destination.

Chemical Waste Management

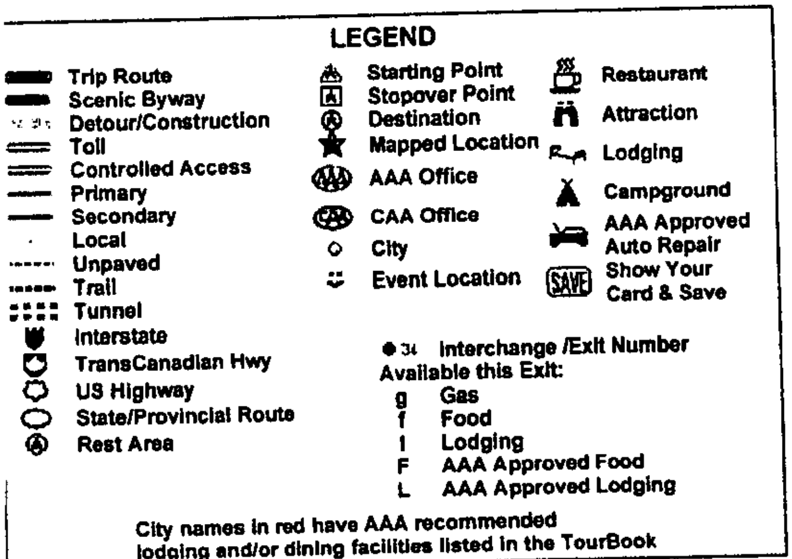
Emelle, AL

Maps & Directions CWM - Emelle

MAP: Overview



LEGEND



From :	2029 Troyer Avenue, Memphis, Tennessee
To :	Al-17 @ Alexander Street, Emelle 35459, Alabama
Total Distance	: 218.6 miles (351.8km)
Total Est. Time	: 4 hrs., 17mins.

DIRECTIONS:

2029 Troyer Avenue, Memphis, Tennessee to Al-17 @ Alexander Street, Emelle 35459, Alabama
Distance: 218.6 miles (351.8 km)

1. Start out heading EAST on TROYER AVENUE towards LLOYD STREET. Drive for 0.2 miles.
2. Turn RIGHT onto LLOYD STREET. Drive for 0.1 miles.
3. Turn LEFT onto MEMPHIS DEPOT PARKWAY. Drive for 0.2 miles.
4. Turn RIGHT onto AIRWAYS BOULEVARD. Drive for 0.7 miles.
5. Take I-240 E towards NASHVILLE. Drive for 1.6 miles.
6. Take exit number 21 towards LAMAR AVE / US-78 / BIRMINGHAM. Drive for 0.1 miles.
7. Keep SLIGHT RIGHT at the fork towards ramp towards LAMAR AVE / US-78 E / BIRMINGHAM. Drive for 0.3 miles.
8. Go STRAIGHT on LAMAR AVENUE. Drive for 6.6 miles.
9. LAMAR AVENUE becomes US-78 E. Drive for 86.6 miles.
10. Take exit number 86A to get on US-45 S towards TUPELO. Drive for 12.7 miles.
11. Take exit towards US-45 S / MS-145 N. Drive for 0.2 miles.
12. Turn LEFT to get on MS-145 heading EAST. Drive for 0.2 miles.
13. Go STRAIGHT on US-45. Drive for 51.8 miles.
14. Turn LEFT onto MAIN STREET. Drive for 2.1 miles.

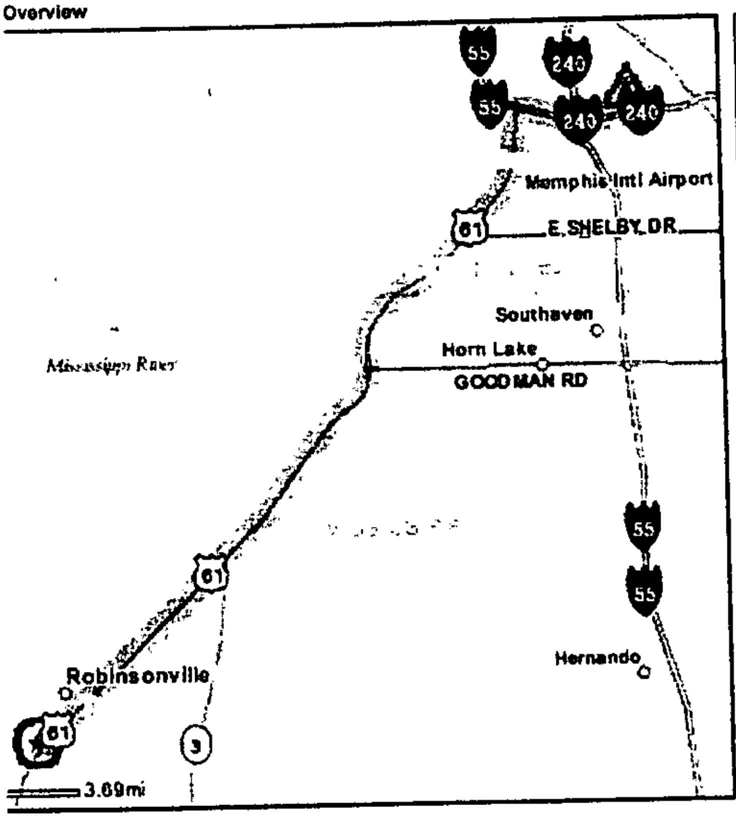
15. MAIN STREET becomes ALABAMA STREET. Drive for 0.1 miles.
16. Turn RIGHT onto IDLEWILD ROAD. Drive for 2.9 miles.
17. IDLEWILD ROAD becomes MS-69 S. Drive for 9.5 miles.
18. MS-69 S becomes AL-14. Drive for 19.1 miles.
19. Turn RIGHT onto AL-17. Drive for 22.2 miles.
20. Turn RIGHT onto ALEXANDER STREET.
21. Drive for a short distance to reach the destination.

Tunica Landfill

Robinsonville, MS

Maps & Directions Tunica Landfill

Overview



From : 2029 Troyer Avenue, Memphis, Tennessee
To : 1000 Bowdre Road, Robinsonville 38664, Mississippi
Total Distance : 31.3 miles (50.4km)
Total Est. Time : 0 hrs., 33mins.

DIRECTIONS:

2029 Troyer Avenue, Memphis, Tennessee to 1000 Bowdre Road, Robinsonville 38664, Mississippi
Distance: 31.3 miles (50.4 km)

1. Start out heading EAST on TROYER AVENUE towards LLOYD STREET. Drive for 0.2 miles.
2. Turn RIGHT onto LLOYD STREET. Drive for 0.1 miles.
3. Turn LEFT onto MEMPHIS DEPOT PARKWAY. Drive for 0.2 miles.
4. Turn RIGHT onto AIRWAYS BOULEVARD. Drive for 0.5 miles.
5. Go STRAIGHT to get on I-240 W. Drive for 2.2 miles.
6. Go STRAIGHT on I-55 N. Drive for 1.7 miles.
7. Take exit number 7 to get on US-61 S towards THIRD ST / US-61 / VICKSBURG. Drive for 25.7 miles.
8. Turn RIGHT onto BOWDRE ROAD.
9. Drive for 0.2 miles to reach the destination.

LEGEND

- Trip Route
- Scenic Byway
- Detour/Construction
- Toll
- Controlled Access
- Primary
- Secondary
- Local
- Unpaved
- Trail
- Tunnel
- Interstate
- TransCanadian Hwy
- US Highway
- State/Provincial Route
- Rest Area

- Starting Point
- Stopover Point
- Destination
- Mapped Location
- AAA Office
- CAA Office
- City
- Event Location

- Restaurant
- Attraction
- Lodging
- Campground
- AAA Approved Auto Repair
- SAVE Show Your Card & Save

34 Interchange /Exit Number
Available this Exit:
g Gas
f Food
l Lodging
F AAA Approved Food
L AAA Approved Lodging

City names in red have AAA recommended lodging and/or dining facilities listed in the TourBook

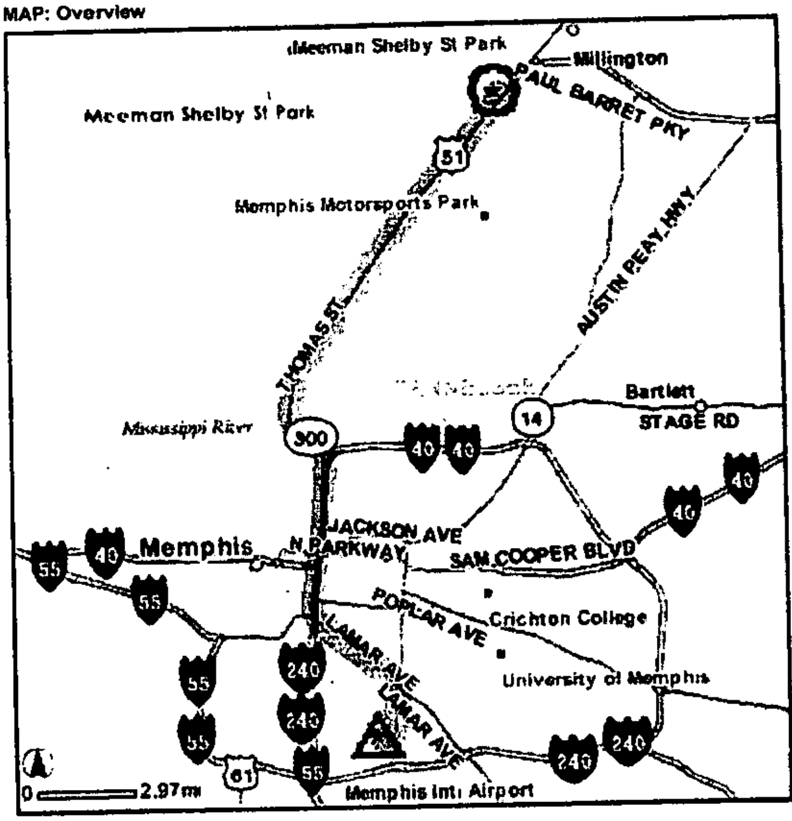
These directions are provided solely as a guideline. No representation is made or warranty given as to their content, route practicability or efficiency. User assumes all risk of use. AAA and its suppliers assume no responsibility for any loss or delay from use.

South Shelby Landfill

Millington, TN

Maps & Directions South Shelby Landfill

MAP: Overview



From :	2029 Troyer Avenue, Memphis, Tennessee
To :	7107 Old Millington Road, Millington, Tennessee
Total Distance :	20.4 miles (32.8km)
Total Est. Time :	0 hrs., 33mins.

DIRECTIONS:

2029 Troyer Avenue, Memphis, Tennessee to 7107 Old Millington Road, Millington, Tennessee
Distance: 20.4 miles (32.8 km)

1. Start out heading EAST on TROYER AVENUE towards LLOYD STREET. Drive for 0.2 miles.
2. Turn RIGHT onto LLOYD STREET. Drive for 0.1 miles.
3. Turn LEFT onto MEMPHIS DEPOT PARKWAY. Drive for 0.2 miles.
4. Turn LEFT onto AIRWAYS BOULEVARD. Drive for 1.3 miles.
5. Turn LEFT onto LAMAR AVENUE. Drive for 2.6 miles.
6. Turn SLIGHT RIGHT to get on I-240 N. Drive for 1.4 miles.
7. Go STRAIGHT on I-40 E. Drive for 2.6 miles.
8. Take exit number 2A to get on TN-300 N towards MILLINGTON / US-51. Drive for 1.3 miles.
9. Take US-51 towards US-51 N / MILLINGTON. Drive for 10.1 miles.
10. Turn LEFT onto MILLINGTON IND PARKWAY. Drive for 0.2 miles.
11. Turn LEFT onto MILLINGTON ROAD.
12. Drive for 0.1 miles to reach the destination.

LEGEND

Trip Route
Scenic Byway
Detour/Construction
Toll
Controlled Access
Primary
Secondary
Local
Unpaved
Trail
Tunnel
Interstate
TransCanadian Hwy
US Highway
State/Provincial Route
Rest Area

Starting Point
Stopover Point
Destination
Mapped Location
AAA Office
CAA Office
City
Event Location

Restaurant
Attraction
Lodging
Campground
AAA Approved Auto Repair
Show Your Card & Save

Interchange /Exit Number
Available this Exit:
g Gas
f Food
l Lodging
F AAA Approved Food
L AAA Approved Lodging

City names in red have AAA recommended lodging and/or dining facilities listed in the TourBook

These directions are provided solely as a guideline. No representation is made or warranty given as to their content, route practicability or efficiency. User assumes all risk of use. AAA and its suppliers assume no responsibility for any loss or delay from use.

APPENDIX D

CONSTRUCTION QUALITY ASSURANCE PLAN

TABLE OF CONTENTS

LIST OF ATTACHMENTS

LIST OF ACRONYMS AND ABBREVIATIONS

AFCEE	Air Force Center for Environmental Excellence
BCT	BRAC Clean-up Team
BRAC	Base Realignment and Closure
CCE	Construction Certifying Engineer
CQAP	Construction Quality Assurance Plan
Depot	Memphis Depot
DoD	Department of Defense
DLA	Defense Logistics Agency
DRC	Depot Redevelopment Corporation
EPA	U.S. Environmental Protection Agency
H&S	Health & Safety
MACTEC	MACTEC Engineering and Consulting, Inc.
MI	Main Installation
PM	Project Manager
PMP	Project Management Plan
PSVP	Performance Standards Verification Plan
QA	Quality Assurance
QC	Quality Control
RA	Remedial Action
RAWP	Remedial Action Work Plan
RD	Remedial Design
ROD	Record of Decision
TDEC	Tennessee Department of Environment and Conservation
TO	Task Order
WMP	Waste Management Plan

D.1.0 INTRODUCTION

This Construction Quality Assurance Plan (CQAP) has been prepared by MACTEC Engineering & Consulting, Inc. (MACTEC) to describe quality assurance/quality control (QA/QC) activities associated with the excavation activities associated with the Remedial Action (RA) to be conducted at Dunn Field, which is located across Dunn Avenue from the north-northwest portion of the Main Installation (MI) of the Memphis Depot (Depot). This CQAP has been prepared for the Air Force Center for Environmental Excellence (AFCEE) in conjunction with the Defense Logistics Agency (DLA) under task order (TO) 29 of contract number F41624-03-D-8606. This CQAP describes QA/QC activities associated with the excavation activities proposed within the RAWP.

D.1.1 PURPOSE AND OBJECTIVES

The QA/QC activities associated with the RA were developed to aid in achieving the following goals:

- Perform excavation of five disposal sites at Dunn Field in accordance with the approved Dunn Field Disposal Sites Final Remedial Design (RD) (CH2M Hill, 2004a) Construction Drawings (Provided in Appendix A of the RAWP).
- Restore borrow and disturbed areas in accordance with the Construction Specifications.
- Satisfy requirements of regulatory agencies related to documentation.
- Satisfy QA/QC requirements for the collection and analysis of samples required during and after the remedial activities.
- Verify the remediation goals outlined in the Performance Standards Verification Plan (PSVP) are achieved.

This CQAP has been prepared to describe the activities that will be performed during the disposal sites RA to monitor and document the acceptability of the action.

D.2.0 CONSTRUCTION QA/QC ORGANIZATION

D.2.1 RESPONSIBILITY AND AUTHORITY

The project organization is divided into two main groups consisting of the project team and the field team. The project team consists mainly of management personnel. The Construction Certifying Engineer (CCE) will be on-site periodically during the RA construction to monitor progress, attend meetings, resolve disputes, as needed, to ensure that the work is implemented in accordance with the RAWP. The field team will consist of the personnel on-site during the RA activities. The general responsibilities and reporting requirements for each team member are described in the Project Management Plan (PMP) located in Appendix B of the RAWP.

D.2.2 PROJECT MEETINGS

This section includes a discussion of the various progress and status meetings that will be held throughout the RA activities. The purpose of the meetings is to discuss work progress, planning, and other issues related to construction. A portion of these meetings will be dedicated to QA/QC issues, as necessary, to provide an opportunity for the site team to express concerns regarding quality, to relay test results, and to ensure good communication between all organizations involved in the RA activities.

D.2.2.1 Pre-Construction Meeting

A pre-construction meeting will be scheduled prior to beginning major construction activities at Dunn Field. The meeting attendees may include the MACTEC Project Manager (PM), MACTEC Site Superintendent, AFCEE Contracting Officer Representative (COR), Health and Safety (H&S) Manager, and the Construction Certifying Engineer (CCE). Members of the Base Realignment and Closure (BRAC) Clean-up Team (BCT) and Depot Redevelopment Corporation (DRC) will also be invited to the pre-construction meeting. A portion of the meeting will be dedicated to the discussion of QA issues. These QA topics shall include, but may not be limited to, the following:

- Reviewing the responsibilities of each organization
- Discussing the authority of agencies and project and field team members to order work stoppages

- Reviewing lines of authority and communication for each organization
- Review of preliminary submittals – SHSP, RASAP, stormwater documents, etc.
- Providing each organization with all relevant QA/QC documents and supporting information
- Familiarizing each organization with the CQAP and its role relative to the design criteria, plans, and specifications
- Determining any changes to the CQAP that may be needed to document that the facility shall be constructed to meet or exceed the specified design requirements
- Discussing the established procedures or protocol for observations and tests, including sampling strategies
- Discussing the established procedures or protocol for handling construction deficiencies, repairs, and retesting, including "stop work" conditions
- Reviewing methods for documenting and reporting inspection data
- Reviewing methods for distributing and storing documents and reports
- Reviewing work area security and safety protocol
- Reviewing the proposed project schedule
- Discussing procedures for the location and protection of construction materials and for the prevention of damage of the materials from inclement weather or other adverse events
- Conducting a site walk-around to review construction materials and inspect equipment storage locations
- Action items, assigned actionees, and minutes shall be recorded and transmitted to the required distribution list and to meeting attendees.

D.2.2.2 Daily Meetings

The Site Superintendent will conduct daily pre-job briefings at the work area. The participants will include, at a minimum, the construction field personnel (including lower tiered subcontractors), and the field engineer. The primary purpose of these meetings is to address the day's planned activities and health and safety issues. Following the daily pre-job meetings, the Site Superintendent, and the CCE (or his representative) will meet to discuss CQAP activities planned for that day and interface needs with the construction personnel. The Project Chemist and/or H&S Manager will be consulted as necessary via telephone. The topics typically covered are listed below:

- Review the previous day's activities and accomplishments
- Review the work location and activities for the day (plan of the day)
- Discuss subcontractor's personnel and equipment assignments for the day
- Address scheduling of resources for upcoming work
- Review any new test data
- Discuss any potential construction problems
- Discuss construction quality assurance -planned activities and interface needs
- Discuss any health and safety issues.
- This meeting shall be documented and the documentation shall be retained on file by the Site Superintendent. The documentation shall be distributed to a list of individuals, to be determined at the Pre- Construction Meeting.

D.2.2.3 Weekly Progress Meetings

Weekly meetings will be held between RA Project Team via conference call to discuss construction progress. At a minimum, the weekly progress meetings shall be attended by the MACTEC PM or designated alternate, MACTEC Site Superintendent, CCE (or designated alternate) and the AFCEE COR or designated alternate. The BCT representatives will also be invited to attend these meetings. The purpose of the meeting is to accomplish the following:

- Review the previous week's activities and accomplishments
- Review construction progress schedule
- Review analytical data and determine whether additional excavation is required to meet RA objectives
- Review planned activities for the upcoming week
- Finalize resolution of problems from the previous week
- Discuss the potential problems with the work planned for the upcoming week.
- Minutes will be recorded and transmitted to the required distribution list and meeting attendees.

D.2.2.4 Problem or Work Deficiency Meetings

Meetings shall be convened as necessary to address inspection deficiencies, and non-conformances. Deficiencies observed during construction by the CCE (or other on-site representatives, including H&S issues) will be brought to the attention of the appropriate personnel within 48 hours which may include the MACTEC PM, MACTEC Site Superintendent, AFCEE COR, and the BCT representatives. These deficiencies will be tracked in the Site Superintendent's field log book until resolution, and included in the daily summary report. The CCE will also track these deficiencies including details of the deficiency, corrective action required, and date of corrective action.

D.3.0 IMPLEMENTATION OF REMEDIAL ACTION

This section describes the construction activities and submittal requirements that will be performed by MACTEC during the RA Activities. In addition, the detailed Construction Specifications related to the RA activities were provided in the RD and are provided in Attachment 1 of this CQAP.

D.3.1 GENERAL REQUIREMENTS

The Construction Specifications related to the following are provided as Attachment 1.

- Summary of Work (01010)
- Measurements and Payments (01025)
- Coordination (01040)
- Submittals (01300)
- Progress Schedule (01310)
- Construction Facilities and Temporary Controls (01500)
- Contract Closeout (01780)

D.3.2 SITE CONSTRUCTION ACTIVITIES

D.3.2.1 Site Preparation

The Construction Specifications for the site preparation are provided as Attachment 1. Prior to initiating excavation activities, the following site preparation activities will be conducted:

- Site Preparation (02200)
- Mobilizing construction equipment and personnel
- Installing sediment and erosion control barriers
- Constructing haul roads
- Dewatering (02240)
- Clearing, grubbing, and stripping
- Preparing stockpile area subgrade

Notice of the RA Implementation will be submitted to EPA and TDEC upon mobilization of the RA Contractor to Dunn Field. Notification will be made in accordance with the Federal Facilities Agreement and as noted in the master schedule. Prior to the start of the construction activities, the RA field team will review and become familiar with the RD and RAWP, including all Construction Drawings and Construction Specifications. The MACTEC Site Manager will also be familiar with the most recent construction schedule so that adequate resources (ie., laboratory, field testing equipment, staff, and CQA forms) including contingencies (e.g., backup equipment, alternate laboratory, and alternate RA staff) for RA activities will be commensurate with the anticipated construction productivity and work schedule. All necessary measures will be taken to avoid delaying construction activities and the completion of the RA. QA requirements outlined in each individual specification section will be followed during the RA.

D.3.2.2 Excavation and Backfill

The following Construction Specifications for activities associated with the excavation and backfill are provided as Attachment 1.

- Excavation (02315)
- Fill and Backfill (02316)
- Borrow Excavation (02317)
- Soil Stabilization (02370)
- Restoring site
- Demobilizing.

Approximately 2,290 cubic yards of hazardous and non–hazardous material will be excavated from the Dunn Field disposal sites. The locations of the proposed excavated areas and related stockpile areas are provided in Figures 2-1 through 2-3 of the RAWP. The excavation perimeters will be sampled in accordance with the Remedial Action Sampling and Analysis Plan. The PSVP provided in the RD and included as Attachment 2 of the CQAP provides a listing of the required samples and analysis.

The hazardous and non-hazardous material will be segregated during excavation. Excavated non-hazardous soils will be stockpiled on 20 mil liners during the final waste characterization and the hazardous soils will be placed in roll-off containers. Hazardous soils will be segregated based on the survey coordinates provided in the RD. Additionally, field personnel will perform visual inspections of excavated soils to determine if soil may potentially be hazardous. The materials will be sampled to characterize for the appropriate treatment/disposal method as outlined in Table 3-2 of PSVP.

The excavated areas will be backfilled using material imported from off-site sources and/or borrow material from on-site sources. All backfill material, whether from on on-site source or from an off-site source, will be sampled to ensure the material is clean. The sampling frequency for all backfill material from on-site sources will be one sample per every 250 CY. Backfill material from off-site sources will be sampled once per every 500 CY. The backfill, borrow excavation and soil stabilization requirements are provided in the Construction Specifications located in this Appendix.

D.3.2.3 Transportation and Disposal

The construction specifications for transportation and disposal (02999) are provided as Attachment 1. The excavated waste will be transported and disposed of in accordance with the construction specifications and the Waste Management Plan (WMP), provided in Appendix C of the RAWP.

D.4.0 REFERENCES

CH2M Hill, 2004a. Rev. 1 Dunn Field Disposal Sites Final Remedial Design. Prepared for the U.S. Army Engineering and Support Center, Huntsville, Alabama. April 2004.

CH2M Hill, 2004b. Final Dunn Field Record of Decision. Prepared for the U.S. Army Engineering and Support Center, Huntsville, Alabama. March 2004.

ATTACHMENT 1

CONSTRUCTION SPECIFICATIONS

CONTENTS

DIVISION 14—CONVEYING SYSTEMS (NOT USED)

DIVISION 15—MECHANICAL (NOT USED)

DIVISION 16—ELECTRICAL (NOT USED)

END OF SECTION

SECTION 01010
SUMMARY OF WORK

PART 1 GENERAL

1.1 WORK COVERED BY CONTRACT DOCUMENTS

A. The completed Work includes the excavation, characterization, transportation, and offsite disposal of contaminated soil and debris from Memphis Depot Dunn Field Disposal Sites.

1. The Memphis Depot originated as a military facility in the early 1940s. Its initial mission and function was to provide stock control, materiel storage, and maintenance services for the U.S. Army. In 1995, the Depot was placed on the list of Department of Defense (DoD) facilities to be closed under Base Realignment and Closure (BRAC). Storage and distribution of materiel for all U.S. military services and some civil agencies continued until the Depot closed in September 1997.

2. The Disposal Area (approximately 14 acres) consists of former disposal pits and trenches in the northwestern quadrant of Dunn Field.

B. Contaminated soil shall be excavated from Disposal Sites 3, 4.1, 10, 13, and 31 as shown on the drawings and disposed of in RCRA permitted hazardous and/or non-hazardous landfill. After confirmation sampling, the excavations hall be backfilled with clean, offsite borrow materials. The work consists of the following specific elements:

1. Excavation of approximately 225 cubic yards of soil and debris (glass bottles and crushed drums) from Disposal Site 3. Following confirmation sampling, the excavation, will be backfilled, compacted, and reseeded. Soil and debris will be transported to and disposed of in a RCRA permitted non-hazardous landfill.

