DEPARTMENT OF THE ARMY
U.S. Army Corps of Engineers

CEMP-ET | Washington, DC 20314-1000 | ETL 1110-1-154

Technical Letter
No. 1110-1-154

28 February 1994

Engineering and Design

STANDARD OUTLINES FOR SCOPES-OF-WORK FOR INVESTIGATIONS AND STUDIES AT HAZARDOUS, TOXIC, AND RADIOACTIVE WASTE (HTRW) SITES UNDER CERCLA (SARA), RCRA, AND NEPA

Distribution Restriction Statement

Approved for public release; distribution is unlimited.

DEPARTMENT OF THE ARMY ETL 1110-1-154
U.S. Army Corps of Engineers
CEMP-RT Washington, D.C. 20314-1000

Technical Letter
No. 1110-1-154 28 February 1994

Engineering and Design
STANDARD OUTLINES FOR SCOPES-OF-WORK
FOR INVESTIGATIONS AND STUDIES
AT HAZARDOUS, TOXIC, AND RADIOACTIVE WASTE (HTRW) SITES
UNDER CERCLA (SARA), RCRA, AND NEPA

1. Purpose.

a. This letter transmits a package of detailed standard outlines for scopes-of-work (SOWB) to be used in obtaining contract services and defining in-house activities to perform investigations and studies at Hazardous, Toxic, and Radioactive Waste (HTRW) sites. Outlines are provided for performing the investigations and studies under the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA) as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA) and the Resource Conservation and Recovery Act of 1976 (RCRA) as amended by the Hazardous and Solid Waste Amendments of 1984 (HSWA). Provisions are included in the outlines to ensure the requirements of the National Environmental Policy Act (NEPA) are fulfilled.

b. The outlines are intended to be a guide to format and a checklist of topics to be addressed in a SOW for contract (or in-house) support to ensure that the work:

(1) addresses all aspects of the problem,

(2) is technically accurate,

(3) meets regulatory requirements, and

(4) is appropriately coordinated with the customer, the regulators, the public, and within USACE.

2. Applicability. This letter applies to HQUSACE/OCE elements, major subordinate commands, districts, laboratories, and field operating activities (FOA) having HTRW investigation, design and remedial action responsibility within the military or civil works programs.

3. References. Documents referenced in this ETL are listed. Additional documents useful in preparation of HTRW SOWs are provided at enclosure 1.

a. Public Law (FL) 96-510, Comprehensive Environmental Response, Compensation and Liability Act of 1980 as amended by FL 99-499, the Superfund Amendments and Reauthorization Act of 1986.

b. FL 91-190, National Environmental Policy Act of 1969 (NEPA).

c. FL 94-580, Resource Conservation and Recovery Act of 1976 (RCRA) as amended by FL 98-616, the Hazardous and Solid Waste Amendments of 1984.

d. 40 Code of Federal Regulation (CFR) 260 through 268 EPA Regulations Implementing RCRA.

e. 40 CFR 300 through 311 EFA Regulations Implementing CERCLA.

f. 40 CFR 1500 through 1508 Council on Environmental Quality (CEQ) Regulations Implementing NEPA.

g. ER 1110-1-263, Chemical Data Quality Management for Hazardous Waste Remedial Activities.

h. Memorandum, CEMP-R, 27 February 1991, subject, Requirement to Consider Innovative Technology in Scopes of Work for USACE Hazardous and Toxic Waste Programs.

4. Terminology and Definitions. Refer to the current HTW Management Plan for selected definitions. Acronyms are provided as enclosure 18.

5. Discussion.

a. Separate outlines are provided as enclosures for the following types of studies:

Remedial Investigation/ Feasibility Study (RI/FS)	- encl. 2
Preliminary Assessment/ Site Inspection (FA/SI)	- encl. 3
Engineering Evaluation/ Cost Analysis (EE/CA)	- encl. 4
RCRA Facility Assessment (RFA)	- encl. 5

RCRA Facility Investigation (RFI) - encl. 6
RCRA Corrective Measures Study (CMS) - encl. 7

b. Not all topics in the outlines are appropriate for each project. In most cases, only a subset of the topics will be required. Under some circumstances, additional scope topics will have to be developed to supplement those presented here. The outlines are meant to be edited or supplemented as appropriate for the project at hand.

c. The tasks and submittals required of the contractor are to be described first in the SOW. The technical details of how the tasks are to be executed are provided last.

d. The outlines are supplemented by text describing both the typical requirements and the appropriate sources of input for each outline topic. This explanatory text is separated from the outline contents by rows of asterisks. This text is written solely for the benefit of the Corps personnel preparing the scope. It is not intended for the contractors' information. The explanatory text provided under each topic is intended to:

(1) Discuss the requirements and typical level of detail.

(2) List related topics that should be cross referenced.

(3) Discuss typical submittal requirements, if any, for the task described.

(4) Identify the appropriate technical personnel to be used as a source for the text where appropriate.

(5) Identify the support or coordination typically required from outside agencies or entities such as the installation to complete the requirements.

(6) Provide useful information or warnings to assist in preparing a successful SOW.

e. Some sample language for certain SOW topics has been and will be provided as enclosures to this letter. This language is not meant to be used without modification, but is meant as a guide. Actual site/project characteristics must be addressed under each topic. These enclosures do not address topics which would include language that varies widely depending on the project or the USACE command. These enclosures include:

Health and Safety SOW Language	-encl. 8
Chemistry Technical Requirements	-encl. 13.

f. In addition, enclosures are provided which present general guidance relevant to successful scoping, including:

Checklists for Geophysics at HTRW Sites	-encl. 9
Checklists for Ground Water Modeling at HTRW Sites	-encl. 10
Alternative Development and Selection	-encl. 11
Treatability Studies and Treatability Study Reports	-encl. 12
Suggested Scope-of-Work Borehole Logging Requirements	-encl. 14
Regulatory Response Authorities	-encl. 15
Air Pathway Assessment	-encl. 16
Checklist for Review of Workplans	-encl. 17
Summary of Acronyms	-encl. 18

g. The outlines discuss contractor planning submittals that are consistent with existing USACE Engineer Regulations, including the requirements in ER 1110-1-263 to provide a Chemical Data Acquisition Plan. Future guidance will likely require changes in the nature of the plans. These changes are intended to better reflect a trend toward the use of an overall project plan including individual sections for laboratory analyses, field activities, health and safety, and community relations.

6. Actions Required.

a. The topics listed in the outlines are to be considered in preparation of SOWs. It is strongly recommended that input be sought from the appropriate technical staff within USACE during the preparation of the technical portions of the SOWs. The involvement of in-house technical expertise in scoping an HTRW project is essential to providing a cost-effective, high quality service to the customer and to providing quality reviews of subsequent submittals.

b. SOWs are to be developed for work under references 3.a. through 3.g.

c. In the course of developing SOWs based on these standard outlines, consideration of innovative technology should be promoted in accordance with reference 3.h.

FOR THE DIRECTOR OF MILITARY PROGRAMS:

18 Enclosures

CARY JONES, P.E.
Chief, Environmental Restoration
Division
Directorate of Military Programs

Encl 1 - References
Encl 2 — RI/FS
Encl 3 — PA/SI
Encl 4 - EE/CA
Encl 5 - RCRA FA
Encl 6 - RCRA FI
Encl 7 - RCRA CMS
Encl 8 - Health & Safety SOW Language
Encl 9 - Checklists for Geophysics at HTRW Sites
Encl 10 - Checklists for Ground Water Modeling at HTRW Sites
Encl 11 — Alternative Development & Selection
Encl 12 — Treatability Studies and Treatability Study Reports
Encl 13 - Chemistry Technical Requirements
Encl 14 — Suggested Scope-of-Work Borehole Logging Requirements
Encl 15 - Regulatory Response Authorities
Encl 16 - Air Pathway Assessment
Encl 17 — Checklist for Review of Workplans
Encl 18 - Summary of Acronyms

APPLICABLE REFERENCES FOR PREPARING SCOPES-OF-WORK FOR INVESTIGATIONS AND STUDIES AT HTRW SITES UNDER CERCLA (SARA) RCRA, AND NEPA

1. Legal References

1.1 Partial Listinq off Related Federal Laws

Clean Air Act as amended (42 U.S.C. §7401 to 7671q)

Federal Water Pollution Control Act (33 U.S.C. §§1251 to 1387

Comprehensive Environmental Response, Compensation and Liability Act of 1980 as amended by the Superfund Amendments and Reauthorization Act of 1986 (42 U.S.C. §§9601 to 9675)

Endangered Species Act of 1966 (16 U.S.C. §§1531 to 1544)

Federal Technology Transfer Act of 1986 (15 U.S.C. §§3701 to 3714)

Fishery Conservation and Management Act of 1976 (16 U.S.C. §1801 et seq.)

Hazardous Materials Transportation Act of 1970 as amended (49 U.S.C. §1801 et seq.)

Low Level Radioactive Waste Policy Act of 1985 as amended (42 U.S.C. §§2021b to 2021j)

Marine Protection, Research and Sanctuaries Act of 1972 (33 U.S.C. §§1401 et seq., and 16 U.S.C. 1431 et seq.)

Marine Mammal Protection Act (16 U.S.C. §§1361 et seq.)

Migratory Bird Treaty Act (16 U.S.C. §§703 et seq.)

National Environmental Policy Act of 1969 as amended (42 U.S.C. §§4321 to 4370b)

Enclosure 1

Nuclear Waste Policy Act of 1984 (42 U.S.C. §§10l01 et seq.)

Occupational Safety and Health Act of 1970

Resource Conservation and Recovery Act of 1976 as amended by the Hazardous and Solid Waste Amendments of 1984 (42 U.S.C. §6901 et seq.)

Safe Drinking Water Act as amended (42 U.S.C. §S300f to 300j-26)

Stevenson-Wydler Technology Innovation Act of 1980 (15 U.S.C. §§3701 et seq.)

Toxic Substances Control Act of 1976 as amended (15 U.S.C. §§2601 to 2671)

Wild and Scenic Rivers Act (16 U.S.C. §§1271 et seq.) Oil Pollution Act of 1990 (33 U.S.C. §§2701 to 2761)

Atomic Energy Act of 1954 as amended by Low-Level Radioactive Waste Policy Act (42 U.S.C. §§2014, 2021 to 2021d, 2022, 2111, 2113, 2114)

Pollution Prevention Act of 1990 (42 U.S.C. §§13101 to 13109)

Asbestos Hazard Emergency Response Act (15 U.S.C. §§2641 to 2654)

Emergency Planning and Community Right-To-Know Act (42 U.S.C. §§11001 to 11050)

Federal Insecticide, Fungicide, and Rodenticide Act (7 U.S.C. S§136 to 136y)

Coastal Zone Management Act (16 U.S.C. §§1451 to 1464)

National Historic Preservation Act (16 U.S.C. §§470-470w-6)

Noise Control Act (42 U.S.C. §§4901 et seq.

Fish and Wildlife Coordination Act (16 U.S.C. §§661-666c)

Refuse Act (§407, Rivers and Harbors Act of 1899, 33 U.S.C. §407)

1.2 Presidential Orders

Executive Order 12088 Federal Compliance with Pollution Control Standards October 13, 1978

Executive Order 12196, Occupational Safety and Health Programs for Federal Employees, February 27, 1980

Executive Order 12580 Superfund Implementation 23 January 1987

1.3. Code of *Federal Regulation (CFR) References*

29 CFR 1910 Occupational Safety and Health Standards

29 CFR 1910.120 Hazardous Waste Operations and Emergency Response.

29 CFR 1926 Safety and Health Regulations for Construction

40 CFR 250 through 270 EPA Regulations Implementing RCRA

40 CFR 261.4 (e) and (f) RCRA Treatability Exclusions

40 CFR 261 Identification and Listing of Hazardous Waste

40 CFR 268 Land Disposal Restrictions (LDR)

40 CFR 280 through 281 EPA Regulations for Underground Storage Tanks

40 CFR 300 through 311 EPA Regulations Implementing CERCLA

40 CFR 761 EPA PCB Regulations

40 CFR 1500 through 1508 CEQ Regulations Implementing NEPA

49 CFR 170 through 179 DOT Hazardous Materials Transportation Regulation

1.4 Federal Registers (FR)

FR 11796-11877, March 29, 1990, Hazardous Waste Management System Identification and Listing of Hazardous Waste; Toxicity Characteristics Revisions

55 FR 30798 - 30884, July 27, 1990, Corrective Action for Solid Waste Management Units (SWMUs) at Hazardous Waste Management Facilities; Proposed Rule

57 FR 958-1042, January 9, 1992, Land Disposal Restrictions for Newly Listed Wastes and Contaminated Debris; Proposed Rule

1.5 State *and Local Laws/Ordinances*

State Standard Preliminary Assessment and Site Inspection Forms

2. Military Regulations and Publications

2.1 Air Force Guidance

Air Force Installation Restoration Program Management Guidance, 1989, Available from NTIS, 5285 Port Royal Road, Springfield VA. 22161

2.2 Army Regulations

AR 200-1 Environmental Protection and Enhancement

AR 200-2 Environmental Effects of Army Actions

DA PAM 40-578 Health Risk Assessment Guidance for the Installation Restoration Program and Formerly Used Defense Sites

2.3 Corps of Engineers Publications

2.3.1 Engineer Regulations

ER 5-7-1(FR) Project Management

ER 385-1-92 Safety and Occupational Health Document Requirements for Hazardous, Toxic, and Radioactive Waste (HTRW) Activities

ER 1110-1-263 Chemical Data Quality Management for Hazardous Waste Remedial Activities

2.3.2 Engineer Manuals

EM 385-1-1 Safety and Health Requirements Manual

EM 1110-2-505 Guidelines for Preliminary Selection of Remedial Actions for Hazardous and Toxic Waste Sites

EM 1110-2-1415 Hydrologic Frequency Analysis

2.3.3 Other USACE Publications

Accuracy of Computed Water Surface Profiles, USACE Hydrologic Engineering Center Publication, HEC RD-26, December, 1986.

Corps of Engineers Wetlands Delineation Manual, Waterways Experiment Station Technical Report Y-87-l, January, 1987.

Current HTW Management Plan

3. EPA Publications

EPA CERCLA Compliance with Other Laws Manual, Interim Final, EPA 540 G-89/006, August 1989, and Part II Clean Air Act and Other Environmental Statutes and State Requirements, EPA 540 G-89/009, August, 1989

EPA Characterization of Hazardous Waste Sites, A Methods Manual, 2 Vol. EPA/600/4-84/075, April, 1985

EPA Community Relations in Superfund, Office of Solid Waste and Emergency Response (OSWER) Directive 9230.0-3B, June, 1988.

EPA Contract Laboratory Program Statement of Work for Inorganics Analysis (SOW 788 including Rev. 2/89 , 6/89, and 3-90) and for Organic Analysis (SOW 2/88 including Rev. 9/88, 4/89, and 4/91).

EPA Corrective Measures for Releases to Soil from Solid Waste Management Units, EPA/530/SW-88/022, August, 1985

EPA Data Quality Objectives for Remedial Response Activities, EPA/9335.0-7B, March, 1987

EPA Data Quality Objectives for Remedial Response Activities, Example Scenario: RI/FS Activities at a Site with Contaminated Soils and Ground Water, EPA/540/G-87/004, March, 1987

EPA Definition of Solid Waste Management Units for the Purpose of Corrective Action Under Section 3004(u), OSWER Directive 9502.00-6, July, 1987

EPA Drum Handling Practices at Hazardous Waste Sites, EPA/600/2-86/013, January, 1986

EPA Ecological Assessment of Hazardous Waste Sites: A Field and Laboratory Reference, EPA/600/3-89/013, March, 1989

EPA Expanded Site Inspection Guidance, EPA/9345.l, October, 1987

EPA Exposure Factors Handbook, EPA/600/8-89/043, July, 1990

EPA Furthering the Use of Innovative Technology in OSWER Programs, OSWER Directive 9380.0-17, July, 1991

EPA Field Manual for Grid Sampling of PCB Spill Sites to Verify Cleanup, EPA-560/5-86-017, May, 1986

EPA Geophysical Techniques for Sensing Buried Wastes and Waste Migration, EPA-600/7-84-064, June, 1984

EPA Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA. EPA/540/SW-89/031, OSWER Directive 9355.3-01, May, 1989

EPA Guide for Conducting Treatability Studies Under CERCLA, EPA/540/R-92/071a, October, 1992.

EPA Guide for Conducting Treatability Studies under CERCLA: Aerobic Biodegradation Remedy Screening EPA/540/2-91/013A, July, 1991.

EPA Guide for Conducting Treatability Studies under CERCLA: Chemical Dehalogenation EPA/540/R-92/013a, May, 1992.

EPA Guide for Conducting Treatability Studies under CERCLA: Soil Vapor Extraction (Interim Guidance) EPA/540/2-91/019A, September 1991.

EPA Guide for Conducting Treatability Studies under CERCLA: Soil Washing (Interim Guidance) EPA/540/2-91/020A, September 1991.

EPA Guide for Conducting Treatability Studies under CERCLA: Solvent Extraction (Interim Guidance) EPA/540/R-92/016a, August 1992.

EPA Guide for Conducting Treatability Studies under CERCLA: Thermal Desorption Remedy Selection (Interim Guidance) EPA/540/R-92/074A, September 1992.

EPA Guidance for Data Useability in Risk Assessment, Interim Final, EPA 540 G-90 008, October, 1990

EPA Guidance on Applying the Data Quality Objectives Process for Ambient Air Monitoring Around Superfund Sites (Stages I & II), EPA-450/4-89-015, August 1989

EPA Guidance on Applying the Data Quality Objectives Process for Ambient Air Monitoring Around Superfund Sites (Stage III), EPA-450/4-90-005, March 1990

EPA Guidance on Implementation of the "Consistency" Exemption to the Statutory Limits on Removal Actions, EPA/9360.0-12A, June, 1989

EPA Guidance on Remedial Actions for Contaminated Ground Water at Superfund Sites, EPA 540/G-88/003, December, 1988

EPA Guide for Decontaminating Buildings, Structures, and Equipment at Superfund Sites, EPA/600/2-85/028, March, 1985

EPA Guide to Selecting Superfund Remedial Actions, EPA/9355.0-27FS, 1990

EPA Integrated Risk Information System (IRIS)

EPA Management of Investigation-Derived Wastes During Site Inspections, EPA/540/G-91/009, May, 1991

EPA, Methods For Chemical Analysis of Water and Wastes, EPA-600/4-79-020, March, 1983.

EPA, Methods for the Determination of Organic Compounds in Drinking Water, EPA/600/4-88/039, December 1988.

EPA Outline of EE/CA Guidance, EPA Memorandum, March 30 1988

EPA Preliminary Assessment Petition, EPA/9200.5-301, November, 1988

EPA Risk Assessment Guidance for Superfund Volume I - Human Health Evaluation Manual (Part A), EPA/540/l-89/002, December 1989

EPA Risk Assessment Guidance for Superfund Volume I - Human Health Evaluation Manual (Part B, Development of Risk-based Preliminary Remediation Goals), OSWER Directive 9285.7-01B, December 1991

EPA Risk Assessment Guidance for Superfund Volume I - Human Health Evaluation Manual (Part C, Risk Evaluation of Remedial Alternatives) EPA Guide for Conducting Treatability Studies under CERCLA: Solvent Extraction Remedy Selection (Under Development).

EPA Guide for Conducting Treatability Studies under CERCLA: Thermal Desorption Remedy Selection (Under Development).

EPA Guidance for Data Useability in Risk Assessment, Interim Final, EPA 540 G-90 008, October, 1990

EPA Guidance on Applying the Data Quality Objectives Process for Ambient Air Monitoring Around Superfund Sites (Stages I & II), EPA-450/4-89-015, August 1989

EPA Guidance on Applying the Data Quality Objectives Process for Ambient Air Monitoring Around Superfund Sites (Stage III), EPA-450/4-90-005, March 1990

EPA Guidance on Implementation of the "Consistency" Exemption to the Statutory Limits on Removal Actions, EPA/9360.0-12A, June, 1989

EPA Guidance on Remedial Actions for Contaminated Ground Water at Superfund Sites, EPA 540/G-88/003, December, 1988

EPA Guide for Decontaminating Buildings, Structures, and Equipment at Superfund Sites, EPA/600/2-85/028, March, 1985

EPA Guide to Selecting Superfund Remedial Actions, EPA/9355.0-27F5, 1990

EPA Integrated Risk Information System (IRIS)

EPA Management of Investigation-Derived Wastes During Site Inspections, EPA/540/G-91/009, May, 1991

EPA, Methods For Chemical Analysis of Water and Wastes, EPA-600/4-79-020, March, 1983.

EPA, Methods for the Determination of Organic Compounds in Drinking Water, EPA/600/4-88/039, December 1988.

EPA Outline of EE/CA Guidance, EPA Memorandum, March 30 1988

EPA Preliminary Assessment Petition, EPA/9200.5-301, November, 1988

EPA Risk Assessment Guidance for Superfund Volume I - Human Health Evaluation Manual (Part A), EPA/540/1-89/002, December 1989

EPA Risk Assessment Guidance for Superfund Volume I - Human Health Evaluation Manual (Part B, Development of Risk-based Preliminary Remediation Goals), OSWER Directive 9285.7-O1B, December 1991

EPA Risk Assessment Guidance for Superfund Volume I - Human Health Evaluation Manual (Part C, Risk Evaluation of Remedial Alternatives), OSWER Directive 9285.7-OlC, December 1991

EPA Risk Assessment Guidance for Superfund Volume II - Environmental Evaluation Manual, EPA/540/1-89/001, March 1989

EPA Risk Assessment, Management and Communication of Drinking Water Contamination, EPA 625/4-89/024, April, 1989

EPA RCRA Corrective Action Decisions Documents: Statement of Basis and Response to Comments, OSWER Directive No. 9902.6, 1991

EPA RCRA Corrective Action Plan EPA/530/SW-88/028, June, 1988

EPA RCRA Facility Assessment Guidance, EPA/530/SW-86/053., October, 1986

EPA RCRA Facility Investigation (RFI) Guidance, 4 Vol., EPA/530/SW-89/031, May, 1989

EPA RCRA Ground Water Monitoring Technical Enforcement Guidance Document, OSWER Directive 9950.1, 1986

EPA Soil Sampling Quality Assurance User's Guide, EPA 600/8-89/046, March, 1989

EPA Standard PA and SI Forms

EPA Superfund Community Relations Program: A Handbook, EPA/540/G-88/002, 1988.

EPA Superfund Exposure Assessment Manual, EPA/540/1-88/001, April, 1988

EPA Superfund Removal Procedures: Action Memorandum Guidance, OSWER 9360.3-01, September, 1990

EPA Superfund Removal Procedures, EPA/9360. 0-03B, February, 1988

EPA SW-846, Test Methods for Evaluating Solid Waste Physical I Chemical Methods, 3rd Edition, [lst update: January, 1990, 2nd update: June 1990)

EPA Use of Removal Approaches to Speed Up Remedial Action Projects, EPA 9335.0-25A, July, 1989

EPA Verification of PCB Spill Cleanup by Sampling and Analysis, EPA-560/5-85-026, August, 1985

4. National Institute of Occupational Safetv and Health (NIOSH) Publications

NIOSH/OSHA/USCG/EPA Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, October, 1985, DHHS (NIOSH) Publication No. 85-115

NIOSH Registry of Toxic Effects of Chemical Substances [updated frequently]

Manual of Analytical Methods, 3rd Edition, National Institute of Occupational Safety and Health, 1984 and all supplements.

5. Other

Standard Methods for the Examination of Water and Wastewater, American Public Health Association - American Water Works Association - Water Pollution Control Federation, 17th Edition, 1989.

Annual Book of ASTM Standards, American Society for Testing and Materials

OUTLINE FOR REMEDIAL INVESTIGATION/FEASIBILITY STUDY (RI/FS) SCOPE-OF-WORK UNDER CERCLA/SARA

1.0 Site Description, Project Planning Overview and Objectives

1.1 Site Description

1.1.1 Site Background

****
In this section, briefly summarize the physical features of the site, nature and extent of chemical contamination, operational history and past use of the site, based on available information. Describe how past activities may have led to existing contamination, referring to other reports for detailed discussions. It is important to describe any processes, e.g. degreasing, electroplating, as well as suspected disposal activities which may have occurred at the site. Also discuss operations and activities off site that may have contributed to the contamination. This information should be distributed and discussed with the team prior to preparation of the scope. If not thoroughly researched previously, this should be the first task to be performed by the Contractor in the RI.
****

1.1.2. Previous Studies

****
Review previous studies conducted at the site, and summarize key information in this section of the scope. Key information should include the regulatory history of the site, the program (IRP, FUDS, DOE...) under which the study was conducted, as well as phase of study relative to site closeout. Briefly summarize the time line of the activities performed previously, as well as those anticipated to achieve site closeout. Describe the primary contribution of previous studies, including data describing the nature and extent of contamination, operational history, and preliminary risk analysis, relative to this phase of the study. Include Department of Health and Human Services Agency for Toxic Substances and Disease Registry (ATSDR) Health Assessment summary, if available. Conjecture briefly how previously gathered data can be used as well as supplemented by data requirements described in this SOW. The reports and other

available documents should be referenced under Section 1.6 (References).
****

1.1.3 Regulatory Authorities

****
Include appropriate references to regulatory program/authority under which the site is now being addressed (i.e. CERCLA/SARA, Executive Order 12088, the National Contingency Plan, NEPA, any IAGs, Federal Facility Agreements, CERCLA 104 orders, AR 200-1, etc.). Indicate which agency is the lead agency. Indicate whether agency such as AEHA has review/approval authority for submittals under the Surgeon General. Indicate whether there are any state mini-Superfund laws applicable at this site, which are in addition to federal requirements, rather than in lieu of existing federal regulatory requirements. There are no provisions in federal CERCLA for transfer authority; the federal EPA cannot transfer CERCLA authority to the states. Therefore some states will write, then adopt, their own mini-Superfund law. This section can be prepared by any team member with an environmental regulatory background.
****

1.2 Project Planning Overview and Objectives

****
This section essentially consists of project objectives, site strategy information, and data needs criteria, rather than directives, provided to the Contractor as a result of technical project planning efforts.

The quality of any individual study performed will be dependent upon the set of data available to site decision makers to support decisions leading to site closeout. The technical project planning team, in accordance with ER 5-7-l(FR), Project Management, is responsible for defining the quality of investigations and design submittals prepared under the HTRW program. A practical method in measuring and defining quality in the HTRW program, is through adequate planning, and development of quality goals or objectives. The use of HTRW technical project planning guidance in development of these goals or objectives for data collection design is strongly encouraged.

The USACE project team involved in scope preparation should consist of decision makers, data users, and data collection support personnel. Decision makers are defined as Executive

Agency representatives, Customer MACOM and installation representatives, USACE project and technical managers, and representatives from affected regulatory agencies.

Data users include technical support personnel such as designers, regulatory specialists, individuals responsible for worker health and safety, and risk assessors. Data collection support personnel will probably include chemists, geologists, biologists, statisticians, industrial hygienists, and engineers.

Each member of the project planning team will contribute in defining data collection requirements or needs and methods of collecting data to fulfill those needs, which will allow decision makers to properly evaluate information in making project/site decisions. Information concerning individual project team representative's contribution to scope preparation will be defined further in subsequent sections of this guidance.
****

1.2.1 Site Strategy Development

****
Site Strategy development is the determination by the project planning team of long term objectives for the site for overall execution, and specific data needs, to achieve site closeout. Using existing information gathered by the TM, described in Section 1.1, concerning the applicable regulatory program, historical data and operational history, previous reports, and information constraints such as schedule and budget for the project, the team will attempt to define overall strategy for the site. The developed strategy determines the opportunities and options for characterizing and remediating portions of the site under an accelerated schedule, operable unit specification, and preliminary determination of critical elements to be included in each phase of execution planned to achieve site closeout. This long term evaluation of site strategy will enable the team to identify general data needs associated with each phase of project execution, and initially consider the most effective/plausible means of proceeding with future characterization and remediation plans. The team may want to consider the possibility of collecting data to support future phase execution data needs early on, to eliminate possible future project delays, and allow them some predictive ability in determining possible data needs to support future site decisions. Strategy development will be dependent on or a function of the information provided by the customer regarding schedule

and available funding for the single phase project execution, and projections for future funding and schedule requirements.

The team may or may not wish to include details of the site strategy development, other than general information as it pertains to the specific project, in this section of the SOW. Specification of strategy goals will depend on the sensitive nature of the information, and the Contractor's "need to know" to effectively carry out team quality goals and requirements.
****

1.2.2 Project Objectives and Project Decision Statements

********** **********
The strategy developed for the site as a whole, enables the project team to focus resources on data needs in support of site decisions for the specific phase of project execution, or project objectives/project decision statements. Minimally, these project specific statements should be included in this section of the SOW.

Examples of project decision statements include:

RI - Media-specific contamination determined to pose an unacceptable risk to identified current or potential future receptors from potential exposures to site wastes, will require the development of remediation goals to reduce or eliminate health risks.

FS - Alternatives will be identified and screened which will contribute to reduction of health risk and compliance with ARAR’s, as is technically feasible and cost effective.

General project objectives, or phase execution requirements, to be considered in the determining data needs for the RI/FS are;

- degree of risk to human health and the environment
- degree of regulatory compliance
- liability
- feasibility of remedial alternatives

Data needed to evaluate each of these project objectives or in support of decision statements for the RI/FS generally coincide with data required to support the baseline risk assessment, feasibility study, regulatory compliance evaluation, and liability.

Use of conceptual site models will aid the team in determining the data needs associated with each of these categories. The team may summarize the results of the conceptual site model evaluation in this section of the SOW, and minimally define data needs, as preliminary criteria to support determination of data quality objectives.
****

1.2.3 Data Quality Objectives

****
This section should provide a brief summary of project team's efforts in defining data quality objectives. The team is encouraged to use the USACE project planning guidance, to develop these formal project objective statements. Carefully crafted objectives, developed by the project planning team, are the product of:

- the site strategy planning analysis
- the project specific strategy development,
- conceptual site model development
- data need determination and
- data collection design evaluation.