2. Excavation of approximately 225 cubic yards of soil and debris contaminated with benzene, lead, and copper from Disposal Site 4.1. Following confirmation sampling, the excavation, will be backfilled, compacted, and reseeded. Soil and debris will be transported to and disposed of in a RCRA permitted non-hazardous landfill.

3. Excavation of approximately 250 cubic yards of copper-contaminated soil and debris and 360 cubic yards of lead-contaminated soil and debris from Disposal Site 10. Following confirmation sampling, the excavation, will be backfilled, compacted, and reseeded. Copper-contaminated soil and debris will be transported to and disposed of in a RCRA permitted non-hazardous landfill. Lead-contaminated soil and debris will be transported to and disposed of in a RCRA permitted hazardous landfill.

4. Excavation of approximately 55 cubic yards of soil and debris (glass bottles) from Disposal Site 13. Following confirmation sampling, the excavation, will be backfilled, compacted, and reseeded. Soil and debris will be transported to and disposed of in a RCRA permitted non-hazardous landfill.

5. Excavation of approximately 900 cubic yards of PAH-contaminated soil and debris and 275 cubic yards of PAH- and copper-contaminated soil and debris from Disposal Site 31. Following confirmation sampling, the excavation, will be backfilled, compacted, and reseeded. Soil and debris will be transported to and disposed of in a RCRA permitted non-hazardous landfill.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

END OF SECTION

SECTION 01025
MEASUREMENT AND PAYMENT

PART 1 GENERAL

1.1 SUBMITTALS

A. Informational:

1. Schedule of Values: Submit on Contractor's standard form
2. Schedule of Estimated Progress Payments: Submit with initially acceptable Schedule of Values
3. Application for Payment
4. Final Application for Payment

1.2 SCHEDULE OF VALUES

A. Prepare a separate Schedule of Values for each schedule of the Work under the Agreement.

B. Upon request of the Contracting Officer, provide support documentation to support the accuracy of the Schedule of Values.

C. Unit Price Work: Reflect unit price quantity and price breakdown from conformed Bid Form.

D. Lump Sum Work: Reflect Schedule of Values format included in conformed Bid Form, specified allowances, alternates, and equipment selected by Owner, as applicable.

E. An unbalanced or front-end loaded schedule will not be acceptable.

F. Summation of the complete Schedule of Values representing all the Work shall equal the Contract Price.

1.3 APPLICATION FOR PAYMENT

A. Transmittal Summary Form: Attach one Summary Form with each detailed Application for Payment for each schedule and include Request for Payment of Materials and Equipment on Hand as applicable. Execute certification by authorized officer of Contractor.

B. Use detailed Application for Payment Form suitable to the Contracting Officer.

C. Provide separate form for each schedule as applicable.

D. Include accepted Schedule of Values for each schedule or portion of Work, the unit price breakdown for the Work to be paid on unit price basis, a listing of Owner selected equipment, if applicable, and allowances, as appropriate.

E. Preparation:

1. Round values to nearest dollar.
2. List each Change Order executed prior to date of submission as separate line item. Totals to equal those shown on the Transmittal Summary Form for each schedule as applicable.
3. Submit Application for Payment, including a Transmittal Summary Form and detailed Application for Payment Form(s) for each schedule as applicable, a listing of materials on hand for each schedule as applicable, and such supporting data as may be requested by The Contracting Officer.

1.4 MEASUREMENT—GENERAL

A. Weighing, measuring, and metering devices used to measure quantity of materials for Work shall be suitable for purpose intended and conform to tolerances and specifications as specified in National Institute of Standards and Technology, Handbook 44.

B. Whenever pay quantities of material are determined by weight, material shall be weighed on scales furnished by Contractor and certified accurate by state agency responsible. Weight or load slip shall be obtained from weigher and delivered to Owner's representative at point of delivery of material.

C. Vehicles used to haul material being paid for by weight shall be weighed empty daily and at such additional times as required by the Contracting Officer. Each vehicle shall bear a plainly legible identification mark.

D. Materials that are specified for measurement by the cubic yard measured in the vehicle shall be hauled in vehicles of such type and size that actual contents may be readily and accurately determined. Unless all vehicles are of uniform capacity, each vehicle must bear a plainly legible identification mark indicating its water level capacity. Vehicles shall be loaded to at least their water level capacity. Loads hauled in vehicles not meeting above requirements or loads of a quantity less than the capacity of the vehicle, measured after being leveled off as above provided, will be subject to rejection, and no compensation will be allowed for such material.

E. Units of measure shown on Bid Form shall be as follows, unless specified otherwise.

Item	Method of Measurement
AC	Acre—Field Measure by the Contracting Officer
CY	Cubic Yard—Field Measure by the Contracting Officer within limits specified or shown
CY-VM	Cubic Yard—Measured in Vehicle by Volume
EA	Each—Field Count by the Contracting Officer
GAL	Gallon—Field Measure by the Contracting Officer
HR	Hour
LB	Pound(s)—Weight Measure by Scale
LF	Linear Foot—Field Measure by the Contracting Officer
SF	Square Foot
SY	Square Yard
TON	Ton—Weight Measure by Scale (2,000 pounds)

F. Measurement of Items:

Item	Unit	Description
Mobilization and demobilization	LS	Includes mobilization and demobilization of personnel and equipment to the site, project management tasks (e.g., invoices, schedule), and submittals.
Erosion control	LS	Includes support fence and filter fabric installation, maintenance, and removal.
Site preparation	LS	Includes installing a removing site security measures, clearing, grubbing, and stripping.
Staging area construction	LS	Includes placement of bottom and top liners, construction of storm water diversion berms, and disposal of liners at the completion of the RA.
Excavation	CY	Includes excavation of soil and debris and placement in staging areas.
Backfill	CY	Includes transportation of clean soil from offsite, backfill, and compaction.
Loading	CY	Includes the loading of characterized soil form the staging areas to trucks for offsite disposal.
Non-hazardous soil transportation and disposal	TN	Includes transportation and disposal of non-hazardous soil
Hazardous soil transportation and disposal	TN	Includes transportation and disposal of hazardous soil
Water management	GAL	Management of storm water pumped from excavations or soil staging areas.
Decontamination	LS	Decontamination of heavy equipment.
Site restoration	LS	Includes seeding and fertilizing and confirming the adequate growth of as determined by the Contracting Officer.

1.5 PAYMENT

A. General:

1. Progress payments will be made monthly.
2. The date for Contractor's submission of monthly Application for Payment shall be established at the Preconstruction Conference.

B. Payment for all the Work shown or specified in Contract Documents is included in the Lump Sum or Unit Price Contract Price as described in the Bid Form and as described herein.

1.6 NONPAYMENT FOR REJECTED OR UNUSED PRODUCTS

A. Payment will not be made for following:

1. Loading, hauling, and disposing of rejected material.
2. Quantities of material wasted or disposed of in manner not called for under Contract Documents.
3. Rejected loads of material, including material rejected after it has been placed by reason of failure of Contractor to conform to provisions of Contract Documents.
4. Material not unloaded from transporting vehicle.
5. Defective Work not accepted by Owner.
6. Material remaining on hand after completion of Work.

1.7 PARTIAL PAYMENT FOR STORED MATERIALS AND EQUIPMENT

A. Partial Payment: No partial payments will be made for materials and equipment delivered or stored unless Shop Drawings or preliminary operation and maintenance manuals are acceptable to the Contracting Officer.

B. Final Payment: Will be made only for products incorporated in Work; remaining products, for which partial payments have been made, shall revert to Contractor unless otherwise agreed, and partial payments made for those items will be deducted from final payment.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

END OF SECTION

SECTION 01040
COORDINATION

PART 1 GENERAL

1.1 UTILITY NOTIFICATION AND COORDINATION

A. Coordinate the Work with various utilities within Project limits. Notify applicable utilities prior to commencing Work, if damage occurs, or if conflicts or emergencies arise during Work.

1. Electricity Company: MLGW
   a. Telephone: (901) 544-MLGW (6549)
2. Water Department: MLGW
   a. Telephone: (901) 544-MLGW (6549)
3. Public Works: City of Memphis
   a. Contact Person: Jerry Collins, Director
   b. Telephone: (901) 576-6742

1.2 ADJACENT FACILITIES AND PROPERTIES

A. Examination:

1. After Effective Date of the Agreement and before Work at Site is started, Contractor, the Contracting Officer, and affected property owners and utility owners shall make a thorough examination of pre-existing conditions including existing buildings, structures, and other improvements in vicinity of Work, as applicable, which could be damaged by construction operations.

1.3 REFERENCE POINTS AND SURVEYS

A. Contractor's Responsibilities:

1. Provide additional survey and layout required to layout the Work.
2. Check and establish exact location of existing facilities prior to construction of new facilities and any connections thereto.
3. In event of discrepancy in data or staking provided by Owner, request clarification before proceeding with Work.
4. Maintain complete accurate log of survey Work as it progresses as a Record Document.
5. On request of the Contracting Officer, submit documentation.
6. Provide competent employee(s), tools, stakes, and other equipment and materials as the Contracting Officer may require to:
   a. Establish control points, lines, and easement boundaries.]

b. Check layout, survey, and measurement Work performed by others.

c. Measure quantities for payment purposes.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

END OF SECTION

SECTION 01300
SUBMITTALS

PART 1 GENERAL

1.1 DEFINITIONS

A. Action Submittal: Written and graphic information submitted by Contractor that requires the Contracting Officer's approval.

B. Informational Submittal: Information submitted by Contractor that does not require the Contracting Officer's approval.

1.2 PROCEDURES

A. Direct submittals to the Contracting Officer

B. Transmittal of Submittal:

1. Contractor shall: Review each submittal and check for compliance with Contract Documents.
2. Complete, sign, and transmit with each submittal package, one Transmittal of Contractor's Submittal form in format approved by the Contracting Officer.
3. Identify each submittal with the following:
   a. Numbering and Tracking System:
      1) Sequentially number each submittal.
      2) Resubmission of submittal shall have original number with sequential alphabetic suffix.
   b. Specification section and paragraph to which submittal applies.
   c. Project title and the Contracting Officer's project number.
   d. Date of transmittal.
   e. Names of Contractor, Subcontractor or Supplier, and manufacturer as appropriate.
4. Identify and describe each deviation or variation from Contract Documents.

C. Format:

1. Do not base Shop Drawings on reproductions of Contract Documents.
2. Package submittal information by individual Specification section. Do not combine different Specification sections together in submittal package, unless otherwise directed in Specification.
3. Present in a clear and thorough manner and in sufficient detail to show kind, size, arrangement, and function of components, materials, and devices, and compliance with Contract Documents.

4. Index with labeled tab dividers in orderly manner.

D. Timeliness: Schedule and submit in accordance Schedule of Submittals, and requirements of individual Specification sections.

E. Processing Time:

1. Time for review shall commence on the Contracting Officer's receipt of submittal.
2. Contracting Officer will act upon Contractor's submittal and transmit response to Contractor not later than 30 days after receipt, unless otherwise specified.
3. Resubmittals will be subject to same review time.
4. No adjustment of Contract Times or Price will be allowed due to delays in progress of Work caused by rejection and subsequent resubmittals.

F. Resubmittals: clearly identify each correction or change made.

G. Incomplete Submittals:

1. Contracting Officer will return entire submittal for Contractor's revision if preliminary review deems it incomplete.
2. When any of the following are missing, submittal will be deemed incomplete:
   a. Transmittal of Contractor's Submittal, completed and signed.
   b. Insufficient number of copies.

H. Submittals not required by Contract Documents:

1. Will not be reviewed.
2. Contracting Officer will keep one copy and return all remaining copies to Contractor.

1.3 ACTION SUBMITTALS

A. Prepare and submit Action Submittals required by individual Specification sections.

B. Shop Drawings:

1. Copies: Six.
2. Identify and Indicate:
   a. Applicable Contract Drawing and Detail number, products, units and assemblies, and system or equipment identification or tag numbers.

b. Critical field dimensions and relationships to other critical features of Work. Note dimensions established by field measurement.
c. Project-specific information drawn accurately to scale.
3. Manufacturer's standard schematic drawings and diagrams as follows:
a. Modify to delete information that is not applicable to the Work.
b. Supplement standard information to provide information specifically applicable to the Work.
4. Product Data: Provide as specified in individual Specifications.

C. Samples:

1. Copies: Two, unless otherwise specified in individual Specifications.
2. Preparation: Mount, display, or package Samples in manner specified to facilitate review of quality. Attach label on unexposed side that includes the following:
a. Manufacturer name.
b. Model number.
c. Material.
d. Sample source.
3. Full size Samples:
a. Size as indicated in individual Specification section.
b. Prepared from same materials to be used for the Work.
c. Physically identical with product proposed for use.

D. Action Submittal Dispositions: Contracting Officer will review, mark, and stamp as appropriate, and distribute marked-up copies as noted:

1. Approved:
a. Contractor may incorporate product(s) or implement Work covered by submittal.
b. Distribution:
1) One copy furnished Resident Project Representative.
2) One copy retained in the Contracting Officer's file.
3) Remaining copies returned to Contractor appropriately annotated.
2. Approved as Noted:
a. Contractor may incorporate product(s) or implement Work covered by submittal, in accordance with the Contracting Officer's notations.
b. Distribution:
1) One copy furnished Resident Project Representative.
2) One copy retained in the Contracting Officer's file.
3) Remaining copies returned to Contractor appropriately annotated.

3. Partial Approval, Resubmit as Noted:
    a. Make corrections or obtain missing portions, and resubmit.
    b. Except for portions indicated, Contractor may begin to incorporate product(s) or implement Work covered by submittal, in accordance with the Contracting Officer's notations.
    c. Distribution:
        1) One copy furnished Resident Project Representative.
        2) One copy retained in the Contracting Officer's file.
        3) Remaining copies returned to Contractor appropriately annotated.
4. Revise and Resubmit:
    a. Contractor may not incorporate product(s) or implement Work covered by submittal.
    b. Distribution:
        1) One copy furnished Resident Project Representative.
        2) One copy retained in the Contracting Officer's file.
        3) Remaining copies returned to Contractor appropriately annotated.

1.4 INFORMATIONAL SUBMITTALS

A. General:

1. Copies: Submit three copies, unless otherwise indicated in individual Specification section.
2. Refer to individual Specification sections for specific submittal requirements.
3. Contracting Officer will review each submittal. If submittal meets conditions of the Contract, the Contracting Officer will forward copies to appropriate parties. If the Contracting Officer determines submittal does not meet conditions of the Contract and is therefore considered unacceptable, the Contracting Officer will retain one copy and return remaining copies with review comments to Contractor, and require that submittal be corrected and resubmitted.

B. Application for Payment: In accordance with Section 01025, Measurement and Payment.

C. Certificates:

1. General:
    a. Provide notarized statement that includes signature of entity responsible for preparing certification.
    b. Signed by officer or other individual authorized to sign documents on behalf of that entity.

2. Installer: Prepare written statements on manufacturer's letterhead certifying that installer complies with requirements as specified in individual Specification sections.
3. Material Test: Prepared by qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements.
4. Certificates of Successful Testing or Inspection: Submit when testing or inspection is required by Laws and Regulations or governing agency or specified in individual Specification sections.

D. Schedules:

1. Schedule of Submittals: Prepare separately or in combination with Progress Schedule as specified in Section 01310, Progress Schedules.
   a. Show for each, at a minimum, the following:
      1) Specification section number.
      2) Identification by numbering and tracking system as specified under Paragraph Transmittal of Submittal.
      3) Estimated date of submission to the Contracting Officer, including reviewing and processing time.
   b. On a monthly basis, submit updated schedule to the Contracting Officer if changes have occurred or resubmittals are required.

2. Schedule of Values: In accordance with Section 01025, Measurement and Payment.

3. Progress Schedules: In accordance with Section 01310, Progress Schedules.

E. Special Guarantee: Supplier's written guarantee as required in individual Specification sections.

F. Statement of Qualification: Evidence of qualification, certification, or registration as required in Contract Documents to verify qualifications of professional land surveyor, engineer, materials testing laboratory, specialty Subcontractor, trade, Specialist, consultant, installer, and other professionals.

G. Submittals Required by Laws, Regulations, and Governing Agencies:

1. Submit promptly notifications, reports, certifications, payrolls, and otherwise as may be required, directly to the applicable federal, state, or local governing agency or their representative.
2. Transmit to the Contracting Officer for Owner's records one copy of correspondence and transmittals (to include enclosures and attachments) between Contractor and governing agency.

H. Test and Inspection Reports:

1. General: Shall contain signature of person responsible for test or report.
2. Factory:
   a. Identification of product and Specification section, type of inspection or test with referenced standard or code.
   b. Date of test, Project title and number, and name and signature of authorized person.
   c. Test results.
   d. If test or inspection deems material or equipment not in compliance with Contract Documents, identify corrective action necessary to bring into compliance.
   e. Provide interpretation of test results, when requested by the Contracting Officer.
   f. Other items as identified in individual Specification sections.
3. Field: As a minimum, include the following:
   a. Project title and number.
   b. Date and time.
   c. Record of temperature and weather conditions.
   d. Identification of product and Specification section.
   e. Type and location of test, Sample, or inspection, including referenced standard or code.
   f. Date issued, testing laboratory name, address, and telephone number, and name and signature of laboratory inspector.
   g. If test or inspection deems material or equipment not in compliance with Contract Documents, identify corrective action necessary to bring into compliance.
   h. Provide interpretation of test results, when requested by the Contracting Officer.
   i. Other items as identified in individual Specification sections.

1.5 SUPPLEMENTS

A. The supplements listed below, following "END OF SECTION", are part of this Specification.

1. Forms: Transmittal of Contractor's Submittal

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

END OF SECTION

TRANSMITTAL OF CONTRACTOR'S SUBMITTAL (ATTACH TO EACH SUBMITTAL)			
Date:			
To:	Submittal No.:		
	New Submittal		
	Resubmittal		
From:	Project No.:		
	Specification Section No.: **(Cover only one section with each Transmittal)**		
	Schedule Date of Submittal:		
SUBMITTAL TYPE:	Shop Drawing	Sample	Informational

THE FOLLOWING ITEMS ARE HEREBY SUBMITTED:

Number of Copies	Description of Item Submitted (Type, Size, Model Number, Etc.)	Spec. and Para. No.	Drawing or Brochure Number	Contains Variation to Contract	
				No	Yes

Contractor hereby certifies that (i) Contractor has complied with the requirements of Contract Documents in preparation, review, and submission of designated Submittal and (ii) the Submittal is complete and in accordance with the Contract Documents and requirements of laws and regulations and governing agencies.

By:____________________________

Contractor (Authorized Signature)

SECTION 01310
PROGRESS SCHEDULES

PART 1 GENERAL

1.1 SUBMITTALS

A. Informational Submittals:

1. Preliminary Progress Schedule: Submit at least 7 days prior to pre-construction conference.

1.2 PRELIMINARY PROGRESS SCHEDULE

A. In addition to basic requirements outlined in General Conditions, show a detailed schedule, beginning with Notice to Proceed through Final Completion.

B. Show activities including, but not limited to the following:

1. Notice to Proceed.
2. Permits.
3. Initial Site work.
4. Earthwork.
5. Specified Work sequences and construction constraints.
6. Contract Milestone and Completion Dates.
7. Owner-furnished products delivery dates or ranges of dates.
8. Project close-out summary.
9. Demobilization summary.

C. Format: In accordance with Article Progress Schedule—Bar Chart.

1.3 PROGRESS SCHEDULE—BAR CHART

A. General: Comprehensive bar chart schedule, generally as outlined in Associated General Contractors of America (AGC) Publication No. 1107.1, "Construction Planning and Scheduling, latest edition.

1.4 SCHEDULE ACCEPTANCE

A. Contracting Officer's acceptance will demonstrate agreement that:

1. Proposed schedule is accepted with respect to:

a. Contract Times, including Final Completion and all intermediate Milestones are within the specified times.
b. Specified Work sequences and constraints are shown as specified.

2. In all other respects, the Contracting Officer's acceptance of Contractor's schedule indicates that, in the Contracting Officer's judgement, schedule represents reasonable plan for constructing Project in accordance with the Contract Documents. Contracting Officer's review will not make any change in Contract requirements. Lack of comment on any aspect of schedule that is not in accordance with the Contract Documents will not thereby indicate acceptance of that change, unless Contractor has explicitly called the nonconformance to the Contracting Officer's attention in submittal. Schedule remains Contractor's responsibility and Contractor retains responsibility for performing all activities, for activity durations, and for activity sequences required to construct Project in accordance with the Contract Documents.

B. Unacceptable Preliminary Progress Schedule:

1. Make requested corrections; resubmit within 10 days.
2. Until acceptable to the Contracting Officer as Baseline Progress Schedule, continue review and revision process, during which time Contractor shall update schedule on a monthly basis to reflect actual progress and occurrences to date.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

END OF SECTION

SECTION 01500
CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 GENERAL

1.1 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. Federal Emergency Management Agency.
2. U.S. Department of Agriculture, "Urban Hydrology for Small Watersheds".
3. U.S. Weather Bureau, "Rainfall-frequency Atlas of the U.S. for Durations From 30 Minutes to 24 Hours and Return Periods From 1 to 100 Years".

1.2 SUBMITTALS

A. Informational Submittals:

1. Copies of permits and approvals for construction as required by Laws and Regulations and governing agencies.

2. Temporary Construction Submittals:
   a. Contractor's field office, storage yard, and storage building plans, including gravel surfaced area.
   b. Fencing and protective barrier locations and details.
   c. Staging area location plan.

3. Temporary Control Submittals:
   b. Plan for disposal of waste materials and intended haul routes.

1.3 MOBILIZATION

A. Mobilization shall include, but not be limited to, these principal items:

1. Obtaining required permits.
2. Moving Contractor's field office and equipment onto Site.
3. Providing onsite communication facilities, including telephones.
4. Providing onsite sanitary facilities and potable water facilities as specified and as required by Laws and Regulations, and governing agencies.
5. Arranging for and erection of Contractor's work and storage yard.
6. Posting OSHA required notices and establishing safety programs and procedures.
7. Having Contractor's superintendent at Site full time.

1.4 PROTECTION OF WORK AND PROPERTY

A. Comply with Owner's safety rules while on Owner's property.
B. Keep Owner informed of serious onsite accidents and related claims.
C. Use of Explosives: No blasting or use of explosives will be allowed onsite.

PART 2 PRODUCTS

2.1 CONTRACTING OFFICER'S FIELD OFFICES

A. Furnish equipment specified for exclusive use of the Contracting Officer and its representatives.
B. Ownership of equipment furnished under this article will remain, unless otherwise specified, that of Contractor.
C. Equipment furnished shall be new or like new in appearance and function.

PART 3 EXECUTION

3.1 TEMPORARY UTILITIES

A. Power:

1. No electric power is available at Site.

B. Water:

1. No construction or potable water is available at Site. Make arrangements for and bear costs of providing water required for construction purposes and for drinking by construction personnel during construction.

2. Hydrant Water:
   a. Is available from nearby hydrants. Secure written permission for connection and use from water department and meet requirements for use. Notify fire department before obtaining water from fire hydrants.
   b. Use only special hydrant-operating wrenches to open hydrants. Make certain hydrant valve is open full, since cracking valve causes damage to hydrant. Repair damaged hydrants and notify appropriate agency as quickly as possible. Hydrants shall be completely accessible to fire department at all times.]
   c. Include costs to connect and transport water to construction areas in Contract Price.

C. Sanitary and Personnel Facilities:
   1. Provide and maintain facilities for Contractor's employees, Subcontractors, and all other onsite employers' employees. Service, clean, and maintain facilities and enclosures.

D. Telephone Service:

   1. Contractor: Arrange and provide onsite telephone service for use during construction.

3.2 PROTECTION OF WORK AND PROPERTY

A. General:

   1. Perform Work within right-of-way and easements in a systematic manner that minimizes inconvenience to property owners and the public.
   2. No residence or business shall be cut off from vehicular traffic.
   3. Maintain in continuous service all existing oil and gas pipelines, underground power, telephone or communication cable, water mains, irrigation lines, sewers, poles and overhead power, and all other utilities encountered along line of the Work, unless other arrangements satisfactory to owners of said utilities have been made.
   4. Where completion of the Work requires temporary or permanent removal or relocation of existing utility, coordinate all activities with owner of said utility and perform all work to their satisfaction.
   5. Protect, shore, brace, support, and maintain underground pipes, conduits, drains, and other underground utility construction uncovered or otherwise affected by construction operations.
   6. Keep fire hydrants and water control valves free from obstruction and available for use at all times.
   7. In areas where Contractor's operations are adjacent to or near a utility (such as gas, telephone, television, electric power, water, sewer, or irrigation system) and such operations may cause damage or inconvenience, suspend operations until arrangements necessary for protection have been made by Contractor.
   8. Notify property owners and utility offices that may be affected by construction operation at least 2 days in advance.
      a. Before exposing a utility, obtain utility owner's permission. Should service of utility be interrupted due to Contractor's operation, notify proper authority immediately. Cooperate with said authority in restoring service as promptly as possible and bear costs incurred.

9. Do not impair operation of existing sewer system. Prevent construction material, pavement, concrete, earth, volatile and corrosive wastes, and other debris from entering sewers, pump stations, or other sewer structures.
10. Maintain original Site drainage wherever possible.

B. Site Security:

2. Provide and maintain additional temporary security fences as necessary to protect the Work and Contractor□furnished products not yet installed.

C. Barricades and Lights:

1. Provide as necessary to prevent unauthorized entry to construction areas and affected roads, streets, and alleyways, inside and outside of fenced area, and as required to ensure public safety and the safety of Contractor's employees, other employer's employees, and others who may be affected by the Work.
2. Provide to protect existing facilities and adjacent properties from potential damage.
3. Locate to enable access by facility operators and property owners.
4. Protect streets, roads, highways, and other public thoroughfares that are closed to traffic by effective barricades with acceptable warning signs.