Objectives define the quality of data required to support project decisions, and the maximum level of uncertainty that is acceptable in the data. These efforts provide the criteria for specification and collection of technically sound and defensible data, to be used to support project decisions and contribute to site closeout.

Information from Section 1.2.1, Site Strategy Development, and Section 1.2.2, Project Decision Statements, are used in conjunction with criteria for data collection design specified in RI/FS SOW Sections 2.3 and 2.4, in determining the overall data quality objectives.

An example of a Data Quality Objective Statement which the planning team might develop, in support of these data needs, for this section of the SOW could be:

> "Sufficient groundwater samples shall be collected from the shallow aquifer to: allow a minimum detectable difference of 20% with associated minimum confidence interval of 80%; in support of the quantitative risk characterization evaluations for the site."

The statement reflects the planning team's collective effort

to define characteristics of the intended use of the data, and the means to achieve that intended use. The quantity, quality, and type of data specified becomes a function of required confidence, decision maker's and data user's requirements, schedule, and funding.

Data Collection Design specifications and planning rationale used in defining the data quality objectives are further defined in the Field Investigation and Data Analysis sections, Tasks 3 and 4 of the RI/FS SOW outline.

The effort expended by the project planning team to develop these initial or preliminary data quality objectives, will provide a quantifiable means to identify and measure quality of the products of the HTRW program. The Contractor becomes a participant in this process of quality assurance by expanding on and implementing these goals or objectives in preparing workplans, and reports for the study.
****

1.3 Summary of RI/FS Tasks

****
Give only a superficial listing of tasks to be performed under this SOW. Details of each to follow.
****

Task 1 - Contractor Workplan Preparation
Task 2 - Community Relations
Task 3 - Field Investigations
Task 4 - Sample Analyses, Data Assessment/Validation and Reporting
Task 5 - Data Evaluation/Fate and Transport Analysis
Task 6 - Baseline Risk Assessment
Task 7 - RI Report
Task 8 - Remedial Alternative Development and Screening
Task 9 - Treatability Studies and Treatability Study Reports
Task 10- Detailed Analysis of Alternatives
Task 11- FS Report
Task 12- Post RI/FS Support

1.4 References

****
Include citations of previous reports, guidance documents

such as Conducting Remedial Investigations/Feasibility Studies under CERCLA, DA PAM 40-578, USACE guidance, Risk Assessment Guidance for Superfund, ATSDR Health Assessments, etc. Include any Federal Facility Agreements, Interagency Agreements, Consent Orders, Compliance Orders, and a description of effects of these agreements/schedules on execution of the project, such as mandatory review periods, primary document submittals, regulatory requirements, and special considerations. List only those documents the project team possesses or can locate. Those being provided to the Contractor should be noted.
****

2. Project Requirements

****
Under this section, the efforts required of the Contractor are discussed. When tasking the Contractor make sure it is clearly explained what is expected.
****

2.1 Task 1 Contractor Workplan Preparation

******** **********
Planning documents to be produced by the Contractor include the general Project Workplan, with attachments for the Site Safety and Health Plan (SSHP), the Chemical Data Acquisition Plan (CDAP), Monitoring Well Installation and Drilling Plan (MWIP), and Community Relations Plan (CRP). A treatability study workplan attachment may also be required. The advantage of the single planning document approach;

- promotes consistency,
- acknowledges and advocates the interdependence and interaction of specific plan requirements,
- and alleviates reproduction of redundant information.

The single workplan document also provides all project team members, regulators, and customers with all pertinent project information in a single submittal, promoting a wider review of submittals and subsequent acceptance of plan requirements. The information included in Section 1.0, and in subsequent sections of the SOW, regarding site description, evaluation of existing data, data quality objectives, and sample collection design should be discussed in sufficient detail to allow the Contractor to properly evaluate and implement project team requirements when preparing implementation plan attachments.

Note: Ideally, the USACE project planning team should develop the project data quality objectives, and data collection design requirements, which may be expanded on by the Contractor in plans and reports. However, an option which could be exercised would be to issue a work order directing the Contractor to prepare the Data Quality Objectives in the project workplan. Following a consensus of agreement by the planning team, a separate work order for field work requirements and report preparation would be issued, based on these objectives. The Contractor, with participation from USACE planning team representatives, should be directed to use the USACE project planning guidance, in developing the data quality objectives and in preparing the project workplan.

Elements of the general workplan, should include introductory information, such as site physical description, and existing chemical data, evaluation of existing data, project objectives, data quality objectives, and data collection design requirements. The plan attachments, such as the CDAP and MWIP, are specific instructions designed to implement data collection design requirements in carrying out these objectives. The supplemental individual plan attachments should not reiterate the introductory information or project objectives included in the main workplan.

Data collection design information and instructions to the Contractor are included under Tasks 3 and 4 of the SOW.
****

2.1.1 Available Data Review

****
The information reviewed by the project team in determining site and project strategy and objectives, shall be made available to the Contractor, in the form of previous reports, records, and guidance documents. This section describes the requirements for the Contractor to collect and evaluate available information on the site, including existing chemical data, operational history information, physical characteristics of the site, as well as project team site strategy development summary, project decision statements, as stated in paragraphs in Section 1. of the SOW. This section should be prepared by the team as a whole, with input as appropriate from regulators and the customer.

Note: Evaluation of existing data should consider treatment of data relative to elements discussed in detail under Section 2.4, Sample Analyses, Data Assessment/Validation and Re-

porting and Section 2.5, Data Evaluation/Fate and Transport.
****

2.1.1.1 Review Previous Reports/Data
2.1.1.2 Background Information/Site History
2.1.2 Background Data Collection
2.1.2.1 Literature Searches and Air Photo Survey
2.1.2.2 Interviews

****
This section would require the Contractor to conduct appropriate interviews (most likely by phone) with persons knowledgeable about the site. This section would most likely be prepared by the project manager. Coordination would be required with the installation or facility to develop a starting list of persons to be contacted. Research to identify past employees or others knowledgeable of the site history may be required of the Contractor.
****

2.1.2.3 History of Regulatory, Response Actions

****
It is important that the Contractor gather sufficient information to construct the compliance background for the site, which will be recorded in the project workplan, and other site reports. Here, the Contractor would be tasked to gather enforcement type documents, enforcement orders, ATSDR health assessments, state inspection reports, etc., in describing the regulatory history in the project workplan. The project manager, regulatory specialist, or designee should prepare this section of the SOW, with the input of the installation, if appropriate.
****

2.1.2.4 Domestic/Industrial/Municipal Well, Surface Water Intake Inventory

****
This section would require the Contractor to develop this data group by performing a survey of the existing wells and surface water intakes in the vicinity of the site(s) in accordance with the Domestic/Industrial/Municipal Well Inventory portion of the Geotechnical Requirements (6.5). This section should be developed with input from the hydrogeologist and team member responsible for review of the

risk assessment. This section should require the data be presented in the RI report. This work may require coordination with local utility officials, the installation, and state or local regulatory agencies, such as county health departments or state water resource agencies. This coordination can be entirely delegated to the Contractor.
****

2.1.2.5 Site Boundaries Identification

****
The Contractor should be required to develop a site map through a record search that will help to identify roads and property boundaries and owners. This will help to determine access requirements to the site or other property near the site. The information available would determine the detail of the site map. The Contractor should be tasked to do a survey to better define the site and surrounding area. This tasking should cross reference section 2.3.1 which requires generation of standard survey information and also property lines/boundaries at the site and near the vicinity of the site. The ability to acquire property may alter the alternative selected. Access to the site and surrounding area by the Contractor should be considered when scoping the RI/FS. Long lead times may be required. Rights of entry for access via private lands and roads are necessary and must be obtained by the Government prior to initiation of the field work. In areas of separately owned mineral rights, it may be necessary to obtain separate subsurface rights of entry. There should be a cross reference to the Project Management Section (3.5.2) discussing Government-furnished information if existing survey data and information on access rights are available. Reference to Section 6.1.11 (Site Surveying) may also be appropriate.
****

2.1.3 Preliminary Site Visit
2.1.4 Preparation of Site Background Summary

****
This section requires the information gathered by the Contractor under Section 2.1.2.2, and provided to the Contractor under Section 2.1.2.1. to be summarized in the introductory section of the main workplan. The Contractor should be required to include in this section of the workplan all available data gathered from data review, interviews, and site visits. The summary should include data concerning site history, regulatory status, liability, preliminary risk

analysis, physical features of the site, and nature and extent of chemical contamination. The general workplan introduction section should include elements such as:

- site history,
- physical features of the site,
- known extent of contamination,
- data evaluation of existing chemical data
- findings of any preliminary risk analysis,
- probable remedial alternatives,
- and regulatory status.

This information provides the basis for the site strategy, general project objectives, data quality objectives, and data collection requirements discussion in subsequent sections of the Workplan, and is the single source of background information referenced in the Workplan attachments. Consider the following format:

****

2.1.4.1 Regional Setting
2.1.4.2 Site Physical Description
2.1.4.3 Operational History
2.1.4.4 History of Regulatory Response Act ions
2.1.4.5 Nature and Extent of Contamination
2.1.5 Development of Data Quality Objectives

****

This section should require that site strategy and project specific objectives developed initially by the project planning team be expanded and discussed in the next section of the workplan by the Contractor. This section should reference workplan requirements included in USACE guidance on HTRW technical project planning in specifying Contractor contribution to planning requirements in defining Data Quality Objectives.

Data need categories for the RI/FS, defined as risk, liability, feasibility, and compliance, should be used with project constraints in constructing the framework for formal data quality objectives determination, and selecting the most appropriate data collection program.

In defining specific data groups from data needs, further development of conceptual models will be required, for each data need category. Information regarding level of accept-

able error or uncertainty, and confidence required for each data group shall be discussed by the Contractor in this section in developing the data quality objectives. Statistical analysis shall be used to define quantity and quality of samples required to meet uncertainty requirements.

Each constraint, cost and schedule, program requirements, shall be evaluated and discussed in this section in proposing specific objective statements.
****

2.1.6 Data Collection Design

****
This section should require that the Contractor discuss data collection design requirements in the workplan. The design requirements developed by the USACE team are presented in Tasks 3 and 4 of the SOW. The Contractor may be required to refine or develop the data collection program. The rationale used in devising the data collection program, or the means of achieving the data quality objectives, should be included in the Contractor's workplan.

The project planning team data collection support personnel, or data implementors, will initially define these data collection strategy requirements in tasks 3 and 4 of the SOW. Data collection strategy options include alternative designs in defining quantity of data collected, quality of analytical data, and types of samples required to support data needs within the specified range of confidence and within budget limitations.

Sampling methodology is determined for each data group, considering levels of uncertainty associated with data collection methods, chemical analysis, quantity, and sample location. The level of uncertainty is a function of the error; measurement error, systematic error, and random errors. Selection of the appropriate sampling method, number of samples, in suitable sampling locations, given cost and schedule constraints will reduce the error and/or uncertainty associated with a specific data collection design option. Statistical analysis is a useful, quantifiable method in evaluating the error and uncertainty, and should be used as directed in the HTRW technical project planning guidance in determining the elements for the most appropriate sample collection design program.

The outcome of the data collection options discussion should be to propose a data collection program which will meet spe-

cific data quality objectives for the project. All sample design and analytical requirements, QA/QC specified in defining data quality objectives shall be discussed by the Contractor in sufficient detail in the general project workplan, to allow reviewers to understand the criteria or reasoning used in selecting the specific data collection program. Adequate discussion shall be required in the workplan regarding how data collection design will meet data needs or data quality objectives to 1) allow for adequate evaluation of site risks, 2) alternative screening and development, and design, 3) regulatory compliance, and 4) liability, given project constraints, including the statistical basis for sufficiency, evaluation of uncertainty and specific numerical errors for confidence of data.

The methods by which data collection will be implemented such as sample collection techniques, chemical analyses, and well installation requirements will be described by the Contractor, in detail in the corresponding workplan attachments.
****

2.1.7 Workplan RI/FS Report Requirements Discussion

****
This section of the scope, rather than referencing a guidance document, would require that specific RI/FS report elements be described in the project workplan, and would specify the degree of treatment expected in plan preparation. For example, the project planning team may want the Contractor to indicate in the workplan what is to be included in the Risk Assessment portion of the RI/FS report, such as models used, and pathways evaluated. This added detail will allow the team to determine early on what is expected to be included in the RI/FS report, and to convey those expectations to the Contractor in comments on the plans, rather than by review of the actual reports. General report topics to be evaluated by the Contractor in the Workplan for report preparation include the following subtopics.
****

2.1.7.1 Data Evaluation
2.1.7.2 Nature and Extent of Contamination
2.1.7.3 Fate and Transport
2.1.7.4 Risk Assessment
2.1.7.5 Preliminary Identification of ARARs and Preliminary Remediation Goals (PRGs)

****
This section should require the Contractor to touch base with the regulators at this point to get a feel for any ARARs that may be applied to the site. This meeting or phone call should be coordinated and attended by the project manager, technical manager, or designated representative. Contractors shall not contact customers or regulators directly, without supervision of the USACE manager. Formal records of these discussions, such as a telephone record, and meeting notes, shall be prepared by the Contractor, and made available to USACE project/technical manager within a 10 day period.

Preliminary Remediation Goals are developed by the Contractor in the Project workplan, as general numeric evaluations of acceptable levels of contaminants in site media, based on probable site risks. These are determined by using default values, defined in Part B, of the Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation, and back calculating the allowable concentration, using a target risk value for the media of concern. These values will be used to preliminarily define remediation goals, general quantity of material which may require action, possible alternatives which may be proposed to meet these goals, and general cost of the response action. This step in the workplan preparation is important in providing decision makers with information concerning general site risks and probable response action, early in the study process, focusing resources, data collection, and evaluation efforts on pertinent project risk and design considerations.
****

2.1.7.6 Development of Remedial Alternatives

2.1.8 Preparation of Workplan Attachments

****
The technical requirements for the SSHP, CDAP, MWIP, and treatability study attachments are found in sections 4-6.
****

2.1.8.1 Site Safety and Health Plan (SSHP) Attachment

2.1.8.2 Chemical Data Acquisition Plan (CDAP) Attachment

2.1.8.3 Monitoring Well Installation and Drilling Plan (MWIP) Attachment

2.1.8.4 Community Relation Plan (CRP) Attachment

****
This section requires the Contractor to prepare a CRP attachment to the general workplan. The project manager should consider the sensitivity and political atmosphere of the site, the project, the contamination and the surrounding community when preparing this portion of the scope. EPA guidance can be used to assist the project manager in this task. See EPA Office of Solid Waste and Emergency Response (OSWER) Directive 9230.03B, "Community Relations in Superfund". Cross reference Task 2, Community Relations.
****

2.1.8.5 Treatability Study Workplan Attachment

****
Refer to Enclosure 12 of the ETL for information concerning this plan.
****

2.2 Task 2 Community Relations

****
This section describes the required Contractor support for community relations, and is normally prepared by the project manager and risk assessor. Unless otherwise directed, the customer will take the lead in community relations. Coordinate with the customer to make sure they will take the lead. Ask the customer what level of community relations' support the Contractor will need to provide.
****

2.2.1 Establishment of Repositories

****
This section would outline the Contractor's responsibilities in establishing a document repository. As a note to the team, consider establishing a repository early. A repository is a place, such as the local library or the Corps/installation Public Affairs Office, where the administrative record is kept for public viewing. Do not wait to the last minute to scope this requirement. In the first scope, the project manager should at least start the Contractor on looking at the requirements and physical location of the repository. For NPL sites under the Superfund program, guidance by the EPA should be followed. The project manager would be best to develop this section in conjunction with the installation, if appropriate.
****

2.2.2 Preparation of Community Relations Support

****
The community relations support required by the Contractor can vary. The project manager needs to coordinate with the customer as to the level of support needed. The requirements should be clearly identified in the scope of work and clarified with the customer. A list of items for community relations activities and requirements are identified in the OSWER Directive identified in the above paragraph on community Relation Plan attachment to the project workplan. For CERCLA community relations requirements it is recommended that the OSWER Directive be used. This handbook was issued as policy and guidance for community relations in the Superfund program. This document identifies the requirements for community relations for various activities that may be conducted under this scope and is a good tool to identify what support may be needed from the Contractor and for a project to be a success.
****

2.2.3 Preparation of Responsiveness Summary

****
One item that may be required of the Contractor after the public meeting is a Responsiveness Summary. This should be coordinated with the customer and identified in the scope. This document provides responses to each of the significant comments, criticisms, and any new data submitted.
****

2.3 Task 3 Field Investigations

****
This section of the SOW should present specific information on the quantity and location(s) for various field activities and chemical sampling, based on the data collection options considered in defining project DQOs. Specifications for actual implementation of the activities are presented in sections 4-7 of the SOW (Health and Safety, Chemistry, Geotechnical, and Air). Requirements in this section of the SOW generally should be cross referenced to the other sections relating to the Data Quality Objectives. Additional cross references are noted under the specific activities.

NOT ALL ACTIVITIES listed here are appropriate for every project. The information on quantities is required for the preparation of the Government Estimate and the Contractor's proposal.

The primary consideration during the evaluation and selection of any sampling method should be whether the particular method allows data to be obtained that are representative of the actual environmental conditions. Secondary issues to be considered during the review of potential sampling methods include compatibility with available analytical methods, compatibility with existing site conditions, method reliability, method versatility, logistical considerations, health and safety considerations, and cost.

Intrusive sampling introduces both systematic and random error into the data. Selection of the appropriate sampling method will reduce the introduction of systematic error, while establishment of and strict adherence to quality assurance and quality control criteria will reduce the introduction of random error. Typically, the uncertainty introduced as a result of the means and methods used to collect the sample exceeds the uncertainty introduced as a result of sample analysis. Therefore, care should be taken to consider only those sampling methods that will yield the most representative data set for the site.

Location of sampling is a critical factor in determining the representativeness of the data. Four basic approaches are generally used to determine the physical location of samples collected from environmental media, which are:

- Haphazard sampling
- Judgmental sampling
- Statistical sampling
- Geostatistical sampling.

Haphazard sampling entails the collection of samples at locations convenient to the sample collector, and the objectives developed for the project can be met by obtaining data from most any location at the site.

Judgmental sampling approaches uses technical expertise to determine the most appropriate sampling location, based on operational history, visual survey, and previous sampling.

There are three approaches which can be used in determining appropriate sample locations for statistically based sampling. These are simple random sampling, stratified random

sampling and systematic random sampling. Each method has an uncertainty or error associated with it. Uncertainty or error can be reduced by increased sampling effort, but this increases cost.

Geostatistical sampling design takes advantage of available knowledge of the spatial variability of the parameter of interest to estimate the optimum spacing distance between sample, and the optimal geometry of the sampling grid.

When selecting the most appropriate method to determine sampling locations and the number of samples to be collected from a specific sample media, the following should be considered: the acceptable error as previously identified, the cost available for sampling, and the time required for sample collection and analysis. Additionally, background sampling requirements should account for natural variability of certain parameters.

The number of samples is dependent upon the use of the data to complete the engineering and scientific evaluations specified as data needs. Evaluation of numbers of samples may be based either on expert judgment or statistical analysis. This determination should be coordinated with the project hydrogeologist and a statistician. The statistical basis for the number of samples required is dependent upon the acceptable uncertainty and the selected level of confidence in the data. As described previously, the level of uncertainty is determined by the random and systematic error associated with the data. The selected level of confidence refers to the likelihood that measured value will fall within a specified range from the average value. The level of confidence obtained is a function of the number of samples collected. Equations used to determine the statistically based minimum number of samples required are included in the USACE project planning guidance.

Critical samples are those samples which must be taken in order to fill a data need or a particular objective. These may be, for example, samples collected to prove compliance with a regulatory action level or collected to allow a statistical assessment of the extent of contamination or to provide background or upgradient information. Particular care must be taken to identify critical samples during the design and implementation of the data collection program to ensure that critical samples are obtained in the manner prescribed within the workplans. This includes (1) assuring the sample is representative of the medium of interest, (2) assuring the sample is taken in a manner which maintains the integrity of

the sample and any analytes of interest, and (3) assuring the results are within the prescribed limits of uncertainty for the designated critical samples to allow the project objectives to be attained.

The rationale for the selection of a specific sampling scheme should be discussed for each environmental media or data group defined in the SOW by the responsible project planning team member. By presenting data collection design requirements for at least some of the locations, the Corps reduces the probable number of technical comments on the Contractor's workplan or proposal, because the Contractor will already know what quality, at a minimum, the Corps expects.

If the project contains more than one site, each of the sites should be addressed separately in this section. This encourages the Contractor to develop a proposal based on site-by-site work which allows the customer to see what each site is costing and adjust priorities accordingly. A "project" is defined as the total work to be addressed in the SOW. A "site" is defined here as a geographic study area that is distinct from others based on site history, contamination, or regulatory definition (e.g. solid waste management unit).

Note: The performance of these activities will require considerable coordination between the Corps, the land owner/installation, and local utilities, as discussed in the technical requirements of the SOW. Depending on the nature of the involvement of the regulators (as specified in a Federal Facility Agreement), these requirements may need to be coordinated with them as well. The responsibility for coordination to be accepted by the Contractor must be clearly spelled out under the Project Management Section. Specific coordination requirements are discussed under the individual activities.
****

2.3.1 Site Topographic and Boundary Surveys

****
This section should describe the surveying required to support the field work, including only the type of survey and area to be surveyed. Refer to the detailed requirements under Surveying in Section 6.1.11 of this SOW. This section would be developed with input from the project manager and surveyor. Coordination may be required with the installation, landowner, or EPA, as appropriate, to see if

any of the topographic data is currently available. May also consider contacting the state and U.S. Geological Survey for any available existing data. This section should also identify the need to determine property lines and owners. There should be a cross reference to the Project Management Section. That section should discuss what existing survey data will be furnished by the Government, if it is available, as well as describe current and planned access rights.
****

2.3.2 Geophysical Surveys

****
This section describes the required surface or downhole geophysics to be performed. Primarily, this section should describe the rationale of any geophysical work, in how it meets specific data needs. This section could present the areas/locations to be surveyed; the type(s) of geophysical survey instruments, if known, and the spacing of survey lines, the length of lines or depth of the logs. This section should be developed by the hydrogeologist and/or a geophysicist. Flexibility is recommended in the SOW. Allow the Contractor some input based on his/her experience and capability. The Contractor should be required to propose details in the appropriate plan.
****

2.3.3 Soil Gas Sampling

****
This section should describe the number, depth, and locations of the soil gas samples as well as the rationale of the sampling. The section should also generally define the chemical analyses required for the soil gas samples. Th scope should provide for some flexibility based on the Contractor's capability and experience. This section should be developed by the chemist and hydrogeologist, with specification of data needs by data users.
****

2.3.4 Drum/Tank Sampling

****
This section should describe the number of samples to be taken, the locations of the tanks/drums, and means for selecting drums for sampling this data group. It should also describe the appropriate chemical analyses (both lab and field). This should be prepared with input from the data users, and data implementors, the chemists. Because of the

safety hazards inherent in drum sampling, input should be provided with regard to health and safety and compliance requirements. The section should reference the Health and Safety Requirements (section 4.). A site visit to observe the drums prior to scoping this activity would be very useful. The scope should describe the historical contents, tank construction materials, and any other data useful to the Contractor.
****

2.3.5 Surface Soil Sampling

****
This section should define the number and locations of the surface soil samples as well as rationale, and required analyses, using the methodology or criteria defined generally in Section 2.3, and the USACE Project Planning guidance document. Any required compositing should be described. If very discrete samples are to be taken, the depth of the samples should also be specified. This section should be prepared with input from the data users such as the risk assessor, design engineer, and industrial hygienist, as well as data implementors such as the chemist, and hydrogeologist. If known, any surface obstructions to sampling should be noted. Sampling of background conditions is strongly recommended whenever sampling soil.
****

2.3.6 Surface Water/Lagoon Sampling

****
This section should specify the rationale for and the number, locations, and depth of surface water or sediment sampling, as well as the required analyses in meeting specific data needs and project objectives. Requirements for sampling water and sediment in sewer systems may be appropriate and would be best quantified here. The flow conditions under which samples are to be taken from surface water or sewers, if applicable, should be described. Any compositing or field screening should also be described. The data users will define the data needed, and the data implementors will advise on the methods to attain data, such as the chemist, industrial hygienist, hydrologist, aquatic biology expert, and process engineer may also be appropriate, such as methodology for sampling a stream, river, waste lagoon or pond. Additionally, project team should seek advise from site decision makers and data users including ecological regulatory experts, for criteria and analyses requirements, so that sampling supports decisions required. Activities may

require coordination with owner or installation if activities are on-going at the lagoon or if there are regulated discharges to the stream/pond. May want to require the Contractor to investigate these outside impacts during preparation of the workplans. Sampling of background/upstream conditions is strongly recommended.
****

2.3.7 Leachate Sampling

****
This section should specify the rationale, number and locations of leachate sampling, as well as the required analyses. The weather conditions and flow rates under which samples are to be taken, if applicable, should be described. Any compositing or field screening may also be described here. Input should be sought from the data user and the data implementors, the chemist and hydrogeologist; however, if sampling around an impoundment or landfill, input or data needs should be identified by a geotechnical engineer as appropriate.
****

2.3.8 Subsurface Soil Sampling

****
This section should specify the rationale for number, locations, and depth of soil borings drilled to obtain chemical and geotechnical information and samples. The quantity can be specified based on total drilled footage, average depth, or specified depths for each hole. This drilling can be combined with well installation under the monitoring well or aquifer testing activities, but the writer must check that the drilling is not specified again under those sections by carefully cross referencing. Any geotechnical testing or sampling should be described. Analytical requirements, both chemical and geotechnical must be stated. Sampling of background conditions is strongly recommended whenever sampling soils.

Input should be sought from the data users, the risk assessor and the industrial hygienist, and geotechnical engineer, as well data implementors such hydrogeologist and chemist, to determine placement, depth, and sampling requirements. Note any site access problems that may affect the use of a drill rig or note any surface obstructions which may affect the use of a hand/power auger. Coordinate with the installation or land owner to identify any unusual conflicts with utilities.

The writer should be aware that the Contractor typically has the responsibility to coordinate and obtain utility clearances but not access rights.
****

2.3.8.1 Soil Borings

2.3.8.1.1 Geotechnical Analyses

****
This section should describe the frequency or depth of geotechnical sampling and the types of lab analyses to be performed as well as the rationale. This input normally is provided by the data user; the design geotechnical engineer or, on occasion, by the hydrogeologist.
****

2.3.8.1.2 Chemical Analyses

2.3.8.2 Test Pits

****
As suggested previously, provide general criteria suggesting why this method of sampling should be used over conventional sampling methods, and how it may be used to support data needs and the site decision.
This section should specify the rationale for and the number, locations, and length/depth of test pits excavated to obtain chemical and geotechnical information and samples. The quantity can be specified based on acceptable uncertainty, for evaluating total excavated volume or footage, average depth, or specified depths for each pit. On occasion, if the pits are excavated to the water table, the work can be combined with well installation under the monitoring well or aquifer testing activities. Again, assure the work is not specified again under those sections by carefully cross referencing. Any geotechnical testing or sampling should be described. Analytical requirements, both chemical and geotechnical must be stated.

Input should be sought from data users, industrial hygienist, and geotechnical engineer and data implementors such as the hydrogeologist and chemist. Note any site access problems that may eliminate possible effective use of a backhoe or excavator. Note any subsurface obstructions which may affect the choice of the excavator. Coordinate with the installation or landowner to identify any unusual conflicts with utilities. Note that the Contractor typically has the responsibility to coordinate and obtain utility clearances but not access rights.
****

2.3.8.2.1 Sidewall/Bucket Sampling

****
Specify where the sampling is to be performed. In some cases, sidewall sampling by personnel who enter the trench may be appropriate, but in other cases, sampling from the backhoe bucket may be adequate. Input should be sought from the data user, such as the risk assessor, and the industrial hygienist, and the data implementors including the chemist and hydrogeologist.
****

2.3.8.2.2 Chemical Analyses
2.3.8.2.3 Geotechnical Samples

****
See discussion under the Subsurface Soil Sampling Section.

****

2.3.9 Fracture Trace Analyses

****
This section requires a study of air photos or even satellite imagery for possible fracture-fault-joint orientation and frequency. These features can affect the flow of ground water and thus this study may suggest well placement. This section should only define the area to be studied and, if appropriate, should discuss the available imagery to be used. This section may also require the field measurement of strike and dip of fractures, joints, faults, foliations, etc. to verify features identified on the imagery. This section would be developed by the data user and data implementor, which in this case would be the hydrogeologist. This work would be done early in the study and may require its own submittal prior to submittal of the overall workplans. Coordination may be required with military agencies, Department of Agriculture, and EPA, to obtain air photos of past or current sites.
****

2.3.10 Monitoring Well Installation and Sampling

****
This section describes the rationale for and the number, location, and depth of wells to be installed at the site. It also requires the frequency of well sampling and water level measurement and the performance of single well aquifer testing. Finally, it specifies the analytical tests to be

performed on the ground water samples. It can also specify number, location, and depth of soil samples to be taken for chemical and geotechnical analyses, if the drilling is not already covered under 6.3 Subsurface Soil/Rock Sampling. Note this section should be carefully cross-referenced with the Subsurface Soil/Rock Sampling Section (6.3) to avoid duplication of work. This work should be cross referenced with the Fracture Trace Analysis Section since, in some cases, the well locations will be proposed based on the results of the analysis.

This section is developed based on close coordination between the data users, such as the risk assessor and designer, and the data implementors such as the hydrogeologist and chemist. Additionally, project team should seek advise from decision makers including regulatory agencies for criteria and analyses requirements, so that appropriate data needs may be specified which support site decisions. Coordination may also be required with the state regulators, if the well installation requires permits. This responsibility is normally assigned to the Contractor but not access rights.
****

2.3.11 Air Sampling

****

This section should describe the rationale and requirements for sampling the air at the site. Air sampling during field investigations may have various purposes. Among these are determination of background concentrations of airborne contaminants at undisturbed sites and determination of emission rates from various remedial activities and alternatives. After considering data needs and uses, this section should include requirements for sample locations (i.e., source, perimeter, receptor, etc.), numbers, frequency, duration, and analytical parameters. Any special instructions specific to the site, such as the time of sampling relative to weather and wind conditions, site operation schedule, etc. should be discussed. This section should not be used to define air monitoring requirements for worker safety and health as those are addressed in the SSHP. Requirements for meteorological monitoring, if any, should also be described here.

This section should be developed by the chemist, the industrial hygienist, the risk assessor, process engineer, and possibly a meteorologist. It should be carefully cross referenced with the analytical procedures in section 2.4 as

well as additional requirements in the chemistry and air sections (5 and 7) to avoid duplication.
****

2.3.12 Wipe Samples

****
The number of wipe samples and locations or general surfaces to be wiped should be defined here. The analysis of the wipe samples should be specified. This section should be developed based on input from the risk assessor, and industrial hygienist, with the coordination of the chemist.
****

2.3.13 Infiltration Testing

****
The number and locations (optional) of infiltration tests should be specified. This section should be developed based on data needs identified by the hydrogeologist, the geotechnical engineer, and other personnel involved in the review of the risk assessment (since infiltration rates may affect the risk assessment).
****

2.3.14 Vadose Zone Permeability Testing

****
This section would describe the number of unsaturated soil in-situ air permeability tests and prescribe certain locations as well as the rationale for sampling. There is a broad range of tests to this end which require different levels of effort. If the type of test varies from site to site, the type of test should be defined. This section could be developed by the hydrogeologist, but engineers familiar with soil vapor extraction should have input. This section should be cross referenced with the data needs defined in the section on treatability studies (2.9) since the data gathered may affect or overlap the results of certain treatability studies. It should also be cross referenced with the section on air sampling, if the air quality impacts of the test are of interest, and fate and transport sections if modeling is required.
****

2.3.15 Tracer Studies

****
This section should define the number, locations, and rationale of any tracer tests to be performed. The purpose of these tests should be carefully described, and may include development of dispersivity values, verification of ground water flow path and rate, or investigation of potentially leaking utilities. If chemical analyses are required as part of monitoring the tests, these should be coordinated with the chemist and cross referenced to the Analytical Procedures Section (2.4.2). If the tracer tests use soil gas measurements as a monitoring process, then this section should cross reference to the Soil Gas Section (2.4.2.7).
****

2.3.16 Aquifer Tests

****
This section should define the number, locations and rationale of multi-well aquifer tests to be performed at the site, as well as the number, frequency, and analyses of chemical samples of the discharged water over the course of the tests. Because of the frequency and number of samples to be analyzed in some cases, it may be appropriate to specify the establishment of an on-site lab in this section. This would require careful cross-referencing with the section on Sample Analyses, Data Assessment and Reporting (2.4) to clarify the numbers of samples for on-site versus fixed lab analyses as well as the appropriate QA/QC. The majority of this section would be prepared by the hydrogeologist with in put from the data users; however, close coordination between the chemist and hydrogeologist may be necessary depending on the level of effort in sampling. As discussed under Geotechnical Requirements (Section 6), this activity may require coordination with the installation, a local treatment plant, or the regulators, depending on the mode of pump test water discharge, and the importance of the impact of other nearby activities, such as production well use. Note again that this activity can generate large volumes of possibly contaminated water that must be treated and/or disposed of.
****

2.3.17 Imminent Threats to Human Health or the Environment

****
This section should state that if the Contractor, during performance of field work, notes conditions at the site that pose an imminent threat to public health or the environment, the Contractor is instructed to immediately take initial re-

sponse actions and bring the situation to the attention of the Contracting Officer. USACE will be responsible for contacting EPA, state, and local authorities.
****

2.4 Task 4 Sample Analyses, Data Assessment/Validation and Reporting

****
The Sample Analyses, Data Assessment/Validation and Reporting Section of the SOW should include as much site-specific information as is possible. It is important for the Contractor to obtain adequate guidance as to what is expected in all phases of the project. As with information outlined in all tasks of the SOW, an interdisciplinary approach is necessary for a cohesive contract document to be generated. The project chemist must collaborate with the data users in formulating the appropriate analytical requirements to meet data quality objectives, based on acceptable uncertainty associated with sampling, and project constraints, for the data collection design.

The selection of the appropriate analytical method is critical to generation of a data set that will meet data needs to support site decisions. Data that is representative of both the type of contaminant and the contaminant levels in the sample to meet data needs should be evaluated. The following factors should be considered by the team during their review and section of methods to analyze samples collected at the site:

- -contaminants of interest
- -sample media
- -likely range of contaminant concentration
- -analytical turnaround time
- -identification or quantification or both required
- -required quantitation limit
- -cost

Quantitative analysis also introduces both systematic and random error into the data. Selection of the appropriate analytical method will reduce the introduction of systematic error, while establishment of and strict adherence to QA/QC criteria will reduce the amount of random error introduced. The team should consult USACE project planning guidance in choosing the appropriate analytical methods. The guidance includes each method's possible use and applicable precision and accuracy performance criteria.

The type of samples collected can be discrete or composite samples, dependent on the intent of the data and representativeness of the medium sampled. Composite sampling can result in the non-detection (false negative) of low concentration of analytes or compounds, due to dilution factors introduced.

Precision, accuracy, representativeness, completeness, and comparability (PARCC), are used to measure the quality of data obtained from sampling. The level of precision, or random error associated with a given set of measurements, calculated using standard deviation or relative percent difference in replicate analysis, is determined by the objectives of the project. Precision is commonly controlled by taking a sufficient number of samples, including replicates.

Accuracy is the estimate of the relative agreement of the measured value with true or expected value. Accuracy is controlled by prescribing appropriate sampling procedures, sample handling (including preservation) and analytical procedures. In addition, strict adherence to standard operating procedures during sampling and analysis, and avoiding field cross-contamination by implementation of thorough decontamination procedures.

Representativeness is the degree to which data accurately and precisely portrays the environmental condition being studied.

Completeness is the estimate of the number of valid measurements made as compared to the total number of measurements performed. The level of completeness required for a given set of data is determined by the number of valid measurements that must be obtained to satisfy the data use.

Comparability is the qualitative estimate of the relative confidence with which the data obtained from one set of measurements may be compared to data from another set of measurements. The degree of comparability is directly related to the precision, accuracy, and representativeness of the data in each set. The team should evaluate these factors that are likely to contribute to systematic and random error of the data and select appropriate methods that allow collection of the type, quality, and quantity of data need to support site decisions.

Once the specific data collection program is selected, the chemist should assist in defining the implementation requirements, for data collection and analysis for incorporation within the workplan attachments (CDAP). Additional informa-

tion on implementation requirements are provided in greater detail in Enclosure 13 to the ETL.

The Contractor represents an expert source of information in HTRW investigations and should develop an interactive communication with the USACE project team during negotiations and through execution of the RI/FS. The USACE project team must decide what level of flexibility the Contractor will have with respect to each aspect of the project. If a multi-site RI/FS is being developed, each site should be addressed separately within this section with individual tables prepared outlining sample types and quantities, corresponding analytical specifications which were devised from the data collection design analysis, and associated statistical variables. An example and suggested format for these tables are located within the project planning guidance (Completed Data Collection Option Array). Additional frequency tables may be prepared outlining a summary of field samples and field generated QA/QC sample numbers for the individual sites and / or the project as a whole. This serves a dual purpose of clarifying what is required of the Contractor at each site, and making negotiations more manageable. Quite often, the customer will also require project cost breakdown on a site-by-site basis.

General chemistry workplan attachment (CDAP) requirements are outlined in the technical requirements section (5) to this SOW. A detailed discussion of the implementation requirements is located within Enclosure 13 to the ETL. Work specified in this section of the SOW must be appropriately addressed in subsequent Contractor submittals. The review of submittals to assure project goals are being met is a duty of the USACE project team.
****

2.4.1 Data Review and Assessment/Validation

****
This section should specify functional guidelines for data review and assessment/validation for determining new data collection requirements which the Contractor is responsible to perform. A detailed explanation of Data Evaluation as opposed to Data Assessment/Validation requirements for evaluation of data are included in Task 5 Section 2.5, "Data Evaluation/Fate and Transport". The following specifications for data assessment/validation is as it applies to new data collection design considerations.

The chemist, based on project-specific data needs defined by data users, should develop and describe within the SOW the acceptable PARCC parameters for data assessment, as it applies to new data collection design considerations. These criteria should be defined based on data user requirements. The project designer, regulatory compliance specialist, and risk assessor should define the data needs to be addressed by data collection design specifications in this section. The chemist may collaborate with the data users to ensure data needs established are complete. Input on other potential contaminants based upon operations and disposal practices, contaminant breakdown products, and/or contaminant physical characteristics which may effect mobility may be suggested when defining the overall data needs.
****

2.4.1.1 Existing Analytical Data

****
Existing data review and assessment/validation are critical interdisciplinary areas within the SOW. When developing requirements for data to be collected for a project, the data needs must be reviewed relative to existing data, in determining whether data may be reused and/or supplemented if appropriate, when specifying Contractor requirements to generate new data. The USACE project team should compile available data to help make determinations of usability of existing data relative to identified data needs, avoiding a duplication of effort, minimizing costs, and time associated with collection of data. This information should be summarized in section 1. of the scope.

The project chemist, risk assessor, hydrogeologist, and process engineer jointly review past data, given the intended level of confidence required, quality expected, in verifying whether it meets DQOs, subsequently identifying any data gaps, in defining additional data required. The project team can then specify additional data needs with the most efficient utilization of resources.

The Contractor is required in this section to summarize this review and evaluation within the project workplan, attachments, and subsequent reports. In some cases, the Contractor may be tasked to conduct the data evaluation initially in the project workplan, for review and approval of the project planning team, in devising new data collection requirements. For either case, whether USACE project planning team, or Contractor conduct the data evaluation of existing data, in most

situations, the Contractor is tasked to thoroughly search for and review existing site data.

Existing analytical data will be reviewed for it's usability based upon the project DQOs. In the event sufficient information does not accompany the background data for this assessment, it may be used qualitatively to identify contaminants of concern, narrow or expand future analytical protocols, or direct sample acquisition. This section should include project requirements for acceptable existing analytical data. Define PARCC parameters for each end-use of data (see tasks 5, 6, 7, and 8). Instructions should be cross-referenced from Sections 2.1, and Section 2.4.1 and Section 2.5. Task the Contractor to submit details on required data review to be conducted on existing analytical data in the Project Workplan, with implementation requirements specified in the CDAP attachment.

Background data may be obtained from EPA technical and enforcement files, state/local regulatory agency files, U.S. Geological Survey files, government installations, and other relevant sources in order to describe the current situation at the site(s). Preliminary data collected should be confirmed by on-site observations. A site walkover clarifies current site conditions compared to conditions during previous investigations. Often sites are manipulated or altered subsequent to studies. Quality of data should be analyzed to determine its usability. Some factors to consider in addition to project specific DQOs, when reviewing the quality of data includes: age of the data, procedures and documentation.

The uncertainty associated with available data and whether proposed project activities will supplement this data should be specified in the SOW, for workplan preparation and report generation, defined by Data Quality Objectives, and specific data needs.
****

2.4.1.2 New Data

****
This section should define guidelines for the appropriate analytical levels to be used for data collection design for new data collected during the project and corresponding PARCC parameters which will indicate acceptable data quality based upon the identified data needs. Data users will define data needs for each site with considerations for tasks #6, 7, and 8. The Contractor is tasked to propose data review and

assessment/validation details in the Project Workplan, with implementation requirements included in the CDAP.

Once the project technical staff has determined general site strategy, project objectives, acceptable uncertainty and data needs as identified by the data users, the chemist should specify the analytical method design requirements. Each of the following factors shall be considered in designating each analytical parameter: (1) Levels of acceptable precision, accuracy, representativeness, completeness, and comparability (PARCC parameters), (2) required quantitation limits/sensitivity, (3) determine completeness requirements for identified critical data, (4) data assessment / validation requirements, and (5) the format for data presentation. In some cases, the precision and accuracy criteria published within the analytical methods may be sufficient for the data need and should be referenced for each analytical method specified, rather than stated in their entirety. Specify the applicable quality control tables from within the methods for criteria to be maintained during sample analysis. For methods which do not publish quality control criteria or if more stringent criteria than what is published is desired, the chemist should specify the criteria to be maintained individually. Guidance on this subject may be obtained from the USACE project planning guidance, as well as referenced directly from SW-846 chapter one, and Contract Laboratory Program (CLP). Data users will help define specific features of data needs including allowable quantitation limits, and quality of data required, and the chemist should verify the specified methods which are applicable and are able to confidently achieve quantitation limits below the contaminant levels. The SOW should state which qualifiers on data (i.e. PARCC parameters) can invalidate the use of certain data, (see section on Data Usability under task 5).
****

2.4.2 Analytical Procedures

****
The following sections of the SOW will outline specific analytical protocols to be followed on a site-specific basis for each data group. Tables should also be generated by the chemist to summarize this information. The Contractor will summarize each of these subsections in the CDAP attachment to the workplan.

Before developing this section of the SOW, the chemist should be provided information from the data users, for data needed such as what contaminant he/she wants to detect (i.e. metals,

PCBs, volatiles), acceptable uncertainty, what detection limits are needed (%, ppm, ppb), and what matrix type, data group, will be sampled on a site by site basis for the entire RI/FS. Factors to be considered in selecting an analytical method for a specific data need include specificity, sensitivity, variability, accuracy, analytical measurement error, cost, necessary equipment, time, skill level, QC, and required documentation.

The Chemist should specify analytical procedures as needed and cite the appropriate references and methods required. The chemist should also specify whether field screening techniques or mobile laboratories/on-site analyses will be used. This section specifically identifies the criteria for each analyses on a site and matrix-specific, data group basis. Actual numbers of samples specified for each sampling location are discussed under Task 3 Field Investigations. The project chemist should generate tables summarizing information stated in this section of the SOW. An example and suggested format for these tables are located within the project planning guidance (Completed Data Collection Option Array).

The rationale for SOW instructions on analytical procedures must be included in this section. The project planning methodology used in constructing DQOs, is critical in determining fact in any text describing rationale. The Contractor will be required to reiterate DQOs in subsequent deliverables, when describing analytical methods chosen, evaluating data collected, expected quality, acceptable uncertainty, confidence required, and sampling collection and analysis protocols.

The chemist should add detail to other applicable sections of this task related to each analytical procedure. The Contractor is responsible for reviewing and adding input in this section of the SOW thereby assuring the goals of the RI/FS will be met. The chemist and project technical staff must carefully review Contractor suggestions based upon professional judgement.
****

2.4.2.1 Field Screening

****
This section should define field screening methods to be used in support of sample design, for the RI/FS. The chemist and geologist should propose acceptable methods to the Contractor. A Contractor may also be given latitude to propose

field screening applications. The Contractor must summarize all field screening in the CDAP for review and approval. Care should be taken to confirm the acceptability of the proposed screening methods with regulatory interests.

Field screening is primarily used to provide indications of contamination at analytical levels I and II. Decisions based on these results are usually qualitative in many circumstances. Results of field screening are usually used to design judgmental soil sampling options in focusing on specific areas of contamination or "hot spots", to screen samples for chemical analysis requirements, or as a source of additional sample monitoring information.

Proper field screening techniques can be instrumental in reducing the time it takes to perform an RI/FS, reduce costs, reduce "intrusive" sampling locations, and, in general, lead to more effective use of level III and IV analyses. Field methods and field test kit examples are as follows: soil gas, organic screening (HNU,, OVA), metals screening (geophysical, X-ray fluorescence), PCB/PCP test kits.
****

2.4.2.2 Water

****
The chemist should consult with the project technical staff and specific data users to develop an appropriate analytical protocol as it pertains to water matrices in order to meet the project objectives as established by the data users. Reference previous sections in this ETL over Project Planning Overview and Objectives and the USACE project planning guidance for input on formulating project objectives. Once the objectives are established, the chemist consults with the data users to formulate the most appropriate analytical protocol to fulfill the data needs. Water analyses often deal with trace levels, therefore it is critical that data needs of the data quality objectives associated with various water analyses be clearly stated in the SOW.

Data needs to meet compliance requirements should be evaluated closely. There are more ARARs for groundwater and surface water than any other environmental matrix. Additionally, data needs to support risk assessment, evaluated relative to toxicity reference concentrations, those levels applicable for effective evaluation of risk, should be considered when selecting analytical methods.

Water quality parameters, such as total dissolved solids,

chloride, sulfates, and carbonates may also be identified as a data need for specific design considerations, and toxicity evaluation, and fate and transport. These parameters are important in defining water resource quality and subsequent risk analysis and regulatory requirements. Later treatability studies data needs for water samples may also require the chemist to include water quality criteria evaluation during the RI/FS process. The chemist should consult with' a process engineer.

The chemist should be aware that the results of the metals analyses of filtered versus unfiltered water samples often come under scrutiny. Specific data needs in this regard should be identified by the data users; however, it is often advisable to run a percentage of samples for both filtered and unfiltered metals samples in order to eliminate inadequate results later during data interpretation. Consult with the risk specialist, regulatory specialist, and designer before settling on a program of metals evaluation in groundwater samples.

Data needs for chemicals/products resulting from degradation/removal mechanisms such as biodegradation, photolysis, chemical reactions, and radioactive decay may have to be considered in analytical method selection and sampling requirements.

The chemist should also be aware that testing of drilling or other source water may be necessary. Consult with the geologist and reference Section 6.1.8 to determine whether water will be used during drilling operations.
****

2.4.2.2.1 Surface Water Samples
2.4.2.2.2 Ground Water Samples
2.4.2.3 Soils/Sediments/Sludges

****
The chemist should be supplied with information regarding the specific data need, after consulting with the project technical staff and specific data users to develop an appropriate analytical protocol as it pertains to soil, sediment and sludge matrices. Background sample analysis is critical to every RI/FS, the data user and the chemist should make certain these samples are collected and analyzed on a site-specific basis. In some instances, an installation-specific collection of background soil samples may be appropriate. Decision makers, regulators must be

consulted for each installation to determine the most appropriate approach.

Data needs for chemicals/products resulting from degradation/removal mechanisms such as biodegradation, photolysis, chemical reactions, and radioactive decay may have to be considered in analytical method selection and sampling requirements.
****

2.4.2.4 Drum Samples

****
Analytical protocols for drums must be based on data needs defined by regulatory specialists, and designers from background accounts of suspected contents, for disposition, and applicable regulatory compliance specifications. Past records or information should prove useful, and should be reviewed by the project team in defining data needs. Based on remediation/design data needs, if the waste is to be moved off-site, RCRA characterization should be performed. Used oil, or PCB-containing waste may require other analytical approaches. The projected design or remediation data needs for the drummed contents should be identified for the chemist to develop the analytical approach. Compatibility testing may be chosen based upon bulking options. Field screening with supplemental off-site laboratory disposal analyses are two considerations for implementing the analytical program for drums.

Data needs defined by the project regulatory expert should be obtained to assist the chemist in decisions regarding drum analytical protocols. The analytical test to be run may fully depend on the design needs or ultimate fate of the waste. The Contractor should be given liberal input in this aspect of the RI/FS.
****

2.4.2.5 Wipe Samples

****
Wipe sampling is often incorporated in project specifications to determine if buildings, containers, or structures are contaminated prior to demolition/removal. If this is appropriate for the project, data users should review the past history of the site to determine data needs and the chemical parameters of interest. The risk assessor and industrial hygienist should be consulted as to data needs

such as potential analytical concerns and probable sample numbers necessary to characterize contamination in each specific application. The Contractor typically proposes, pending review and approval, the specific procedure to collect and analyze each wipe sample.

The data users should be aware that wipe sampling action levels exist for PCBs. However, it may not be clear what solvent / liquid media type is appropriate for various wipe-sampling schemes. This is dependent on the individual wipe samples' required analysis. The data users should rely on the chemist and appropriate laboratory personnel to decide the appropriate liquid media to be used with that wipe. It is necessary to supply the laboratory with individual wipes for each analytical parameter to be run, as well as, sending a blank wipe sample for each parameter to allow quantification of any interferences from the filter (or gauze) or the liquid media used.
****

2.4.2.6 Air Samples

****
This section should describe the rationale and requirements for use of specific analytical methods for air. As stated in section 2.3.11, air sampling during field investigations may have various purposes. Among these are determination of background concentrations of airborne contaminants at undisturbed sites and determination of emission rates from various remedial activities and alternatives. Concerns generally focus on gaseous emissions of volatile and semivolatile organics and particulate emissions of semivolatile organics and inorganics. Methods should be chosen after considering data needs and uses. Methods may include both field screening techniques and in-depth laboratory analyses. Since many methods describe requirements for sample collection in addition to analytical procedures, this section should be carefully cross referenced with section 2.3.11 as well as additional methodology requirements in the chemistry and air technical sections (5 and 7).

This section should be prepared by the chemist with input from the industrial hygienist, the risk assessor, process engineer, and possibly an air monitoring expert and meteorologist.

Air monitoring with health and safety applications is defined by the industrial hygienist. The chemist and industrial

hygienist must work closely to assure all air sampling protocols are appropriately detailed in the SOW.
****

2.4.2.7 Soil Gas

****
Soil gas analytical methods may be incorporated into a sampling scheme to determine the presence of volatile organics in the soil pores. Soil gas surveys are typically used to supplement or direct conventional soil and groundwater sampling and analyses data needs. It is not useful quantitatively to solely determine regulatory compliance nor does it serve risk assessment data needs. Reference section 2.3 Field Investigations for details on the effort required for soil gas sampling. The utility of soil gas analytical methods vary depending upon the nature of the contaminant and the environment at a particular site. The chemist and hydrogeologist should collaborate in determining the pros and cons associated with available soil gas options, based on identified resources available, the application to data need, extent of soil gas sampling to occur at the site, and the level of analytical testing best serving the RI/FS process.

Contractors should have significant input in proposing soil gas analytical approaches based on capabilities in-house or which may be subcontracted.

The chemist should be aware that compound-specific analyses are available compared to total analyses. If compound-specific analyses are being performed on-site, the chemist should consider specifying off-site laboratory confirmation at some frequency.
****

2.4.3 Quality Assurance/Quality Control Samples

****
USACE ER 1110-1-263 requires that Field Quality Assurance (QA) and Quality Control (QC) replicate samples be collected and analyzed by the government QA and the contract laboratories, respectively. In addition to the QC replicate mentioned above, other QC samples may include field (equipment) blanks, trip blanks, etc. This section of the SOW must state the QA/QC requirements for the project on site by site basis. The chemist should provide the information in a tabular form. The Contractor must also summarize this information in the CDAP.

When evaluating the levels of QA/QC for an RI/FS, the chemist must clearly keep in mind the project data needs and DQOs. QA/QC varies dramatically depending upon analytical level (I, II, III, IV,or V) of the analysis selected.

As outlined in Enclosure 13, a pre-draft data package will be submitted to the QA laboratory for generation of the Chemical Quality Assurance Report (CQAR). This includes a comparison of the data generated from the Contractor's QC and the USACE QA laboratories and an assessment of the QC maintained during the analyses. In order to complete the CQAR, the QA laboratory reviews the internal quality control and method requirements, providing a preliminary determination on the usability of the data generated during the project. This data package should contain at a minimum all chain of custody and completed cooler receipt forms, and those items outlined within Enclosure 13 to allow the USACE QA laboratory to review PARCC parameters. The timeliness of the USACE generated CQAR will be contingent upon the completeness of the data compilation and the punctual release of this material. For this reason, the project chemist may require the opportunity to review the submittal for completeness and verification that DQOs were met prior to/or concurrent with the release to the Division laboratory.
****

2.4.3.1 QA Laboratory

****
This section should specify which USACE lab will be the QA lab for the project. It should also be stated that the Contractor is responsible to send field-generated QA samples to the specified laboratory. The project chemist should generate frequency tables summarizing exact numbers of QA samples to be sent to the QA lab on a site by site basis. The Contractor should reiterate this in the CDAP.

USACE PM should specify the QA laboratory after contacting CEMRD. The project chemist should check with the QA lab to find if they have special identification/information needs attached to field samples that will be sent to them by the Contractor in the field. The Contractor should also be tasked to identify which field sample they will analyze that corresponds to the USACE QA sample. Insert language in the SOW that the Contractor is responsible to notify the respective USACE QA lab of incoming samples at least 2 days in advance.
****

2.4.3.2 QC Samples

****
This section should contain specifications as to the type and numbers of QC samples to be generated on a site-specific basis. The chemist should generate a table summarizing this information. The chemist should also specify laboratory QC requirements on a method specific basis. The Contractor will summarize this in the CDAP.

QC will vary depending on the analytical procedures chosen to meet data needs and DQOs. The chemist should develop tables summarizing the type and quantity of QC field samples for each site in the RI/FS, and the rationale used in selecting these requirements. Field QC samples may include field replicates / duplicates, field blanks / equipment blanks (rinsates), and trip blanks. QC samples sent from the field to the contract lab should be blindly labeled.
****

2.4.4 Laboratory Internal Quality Control

****
The Contractor laboratory is also responsible to perform internal QA/QC samples per batch for each analytical method specified. The project chemist should include language in the SOW directing the contract laboratory as to their QA/QC requirements. An additional analysis fee may be attached per internal QC sample when specified to be performed on USACE project samples. The project chemist must also ensure that sufficient sample volumes are submitted for analysis in light of the project QA/QC requirements. Acceptance criteria for precision and accuracy of laboratory internal QC is detailed in section 2.4.1.
****

2.4.5 Method Detection Limits

****
This section must contain instructions to the Contractor as to specific method detection limits and/or practical quantitation limit which will be contract requirements for this RI/FS. The risk assessor, designer, and the regulatory specialist should define these criteria for the chemist for each of the analytical methods specified in the previous section. The Contractor must summarize method detection/practical quantitation limits in the CDAP, and the rationale used in selection/specification.

Method detection limits have a direct effect on ability to properly evaluate identification of potential chemical and location-specific ARARs, To Be Considered (TBC) information, design criteria, and risk assessment. Action levels of contaminants of concern should be investigated and summarized in this section. It is critical that the analytical technique chosen has a detection limit below the level of concern. The chemist should also consider that, regardless of the specified method detection limit, the actual practical quantitation limit reported may (and usually is) be sample specific. Samples containing complex matrices and numerous analytes at widely-different concentration ranges may result in raised quantitation limits due to dilution factors. This must be considered by the chemist when selecting analytical options.

It is important to include criteria for detection\quantitation limit requirements in this section, for meeting data quality objectives. Specify minimally, according to each procedure outlined above. It is also necessary that Contractor understands and includes this rationale in the contract submittals.
****

2.4.6 Laboratory Turnaround Time

****
This section should include information from the chemist as to the turnaround time for completed data reports to be generated from the laboratory. This will be stated in the CDAP by the Contractor.

The project chemist should be provided with project information from decision makers and data users regarding scheduling constraints, and budget, in specifying SOW requirements for reporting. The usual turnaround time for reporting data to a customer from a contract laboratory is approximately 45 days. An additional fee is usually attached per sample for expedited turnaround times.
****

2.4.7 Sample Handling

****
In this section of the SOW the chemist must specify sample handling for the RI/FS. Enclosure 13 to the ETL contains chemistry technical requirements for this topic separated by matrix. Special attention and specification within the SOW should be given to non-traditional needs. The Contractor

must summarize all sample handling procedures in the CDAP.

During every phase of site characterization and sampling, consistent procedures and documentation must be performed in order to achieve information that will be used for decisions in the RI/FS process. The chemist must specify in the SOW that the Contractor is responsible for documenting sampling activities and developing SOPs for all sampling methodologies. DQOS specific to the RI/FS must be incorporated in SOW instructions and in Contractor submittals.

Maintaining sample integrity, the chain of custody (COC), and evaluating sampling accuracy are critical factors that must be documented and reviewed before resulting data is considered valid. Verification of sample shipment may be accomplished by requiring the Contractor's QC laboratory to complete a cooler receipt form or equivalent upon receipt and opening of the cooler. The form is then returned with a copy of the COC along with the data report. The project chemist must consult with data users to determine if standard USACE sample handling protocols are adequate for the project or if special applications exist.

Sample handling should also consider sample disposal. Chemist should contact Corps lab to determine how samples will be disposed of after analysis since there is a potential that the samples may, on occasion, be returned to the site for disposal.
****

2.4.8 Preservatives and Holding Times

****
The project chemist must specify preservatives and holding times that will be contractually required during the course of the RI/FS. A table should be prepared for insertion into the SOW clearly outlining each analytical protocol with this information. The Contractor should be made aware that holding times are not to be violated and, should this happen, the Contractor is liable for possible resampling.
****

2.4.9 Investigation-Derived Wastes (IDW)

****
EPA has issued guidance for handling IDW entitled "Management of Investigation-Derived Wastes During Site Inspections", EPA 540/G-91/009, dated May 1991. The chemist should be aware that IDW will be present both at the site and at the

laboratory subsequent to sample analysis. Sampling IDW is addressed in section 2.3. All laboratories conducting analyses must be instructed whether to ship completed samples back to the site, or to handle them appropriately as IDW. There may be a nominal fee involved with the disposal of solid samples by the laboratory. For this reason, the project chemist should require the acquisition of only enough sample volume to conduct the required analysis and associated quality control (QC) according to the analytical method. Waste from an RI/FS site must be considered as "suspected hazardous IDW" until it can be proven otherwise. In addition to standard analyses typically run in an RI/FS, wastes may also be tested for RCRA characteristic waste analyses. The project chemist and Contractor must develop some analytical protocol that will be adequate to determine whether IDW from the subject site may be classified as non-hazardous or a characteristic hazardous waste. The contract laboratory must also be instructed whether to ship completed samples back to the site or to handle them as IDW. The chemist must be aware that the proposed analytical protocol for the site IDW must be appropriate not only to determine if the waste is hazardous, but also must generate enough information for later manifesting and shipping requirements, if necessary.