D. Signs and Equipment:

1. Conform to requirements of manual published by the Tennessee DOT.
2. Traffic Cones: Provide to delineate traffic lanes to guide and separate traffic movements.
3. Provide at obstructions, such as material piles and equipment.
4. Use to alert general public of construction hazards, which would include surface irregularities, unramped walkways, grade changes, and trenches or excavations in roadways and in other public access areas.

E. Waterways:

1. Keep ditches, culverts, and natural drainages continuously free of construction materials and debris.

F. Dewatering: Construct, maintain, and operate cofferdams, channels, flume drains, sumps, pumps, or other temporary diversion and protection works. Furnish materials required, install, maintain, and operate necessary pumping and other equipment for the environmentally safe removal and disposal of water from the various parts of the Work. Maintain foundations and parts of the Work free from water.

G. Archaeological Finds:

1. General: Should finds of an archaeological or paleontological nature be made within the limits of the Site, immediately notify Owner and the Contracting Officer and proceed in accordance with the General Conditions. Continue the Work in other areas without interruption.

H. Endangered Species:

1. Take precautions necessary and prudent to protect native endangered flora and fauna.
2. Notify the Contracting Officer of construction activities that might threaten endangered species or their habitats.
3. Contracting Officer will mark areas known as habitats of endangered species prior to commencement of onsite activities.
4. Additional areas will be marked by the Contracting Officer as other habitats of endangered species become known during construction.

3.4 TEMPORARY CONTROLS

A. Air Pollution Control:

1. Minimize air pollution from construction operations.
2. Burning:
   a. Of waste materials, rubbish, or other debris will not be permitted on or adjacent to Site.
3. Conduct operations of dumping rock and of carrying rock away in trucks to cause a minimum of dust. Give unpaved streets, roads, detours, or haul roads used in construction area a dust-preventive treatment or periodically water to prevent dust. Strictly adhere to applicable environmental regulations for dust prevention.
4. Provide and maintain temporary dust-tight partitions, bulkheads, or other protective devices during construction to permit normal operation of existing facilities. Construct partitions of plywood, insulating board, plastic sheets, or similar material. Construct partitions in such a manner that dust and dirt from demolition and cutting will not enter other parts of existing building or facilities. Remove temporary partitions as soon as need no longer exists.

C. Water Pollution Control:
1. Divert sanitary sewage and non-storm waste flow interfering with construction and requiring diversion to sanitary sewers. Do not cause or permit action to occur which would cause an overflow to existing waterway.
2. Prior to commencing excavation and construction, obtain the Contracting Officer's agreement with detailed plans showing procedures intended to handle and dispose of sewage, groundwater, and stormwater flow, including dewatering pump discharges.
3. Comply with procedures outlined in U.S. Environmental Protection Agency manuals entitled, "Guidelines for Erosion and Sedimentation Control Planning" and "Implementation, Processes, Procedures, and Methods to Control Pollution Resulting from All Construction Activity," and "Erosion and Sediment Control-Surface Mining in Eastern United States."
4. Do not dispose of volatile wastes such as mineral spirits, oil, chemicals, or paint thinner in storm or sanitary drains. Disposal of wastes into streams or waterways is prohibited. Provide acceptable containers for collection and disposal of waste materials, debris, and rubbish.

D. Erosion, Sediment, and Flood Control:

1. Provide, maintain, and operate temporary facilities to control erosion and sediment releases, and to protect the Work and existing facilities from flooding during construction period.
2. Design erosion and sediment controls to handle peak runoff resulting from 25-year, 24-hour storm event based on U.S. Weather Bureau, "Rainfall-Frequency Atlas of the United States for Durations from 30 Minutes to 24 Hours and Return Periods from 1 to 100 Years," Technical Paper No. 40, 1981.
3. Size temporary stormwater conveyances based on procedures presented in U.S. Department of Agriculture, "Urban Hydrology for Small Watersheds," Soil Conservation Service Engineering Technical Release No. 55, 1986.

3.5 STORAGE YARDS AND BUILDINGS

A. Temporary Storage Yards: Construct temporary storage yards for storage of products that are not subject to damage by weather conditions.

3.6 VEHICULAR TRAFFIC

A. Comply with Laws and Regulations regarding closing or restricting use of public streets or highways. No public or private road shall be closed, except by written permission of proper authority. Assure the least possible obstruction to traffic and normal commercial pursuits.

B. Conduct the Work to interfere as little as possible with public travel, whether vehicular or pedestrian.

C. Whenever it is necessary to cross, close, or obstruct roads, driveways, and walks(whether public or private), provide and maintain suitable and safe bridges, detours, or other temporary expedients for accommodation of public and private travel.

D. When flaggers and guards are required by regulation or when deemed necessary for safety, furnish them with approved orange wearing apparel and other regulation traffic control devices.

3.7 CLEANING DURING CONSTRUCTION

A. In accordance with General Conditions, as may be specified in other Specification sections, and as required herein.

B. Provide approved containers for collection and disposal of waste materials, debris, and rubbish. At least at weekly intervals, dispose of such waste materials, debris, and rubbish offsite.

C. At least weekly, brush sweep entry drive and roadways, and all other streets and walkways affected by the Work and where adjacent to the Work.

END OF SECTION

SECTION 01780
CONTRACT CLOSEOUT

PART 1 GENERAL

1.1 SUBMITTALS

A. Informational Submittals:

1. Submit prior to application for final payment.
    a. Record Documents: As required in General Conditions.
    b. Consent of Surety to Final Payment: As required in General Conditions.
    c. Releases or Waivers of Liens and Claims: As required in General Conditions.
    d. Releases from Agreements.
    e. Final Application for Payment: Submit in accordance with procedures and requirements stated in Section 01025, Measurement and Payment.

1.2 RECORD DOCUMENTS

A. Quality Assurance:

1. Furnish qualified and experienced person, whose duty and responsibility shall be to maintain record documents.
2. Accuracy of Records:
    a. Coordinate changes within record documents, making legible and accurate entries on each sheet of Drawings and other documents where such entry is required to show change.
    b. Purpose of Project record documents is to document factual information regarding aspects of the Work, both concealed and visible, to enable future modification of the Work to proceed without lengthy and expensive Site measurement, investigation, and examination.
3. Make entries within 24 hours after receipt of information that a change in the Work has occurred.
4. Prior to submitting each request for progress payment, request the Contracting Officer's review and approval of current status of record documents. Failure to properly maintain, update, and submit record documents may result in a deferral by the Contracting Officer to recommend whole or any part of Contractor's Application for Payment, either partial or final.

1.3 RELEASES FROM AGREEMENTS

A. Furnish Owner written releases from property owners or public agencies where side agreements or special easements have been made, or where Contractor's operations have not been kept within the Owner's construction right-of-way.

B. In the event Contractor is unable to secure written releases:

1. Inform Owner of the reasons.
2. Owner or its representatives will examine the Site, and Owner will direct Contractor to complete the Work that may be necessary to satisfy terms of the side agreement or special easement.
3. Should Contractor refuse to perform this Work, Owner reserves right to have it done by separate contract and deduct cost of same from Contract Price, or require Contractor to furnish a satisfactory bond in a sum to cover legal Claims for damages.
4. When Owner is satisfied that the Work has been completed in agreement
with Contract Documents and terms of side agreement or special easement, right is reserved to waive requirement for written release if: (i) Contractor's failure to obtain such statement is due to grantor's refusal to sign, and this refusal is not based upon any legitimate Claims that Contractor has failed to fulfill terms of side agreement or special easement, or (ii) Contractor is unable to contact or has had undue hardship in contacting grantor.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION

3.1 MAINTENANCE OF RECORD DOCUMENTS

A. General:

1. Promptly following commencement of Contract Times, secure from the Contracting Officer at no cost to Contractor, one complete set of Contract Documents. Drawings will be full size.
2. Label or stamp each record document with title, "RECORD DOCUMENTS," in neat large printed letters.
3. Record information concurrently with construction progress and within 24 hours after receipt of information that change has occurred. Do not cover or conceal Work until required information is recorded.

B. Preservation:

1. Maintain documents in a clean, dry, legible condition and in good order. Do not use record documents for construction purposes.
2. Make documents and Samples available at all times for observation by the Contracting Officer.

C. Making Entries on Drawings:

1. Using an erasable colored pencil (not ink or indelible pencil), clearly describe change by graphic line and note as required.
   a. Color Coding:
      1) Green when showing information deleted from Drawings.
      2) Red when showing information added to Drawings.
      3) Blue and circled in blue to show notes.
2. Date entries.
3. Call attention to entry by "cloud" drawn around area or areas affected.
4. Legibly mark to record actual changes made during construction, including, but not limited to:
   a. Locate existing facilities, piping, equipment, and items critical to the interface between existing physical conditions or construction and new construction.
   b. Changes made by Addenda and Field Orders, Work Change Directive, Change Order, and the Contracting Officer's written interpretation and clarification using consistent symbols for each and showing appropriate document tracking number.
5. Dimensions on Schematic Layouts: Show on record drawings, by dimension, the centerline of each run of items such as are described in previous subparagraph above.
   a. Clearly identify the item by accurate note such as "cast iron drain," "galv. water," and the like.
   b Show, by symbol or note, vertical location of item ("under slab," "in ceiling plenum," "exposed," and the like).
   c. Make identification so descriptive that it may be related reliably to Specifications.

3.2 FINAL CLEANING

A. At completion of the Work or of a part thereof and immediately prior to Contractor's request for certificate of Substantial Completion; or if no certificate is issued, immediately prior to Contractor's notice of completion, clean entire Site or parts thereof, as applicable.

1. Leave the Work and adjacent areas affected in a cleaned condition satisfactory to Owner and the Contracting Officer.

B. Use only cleaning materials recommended by manufacturer of surfaces to be cleaned.

END OF SECTION

SECTION 02200
SITE PREPARATION

PART 1 GENERAL

1.1 DEFINITIONS

A. Interfering or Objectionable Material: Trash, rubbish, and junk; vegetation and other organic matter, whether alive, dead, or decaying; topsoil.

B. Clearing: Removal of interfering or objectionable material lying on or protruding above ground surface.

C. Grubbing: Removal of vegetation and other organic matter including stumps, buried logs, and roots greater than 2 inches caliper to a depth of 6 inches below subgrade.

D. Scalping: Removal of sod without removing more than upper 3 inches of topsoil.

E. Stripping: Removal of topsoil remaining after applicable scalping is completed.

F. Project Limits: Areas, as shown or specified, within which Work is to be performed.

1.2 SCHEDULING AND SEQUENCING

A. Prepare site only after adequate erosion and sediment controls are in place.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION

3.1 GENERAL

A. Clear, grub, and strip areas actually needed for waste disposal, borrow, or site improvements within limits shown or specified.

B. Do not injure or deface vegetation that is not designated for removal.

3.2 LIMITS

A. As follows, but not to extend beyond Project limits. Excavation: 5 feet beyond top of cut slopes.

B. Remove rubbish, trash, and junk from entire area within Project limits.

3.3 CLEARING

A. Clear areas within limits shown or specified.

3.4 GRUBBING

A. Grub areas within limits shown or specified.

3.5 SCALPING

A. Scalp areas within limits shown or specified.

3.6 STRIPPING

A. Do not remove topsoil until after scalping is completed.

B. Strip areas within limits to minimum depths shown or specified. Do not remove subsoil with topsoil.

3.7 DISPOSAL

A. Clearing and Grubbing Debris:

1. Dispose of debris offsite.
2. Burning of debris onsite will not be allowed.
3. Limit offsite disposal of clearing and grubbing debris to locations that are approved by federal, state, and local authorities, and that will not be visible from Project.

B. Scalpings: As specified for clearing and grubbing debris.

C. Strippings:

1. Dispose of strippings that are unsuitable for topsoil or that exceed quantity required for topsoil offsite.
2. Stockpile topsoil in sufficient quantity to meet Project needs. Dispose of excess strippings as specified for clearing and grubbing.

END OF SECTION

SECTION 02240
DEWATERING

PART 1 GENERAL

1.1 SUBMITTALS

A. Information Submittals:

1. Water storage container.
2. Water disposal location.
3. Discharge permits.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION

3.1 GENERAL

A. Remove and control water during periods when necessary to properly accomplish Work.

3.2 SURFACE WATER CONTROL

A. See Section 01500, CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS, Article TEMPORARY CONTROLS.

B. Remove surface runoff controls when no longer needed.

3.3 DEWATERING SYSTEMS

A. Maintain excavations free of water, regardless of source, and until backfill and compacted.

B. Contain water collected from the excavation(s) in a Contracting Officer - approved storage tank until authorized for disposal.

C. Dispose of the water collected form the excavation(s) at a Contracting Officer -approved location.

3.4 MONITORING FLOWS

A. Monitor volume of water pumped per calendar day from excavations, as Work progresses.

END OF SECTION

SECTION 02315
EXCAVATION

PART 1 GENERAL

1.1 DEFINITIONS

A. Common Excavation: Removal of material not classified as rock excavation.

1.2 SUBMITTALS

A. Informational Submittals:

1. Excavation Plan, detailing:

a. Methods and sequencing of excavation.
b. Proposed locations of stockpiled excavated material.
c. Proposed onsite and offsite spoil disposal sites.
d. Numbers, types, and sizes of equipment proposed to perform excavations.

1.3 DESCRIPTION OF WORK

The Work consists of the elements described in Section 01010, Summary of Work.

1.4 QUALITY ASSURANCE

A. Provide adequate survey control to avoid unauthorized over-excavation.

1.5 WEATHER LIMITATIONS

A. Material excavated when frozen or when air temperature is less than 32 degrees Fahrenheit (°F) shall not be used as fill or backfill until material completely thaws.

B. Material excavated during inclement weather shall not be used as fill or backfill until after material drains and dries sufficiently for proper compaction.

1.6 SEQUENCING AND SCHEDULING

A. The Contractor shall verify the limits of excavation and contaminated soil requirements prior to the start of any excavations at each Disposal Site. Currently estimated limits of excavation are shown on the Drawings and shall be staked or otherwise marked by the Contractor prior to excavation.

The final excavation limits may change based upon the results of confirmation sampling.

B. Clearing, Grubbing, and Stripping: Complete applicable Work specified in Section 02200, Site Preparation, prior to excavating.

C. Excavation Support: Install and maintain, as specified in Section 02260, Excavation Support and Protection, as necessary to support sides of excavations and prevent detrimental settlement and lateral movement of existing facilities, adjacent property, and completed Work.

D. No excavations or other surface soil disturbances shall begin until all security, drainage, erosion, and sediment control devices, exclusion zones, and protective markings for utilities and other items to be protected are properly installed and approved by the Contracting Officer.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION

3.1 GENERAL

A. Excavate to lines, grades, and dimensions shown and as necessary to accomplish Work. Excavate to within tolerance of plus or minus 0.1 foot, except where dimensions or grades are shown or specified as maximum or minimum. The excavation shall be performed in a manner that will limit the potential for contaminated material to be mixed with uncontaminated materials. A log of materials and any visible signs of contamination encountered during excavation shall be maintained for each disposal site.

B. Do not over-excavate without written authorization of the Contracting Officer.

C. Remove or protect obstructions as shown and as specified in Section 01500, Construction Facilities and Temporary Controls, Article Protection of Work and Property.

3.2 UNCLASSIFIED EXCAVATION

A. Excavation is unclassified. Complete all excavation regardless of the type, nature, or condition of the materials encountered.

3.3 DRAINAGE AND DEWATERING

A. All excavations will be above the water table. Drainage and dewatering will include control of surface water drainage and collection and disposal of precipitation that falls into the excavation.

B. Surface water shall be directed away from excavation areas in a manner that will prevent flooding and erosion. Diversion ditches, dikes, and grading shall be provided and maintained throughout excavation and backfill operations. Work shall be sequenced in a manner that each work site, areas adjacent to each work site, and affected operations shall be effectively drained.

C. The contractor shall maintain appropriate means to collect and remove standing water in the excavations during excavation, sampling, and backfill operations. Standing water may be allowed to remain in the excavations between period of excavation and backfill of approved by the Contracting Officer. All water from active excavations shall be collected and disposed of in accordance with Section 02316, TRANSPORTATION AND DISPOSAL OF CONTAMINATED MATERIALS.

3.4 STOCKPILING EXCAVATED MATERIAL

A. Stockpile excavated material that is suitable for use as fill or backfill until material is needed. Segregate excavated material suitable for backfill from material proposed for offsite disposal.

B. Non-hazardous contaminated materials stockpiles shall be constructed to isolate the excavated material from the environment. Non-hazardous material stockpiles shall be constructed to include:

1. A chemical resistant geomembrane liner. Non-reinforced geomembrane liners shall have a minimum thickness of 20 mils. Scrim reinforced geomembranes shall have a minimum weight of 40 lbs per 1,000 square feet. The ground surface on which the geomembrane is to be placed shall be prepared in accordance with Section 02200, SITE PREPARATION.
2. Geomembrane cover to prevent precipitation from entering the stockpile. Non-reinforced geomembrane liners shall have a minimum thickness of 10 mils. Scrim reinforced geomembranes shall have a minimum weight of 26 lbs per 1,000 square feet. The cover material shall be anchored with sand bags or other measures approved by the Contracting Officer to prevent the cover from being removed by the wind.
3. Construct berms, minimum of 12 inches in height, around the stockpile using clean soil from onsite or offsite source to secure the cover and divert storm water runoff. Vehicle access points shall also be bermed.
4. The contractor shall maintain appropriate means to collect and remove standing water in the stockpiles during the Work. All water shall be collected and disposed op in accordance with Section 02316, TRANSPORTATION AND DISPOSAL OF CONTAMINATED MATERIALS.

C. Hazardous materials shall be stored in water-tight roll-off containers. An impermeable cover shall be placed over the units to prevent precipitation from contacting the stored material. The units shall be located on the project site at locations approved by the Contracting Officer.

D. Post signs indicating proposed use of material stockpiled. Post signs that are readable from all directions of approach to each stockpile. Signs should be clearly worded and readable by equipment operators from their normal seated position.

E. Confine stockpiles to within easements, rights-of-way, and approved work areas. Do not obstruct roads or streets.

F. Do not stockpile excavated material adjacent to trenches and other excavations, unless excavation side slopes and excavation support systems are designed, constructed, and maintained for stockpile loads.

END OF SECTION

SECTION 02316
FILL AND BACKFILL

PART 1 GENERAL

1.1 DEFINITIONS

A. Prepared Ground Surface: Ground surface after completion of required demolition, clearing and grubbing, scalping of sod, stripping of topsoil, excavation to grade, and subgrade preparation.

B. Completed Course: A course or layer that is ready for next layer or next phase of Work.

C. Lift: Loose (uncompacted) layer of material.

D. Well-Graded

1. A mixture of particle sizes with no specific concentration or lack thereof of one or more sizes.
2. Does not define numerical value that must be placed on coefficient of uniformity, coefficient of curvature, or other specific grain size distribution parameters.
3. Used to define material type that, when compacted, produces a strong and relatively incompressible soil mass free from detrimental voids.

F. Borrow Material: Material from required excavations or from designated borrow areas on or near Site.

G. Imported Material: Materials obtained from sources offsite, suitable for specified use.

1.2 SEQUENCING AND SCHEDULING

A. Complete applicable Work specified in Section 02200, Site Preparation and Section 02315, Excavation.

PART 2 PRODUCTS

2.1 SOURCE QUALITY CONTROL

A. Chemical Analysis of General Backfill and Topsoil

1. A minimum of one sample shall be collected for every 1,000 cubic yards of general fill and for every 1,000 cubic yards of topsoil, or part thereof, delivered to the site to confirm that thee materials are free of chemical contamination. Each sample shall be a composite sample representative of the materials to be delivered. The composite sample shall be subjected to the full range of Level 3 analytical procedures for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), herbicides, pesticides, polychlorinated biphenyls (PCBs), and metals in accordance with the Table 1.
2. Clearly mark to show source of material and intended use.
3. Sampling procedures, duplicates, and blanks required QC, and data validation, calibration, and documentation shall be done in conformance with procedures in applicable portions of the Remedial Action Sampling and Analysis Plan (RA SAP).

TABLE 1
Summary of General Backfill Analytes

Prelim TAT/ Final TAT	Data Package	Required Analysis	Analytical Methods	Holding Time	Sample Preservation	Containers
7 days/ 14 days	CLP-type full package	TCL VOCs	5035	14 days	$HnaSO_3$ or CH_4O; Cool to 4°C	Three (3) 40 mL vials: • One (1) with CH_4O • two (2) with $HNaSO_3$.
		TCL SVOCs	8270C	14 day extraction; 40 day analysis	Cool to 4°C	Four (4) 8oz WM glass
		TCL Pesticides	8081A			
		TCL PCBs	8082			
		Herbicides	8151A			
		TAL Metals	6010B/ 7471A	6 months; Hg = 28 days		

2.2 EARTHFILL

A. Excavated material from designated borrow sites shall be free from rocks larger than 3 inches, from roots and other organic matter, ashes, cinders, trash, debris, and other deleterious materials.

B. Material containing more than 10 percent gravel, stones, or shale particles is unacceptable.

PART 3 EXECUTION

3.1 GENERAL

A. Keep placement surfaces free of water, debris, and foreign material during placement and compaction of fill and backfill materials.

B. Place and spread fill and backfill materials in horizontal lifts of uniform thickness (not to exceed 8 inches), in a manner that avoids segregation; each lift will be compacted with at least four (4) passes of a footed compactor to achieve an unyielding surface prior to placing succeeding lifts. The moisture content of the compacted material will be maintained sufficient to achieve the proper compaction. The compacted fill will be capable of supporting loaded dump trucks without formation of ruts or depressions. The backfilled sites will be graded and shaped to establish approximate original grades and positive surface drainage.

END OF SECTION

SECTION 02317
BORROW EXCAVATION

PART 1 GENERAL

1.1 SUBMITTALS

A. Information Submittal: Borrow Pit Plan, detailing development, operation, and reclamation of each pit.

1.2 WEATHER LIMITATIONS

A. Except as approved by the Contracting Officer, do not operate borrow pits when borrow is too wet to achieve required compaction.

1.3 SEQUENCING AND SCHEDULING

A. Clearing, Grubbing, and Stripping: Complete applicable Work specified in Section 02200, SITE PREPARATION, prior to borrow pit development.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION

3.1 BORROW PIT OPERATION

A. Review Borrow Pit Plan with the Contracting Officer prior to excavating from borrow pits. Obtain the Contracting Officer's acceptance of deviations from Borrow Pit Plan prior to their implementation.

B. Do not excavate more borrow material than required for Work. Leave surplus material in place.

3.2 RECLAMATION

A. Grade borrow pits and replace topsoil, as specified in Section 02315, FILL AND BACKFILL, to drain without ponding surface water and to blend graded surfaces neatly with surrounding terrain at completion of borrow operations.

B. Final Slopes:

1. Maximum: Three horizontal to one vertical.
2. Minimum: 5 percent.

C. Do not use borrow pits for disposal, unless otherwise specified or shown.

END OF SECTION

SECTION 02370
SOIL STABILIZATION

PART 1 GENERAL

1.1 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. American Society for Testing and Materials International (ASTM):
   a. D4355, Standard Test Method for Deterioration of Geotextiles from Exposure to Ultraviolet Light and Water (Xenon Arc Type Apparatus).
   b. D4632, Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.

1.2 DEFINITIONS

A. Maintenance Period: Begin maintenance immediately after each area is planted and continue for a period of 8 weeks after all planting under this section is completed.

B. Satisfactory Stand: Grass or section of grass that has:

1. No bare spots larger than 3 square feet.
2. Not more than 10 percent of total area with bare spots larger than 1 square foot.
3. Not more than 15 percent of total area with bare spots larger than 6 square inches.

1.3 SUBMITTALS

A. Shop Drawings: Product Data: Commercial products.

B. Information Submittals:

1. Construction Period Drainage and Erosion/Sedimentation Control Plan and Procedures.
2. Manufacturer's Installation Instructions: Commercial products.
3. Seed certifications.
4. Copies of delivery invoices or other proof of quantities of mulch and fertilizer.

1.4 DELIVERY, STORAGE, AND PROTECTION

A. Seed:

1. Furnish in standard containers with seed name, lot number, net weight, percentages of purity, germination, and hard seed and maximum weed seed content, clearly marked for each container of seed.
2. Keep dry during storage.

B. Hydroseeding Mulch: Mark package of wood fiber mulch to show air dry weight.

1.5 SEQUENCING AND SCHEDULING

A. Contracting Officer's acceptance of Construction Period Erosion/Sedimentation Control Plan required prior to starting earth disturbing activities.

B. Prepare topsoil as specified in Section 02911, SOIL PREPARATION, before starting Work of this section.

C. Complete soil preparation, seeding, fertilizing, and mulching immediately after final grades have been reached.

D. Seeding: Perform under favorable weather conditions during seasons that are normal for such Work as determined by acceptable local practice.

PART 2 PRODUCTS

2.1 FERTILIZER

A. Commercial, uniform in composition, free-flowing, suitable for application with equipment designed for that purpose.

B. Fertilizer shall have the following minimum percentage of plant food by weight:

1. Summer Hydroseed Mix:
   a. Nitrogen: 20 percent.
   b. Phosphoric Acid: 10 percent.
   c. Potash: 10 percent.

2. Winter Hydroseed Mix:
   a. Nitrogen: 16 percent.
   b. Phosphoric Acid: 8 percent.
   c. Potash: 0 percent.

2.2 SEED

A. Fresh, clean new-crop seed that complies with the tolerance for purity and germination established by Official Seed Analysts of North America.

2.3 MULCH

A. Wood Cellulose Fiber Mulch:

1. Specially processed wood fiber containing no growth or germination inhibiting factors.
2. Dyed a suitable color to facilitate inspection of material placement.
3. Manufactured such that after addition and agitation in slurry tanks with water, the material fibers will become uniformly suspended to form homogenous slurry.
4. When hydraulically sprayed on ground, material will allow absorption and percolation of moisture.

B. Straw:

1. Clean salt hay or threshed straw of oats, wheat, barley, or rye, free from seed of noxious weeds. Suitable for spreading with mulch blower equipment.
2. Average Stalk Length: 6 inches.
3. Seasoned before baling or loading.

2.4 CLEARING LIMIT FENCE

A. Pervious Sheet: Polyester, polypropylene, or nylon filaments, woven into a uniform pattern, distinct and measurable openings.

1. Filaments: Resistant to damage from exposure to ultraviolet rays and heat.
2. Material Edges: Finish so filaments retain their relative positions under stress.

B. In accordance with requirements of Table 1:

TABLE 1
Filter Fence

Physical Property	Required Value	Test Method
Weight, oz/sq yd, min.	4	ASTM D3776
Equivalent Opening Size, max.	50-70	U.S. Standard Sieve
Grab Tensile Strength, lb, min.	160	ASTM D4632
Ultraviolet Radiation Resistance, % Strength Retention	70	ASTM D4355

2.5 SUPPORT FENCE

A. Wire Mesh Material: As recommended by manufacturer of geotextile; strong enough to support applied loads.

B. Support Posts: As recommended by manufacturer of geotextile.

C. Fasteners: Heavy-duty wire staples at least 1 inch long, tie wires, or hog rings, as recommended by manufacturer of geotextile.

2.6 STRAW BALES

A. Machine baled clean salt hay or straw of oats, wheat, barley, or rye, free from seed of noxious weeds, using standard baling wire or string.

2.7 POSTS FOR STRAW BALES

A. 2-inch by 2-inch untreated wood or commercially manufactured metal posts.

PART 3 EXECUTION

3.1 SOIL PREPARATION

A. Before start of hydroseeding, and after surface has been shaped and graded, and lightly compacted to uniform grade, scarify soil surface to minimum depth of 1 inch.

3.2 SEEDING

A. Prepare 1-inch deep seed bed; obtain the Contracting Officer's acceptance prior to proceeding.

B. Apply by seeding or hydroseeding method on moist soil, but only after free surface water has drained away. Prevent drift and displacement of mixture into other areas.

3.3 MULCHING

A. Apply uniformly on disturbed areas.

B. Application: Sufficiently loose to permit penetration of sunlight and air circulation, and sufficiently dense to shade ground, reduce evaporation rate, and prevent or materially reduce erosion of underlying soil.

1. Straw: Apply by hand or mechanical means to minimum depth of 2 inches.
2. Wood Cellulose Fiber: 1,000 to 1,500 pounds per acre.

3.4 CLEARING LIMIT FENCE

A. Install in accordance with manufacturer's standard instructions and before beginning clearing and grubbing operations.

3.5 SUPPORT FENCE AND GEOTEXTILE

A. Install prior to starting earth disturbing activities upslope of fence.

B. One-piece geotextile or continuously sewn to make one-piece geotextile for full height of the fence, including portion buried in the toe trench.

C. When joints are necessary, splice geotextile together only at a support post, with a minimum 6-inch overlap, and securely fasten both ends to support post.

D. Geotextile shall not extend more than 24 inches above the ground surface. Securely fasten to upslope side of each support post using ties. Geotextile shall not be stapled to existing trees.

E. Fasten wire mesh material support fence securely to upslope side of post fasteners. Extend wire into the trench a minimum of 4 inches, and not more than 36 inches above the ground surface.

F. Take precaution not to puncture geotextile during installation. Repair or replace damaged area.

G. Remove support fence for geotextile after upslope area has been permanently stabilized. Immediately dress sediment deposits remaining after the geotextile fence has been removed to conform to existing grade. Prepare and seed graded area.

3.6 SOIL STOCKPILES

A. Protect from erosion with 20 mil PVC liner.

3.7 STRAW BALES

A. Imbed minimum of 4 inches in flat-bottomed trench.

B. Place with ends tightly abutting or overlapped. Corner abutment is not acceptable.

C. Install so that bale bindings are oriented around the sides and not over the top and bottom of the bale.

D. Use two posts for each bale. Drive posts through the bale until top of post is flush with top of bale.

E. Wedge loose straws in any gaps between bales.

END OF SECTION

SECTION 02999
TRANSPORTATION AND DISPOSAL OF CONTAMINATED MATERIALS

PART 1 GENERAL

1.1 REFERENCES

A. The publications listed below form part of this specification to the extent referenced. The publications are referred to in the text by their basic designations only.

Code of Federal Regulations

40 CFR 61	National Emission Standards for Hazardous Air Pollutants
40 CFR 261	Identification and Listing of Hazardous Waste
40 CFR 262	Standards Applicable to Generators of Hazardous Waste
40 CFR 263	Standards Applicable to Transporters of Hazardous Waste
40 CFR 266	Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities.
40 CFR 268	Land Disposal Restrictions
40 CFR 300	National Oil and Hazardous Substance Pollution Contingency Plan
40 CFR 302	Designation, Reportable Quantities, and Notification
49 CFR 107	Hazardous Materials Program Procedures
49 CFR 172	Hazardous Materials Table, Special Provisions, Hazardous Materials Communication, Emergency Response Information, and Training Requirements
49 CFR 173	Shippers – General Requirements for Shipments and Packagings
49 CFR 178	Specifications for Packagings

1.2 Submittals

A. Prior to the start of Work, a Contaminated Materials Plan detailing the manner in which contaminated material shall be managed.

B. Information necessary to file state annual or EPA reports for all contaminated materials transported, treated, stored, or disposed of under this contract. The contractor shall forward these data to the Contracting Officer at the specified time. The submittal shall contain all of the information necessary for filing of the formal reports in the form and format required by the governing federal or state agency. A cover letter shall accompany the data to include the contract number, Contractor name, and project location.

B. In the event of a spill or release of a hazardous substance (as designated in 40 CFR 302), or pollutants or contaminants, or soil (as governed by the Oil Pollution Act [OPA], 33 USC 2701 et seq.), the Contractor shall notify the Contracting Officer immediately. If the spill exceeds a reporting threshold, the Contractor shall follow the pre-established procedures for immediate reporting to the Contracting Officer.

C. A letter certifying that EPA considers the facilities to be used for offsite disposal of hazardous waste to be acceptable in accordance with the Offsite policy in 40 CFR 300, Section 440. This certification shall be provided for wastes from RCRA sites as well as from CERCLA responses.

D. Letters or other documentation verifying that the proposed disposal and/or treatment sites for non-hazardous waste and/or liquid materials are compliant with current State and Federal regulations and that they are licenses to accept the wastes proposed for disposal. In addition, the verification documents hall state the limitations and requirements (e.g., waste characterization, analytical data, maximum concentrations, etc.(of the disposal facility to accept such wastes.

E. Certificates documenting the ultimate disposal of contaminated materials within 180 days of initial shipment. Receipt of these certificates will be required for final payment.

F. All transportation related shipping documents to the Contracting Officer, including draft waste manifests, draft bills of lading, lists of corresponding proposed labels, packages, marks, and placards to be used for shipment, and supporting waste analysis documents, for review a minimum of 2 days prior to anticipated pickup. Packaging assurances shall be furnished prior to transporting contaminated material; "generator copies" of waste manifests, bills of lading, and supporting waste analysis documents shall be furnished when shipments are originated.

G. Notices of non-compliance of notices of violation by a federal, state, local regulatory agency issued to the Contractor in relation to any Work performed under this contract. The Contractor shall immediately provide copies of such notices to the Contracting Officer. The Contractor shall also furnish all relevant documents regarding the incident and any information requested by the Contracting Officer.

1.3 QUALIFICATIONS

A. The Contractor shall designate, by position and title, one person to act as the Transportation and Disposal Coordinator (TDC) for this contract. The TDC shall serve as the single pint of contact for all environmental regulatory matters and shall have overall responsibility of total environmental compliance at the site including but not limited to accurate identification of hazardous and non-hazardous wastes; determination of proper shipping names; identification of marking, labeling, packaging, and placarding requirements; completion of waste profiles, waste manifests, bills of lading, exception and discrepancy reports; and all other environmental documentation.

1.4 LAWS AND REGULATIONS REQUIREMENTS

A. Work shall meet or exceed the minimum requirements established by Federal, state, and local laws and regulations that are applicable. These requirements are amended frequently and the Contractor shall be responsible for complying with amendments as they become effective. In the event that compliance exceeds the scope of work or conflicts with specific requirements of the contract, the Contractor shall notify the Contracting Officer immediately.

1.5 DEFINITIONS

A. Contaminated Materials - Soil, water, debris, etc. that have become contaminated, or that are suspected of being contaminated, by chemical constituents above regulatory limits.

B. Hazardous Waste - A waste which meets criteria established in RCRA or specified by the EPA in 40 CFR 261 or which has been designated as hazardous by a RCRA authorized state program.

C. Non-hazardous Waste - Waste, soil, water, or debris that do not meet the hazardous waste criteria specified above.

PART 2 PRODUCTS

2.1 MATERIALS

The contractor shall provide all of the materials required for the packaging, labeling, marking, placarding, and transportation of the contaminated materials in conformance with DOT standards. Details in this specification shall not be construed as establishing the limits of the Contractor's responsibility.

A. The Contractor shall provide bulk and/or non-bulk containers for packaging contaminated materials (contaminated soil, water, and/or debris). Containers for hazardous waste must be consistent with the authorizations referenced in the Hazardous Materials Table in 49 CFR 172, Section 101, column 8. Bulk and non-bulk packaging shall meet the corresponding specifications in 49 CFR 173 referenced in the Hazardous Materials Table, 40 CFR 172, Section 101. Each packaging shall conform to the general packaging requirements of Subpart B of 49 CFR 173, tot he requirements of 49 CFR 178 at the specified packaging group performance level, to the requirements of special provisions of column 7 of the Hazardous Materials Table in 49 CFR 172, Section 101, and shall be compatible with the material to be packaged as required by 40 CFR 262.

B. The Contractor shall provide, as appropriate, markings for each contaminated soil, water, or debris package, freight container, and transport vehicle consistent with the requirements of 49 CFR 172, Subpart D and 40 CFR 262, Section 32 (for hazardous waste).

C. The Contractor shall provide primary and subsidiary labels for contaminated materials consistent with the requirements in the Hazardous Materials Table in 49 CFR 172, Section 101, column 6. Labels shall meet design specifications required by 49 CFR 172, Subpart E including size, shape, color, printing, and symbol requirements.

D. For each offsite shipment of contaminated materials, the Contractor shall provide, as necessary, primary and subsidiary placards consistent with the requirements of 49 CFR 172, Subpart F. Placards hall be provided for each side and each end of bulk packaging, freight container, and transport vehicles requiring such placarding.

2.2 EQUIPMENT AND TOOLS

The Contractor shall provide miscellaneous equipment and tools necessary to handle contaminated materials, including hazardous waste, in a safe and environmentally sound manner.

PART 3 EXECUTION

3.1 OFFSITE HAZARDOUS AND NON-HAZARDOUS WASTE MANAGEMENT

The Contractor shall be responsible for arranging transportation to and disposal of all contaminated materials at an appropriate treatment, disposal, or storage (TSD) facility licensed to accept the materials. The Work shall include all sampling and analysis necessary to determine the disposal requirements and for acceptance of the waste as the TSD facility.

A. The Contractor shall provide the Contracting Officer with EPA ID numbers, names, locations, and telephone numbers of proposed TSD facilities and transporters. Letters of acceptance of the waste by the proposed TSD facility shall be provided, including limitations on acceptance and analytical/testing requirements for waste acceptance. This information shall be contained in the Waste Management Plan for approval prior to waste disposal.

1. Hazardous wastes shall be disposed of in RCRA Subtitle C permitted facilities which meet the requirements of 40 CFR 264 ort facilities operating under interim status and meeting the requirements of 40 CFR 265. Offsite TSD facilities with significant RCRA vi9loations or compliance problems shall not be used.
2. Facilities receiving hazardous waste must be permitted in accordance with 40 CFR 270, must be operating under interim status in accordance with 40 CFR 265 requirements, or must be permitted by an authorized state program. Prior to using the TSD facility, the Contractor shall determine the status of the facility and document all information necessary to satisfy the requirements of the EPA Offsite policy and furnish this information to the Contracting Officer.
3. Non-hazardous waste materials shall be disposed of at a non-hazardous TSD facility currently licensed to accept the type(s) of waste being disposed. The Contractor shall obtain waste verification requirements and acceptance criteria for the facility in writing.

B. Prior to shipment of any hazardous material offsite, the Contractor's TDC shall provide written certification to the Contracting Officer that the contaminated materials have been properly packaged, labeled, and marked in accordance with the applicable DOT and EPA requirements.

C. The Contractor shall use manifests for transporting wastes as required by 40 CFR 263 or any applicable state or local law or regulation. Transportation shall comply with all requirements in the DOT referenced regulations in the 49 CFR series. Manifests shall be completed using instructions in 40 CFR 262, Subpart B and nay applicable state or local law or regulation. Manifests and waste profiles shall be submitted to the Contracting Officer for review and approval. In addition, the Contractor shall prepare LDR notifications as required by 40 CFR 268 or any applicable state or local law or regulation for each shipment of hazardous waste. Notifications shall be submitted with the manifest to the Contracting Officer for review and approval.

D. The waste shall be transported to an approved TSD facility within 90 days of the accumulation start date on each container. The Contractor shall ship hazardous wastes only to facilities which are properly permitted to accept waste.

3.2 HAZARDOUS MATERIAL MANAGEMENT

A. The Contractor, in consultation with the Contracting Officer, shall evaluate prior to shipment of any material offsite whether or not the material is regulated as a hazardous waste. This shall be done for the purpose of determining proper shipping descriptions, marking requirements, etc., as described.

1. The Contractor shall use 49 CFR 172, Section 101 to identify proper shipping names for each hazardous material (including hazardous wastes) to be shipped offsite.
2. The Contractor shall package, label, and mark hazardous materials/wastes using the specified materials and in accordance with the referenced authorizations.
3. The Contractor shall ensure that each shipment of hazardous materials sent offsite is accompanied by the properly completed shipping documents.

3.3 WASTE MINIMIZATION

The Contractor shall minimize the generation of hazardous waste to the maximum extent practicable. The Contractor shall take all necessary precautions to avoid mixing clean and contaminated wastes.

3.4 RECORD KEEPING

The Contractor shall be responsible for maintaining adequate records to support information provided to the Contracting Officer regarding exception reports, annual reports, and biennial reports.

3.5 SPILL RESPONSE

The Contractor shall be responsible to any spill of contaminated materials (including hazardous materials, non-hazardous materials) which are in the custody or care of the Contractor pursuant to this contract. Any direction form the Contracting Officer concerning a spill or release shall not be considered a change under the contract. The Contractor shall comply with all applicable requirements of Federal, state, or local laws of regulations regarding and spill incident.

3.6 EMERGENCY CONTACTS

The Contractor shall be responsible for complying with the emergency contact provision in 49 CFR 172, Section 604. Whenever the Contractor ships hazardous materials, the Contractor shall provide a 24-hour emergency response contact and phone number of a person knowledgeable about the contaminated materials being shipped and who has the comprehensive emergency response and incident mitigation information for that materials, or has immediate access to a person who possesses such knowledge and information. The phone must be monitored on a 24-hour basis at all times when the hazardous materials are in transportation including during storage incidental to transportation. The Contractor shall ensure that information regarding this emergency contact and phone numbers are placed on all contaminated materials shipping documents. The Contractor shall designate an emergency coordinator and post the following information at all areas in which contaminated materials are managed:

A. The name of the emergency coordinator.

B. Phone number through which the emergency coordinator can be contacted on a 24 hour basis.

C. The phone number of the local fire department.

D. The location of the fire extinguishers and spill control materials.

END OF SECTION

ATTACHMENT 2

PERFORMANCE STANDARDS VERIFICATION PLAN

809 266

Defense Distribution Center (Memphis)
Dunn Field

Disposal Sites Prefinal Remedial Design

Performance Standards Verification Plan

Rev. 1

PREPARED FOR

U.S. Army Engineering and Support Center, Huntsville
4820 University Square
Huntsville, AL 35816

April 2004

PREPARED BY

CH2M HILL
115 Perimeter Center Place NE, Suite 700
Atlanta, GA 30346

Contents

Attachments

SECTION 1
Introduction

This Performance Standards Verification Plan (PSVP) is part of the Dunn Field Disposal Sites RD and has been prepared for the U.S. Army Corps of Engineers (USACE) - Huntsville Center as part of Task Order 6 under contract number DACA87-02-D-0006. This document contains a Field Sampling and Analysis Plan (FSP) and a Quality Assurance/Quality Control Project Plan (QAPP). The QAPP has been written as an annotated outline for the RA contractor to use as guidance in development of site-specific documentation.

This PSVP addresses all quantitative Performance Standards for the soil and water compliance sampling activities required through completion of the remedial action (RA), as well as post RA monitoring. The Construction Quality Assurance Plan (CQAP) developed by the RA contractor will address all qualitative Performance Standards.

1.1 Purpose of the Performance Standards Verification Plan

The purpose of this PSVP is to identify and describe the sampling and analysis work and the Quality Assurance/Quality Control (QA/QC) elements required during and after the remediation to verify that all RD Performance Standards have been met. The work addressed by this plan includes the following:

- Sampling and analysis of excavation perimeter.
- Sampling and analysis of excavated material for transportation and disposal (T&D) waste characterization.
- Sampling and analysis of drummed or battled liquid waste to characterize for further action
- Sampling and analysis of borrow soils.
- Sampling and analysis of water from the excavations and decontamination areas to characterize for further action.

This plan will be reviewed and approved by EPA.

1.2 Organization of the PSVP

The remainder of this PSVP is organized as follows:

- Sections 2 through 5 FSP
- Section 6 QAPP
- Section 7 References

The Site description, geology, hydrogeology, and history are provided in the *Remedial Design Work Plan, Rev. 1* (CH2M HILL, 2004).

SECTION 2

Sampling Overview

An overview of the various sampling activities to be conducted during and after the RA is presented in this section. Sampling objectives for specific soil/waste and water media are presented below.

2.1 Objectives

2.1.1 Excavated Soil

During the RA, contaminated soil will be removed from Disposal Sites 3, 4.1, 10, 13, and 31. Soil considered hazardous based on the results of the *Disposal Sites Pre-Design Investigation Data Collection Plan Technical Memorandum, Rev.* 2 (CH2M HILL, 2004) will be segregated from soils currently characterized as non-hazardous. Excavated soil anticipated to be non-hazardous will be stockpiled on 20 mil liners during the final waste characterization; the soil anticipated to be characterized as hazardous will be staged in roll-off containers. The excavated soils will be sampled and analyzed using the toxicity characteristic leaching procedure (TCLP) to evaluate disposal options.

2.1.2 Waste

Waste (in bulk and drums) will be staged, segregated and sampled to characterize for the appropriate treatment/disposal method. Empty drums will be transported offsite for disposal.

2.1.3 Excavation Perimeter

Confirmation samples will be collected from the side walls and bottoms of the proposed excavations to assess whether additional excavation is required. The perimeter of the excavations will sampled in accordance with the State of Michigan DEQ *Verification of Soil Remediation* Guidance Document (Michigan DEQ, April 1994).

2.1.4 Borrow Soil

Soil from potential borrow areas will be sampled and analyzed to ensure that the backfill material is clean.

2.1.5 Storm Water and Decontamination Water

Samples of storm water and decontamination water will be collected and analyzed to determine the appropriate disposal methods.

2.2 Field Screening

Visual assessment will be used by the field Engineer to select excavation confirmation sample locations, extend the limits of the excavation (e.g. presence of stained soil), and segregate soils as necessary.

In addition, field screening will be performed via ambient air monitoring for health and safety (H&S) purposes during all excavation activities.

2.3 Laboratory Tests

Laboratory testing will be used to provide results for verification that performance standards have been met and to characterize samples for further treatment/disposal. A description of how laboratory testing will be used for each specific media is presented in Section 3.

SECTION 3

Sampling Strategy and Sample Analysis

This section describes the sampling strategy to be used for each of the media presented in Section 2. Laboratory analytical testing will be performed for all soil, waste, and water samples.

3.1 Excavated Soil

3.1.1 Post Remedial Soil Compliance Monitoring

Confirmation samples will be collected in accordance with the State of Michigan DEQ *Verification of Soil Remediation* Guidance Document (Michigan DEQ, April 1994). Because all of the proposed excavations are less than 0.25 acre, the small site soil cleanup verification guidance, which emphasizes biased sampling, will be used for this RA. The biased approach specified in this guidance recommends soil sampling from areas most likely to exceed the cleanup criteria. This approach minimizes the number of samples required to verify that a site meets the cleanup criteria.

The samplers will choose the confirmation sample locations based on information from the RI, the pre-design investigation, and observations during the removal effort. Sample location rationale will be include in the Remedial Action Completion Report (RACR) . Tables 1 and 2 in the Michigan DEQ *Verification of Soil Remediation* Guidance Document were used to determine the minimum number of floor and side wall samples for each of the Disposal Site excavations. The number of samples is provided below.

Disposal Site	COCs	Floor Area (ft^2)	Total Sidewall Area (ft^2)	Number of Samples Floor	Number of Samples Side wall
3	(bottles and drums)	600	1,000	3	6
4.1	copper and lead	600	1,000	3	6
10	Copper and lead	2,200	3,240	5	9
13	(bottles)	150	500	2	5
31	PAHs and copper	5,850	3,060	7	9
Total		9,400	8,800	20	35

Samples will be analyzed for select target compound list/target analyte list (TCL/TAL) parameters, as presented in Tables 3-1 and 3-2.

3.1.2 Waste Characterization Sampling

Samples will be collected from the soil stockpiles and roll-off containers and analyzed for leachability according to toxicity characteristic leachate procedures (TCLP) via EPA Method 1311 in accordance with Table 3-2; samples will also be analyzed for reactivity, corrosivity and ignitability (RCI). Composite samples will be collected every 250 cubic yards of excavated material or, at a minimum, per disposal site. At least five aliquots will be collected from each batch using a clean stainless steel spoon or hand auger. Each of the aliquots will be transferred to a clean stainless steel bowl for mixing. The composite will be placed into the appropriate sample jars for transport to the laboratory for analysis.

Samples for VOC analysis will be collected directly from the stockpile not from composited soil and according to EPA SW846 Method 5035 using a syringe. This method is thoroughly described in Section 12.4 of the November 2001, US EPA Science and Ecosystem Services Division *Environmental Investigation Standard Operating Procedures and Quality Assurance Manual* (EISOPQAM).

3.1.3 Liquid Waste

All drums and bottles will be excavated in accordance with the attached EPA Drum Sampling Standard Operating Procedure (SOP) (Attachment A) and segregated from the excavated soil. If the liquid waste remains in drums, one composite sample will be taken from no more than ten drums of like waste. If collected in bulk, the liquid waste will be sampled once per bulk container (tanker truck, roll-off). The liquid waste will be sampled for the methods listed in Table 3-2. The liquid waste will be sent for offsite disposal/treatment based on the sampling results.

3.1.4 Borrow Areas Sampling

Grab samples will be collected every 500 cubic yards from each offsite borrow area or every 250 cubic yards from each onsite borrow area using stainless steel hand augers, bowls, and spoons to ensure that the Disposal Site excavations are backfilled with clean soil. Samples will be analyzed for select TCL/TAL parameters, as presented in Table 3-3. Samples will be collected with a clean hand auger and transferred to a clean stainless steel bowl before placing the material into the appropriate sample jars for transport to the laboratory for analysis.

TCL/TAL parameters include VOCs, semivolatile organic compounds (SVOCs), pesticides/herbicides, polychlorinated biphenyls (PCBs), and metals.

3.2 Water

3.2.1 Storm Water

Storm water may accumulate in the excavations and staging areas due to incidental rainfall. Storm water removed from the excavations and stockpiles will be containerized in a mobile tank as necessary. At the completion of remedial activities, samples will be analyzed for the TCL/TAL parameters presented in Table 3-4 to assess disposal options (e.g., POTW).

3.2.2 Decontamination Water

Decontamination water will be collected in drums. At the completion of remedial activities, samples will be analyzed for the TCL/TAL parameters presented in Table 3-4 to assess disposal options (e.g., POTW).

3.3 Air

For H&S protection of all field staff, all operations at the site will include ambient air monitoring that includes instrumentation capable of detecting explosive vapors (i.e., combustible gas indicators), oxygen content, dust levels, and organic vapors. Ambient air monitoring with a calibrated FID at regular intervals is required for the entire excavation period. In addition, ambient air measurements will be collected prior to excavation to establish ambient and background conditions and, at the end of the excavation to determine if any residual vapors exist near the disposal areas. FID monitoring will be conducted at various monitoring points (MP) selected during the background measurement collection and maintained for the entire field effort. Analytical instruments will be calibrated in accordance with the manufacturer's instructions. All measurements will be recorded in field notebooks with the date, time, and location of the recording clearly noted and noted in a daily calibration log.

During the excavation effort, screening for hazardous ambient conditions will be conducted through the use of a combustable gas indicator (CGI)/oxygen (O_2) meter and dust monitors. This sampling effort is necessary to alert personnel to potential buildup of explosive levels of gases in the disposal pits or for hazardous dust levels, especially at sites containing lead in the soil. For hazardous gas monitoring, instruments can be placed at an established MP preferably close to the edge of each excavation whereas for dust monitoring, MPs can be established at the work perimeter or perimeter of Dunn Field. The measurements will be recorded in field notebooks with the date and time of the recording and location of the measurement clearly noted. Analytical instruments will be calibrated in accordance with the manufacturer's instructions and noted in a daily calibration log.