While this IDW guidance is for CERCLA sites, since the IDW may be a RCRA hazardous waste, it is important to talk with your state RCRA office to gain an understanding of the definitions of wastes and the requirements for disposal of IDW. Some states will allow you to screen the samples and put them back onto the site or bulk them for disposal. Other states will require a full analytical scan to determine if you have a RCRA hazardous waste.

A solid waste is a RCRA characteristic waste if it exhibits the characteristic of ignitability, corrosivity, reactivity, or toxicity (Toxicity Characteristic Leaching Procedure, TCLP, see FR 11796-11877, March 29, 1990). The TCLP has replaced the EP-toxicity test for identifying RCRA characteristic waste. However, a few states still require the EP-toxicity testing done in addition to the required TCLP analysis. As stated earlier, verify with your state RCRA off ice for the requirements of listing and disposal. Any type of IDW that contains listed hazardous wastes should be considered a RCRA hazardous waste.

The project chemist should include instructions in the SOW to the Contractor on how IDW from the subject site is to be managed. The Contractor may also be tasked to propose a waste handling plan (within the text of the CDAP) thereby

proposing how to determine whether wastes from the RI/FS project site are characteristic, listed or non-hazardous. Both the project chemist and the regulatory expert should review the proposed Contractor plan for handling IDW to assure compliance with regulations. The project manager should also consult with the customer and regulators to assure IDW are handled in an acceptable manner during the RI/FS. The project chemist may need to cost out additional tasks during negotiations for chemical testing and handling of IDW (see EPA guidance document 540/G-91/009, Management of Investigation-Derived Waste During Site Inspections). The project chemist and hydro geologist will need to estimate the approximate volumes and types of I.W. that will be generated in the RI/FS process.
Types of I.W.:

-Soil cuttings
-Groundwater from well development or purging
-Personal protective equipment (P.E.)
-Disposable sampling equipment
-Drilling mud or water
-Cleaning/decontamination fluids
-Laboratory I.W.

Cross reference to the Geotechnical Requirements Section regarding activities which may generate I.W..
****

2.5 Task 5 Data Evaluation/Fate and Transport Analysis

2.5.1 Data Evaluation

****
This section describes the requirements for the Contractor to evaluate newly acquired data. The data evaluation step of the report preparation, as defined by the USACE project planning guidance, consists of three steps;

- Assessment/Validation of collected data
- Evaluation of collected data
- Verify Usability and DQO Attainment

The first two steps enables us to determine if the data obtained are reliable and generally acceptable for use on the project. The last step is designed to determine if the maximum levels of specified uncertainty used in designing the data collection program were attained.

The Contractor will be responsible for reviewing and evaluating *I* validating data resulting from the investigation, in accordance with the specified requirements. The

presentation of data is to be both tabular and discussed in text form. The data text presentations should clearly define whether DQOs were met, and to what degree they were met. The level of detail put into this section of the SOW will help define what data evaluation tasks are contractually required for this particular RI/FS. Data must be reviewed relative to original data quality objectives, in addressing the data needs. What may be acceptable to be used to address data needs in a treatability study may not be acceptable in a risk assessment. Additionally, the final acceptability of data quality is not established until the reviewed QA/QC package accompanies the analytical data.
****

2.5.1.1 Comparison to Data Quality Objectives - Establish Data Usability

****
This section would require that the original data quality objectives defined by the project planning team and further refined by the Contractor in the workplan be reiterated in the Data Evaluation Section of the RI Report, to provide a comparative basis of data usability for new data collected, and reiteration of workplan evaluation of existing data. Original objectives including specifications for defining acceptable uncertainty, documentation requirements, analytical detection limits, data quality and quantity requirements, precision, accuracy, completeness, comparability, and representativeness are evaluated against the data collected, to determine whether data may be used for the originally intended purpose. More specific usability parameters such as geotechnical and or hydrogeological characteristics are evaluated also to support the intended uses of the data including risk assessment, feasibility study, and design. This section should be prepared by the project team.
****

2.5.1.1.1 Refinement of Site Conceptual Model

****
Conceptual Site Models, such as what may have been initially specified by the project team in Section 1.0 of the SOW, are schematic representations, rather than figures, to show interrelationship of data need elements needed to serve project decision needs, such as risk, liability, feasibility, and compliance.

As part of data evaluation, the Contractor will be required to assemble all new data of acceptable quality into previously defined data need categories, and apply this information in refining the Workplan Conceptual Site Models. This will aid in organizing the evaluation, in allowing a preliminary determination of whether general data needs have been met, and data quality objectives have been achieved for the project. The section should require the Contractor to reevaluate model elements, to determine generally for data need categories whether data collected fulfills data needs to be used to: 1) evaluate risk to human health and the environment, 2) assess feasibility of remedial alternatives and design requirements, 3) determine regulatory compliance, and 4) define liability and cost recovery considerations, as specified by original data quality objectives.
****

2.5.1.1.2 Hydrogeology

****
This section should require the Contractor to analyze the new data to refine the understanding of the hydrogeology of the site as it relates to specific data needs and data quality objectives. Hydrogeology data is used in evaluating migration pathways for the site contaminants for the risk assessment, for remedial design, for compliance purposes, and in clarifying liability issues. This analysis would include, for example, the interpretation of geologic environments of deposition, the heterogeneity of the site stratigraphy, the characteristics of the site soils/rock which may affect contaminant transport (thickness, permeability, organic carbon content), and the ground water flow direction and rate. This would include the production of cross sections, maps, histograms or other presentations of the data. This information would be presented in the RI/FS report and will be used in the fate and transport as well as alternative analysis. This section should be prepared by the hydro geologist.
****

2.5.1.2 Nature and Extent of Contamination

****
This section should describe the requirements for refining knowledge of the volume of sources areas or the nature and extent of contamination at the sites, as it relates to specific data needs. Design needs may include quantitation of specific volumes of contaminated media for evaluation of

feasibility of remedial alternatives, and risk assessment may require quantitation of exposure to populations from specific portions of site media. The Contractor should be required to address each data need in providing the degree of quantitation required for each effected media, and in organizing and presenting the information, pertinent to the intended use of the data.

This section can be written by the any of the project team members, but should be reviewed by the chemist, hydro geologist, and the data users. This section may require the Contractor to prepare drawings illustrating the extent in map view or cross section, and tables of contaminants identified at the site. The Contractor should be encouraged to use computer-generated graphics and tables to reduce cost and improve quality by reducing editing effort and assuring consistency. The Contractor should segregate discussions for each media/area as dictated by data needs. These items are to be developed as part of the RI report and do not require a separate submittal. Careful cross referencing to the RI Report Section (2.7) would be helpful in avoiding a duplication of instruction on preparing these items and double payment for the work.
****

2.5.2 Fate and Transport Analysis

****
This section should require the analysis of the potential for transport of contaminants by all affected transport pathways; ground water, surface water, air, as originally defined by the conceptual site models, to meet specific data needs.

In addition to applicable transport mechanisms, transformation and/or attenuation mechanisms should also be evaluated for the effected media. In some cases quantitative analysis of chemicals/products resulting from degradation/removal mechanisms such as biodegradation, photolysis, chemical reactions, and radioactive decay should be considered in determining future likely conditions and chemical residuals remaining on site, for compliance considerations, design, and risk analysis.

This section may specify modeling of contaminant transport in air, ground water, or surface water, as appropriate. This section should be based on data needs identified by the risk assessor, for exposure point concentrations, for the designer, and regulatory specialist for issues impacting compliance, with input from the hydro geologist, chemist, and

air modeler. DQOs outlined in the SOW and defined in the workplan, will specify sampling requirements to support modeling. The Contractor should have previously, in data usability evaluation, determined whether data collected will meet modeling needs specified in these DQOs. Data gaps and uncertainties in analysis should be discussed. If modeling of surface water or ground water is required, refer to the geotechnical requirements, section 6, of this SOW. Refer to section 7, Air, if air transport modeling is required. Cross reference with those sections to assure consistency.
****

2.6 Task 6 Baseline Risk Assessment

****
Project team and member responsible for risk assessment shall specify level of effort required for the risk assessment based on customer specific requirements and regulatory restraints. The risk assessor should also be cognizant of any additional requirements set forth in state regulatory guidance and criteria, or provided by the customer or other agency, such as AEHA, in specifying requirements for Contractor preparation of the risk assessment. Army IRP and FUDS projects will require review and approval of risk assessment by AEHA for the Surgeon General, under AR 200-1, and team member should include AEHA representative in scoping and submittal evaluation process. Minimally, the format and content should follow EPA's "Risk Assessment Guidance for Superfund, Volumes I & II", 1989 (RAGS). Regulatory requirements or procedural basis for risk assessment follow from the NCP, 300.430, which describes the role of risk assessment in site evaluation and remedy selection. The program goal of the RI/FS is to propose and select remedies that are protective of human health and the environment. The results of the baseline risk assessment helps establish site remedial action goals and acceptable exposure levels for use in developing remedial alternatives, as defined in Part B and C of the RAGS.
****

2.6.1 Human Health Assessment

2.6.1.1 Identification of Chemicals of Concern

****
Data identified as required to support the risk assessment in the DQOs for the project, are evaluated in this section, in addition to the data evaluation section of the RI, to determine if data collected was of sufficient quantity and

quality as was specifically intended. If sampling design and analytical DQOs were formulated properly with the end use in mind, data to evaluate the nature and extent, which will support the fate and transport analysis and modeling, will be of sufficient quality and quantity to adequately evaluate exposure routes, exposure point concentrations, intakes, and the potential risks associated with a specific site.

DQOs for sampling requirements to support the risk assessment take into account statistical representativeness, bounds of the data, toxicity reference concentrations in determining detection limits, spatial representativeness to properly evaluate exposure routes, and quality assurance/quality control, specific sampling and analytical requirements to assure data may be used for risk quantification.

Selection of chemicals therefore must evaluate data quality and quantity sufficient to support the risk assessment by evaluating data by originally intended DQOs for quality with respect to sample quantitation limits, qualifiers and codes, blanks, background samples, frequency of detection, and statistical representativeness. Contractor must then present data for chemicals selected as the range of concentrations detected, frequency of detection, and sample quantitation limits. The values used to assess risk should be concentrations averaged for a chemical at a specific area expressed as the 95th percent upper confidence on the arithmetic average using standard statistical methods, if possible. DQOs for sample collection should take into account sufficient quantity of data is gathered to calculate a meaningful average concentration that populations may reasonably be expected to be exposed to over time. Data collected for modeling to calculate exposure point concentrations should also take into account sufficient data is collected such that the average value calculated represents a statistically meaningful value.

Those chemicals which have reasonable probability of occurring in background samples, such as naturally occurring metals or ubiquitous chemical constituents, should be screened as to whether they exceed statistically determined average background concentrations and whether chemicals may be attributed to operations/activities associated with the site.

Instructions should also be given regarding tabular format of information required, and specific data to be included in the risk assessment section of the RI. Preferably if site covers a large geographical area, risk analysis should

address each discrete source area separately, to aid in ease of evaluation, avoid unnecessary conservatism, and so that results of risk assessment may be easily integrated into remedial action objectives for discrete units.
****

2.6.1.2 Exposure Assessment

****
The conceptual site model, preliminarily developed by the project planning team, and further refined by the Contractor in the workplan and data evaluation section of the RI, is expanded further in this section as the basis for the exposure assessment. The source area, intermedia transport mechanisms, exposure routes, and populations are required to be evaluated by this section in order to define exposure pathways and to develop potential receptor intakes. In addition to detected contaminants, possible degradation mechanisms should be discussed, quantitatively, if appropriate. Each discrete source area for contamination of different media, if distributed over a large area, should be discussed separately. Contractor should identify and discuss all relevant exposure pathways, surface water transport, air dispersion, groundwater transport developed in the Fate and Transport Section, to calculate exposure point concentrations, for current and potential future exposures to identified receptors.

Exposure routes to be considered include: 1) ingestion of soils and water, as well as agricultural products such as fish, game, dairy and meat products, 2) inhalation of dusts and vapors through outside exposures, and exposures in dwellings/industrial, and 3) direct contact. Contractor should include a discussion as to why exposure routes are selected, and why others are eliminated from the evaluation.

(Note: Consider using EPA's Uptake BioKinetic Model (UBK) specifically for evaluation of exposures to lead contaminated sites, and determination of acceptable levels of lead in soils. UBK evaluates lead concentrations in different media and the predicted corresponding effect of blood lead concentrations.)

Populations initially identified in the conceptual site model, should be evaluated in more detail, as to those populations which may reasonably be expected to potentially come into contact with site wastes, by the identified exposure routes, both currently and in the future. Generally "worst case" assessments should be avoided as unrealistic.

Receptors should be identified with full consideration given to all potential limiting factors; census projections, community master plans, zoning, intended resource and quality of life considerations in predicting future land use. Cross referencing with environmental risk assessment current and future use scenarios will be required in identifying realistic potential exposure scenarios for humans. It is important that a balance be maintained in identifying receptors and potential exposure scenarios between attempting to identify all potential risks to human health and factors that may realistically prevent those exposures.

Intakes for exposure routes; ingestion, inhalation, dermal contact, should be calculated using exposure point concentrations and default values available in the EPA "Exposure Factors Handbook", 1990, and values published by each EPA region. These parameters include accepted default values for average body weights, averaging times for chronic/acute exposures, and contact rates for exposures. Exposure duration and frequency of exposure are site specific evaluations of the realistic expectations for exposure, rather than defaults. Additionally, Contractor should differentiate between the reasonable maximum exposure and an average exposure intake, as well as subchronic vs. chronic exposures, and non-carcinogenic and carcinogenic intakes.

All calculations used in the assessment should be documented within the text as well as all references used in the analysis.
****

2.6.1.3 Toxicity Assessment

****
The toxicity assessment is a descriptive section of the risk assessment in the RI/FS report that summarizes applicable available toxicity information for identified chemicals of concern. It is recommended that Contractor use information from the following sources in order of hierarchy suggested: 1) IRIS (Integrated Risk Information System), an EPA database which is updated frequently with verified toxicity information, 2) Health Effects Assessment Summary Tables (HEAST), 3) EPA Criteria Document, 4) ATSDR Toxicological Profiles, 5) EPA Environmental Criteria and Assessment Office (ECAO), 6) open literature, in identifying specific toxicity values, such as reference doses and slope factors. General toxicity information for chemicals is available from a variety of sources of information including other data bases. If no information is available regarding a chemical

the Contractor is encouraged to contact USACE risk assessment team member for recommendations, rather than EPA directly.

The descriptive sections or toxicity profiles should minimally include a summary of the study used to derive reference doses and slope factors, confidence, weight of evidence, indicated effect, and the selection criteria regarding specific values for the exposure durations indicated for the risk assessment. These could include acute exposures, chronic exposures, and subchronic exposures developmental effects for non-carcinogens, and chronic exposures only for carcinogenic effects.

The summaries of the toxicity assessments should be within the body of the risk assessment with any accompanying full text included in an appendix to the risk assessment or RI.
****

2.6.1.4 Risk Characterization

****
In this section, the Contractor will be required to quantitatively compare site specific chemical intakes to referenced toxicity values to derive a numerical evaluation of adverse health effects or risk associated with potential exposures. Contractor should clearly identify, in a tabular format, risks, hazard indices associated with each chemical for each route of exposure, and additionally, the summation of chemicals over all pathways, and conversely the summation of each pathway to derive a total hazard index or risk.

Additionally, risk characterization may also require a comparison of the quantitative risk in the baseline risk assessment to the qualitative risk statements issued by the ATSDR when a health assessment has been prepared for an NPL facility.

Contractor will be expected to discuss all results within the body of the text, including uncertainties and limiting factors associated with quantitation, and provide a summary of all results.

Those risks or health hazards which are determined to fall outside the range of acceptable risks (lE-04 to lE-06), or health hazard index above unity, will be used to establish preliminary remedial action objectives based on identified risks or health hazards associated with a pathway, chemical and population. These preliminary objectives shall be included in the summary of the risk assessment and will be

forwarded to the feasibility study to establish remedial action goals. Parts B and C of the Risk Assessment Guidance for Superfund, provide additional instruction in regard to risk evaluation for site decision requirements. Additionally, the summary and conclusions of the baseline risk assessment shall be forwarded for qualitative analysis of risk associated with each alternative as compared to the "no action" or baseline alternative. Risk Assessor team member should also specify that the Contractor should consult USACE, before providing any recommendations or conclusions for the risk assessment. It should be understood that authority and responsibility for environmental decisions remain with the Government, rather than at the discretion of the Contractor.
****

2.6.1.5 Uncertainty Analysis

****
An essential part of the risk assessment process is the uncertainty analysis. Numerical and non-numerical evaluations of errors and uncertainties associated with sampling design and analysis, fate and transport, intake assessment, toxicity assessment, and risk characterization should be discussed so that customer has an indication of limitations of the results or risks calculated in making an informed decision regarding remediation. Each section of the risk assessment should include a full uncertainty analysis, which may be qualitative, but is in some cases more useful from a quantitative perspective. Evaluation should include degree of false positives expected, and false negatives, and in what manner errors may effect overall decision making and site management. DQOs originally determined should take into account acceptable error expected in the risk assessment based on quality and quantity of data collected, and should be referenced in this analysis.
****

2.6.2 Environmental Evaluation

****
The environmental evaluation is less straightforward than the human health evaluation. In some ways, it may be complicated by competing exposure pathway analysis for human receptors, particularly in defining potential environmental populations and in determining remedial action objectives. Although not necessarily stated, neither assessment takes precedence over the other in weighing remediation requirements. Although the requirement for performing the environmental evaluation

finds its authority in CERCLA Section 121, the requirement is intended to respond to other applicable statutes including Endangered Species Act, Wild and Scenic Rivers Act, Marine Protection, Research and Sanctuaries Action, Fish and Wildlife Conservation Act, Migratory Bird Treaty Act, the Marine Mammal Protection Act, as well as state and local laws.

Though some elements of the human health risk assessment are similar to the environmental evaluation, selection of chemicals of concern, exposure assessment, toxicity assessment, and risk characterization, the information and criteria for each step in the evaluation are usually separate from the human health evaluation and original to the environmental evaluation. DQOs proposed to support the environmental assessment for sample design and analysis, may have some overlap with the human health assessment, but for the most part are unique statements.
****

2.6.2.1 Identification of Chemicals of Concern

****
DQOs developed specifically for the environmental evaluation, using the preliminary conceptual site model for environmental receptors as a guideline, are restated in this section to evaluate quality and applicability of data collected to originally intended purposes.

The environmental evaluation may require unique analytical methods, such as metal speciation, dissolved and total metals, and biological and chemical oxygen demand, and unique sampling designs to properly evaluate potential exposures. Depending on site specific regulatory requirements and customer requirements, the degree of testing may be limited to chemical testing, or may involve site specific toxicity testing. Regulatory authorities responsible for determining planning and preservation of ecological environments should be consulted to determine critical information regarding current future use of the area, and other specific concerns so that DQOs and conceptual site model may be focused for actual intended uses.

In this section, the Contractor will be required to evaluate data collected for quality and usability, with regard to DQOs originally formulated. Included would be evaluation of detection limits with toxicity reference concentrations, data quality indicators, and statistical representativeness.

Contractor shall include acceptable data collected in tabular format, indicating range of concentrations, frequency of detection and detection limits of the analytical methods. Additionally, Contractor will be required to determine the 95th percent upper confidence on the arithmetic average using standard statistical methods, if possible. DQOs for sample collection should take into account sufficient quantity of data is gathered to calculate a meaningful average concentration that populations may reasonably be expected to be exposed to over time. Data collected for modeling to calculate exposure point concentrations should

also take into account sufficient data is collected such that the average value calculated represents a statistically meaningful value.
****

2.6.2.2 Exposure Assessment

****
The conceptual site model, preliminarily developed by the project planning team, and further refined by the Contractor in the workplan and Data Evaluation Section of the RI, is expanded further in this section as the basis for the exposure assessment. The source area, intermedia transport mechanisms, exposure routes, and populations are required by this section to be evaluated in order to define exposure pathways and develop potential receptor intakes. The Contractor should identify and discuss all relevant exposure pathways, surface water transport, air dispersion, groundwater transport developed in the Fate and Transport Section, to calculate exposure point concentrations for current and potential future exposures to identified receptors.

Populations initially identified in the conceptual site model should be evaluated in more detail, such as results from mapping ecological and terrestrial environments, as to those populations which may reasonably be expected to potentially come into contact with site wastes, by the identified exposure routes, both currently and in the future. Critical habitats, threatened and endangered species, wetland environments, should be identified and documented as well as other populations present. Cross reference to Section 2.10.6, NEPA Compliance Activities, to assure the Contractor is not tasked twice to do this work. The most important factor in developing a valid environmental evaluation is

properly determining potentially exposed populations. Project planning team should consult U.S. Fish and Wildlife, State and local resource coordinators and the National Oceanic and Atmospheric Administration to aid in determining potentially exposed environmental populations for the preliminary conceptual site model development and DQOs. Additionally, project planning team should be sensitive to any potential overlaps in identifying receptor populations for human health and environmental populations for current and future use. It is recommended that a representative population should be chosen from the various species identified, to evaluate the overall impacts for the community of plants and/or animals that could be exposed.

The combined human health and environmental assessments should be a cohesive interpretation of potential future use conditions in determining potential impacts to human health and the environment, rather than separate and detached. Conclusions of both assessments will have a direct bearing on remedial action goals and therefore remediation requirements.

Intakes for exposure routes; ingestion, inhalation, dermal contact, should be calculated using exposure point concentrations and reasonable intake parameters that can be assimilated into an environmental assessment. EPA regional environmental assessment groups, and state authorities may be helpful in determining these intake values. These parameters include reasonable values for average body weights, averaging times for chronic/acute exposures, and contact rates for exposures. Exposure duration and frequency of exposure are site-specific evaluations of the realistic expectations for exposure, rather than defaults. Additionally, the Contractor should differentiate between the reasonable maximum exposure and an average exposure intake, as well as subchronic vs. chronic exposures, and non-carcinogenic and carcinogenic intakes.

All calculations used in the assessment should be documented within the text as well as all references used in the analysis.
****

2.6.2.3 Toxicity Assessment

****
The toxicity assessment is a descriptive section that summarizes applicable available toxicity information for identified chemicals of concern. It is recommended that Contractor use information available from sources discussed in

Section 2.6.1.3 as well as the NIOSH Registry of Toxic Effects of Chemical Substances (RTECS), EPA specific toxicity studies performed for specific chemicals of concern, and information provided by regional EPA environmental assessment groups. General animal toxicity information for chemicals that may be used in a qualitative comparative analysis is available from a variety of sources of information. Quantitative toxicity evaluation data is not usually available, however, for environmental assessments for general use. Contractor may propose quantitative evaluation if procedures are reviewed and approved by USACE risk assessment team member in conjunction with regional EPA environmental assessment group.

The descriptive sections or toxicity profiles, should minimally include a summary of study used to toxicity values, indicated effect, and criteria for selecting specific values for the exposure durations indicated for the risk assessment, such as acute exposures, chronic exposures, and subchronic exposures developmental effects for non-carcinogens, and chronic exposures only for carcinogenic effects.

The summaries of the toxicity assessments should be within the body of the risk assessment, with any accompanying full text included in an appendix to the risk assessment or RI.
****

2.6.2.4 Qualitative Risk Assessment

****
A narrative discussing comparatively potential adverse health effects expected based on potential intakes of the representative populations and toxicity values should be included in this section. Quantitative analysis is not necessary, in view of lack of toxicity information, and/or if not requested specifically by the customer or regulatory authority.

Minimally, tabular format comparing toxicity information with expected intakes and an explanatory analysis should be sufficient.

If a quantitative analysis is required or requested, site-specific as well as literature values should be used to numerically evaluate the potential for adverse health effects or cancer, using advice from specific technical experts from effected regulatory agencies.
****

2.6.2.5 Uncertainty Analysis

****
Numerical and non-numerical evaluations of errors and uncertainties associated with sampling design and analysis, fate and transport, intake assessment, toxicity assessment, and risk characterization should be discussed so that customer has an indication of limitations of the results or risks calculated in making an informed decision regarding remediation. Each section of the risk assessment should include a full uncertainty analysis, which may be qualitative, but is in some cases more useful from a quantitative perspective. Evaluation should include degree of false positives expected, and false negatives, and in what manner errors may effect overall decision making and site management. DQOs originally determined should take into account acceptable error expected in the risk assessment based on quality and quantity of data collected, and should be referenced in this analysis.
****

2.6.3 Risk Summary, Risk Management Recommendations, and Identification of Preliminary Remedial Action Objectives

****
The risk assessment is used to identify the hazards or risks at a site so that management decisions can be made accurately with regard to environmental regulations and expenditures for the degree of response action required. The Contractor is required to state the conclusions of the risk assessment in this section, with directions for specific content given by the USACE risk assessor. The risk management discussion following the summary, should be based on specific requirements provided by the USACE risk assessor. This is a Government In Nature (GIN) decision discussion, and the Contractor shall refrain from editorializing or developing this section without specific content requirements and recommendations supplied by the USACE risk assessor. Content requirements of the risk management section include a quantitative discussion of inherent uncertainty associated with risk characterization and development of a range of risk to determine remediation goals, rather than the single value provided by the risk assessment.

Using this range of risk values, Contractor will be required to develop remediation goals, which are refined from Preliminary Remediation Goals, developed for the workplan, in accordance with Part B, Risk Assessment Guidance for

Superfund, Volume I from EPA. The risk range, taking into account numeric uncertainties from the risk characterization, is used a the target risk values in determining remediation goals/cleanup levels. These will be reintroduced in the Remedial Action Objectives section of the Feasibility Study, with the ARARs in determining overall remediation goals and remedial alternatives for the site. The entire team should participate in the identification of the remedial action objectives.
****

2.7 Task 7 RI Report

****
Provide details on content and format of the RI report under this task. Refer to EPA RI/FS guidance as to content and format. For scheduling, see the Project Management Section. The development on the content and format should be by the team. The regulator agencies who review the report and the customer or compliance agreements may also dictate the content and format. Make sure this is clearly spelled out in the SOW and not left up to the Contractor. Remember the format and content may change as more or new information is developed on the project.
****

2.7.1 Pre-Draft Data Package

****
As specified in section 2.4.3 a pre-draft final report deliverable will be submitted to the QA laboratory for comparison between the data generated from the Contractor's QC and the USACE QA laboratories. This review also encompasses an assessment of the internal quality control and method requirements, allowing a determination on the adequacy of the data generated during the project. This deliverable should contain at a minimum all chain of custody forms and those items outlined within the 16 August 89 memorandum entitled Minimum Chemistry Data Reporting Requirements for DERP and Superfund HTW Projects. The timeliness of the USACE generated QA/QC Report will be contingent upon the completeness of the data compilation and the punctual release of this material.
****

2.7.2 Draft RI

****

This section should address the draft document and any special requirements. The scoping team needs to determine the type of draft documents that the Contractor will need to delivery. It may be advisable that the scope identify a draft that will be provided and reviewed by the team and user prior to submittal to the regulator agencies. The Contractor will then incorporate the comments from the team into a draft that will be submitted to the regulator agency or agencies for review and comment. This will assure that a quality product is provided to the regulatory agency and it meets the requirements of the team and user.