Table 3-1

Compliance Sample Analytical Methods

Rev. 0 Memphis Depot Dunn Field Disposal Sites Prefinal Remdial Design

Prelim TAT/ Final TAT	Data Package Requirement	Required Analysis	Analytical Methods	Holding Time	Sample Preservation	Containers
7 days/14 days	CLP-type full package	TCL SVOCs	8270C	14 day extraction; 40 day analysis	Cool to 4°C	(4) 8oz WM glass
		TAL Metals	6010B/7471A	6 months	Cool to 4°C	

Notes:

TAT = turnaround time

TCL/TAL = Target Compound List/Target Analyte List

SVOCs = Semi-volatile organic compounds

CLP = EPA Contract Laboratory Program quality assurance control procedures

TCLP = Toxicity Characteristic Leachate Procedure, analysis method

C = Celcius

Table 3-2

Transport and Disposal and Quality Assurance/Quality Control Samples

Rev. 0 Memphis Depot Dunn Field Disposal Sites Prefinal Remedial Design

Sample Point	Matrix	Sampling Frequency	Approx. Sample No.	Sampling Method	Sampling Equipment	Prelim TAT/ Final TAT	Data Package Reqmnt	Required Analysis	Analytical Methods	Holding Time	Sample Preservation	Containers
Stockpiles or Roll-Offs	Soil	Every 250 CY or once per DS	15	Prepared in Field	Hand-auger device prior to compositing (except for VOCs)	4 days/7 days	CLP-like full package	TCLP VOCs	1311/8260B	14 day TCLP extr; 14 day analysis	Cool to 4°C	(4) 8oz WM glass
								TCLP SVOCs	1311/8270C	14 day TCLP extr; 7 day extr; 40 day analysis	Cool to 4°C	
								TCLP Pesticides	1311/8081A	14 day TCLP extr; 7 day extr; 40 day analysis	Cool to 4°C	
								TCLP Herbicides	1311/8151A	14 day TCLP extr; 7 day extr; 40 day analysis	Cool to 4°C	
								TCLP Metals	1311/6010B7470A	6 month TCLP extr; 6 month analysis Hg: 28 day TCLP extr; 28 day analysis	Cool to 4°C	
								Reactivity (Reactive Cyanide & Reactive Sulfide)	SW7.3.3.2 & SW7.3.4.2	ASAP	Cool to 4°C	
								Corrosivity	9045C	ASAP	Cool to 4°C	
								Ignitability	1010/1030	ASAP	Cool to 4°C	
Drums and Bottles	liquid waste	Every 10 containers or once per DS	5	EPA SOP	COLIWASA or other appropriate	4 days/7 days	CLP-like full package	TCL VOCs	8260B	14 days	HCl pH< 2; Cool to 4°C	(4) 8oz WM glass
								TCL SVOCs	8270C	14 day extr; 40 day analysis	Cool to 4°C	
								TCL Pesticides	8081A	14 day extr; 40 day analysis	Cool to 4°C	
								TCL PCBs	8082	14 day extr; 40 day analysis	Cool to 4°C	
								Herbicides	8151A	14 day extr; 40 day analysis	Cool to 4°C	
								TAL Metals	6010B/7471A	6 months; Hg = 28 days	HNO_3 pH< 2; Cool to 4°C	
								Reactivity (Reactive Cyanide & Reactive Sulfide)	SW7.3.3.2 & SW7.3.4.2	ASAP	Cool to 4°C	
								Corrosivity	9045C	ASAP	Cool to 4°C	
								Ignitability	1010/1030	ASAP	Cool to 4°C	
Equipment Rinsate Blank	Water	1 per set of field-cleaned equipment (10%)	10% or at least one per day of sampling	Prepared in Field	Analyte-free water, SS funnel	7 days/14 days	CLP-like full package	TCL VOCs	8260B	14 days	HCl pH< 2; Cool to 4°C	(2) 40 mL vials
								TCL SVOCs	8270C	14 day extr; 40 day analysis	Cool to 4°C	(1) Liter amber glass
								TCL Pesticides	8081A	14 day extr; 40 day analysis	Cool to 4°C	(1) Liter amber glass
								TCL PCBs	8082	14 day extr; 40 day analysis	Cool to 4°C	(1) Liter amber glass
								Herbicides	8151A	14 day extr; 40 day analysis	Cool to 4°C	(1) Liter amber glass
								TAL Metals	6010B/7471A	6 months; Hg = 28 days	HNO_3 pH< 2; Cool to 4°C	(1) 500 mL HDPE
Trip Blank	Water	Once	8	Prepared by Lab	N/A	7 days/14 days	CLP-like full package	TCL VOCs	8260B	14 days	HCl pH< 2; Cool to 4°C	(2) 40 mL vials
*MSDS***	Soil	1 per 20 samples	4	Prepared in Field	Same Equipment for Soil Samples	7 days/14 days	CLP-like full package	Selected by Personnel in Field	Appropriate Method	Corresponds to Method	Appropriate Measures	Appropriate Containers
Duplicates	Soil	1 per 10 samples	12	Prepared in Field	Same Equipment for Soil Samples	7 days/14 days	CLP-like full package	TCL VOCs	5035/8260B	14 days	HCl pH< 2; Cool to 4°C	(2) 40 mL vials
								TCL SVOCs	8270C	14 day extr; 40 day analysis	Cool to 4°C	(1) Liter amber glass
								TCL Pesticides	8081A	14 day extr; 40 day analysis	Cool to 4°C	(1) Liter amber glass
								TCL PCBs	8082	14 day extr; 40 day analysis	Cool to 4°C	(1) Liter amber glass
								Herbicides	8151A	14 day extr; 40 day analysis	Cool to 4°C	(1) Liter amber glass
								TAL Metals	6010B/7471A	6 months; Hg = 28 days	HNO_3 pH< 2; Cool to 4°C	(1) 500 mL HDPE

Notes.

**Matrix Spike(MS)/MS Duplicate Samples (MSDS) samples will be supplied to the laboratory as an extra bottle containing the sample and the analysis will be the responsibility of the laboratory.

TAT = Turnaround time

CLP = EPA Contract Laboratory Program quality assurance control procedures

SS= Stainless steel

TCL/TAL = Target Compound List/Target Analyte List

VOCs = Volatile organic compounds

SVOCs = Semi-volatile organic compounds

C = degrees celcius

ml = milliliter

Table 3-3

Borrow Area Sample Analytical Methods

Rev. 0 Memphis Depot Dunn Field Disposal Sites Prefinal Remedial Design

Prelim TAT/ Final TAT	Data Package Requirement	Required Analysis	Analytical Methods	Holding Time	Sample Preservation	Containers
7 days/14 days	CLP-type full package	TCL VOCs	5035/8260B	14 days	Sodium Bisulfite or Methanol; Cool to 4°C	(3) 40 mL vials; one with methanol; 2 with sodium bisulfate (pH of sample should be 2 or lower)
		TCL SVOCs	8270C	14 day extr; 40 day analysis	Cool to 4°C	(4) 8oz WM glass
		TCL Pesticides	8081A	14 day extr; 40 day analysis	Cool to 4°C	
		TCL PCBs	8082	14 day extr; 40 day analysis	Cool to 4°C	
		Herbicides	8151A	14 day extr; 40 day analysis	Cool to 4°C	
		TAL Metals	6010B/7471A	6 months; Hg = 28 days	Cool to 4°C	

Notes:

TAT = turnaround time

TCL/TAL = Target Compound List/Target Analyte List

VOCs = Volatile organic compounds

SVOCs = Semi-volatile organic compounds

CLP = EPA Contract Laboratory Program quality assurance control procedures

TCLP = Toxicity Characteristic Leachate Procedure, analysis method

C = Celcius

809 278

809 279

Table 3-4

Water Sample Analytical Methods

Rev. 0 Memphis Depot Dunn Field Disposal Sites Prefinal Remedial Design

Prelim TAT/ Final TAT	Data Package Reqmnt	Required Analysis	Analytical Methods	Holding Time	Sample Preservation	Containers
7 days/14 days	CLP-like full package	TCL VOCs	5035/8260B	14 days	HCl pH< 2; Cool to 4°C	(2) 40 mL vials
		TCL SVOCs	8270C	14 day extr; 40 day analysis	Cool to 4°C	(1) Liter amber glass
		TCL Pesticides	8081A	14 day extr; 40 day analysis	Cool to 4°C	(1) Liter amber glass
		TCL PCBs	8082	14 day extr; 40 day analysis	Cool to 4°C	(1) Liter amber glass
		Herbicides	8151A	14 day extr; 40 day analysis	Cool to 4°C	(1) Liter amber glass
		TAL Metals	6010B/7471A	6 months	HNO_3 pH< 2; Cool to 4°C	(1) 500 mL HDPE

Notes:

TAT = Turnaround time

CLP = EPA Contract Laboratory Program quality assurance control procedures

TCL/TAL = Target Compound List/Target Analyte List

VOCs = Volatile organic compounds

SVOCs = Semi-volatile organic compounds

C = degrees celcius

ml = milliliter

SECTION 4
Sample Identification and Labeling

4.1 Sample Identification

4.1.1 Soil and Water Samples

Each soil and water sample collected from the site during the remediation will be identified by an unique sample designation code. The sample designation code will be recorded on the sample label affixed to the sample container, in the field log book, and on the chain-of-custody form that will accompany the sample. In addition, the sample designation code will be used to track each sample.

The samples will be identified by the following sample designation scheme:

Project -	Date -	Sampling - Location	Sample - Type	Sample Number

where:

project	=	Dunn Field Disposal Sites RA (DSRA)
date	=	date of sample collection (month, day, year)
sampling location	=	DS3 for Disposal Site 3 WB1 for waste batch number 1 BA1 for borrow area sample number 1 SW1/DS3 for storm water sample number 1 from Disposal Site 3 DR1 for drummed liquid waste drum number 1 TB for trip blank RB or EB for rinseate or equipment blank, respectively FB for field blank.
sample type	=	grab (G) or composite (C)
sample number	=	first, second, third, etc.–sample collected from same location

Therefore, a sample designation code DSRA-081504-WB1-C-01 would indicate the first composite sample from "waste batch 1" that was collected on August 15, 2004. Similarly, a sample designation code DSRA-081504-TB-G-1 would indicate trip blank number one shipped on August 15, 2004 from the site.

For organics analyses, the sample for matrix spike/matrix spike duplicate (MS/MSD) (see Section 5.4.5) will be identified on the chain-of-custody form. Field duplicates will not be identified on the chain-of-custody form; these samples will be given fictitious sample designation codes. The field duplicates, however, will be identified in the field logbook.

4.1.2 Air Samples

The field screening data collected from the PID, OVA-FID, and CGI/O_2 meters will include the following:

- Date and time
- Elapsed time since excavation began (as necessary)
- Location of measurement/location where the sample was collected (as necessary)
- Instrument measurement

Each measurement will be handwritten into a bound field notebook and, after each excavation has been completed, the data will be transferred into an electronic file for post-remedy implementation documentation. Field notebooks should also contain instrument calibration completion records and background monitoring information.

4.2 Soil and Water Sample Labels

All soil and water samples obtained at the site will be placed in an appropriate sample container, as identified in Tables 3-2 through 3-4, for shipment to the laboratory. Each sample container will be identified with a separate identification label. Labeling will be done in indelible/waterproof ink. Errors will be crossed out with a single line, dated, and initialed. Each securely affixed label will include the following information:

- Project identification
- Sample identification
- Sampler's name or initials
- Preservatives added
- Date of collection
- Time of collection
- Required analytical method numbers

4.3 Sample Logbook Documentation

The field logbooks will be maintained by the Site Manager and by personnel responsible for sampling and support activities. They will be completed in permanent blue or black ink. Errors will be corrected by crossing out with a single line and then dating and initialing. The use of correction fluid will not be permitted. The field logbooks used during the remedial activities will remain on-site during the entire field effort.

In general, these logbooks will contain the specific details supporting the tasks performed by the person maintaining the field logbook, including ambient air monitoring readings and sample documentation. Any administrative occurrences, conditions, or activities that have affected the field work will also be recorded. All entries into these logbooks will be signed and dated. The following is a partial list of the types of information to be recorded in the field logbooks:

- Name and title of author, and date and time of entry
- Name and address of field contact

- Names and titles of field crew for each day
- Weather conditions at the Site for each day
- Documentation of H&S activities
- Field instrument calibration information
- Type of sampled media (e.g., soil, water, etc.)
- Sample identification numbers
- Observations on sample color, odor, or unusual characteristics
- The information contained on the sample bottle labels
- All field measurements, such as CGI/O_2 readings, FID measurements, etc.
- Number and type of bottles shipped to the laboratory
- Airbill number from overnight courier forms
- Decontamination procedures
- Number of coolers shipped

Duplicate samples will be identified in the field logbook. However, these samples will not be identified as duplicates on the chain-of custody records.

SECTION 5

General Sampling Procedures

5.1 Introduction

This section presents the general sampling information, including sample containers, preservation, packaging, shipping, chain-of custody and QA/QC sampling to be performed at the Site during the collection of samples. Also, specific screening and sampling procedures and equipment decontamination are presented by each sampling media.

5.2 Sample Containers, Preservation, and Holding Time

During field activities, all samples for offsite analysis will be kept cool in an ice chest prior to shipping. Keeping samples cool will minimize biological and chemical activity. In addition to cooling as a general means of preservation, specific measures are required for certain parameters in water. Tables 3-1 to 3-4 summarize the laboratory analyses to be performed on soil/waste and water samples, sample containers to be used, preservation measures and the maximum holding times. Sample containers will be provided by the laboratory and will be certified pre-cleaned to EPA specifications. The certification forms will be filed onsite.

5.3 General Sampling Procedures

Each person involved in sample collection at the project site will be instructed on how to obtain representative soil samples. Project personnel will receive additional training in proper field documentation.

All samples will be properly identified and labeled in the field. Immediately upon collection, each sample is sealed and labeled. Gummed labels will be used for samples and will be marked as described in Section 4.1.1.

5.3.1 Sample Custody

Proper sample custody procedures will be used to ensure that samples have been obtained from the locations stated and that they have reached the laboratory without alteration. All sample bottles will be maintained in a locked storage area prior to use.

Evidence of the sample traceability from collection to shipment, laboratory receipt, and laboratory custody will be documented. A sample is considered to be in a person's custody if the sample is:

- In a person's actual possession
- In view after being in a person's possession
- Locked so that no one can tamper with it after having been in physical custody
- In a secured area, restricted to authorized personnel

The field team leader is responsible for overseeing and supervising the implementation of proper sample custody procedures in the field. He is also designated as the field sample custodian and is responsible for ensuring sample custody until the samples have been transferred to a courier or directly to the laboratory.

Once the samples have been received by the laboratory, a designated person is responsible for maintaining a file of all the original documents (e.g., chain of custody forms, traffic reports, special analytical services request form, etc.) pertinent to sample custody and sample analysis protocol.

5.3.2 Chain-of-Custody Records

A Chain-of-Custody Record will accompany the sample during shipment to the laboratory, and through the laboratory. When transferring samples, the individuals relinquishing and receiving will sign, date and note the time on the record. The laboratory maintains a file copy, and the completed original will be returned to the project manager as a part of the final analytical report. This record will be used to document sample custody transfer from the sampler to a laboratory.

Shipments will be sent by overnight express carrier and air bills will be kept as receipt of shipment. Airbills will be retained as part of the permanent documentation. All sample shipments will be in accordance with U.S. DOT regulations (49 CFR 171 through 177).

5.3.3 Sample Handling

The collected samples will be placed in the appropriate pre-cleaned sample bottles containing the required preservative (Tables 3-2 through 3-4). After the samples are placed in the sample containers they are packaged and prepared for shipment to the laboratory in the following manner:

- Clean the outer surface of the filled container with paper towels (dye free), using deionized, organic-free water, as necessary.
- Attach completed sample label to the container and cover the label with clear tape. (This may be done prior to sample collection.)
- Seal the container by wrapping tape around the lid of the container. Use Teflon® tape on volatile organic samples. Use PVC tape on all other samples.
- Place polynet over glass containers and wrap in bubble pack. Securely tape the bubble pack with clear tape.
- Place bubble-packed container in Ziploc®-type bag and seal.
- Package ice cubes by sealing in two Ziploc®-type plastic bags if preservation specifies cooling to 4°C.
- Line insulated shipping cooler with a large plastic bag. Place samples in insulated shipping cooler with ice.
- Seal chain-of-custody form in a Ziploc®-type plastic bag and tape to the inside of the cooler lid.

- Close the large plastic bag and seal with tape.
- Sign and date custody seals and secure over opposite ends of cooler.
- Securely seal shipping container with packing tape.
- Attach airbill and ship to analytical laboratory via overnight courier.

5.3.4 Documentation

All documents will be completed in permanent black ink. Errors will be corrected by crossing out with a single line and then dating and initialing. The use of correction fluid will not be permitted. The documents used during the field investigation will remain on-Site during the entire field effort. Forms used will be kept organized in a central file also located on-Site.

Three types of logbooks will be maintained throughout the field investigation. These are the **Site logbook, field logbook,** and **field equipment logbook.**

The **Site logbook** is the master field investigation document that is a bound book with hard cover and sequentially numbered pages. Its primary purpose is to contain within one document the actual field data or references to other field documents that contain a specific description of every activity that has occurred in the field on any given day. Any administrative occurrences, conditions, or activities that have affected the field work will also be recorded. All entries into these logbooks will be signed and dated. The following is a partial list of the types of information to be recorded in the logbooks:

- Name and title of author, and date and time of entry
- Name and address of field contact
- Names and titles of field crew
- Documentation of H&S activities
- Type of sampled media (e.g., soil, water, etc.)
- Sample identification numbers and reference to appropriate field logbook
- References for all maps and photographs of the sampling sites
- Reference to appropriate logbooks containing field measurements, such as CGI/O_2 readings, FID measurements etc.
- Decontamination procedures
- Instrument calibration and appropriate field logbooks

Separate **field logbooks** will be maintained by the Site Manager and by personnel responsible for sampling and support activities. The requirements for these logbooks are the same as for the Site logbooks. The specific information required for the sampling **field logbook** is described in detail in Section 4.3.

The **field equipment logbook** is used to document the proper maintenance and calibration of field testing equipment. All equipment will be inspected and approved by the field team leader before being used, and all calibration records shall be maintained for each instrument used on-site and shall be kept in the logbook. The field equipment logbook will include:

- Name and identifying number of the instrument
- Date calibrated
- Calibration points
- Identification of the calibrator
- Manufacturer, lot number, and expiration date of calibration standards
- Results of the calibration

Along with the completion of data entry in each of the above-mentioned logbooks, field data forms will also be completed and maintained at the site for all field activities.

5.3.5 Decontamination

All sampling equipment will be decontaminated before initial use and between reuse as specified in the decontamination procedures (Section 5.5.4). Equipment will also be decontaminated prior to leaving a site. Once all samples to be taken at a site have been labeled and packaged properly, all equipment and protective clothing which have been utilized at that site for that day will be decontaminated as necessary prior to leaving. The decontamination will be performed in the personal decontamination area as specified in the site-specific Health and Safety Plan (HASP).

5.4 QA/QC Sampling Procedures

During each sampling effort, a number of QA/QC samples must be collected for laboratory analysis. The types of QA/QC samples that will be collected, along with a brief description of each sample type, are outlined below.

5.4.1 Trip Blanks

Trip blanks will be collected and analyzed for volatile organic compounds. The analytical results will serve as a baseline measurement of volatile organic contamination that samples may be exposed to during transport and laboratory storage prior to analysis.

Trip blanks originate in the laboratory. They are HPLC-Grade water placed in sample containers, transported to the sample collection site, handled with the samples, and returned to the laboratory with samples of water collected for volatile organic analysis. The trip blank containers are not opened in the field.

One trip blank will be sent to the laboratory for each shipping container sent to the laboratory for volatile organic analyses. The trip blank(s) will be stored in the laboratory with the associated samples and will be analyzed by the laboratory for volatile organics.

5.4.2 Rinseate or Equipment Blanks

Rinseate blanks will be collected from the primary soil or liquid sampling equipment used. The purpose for collecting and analyzing these blanks is to verify the cleanliness and proper decontamination of the sampling equipment.

Rinseate blanks are comprised of HPLC-grade water which is poured into the sampling device following equipment decontamination, transferred to the appropriate sample containers, and shipped to the laboratory for analysis. The rinseate blanks will be analyzed for the same parameters as the associated samples.

One rinseate blank will be collected at a frequency of one every week that soil or liquid sampling equipment is cleaned and decontaminated in the field.

5.4.3 Field Blanks

Field blanks are samples of the municipal water and of the HPLC-grade analyte-free water used for equipment decontamination. The samples are collected in the field and analyzed for the same parameters as the environmental samples which are collected with decontaminated equipment. The purpose of the field blanks is to detect contamination which may be introduced into the samples through decontamination rinse waters.

A field blank will be collected for each type of water used to decontaminate liquid sampling equipment. If the manufacturer of the HPLC-grade water supplies water from more than one lot, a separate field blank will be collected for each lot of HPLC water.

5.4.4 Field Duplicates

Field duplicates will be collected during the field effort. Duplicate samples are samples collected simultaneously from the same media source under identical conditions, homogenized and split into separate containers. Ten percent of the samples for each matrix will be collected in duplicate and submitted for laboratory analysis. Field duplicates will be labeled so that persons performing laboratory analyses cannot distinguish duplicates from other samples.

5.4.5 Matrix Spikes

For organics and metals analysis, MS/MSDs are used to assess interferences in analytical results caused by the sampled matrix. The MS/MSDs are spiked by the analytical laboratory with known concentrations of specified compounds, and the MS/MSDs are then analyzed. The percent recovery is calculated and is used to evaluate interference effects.

One sample for MS and one sample for MSD will be collected for every 20 environmental samples of each media. The samples for MS/MSD will be collected immediately after an original sample and will be labeled with the same identifier as the original; however, the MS/MSD sample labels and chain-of-custody forms will note that the samples are to be used as MS/MSDs.

5.5 Specific Sampling Procedures

The sampling equipment and procedures to be used for the various media are presented in this section. The sampling procedures included are listed below:

Section 5.5.1 Stockpile and Roll-Off Container Sampling Procedures
Section 5.5.2 Borrow Area Sampling Procedures
Section 5.5.3 Water Sampling
Section 5.5.4 Equipment Decontamination

5.5.1 Stockpile and Roll-Off Container Sampling Procedures

Soil samples will be collected from stockpiles with a hand auger or other sampling device appropriate for the field conditions encountered at the time of sampling. Soil will be collected by pushing the auger toward the center of the pile while simultaneously rotating the device to cut a core as it is pushed. The device will be pushed into the pile until the auger bucket is filled with soil. After which, the auger will be withdrawn slowly to retrieve the soil. A sample will be obtained by collecting at least five aliquots from 250 cubic yard batches or from the soil from one disposal area (whichever is smaller).

Rather than sampling directly from the roll-off-containers, the aliquots can be collected directly from the excavator bucket (immediately before the soil is placed in the container) using a stainless steel spoon and bowl, according to procedures described in Section 12.3.2 of the November 2001, US EPA Science and Ecosystem Services Division EISOPQAM.

The first sample location from each batch will be use for VOC TCLP analysis. After placing enough soil in the VOC TCLP container, the remaining soil from the first aliquot and the subsequent four aliquots will be deposited in a stainless steel mixing bowl for compositing. Once mixed, the soil will be transferred to the appropriate sample containers.

5.5.2 Sampling of Drummed/Bottled Liquid Waste

Liquid waste will be composite sampled either from drums or bottles of similar material. If two or more distinct layers of liquid are present in the containers, each phase will be sampled to characterize the waste.

For the liquid waste sampling, a sample will be obtained by collecting equal amounts of waste from no more than ten containers (drums or bottles) of similar material using a COLIWASA, or other appropriate sampling apparatus (see Attachment A). An equal amount of liquid waste will be taken from each container and deposited in a non-reactive container (e.g. Pyrex). The sample will be thoroughly mixed in the container and divided into the sampling containers. Decontaminated sampling equipment will be used for each composite sample.

5.5.3 Borrow Area Sampling Procedures

Soil samples will be collected from the borrow area(s) with a hand auger or other sampling device appropriate for the field conditions encountered at the time of sampling. Samples will be collected every 500 cubic yards of offsite borrow material and every 250 cubic yards if an onsite source is used.

Soil will be collected by pushing the auger into the ground while simultaneously rotating the device to cut a core as it is pushed. The device will be pushed into the ground until the auger bucket is filled with soil. After which, the auger will be withdrawn slowly to retrieve the soil. A sample will be obtained by collecting at least five aliquots from each borrow area to form one composite sample.

The first sample location from each batch will be use for VOC analysis. After placing enough soil in the VOC container, the remaining soil from the first aliquot and the subsequent four aliquots will be deposited in a stainless steel mixing bowl for compositing. Once mixed, the soil will be transferred to the appropriate sample containers.

5.5.4 Water Sampling

Water samples will be collected by inserting a bailer into the storage tank or drum. The bailer will extend to near the bottom of the tanks in order to collect a representative sample of the water in the storage tank. The sample bottles will then be filled directly from the bailer filling the VOC sample vials first.

5.5.5 Equipment Decontamination

The reusable field sampling equipment will be decontaminated prior to initial use and as specified in each sample media sampling procedure. The following is a list of general requirements:

- The decontamination pad area will be the first choice as a location for decontaminating of sampling equipment.
- All decontamination fluids will be collected and contained in the decontamination storage drums or tanks.
- Potable water shall be collected from a supply system with a source of treated water. Untreated water, as from a groundwater well, shall not be used.
- Detergent shall be laboratory-grade non-phosphate detergent such as Alconox® or Liquinox®.
- Isopropanol shall be pesticide-grade or better.
- Isopropanol and organic-free deionized water shall be applied using Teflon squirt bottles or directly from the container.
- Equipment will be air dried prior to use.

5.5.4.1 Health and Safety

H&S requirements will be strictly adhered to during decontamination. The minimum specific H&S requirements are described in the HASP. The level of protective equipment will depend on the task being performed and the exposure to decontamination solvents.