It should be noted and the team should understand that during the review process additional questions or concerns could be raised that will need to be addressed. To address these issues, additional field work may be required which would result in another document being submitted. These additional requirements can not be clearly identified in the initial scope and any additional effort should be closely coordinated with the team and user.
****

2.7.3 Final RI

****
The scoping team needs to determine the general content requirements of the final document that the Contractor will be required to deliver using expert judgement, USACE guidance, and EPA RI/FS guidance. Based on the complexity of the project, the Final RI report requirements may not be able to be scoped at this time. It may be advisable that the Final RI be scoped as a new deliverable after the Draft RI has been reviewed and all additional RI work has been completed. The team and user should review the Final RI before it is provided to the regulatory agencies. The Contractor should incorporate the comments from the team into the Final RI and then submit to the regulatory agency or agencies. This will assure that a quality product is provided to the regulatory agency and it meets the requirements of the team and customer.
****

2.7.4 DPM

****
Contractor should provide a list of information, specified by the project team, that will be used by DOD personnel to score the site per the Defense Priority Model. This information compiled from data included in the RI report, will enable DOD

personnel to easily evaluate and score sites and to determine priority for remediation. List of information required should be specified from DPM User's Manual.
****

2.8 Task 8 Remedial Alternatives Development and Screening

****
See Enclosure 11, Alternative Selection for discussion of the requirements. Development of alternatives should be concurrent with other RI/FS activities. As soon as the contaminated media and the nature of the contamination are discovered, the process engineers can start to identify appropriate types of treatment. Analyses for substances that may interfere with treatment can be conducted on splits of samples taken for completion of the characterization analyses.
****

2.8.1 Develop Remedial Action Objectives

****
The preliminary remedial action objectives developed previously are reiterated in this section, as a summary of PRGs/risk based cleanup levels and ARARs for the site which the remediation goals are based on. Alternatives are identified and developed relative to these goals.
****

2.8.2 Establish General Response Actions
2.8.3 Identify and Screen Technologies
2.8.4 Configure and Screen Alternatives

2.9 Task 9 Treatability Studies and Treatability Study Reports

****
See Enclosure 12 to the ETL: Treatability Studies and Treatability Study Reports for more detail on the content of this section of the scope-of-work and additional guidance on scoping treatability studies. Treatability study reports may be submitted concurrently with the RI/FS or separately.
****

2.9.1 Treatability Study Workplans
2.9.2 Treatability Studies

2.10 Task 10 Detailed Analysis of Alternatives

****
See Enclosure ll, Alternative Selection for discussion of the requirements. Development of alternatives should be concurrent with other RI/FS activities.
****

2.10.1 Technical Description of Alternatives and Applicable ARARs
2.10.2 Detailed Analysis of Alternatives.
2.10.3 Performance Modeling

****
This section should describe any modeling required to assist in the analysis of the alternatives. The general objectives of the modeling should also be noted here and the Contractor should be directed to elaborate on the objectives depending on the alternatives. This section should be developed with input from the process engineer, the hydrogeologist, the chemist, and the industrial hygienist (particularly for air dispersion modeling). This part of the SOW should refer to the sections on ground water modeling within the Geotechnical Requirements (Section 6.9), if applicable, and the air section (Section 7). These other sections provide the specifications for the performance of modeling. This section should also be cross referenced with other parts of the SOW that relate to modeling, such as Risk Assessment (Section 2.6) and Fate and Transport Analyses (Section 2.5.2) to assure that modeling efforts are not duplicated.
****

2.10.3.1 Ground Water
2.10.3.2 Contaminant Transport
2.10.3.3 Geochemical Modeling
2.10.3.4 Atmospheric Dispersion Modeling

****
There are several types of atmospheric dispersion modeling that may be performed during all phases in the process of investigation and feasibility study. The feasibility study data needs requirements should include evaluation of air emissions associated with specific treatment alternatives to determine controls/actions levels required for compliance the with the Clean Air Act, and risk to human health and environmental receptors. Modeling performed for the Remedial Investigation to support the baseline risk assessment may not have addressed these specific requirements for alternative analysis, however models used for baseline analysis may be expanded for specific features evaluated in alternative

analysis. For instance, if evaluation of off-gassing impacts associated with soil vapor extraction alternatives is required, the modeling performed for soil-air intermedia transport of volatile chemicals under the RI fate and transport analysis may be expanded to meet this need. This section should be cross referenced with section 7, Air.
****

2.10.4 Cost Estimates

****
This section should require cost estimates for feasibility studies which are detailed to a level commensurate with the level of design, with appropriate design contingencies applied to relevant cost items. The section should note that alternative estimates for feasibility studies, however, do not always include all the costs necessary for remediation of an HTRW project. If the sole purpose of estimating alternatives is the selection of the method of remediation and not the total construction or project cost, some items may not require pricing. Costs which are minor, or costs which don't vary between alternatives but are common to all, are frequently not included since they would not impact the selection of an alternative. This is not a problem as long as there is documentation in the report that identifies which costs are, and which are not, included in the estimate. The SOW should require this documentation. The selected alternative however, should reflect the total project cost of the remediation. The scope should require the Contractor to prepare estimates which consider all the following costs associated with the selected alternative. These must be considered if a total construction cost is needed for budgetary and/or programming purposes.

This section should be prepared with input from the appropriate cost engineering staff.
****

2.10.4.1 Construction Costs

****
Consult a construction representative, preferably in a resident office to get some insight into day-to-day tricks and hidden costs. The scope preparer may be able to avoid additional costs by carefully preparing the scope based on knowledge gained by construction representatives. This should be done by project leader.
****

2.10.4.1.1 Off-site utility Connections and Fees
2.10.4.1.2 Mobilization/Demobilization
2.10.4.1.3 Health and Safety
2.10.4.1.4 Permits and Fees
2.10.4.1.5 Testing and Analyses
2.10.4.1.6 Operation and Maintenance
2.10.4.1.7 Transportation Costs
2.10.4.1.8 Disposal Costs
2.10.4.1.9 Contractor's Overhead
2.10.4.1.10 Contractor's Profit
2.10.4.1.11 Performance Bond
2.10.4.2 Markups

****
The SOW should require the Contractor to consider standard percentages as given in Army technical cost engineering guidance. The following markups should be applied to the construction cost to determine the total project cost:
****

2.10.4.2.1 Cost Growth to Construction Midpoint
2.10.4.2.2 Construction Contingency
2.10.4.2.3 Supervision and Administration
2.10.4.2.4 Engineering and Design During Construction
2.10.4.2.5 Additional Lab Testing
2.10.5 Plans/Schematics/CADD

****
This section would present requirements for the preparation of any drawings necessary for the FS as well as describe any compatibility requirements if computer-aided design and drafting (CADD) is to be used.
****

2.10.6 NEPA Compliance Activities

****
This section describes the consideration the Contractor will need to give to compliance with NEPA. Note that NEPA applies. If the site is an Army NPL site, review AR 200-2. The RI/FS can be called a "functional equivalent" if all requirements in AR 200-2 are fulfilled. If site is not an Army NPL site, the RI/FS process must meet full NEPA requirements. Project leader should discuss this with your

NEPA expert and office of counsel for specific elements to include in the scope. For non-Army NPL sites, coordinate with the customer to determine NEPA requirements.
****

2.10.6.1 Wetlands Determination

****
Normally the Corps has the regulatory responsibility for wetlands determination and has an organization available to develop the determination. It is recommended, however, that the Contractor be required to perform a preliminary wetlands evaluation, if appropriate for the site. Based on the results of this preliminary evaluation, a more detailed determination can be made by the Corps. Reference the Corps of Engineers Wetlands Delineation Manual, 1987. The Contractor should be informed by this scope section of the potential for wetlands at the site and their responsibility in the wetlands determination process should be outlined. This section should describe the steps that will be taken by the government for a final determination of the presence of wetlands and how that may affect the feasibility study. Cross reference Section 3.5.11 Government Support - Wetlands Determination if the Corps will provide the determination. This section would require input from resource specialists normally found in the regulatory branches of operation divisions in Corps districts. This would require coordination with other regulatory agencies.
********** **********

2.10.6.2 Flood Frequency/Flood Plain Analysis

****
This section would require the Contractor to evaluate the location of the site relative to the flood plain of nearby surface streams. If the site being investigated is located in an apparent flood plain (it would be sufficient to use a Federal Emergency Management Agency [FEMA] Flood Insurance Rate Map [FIRM] or a FEXA Flood Hazard Boundary Map [FHBM] to make this determination if either one is available for the site), steps need to be taken to estimate the frequency of flood depths and velocities that can be used to characterize the potential flood problems associated with any plan that may be put into effect to stabilize the site. This section should be developed by a hydrologic engineer. Cross reference the requirements in Surface Water Modeling, section 6.9.
****

2.10.6.3 Assessment of Cultural Resources

****
This section would require the Contractor to assess the archeological, historical, and cultural resources of the site relative to the applicable criteria referenced above. This section should be developed with input from resource specialists, often located in the Corps' planning divisions.
****

2.11 Task 11 FS Report

****
Provide details on content and format of FS Report under this task. Refer to EPA FS guidance as to content and format of the FS Report. For scheduling refer to the Project Management Section. The regulatory agencies who review the report and the customer or compliance agreements may also dictate the content and format. Make sure this is clearly spelled out in the SOW and not left up to the Contractor. Note that the format and content may change as more or new information is developed on the project.

The scope should note that the Contractor and/or design agency recommends an alternative to the customer or decision maker. The recommended alternative is not necessarily the least costly and does not always meet all of the ARARs, and selection is a risk management decision. The report should go no farther than a recommendation. Discussion of the bases for selection is included with the recommendation. Final selection of an alternative is the responsibility of the decision maker or customer after consideration of input from the concerned parties and the public.
****

2.11.1 Draft FS

****
See discussion on Draft RI. Same procedures and requirements may apply.
****

2.11.2 Final FS

****
See discussion on Final RI. Same procedures and requirements may apply.
****

2.12 Task 12 Post RI/FS Support

****
Provide details on content and format for the effort

requested under this task. Refer to EPA RI/FS guidance. For scheduling see section on Project Management.
****

2.12.1 Proposed Plan
2.12.2 Draft ROD/Decision Document

****
The draft ROD is required to substantially duplicate the detailed analysis of alternatives in Enclosure 11.
****

2.12.3 Cost Estimate

****
Estimate for programming funds for the remedial action(s).
****

3. Project Management

****
The items under this heading describe some of the requirements relevant to project management; including schedules, submittals, points of contact, etc. These requirements would largely be prepared by the USACE project manager in coordination with the project team. The term "project manager" is used to reference either project manager or technical manager at the districts. It is important that the project manager utilize the TOTAL QUALITY MANAGEMENT and PROJECT MANAGEMENT ER 5-7-l(FR) principals as tools on a RI/FS project, and the PROJECT MANAGEMENT ER 5-7-1(FR) guidance is a good example of implementation guidelines for these principles and should comply with these requirements. The project manager must utilize the members of the total team to the fullest, by facilitating discussions between data users, decision makers, and data implementors. The project manager can not make technical or political decisions without the support of the team. For an RI/FS project to really succeed all members of the team must be involved in the planning process. The extra effort in coordinating with the total team will save time and money in the end. Not involving the total team will cause delays, cost to the project and cost increases to the alternatives. Note that

all delays, no matter how small, will result in delays and cost increases to the total project.
****

3.1 Project Manager

****
Require the Contractor to identify single project manager. In some cases the Contractor may have a team approach to management, the Contractor should be required to identify one single project manager for the USACE. Also, the Contractor should identify other members of the design team. The Contractor should not be allowed to change project manager or major team members without notifying the USACE project manager. The requirements for the Contractor should be clearly spelled out under this section.
****

3.2 Coordination with Other Entities

****
Of major importance is coordination with regulators, one of the site decision makers, along with the customer. Be cooperative, but don't play dead. Know the basic regulations and put these applicable regulations into the scope (see Section 1.6) so that the Contractor is also aware of any applicable regulations.

Identify to the Contractor the limits on dealings with regulatory agencies under this section. A standard operating procedure needs to be established between USACE, the Contractor, and the customer on how to handle site visits and oversight by enforcement agencies. Site visits by enforcement authorities must be managed by DOD staff, not Contractors, in order to protect DOD interests. At active federal facilities, it is advisable to involve the installation staff in review and comment on this section.

Also identify in the scope to the Contractor that this Coordination is not just limited to the typical regulatory agencies but also to the federal, state, and local governmental and non governmental agencies that may have an effect on project constraints such as the project schedule and possibly decisions such as the alternative selected.

It is recommended that the team try to identify the various entities needing coordination during the RI/FS. The Contractor should be required to identify any other entities with whom coordination would be required for the alternatives

being evaluated. Identification of entities is an ongoing process as the project moves along and should be a requirement of the Contractor. Don't assume the Contractor will do this without direction.
****

3.3 Conference Notes

****
The Contractor should be required to submit notes for conferences and any meetings that they attend in reference to this project. These are important documents that the Contractor should be tasked to perform. They document the decision process and the Contractor should provide them as soon as possible after the meeting or conference. A time period after the meeting should be established for the distribution on the conference notes. Also identify the distribution requirements of the conference notes here or under submittals. The Contractor should be reminded that only factual information be provided. This information may be used in legal actions.
****

3.4 Confirmation Notices

********** **********
The Contractor should be required to provide originals of all telephone conversation records or confirmation notices that the USACE project manager or the customer may deem necessary. This may include any contact with any regulatory agencies, cost estimating, and any decision process. These requirements need to be clearly spelled out for the Contractor in the scope. Note that the more detailed the records are, the more cost. The Contractor should be reminded that only factual information be provided. This information may be used in legal actions.
****

3.5 Government Support

****
Clearly identify to the Contractor what will and will not be provided as support from the government. This will require close coordination with the customer (EPA, Facility Engineer, etc.). Delays in providing the support will results in possible cost to the Contractor who will claim that cost against the government. Surveys, permits, and rights of

entry are very important in a successful completion of a project.
****

3.5.1 Government Provided Data and Information
3.5.2 Existing Plans/Surveys/Air Photos
3.5.3 Utilities

****
This section would identify any utilities available for use by the Contractor, including water source, electricity, wash racks, phone service. This requires careful coordination with the installation, since the installation will in general be providing this directly to the Contractor.
****

3.5.4 Permits

****
This section would describe any permits such as digging, discharge, or well permits the government would obtain for the Contractor. Cross reference to section 6.1.4.
****

3.5.5 Rights of Entry
3.5.6 Security
3.5.7 Equipment Storage/Staging Areas
3.5.8 Temporary Office

****
Again, this would require careful coordination with the installation.
****

3.5.9 Grading and Site Restoration
3.5.10 Cuttings/Spoil Disposal

****
See notes under the Investigation-Derived Wastes Section. All waste disposed of off-site must be disposed of in accordance with federal and state solid and hazardous waste requirements. This may be a service provided by the Corps under a separate contract or by the installation through a Defense Reutilization and Marketing Office.
****

3.5.11 Wetlands Determination
3.5.12 Explosives Clearance

****
As stated in the National Contingency Plan 300.120, DOD will be the removal response authority with respect to incidents involving DOD military weapons and munitions (or weapons and munitions under DOD custody, control, or jurisdiction). In the event that DOD weapons or munitions are present onsite, a representative from the Ordnance and Explosive Waste (OEW) Mandatory Center of Expertise (MCX) and Design Center, located in Huntsville, AL shall be provided as the On-Scene Coordinator (OSC)/Remedial Project Manager responsible for taking all removal actions.
****

3.6 Travel and Meetings

****
The number and types of meetings should be clearly identified under this section. Any special requirements or type of disciplines that are required for certain meetings should be included in the scope. The requirements identified here will dictate the cost that the Contractor will submit. Remember to verify that the Contractor provides what was negotiated.

The following is a list of meetings that may be required under this scope. It should be noted that the number and type of meetings will depend on the type of documents that the Contractor will be providing. For example, a pre-draft meeting may be held to review the team and user comments and discuss the documents with the Contractor before the revised document is forwarded to the regulating agencies. The draft report meeting should be with the regulator agencies and the Contractor to discuss the comments from the regulator agencies. Additional special meetings may be required based on the complexity of the project and should be coordinated with the team and user during the scoping.
****

3.6.1 Site Walkover
3.6.2 Draft Workplan Meeting/Field Work Start-up Meeting
3.6.3 RI Pre-Draft Report Review Meeting
3.6.4 RI Draft Report Meeting
3.6.5 RI Final Report Review Meeting
3.6.6 FS Pre-Draft Report Review Meeting
3.6.7 FS Draft Report Meeting
3.6.8 Treatability Study Meeting (if required)
3.6.9 FS Final Report Review Meeting
3.6.10 Public Meetings
3.6.11 Site Visits

3.6.12 Additional Trips

****
Verify that the appropriate additional trip clauses are included in the contract.
****

3.7 Schedules

****
The project manager will need to provide a schedule to the Contractor in the scope. This will allow the Contractor to develop the estimate on the needs of the government. The Contractor should be required in the scope to develop a more detailed schedule to support the cost estimate that is submitted. This would be a helpful tool in negotiations. Realistic schedules that are well developed and thought out will prevent problems in the long run with the negotiations with the Contractor, with the customer, and with regulatory agencies. The project manager should be realistic about schedules and they need to develop them around the TOTAL QUALITY MANAGEMENT and PROJECT MANAGEMENT principals developed by USACE, in the project planning guidance document, and ER 5-7-1(FR).

When developing a schedule, all projects aspects should be considered by the project manager and team. The project manager cannot develop a schedule without input from the total team. (Technical, Contracting, Office of Counsel, Customer, Resource Management, etc.). These considerations must also include the review times required by regulatory bodies and non-regulator agencies (such as AEHA) that may affect the schedule. The project schedule must consider the requirements of any Federal Facility Agreement (FFA), consent order, memorandum of understanding, etc.

Development of a RI/FS schedule is very difficult when other governmental agencies are involved in providing information, reviews, or the decision process. Using this outline can help in development of a schedule by estimating the time frame for each activity. Project managers must remember in developing a schedule that the USACE has control only over the people under USACE control. Uncertainties and contingencies must be considered.

The Contractor should be required to use critical path/time line tools in developing the schedules that can graphical provide the various components of the schedule and milestone

dates. This will help in identifying parallel activities that may effect the schedule.
********** **********

3.8 Submittals

****
This section summarizes the submittals expected during the course of the RI/FS project. No technical requirements are presented here.

The type and number of reports should be coordinated with the customer and the various reviewing agencies. Also special considerations should be taken as to what type or kind of submittal certain agencies should receive.
****

3.8.1 General Submittal Requirements
3.8.2 Document Submittal Register

****
The type of submittal, number of copies, and who are required to receive the submittals are specified here. The register identifies who will receive copies of the submittals. This listing should include, as a minimum, POC name, title, address, telephone, and facsimile. During the course of the project this listing will need to be updated.
********** **********

3.8.3 RI/FS Workplans

****
The requirements for these plans are detailed in the various technical sections or guidance documents.

As a matter of background, the Project Workplan is intended to be a single project document, with individual plan requirements, CDAP, SSHP, CRP, MWIP and TSP, as attachments to that plan, rather than separate deliverables. All background information, project strategy, data quality objectives, and data collection design requirements are included in the Project Workplan. Implementation requirements, field sampling techniques, analytical protocols, and well construction requirements, are included in the plan attachments. There should not be duplication of Project Workplan material included in the attachments, and plan attachments should rely on the main workplan to provide all general and overall project information which may have an effect on plan attachment preparation. Information such as organizational struc-

ture and responsibilities should also be included in the main workplan for each area of interest rather than in the plan attachments.
****

3.8.3.1 Project Workplan
3.8.3.2 Chemical Data Acquisition Plan (CDAP) Attachment
3.8.3.3 Monitoring Well Installation and Drilling Plan (MWIP) Attachment
3.8.3.4 Site Safety and Health Plan (SSHP) Attachment
3.8.3.5 Community Relations Plan (CRP) Attachment
3.8.3.6 Treatability Study Workplan Attachment

3.8.4 Progress Reports

****
The type and requirements for reports that the Contractor will be required to provide or submit would be discussed under this section. The requirements for these submittals should be identified on the Corps' schedule or the Contractor' s schedule.
****

3.8.4.1 Monthly Progress Reports
3.8.4.2 Daily Quality Control Reports

3.8.5 Drilling Logs
3.8.6 Monitoring Well Construction Diagram and Development Record
3.8.7 Survey Documents
3.8.8 RI Report

****
The type and number of reports should be coordinated with the customer and the various reviewing agencies. Also special considerations should be taken as to what type or kind of submittal certain agencies should receive.
****

3.8.8.1 Pre-Draft Data Package
3.8.8.2 Draft RI
3.8.8.3 Final RI

****
Various draft documents may be considered for the following reports
****

3.8.9 Quality Control Summary Report
3.8.10 Treatability Study Report
3.8.10.1 Draft Treatability Study Report
3.8.10.2 Treatability Study Report
3.8.11 FS Report
3.8.11.1 Draft FS
3.8.11.2 Final FS

4. Health and Safety Technical Requirements

****
This section presents the technical requirements for health and safety. Refer to Enclosure 8 to the ETL for the suggested language for this SOW section.

Two topics, "Site Description and Contamination Characterization" and "Staff Organization, Qualifications, and Responsibilities" may be addressed as a portion of the workplan as outlined in section 2.1. In the event this material is addressed within the workplan (WP), the applicable WP sections should be referenced within these sections of the SSHP. Regardless of location, these topics should address the requirements contained in Enclosure 8.
****

5. Chemistry Technical Requirements

****
This section presents the technical requirements for performance of sampling and analysis activities. Specific requirements are discussed under the individual topics. Additional guidance on the typical content of this section is provided as Enclosure 13 to the ETL, Chemistry Technical Requirements. An outline of the section is provided here.
****

5.1 Introduction
5.1.1 CDAP Format and Implementation Requirements
5.1.1.1 Section 1. Table of Contents
5.1.1.2 Section 2. Project Background Data
5.1.1.3 Section 3. Chemical Requirements to Support Project DQOs
5.1.1.4 Section 4. Contractor Project Organization and Functional Areas of Chemistry Responsibilities
5.1.1.5 Section 5. Field Activities

5.1.1.5.1 Field Instrumentation and Equipment (Calibration and Maintenance)
5.1.1.5.2 Field Documentation

5.1.1.5.3 Daily Quality Control Reports (DQCRs)
5.1.1.5.4 QC and QA Field Samples
5.1.1.5.5 Decontamination Procedures
5.1.1.5.6 Matrix: Groundwater Samples
- 5.1.1.5.6.1 Field Screening
- 5.1.1.5.6.2 Locations
- 5.1.1.5.6.3 Sampling Procedure
- 5.1.1.5.6.4 Analytical Procedure
- 5.1.1.5.6.5 Sample Containers, Preservations, Holding Times

5.1.1.5.7 Matrix: Surface Water Samples
- 5.1.1.5.7.1 Field Screening
- 5.1.1.5.7.2 Locations
- 5.1.1.5.7.3 Sampling Procedure
- 5.1.1.5.7.4 Analytical Procedure
- 5.1.1.5.7.5 Sample Containers, Preservations, Holding Times

5.1.1.5.8 Matrix: Leachate Samples
- 5.1.1.5.8.1 Field Screening
- 5.1.1.5.8.2 Locations
- 5.1.1.5.8.3 Sampling Procedure
- 5.1.1.5.8.4 Analytical Procedure
- 5.1.1.5.8.5 Sample Containers, Preservations, Holding Times

5.1.1.5.9 Matrix: Soil Samples
- 5.1.1.5.9.1 Field Screening
- 5.1.1.5.9.2 Locations
- 5.1.1.5.9.3 Sampling Procedure
- 5.1.1.5.9.4 Analytical Procedure
- 5.1.1.5.9.5 Sample Containers, Preservations, Holding Times

5.1.1.5.10 Matrix: Sludge/Sediment Samples
- 5.1.1.5.10.1 Field Screening
- 5.1.1.5.10.2 Locations
- 5.1.1.5.10.3 Sampling Procedure
- 5.1.1.5.10.4 Analytical Procedure
- 5.1.1.5.10.5 Sample Containers, Preservations, Holding Times

5.1.1.5.11 Matrix: Air Samples
5.1.1.5.11.1 Locations
5.1.1.5.11.2 Sampling Procedure
5.1.1.5.11.3 Analytical Procedure
5.1.1.5.11.4 Sample Containers, Preservations, Holding Times
5.1.1.5.12 Matrix: Surface Samples
5.1.1.5.12.1 Field Screening
5.1.1.5.12.2 Locations
5.1.1.5.12.3 Sampling Procedure
5.1.1.5.12.4 Analytical Procedure
5.1.1.5.12.5 Sample Containers, Preservations, Holding Times
5.1.1.5.13 Matrix: Soil Gas Samples
5.1.1.5.13.1 Field Screening
5.1.1.5.13.2 Locations
5.1.1.5.13.3 Sampling Procedure
5.1.1.5.13.4 Analytical Procedure
5.1.1.5.13.5 Sample Containers, Preservations, Holding Times
5.1.1.5.14 Matrix: Drum / Tank Samples
5.1.1.5.14.1 Field Screening
5.1.1.5.14.2 Locations
5.1.1.5.14.3 Sampling Procedure
5.1.1.5.14.4 Analytical Procedure
5.1.1.5.14.5 Sample Containers, Preservations, Holding Times

5.1.1.6 Section 6. Sample Chain of Custody, Packing and Shipping
5.1.1.7 Section 7. Laboratory Activities
5.1.1.7.1 Cooler Receipt Form
5.1.1.7.2 Instrument Calibration and Frequency
5.1.1.7.3 Quality Control Procedures
5.1.1.7.4 Preventive Maintenance
5.1.1.7.5 Corrective Action
5.1.1.7.6 Data Reduction, Assessment Validation, and Documentation
5.1.1.8 Section 8. Chemical Data Quality Management Deliverables
5.1.1.8.1 Daily Quality Control Reports

****

This section presents the technical requirements for performance of the geotechnical activities. Specific requirements are discussed under the individual topics. This section should present the acceptable procedures and products to be used by the Contractor. This information allows an accurate estimate and proposal to be developed and minimizes the severity of the comments that may need to be made on the Contractor's workplans. The level of detail depends on the project and the Contractor's experience in working with the Corps. If the Contractor has done work for the Corps previously and is aware of these requirements, the scope may refer to previous contracts or work orders for these requirements, adding only those project specific changes. For indefinite delivery contracts, many of these requirements may be part of the primary contract, and need not be reiterated in each work order. In that case, only those project-specific requirements or changes from the contract requirements need be discussed here. If the requirements are not part of the primary contract, the SOW must present or refer to these technical requirements.

Unless otherwise noted, the language for each topic is to be developed by the hydrogeologist and/or geotechnical engineer

with concurrence of the chemist and industrial hygienist. The other team members need to be aware of these requirements because of the impacts on data quality and health and safety.

Most of the following sections require some description of the Contractor's proposed implementation in the workplans. Details related to drilling, monitoring well installation, geophysical surveying, infiltration/aquifer testing are to be proposed in the Monitoring Well Installation Plan Attachment. Other activities may require specific discussion in another supporting workplan attachment. Some activities will require specific analyses that are to be described in detail in the reports. Some activities also require specific submittals separate from these plans and reports. These are discussed under the individual topics.

Many of these activities will require coordination with the land owner or installation, and many of the intrusive activities will need utility clearances. Depending on the nature of the regulatory involvement, some activities (or the review of this section) may require coordination with regulatory agencies. Some of the coordination recommended here duplicates the advice provided under the Project Requirements Section, but is provided here as well to assure that the coordination is done.

In general, many of these sections should be cross referenced to the Chemistry Technical Requirements (Section 5.) or the Sample Analyses, Data Assessment and Reporting Section (2.4) because of the interrelated nature of field sampling for chemical analysis. There should be no duplication with the Field Investigations Section (2.3). This section only provides the general technical requirements for performance, not the specifics on sampling location, numbers, and analyses.
****

6.1 General Specifications

6.1.1 Qualified Hydrogeologist/Geotechnical Engineer

****
This section would specify the minimum requirements for the experience, training, or registration/certification of the Contractor's project hydrogeologist, hydrogeologist/engineer in the field, or project geotechnical engineer. Information on general organization structure and responsibilities in the General Project Workplan should not be reiterated in the plan attachment. This decision may depend on the complexity

of the project or its critical nature. The more experience required, the higher the labor rates the Contractor will propose, though the higher cost may yield a better product. The Contractor should be required to submit the hydrogeologists' or engineers' resumes along with the chemists in the CDAP.
****

6.1.2 Applicable Driller and Surveyor Permits and Licenses

****
In some cases, it may be necessary to require the use of a driller or surveyor licensed in the state in which the project is located. If required, this should be discussed in negotiations or in the workplans. Drillers and surveyors employed by the Corps should not need to be licensed, but use of licensed drillers or surveyors may be required if the work is to be contracted.
****

6.1.3 Compliance with State Requirements

****
The Contractor should be directed to conform to state well construction and environmental requirements. The responsibility to investigate and evaluate these requirements should be placed on the Contractor (since they are usually local). The Contractor should be required to notify the Government if there is a conflict between state requirements and this SOW.
****

6.1.4 Utility Clearances

****
This section should specify who has the responsibility for obtaining digging permits and utility clearances. Most often, the Contractor is required to obtain all utility clearance and digging permits. This will require coordination with the land owner or installation. They may need to assist the Contractor in obtaining these permits. Cross reference with section 3.5.4 if the Government will assist in obtaining permits. The section should also prescribe acceptable procedures for relocating sampling sites if utilities pose a problem. It may be desirable to request a copy of the permit be included in the RI report.
****

6.1.5 Disposal of Investigation Derived Waste (IDW)

****
This is a difficult topic. This section describes the responsibility for disposal of cuttings, drill fluids, decontamination fluids, development or purge water, pump test water, chemical samples, rock core, and other potentially contaminated material generated in the field. The disposal means and responsibility vary depending on the type of waste, the contaminant, the project, and regulatory atmosphere.

If RCRA Hazardous IDW is to be stored onsite, contact the State RCRA regulators to determine storage requirements. In most instances, the state will require that IDW be stored in accordance with the storage provisions of RCRA for generators which are found in 40 CFR 262 and 40 CFR 264.

This topic requires careful coordination with the project manager, the installation, the state regulators and Treatment, Storage or Disposal (TSD) facility. The analytical lab and project chemists should be consulted for information regarding the disposal of analytical samples after the lab is done with them. Someone familiar with environmental laws and regulations should also be consulted.

This topic should reference the Sample Analyses, Data Assessment and Reporting Section (2.4), particularly those sections describing waste-generating activities such as decontamination, subsurface soil/rock sampling, aquifer testing, etc.

Any additional chemical analyses necessary to make decisions about IDW disposal must be coordinated with the chemist to assure that the numbers of analyses shown in tables accurately reflect this work.

See EPA Guidance Document EPA/540/G-91/009, Management of Investigation-Derived Wastes During Site Inspections, May 1991.
****

6.1.6 Explosive Ordnance Disposal

****
This section would discuss the procedures and responsibilities for disposal of possible ordnance. This activity will require coordination with the Ordnance and Explosive Waste Mandatory Center of Expertise (OEW-MCX) at CEHND, the installation, Explosive Ordnance Disposal (EOD) unit, and local officials (in some instances). This section should be

developed by a safety engineer experienced in ordnance disposal, with the involvement of the project manager and the hydrogeologist.

It is very important to note the type of waste, especially if the production of ordnance was the manufacturing process. In this case, coordination with the state RCRA office may be necessary.
****

6.1.7 Decontamination of Equipment/Tools

****
This topic describes the acceptable procedures for decontamination of the sampling tools, bailers, drill rigs, backhoes, etc. This should be developed in consultation with the chemist and industrial hygienist and should be cross referenced with the Chemistry and Safety and Health Technical Requirements. These procedures would be outlined in the CDAP and the SSHP.