5.5.4.2 Equipment Decontamination Procedures

All reusable sampling equipment will be decontaminated prior to use. All sampling equipment will be decontaminated using the following procedures:

1. Equipment will be washed thoroughly with tap/potable water and laboratory-grade detergent using a scrub brush to remove dirt and surface film.
2. The equipment will be rinsed thoroughly with tap/potable water.
3. Rinse thoroughly with deionized water.
4. Rinse equipment twice with isopropanol.
5. Rinse thoroughly with organic-free water and allow to air dry as long as possible.
6. If organic-free water is not available, allow equipment to air dry as long as possible. Rinse will not be performed using distilled or deionized water.
7. Wrap equipment with aluminum foil, if appropriate, to prevent recontamination of equipment during storage or shipment.

SECTION 6

QAPP - Annotated Outline

This section of the PSVP presents an annotated outline of a QAPP to be used by the RA contractor for development of a site-specific document. Each section will be presented with information that needs to be included in a standard QAPP.

6.1 Section 1.0 – Purpose and Scope

The purpose of the QAPP is to document the quality assurance requirements applicable to the remedial action and post remedial action monitoring that are necessary to obtain data for meeting the criteria outlined in the ROD. The scope of the QAPP typically includes field sampling, analytical testing, equipment maintenance, data reduction, and reporting. The QAPP augments the sampling plan by incorporating the design of the sampling and analysis events based on a systematic plan developed using the data quality objectives (DQOs) process. The QAPP as presented herein applies to work performed at the Memphis Depot in any office or laboratory.

Guidance documents are available for QAPP development, including *EPA Requirements for Quality Assurance Project Plans for Environment Data Operations* (EPA QA/R-5), *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA* (OSWER Directive 9355.3-01), and *Guidance for the Data Quality Objectives Process* (EPA-600-R-96-055, September 1994).

6.1.1 Section 1.1 - Project Objectives

The project objectives for the remedial action for the Dunn Field are to be discussed within this section as well as the Remedial Action Work Plan. Standard objectives for a QAPP include discussion of the quality control (QC) levels and applicability of each, specific QA/QC procedures to be implemented to achieve the objectives, and project team organization and responsibility. The objectives must meet the data quality objectives that will be defined further in the document and the remedial goals outlined in the ROD.

This section should also include a brief description of any site investigation, site characterization, or confirmation sampling that are anticipated during field activities and the objectives of these activities.

6.2 Section 2.0 – Project Organization and Responsibilities

This section presents the project team organization, key personnel qualifications and responsibilities.

6.2.1 Section 2.1 - Project Team Organization

The project team is typically organized into the contractor, the organization contracting the work, and any subcontractor that may be involved with the project. A project team organization is identified in this section by title only and is developed for each company or organization that will provide personnel for the project.

6.2.2 Section 2.2 - Personnel Qualifications and Responsibilities

This section develops the role and responsibility of each person that will be involved on the Dunn Field RA. The goal is to ensure that each team member understands the objectives of the project and understands how their role will actively participate as well as supplement the project team. Staff member roles and responsibility of the contractor will be presented along with personnel from the contracting organization. In addition, personnel from any subcontractors, if known during development of the QAPP, will be provided in this section. The role and responsibility of any subcontractors must also be developed and presented within.

A project organization tree should be presented that presents the role of each person, name of the person, and organization and the lines of communication amongst the group.

6.2.3 Section 2.3 - Project Communication

A critical element during performance of site activities is to establish and maintain lines of communication among all project personnel. This section identifies these lines of communication as well defines meeting schedules, field activity reporting schedules, and project update schedules.

6.3 Section 3.0 - Data Quality and Quality Assurance Objectives for Sampling

This section presents the data quality objectives (DQOs) and QA objectives for the RA sampling activities. DQOs are quantitative and qualitative statements that specify the quality of the data required to support decisions during the remedial response activities. They are based on the end uses of the data to be collected. The basis on which these objectives are established are defined in the sections following the introduction. The criteria for evaluating data quality precision, accuracy, representativeness, comparability, and completeness are established within this section, along with the mechanisms used to determine if they are met.

6.3.1 Section 3.1 - Establishing DQOs

Objectives for data quality reflect the expected uses of the data, the expected levels of contamination, and the available analytical and sampling resources. This section identifies each data use, such as contaminant characterization, H&S, risk assessment, or engineering design, and a brief description of how the data will be used.

6.3.2 Section 3.2 - Data Quality Levels

Data must be of sufficient quality to support the decision-making process. A tiered approach to sampling and analysis is recommended so that the field team can adjust the sampling effort to accommodate site-specific conditions. The tiered approach uses four categories of data, with each category having a different level of supporting QA/QC documentation. The four categories, or levels, correspond to QC levels 1,2, 3, and 4. Level 1 includes field monitoring activities, such as pH, temperature, conductivity, and organic vapor monitoring. Level 2 screening activities and Level 3 analysis provide confirmation by an analytical laboratory. Level 4 analysis provides legally defensible data, if needed. Level 3 and Level 4 data are both reproduced according to USEPA CLP methods; however, the data package includes the unreduced experimental data so that the entire analytical process can be recreated and recalculated. For each QC level, the potential measures and methods to be used, as well as the applicable data package deliverables are also defined in this section. For the Dunn Field RA, the use and applicability for each of the available measures and methods will be evaluated and appropriate measures and methods will be selected.

6.4 Section 4.0 – Field Sampling Procedures

This section defines the general sampling requirements for field activities, including definition of access to the site, composition of the field teams and roles and responsibilities, order of sample collection, devices or equipment to be used during sampling, sample collection methods, description of the sample containers, description of sample maintenance integrity, sample custody and document control, field log development, and communications amongst the field team(s) and the team leader. Specific information related to field documentation is also described in this section along with a description of the timeframe to collect these notes.

6.4.1 Section 4.1 - Sample Blanks and Field Duplicates

This section includes description of the type of environmental and field QC samples to be collected during field activities and the analyses assigned to each type. The three common types of sample blanks include trip, equipment or rinseate, and field blanks. Field duplicate, including matrix spike and matrix spike duplicates, and split sample collection are also described within this section. Frequency of QC sample collection is also presented within this section.

6.4.2 Section 4.2 - Sample Numbering and Containers

Proper sample collection, labeling of samples, preservation, and shipment of samples is key to successful data collection and interpretation of the results. This section presents the numbering or naming method for each sample to be collected and the container that is to be used according to the analyses to be performed upon the samples. A table should be developed within this section that presents the sample analyses to be performed, the sample matrix, containers, quantity, preservative, and holding time.

6.4.3 Section 4.3 – Sample Chain-of-Custody (COC)

Sample custody and documentation procedures are described within this section and will be adhered to during all field activities. If there is a change in the procedure, the field notes or other logs should reflect the change in the system. Components of sample custody procedures include the use of field log books, sample labels, custody seals, and COC forms. This section should include a description of the information to be recorded on the COC and the filing and the procedures surrounding the COC. Sample custody whether in the field or office should be described and presented to team members.

6.4.4 Section 4.4 – Sample Shipment Procedures

Sample delivery procedures, sample packaging, package labeling, and package transference are described in detail within this section. This section should also include information as to collection and filing of the shipping papers.

6.4.5 Section 4.5 – Laboratory Sample Custody

This section describes procedures followed by the laboratory sample custodian once samples have arrived at the laboratory.

6.4.6 Section 4.9 – Disposal of Investigation Derived Wastes

Waste disposal for investigation derived wastes (IDW) generated during sampling activities are presented within this section. The information will include procedures on the collection, classification, storage, analysis, and treatment, if necessary, of IDW. In addition, should also include reference to the types of personal protective equipment worn during handling of IDW.

6.5 Section 5.0 – Field Procedures

Procedures to be followed during all field activities are detailed within this section of the QAPP. This section will include a description of the following:

- Media to be sampled
- Methods and materials used during sampling
- Field analytical procedures
- Sample location and depth, as necessary
- Proper sample collection procedures for each media
- Procedures used during investigation or remedial action activities
- Procedures and details on field logs and other documentation developed during site activities
- Communication pathways for time critical decisions during the field effort

6.6 Section 6.0 – Calibration Procedures

This section describes procedures for maintaining the accuracy of all the instruments and measuring equipment which are used for conducting field tests and laboratory analyses. These instruments and equipment should be calibrated prior to each use or on a scheduled, periodic basis.

6.6.1 Section 6.1 – Field Instruments

Instruments and equipment used to gather, generate, or measure environmental data will be calibrated with sufficient frequency and in such a manner that accuracy and reproducibility of results are consistent with the manufacturer's specifications.

Equipment to be used during the field activities and procedures for certifying proper operating condition will be described within this section. Intervals for field instrument calibration will be developed here. Calibration should be performed at the intervals specified by the manufacturer or more frequently as conditions dictate.

6.6.2 Section 6.2 - Laboratory Instruments

The calibration procedures and frequencies for laboratory instruments will be developed here but should be according to methods specified in SW-846 and the *Methods for Chemical Analysis of Water and Wastes,* EPA-600/4-79-020.

6.7 Section 7.0 – Analytical Procedures

Analytical procedures, according to EPA Method SW-846, used during laboratory analysis of all samples are presented in this section. Information to include in this section is a description of the data packages, target compound lists, reporting limits, and any special analyses to be performed by the laboratory.

6.7.1 Section 7.1 – Laboratory Quality Control

This subsection defines the QA/QC procedures and analytical procedures to be used in the laboratory and includes definitions of standard laboratory terms, such as method detection limit, estimated quantitation limit, and calibration check, sample integrity, and internal quality control procedures. Much of this information will be supplied by the subcontract laboratory but reviewed by the RA contractor for agreement and discussion, as necessary.

6.8 Section 8.0 – Data Reduction, Validation, Reporting and Assessment Procedures

6.8.1 Section 8.1 – Data Reduction

The procedures used for calculations and data reduction are specified in each laboratory analytical method as referenced in tables in the QAPP. Calculations required to arrive at the final (reported) value for each sample include factors such as sample dilution ratios and conversion to dry-weight basis for solid samples. These should be described within the QAPP before samples are submitted to the laboratory. All data will be reported in the units listed in the QAPP. Concentration units are to be listed on reports and any special conditions, such as dry weight conversions will be noted.

6.8.2 Section 8.2 – Data Validation

Data validation procedures are described in this subsection and should include a description of data reviews for both editorial and technical validity. The editorial review consists of a check for typographical, transpositional and omission errors. This review also includes a proofreading of any text which may accompany the data. The technical review consists of a check to see that all precision, accuracy and detection limits have been met. All analytical data will be verified prior to being released by the laboratory.

6.8.3 Section 8.3 – Data Reporting

The laboratory report should include traceability to the samples analyzed, and will contain the following information:

- Name of report
- Date of report preparation
- Laboratory name, address, and telephone number
- Sample I.D. number
- Name of sample
- Type of sample (water, soil, etc.)
- Analyses performed
- Initial sample volume for analysis
- Final sample volume (after extraction) for analysis
- Type of extraction performed (including method number)
- Date of sampling
- Date sample was received
- Date extractions/analyses were performed
- Applicable laboratory blank results
- Sample detection limits for each compound
- Quality control check sample summaries including percent recoveries and relative percent differences
- Calibration and instrument tuning performance summaries

6.8.4 Section 8.4 – Data Assessment Procedures

The precision, accuracy, and completeness of measurement data generated during the investigation will be assessed in this section. This is made possible by the inclusion of QC procedures and samples in the data collection process. Procedures used to ensure that field measurements and laboratory data are described in subsections within this section. Accuracy of the field measurements will be assessed and reported by using daily instrument calibrations, calibration checks, and analysis of blanks. Laboratory results will be assessed for compliance with required precision, accuracy, completeness and sensitivity. A description and formulae employed to calculate each of these requirements will be presented in the QAPP.

6.9 Section 9.0 – Performance and System Audits

The laboratory QA officer will carry out performance or systems audits to insure that data of known and defensible quality are produced during the program. A description of that process will be presented in this section of the QAPP.

6.9.1 Section 9.1 – System Audits

Systems audits are qualitative evaluations of components of the laboratory quality control measure systems. They determine if the measurement systems are being used appropriately. The audits may be carried out before all systems are operational, during the laboratory program, or after the completion of the laboratory program. A description of the occurrence and procedures to be used during the system audit are to be described in this subsection.

6.9.2 Section 9.2 – Performance Audits

The performance audit is a quantitative evaluation of the measurement systems of a program. It requires testing the measurement systems with samples of known composition or behavior to evaluate precision and accuracy. The persons responsible for this audit and the schedule of occurrence should be developed in the QAPP.

6.9.3 Section 9.3 – External Audit

A description of an external audit and a schedule should be developed within the QAPP. The QA/QC Officer will perform at least one complete sample handling, analysis, and laboratory procedures audit apart from the normal audits performed by the laboratory QA Officer prior to, during, or subsequent to the additional data. The laboratory will be using methods as described in the QAPP.

6.10 Section 10.0 – QA/QC Reporting to Management

A schedule will be developed within the QAPP for monthly reporting on the performance of the measurement system and the data quality to the contractor's Project Manager. These reports will at least include:

- Periodic assessment of measurement quality indicators, i.e., data accuracy, precision and completeness
- Results of system audits
- Significant QA/QC problems and recommended solutions

This section will also describe the person responsible for these reports and a summary of the data quality reports.

6.11 Section 11.0 – Preventative Maintenance

This section typically includes a discussion of the preventative maintenance for field equipment, instruments, tools, gauges and other items. A description of the procedures involved including instrument type, activity, and frequency, documentation, and repair procedures will be developed in the QAPP. The laboratory instruments will be maintained as specified in the laboratory's QA Manual. Maintenance records will be documented and traceable to specific equipment at the laboratory.

6.12 Section 12.0 – Corrective Actions

This section describes the roles and responsibilities for initiating corrective actions during the RA, whether in the field or in the laboratory. This section should also include a description of the following:

- Corrective action steps to follow for field work
- Documentation of the problem, including identifying the problem, possible causes person responsible for undertaking action to remedy the situation

- Corrective actions planned and completed during field work
- Laboratory corrective action procedures

6.13 Section 13.0 – Sample and Database Management

The data management task for CH2M HILL Memphis Depot projects has been accomplished through the use of the SEM Environmental Data Management System (EDMS) tool set. The current tool set being utilized is EDMS97_Generic. This CH2M HILL tool set is proprietary software, and was developed to support a variety of needs and site management projects. The EDMS tool set is Microsoft Access 97 based, with associated project data tables residing in either an Access 97 database or in a Microsoft SQL Server database. Through the use of menu driven screens , the various EDMS components can provide both field and analytical support for a project.

A full description of the EDMS System is presented as Appendix E to the *Rev. 0 Long-Term Groundwater Monitoring Plan* in Appendix B of the *Rev. 0 Main Installation Remedial Design*. The RA contractor for the Dunn Field activities may want to present a description of a different sample and database management system, such as the Air Force Center for Environmental Excellence (AFCEE) IRPMS system, that they will instill within the program.

SECTION 7
References

CH2M HILL. *Rev. 1 Memphis Depot Dunn Field Remedial Design Work Plan.* Prepared for the U.S. Army Engineering and Support Center, Huntsville, Alabama. February 2004.

CH2M HILL. *Rev. 2 Disposal Sites Pre-Design Investigation Data Collection Plan Technical Memorandum.* Prepared for the U.S. Army Engineering and Support Center, Huntsville, Alabama. April 2004.

CH2M HILL. *Rev. 1 Memphis Depot Dunn Field Final Remedial Design.* Prepared for the U.S. Army Engineering and Support Center, Huntsville, Alabama. April 2004.

Michigan DEQ. *Verification of Soil Remediation Guidance Document, Revision 1.* Waste Management Division. April 1994.

United States Environmental Protection Agency, October 1988. *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA.* Office of Solid Waste and Emergency Response Directive 9355.3-01.

United States Environmental Protection Agency, September 1994. *Guidance for the Data Quality Objectives Process.* EPA-600-R-96-055.

United States Environmental Protection Agency, November 1995. *EPA Requirements for Quality Assurance Project Plans for Environment Data Operations.* EPA QA/R-5.

ATTACHMENT A

EPA Standard Operating Procedure for Drum Sampling

DRUM SAMPLING

SOP#: 2009
DATE: 11/16/94
REV. #: 0.0

1.0 SCOPE AND APPLICATION

The purpose of this standard operating procedure (SOP) is to provide technical guidance on implementing safe and cost-effective response actions at hazardous waste sites containing drums with unknown contents. Container contents are sampled and characterized for disposal, bulking, recycling, segregation, and classification purposes.

These are standard (i.e., typically applicable) operating procedures which may be varied or changed as required, dependent on site conditions, equipment limitations or limitations imposed by the procedure. In all instances, the ultimate procedures employed should be documented and associated with the final report.

Mention of trade names or commercial products does not constitute U.S. Environmental Protection Agency (U.S. EPA) endorsement or recommendation for use.

2.0 METHOD SUMMARY

Prior to sampling, drums must be excavated, (if necessary), inspected, staged, and opened. Drum excavation must be performed by qualified personnel. Inspection involves the observation and recording of visual qualities of each drum and any characteristics pertinent to the classification of the drum's contents. Staging involves the physical grouping of drums according to classifications established during the physical inspection. Opening of closed drums can be performed manually or remotely. Remote drum opening is recommended for worker safety. The most widely used method of sampling a drum involves the use of a glass thief. This method is quick, simple, relatively inexpensive, and requires no decontamination. The contents of a drum can be further characterized by performing various field tests.

3.0 SAMPLE PRESERVATION, CONTAINERS, HANDLING, AND STORAGE

Samples collected from drums are considered waste samples and as such, adding preservatives is not required due to the potential reaction of the sample with the preservative. Samples should, however, be cooled to 4°C and protected from sunlight in order to minimize any potential reaction due to the light sensitivity of the sample.

Sample bottles for collection of waste liquids, sludges, or solids are typically wide mouth amber jars with Teflon-lined screw caps. Actual volume required for analysis should be determined in conjunction with the laboratory performing the analysis.

Waste sample handling procedures should be as follows:

1. Label the sample container with the appropriate sample label and complete the appropriate field data sheet(s). Place sample container into two resealable plastic bags.

2. Place each bagged sample container into a shipping container which has been lined with plastic. Pack the container with enough non-combustible, absorbent, cushioning material to minimize the possibility of containers breaking, and to absorb any material which may leak.

   Note: Depending on the nature and quantity of the material to be shipped, different packaging may be required. The transportation company or a shipping/receiving expert should be consulted prior to packing the samples.

3. Complete a chain of custody record for each shipping container, place into a resealable

plastic bag, and affix to the inside lid of the shipping container.

4. Secure and custody seal the lid of the shipping container. Label the shipping container appropriately and arrange for the appropriate transportation mode consistent with the type of hazardous waste involved.

4.0 INTERFERENCES AND POTENTIAL PROBLEMS

If buried drums are suspected, geophysical investigation techniques such as magnetometry or ground penetrating radar may be employed in an attempt to determine the location and depth of drums. During excavation, the soil must be removed with great caution to minimize the potential for drum rupture.

Until the contents are characterized, sampling personnel should assume that unlabelled drums contain hazardous materials. Labelled drums are frequently mislabelled, especially drums that are reused. Because a drum's label may not accurately describe its contents, extreme caution must be exercised when working with or around drums.

If a drum which contains a liquid cannot be moved without rupture, its contents may be immediately transferred to a sound drum using an appropriate method of transfer based on the type of waste. In any case, preparations should be made to contain the spill (i.e., spill pads, dike, etc.) should one occur.

If a drum is leaking, open, or deteriorated, then it must be placed immediately in overpack containers.

The practice of tapping drums to determine their contents is neither safe nor effective and should not be used if the drums are visually overpressurized or if shock-sensitive materials are suspected. A laser thermometer may be effective in order to determine the level of the drum contents via surface temperature differences.

Drums that have been overpressurized to the extent that the head is swollen several inches above the level of the chime should not be moved. A number of devices have been developed for venting critically swollen drums. One method that has proven to be effective is a tube and spear device. A light aluminum tube (3 meters long) is positioned at the vapor space of the drum. A rigid, hooking device attached to the tube, goes over the chime and holds the tube securely in place. The spear is inserted in the tube and positioned against the drum wall. A sharp blow on the end of the spear drives the sharpened tip through the drum and the gas vents along the grooves. Venting should be done from behind a wall or barricade. Once the pressure has been relieved, the bung can be removed and the drum sampled.

Because there is potential for accidents to occur during handling, particularly initial handling, drums should only be handled if necessary. All personnel should be warned of the hazards prior to handling drums. Overpack drums and an adequate volume of absorbent material should be kept near areas where minor spills may occur. Where major spills may occur, a containment berm adequate to contain the entire volume of liquid in the drums should be constructed before any handling takes place. If drum contents spill, personnel trained in spill response should be used to isolate and contain the spill.

5.0 EQUIPMENT/APPARATUS

The following are standard materials and equipment required for sampling:

- Personal protection equipment
- Wide-mouth amber glass jars with Teflon cap liner, approximately 500 mL volume
- Other appropriate sample jars
- Uniquely numbered sample identification labels with corresponding data sheets
- Drum/Tank Sampling Data Sheets and Field Test Data Sheets for Drum/Tank Sampling
- Chain of Custody records
- Decontamination materials
- Glass thieving tubes or COLIWASA
- Coring device
- Stainless steel spatula or spoons
- Laser thermometer
- Drum overpacks
- Absorbent material for spills
- Drum opening devices

Bung Wrench

A common method for opening drums manually is using a universal bung wrench. These wrenches have fittings made to remove nearly all commonly encountered bungs. They are usually constructed of a non-sparking metal alloy (i.e., brass, bronze/manganese, aluminum, etc.) formulated to reduce the likelihood of sparks. The use of a "NON-SPARKING" wrench does not completely eliminate the possibility of a spark being produced.

Drum Deheader

One means by which a drum can be opened manually when a bung is not removable with a bung wrench is by using a drum deheader. This tool is constructed of forged steel with an alloy steel blade and is designed to cut the lid of a drum off or part way off by means of a scissors-like cutting action. A limitation of this device is that it can be attached only to closed head drums. Drums with removable heads must be opened by other means.

Hand Pick, Pickaxe, and Hand Spike

These tools are usually constructed of brass or a non-sparking alloy with a sharpened point that can penetrate the drum lid or head when the tool is swung. The hand picks or pickaxes that are most commonly used are commercially available; whereas, the spikes are generally uniquely fabricated four foot long poles with a pointed end.

Backhoe Spike

Another means used to open drums remotely for sampling is a metal spike attached or welded to a backhoe bucket. This method is very efficient and is often used in large-scale operations.

Hydraulic Drum Opener

Recently, remotely operated hydraulic devices have been fabricated to open drums. This device uses hydraulic pressure to force a non-sparking spike through the wall of a drum. It consists of a manually operated pump which pressurizes fluid through a length of hydraulic line.

Pneumatic Devices

A pneumatic bung remover consists of a compressed air supply that is controlled by a two-stage regulator. A high pressure air line of desired length delivers compressed air to a pneumatic drill, which is adapted to turn bung fitting selected to fit the bung to be removed. An adjustable bracketing system has been designed to position and align the pneumatic drill over the bung. This bracketing system must be attached to the drum before the drill can be operated. Once the bung has been loosened, the bracketing system must be removed before the drum can be sampled. This remote bung opener does not permit the slow venting of the container, and therefore appropriate precautions must be taken. It also requires the container to be upright and relatively level. Bungs that are rusted shut cannot be removed with this device.

6.0 REAGENTS

Reagents are not typically required for preserving drum samples. However, reagents will be utilized for decontamination of sampling equipment.

7.0 PROCEDURES

7.1 Preparation

1. Determine the extent of the sampling effort, the sampling methods to be employed, and the types and amounts of equipment and supplies needed.

2. Obtain necessary sampling and monitoring equipment.

3. Decontaminate or preclean equipment, and ensure that it is in working order.

4. Prepare scheduling and coordinate with staff, clients, and regulatory agency, if appropriate.

5. Perform a general site survey prior to site entry in accordance with the site specific Health and Safety Plan.

6. Use stakes, flagging, or buoys to identify and

mark all sampling locations. If required the proposed locations may be adjusted based on site access, property boundaries, and surface obstructions.

7.2 Drum Excavation

If it is presumed that buried drums are on-site and prior to beginning excavation activities, geophysical investigation techniques should be utilized to approximate the location and depth of the drums. In addition, it is important to ensure that all locations where excavation will occur are clear of utility lines, pipes and poles (subsurface as well as above surface).

Excavating, removing, and handling drums are generally accomplished with conventional heavy construction equipment. These activities should be performed by an equipment operator who has experience in drum excavation. During excavation activities, drums must be approached in a manner that will avoid digging directly into them.

The soil around the drum should be excavated with non-sparking hand tools or other appropriate means and as the drums are exposed, a visual inspection should be made to determine the condition of the drums. Ambient air monitoring should be done to determine the presence of unsafe levels of volatile organics, explosives, or radioactive materials. Based on this preliminary visual inspection, the appropriate mode of drum excavation and handling may be determined.

Drum identification and inventory should begin before excavation. Information such as location, date of removal, drum identification number, overpack status, and any other identification marks should be recorded on the Drum/Tank Sampling Data Sheet (Attachment 1, Appendix A).

7.3 Drum Inspection

Appropriate procedures for handling drums depend on the contents. Thus, prior to any handling, drums should be visually inspected to gain as much information as possible about their contents. The drums should be inspected for the following:

1. Drum condition, corrosion, rust, punctures, bungs, and leaking contents.

2. Symbols, words, or other markings on the drum indicating hazards (i.e., explosive, radioactive, toxic, flammable), or further identifying the drums.

3. Signs that the drum is under pressure.

4. Shock sensitivity.

Monitoring should be conducted around the drums using instruments such as radiation meters, organic vapor analyzers (OVA) and combustible gas indicators (CGI).