Decontamination fluids are considered investigation-derived wastes!
****

6.1.8 Water Source and Testing

****
If water is required for site activities such as rotary drilling or heaving sand control, the source and testing of this water is described here. The chemist should assist in developing this portion of the scope to assure the analyses of the water from the proposed source is included in the analytical tables. If a source is available on site, this should be noted, but this would require coordination with the land owner or installation. These activities should be described by the Contractor in the workplans.
****

6.1.9 Site Restoration and Protection

****
The Contractor is normally required under this section to restore the site after field work or each hole/pit is completed. Any unusual site protection requirements can be discussed here, such as protecting trees, wetlands, etc. It may be necessary to consult with a biologist or wetlands specialist within the Corps, or with the state regulatory agencies.
****

6.1.10 Contractor Responsibility for Wells

****
This section normally outlines the Contractor's liability for functioning wells and states the Contractor shall replace, at no cost to the government, any well that won't yield the required data because of inadequate design or installation.
****

6.1.11 Site Surveying

****
This section should describe the requirements for developing the surveying data required under Task 3, Field Investigations (2.3). This section should set forth the procedures for a survey of sampling locations (proposed or actual), the determination of the site boundary (a cadastral survey), or the preparation of a site topographic map. The survey should be required to be compatible with previous surveys in the area. If previous surveys were of questionable quality, requirements for the resurvey of features should be considered. The requirements are best determined by a team of the project/technical manager, a surveyor, design engineers, the chemist or hydrogeologist, and possibly a real estate officer. Submittal of appropriate work products and field notes are probably best described here. This section should be coordinated with the land owner or installation, and possibly the local registrar of deeds, etc. Installations often have good topographic information available, but it should be relatively current. Cross reference with paragraph 6.1.2 Applicable Driller and surveyor Permits and Licenses.
****

6.2 Monitoring Well Installation and Drilling Plan (MWIP) Attachment

****
This section specifies the content of the Monitoring Well Installation (and Drilling) Plan. This plan sets forth the rationale and step-by-step plan of action for each field activity, including a description of all equipment and materials, up to the actual handling of samples. Normally, this plan discusses the design and implementation details left to the Contractor, including all field activities up to actual handling of the samples. Materials, construction/drilling procedures, geophysical procedures, aquifer testing methods, etc. are appropriate to be discussed in the MWIP.

This section should be coordinated with the chemist and project manager to make sure the scope adequately conveys the differences in intent for the CDAP and the MWIP so there is little duplication of effort by the Contractor in preparing plans. The MWIP can be presented as a section of the CDAP so only one document addresses field sampling.

Refer to Enclosure 17 for a checklist useful in reviewing a MWIP.
****

6.3 Subsurface Soil/Rock Sampling

****
This section discusses the required or acceptable procedures for drilling boreholes and excavating test pits and obtaining samples for logging and chemical and geotechnical analyses. These sections should discuss the procedures for drilling and sampling, not the locations or numbers of boreholes, etc., since that is discussed under the Project Requirements Section. If not already involved, geotechnical engineer should assist in developing the requirements. The industrial hygienist should assure that the scope requires the Contractor's site safety and health officer evaluate the safety and health hazards associated with drilling boreholes and excavating test pits in accordance with applicable standards and safe procedures.

In some cases, many of the topics under this topic should be written to allow flexibility depending on the Contractor's capabilities or local experience, particularly in choosing drilling or excavation methods. On the other hand, the more detail provided here, the less risk of having procedures proposed in the plans that are unacceptable.
****

6.3.1 Drilling Method
6.3.2 Test Pit Excavation

****
This section should specify where the sampling should be done. In some cases, sidewall sampling by personnel who enter the trench may be appropriate, but in other cases, sampling from the backhoe bucket may be adequate. The industrial hygienist should assure the scope requires that sampling activities performed in close proximity to trenches/excavations and sampling activities requiring entry of personnel into the trenches/excavations shall be performed

only after the evaluation by the site safety and health officer. Special consideration shall be given to the requirements of Section 23 "Excavation" and Section 27 "Work in Confined Spaces" of the USACE Safety and Health Requirements Manual, EM 385-1-1 (latest revision). In addition, the requirements of applicable OSHA standards, such as 1926.650 (Subpart P-Excavations) through 1926.652 (Requirements for Protective Systems) and 1910.120 (Hazardous Waste Operations and Emergency Response), shall be met. Refer also to Enclosure 8 of this ETL.
****

6.3.3 Logging Requirements

****
See Enclosure 14 to the ETL for a list of logging requirements. The logs may be considered a separate submittal which are often required within a certain time following completion of each boring. This allows an early check on the adequacy of the logging and the conditions encountered.
****

6.3.4 Geotechnical Sampling and Analyses

****
This section should discuss the general frequency (number per hole), depth, and/or numbers of samples (if for the entire project) to be taken for geotechnical analyses or logging purposes. The performance of tests such as the standard penetration test or the use of a cone-penetrometer rig should be discussed here. The section should also discuss the required testing to be performed and the appropriate methods for geotechnical testing. This section should be developed with input from the geotechnical engineer. If the geotechnical samples are to be analyzed by a Corps lab (often an economical alternative), careful coordination is necessary with the lab to assure the availability of the necessary equipment and time, as well as to discuss any safety issues related to handling the samples or the disposal of the samples after testing.
****

6.3.5 Coring/Core Handling
6.3.6 Hole Abandonment/Decommissioning

****
This section should discuss the acceptable method of abandoning borings or pits. In some states, grouting of the borings may be required, particularly if they encounter ground water.

The use of cuttings for fill may be allowed if clean (see IDW guidance). Coordination may be required with the federal and state regulatory authorities. The hydrogeologist should develop this section in consultation with a chemist and someone familiar with environmental laws and regulations. Cross reference the section on IDW disposal.
****

6.3.7 Sampling Techniques

****
This section describes the acceptable techniques for obtaining soil samples (or perhaps water samples obtained for screening purposes) directly from the boring or pit for chemical analyses. Note that water samples taken by bailer or similar device directly from the open boring or pit are generally not adequate substitutes for water samples taken from monitoring wells or for water samples taken using specially designed downhole water samplers (e.g. a cone penetrometer, a Hydropunch, or BAT probe). This section should not discuss sample packaging and shipment if these items are to be covered under the Chemistry Technical Requirements. A cross-reference to that section would be appropriate. This section should be developed jointly by the hydrogeologist and the chemist. These requirements should be incorporated by the Contractor in preparation of the CDAP.
****

6.3.8 Field Screening

****
This section would discuss the procedures for measuring and recording the results of the screening of the soil samples by photoionization detector (PID) or flame ionization detector (FID), though it could include other field screening techniques, such as explosives screening. If another agency is performing the field screening (say for a nerve agent or unusual compound), coordination will be required between them and the Contractor. The procedures proposed by the Contractor should be outlined in the CDAP. It is very practical to require that only one technique be used throughout the field effort to assure the comparability of the screening results between sampling locations.
****

6.3.9 Location/Elevation Survey of Boreholes/Test Pits

6.4 Monitoring Well Installation

****
This section discusses the required or acceptable procedures, materials, and design for drilling and installation of the monitoring wells. Generally, the hydrogeologist or geotechnical engineer would prepare this entire section, with consultation with the chemist for issues, such as material choice, which could affect sample integrity.

In some cases, many of the topics under this section should be written to allow flexibility depending on the Contractor's capabilities or local experience, particularly in choosing drilling. On the other hand, the more detail provided here, the less risk of having procedures proposed in the plans that are unacceptable. All procedures should be proposed by the Contractor in the Monitoring Well Installation Plan. Details are given in USACE monitoring well installation guidance.

The materials, such as casing, screen, grout, and filter pack should be treated similar to a construction specification, including specification of size, material, and installation techniques. Materials should be specified based on the site conditions to the extent possible.
****

6.4.1 Drilling Method

****
Acceptable drilling methods should be described here considering site conditions and chemicals of concern. Assuring acceptable data quality but providing the Contractor maximum flexibility should be the goal here.
****

6.4.2 Soil/Rock Sampling While Drilling

****
This section should discuss the sampling of soils during drilling of the monitoring well boreholes. This would generally be done to prepare logs or obtain samples for chemical or geotechnical analyses. Cross reference to the Subsurface Soil/Rock Sampling section. This section should only note the general frequency of soil sampling if it is consistent from site to site; otherwise, this should be discussed in the Project Requirements Section.
****

6.4.3 Field Screening

****
Cross reference to the Field Screening Section under Subsurface Soil/Rock Sampling, unless the field screening procedure

differs for the drilling and sampling for monitoring wells.
****

6.4.4 Casing and Screen
6.4.5 Gravel/Sand Pack
6.4.6 Grouting
6.4.7 Surface Completion

****
This section should discuss the way the well is finished at the surface; i.e., protective casings, locks, flush mount finish, protective posts. This is often a matter of the desires of the land owner or installation and will require coordination with them.
****

6.4.8 Well Development

****
This section should cross reference the section on IDW disposal since significant quantities of contaminated water can be generated.
****

6.4.9 Monitoring Well Construction Diagrams

****
This section would require as-built drawings of the wells as they are completed. These are often separate submittals to be submitted within a specified time following completion of each well. Cross reference with the section on logging for logging of the boreholes.
****

6.4.10 Survey

****
This section requires the elevation and coordinate survey of the new wells and specifies the accuracy. Cross reference with the Site Surveying Section.
****

6.4.11 In-Situ Permeability (Single Well) Testing
6.4.12 Water Level Measurements
6.4.13 Dedicated Pumps and/or Bailers

****
This section should prescribe any dedicated bailers or sampling pumps. This may require input from an environmental or mechanical engineer for appropriate pump selection. If the installation or other agency may be sampling the wells a number of times, coordination may be required to assure the wells meet their requirements.
****

6.4.14 Well Sampling

****
This section discusses the requirements for the sampling procedures. Should also, if appropriate, describe procedures for obtaining samples of floating product. Actual sampling round and analyses should be discussed under Project Requirements.
****

6.5 Existing Domestic/Industrial/Municipal Well Inventory

****
This section would require the compilation of a list of existing wells in the vicinity of the site and various data about them, including use and construction. This may require coordination with the installation or landowner if additional wells are on the same property, but generally the Contractor will be required to contact the various land owners or state or local agencies to obtain this information. This section may require cross reference to the section on Available Data Review (2.1.1). This section would provide the technical requirements for the survey directed under the Available Data Review Section.
****

6.6 Aquifer Tests

****
This section describes the performance of pump tests or other aquifer testing. It is normally to be developed by the hydrogeologist, but because of the difficult issue of water disposal, input from an environmental/process engineer is strongly recommended, particularly if the water produced is contaminated. This has proven to be a serious problem, often

to the point of preventing the performance of an aquifer test until an onsite treatment plant is built.
****

6.6.1 Pump Test Plan

****
This would require a plan for conducting the pumping test(s) and construction of the pump test well(s). It would be a part of/addendum to the MWIP.
****

6.6.2 Pumping Well Installation

****
Refer to the Monitoring Well Installation Section for the typical requirements.
****

6.6.2.1 Drilling Method
6.6.2.2 Soil Sampling While Drilling
6.6.2.3 Field Screening
6.6.2.4 Casing and Screen
6.6.2.5 Gravel/Sand Pack
6.6.2.6 Grouting
6.6.2.7 Surface Completion
6.6.2.8 Well Development
6.6.2.9 Well Construction Diagram
6.6.2.10 Well Survey
6.6.2.11 Initial Water Level Measurements
6.6.2.12 Pump
6.6.2.13 Initial Well Sampling

6.6.3 Observation Well Construction

****
Refer to the Monitoring Well Installation Section for the typical requirements.
****

6.6.3.1 Location(s) and Depth(s)

****
"Locations" would refer to the locations relative to the pumping well, not to the locations of the tests.
****

6.6.3.2 Drilling Method
6.6.3.3 Soil Sampling While Drilling
6.6.3.4 Field Screening

6.6.3.5 Casing and Screen
6.6.3.6 Gravel/Sand Pack
6.6.3.7 Grouting
6.6.3.8 Surface Completion
6.6.3.9 Well Development
6.6.3.10 Well Construction Diagram
6.6.3.11 Well Survey
6.6.3.12 Initial Water Level Measurements
6.6.3.13 Initial Well Sampling
6.6.4 Step Testing of Pumping Well
6.6.5 Pump Test Duration
6.6.6 Water Level Monitoring
6.6.7 Water Sampling During Test

****
This section would specify the frequency of and procedures for sampling during the test. Careful coordination is necessary between the hydrogeologist and the chemist in developing this section. This section should only be used if the requirements for sampling during the test are NOT discussed under Project Requirements. Any samples should be included in the chemical analyses summary tables and methods should be discussed under Sample Analyses, Data Assessment and Reporting Section (2.4). Since the results of these samples are often needed on a quick turnaround basis, an onsite lab may be needed. These requirements need to be carefully cross referenced with the Chemistry Technical Requirements.
****

6.6.8 Water Storage or Discharge/Water Treatment

****
This section presents a serious problem to the performance of aquifer tests at HTRW sites. This section would discuss the requirements for the handling of the pump test water. Given the significant impact on cost, some indication of possible alternatives must be included. This section needs the input of the hydrogeologist, the environmental/process engineer, and a chemist, the industrial hygienist, and possibly the geotechnical engineer. The industrial hygienist would assist in determining potential safety and human exposure problems associated with the handling of the water. The geotechnical engineer would provide input on the scope requirements for foundation preparation of the storage tank or treatment plant. This activity must be coordinated with the installation, the landowner, and possibly a local treatment plant for both disposal of the water and for space for the storage

tanks or treatment plant. Since the water is considered IDW, refer to section 6.1.5, Investigation Derived Waste.
****

6.6.9 Recovery Monitoring
6.6.10 Data Reduction and Analyses

****
This section describes the requirements for analyzing the aquifer test data to develop specified aquifer parameters, such as transmissivity. Because the methods chosen to determine the hydrologic parameters such as transmissivity and storage coefficient depend somewhat on the appearance of the pump test data, flexibility is recommended in the scope. If the results of the analyses are relevant to the section on Ground Water Modeling, this section should be cross-referenced.
****

6.6.11 Aquifer Test Report

****
This section would describe the topics to be presented in a portion or appendix of the RI report that summarizes the aquifer testing program.
****

6.7 Geophysical Surveys

****
This section describes the geophysical survey methodology to be performed. Again, this section does NOT describe the locations, etc. of the surveys since that is discussed under the Project Requirements. This section should be developed by the hydrogeologist or a geophysicist. Only issues such as access should need to be coordinated with the landowner or installation. There may be a possibility that operation of some geophysical instruments could interfere with radar and communications at an installation. This has not been a problem, but this may need to be coordinated with the appropriate shops at the installation.
****

6.7.1 Surface Geophysics

****
Refer to Enclosure 9 of the ETL for a checklist for scoping surface geophysics. The requirements should be

accompanied by rationale for the selection. The topics listed below should be considered.
****

6.7.1.1 Methods to be Considered
6.7.1.2 Plan Preparation

****
This requirement would generally specify the topics to be considered under the portion of the MWIP concerning the surface geophysical surveys. Refer to Enclosure 9 for topics to be covered by the Contractor in the plan.
****

6.7.1.3 Instrument Calibration
6.7.1.4 Survey Grid/Traverse Spacing
6.7.1.5 Measurement Protocol
6.7.1.6 Grid/Traverse Surveying
6.7.1.7 Data Recording
6.7.1.8 Data Processing and Analysis
6.7.1.9 Report and Drawings

****
This section would describe the topics to be presented in a portion or appendix of the RI report that summarizes the geophysical surveys.
****

6.7.2 Downhole Geophysics

****
This requirement would generally specify the topics to be considered under the portion of the MWIP concerning the downhole geophysical surveys.
****

6.7.2.1 Operator Licensing
6.7.2.2 Methods to be Used
6.7.2.3 Plan Preparation

****
This requirement would generally specify the topics to be considered under the portion of the MWIP concerning the downhole geophysical surveys.
****

6.7.2.4 Instrument Calibration
6.7.2.5 Data Recording and Log Scale

6.7.2.6 Data Analyses
6.7.2.7 Report and Log Presentation

****
This section would describe the topics to be presented in a portion or appendix of the RI report that summarizes the downhole geophysical surveys.
****

6.8 Vadose Zone Permeability/Infiltration Testing

****
This section describes the requirements for conducting tests of the hydraulic and air permeability testing of the unsaturated zone. The section should describe the acceptable methods to be considered, if known. In many cases, it may be best to utilize the Contractor's expertise. The reference to ASTM designated methods or similar standards would be useful. These requirements would be developed by the hydrogeologist, the geotechnical engineer, or the project team member preparing the risk assessment. If the testing is to be done to support the development and screening of a remediation or disposal alternative, input from an environmental/process engineer would be advisable. It may also be appropriate to cross reference to the Treatability Studies Section if the testing is done for this purpose.
****

6.8.1 Method
6.8.2 Data Analysis

6.9 Modeling

****
This section describes the requirements for performing ground water, vadose zone, geochemical, surface water, and/or contaminant transport modeling. Since modeling can be done to support many aspects of HTRW work, the requirements presented here may vary widely. In some cases, the use of a specific modeling computer code or analytical solution 'nay be required; in other cases, the better approach may be to provide the intent and general guidelines and allow the Contractor to propose a model in the project plans. The topics listed below can present specifications or only require the Contractor to consider the topics in choosing a code/solution or developing the model. More detailed information on scoping ground water modeling can be found in Enclosure 10 to the ETL.

To develop this section, input must be obtained from the hydrogeologist; however, because the modeling may be done to support risk assessment or remedial design, the team members primarily responsible for those items should provide input as well. Many of the modeling tasks will require knowledge or input of chemical properties and behavior; therefore the chemist should also be involved in preparing this section of the scope.

This section should cross reference to those sections in the main body of the scope that would require modeling support, such as alternative screening or risk assessment. It should also reference the description of the conceptual site model presented in section 1 and required of the Contractor in section 2.1.

Generally, little coordination would be required for this item outside of the coordination between the Corps and the Contractor. However, in some cases it may be necessary or best to use a model (code and input) previously developed for the site, say by the regulatory agency or previous Contractor. In this case, coordination by the Corps may be required to obtain this model.

Modeling efforts must be described in the RI/FS workplan and requirements should be presented in section 2.1 of the SOW. Reports are required for each modeling effort by specific sections under this topic. These sections would contain language that require the reports to be prepared and describe the topics to be presented. These reports could be combined if more than one modeling effort is required (say one for risk assessment and another for alternative screening) and would be most appropriate as an appendix to the RI or the FS, depending on the purpose. These sections on the modeling reports should be developed by the hydrogeologist and cross referenced with the submittal requirements to assure consistency under the Submittals Section.
****

6.9.1 Ground Water Transport
- 6.9.1.1 Purpose and Rationale
- 6.9.1.2 Review of Previous Models
- 6.9.1.3 Area to be Modeled
- 6.9.1.4 Type of Model
- 6.9.1.5 Boundary Conditions
- 6.9.1.6 Calibration
- 6.9.1.7 Scenarios to be Considered
- 6.9.1.8 Modeling Report

6.9.2 Contaminant Transport

****
This could include contaminant transport in the ground water or vadose zone.
****

6.9.2.1 Rationale
6.9.2.2 Review of Previous Models
6.9.2.3 Area to be Modeled
6.9.2.4 Type of Model
6.9.2.5 Boundary Conditions
6.9.2.6 Assumptions
6.9.2.7 Calibration
6.9.2.8 Scenarios to be Considered
6.9.2.9 Modeling Report

6.9.3 Vadose Zone Air Flow

****
This could include subsurface gas generation or transport modeling for risk assessment or soil vapor extraction system feasibility evaluation.
****

6.9.3.1 Rationale
6.9.3.2 Review of Previous Models
6.9.3.3 Location
6.9.3.4 Type of Model
6.9.3.5 Boundary Conditions and Assumptions
6.9.3.6 Calibration
6.9.3.7 Scenarios to be Considered
6.9.3.8 Modeling Report

****
This would require a report on the modeling effort. This could be part of the FS report.

****

6.9.4 Geochemical Modeling

****
The work required here is different from the contaminant transport modeling. These models would include those done to evaluate impacts on facilities or the aquifer by inorganic precipitation or biofouling, for example.
****

6.9.4.1 Rationale
6.9.4.2 Type of Model
6.9.4.3 Scenarios to be Considered
6.9.4.4 Modeling Report

****
This would require a report on the modeling effort. This would be part of the FS report.
********** ********

6.9.5 Surface Water Modeling

****
This section describes the required methodology and criteria for surface water modeling to support the screening of alternatives or to identify surface water impacts under NEPA. This section would be prepared by a hydrologist if only local drainage is involved. If stream flow is involved additional help would be required from experts in sediment transport and/or in water quality.
****

6.9.5.1 Local Drainage or Flood Flows

****
This section would describe the necessary procedures to perform simulation of local drainage and flood flows. In the area of flood frequency the following categories of flood data are recognized: systematic records (U.S. Geological Survey gaging stations), historic data (high water marks and newspaper accounts), comparison with similar watersheds (regional frequency studies), and flood estimates from precipitation (HEC-l analysis). Bulletin #17B, March 1982, prepared by the Interagency Advisory Committee on Water Data and published by The U.S. Department of the Interior, Geological Survey, Office of Water Data Coordination, Reston, Virginia 22092 provides the necessary guidance for evaluating data in the first two categories. Guidance for comparing similar watersheds is provided in EM 1110-2-1415, while guidance for making flood frequency estimates from precipitation is provided in the Corps' Hydrologic Engineering Center's (HEC) Training Document No. 15, entitled "Hydrologic Analysis of Ungaged Watersheds Using HEC-1, April 1982. The latter two publications are available from HEC, 609 Second Street, Davis, California 95616. In all cases, a basin description along with a basin map should be provided.

A HEC-2 backwater model should be used in conjunction with the flow frequency results to determine stages and flow velocities associated with all pertinent floods (normally these are the 500-,100-,50-,25-,10- and 2-year events) at the site under investigation. A publication entitled "Accuracy of

Computed Water Surface Profiles", December 1986 prepared by HEC for the Federal Highway Administration provides a basis for determining the type of field surveys required to set the upstream and downstream boundaries for the study, the level of topographic detail needed to get good cross section definition, and a methodology for improving the reliability of estimating Manning's coefficient when calibrating the model to high watermarks. This publication is available from HEC. The Contractor cannot obtain the HEC-2 model directly from HEC. The scoping district can provide the model to the Contractor or the Contractor can obtain commercial software. Cross reference the section on Flood Frequency/Flood Plain Analysis (Section 2.10.6.2).
****

6.9.5.2 Continuous Flow Simulation

****
This section would require the Contractor to perform continuous flow simulations. Continuous flow simulation of a riverine system can be helpful in measuring the impacts of a proposed project on the flow regime in the basin. If long term gaging records are to be used to set up the simulation model, appropriate adjustments need to be made to the historic flow records to make them consistent with baseline conditions (pre-project). Selection of an appropriate time-step (either monthly or daily) will depend on the available data and the accuracy required to make the NEPA impacts assessment.
****

6.9.5.3 Sediment Transport

****
This section would describe the simulation and analysis of sediment transport. When a flow regime is changed, the dynamic balance between sediment movement and the hydraulics of flow is upset. A land-use change can impact the size and gradation of sediment material in the stream's boundaries which can also be a contributing factor to upsetting this dynamic balance. The interaction between the hydraulics of flow and the rate of sediment transport can be simulated with HEC-6, a one-dimensional numerical model of river mechanics. It was developed by the Hydrologic Engineering Center in Davis, California. One of the input parameters to this model is an estimate of the sediment material in the stream's boundaries. Actions proposed for the site involving a land-use change that could vary this input parameter can be

assessed by applying the Soil Conservation Services's Universal Soil Loss equation.
****

6.9.5.4 Water Quality

****
This section would require the simulation of surface water quality impacts. In the practical applications of water quality models, uncertainty in the input data is usually a major limitation. The pathways and ultimate fates of heavy metals and chlorinated organics through the ecosystems are often not fully understood. However, the United States Environmental Protection Agency through its water quality modeling program has modeling packages available that can be useful in screening alternative options.
****

6.10 Fracture Trace Analysis (FTA)

****
This section describes the procedures to be used to develop an analyses of bedrock jointing and faulting and its relationship to ground water flow paths. This work is sometimes scoped to support decisions and conclusions related to plume migration and monitoring. The hydrogeologist would develop this section.
****

6.10.1 Imagery to be Used

****
This section would require the number and type of air photos, satellite imagery, or even other information (such as aeromagnetics or side looking radar) to be used in the analysis. This section would also specify who is responsible for obtaining or providing the imagery.
****

6.10.2 Ground Truth/Verification

****
This section would describe the requirements for field work to verify or correlate the images seen on the imagery with the nature of the bedrock in outcrops or cores.
****

6.10.3 FTA Report

****
This section would describe the content of the report. Generally, this report would be required as an appendix to the RI.
****

6.11 Miscellaneous Methodologies

****
This section describes requirements for activities which may vary in procedure significantly depending on site characteristics or project objectives. Detailed requirements should be developed for these activities based on these factors.
****

6.11.1 Soil Gas Survey Methodology

****
There are several ways to obtain soil gas samples. The sections of the scope under this topic would depend on the technique to be used. In many cases, it may be sufficient to specify only active or passive soil gas sampling and leave the details of the method to the Contractor to propose in the plans. The topics listed below are only typical for an active system. This section should be developed jointly by the hydrogeologist and the chemist and careful cross-referencing is necessary to the other chemistry-related sections for definition of the analytical procedures to complement these requirements for sampling procedures. The team should keep in mind that physical site properties, including soil types and surface features, can affect the applicability of soil gas sampling.
****

6.11.1.1 Probe Design and Placement
6.11.1.2 Probe Purging
6.11.1.3 Sample Recovery
6.11.1.4 Decontamination of Equipment
6.11.1.5 Blank, Background, and Duplicate Samples

6.11.2 Tracer Studies

****
This section would describe the procedures for performing tracer tests to determine ground water flow paths and rates, develop dispersivity estimates, or to verify leaks in site utilities. The requirements would vary widely depending on the site conditions and the intent, but could include the tracer compound, measurement of concentration/observation

points, analyses of data, and method of introduction of tracer. This section should be developed by the hydrogeologist and chemist (with input from the process engineer if related to site utilities).
****

6.12 Geographic Information Systems (GIS)

****
This section describes requirements for the use of GIS in managing the site data generated by field and historical investigations, if appropriate. These activities generate a large amount of raw data, such as chemical data, stratigraphic data, property/land use information that can be handled efficiently with GIS. If there are many sites at an installation, a GIS can help track data from all sites to coordinate evaluation of the overall problems. This section should be prepared by the project manager, hydrogeologist and chemist considering the nature of the project and the customer needs. This section can require the use of a specific GIS or leave the choice to the Contractor. The use of the GIS should be documented in the project workplans.
****

7. Air

****
This section presents the technical requirements for performance of activities associated with air impact assessments. Enclosure 16 presents a general description of air impact assessments for those not familiar with the process.

The level of detail to be included in the scope depends on the project and the Contractor's experience in performing air monitoring and modeling as well as the Contractor's experience in working with the Corps.

The language for each topic should be developed by the individual(s) responsible for air monitoring and air modeling with input and concurrence from the chemist, industrial hygienist, process engineer, and risk assessor (if these individuals do not have direct responsibility for air tasks).

Most of the following sections require some description of the Contractor's proposed implementation in the workplans. Details related to sampling and analysis of ambient air and emission rates are to be included in the CDAP. Details related to industrial hygiene type air monitoring are to be included in the SSHP. Other activities such as

meteorological monitoring, estimation of emission rates using modeling, and atmospheric dispersion modeling may require separate submittals which should be described in this section.