Survey results can be used to classify the drums into categories, for instance:

C Radioactive
C Leaking/deteriorating
C Bulging
C Lab packs
C Explosive/shock sensitive
C Empty

All personnel should assume that unmarked drums contain hazardous materials until their contents have been categorized. Once a drum has been visually inspected and any immediate hazard has been eliminated by overpacking or transferring the drum's contents, the drum is affixed with a numbered tag and transferred to a staging area. Color-coded tags, labels or bands should be used to identify the drum's category based on visual inspection. A description of each drum, its condition, any unusual markings, the location where it was buried or stored, and field monitoring information are recorded on a Drum/Tank Sampling Data Sheet (Attachment 1, Appendix A). This data sheet becomes the principal record keeping tool for tracking the drum on-site.

7.4 Drum Staging

Prior to sampling, the drums should be staged to allow easy access. Ideally, the staging area should be located just far enough from the drum opening area to prevent a chain reaction if one drum should explode or catch fire when opened.

During staging, the drums should be physically separated into the following categories: those containing liquids, those containing solids, those containing lab packs, and those which are empty. This is done because the strategy for sampling and handling drums/containers in each of these categories will be different. This may be achieved by visual inspection of the drum and its labels, codes, etc. Solids and sludges are typically disposed of in open top drums. Closed head drums with a bung opening generally contain liquid.

Where there is good reason to suspect that drums contain radioactive, explosive, or shock-sensitive materials, these drums should be staged in a separate, isolated area. Placement of explosives and shock-sensitive materials in diked and fenced areas will minimize the hazard and the adverse effects of any premature detonation of explosives.

Where space allows, the drum opening area should be physically separated from the drum removal and drum staging operations. Drums are moved from the staging area to the drum opening area one at a time using forklift trucks equipped with drum grabbers or a barrel grappler. In a large-scale drum handling operation, drums may be conveyed to the drum opening area using a roller conveyor. Drums may be restaged as necessary after opening and sampling.

7.5 Drum Opening

There are three basic techniques available for opening drums at hazardous waste sites:

- Manual opening with non-sparking bung wrenches
- Drum deheading
- Remote drum puncturing or bung removal

The choice of drum opening techniques and accessories depends on the number of drums to be opened, their waste contents, and physical condition. Remote drum opening equipment should always be considered in order to protect worker safety. Under OSHA 1910.120, manual drum opening with bung wrenches or deheaders should be performed ONLY with structurally sound drums and waste contents that are known to be non-shock sensitive, non-reactive, non-explosive, and non-flammable.

7.5.1 Manual Drum Opening with a Bung Wrench

Manual drum opening with bung wrenches (Figure 1, Appendix B) should not be performed unless the drums are structurally sound (no evidence of bulging or deformation) and their contents are known to be non-shock sensitive, non-reactive, non-explosive or non-flammable. If opening the drum with bung wrenches is deemed safe, then certain procedures should be implemented to minimize the hazard:

- Field personnel should be fully outfitted with protective gear.
- Drums should be positioned upright with the bung up, or, for drums with bungs on the side, laid on their sides with the bung plugs up.
- The wrenching motion should be a slow, steady pull across the drum. If the length of the bung wrench handle provides inadequate leverage for unscrewing the plug, a "cheater bar" can be attached to the handle to improve leverage.

7.5.2 Manual Drum Opening with a Drum Deheader

Drums are opened with a drum deheader (Figure 2, Appendix B) by first positioning the cutting edge just inside the top chime and then tightening the adjustment screw so that the deheader is held against the side of the drum. Moving the handle of the deheader up and down while sliding the deheader along the chime will enable the entire top to be rapidly cut off if so desired. If the top chime of a drum has been damaged or badly dented it may not be possible to cut the entire top off. Since there is always the possibility that a drum may be under pressure, the initial cut should be made very slowly to allow for the gradual release of any built-up pressure. A safer technique would be to employ a remote method prior to using the deheader.

Self-propelled drum openers which are either electrically or pneumatically driven are available and can be used for quicker and more efficient deheading.

The drum deheader should be decontaminated, as necessary, after each drum is opened to avoid cross contamination and/or adverse chemical reactions from incompatible materials.

7.5.3 Manual Drum Opening with a Hand Pick, Pickaxe, or Spike

When a drum must be opened and neither a bung wrench nor a drum deheader is suitable, then it can be opened for sampling by using a hand pick, pickaxe, or spike (Figure 3, Appendix B). Often the drum lid or head must be hit with a great deal of force in order to penetrate it. Because of this, the potential for splash or spraying is greater than with other opening methods and therefore, this method of drum opening is not recommended, particularly when opening drums containing liquids. Some spikes used have been modified by the addition of a circular splash plate near the penetrating end. This plate acts as a shield and reduces the amount of splash in the direction of the person using the spike. Even with this shield, good splash gear is essential.

Since drums, some of which may be under pressure, cannot be opened slowly with these tools, spray from drums is common and appropriate safety measures must be taken. The pick or spike should be decontaminated after each drum is opened to avoid cross contamination and/or adverse chemical reaction from incompatible materials.

7.5.4 Remote Drum Opening with a Backhoe Spike

Remotely operated drum opening tools are the safest available means of drum opening. Remote drum opening is slow, but provides a high degree of safety compared to manual methods of opening.

In the opening area, drums should be placed in rows with adequate aisle space to allow ease in backhoe maneuvering. Once staged, the drums can be quickly opened by punching a hole in the drum head or lid with the spike.

The spike (Figure 4, Appendix B) should be decontaminated after each drum is opened to prevent cross contamination and/or adverse reaction from incompatible material. Even though some splash or spray may occur when this method is used, the operator of the backhoe can be protected by mounting a large shatter-resistant shield in front of the operator's cage. This combined with the normal personal protection gear should be sufficient to protect the operator. Additional respiratory protection can be afforded by providing the operator with an on-board airline system.

7.5.5 Remote Drum Opening with Hydraulic Devices

A piercing device with a non-sparking, metal point is attached to the end of a hydraulic line and is pushed into the drum by the hydraulic pressure (Figure 5, Appendix B). The piercing device can be attached so that a hole for sampling can be made in either the side or the head of the drum. Some of the metal piercers are hollow or tube-like so that they can be left in place if desired and serve as a permanent tap or sampling port. The piercer is designed to establish a tight seal after penetrating the container.

7.5.6 Remote Drum Opening with Pneumatic Devices

Pneumatically-operated devices utilizing compressed air have been designed to remove drum bungs remotely (Figure 6, Appendix B). Prior to opening the drum, a bung fitting must be selected to fit the bung to be removed. The adjustable bracketing system is then attached to the drum and the pneumatic drill is aligned over the bung. This must be done before the drill can be operated. The operator then moves away from the drum to operate the equipment. Once the bung has been loosened, the bracketing system must be removed before the drum can be sampled. This remote bung opener does not permit the slow venting of the container, and therefore appropriate precautions must be taken. It also requires the container to be upright and relatively level. Bungs that are rusted shut cannot be removed with this device.

7.6 Drum Sampling

After the drum has been opened, preliminary monitoring of headspace gases should be performed first with an explosimeter/oxygen meter. Afterwards, an OVA or other instruments should be used. If possible, these instruments should be intrinsically safe. In most cases it is impossible to observe the contents of these sealed or partially sealed drums. Since some layering or stratification is likely in any solution left undisturbed, a sample that represents the entire depth of the drum must be taken.

When sampling a previously sealed drum, a check should be made for the presence of a bottom sludge. This is easily accomplished by measuring the depth to apparent bottom then comparing it to the known interior depth.

7.6.1 Glass Thief Sampler

The most widely used implement for sampling drum liquids is a glass tube commonly referred to as a glass thief (Figure 7, Appendix B). This tool is cost effective, quick, and disposable. Glass thieves are typically 6mm to 16mm I.D. and 48 inches long.

Procedures for Use:

1. Remove the cover from the sample container.
2. Insert glass tubing almost to the bottom of the drum or until a solid layer is encountered. About one foot of tubing should extend above the drum.
3. Allow the waste in the drum to reach its natural level in the tube.
4. Cap the top of the sampling tube with a tapered stopper or thumb, ensuring liquid does not come into contact with stopper.
5. Carefully remove the capped tube from the drum and insert the uncapped end into the appropriate sample container.
6. Release stopper and allow the glass thief to drain until the container is approximately two-thirds full.
7. Remove tube from the sample container, break it into pieces and place the pieces in the drum.
8. Cap the sample container tightly and label it. Place the sample container into a carrier.
9. Replace the bung or place plastic over the drum.
10. Log all samples in the site logbook and on Drum/Tank Sampling Data Sheets.
11. Perform hazard categorization analyses if included in the project scope.
12. Transport the sample to the decontamination zone and package it for transport to the analytical laboratory, as necessary. Complete chain of custody records.

In many instances a drum containing waste material will have a sludge layer on the bottom. Slow insertion of the sample tube into this layer; then a gradual withdrawal will allow the sludge to act as a bottom plug to maintain the fluid in the tube. The plug can be gently removed and placed into the sample container by the use of a stainless steel lab spoon.

It should be noted that in some instances disposal of the tube by breaking it into the drum may interfere with eventual plans for the removal of its contents. The use of this technique should be cleared with the project officer or other glass thief disposal techniques should be evaluated.

7.6.2 COLIWASA Sampler

The Composite Liquid Waste Sampler (COLIWASA) and modifications thereof are equipment that collect a sample from the full depth of a drum and maintain it in the transfer tube until delivery to the sample bottle. The COLIWASA (Figure 8, Appendix B) is a much cited sampler designed to permit representative sampling of multiphase wastes from drums and other containerized wastes. One configuration consists of a 152 cm by 4 cm I.D. section of tubing with a neoprene stopper at one end attached by a rod running the length of the tube to a locking mechanism at the other end.

Manipulation of the locking mechanism opens and closes the sampler by raising and lowering the neoprene stopper. One model of the COLIWASA is shown in Appendix B; however, the design can be modified and/or adapted somewhat to meet the needs of the sampler.

The major drawbacks associated with using a COLIWASA concern decontamination and costs. The sampler is difficult to decontaminate in the field and its high cost in relation to alternative procedures (glass tubes) make it an impractical throwaway item. It still has applications, however, especially in instances where a true representation of a multiphase waste is absolutely necessary.

Procedures for Use

1. Put the sampler in the open position by placing the stopper rod handle in the T-position and pushing the rod down until the handle sits against the sampler's locking block.

2. Slowly lower the sampler into the liquid waste. Lower the sampler at a rate that permits the levels of the liquid inside and outside the sampler tube to be about the same. If the level of the liquid in the sample tube is lower than that outside the sampler, the sampling rate is too fast and will result in a non-representative sample.

3. When the sampler stopper hits the bottom of the waste container, push the sampler tube downward against the stopper to close the sampler. Lock the sampler in the closed position by turning the T-handle until it is upright and one end rests tightly on the locking block.

4. Slowly withdraw the sample from the waste container with one hand while wiping the sampler tube with a disposable cloth or rag with the other hand.

5. Carefully discharge the sample into the appropriate sample container by slowly pulling the lower end of the T-handle away from the locking block while the lower end of the sampler is positioned in a sample container.

6. Cap the sample container tightly and label it. Place the sample container in a carrier.

7. Replace the bung or place plastic over the drum.

8. Log all samples in the site logbook and on Drum/Tank Sampling Data Sheets.

9. Perform hazard categorization analyses if included in the project scope.

10. Transport the sample to the decontamination zone and package for transport to the analytical laboratory, as necessary. Complete the Chain of Custody records.

7.6.3 Coring Device

A coring device may be used to sample drum solids. Samples should be taken from different areas within the drum. This sampler consists of a series of extensions, a T- handle, and the coring device.

Procedures for use:

1. Assemble the sampling equipment.

2. Remove the cover from the sample container.

3. Insert the sampling device to the bottom of the drum. The extensions and the "T" handle should extend above the drum.

4. Rotate the sampling device to cut a core of material.

5. Slowly withdraw the sampling device so that as much sample material as possible is retained within it.

6. Transfer the sample to the appropriate sample container, and label it. A stainless steel spoon or scoop may be used as necessary.

7. Cap the sample container tightly and place it in a carrier.

8. Replace the bung or place plastic over the drum.

9. Log all samples in the site log book and on Drum/Tank Sampling Data Sheets.

10. Perform hazard categorization analyses if included in the project scope.

11. Transport the sample to the decontamination zone and package it for transport to the analytical laboratory, as necessary. Complete chain of custody records.

7.7 Hazard Categorization

The goal of characterizing or categorizing the contents of drums is to obtain a quick, preliminary assessment of the types and levels of pollutants contained in the drums. These activities generally involve rapid, non-rigorous methods of analysis. The data obtained from these methods can be used to make decisions regarding drum staging or restaging, bulking or compositing of the drum contents.

As a first step in obtaining these data, standard tests should be used to classify the drum contents into general categories such as auto-reactives, water reactives, inorganic acids, organic acids, heavy metals, pesticides, cyanides, inorganic oxidizers, and organic oxidizers. In some cases, further analyses should be conducted to more precisely identify the drum contents.

There are several methods available to perform these tests:

C the HazCat[R] chemical identification system
C the Chlor-N-Oil Test Kit
C Spill-fyter Chemical Classifier Strips
C Setaflash (for ignitability)

These methods must be performed according to the manufacturers' instructions and the results must be documented on the Field Test Data Sheet for Drum/Tank Sampling (Attachment 2, Appendix A).

Other tests which may be performed include:

C Water Reactivity
C Specific Gravity Test (compared to water)
C Water Solubility Test
C pH of Aqueous Solution

The tests must be performed in accordance with the instructions on the Field Test Data Sheet for Drum/Tank Sampling and results of the tests must be documented on these data sheets.

The specific methods that will be used for hazard categorization must be documented in the Quality Assurance Work Plan.

8.0 CALCULATIONS

This section is not applicable to this SOP.

9.0 QUALITY ASSURANCE/ QUALITY CONTROL

The following general quality assurance procedures apply:

1. All data must be documented on Chain of Custody records, Drum/Tank Sampling Data Sheets, Field Test Data Sheet for Drum/Tank Sampling, or within site logbooks.

2. All instrumentation must be operated in accordance with operating instructions as supplied by the manufacturer, unless otherwise specified in the work plan. Equipment checkout and calibration activities must occur prior to sampling/operation, and they must be documented.

10.0 DATA VALIDATION

This section is not applicable to this SOP.

11.0 HEALTH AND SAFETY

When working with potentially hazardous materials, follow U.S. EPA, OSHA, and corporate health and safety procedures.

More specifically, the opening of closed containers is one of the most hazardous site activities. Maximum efforts should be made to ensure the safety of the sampling team. Proper protective equipment and a general awareness of the possible dangers will minimize the risk inherent to sampling operations. Employing proper drum opening techniques and equipment will also safeguard personnel. The use of remote sampling equipment whenever feasible is highly recommended.

12.0 REFERENCES

Guidance Document for Cleanup of Surface Tank and Drum Sites, OSWER Directive 9380.0-3.

Drum Handling Practices at Hazardous Waste Sites, EPA-600/2-86-013.

APPENDIX A

Attachments

ATTACHMENT 1. Drum/Tank Sampling Data Sheet

Samplers: ______________________ Date: ______________________

Site Name: ______________________ Work Order Number: 3347-040-001-__________

Container Number/Sample Number: ______ REAC Task Leader: ______________________

SITE INFORMATION:

1. Terrain, drainage description:____

2. Weather conditions (from observation):______________________________________

   MET station on site: No Yes

CONTAINER INFORMATION:

1. Container type: Drum Tank Other:____

2. Container dimensions: Shape:____

   Approximate size:_____________________________________

3. Label present: No
   Yes:____

   Other Markings: _______________________________________

   ____

   ____

   ____

4. Spill or leak present: No Yes Dimensions:_________________________________

5. Container location: (Circle one) N/A See Map Other: __________________

APPENDIX A (Cont'd)

Attachments

ATTACHMENT 1. Drum/Tank Sampling Data Sheet (cont'd)

SAMPLE INFORMATION:

1. Description: _____ liquid _____ solid (_____ powder or _____ crystals) _____ sludge

2. Color: ________________________ Vapors: ____________________
   Other: ____

3. Local effects present: (damage - environmental, material) ____

FIELD MONITORING:

1. PID: ____________________ Background (clean zone)

   ____________________ Probe used/Model used

   ____________________ Reading from container opening

2. FID: ____________________ Background (clean zone)

   ____________________ Reading from container opening

3. Radiation Meter:

   ____________________ Model used

   ____________________ Background (clean zone)

   ____________________ Reading from container opening

4. Explosimeter/Oxygen Meter:

   ____________________ Oxygen level from container opening

   ____________________ LEL level from container opening

APPENDIX A (Cont'd)

Attachments

ATTACHMENT 2. Field Test Data Sheet for Drum/Tank Sampling

Samplers: ______________________________ Date: ______________________

Site Name: _____________________________ Work Order Number: 3347-040-001-__________

Container Number/Sample Number: ______________ REAC Task Leader: ________________________

SAMPLE MONITORING INFORMATION:

1. PID: ____________________ Background (clean zone)

____________________ Probe used/Model used

____________________ Reading from sample

2. FID: ____________________ Background (clean zone)

____________________ Reading from sample

3. Radiation Meter: ________________ Model used

________________ Background (clean zone)

________________ Reading from sample

4. Explosimeter/Oxygen Meter: ____________ Oxygen level (sample)

____________ LEL level (sample)

SAMPLE DESCRIPTION:

________ Liquid ________ Solid ________ Sludge ________ Color ________ Vapors

WATER REACTIVITY:

1. Add small amount of sample to water: _____ bubbles _____ color change to _______________

_____ vapor formation _____ heat _____ No Change

SPECIFIC GRAVITY TEST (compared to water):

1. Add small amount of sample to water: _____ sinks _____ floats

2. If liquid sample sinks, screen for chlorinated compounds. If liquid sample floats and appears to be oily, screen for PCBs (Chlor-N-Oil kit).

APPENDIX A (Cont'd)

Attachments

ATTACHMENT 2. Field Test Data Sheet for Drum/Tank Sampling (cont'd)

CHLOR N OIL TEST KIT INFORMATION:

1. Test kit used for this sample: Yes No

2. Results: _____ PCB not present _____ PCB present, less than 50 ppm

_____ PCB present, greater than 50 ppm _____ 100% PCB present

WATER SOLUBILITY TEST:

1. Add approximately one part sample to five parts water. You may need to stir and heat gently. **[DO NOT HEAT IF WATER REACTIVE!]** Results: ________ total ________ partial ________ no solubility

pH OF AQUEOUS SOLUTION:

1. Using 0-14 pH paper, check pH of water/sample solution: __________________.

SPILL-FYTER CHEMICAL CLASSIFIER STRIPS:

1. Acid/Base Risk: (Circle one)	Color Change
Strong acid (0)	RED
Moderately acidic (1-3)	ORANGE
Weak acid (5)	YELLOW
Neutral (7)	GREEN
Moderately basic (9-11)	Dark GREEN
Strong Base (13-14)	Dark BLUE
2. Oxidizer Risk: (Circle one)	
Not Present	WHITE
Present	BLUE, RED, OR ANY DIVERGENCE FROM WHITE
3. Fluoride Risk: (Circle one)	
Not Present	PINK
Present	YELLOW

APPENDIX A (Cont'd)

Attachments

ATTACHMENT 2. Field Test Data Sheet for Drum/Tank Sampling (cont'd)

4. Petroleum Product, Organic Solvent Risk: (Circle one)

Not Present	LIGHT BLUE
Present	DARK BLUE

5. Iodine, Bromine, Chlorine Risk: (Circle one)

Not Present	PEACH
Present	WHITE OR YELLOW

<u>SETAFLASH IGNITABILITY TEST</u>:

140°F	Ignitable: ________	Non-Ignitable ________
160°F	Ignitable: ________	Non-Ignitable ________
______	Ignitable: ________	Non-Ignitable ________
______	Ignitable: ________	Non-Ignitable ________
______	Ignitable: ________	Non-Ignitable ________
______	Ignitable: ________	Non-Ignitable ________

Comments:

<u>HAZCAT KIT TESTS</u>:

1. Test: ____________________ Outcome: ____________________

Comments: ____________________

2. Test: ____________________ Outcome: ____________________

Comments: ____________________

APPENDIX A (Cont'd)

Attachments

ATTACHMENT 2. Field Test Data Sheet for Drum/Tank Sampling (cont'd)

3. Test: ______________________ Outcome: ______________________

Comments: ____

____

4. Test: ______________________ Outcome: ______________________

Comments: ____

____

5. Test: ______________________ Outcome: ______________________

Comments: ____

____

<u>HAZCAT PESTICIDES KIT</u>:

Present: ______________________ Not Present: ______________________

Comments: ____

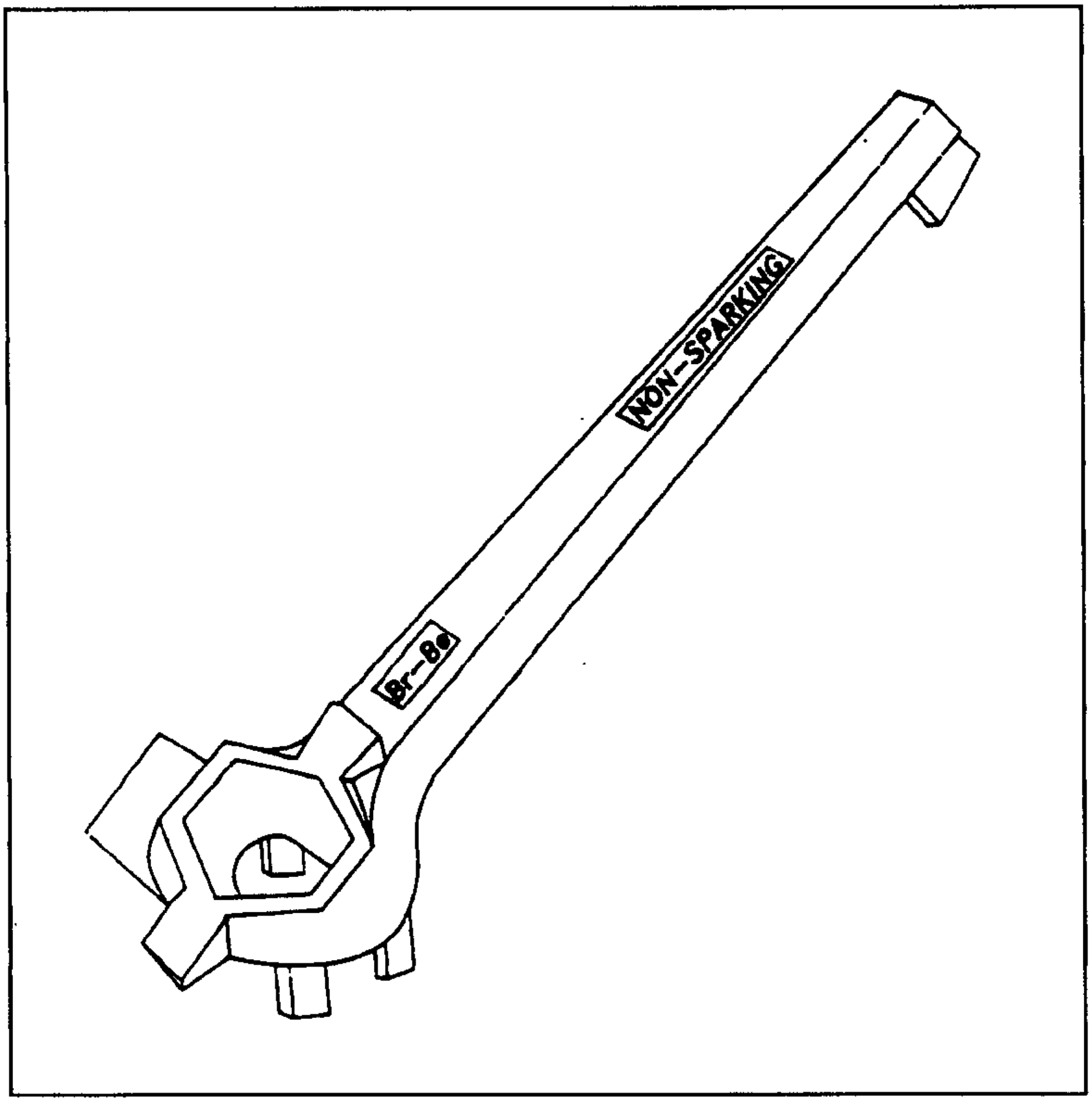
____

____

APPENDIX B

Figures

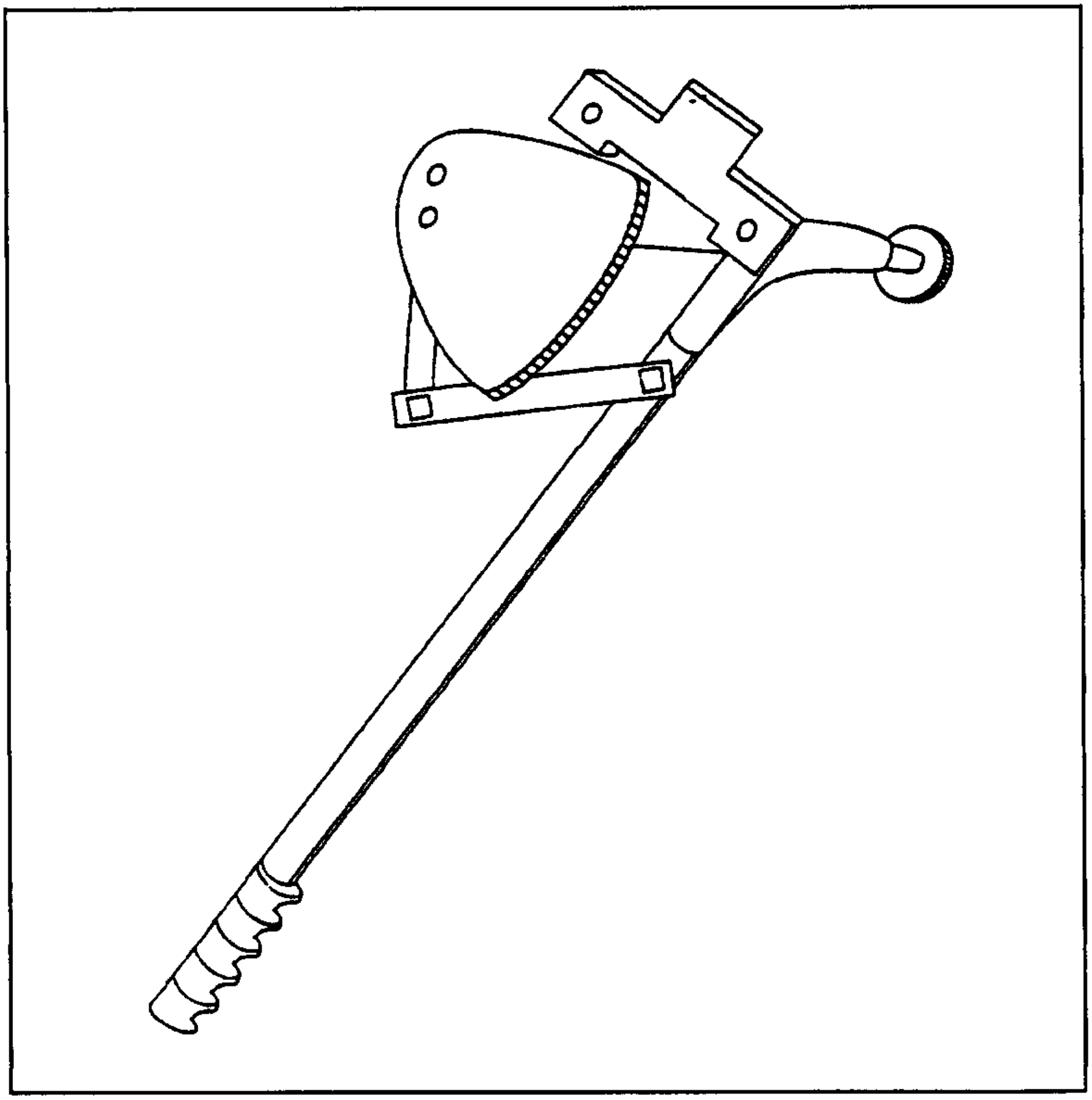
Figure 1. Universal Bung Wrench



APPENDIX B (Cont'd)