In general, many of these sections should be cross referenced to the Health and Safety Technical Requirements (Section 4); the Chemistry Technical Requirements (Section 5); the Sample Analyses, Data Assessment and Reporting section (2.4); the Data Evaluation/Fate and Transport Analysis section (2.5); and the Detailed Analysis of Alternatives section (2.10). There should be no duplication with the Field Investigations section (2.3).
****

7.1 Ambient Air Monitoring/Sampling

****
This section would provide additional details on the performance of ambient air monitoring/sampling. It is probable that most details will be described in the health and safety and chemistry sections (4 and 5, respectively). If additional requirements are needed, they would be described here. One example might be details for construction of ambient air monitoring stations.
****

7.2 Meteorological Monitoring

****
This section would discuss the decision to use available meteorological data or to obtain onsite data. If onsite data is desired, details on siting a meteorological tower, equipment specifications, data collection, processing, and reporting would be included here. This section should cross reference section 2.3.11.
****

7.2.1 Review Available Data
7.2.2 Onsite Monitoring
7.2.2.1 Meteorological Tower
7.2.2.2 Data to be Collected
7.2.2.3 Data processing, Documentation and Reporting

7.3 Emission Rate Measurements

****
This section would discuss procedures for measuring emission rates at undisturbed sites for use in the baseline risk

assessment. Procedures for determining emission rates from various remedial alternatives would also be discussed. If pilot scale tests will be performed, emission rates may be measured to assist in evaluating the impacts from full scale operations. Various techniques, both screening and in-depth, may be described. Some techniques are flux chambers, soil vapor techniques, wind tunnels, head space samplers, sampling stacks, vents, ducts, etc. This section should only discuss details that have not been covered elsewhere, i.e., Chemistry Technical Requirements (section 5), and should cross reference appropriate sections.
This should not duplicate requirements described in section 2, but should provide additional details on how to perform the required measurements.
****

7.4 Emission Rate Estimates

****
If emissions cannot be measured, this section would discuss details for estimating emission rates. If desired, this section could require the use of specific models for estimating emissions from different sources and activities such as lagoons, landfills, land treatment, materials handling, process emissions, leaks and spills on soils, etc. Alternatively, the decision on which model to use could be made by the Contractor and described in appropriate workplans or other submittals.
****

7.4.1 Uncontrolled Emission Sources
7.4.2 Remedial Action Sources
7.4.3 Emission Models
7.4.4 Emission Factors

7.5 Atmospheric Dispersion Modeling

****
This section would discuss additional details for atmospheric dispersion modeling performed as part of the fate and transport analysis (Task 5) and the detailed analysis of alternatives (Task 10). The level of detail will depend on the Contractor's experience. In some cases, the use of a specific model may be required, in other cases, the better approach may be to provide the intent and general guidelines and allow the Contractor to propose a model in the project plans. The topics listed below can present specifications or only require the Contractor to consider the topics in choosing a model.
****

****
This section would describe any other requirements for the Contractor.
****

OUTLINE FOR PRELIMINARY ASSESSMENT/SITE INSPECTION SCOPE-OF-WORK UNDER CERCLA

1. Site Description and Project Overview and Objectives

****
Refer to the RI/FS outline for additional information on the topics to be covered here. In general, section 1 provides information developed by the USACE project team to the Contractor.
****

- 1.1 Site Background
  - 1.1.1 Site History and Usage
  - 1.1.2 Previous Studies and Results
  - 1.1.3 Regulatory Authorities

****
The project manager should specify the appropriate references to regulatory program/ authority under which the site is being addressed (i.e. CERCLA/SARA, Executive Orders 12088 and 12580, the National contingency Plan, NEPA, any IAGs). Also note if the state has a mini-Superfund law. (Federal CERCLA has no transfer authority, so states do not have CERCLA authority. States, however, can adopt their own state laws in order to do the same thing as federal CERCLA.)
****

- 1.2 Project Planning Overview and Objectives
  - 1.2.1 Preliminary Assessment/Site Inspection (PA/SI) Site Strategy
  - 1.2.2 Project Objectives and Project Decision Statements

****
Refer to the extensive discussion of the project objectives development in the RI/FS outline. The PA/SI objectives are a series of statements indicating the specific objectives or goals of the PA/SI. General data needs of the PA/SI are to collect, minimally, sufficient information to support 1) determination of requirements for time-critical and non-time-critical response or removal actions, 2) evaluation pursuant to the Hazard Ranking System (HRS), and 3) elimination of no action sites from further consideration, or screening information to support scoping of additional phases

of investigation. Data needs associated with these requirements would be preliminary risk screening analysis, feasibility of removal action alternative, and regulatory compliance. Determining the quantity and quality of data required to support these project specific decisions of the PA/SI will be defined by the project team as project specific data quality objectives

Determining overall site strategy and project specific objectives is an interactive project team approach, which will enable study to focus resources toward essential project requirements, and will enhance and accelerate the projected response action. Refer to section 1. of the RI/FS outline for more detailed information.
****

1.2.2 Data Quality Objectives

1.3 Development of Potential Actions

****
This would summarize the potential actions such as removal actions or interim remedial measures as identified by the project team. The team may want to consult paragraph 2.10 and Enclosure 11, Alternative Development and Selection. This would include development of potential removal actions or interim remedial measures, definitions of operable units, or identification of possible remedial actions.
****

1.4 Summary of Required Tasks

****
This is only a superficial listing of tasks to be performed under this scope-of-work. No details are to be given here.

Task 1 - Plan Development/Preliminary Assessment
Task 2 - Draft PA Report
Task 3 - Site Investigation Planning
Task 4 - Community Relations
Task 5 - Field Investigations
Task 6 - Sample Analysis, Data Assessment and Reporting
Task 7 - Data Evaluation/Fate and Transport Analysis
Task 8 - Preliminary Risk Screening Analysis
Task 9 - Hazard Ranking System Scoring

Task 10 - Preliminary Response Action Identification
Task 11 - PA/SI Report

1.5 References

****
Include citations of previous reports, guidance documents such as EPA's Conducting Preliminary Assessment/Site Inspection, AR 200-1 (including AEHA involvement), spill notification requirements, Agency for Toxic Substances and Disease Registry (ATSDR) Health Assessments, etc.
****

2. Project Requirements

****
While EPA has guidance and requires certain information to be gathered during the PA and SI, states and agencies such as AEHA may require that additional information be acquired and submitted to them for approval. These agencies should be consulted during project planning, for these additional requirements.
****

2.1 Task 1 Plan Preparation/Preliminary Assessment

2.1.1 Contractor Plan Preparation

****
Refer to Task 1 of the RI/FS SOW outline for instructions on the Contractor plan preparation.
****

2.1.2 Preliminary Assessment

2.1.2.1 Background Data Collection

****
Information can be obtained from EPA technical and enforcement files, state/local regulatory agency files, US Geological Survey files, government installations, ATSDR Health Assessments, and other relevant sources in order to describe the current situation at the site(s). Refer to section 2.1.1 of the RI/FS outline for more information on review of available data.
****

2.1.2.1.1 Review of Previous Reports and Regulatory History
2.1.2.1.2 Literature Searches

2.1.2.1.3 Aerial Photographs
2.1.2.1.4 Interviews
2.1.2.1.5 Site Boundaries Identification
2.1.2.2 Preliminary Site Visit

2.2 Task 2 Draft PA Report
2.2.1 Local/Regional Conditions Summary
2.2.2 Site Boundaries Identification
2.2.3 History of Regulatory Actions
2.2.4 History and Extent of Problem

2.3 Task 3 Site Investigation Planning
2.3.1 Workplan Development

****
Refer to explanatory text for section 2.1 of the RI/FS outline. The Contractor will be required in this section to prepare an overall workplan for the Site Inspection. This workplan will be supplemented by attachments that contain the CDAP, SSHP, and MWIP.
****

2.3.1.1 Identification/Refinement of Data Quality Objectives and Design of Data Collection Program

****** **********
Refer to the RI/FS outline for more information on this topic.
****

2.3.1.1.1 HRS Scoring Requirements

****
Sufficient detail shall be given to discussion regarding how data will allow for adequate evaluation pursuant to HRS, requirements for removal action, or elimination of site from further consideration. Reference Federal Register, Vol. 55, No 241, 51532-51667, Hazard Ranking System, Final Rule, in specifying requirements for Contractor treatment in workplan approach.
****

2.3.1.1.2 Removal Action Alternative Development

****
This would require the Contractor to revise or develop a list of potential removal actions based on the PA. See paragraph 2.10 and Attachment K: Alternative Development and Selection. Development of removal action alternatives should be incorporated in the workplan. Appropriate alternatives should be considered in refining the DQOs.
****

2.3.1.1.3 Preliminary Screening and/or Identification of ARARs
2.3.1.1.4 Development of Data Collection Strategy
2.3.2 Preparation of Workplan Attachments

****
See technical requirements in sections 4, 5, and 6 of the RI/FS for contents of SSHP, CDAP, and MWIP, respectively.
****

2.3.2.1 Site Safety and Health Plan (SSHP) Attachment
2.3.2.2 Chemical Data Acquisition Plan (CDAP) Attachment
2.3.2.3 Monitoring Well Installation and Drilling Plan (MWIP) Attachment

2.4 Task 4 Community Relations

****
Formal public participation activities are not normally associated with the PA/SI phase of the CERCLA process. The project manager should coordinate with the customer and the appropriate regulatory authorities to verify that there are no public participation/community relations requirements.
****

2.5 Task 5 Field Investigations

****
Many of the field activities to be performed under the PA/SI are similar to the activities performed under the RI, except usually much smaller in scope.

NOTE: Only a small subset of the activities listed below would be done in this phase. The sections below are provided for completeness only and should not be inferred to mean that all of these activities are to be done in the PA/SI for each

project. Refer to explanatory text under section 2.3 of the RI/FS outline for more information.

There are differences in approach for the PA/SI scoping from those done in more advanced studies because of the different objectives. PA/SI or confirmation study field activities are generally limited in level of effort compared to later studies. Sampling objectives may be more appropriately served by a biased phased approach, using cost effective screening methods rather than a random statistical basis. Refer to Sections 2.1 and 2.3 of the RI/FS outline for more information on these topics.
****

2.5.1 Site Topographic and Boundary Surveys
2.5.2 Geophysical Surveys
2.5.3 Soil Gas Sampling
2.5.4 Drum Sampling
2.5.5 Surface Soil Sampling
2.5.6 Surface Water/Lagoon Sampling
2.5.7 Leachate Sampling
2.5.8 Subsurface Soil Sampling
2.5.9 Fracture Trace Analyses
2.5.10 Monitoring Well Installation and Sampling
2.5.11 Air Sampling
2.5.12 Wipe Samples
2.5.13 Infiltration Testing
2.5.14 Domestic/Industrial/Municipal Well Inventory

****
Refer to the identical task in Section 2.1.4.5 of the RI/FS outline for the explanatory text for this topic.
****

2.6 Task 6 Sample Analyses, Data Assessment and Reporting

****
The following sections should define the analytical and data assessment/validation protocols for the completion of the PA/SI. Specific data quality objectives (DQOs) should be developed to provide sufficient data and quality for HRS, preliminary risk screening, and regulatory compliance criteria evaluation. This will subsequently support the determination of a time-critical or a non-time-critical response/removal, an elimination of the site from further consideration, or provide support data toward future investigations.

The sampling and analytical approach utilized for the PA/SI requires the same attention toward detail as the RI/FS approach, but for a less encompassing effort. Care must be taken to compile enough information to meet the stated objectives, but the PA/SI is not intended to delineate the extent of contamination. Refer to the explanatory text within the RI/FS SOW outline for additional information over the following.
****

2.6.1 Data Review and Assessment

****
Based upon the data needs for the site-specific PA/SI, including a preliminary risk screening, regulatory compliance determination, health and safety planning, HRS scoring, and response action evaluation, the chemist should specify the level of confidence required for each type of data (existing and new). When developing the data requirements for the project, the chemist and technical staff must balance time and resource constraints with the desired confidence level of the data. Resource constraints not only include monies budgeted for the project overall but also the availability of a laboratory, sampling and analysis equipment, and personnel. Due to the high cost of sampling and analysis, the data collection program should be focused only on the data quality and quantity necessary and sufficient to meet the PA/SI objectives.
********** **********

2.6.1.1 Existing Analytical Data

2.6.1.2 New Data

2.6.2 Analytical Procedures

****
The following sections of the SOW will outline specific analytical protocols to be followed on a site-specific basis for the entire PA/SI. The chemist should generate tables summarizing this information. An example and suggested format for these tables are located within the Project Planning Guidance (Completed Data Collection Option Array). Individual tables should be generated for each site with a multi-site PA/SI. The chemist must be intimately aware of the project background details, and the project DQOs in order to make decisions as to the most appropriate analytical protocol. This should include full knowledge of previous operations, and any previously completed data. The project

chemist should collaborate with other data users to identify areas where data gaps exist requiring further assessment. Reference the explanatory text within the RI/FS SOW outline for additional information over the following.
***** **********

2.6.2.1 Field Screening
2.6.2.2 Water
2.6.2.2.1 Surface Water
2.6.2.2.2 Ground Water
2.6.2.3 Soils/Sediments/Sludges
2.6.2.4 Drum Samples
2.6.2.5 Wipe Samples
2.6.2.6 Air Samples
2.6.2.7 Soil Gas
2.6.3 Quality Assurance/Quality Control Samples
2.6.3.1 QA Laboratory
2.6.3.2 QC Samples
2.6.4 Laboratory Internal Quality Control
2.6.5 Method Detection Limits
2.6.6 Laboratory Turnaround Time
2.6.7 Sample Handling
2.6.8 Preservatives and Holding Times
2.6.9 Investigation-Derived Wastes

2.7 Task 7 Data Evaluation/Fate and Transport Analysis
2.7.1 Data Evaluation
2.7.1.1 Comparison to Data Quality Objectives - Establish Data Usability

****
Refer to the RI/FS outline for more information on the content of this section. Note that this activity would be documented in the PA/SI report and will not require a separate document. For the PA/SI, this section would require usability parameters such as PARCC parameters and geotechnical/hydrogeological needs be evaluated, to support the intended use of the data; HRS scoring, removal actions, or elimination of site from further action.
****

2.7.1.2 Refinement of Site Conceptual Model

****
Refer to the RI/FS outline for more information on this section.

2.7.1.2.1 Nature of Contamination

****
This section should describe the requirements for refining the understanding of the nature of contamination at the sites. Refer to the RI/FS outline for general information about this topic. Careful cross referencing to the PA/SI report section (2.11) would be helpful in avoiding a duplication of instruction on preparing items related to this activity and double payment for the work.
****

2.7.1.2.2 Hydrogeology

****
Refer to the RI/FS for general information on the content of this section. Many of the presentations of the data would be used in the PA/SI report. The analysis performed under this section would only be conducted to the extent possible with information gathered to meet the objectives of the PA/SI.
****

2.7.2 Fate and Transport Analysis

****
Refer to the RI/FS outline for more information on the appropriate content of this section. At this phase of investigation, only simplistic analysis is usually appropriate.
****

2.7.2.1 Air Transport
2.7.2.2 Surface Water Transport
2.7.2.3 Ground Water Transport

****
This section, if applicable at this phase, would require the analysis of the potential for transport of contaminants by ground water by Contractor. This section may specify simple ground water modeling of contaminant transport (using analytical equations), if appropriate. The scope should make it clear that computer modeling would not be appropriate.
****

2.8 Task 8 Preliminary Risk Screening Analysis

****
Project team and member responsible for risk assessment shall specify level of effort required for the preliminary qualitative risk analysis based on customer specific requirements and project needs. Generally, framework should follow EPA's "Risk Assessment Guidance for Superfund, Volumes I & II", 1989, although it is qualitative in nature. Regulatory requirements or procedural basis for risk assessment follow from the NCP, 300.430, which describes the role of risk assessment in site evaluation and remedy selection. The results of the preliminary risk analysis help determine requirements for further action at a site, where no clear regulatory standards may apply.
****

2.8.1 Human Health Assessment

2.8.1.1 Identification of Chemicals of Concern

****
Data identified as required to support the risk or decision analysis in the DQOs for the project are evaluated in this section to determine if data collected was of sufficient quantity and quality as was specifically intended. If sampling design and analytical requirements were formulated properly (with the end use in mind), data to evaluate the nature and extent will be of sufficient quality and quantity to qualitatively evaluate 1) exposure routes, 2) exposure point concentrations, 3) intakes, and 4) the potential risks associated with a specific site. This would support the site decision.

DQOs for sampling requirements to support the preliminary risk analysis, take into account statistical representativeness, bounds of the data, toxicity reference concentrations in determining detection limits, spatial representativeness to evaluate exposure routes, and quality assurance/quality control, specific sampling and analytical requirements to assure data may be used for qualitative risk analysis.

Selection of chemicals therefore, must evaluate data quality and quantity sufficient to support the preliminary risk analysis, by evaluating data by originally intended DQOS for quality with respect to sample quantitation limits, qualifiers and codes, blanks, background samples, frequency of detection.
****

2.8.1.2 Exposure Assessment

****
The conceptual site model, preliminarily developed by the project planning team, and further refined by the Contractor in the workplan and data evaluation section of the PA/SI, is expanded further in this section as the basis for the exposure assessment. The source area, intermedia transport mechanisms, exposure routes, and populations are evaluated in this section to define exposure pathways. Contractor should attempt to identify and discuss all relevant exposure pathways, surface water transport, air dispersion, ground water transport developed in the fate and transport section, to adequately evaluate qualitatively potential risks to receptors, for current and potential future exposures.

Populations initially identified in the conceptual site model should be evaluated in more detail, as to those populations which may reasonably be expected to potentially come into contact with site wastes, by the identified exposure routes, both currently and in the future. Generally, "worst case" assessments should be avoided as unrealistic.

Intakes for exposure routes, ingestion, inhalation, and dermal contact, should not be calculated, but rather discussed as a range of potential exposures concentrations that identified populations could be exposed to.
****

2.8.1.3 Risk Screening Characterization

********** **********
In this section, the Contractor will be required to qualitatively discuss potential exposure point concentrations comparatively to reference concentrations which correspond to acceptable risk exposures.

Those exposure point concentrations for various site media which are projected to exceed reference concentrations based on a qualitative narrative, will be used to establish the basis for time-critical or non-time-critical removal actions, or requirements for further study, in addition to or in absence of any specific regulatory requirements which may guide such action. Those sites which may reasonably be assumed, based on the preliminary risk analysis, to have no

unacceptable health risks associated with potential exposures, may incorporate criteria in developing decision for no further action.
****

2.8.2 Environmental Evaluation

****
The environmental evaluation is less straightforward than the human health evaluation. In some ways, it is complicated by competing exposure pathway analysis for human receptors, particularly in defining potential environmental populations and in determining requirements for response actions, time-critical and non-time critical removal actions. (See requirements in RI/FS "Environmental Evaluation", for developing a qualitative environmental evaluation. Requirements for PA/SI should be similar, but at a lesser level of effort, for data collected to support the analysis.)
****

2.8.3 Identification and Analysis of Available ARARs

****
Contractor should be discouraged from relying on evaluation of background when assessing non-naturally occurring substances, for ARAR/action level determination. Contractor should also be discouraged from attempting to apply regulatory requirements which are not relevant to the site or site wastes, in absence of other criteria. Action levels developed by Contractor, numerical limits for the media of concern, shall be based on risk screening concentrations as well as identified AAARs to determine need for further action, time-critical or non-time-critical removal actions, forwarding site for further study, or eliminating site from further consideration.
********** **********

2.8.4 Develop Recommendations and Conclusions

****
Recommendation is normally to initiate an RI/FS and/or (concurrent) removal action, if conditions indicate. Otherwise, continued site monitoring or the "No Action" alternative is recommended.

In some cases, the site should be addressed by a different program, i.e. "asbestos removal," etc.
****

2.9 Task 9 Hazard Ranking System (HRS) Scoring

****

This section would require the Contractor to use available information from literature and data collected, based on DQOs, to rank site pursuant to the HRS. All information used shall be documented, as well as any assumptions used in arriving at each numerical score used to evaluate the HRS, for receptors, pathways, and chemicals. Reference Federal Register, Vol. 55, No. 241, 51532-51667, Hazard Ranking System, Final Rule, in specifying requirements for Contractor requirements for scoring and USACE involvement in scoring decision.
****

2.10 Task 10 Preliminary Response Action Identification
2.10.1 Analysis of ARARs
2.10.2 Identify Appropriate Response Action

****
Detailed scoping of alternative selection is difficult and inappropriate prior to identification and quantification of contaminated media and contaminants. It is a good idea to include an option for alternative development in the PA/SI. This section would require evaluation beginning where the preliminary evaluation required of the Contractor by Section 2.3.1.1.2, Removal Action Alternative Development. This section should be prepared by the process engineer.

A detailed discussion of the analysis of alternatives is included in Attachment K to the ETL, Alternative Development and Selection.
****

2.11 Task 11 PA/SI Report
2.11.1 Pre-Draft Data Package

****
Reference Section 2.7.1 of the RI/FS SOW outline for specifics on this submittal.

2.11.2 Draft SI Report
2.11.3 Final PA/SI Report
2.11.4 Completion of PA and SI EPA and/or State Standard Forms

3. Project Management

****
Refer to explanatory text under the Project Management Section (3.) in the RI/FS SOW outline, Enclosure 2 to the ETL.
****

- 3.1 Project Manager
- 3.2 Coordination with Other Entities
- 3.3 Conference Notes
- 3.4 Confirmation Notices
- 3.5 Government Support
  - 3.5.1 Government Provided Data and Information
  - 3.5.2 Existing Plans/Surveys/Air Photos
  - 3.5.3 Utilities
  - 3.5.4 Permits
  - 3.5.5 Rights of Entry
  - 3.5.6 Security
  - 3.5.7 Equipment Storage/Staging Areas
  - 3.5.8 Temporary Office
  - 3.5.9 Grading and Site Restoration
  - 3.5.10 Cuttings/Spoil Disposal
  - 3.5.11 Wetlands Determination
- 3.6 Travel and Meetings
  - 3.6.1 Preliminary Site Visit
  - 3.6.2 Draft PA Meeting
  - 3.6.3 Draft Workplan Meeting/Field Work Start-up Meeting
  - 3.6.4 SI Draft Report Review Meeting
  - 3.6.5 SI Final Report Review Meeting
  - 3.6.6 Public Meetings
  - 3.6.7 Site Visits
  - 3.6.8 Additional Trips
- 3.7 Schedules
- 3.8 Submittals

****
This section summarizes the submittals expected during the course of the project. No technical requirements are presented here. Number of copies required are specified here.
****

- 3.8.1 General Submittal Requirements
- 3.8.2 Document Submittal Register
- 3.8.3 SI Workplan
  - 3.8.3.1 Chemical Data Acquisition Plan (CDAP) Attachment

3.8.3.2 Monitoring Well Installation and Drilling Plan (MWIP) Attachment

3.8.3.3 Site Safety and Health Plan (SSHP) Attachment

3.8.4 Progress Reports
3.8.4.1 Monthly Progress Reports
3.8.4.2 Daily Quality Control Reports
3.8.5 Drilling Logs
3.8.6 Monitoring Well Construction Diagram and Development Record
3.8.7 Survey Documents
3.8.8 Draft PA Report
3.8.9 Quality Control Summary Report
3.8.10 PA/SI Report
3.8.10.1 Draft SI
3.8.10.2 Final PA/SI
3.8.10.3 PA and SI Forms

4. NEPA Compliance

****
At this point, there are probably few NEPA requirements. It is suggested that the project manager check with the NEPA experts and office of counsel to determine if there are any applicable NEPA requirements that should be added to this scope.
****

5. Health and Safety Technical Requirements

****
This section presents the technical requirements for health and safety. Refer to Enclosure 8 to the ETL for the suggested language for this SOW section.

Two topics, "Site Description and Contamination Characterization" and "Staff Organization, Qualifications, and Responsibilities" may be addressed as a portion of the workplan as outlined in section 2.1. In the event this material is addressed within the workplan (WP), the applicable WP sections should be referenced within these sections of the SSHP. Regardless of location, these topics should address the requirements contained in Enclosure 8.
****

6. Chemistry Technical Requirements

****
This section presents the technical requirements for performance of sampling and analysis activities. Specific requirements are discussed under the individual topics. Additional guidance on the typical content of this section is provided as Enclosure 13 to the ETL, Chemistry Technical Requirements. An outline of the section is provided here.
****

6.1 Introduction
- 6.1.1 CDAP Format and Implementation Requirements
  - 6.1.1.1 Section 1. Table of Contents
  - 6.1.1.2 Section 2. Project Background Data
  - 6.1.1.3 Section 3. Chemical Requirements to Support Project Data Quality Objectives (DQOs)
  - 6.1.1.4 Section 4. Contractor Project Organization and Functional Areas of Chemistry Responsibilities
  - 6.1.1.5 Section 5. Field Activities:
    - 6.1.1.5.1 Field Instrumentation and Equipment (Calibration and Maintenance)
    - 6.1.1.5.2 Field Documentation
    - 6.1.1.5.3 Daily Quality Control Report (DQCR)
    - 6.1.1.5.4 QC and QA Field Samples
    - 6.1.1.5.5 Decontamination Procedures
    - 6.1.1.5.6 Matrix: Ground Water Samples
      - 6.1.1.5.6.1 Field Screening
      - 6.1.1.5.6.2 Locations
      - 6.1.1.5.6.3 Sampling Procedure
      - 6.1.1.5.6.4 Analytical Procedure
      - 6.1.1.5.6.5 Sample Containers, Preservations, Holding Times
    - 6.1.1.5.7 Matrix: Surface Water Samples
      - 6.1.1.5.7.1 Field Screening
      - 6.1.1.5.7.2 Locations
      - 6.1.1.5.7.3 Sampling Procedure
      - 6.1.1.5.7.4 Analytical Procedure
      - 6.1.1.5.7.5 Sample Containers, Preservations, Holding Times
    - 6.1.1.5.8 Matrix: Leachate Samples
      - 6.1.1.5.8.1 Field Screening
      - 6.1.1.5.8.2 Locations

6.1.1.5.8.3 Sampling Procedure
6.1.1.5.8.4 Analytical Procedure
6.1.1.5.8.5 Sample Containers, Preservations, Holding Times
6.1.1.5.9 Matrix: Soil Samples
6.1.1.5.9.1 Field Screening
6.1.1.5.9.2 Locations
6.1.1.5.9.3 Sampling Procedure
6.1.1.5.9.4 Analytical Procedure
6.1.1.5.9.5 Sample Containers, Preservations, Holding Times
6.1.1.5.10 Matrix: Sludge/Sediment Samples
6.1.1.5.10.1 Field Screening
6.1.1.5.10.2 Locations
6.1.1.5.10.3 Sampling Procedure
6.1.1.5.10.4 Analytical Procedure
6.1.1.5.10.5 Sample Containers, Preservations, Holding Times
6.1.1.5.11 Matrix: Air Samples
6.1.1.5.11.1 Locations
6.1.1.5.11.2 Sampling Procedure
6.1.1.5.11.3 Analytical Procedure
6.1.1.5.11.4 Sample Containers, Preservations, Holding Times
6.1.1.5.12 Matrix: Surface Samples
6.1.1.5.12.1 Field Screening
6.1.1.5.12.2 Locations
6.1.1.5.12.3 Sampling Procedure
6.1.1.5.12.4 Analytical Procedure
6.1.1.5.12.5 Sample Containers, Preservations, Holding Times
6.1.1.5.13 Matrix: Soil Gas Samples
6.1.1.5.13.1 Field Screening
6.1.1.5.13.2 Locations
6.1.1.5.13.3 Sampling Procedure
6.1.1.5.13.4 Analytical Procedure
6.1.1.5.13.5 Sample Containers, Preservations, Holding Times
6.1.1.5.14 Matrix: Drum I Tank Samples
6.1.1.5.14.1 Field Screening

6.1.1.5.14.2 Locations
6.1.1.5.14.3 Sampling Procedure
6.1.1.5.14.4 Analytical Procedure
6.1.1.5.14.5 Sample Containers, Preservations, Holding Times
6.1.1.6 Section 6. Sample Chain of Custody, Packing and Shipping
6.1.1.7 Section 7. Laboratory Activities:
6.1.1.7.1 Cooler Receipt Form
6.1.1.7.2 Instrument Calibration and Frequency
6.1.1.7.3 Quality Control Procedures
6.1.1.7.4 Preventive Maintenance
6.1.1.7.5 Corrective Action
6.1.1.7.6 Data Reduction, Assessment / Validation, and Documentation
6.1.1.8 Section 8. Chemical Data Quality Management Deliverables
6.1.1.8.1 Daily Quality Control Reports
6.1.1.8.2 Laboratory Daily Quality Control Reports
6.1.1.8.3 Non-Routine Occurrences Reports
6.1.1.8.4 Pre-Draft Data Package
6.1.1.8.4.1 Pre-Draft Data Package Organization
6.1.1.8.4.2 Minimum Data Reporting Requirements for Pre-Draft Data Package
6.1.1.8.5 Quality Control Summary Report
6.1.1.8.6 Chemical Quality Assurance Report
6.1.2 Contractor Laboratory Approval
6.1.2.1 Commercial Laboratory Evaluation
6.1.2.2 Laboratory Quality Management Manual
6.1.2.3 Preliminary Questionnaire
6.1.2.4 Performance Evaluation Samples
6.1.2.5 Laboratory Inspection
6.1.2.6 Approval
6.1.2.7 Expiration of Validation
6.2 Miscellaneous Requirements
6.2.1 Investigation Derived Wastes

7. Geotechnical Requirements

****
All of the field activities done for a PA/SI are also often included in a remedial investigation; therefore, refer to text in Section 6 of the RI/FS scope-of-work outline for typical requirements and other information for this section of the PA/SI scope. Note that only those topics provided under Section 6 of the RI/FS scope outline that cover field work specified under Field Investigations (Section 2.5) of this (PA/SI) scope should be included here.
****

- 7.1 General Specifications
  - 7.1.1 Qualified Geologist/Geotechnical Engineer
  - 7.1.2 Applicable Driller Permits and Licenses
  - 7.1.3 Compliance with State Requirements
  - 7.1.4 Utility Clearances
  - 7.1.5 Disposal of Investigation-Derived Waste (IDW)
  - 7.1.6 Explosive Ordnance Disposal
  - 7.1.7 Decontamination of Equipment/Tools
  - 7.1.8 Water Source and Testing
  - 7.1.9 Site Restoration and Protection
  - 7.1.10 Contractor Responsibility for Wells
  - 7.1.11 Site Surveying
- 7.2 Monitoring Well Installation and Drilling Plan (MWIP) Attachment
- 7.3 Subsurface Soil/Rock Sampling
  - 7.3.1 Drilling Method
  - 7.3.2 Test Pit Excavation
  - 7.3.3 Logging Requirements
  - 7.3.4 Geotechnical Sampling and Analyses
  - 7.3.5 Coring/Core Handling
  - 7.3.6 Backfilling
  - 7.3.7 Sampling Techniques
  - 7.3.8 Field Screening
  - 7.3.9 Location/Elevation Survey of Boreholes/Test Pits
- 7.4 Monitoring Well Installation
  - 7.4.1 Drilling Method
  - 7.4.2 Soil/Rock Sampling While Drilling
  - 7.4.3 Field Screening
  - 7.4.4 Casing and Screen
  - 7.4.5 Gravel/Sand Pack
  - 7.4.6 Grouting
  - 7.4.7 Surface Completion
  - 7.4.8 Well Development
  - 7.4.9 Monitoring Well Construction Diagrams

****

This section presents the technical requirements for performance of activities associated with air impact assess-

ments. Enclosure 16 presents a general description of air impact assessments for those not familiar with the process.