Figures

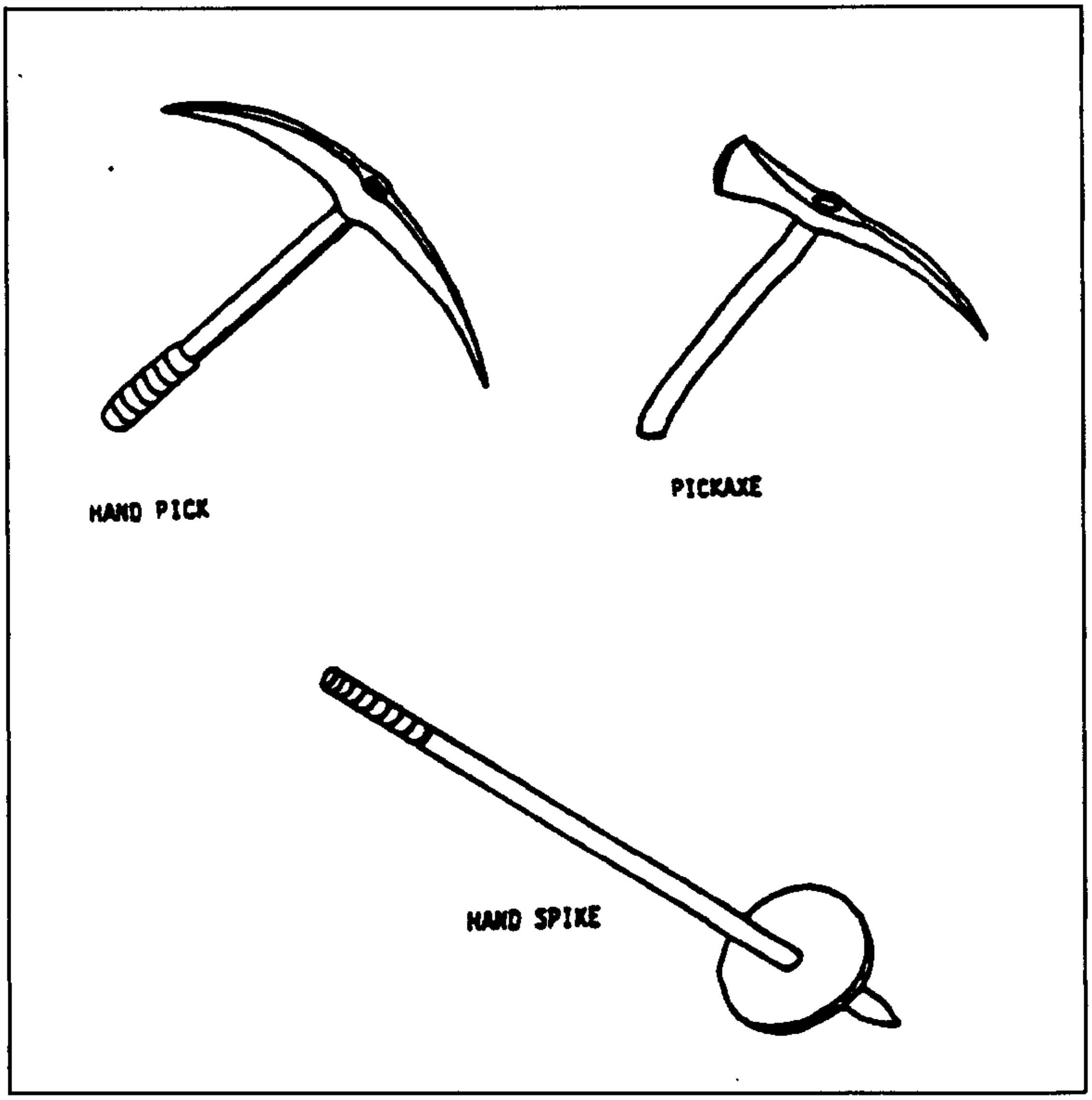
Figure 2. Drum Deheader



APPENDIX B (Cont'd)

Figures

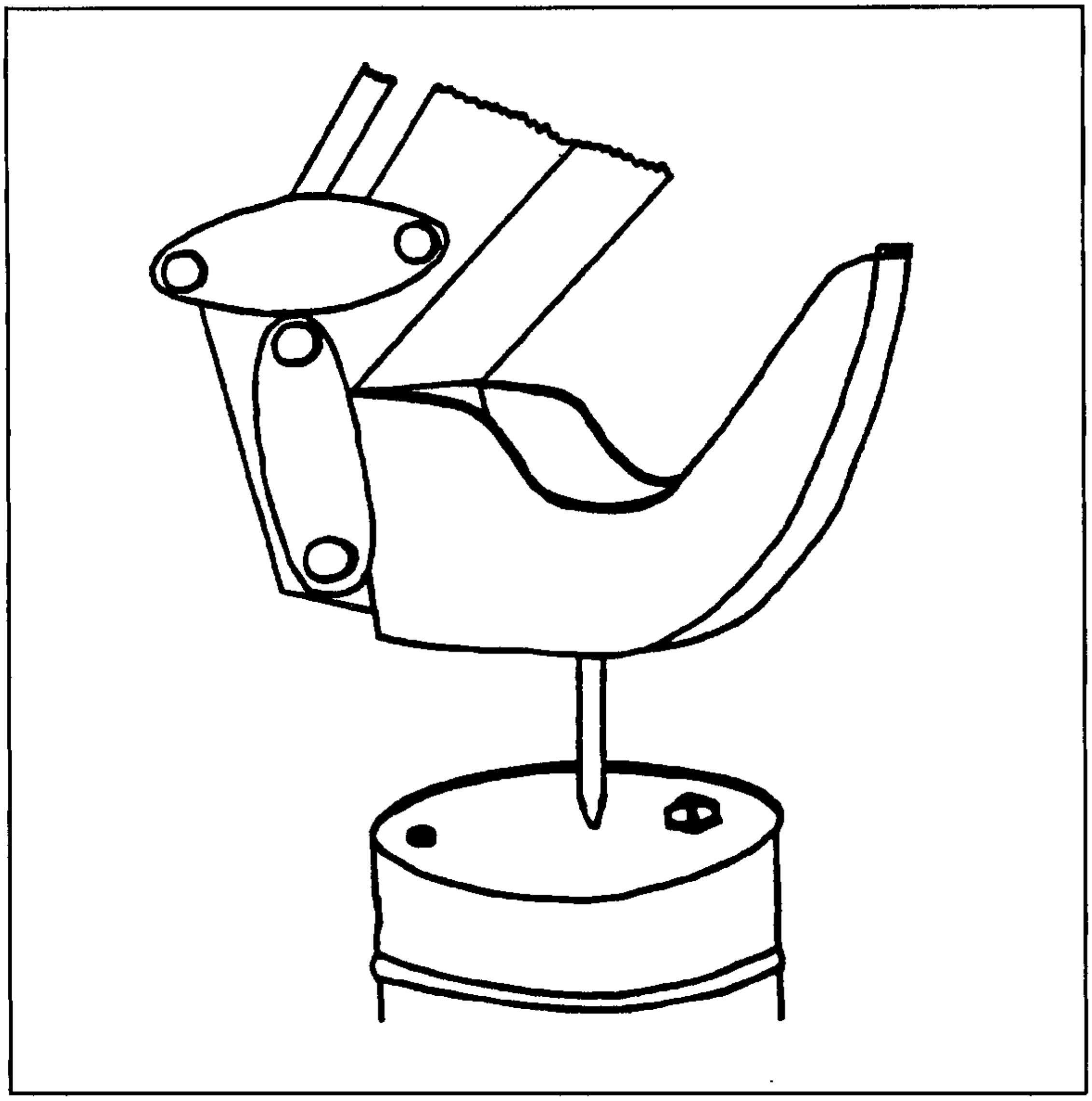
Figure 3. Hand Pick, Pickaxe, and Hand Spike



APPENDIX B (Cont'd)

Figures

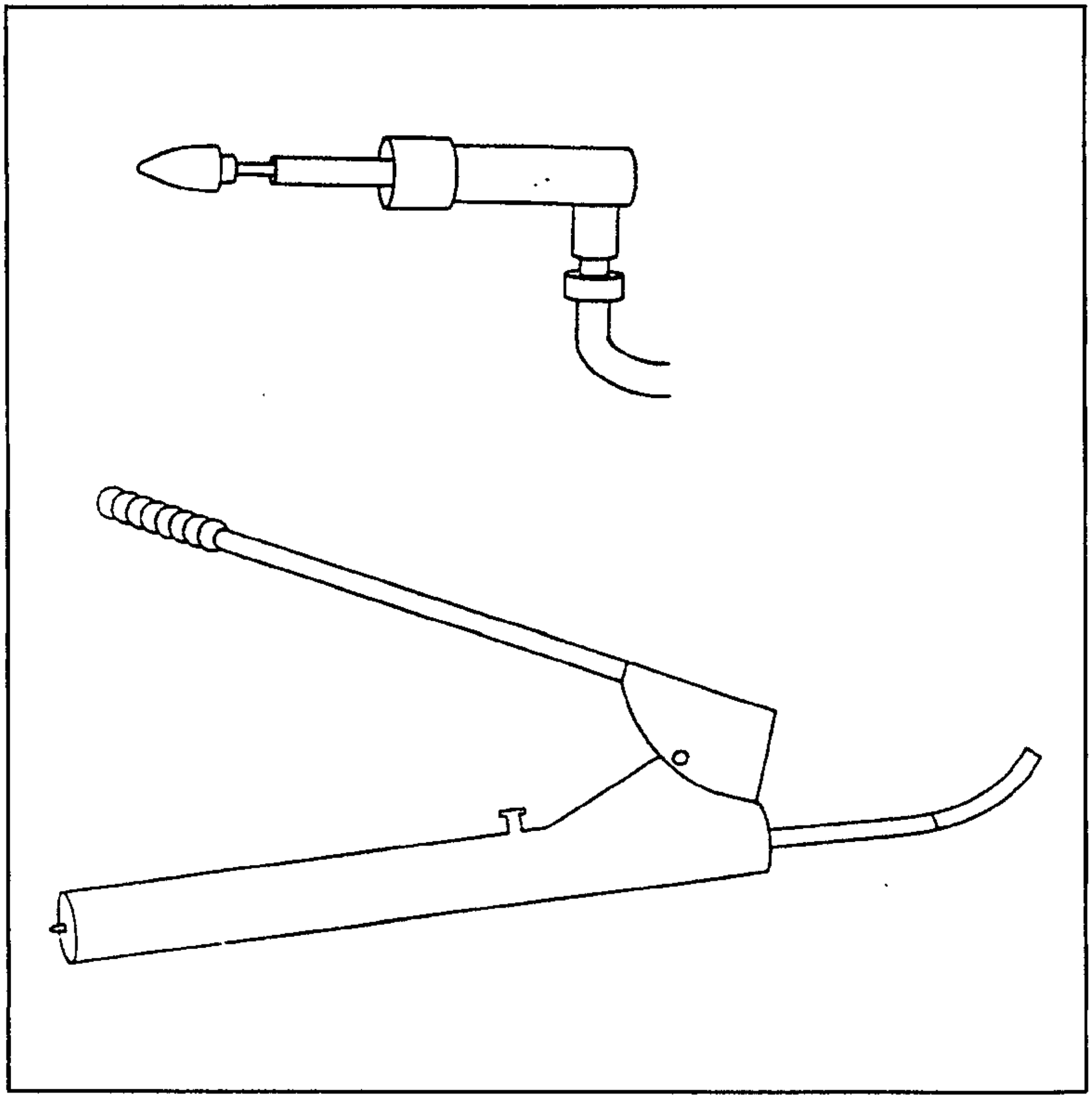
Figure 4. Backhoe Spike



APPENDIX B (Cont'd)

Figures

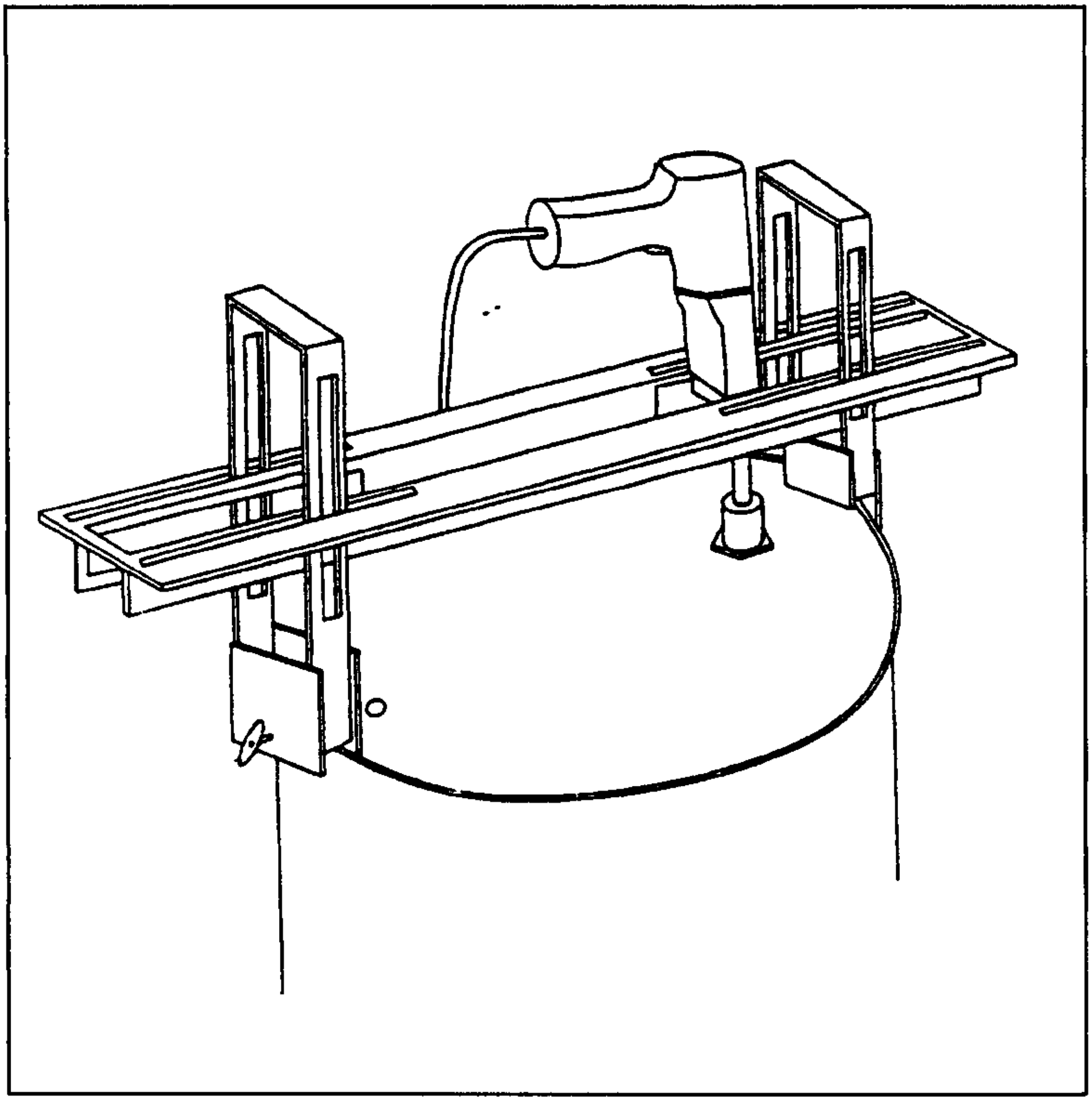
Figure 5. Hydraulic Drum Opener



APPENDIX B (Cont'd)

Figures

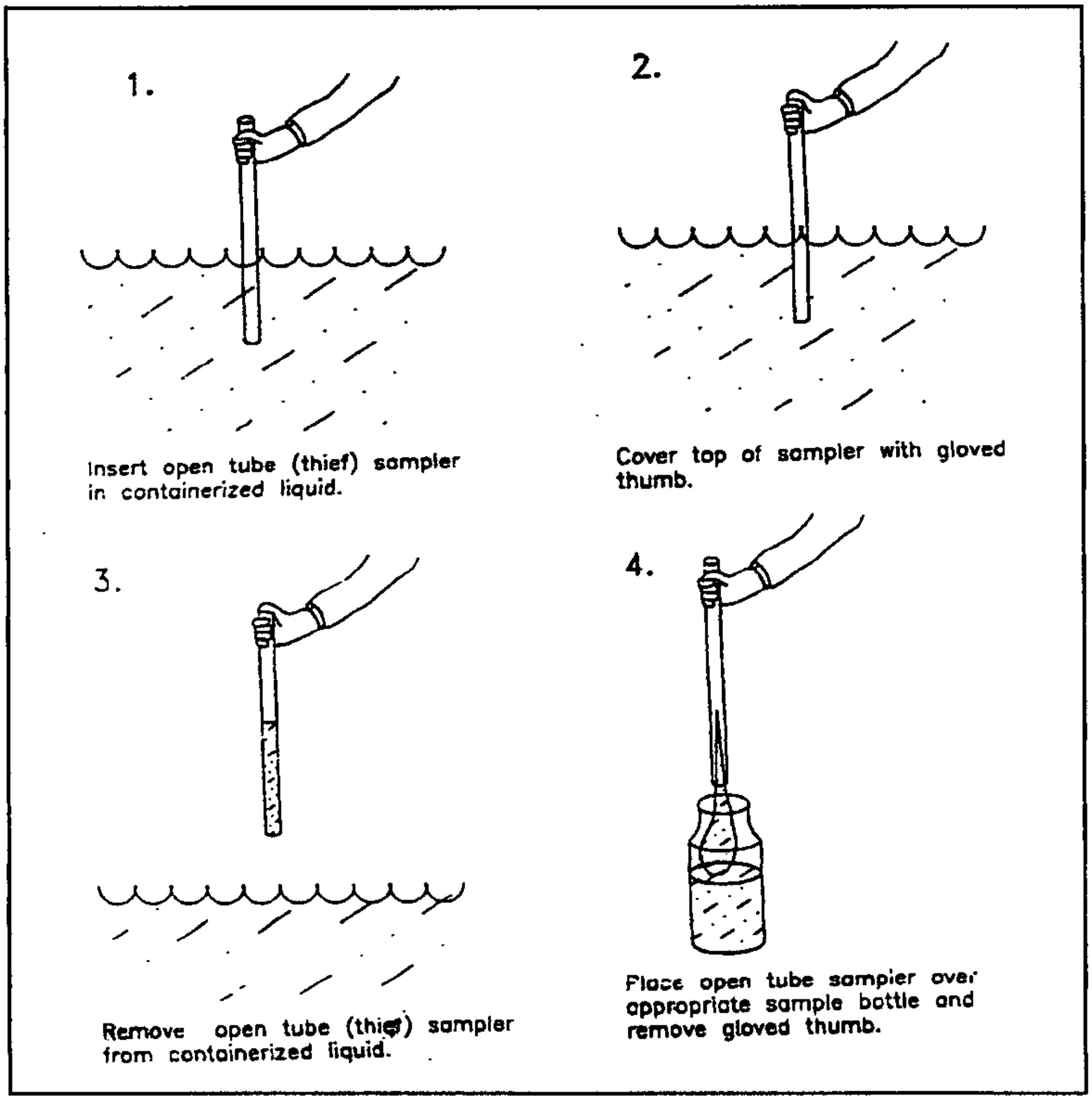
Figure 6. Pneumatic Bung Remover



APPENDIX B (Cont'd)

Figures

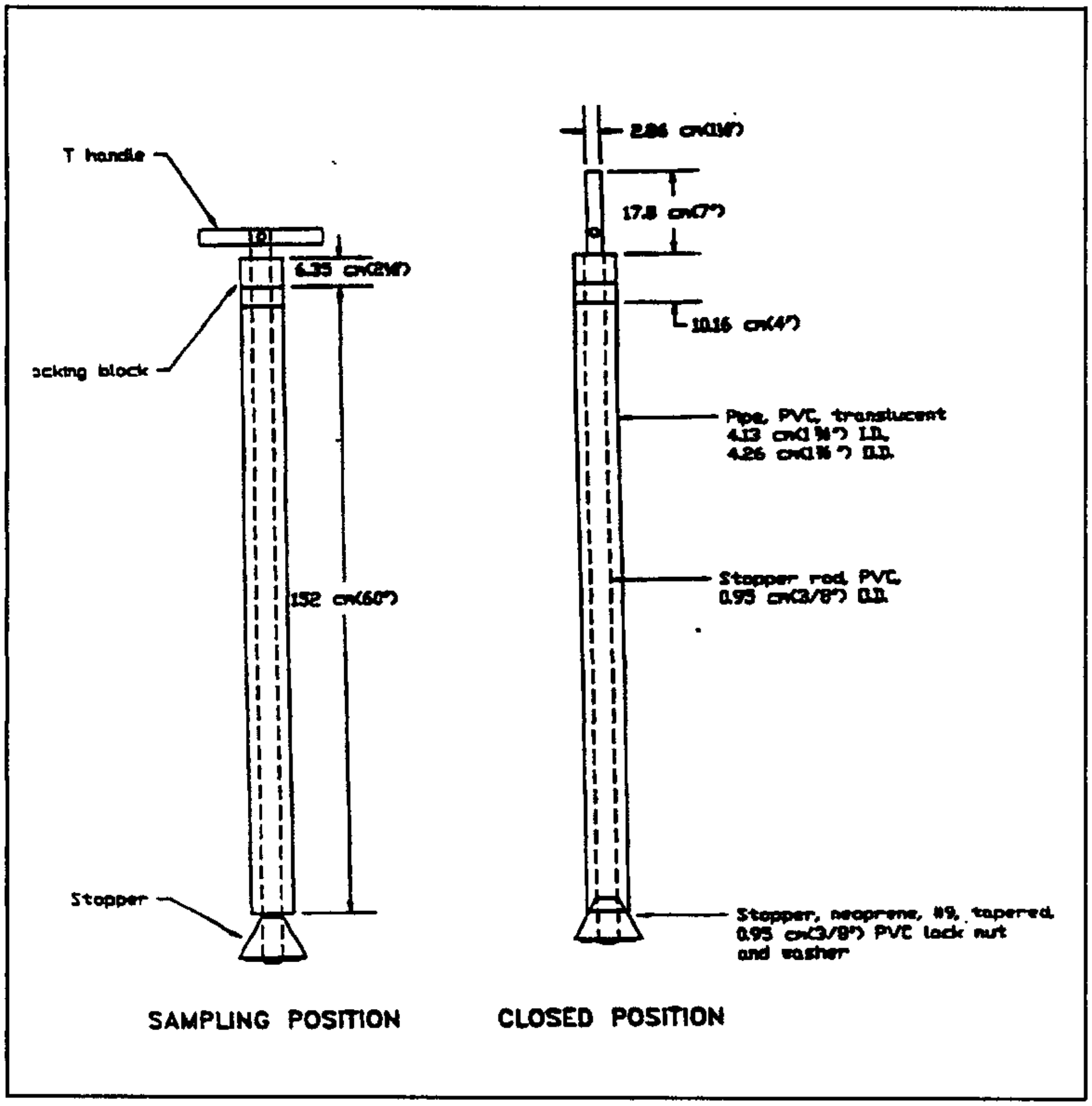
Figure 7. Glass Thief



APPENDIX B (Cont'd)

Figures

Figure 8. COLIWASA



FINAL PAGE

ADMINISTRATIVE RECORD

FINAL PAGE