Explanatory text is included in the RI/FS outline. The scope of activities performed in the PA/SI is generally less than that of the RI/FS. The level of detail to be included in the scope depends on the project and the Contractor's experience in performing air monitoring and modeling as well as the Contractor's experience in working with the Corps.
****

- 8.1 Ambient Air Monitoring/Sampling
- 8.2 Meteorological Monitoring
  - 8.2.1 Review Available Data
  - 8.2.2 On-site Monitoring
    - 8.2.2.1 Meteorological Tower
    - 8.2.2.2 Data to be Collected
    - 8.2.2.3 Data Processing, Documentation and Reporting
- 8.3 Emission Rate Measurements
- 8.4 Emission Rate Estimates
  - 8.4.1 Uncontrolled Emission Sources
  - 8.4.2 Remedial Action Sources
  - 8.4.3 Emission Models
  - 8.4.4 Emission Factors
- 8.5 Atmospheric Dispersion Modeling
  - 8.5.1 Purpose and Rationale
  - 8.5.2 Review of Previous Models
  - 8.5.3 Input Data
    - 8.5.3.1 Source Data
    - 8.5.3.2 Receptor Data
    - 8.5.3.3 Meteorological Data
  - 8.5.4 Modeling Methodology
  - 8.5.5 Reporting Results

9. Miscellaneous Requirements

OUTLINE FOR ENGINEERING EVALUATION/COST ANALYSIS (EE/CA) SCOPE-OF-WORK UNDER CERCLA/SARA

1. Site Description, Project Planning Overview, and Objectives

****
Refer to the RI/FS outline for additional information on the topics to be covered here. Section 1. presents information developed by the project team for the Contractor's information.
****

1.1 Site Description

1.1.1 Location

1.1.2 Site Background

1.1.3 Previous Studies and Results

1.1.4 Regulatory Authorities

****
Include appropriate references to regulatory program/ authority under which the site is being addressed (i.e. CERCLA/SARA, Executive Order 12088, the National Contingency Plan, NEPA, any IAGs).

Furthermore, the manager should contact the state at non-NPL sites in order to determine if there are any state requirements for removal actions. The appropriate information gathered should be summarized here. The appropriate manager should add any statutory requirements imposed by the state. If there are no state requirements, the manager should contact the EPA region for other guidance. State requirements or other EPA guidance should be discussed here.
****

1.2 Project Planning Overview and Objectives

****
Refer to the RI/FS scope outline for additional information on general approaches to developing project objectives for project planning. The described approach would be most appropriate if additional sampling may be necessary.

This section should summarize the applicability of general EE/CA objectives to the project as the USACE team understands it. An EE/CA is a comparative analysis of removal action options for a CERCLA site. EE/CAs are required only for non-time-critical removal actions (RA)/expedited response actions (ERAs). Non-time-critical removal actions are those which address releases or threats of releases where the lead agency determines that more than 6 months are available for planning prior to undertaking a removal.

EE/CAs are not required for time-critical removal actions, however, they may be done. This determination is made at the discretion of the lead federal agency. Future follow-on work at these sites should be anticipated, such as an RI/FS and Record of Decision, as necessary.
****

1.2.1 Site Strategy Development
1.2.2 Project Objectives and Project Decision Statements
1.2.3 Data Quality Objectives
1.3 Summary of Tasks

****
The elements of an EE/CA are similar to the elements required in an RI/FS, and could be construed as a focused or limited RI/FS, in view of statutory requirements, cost, and time constraints of a removal action. The following is only a superficial listing of tasks to be performed under this scope-of-work. No details are specified in this section.
****

Task 1 - Project Planning
Task 2 - Community Relations
Task 3 - Field Investigations
Task 4 - Sample Analyses, Data Assessment and Reporting
Task 5 - Data Evaluation
Task 6 - Development/Refinement of Removal Action Objectives
Task 7 - Development and Initial Screening of Removal Action Alternatives
Task 8 - Treatability Studies
Task 9 - Detailed Analysis of Removal Alternatives
Task 10 - Comparison of Alternatives and Proposal of Removal Action
Task 11 - EE/CA Report
Task 12 - Action Memorandum Preparation

Task 13 - Post EE/CA Support
1.4 References

****
Include citations of previous reports, guidance documents, etc. Note which ones are to be provided to the Contractor. Previous reports or other historical documents should only be referenced if the team possesses or can locate them.
****

2. Project Requirements
2.1 Task 1 Project Planning
2.1.1 Available Data Review

****
This section requires the Contractor to compile available data as it relates to the preparation of the EE/CA and requires the Contractor to visit the site. Based on these activities, the Contractor should be required to assess any data gaps which would affect preparation of the EE/CA. This can be prepared by any team member, but probably best done by the project manager.
****

2.1.1.1 Review Previous Reports/Data
2.1.1.2 Site Walkover
2.1.1.3 Data Gap Identification
2.1.2 EE/CA Workplan Development

****
Refer to the RI/FS SOW outline for general requirements/explanatory text related to these topics. Note that removal action objectives are similar to RI/FS objectives, but are prepared in light of the guidance on removal actions under CERCLA.
****

2.1.2.1 Site Background Summary
2.1.2.2 Identification/Refinement of DQOs
2.1.2.3 Refinement Preliminary Removal Action Objectives
2.1.2.4 Data Collection Design
2.1.3 Preparation of Workplan Attachments

****
Refer to the RI/FS SOW outline for explanatory text for these topics. These plans would generally only be applicable if

additional sampling is required to support the preparation of the EE/CA.
**** **********

2.1.3.1 Site Safety and Health Plan (SSHP) Attachment
2.1.3.2 Chemical Data Acquisition Plan (CDAP) Attachment
2.1.3.3 Monitoring Well Installation and Drilling Plan (MWIP) Attachment
2.1.3.4 Treatability Study Workplan Attachment

2.2 Task 2 Community Relations

****
This section presents requirement for Contractor's involvement in community relations. Refer to the RI/FS outline for additional information. Note that for non-time- critical removal actions, the lead federal agency must, 1) prior to completing the EE/CA, conduct interviews to gain information on how the public would like to be involved in the process and prepare a formal community relations plan; 2) publish notice of availability and brief description of the EE/CA in a local newspaper of general distribution; 3) provide at least a 30-day comment period on the EE/CA; and 4) prepare written responses to comments on the EE/CA. The information repository and administrative record file must be established no later than the signing of the Approval Memorandum. If the site involves an active federal facility, input and comment on this section by the installation is recommended.

Refer to the RI/FS SOW outline for general requirements and explanatory text related to these topics. The appropriate manager shall ensure that the above requirements, plus any state requirements, be added to this scope.
****

2.2.1 Community Relations Plan
2.2.2 Preparation of Community Relations Support
2.2.3 Public Meetings
2.2.4 Responsiveness Summary

2.3 Task 3 Field Investigations

****
This section would require the Contractor to perform field activities in support of the EE/CA, if appropriate. Only

activities necessary to clarify data gaps and better define the scope and nature of the removal action need to be considered here. NOTE: Not all of the activities listed below are required for a given project; this list of possible activities is provided only for completeness. Because the time frame for removal actions is relatively short, field investigations should be very limited in scope.

For additional information, consult the explanatory text under the same topics in the outline for the RI/FS.
****

2.3.1 Site Topographic and Boundary Surveys
2.3.2 Geophysical Surveys
2.3.3 Soil Gas Sampling
2.3.4 Drum Sampling
2.3.5 Surface Soil Sampling
2.3.6 Surface Water/Lagoon Sampling
2.3.7 Leachate Sampling
2.3.8 Subsurface Soil Sampling
2.3.9 Monitoring Well Installation and Sampling
2.3.10 Air Sampling
2.3.11 Wipe Samples
2.3.12 Vadose Zone Permeability/Infiltration Testing
2.3.13 Aquifer Tests
2.4 Task 4 Sample Analyses, Data Assessment and Reporting

****
This section should define analytical procedures and data assessment/validation protocols for completion of the EE/CA. Based on field investigations specified in Task 3, the following sections of this task will be developed by the chemist. Analytical procedures will only be specified for appropriate matrices to be collected in the field investigations.

For additional information, consult the explanatory text in the RI/FS SOW outline.
****

2.4.1 Data Review and Assessment
2.4.1.1 Existing Data
2.4.1.2 New Data
2.4.2 Analytical Procedures
2.4.2.1 Field Screening

2.4.2.2 Water
2.4.2.2.1 Surface
2.4.2.2.2 Ground Water
2.4.2.3 Soils/Sediments/sludges
2.4.2.4 Drum Samples
2.4.2.5 Air Samples
2.4.2.6 Bench Scale Testing
2.4.3 Quality Assurance/Quality Control Samples

****
The requirement for acquisition of field QA/QC samples may be applicable only at the beginning of the treatability study to ensure an accurate characterization of the waste stream.
****

2.4.4 Laboratory Internal Quality Control
2.4.5 Method Detection Limits
2.4.6 Laboratory Turnaround Time
2.4.7 Sample Handling
2.4.8 Preservatives and Holding Times
2.4.9 Investigation-Derived Wastes

****
Treatability studies require much greater volumes than ordinary investigations. Therefore, the remaining laboratory sample may be substantial and require additional cost for disposal by the laboratory, or returning to the site for disposal via the chosen remedial alternative. It is important to collaborate with the project regulatory specialist on correct manifesting and shipping requirements.
****

2.5 Task 5 Data Evaluation

****
This task would generally only be applicable if additional field sampling was required to support the EE/CA.
****

2.5.1 Comparison to Data Quality Objectives - Establish Data Usability

****
Refer to the RI/FS outline for more information on the content for this section. Note that this task would only apply if additional field data is gathered to support the EE/CA. Results of this task would be documented in the EE/CA report and would not require a separate submittal. For the

EE/CA, this section would require that usability parameters, including such items as the PARCC parameters and geotechnical/hydrogeological needs be evaluated for support to the intended use of the data; evaluation of the removal action alternatives.
****

2.5.2 Refinement of Site Conceptual Model

****
Refer to the RI/FS outline for more information on this section.
****

2.5.2.1 Nature and Extent of Contamination

****
This section should describe the requirements for refining the conceptual model of the nature and extent of contamination at the sites. Refer to the RI/FS outline for more information. Careful cross referencing to the EE/CA Report Section (2.11) would be helpful in avoiding a duplication of instruction on preparing items related to this activity and double payment for the work.
****

2.5.2.2 Hydrogeology

****
Refer to the RI/FS for general information on the content of this section. Many of the presentations of the data would be used in the EE/CA report. The analysis performed under this section would only be conducted to the extent possible with information gathered to meet the objectives of the EE/CA.
****

2.6 Task 6 Development/Refinement of Removal Action Objectives

****
See Enclsoure 11 to the ETL, Alternative Selection for additional information.

This section requires the Contractor to consider various criteria in developing or refining removal action objectives. Input for this section should be developed by the project team, including process engineer, project manager, and team

member responsible for the review of risk issues and/or regulatory matters.
****

2.6.1 Statutory Limits

****
The scope should require that the Contractor consider statutory requirements associated with removals and discuss these in the EE/CA report. Although the statutory limits strictly apply to EPA since they use trust funds, it does not strictly apply to DOD. However, work on DOD projects should also consider these limits.
****

2.6.2 Risk Based Mitigation Requirements

****
As part of the EE/CA, an evaluation of removal/remediation requirements should include a cursory examination of risks, and requirements for reducing or mitigating those risks, that will either contribute to the final action at the site, or act to eliminate the hazard. It is assumed that a PA/SI has been performed at the site prior to consideration of any removal action activities, and that the "Risk Screening Analysis", has been written as part of the PA/SI (See PA/SI SOW Guidance). This preliminary screening analysis provides the basis for comparative analysis in the EE/CA of alternatives relative to risk mitigation or reduction. A brief qualitative analysis or summary of how each alternative reduces baseline risks, is used in selecting the removal action alternative, and requirements for this analysis should be included in this section.
****

2.6.3 ARARs Development

****
The scope should require that the Contractor write a letter to all regulatory agencies requesting ARARs. Then the Contractor should also specifically analyze and determine ARARs independently.
****

2.6.4 Development or Refinement of Removal Action Scope

****
This section should actually require the Contractor to define the specific actions required by the removal (not the means, but the "end" for the action, such as removal of the drums or floating product).
****

2.6.5 Removal Action Schedule

****
The scope should require that the Contractor develop a removal action schedule and include this schedule in the EE/CA report.
****

2.7 Task 7 Development and Initial Screening of Removal Action Alternatives

****
Require the Contractor to develop alternatives in accordance with the requirements of Enclosure 11 to the ETL, Alternative Evaluation and Selection.

The definition of "removal action" precludes development of some alternatives that might otherwise be suitable. This section should be developed with input from the process engineer.
****

2.8 Task 8 Treatability Studies

****
With some exceptions, such as required pre-treatment for off-site disposal and ground water/product recovery, treatability studies are generally not appropriate for removal actions. If an off-site disposal facility requires treatability studies for acceptance, consider total acceptance of their prescribed protocol, with QA/QC requirements. Refer to Enclosure 12 to the ETL, Treatability Studies and Treatability Study Reports, for information on treatability studies.

Additional field sampling related to treatability studies should be included under Task 3 Field Investigations. Cross reference that section.
****

2.8.1 Treatability Study Workplan

2.8.2 Treatability Study Procedures
2.8.3 Treatability Study Report
2.8.3.1 Draft Treatability Study Report
2.8.3.2 Final Treatability Study Report

2.9 Task 9 Detailed Analysis of Removal Alternatives

****
See Enclosure 11 to the ETL, Alternative Evaluation and Selection for the details of selection of the most appropriate alternative.

Require the Contractor to evaluate the alternatives against the criteria described in Enclosure 11. Refer to EPA EE/CA guidance for further information. The analysis need not be extensive if time constraints preclude detailed analysis.
****

2.9.1 Technical Feasibility
2.9.2 Implementability of Alternatives
2.9.3 Institutional Considerations and other Compliance Issues
2.9.4 Effectiveness of Alternatives
2.9.5 Environmental Impacts
2.9.6 Reasonable Cost of Alternatives

****
This section should require cost estimates for the removal action alternatives which are detailed to a level commensurate with the level of design, with appropriate design contingencies applied to relevant cost items. Refer to the construction costs section of the RI/FS outline for additional information on the paragraphs under this topic. This section should be prepared with input from the appropriate cost engineering staff.
****

2.9.6.1 Construction Costs
2.9.6.2 Other Markup Costs

2.10 Task 10 Comparison of Alternatives and Proposal of Removal Action

****
See Enclosure 11 to the ETL, Alternative Evaluation and Selection, for the details of selection of the most appropriate alternative.

The Contractor should be required to identify the proposed removal action. If proposed action will exceed $2 million, include justification of need to exceed the statutory limits in the Administrative Record.
****

2.11 Task 11 EE/CA Report

2.11.1 Draft EE/CA Report

****
This section requires the Contractor to prepare a draft EE/CA report. For format, refer the Contractor to the EE/CA guidance. In general, the format is as follows:

Table of Contents
Site Characterization
Identification of Removal Action Objectives
Identification of Removal Action Alternatives
Initial Screening of Alternatives
Analysis of Remaining Alternatives
Comparative Analysis of Alternatives
Recommended Removal Alternative
****

2.11.2 Final EE/CA

2.12 Task 12 Action Memorandum Preparation

****
This section requires the Contractor to prepare an action memorandum. This document would describe the proposed removal action and secures management approval to conduct the action. The responsiveness summary is a summary of significant public comments and the response to these comments.

The NCP states that the Action Memorandum should include the following:

Action Memorandum
Site background
Threat to the public health, welfare and/or the environment
Proposed actions and costs
Expected change in situation should no action be taken or should action be delayed
Important policy issues
Recommendations
Responsiveness Summary
****

2.13 Task 13 Post EE/CA Support

****
This section can require a variety of support from the Contractor. This could include design-like activities. These would be generally limited to site drawings delineating the affected materials and specifications for a contract.
****

3. Project Management

****
Refer to the Project Management Section (3.) in the RI/FS scope outline for explanatory text for this section.
****

- 3.1 Project Manager
- 3.2 Community Relations Support
- 3.3 Coordination with Other Entities
- 3.4 Conference Notes
- 3.5 Confirmation Notices
- 3.6 Government Support
  - 3.6.1 Government Provided Data and Information
    - 3.6.1.1 Existing Plans
    - 3.6.1.2 Surveys
    - 3.6.1.3 Air Photos
  - 3.6.2 Utilities
  - 3.6.3 Permits
  - 3.6.4 Rights of Entry
  - 3.6.5 Security
  - 3.6.6 Equipment Storage/Staging Areas
  - 3.6.7 Grading and Site Restoration
  - 3.6.8 Cuttings/Waste Disposal
- 3.7 Travel and Meetings
  - 3.7.1 Site Walkover
  - 3.7.2 Public Meetings
  - 3.7.3 Draft Treatability Study Review Conference (Option)
  - 3.7.4 Draft EE/CA Review Conference
  - 3.7.5 Other Site Visits
  - 3.7.6 Additional Trips
- 3.8 Schedules
- 3.9 Submittals

****
This section summarizes the submittals expected during the course of the project. No technical requirements are

presented here. Number of copies required are specified here.
****

3.9.1 General Submittal Requirements
3.9.2 Document Submittal Register
3.9.3 EE/CA Workplan
3.9.3.1 EE/CA Workplan
3.9.3.2 Workplan Attachments

****
These plans are described in detail in technical sections and other appendices. These plans may not be necessary if field work or a treatability study is not required.

3.9.3.2.1 Chemical Data Acquisition Plan (CDAP) Attachment
3.9.3.2.2 Site Safety and Health Plan (SSHP) Attachment
3.9.3.2.3 Monitoring Well Installation and Drilling Plan (MWIP) Attachment
3.9.3.2.4 Community Relations Plan (CRP) Attachment
3.9.3.2.5 Treatability Study Workplan Attachment
3.9.4 Progress Reports
3.9.4.1 Monthly Progress Reports
3.9.4.2 Daily Quality Control Reports
3.9.5 Survey Documents
3.9.6 Drill Logs/Monitoring Well Construction Diagrams
3.9.7 Treatability Study Report

****
Include if appropriate. See A Enclosure 12 to the ECL, Treatability Studies and Treatability Study Reports for the details.
****

3.9.7.1 Draft Treatability Study Report
3.9.7.2 Final Treatability Study Report
3.9.8 EE/CA Report
3.9.8.1 Draft EE/CA Report
3.9.8.2 Final EE/CA Report
3.9.9 Cost Estimates
3.9.10 Quality Control Summary Report

3.9.11 Action Memorandum

4. Health and Safety Technical Requirements

****
This section presents the technical requirements for health and safety. Refer to Enclosure 8 to the ECL for the suggested language for this SOW section.

Two Topics, "Site Description and Contamination Characterization" and "Staff Organization, Qualifications, and Responsibilities" may be addressed as a portion of the workplan as outlined in section 2.1. In the event this material is addressed within the workplan (WP), the applicable WP sections should be referenced within these sections of the SSHP. Regardless of location, these topics should address the requirements contained in Enclosure 8.
****

5. Chemistry Technical Requirements

****
This section presents the technical requirements for performance of sampling and analysis activities. Specific requirements are discussed under the individual topics. Additional guidance on the typical content of this section is provided as Enclosure 13 to the ECL, Chemistry Technical Requirements. An outline of the section is provided here.
********** *****

5.1 Introduction
5.1.1 CDAP Format and Implementation Requirements
5.1.1.1 Section 1. Table of Contents
5.1.1.2 Section 2. Project Background Data
5.1.1.3 Section 3. Chemical Requirements to Support Project Data Quality Objectimes (DOS)
5.1.1.4 Section 4. Contractor Project Organization and Functional Areas of Chemistry Responsibilities
5.1.1.5 Section 5. Field Activities

****
Note that treatability studies require much greater sample volumes than ordinary investigations. Therefore, collaboration with the primary laboratory is required to define required volumes, and containment necessary.

5.1.1.5.1 Field Instrumentation and Equipment (Calibration and Maintenance)
5.1.1.5.2 Field Documentation
5.1.1.5.3 QC and QA Field Samples

****
The requirement for acquisition of field QA/QC samples may be applicable only at the beginning of the treatability study to ensure an accurate characterization of the wastestream.
****

5.1.1.5.4 Decontamination Procedures
5.1.1.5.5 Matrix: Groundwater Samples
5.1.1.5.5.1 Field Screening
5.1.1.5.5.2 Locations
5.1.1.5.5.3 Sampling Procedure
5.1.1.5.5.4 Analytical Procedure
5.1.1.5.5.5 Sample Containers, Preservations, Holding Times
5.1.1.5.6 Matrix: Surface Water Samples
5.1.1.5.6.1 Field Screening
5.1.1.5.6.2 Locations
5.1.1.5.6.3 Sampling Procedure
5.1.1.5.6.4 Analytical Procedure
5.1.1.5.6.5 Sample Containers, Preservations, Molding Times
5.1.1.5.7 Matrix: Leachate Samples
5.1.1.5.7.1 Field Screening
5.1.1.5.7.2 Locations
5.1.1.5.7.3 Sampling Procedure
5.1.1.5.7.4 Analytical Procedure
5.1.1.5.7.5 Sample Containers, Preservations, Holding Times
5.1.1.5.8 Matrix: Soil Samples
5.1.1.5.8.1 Field Screening
5.1.1.5.8.2 Locations
5.1.1.5.8.3 Sampling Procedure
5.1.1.5.8.4 Analytical Procedure
5.1.1.5.8.5 Sample Containers, Preservations, Holding Times
5.1.1.5.9 Matrix: Sludge I Sediment Samples
5.1.1.5.9.1 Field Screening

5.1.1.5.9.2 Locations
5.1.1.5.9.3 Sampling Procedure
5.1.1.5.9.4 Analytical Procedure
5.1.1.5.9.5 Sample Containers, Preservations, Holding Times
5.1.1.6 Section 6. Sample Chain of Custody, Packing and Shipping

****
It is important to collaborate with the project regulatory specialist on correct manifesting and shipping requirements.
****

5.1.1.7 Section 7. Laboratory Activities
5.1.1.7.1 Cooler Receipt Form
5.1.1.7.2 Instrument Calibration and Frequency
5.1.1.7.3 Quality Control Procedures
5.1.1.7.4 Preventive Maintenance
5.1.1.7.5 Corrective Action
5.1.1.7.6 Data Reduction, Assessment / Validation, and Documentation
5.1.1.8 Section 8. Chemical Data Quality Management Deliverables
5.1.1.8.1 Laboratory Daily Quality Control Reports
5.1.1.8.2 Quality Control Summary Report
5.1.2 Contractor Laboratory Approval
5.1.2.1 Commercial Laboratory Evaluation
5.1.2.2 Laboratory Quality Management Manual
5.1.2.3 Preliminary Questionnaire
5.1.2.4 Performance Evaluation Samples
5.1.2.5 Lab Inspection
5.1.2.6 Approval
5.1.2.7 Expiration of Validation
5.2 Miscellaneous Requirements
5.2.1 Investigation Derived Wastes

****
Treatability studies require much greater volumes than ordinary investigations. Therefore, the remaining laboratory sample may be substantial and require additional cost for disposal by the laboratory, or returning to the site for disposal via the chosen remedial alternative. It is important to collaborate with the project regulatory specialist on correct manifesting and shipping requirements.
****

6. Geotechnical Requirements

****
The variety of field investigations for an EE/CA is a subset of those appropriate for a remedial investigation; therefore, refer to text in Section 6, Geotechnical Requirements, of the RI/FS scope-of-work outline for typical requirements and other information on the topics listed below. This section is intended to set forth acceptable procedures for doing the work specified under Task 3, Field Investigations (Section 2.3).
****

- 6.1 General Specifications
  - 6.1.1 Qualified Geologist/Geotechnical Engineer
  - 6.1.2 Applicable Driller Permits and Licenses
  - 6.1.3 Compliance with State Requirements
  - 6.1.4 Utility Clearances
  - 6.1.5 Disposal of Investigation-Derived Waste (IDW)
  - 6.1.6 Explosive Ordnance Disposal
  - 6.1.7 Decontamination of Equipment/Tools
  - 6.1.8 Water Source and Testing
  - 6.1.9 Site Restoration and Protection
  - 6.1.10 Contractor Responsibility for Wells
  - 6.1.11 Site Surveying
- 6.2 Monitoring Well Installation and Drilling Plan (MWIP)
- 6.3 Subsurface Soil/Rock Sampling
  - 6.3.1 Drilling Method
  - 6.3.2 Test Pit Excavation
  - 6.3.3 Logging Requirements
  - 6.3.4 Geotechnical Sampling and Analyses
  - 6.3.5 Coring/Core Handling
  - 6.3.6 Backfilling
  - 6.3.7 Sampling Techniques
  - 6.3.8 Field Screening
  - 6.3.9 Location/Elevation Survey of Boreholes/Test Pits
- 6.4 Monitoring Well Installation
  - 6.4.1 Drilling Method
  - 6.4.2 Soil/Rock Sampling While Drilling
  - 6.4.3 Field Screening
  - 6.4.4 Casing and Screen
  - 6.4.5 Gravel/Sand Pack
  - 6.4.6 Grouting
  - 6.4.7 Surface Completion

6.8.3.7 Scenarios to be Considered
6.8.3.8 Modeling Report
6.8.4 Geochemical Modeling
6.8.4.1 Rationale
6.8.4.1 Type of Model
6.8.4.1 Scenarios to be Considered
6.8.4.1 Modeling Report
6.8.5 Surface Water Modeling
6.9 Miscellaneous Methodologies
6.9.1 Soil Gas survey Methodology
6.9.1.1 Probe Design and Placement
6.9.1.2 Probe Purging
6.9.1.3 Sample Recovery
6.9.1.4 Decontamination of Equipment
6.9.1.5 Blank, Background, and Duplicate Samples

7. Air

****
This section presents the technical requirements for performance of activities associated with air impact assessments. Enclosure 16 presents a general description of air impact assessments for those not familiar with the process.

Refer to the RI/FS outline for explanatory text. Activities performed in the EE/CA are similar to that of the RI/FS but may be limited in scope. The level of detail to be included in the SOW depends on the project and the Contractor's experience in performing air monitoring and modeling as well as the Contractor's experience in working with the Corps.
****

7.1 Ambient Air Monitoring/Sampling
7.2 Meteorological Monitoring
7.2.1 Review Available Data
7.2.2 On-site Monitoring
7.2.2.1 Meteorological Tower
7.2.2.2 Data to be Collected
7.2.2.3 Data Processing, Documentation and Reporting
7.3 Emission Rate Measurements
7.4 Emission Rate Estimates
7.4.1 Uncontrolled Emission Sources
7.4.2 Remedial Action Sources
7.4.3 Emission Models
7.4.4 Emission Factors

OUTLINE FOR RCRA FACILITY ASSESSMENT (RFA) SCOPE-OF-WORK

1. Project Overview and Objectives

****
This section essentially consists of information, not directives, given to the Contractor by the project team. For additional general information on the topics in this section, refer to section 1. of the RI/FS outline.
****

1.1 Site Background

1.1.1 Location

1.1.2 Regulatory History

****
In general, this section should present an overview of the regulatory history of the site/installation. In subsequent section, project manager should require in this scope that the Contractor develop the regulatory history associated with this site. This is very important background information.
****

1.1.3 Regulatory Authorities

****
The project manager must secure a copy of the permit conditions, Federal Facility Agreement, Compliance Order, Enforcement Order, etc., that is requiring the initiation of this work. Only after the project manager has that information can he/she successfully scope the RFA. The requirements of the scope will serve to fulfill the requirements in the permit or order. The project manager should reference the permit or enforcement order in the scope.

Under RCRA it is extremely important to cite which RCRA statutory authority the RFA is to be conducted under (see Enclosure 15 of the ETL on regulatory matters for further details on RCRA statutory authorities).

The project manager should specifically depict the state's regulatory authorities in the scope and indicate what role federal EPA region is expected to have at the site. The project manager should describe in the scope what type of

RCRA authority the state has, i.e. pre-Hazardous and Solid Waste ACT (HSWA), base RCRA, no authorization, etc.
****

1.1.4 Site Activities and Overall Waste Handling Practices

****
It is important to research and determine the types of processes and the types of waste used at the site. This information should be included in the scope in order to give the Contractor a better feel of the type of Solid Waste Management Unit (SWMU) that is to be studied. Furthermore, the project manager should require through the scope that the Contractor identify whether or not the waste is listed, characteristic, or a hazardous constituent. Contractor should also be required to specify waste codes as per 40 CFR 261.
****

1.1.5 Previous Studies and Results

****
Since these are or were operating facilities, much operating information should be available. The project manager should require the Contractor to secure past disposal records, waste analysis records, manifests, permits, enforcement records, etc. describing the waste management activities at the site.
****

1.2 RFA Project Planning Overview and Objectives

****
Refer to the explanatory text in section 1. of the RI/FS outline. General objectives of RFA are to collect, minimally, sufficient information to support,

1) identification and gather information on releases at the facility;
2) evaluation of SWMUs and other areas of concern (OACs) for releases,
3) recommendations for further action if appropriate, and
4) screen SWMUs which require no further action

The first phase of the RCRA corrective action process is the RFA, which is typically conducted by the EPA or RCRA authorized state during the RCRA permit process. On occasion,

the owner/operator of the facility may choose to initiate the RFA on their own accord. See Enclosure 15 to the ETL on regulatory matters for further explanation.
****

1.2.1 Site Strategy Development
1.2.2 Project Objectives and Project Decision Statements
1.2.3 Data Quality Objectives

1.3 Summary of Required Tasks

****
This is only a superficial listing of tasks to be performed under this scope-of-work. No details are to be given here.
****

Task 1 Preliminary Available Data Review (PR)
Task 2 Prepare Visual Site Inspection (VSI) Plan
Task 3 Conduct VSI
Task 4 Prepare PR/VSI Report
Task 5 Prepare Sampling Visit (SV) Plans
Task 6 Conduct SV - Field Investigations
Task 7 Sample Analysis, Data Assessment and Reporting
Task 8 Data Evaluation and Recommendations Development
Task 9 Prepare RFA Report Task 10 Post RFA Support

1.4 References

****
Include citations of enforcement orders, permits, past inspection reports, past operating records, previous reports, guidance documents such as RCRA Facility Assessment Guidance, etc. Note which of these documents are provided to the Contractor. Previous reports or other historical documents should only be referenced if the team possesses or can locate them.
****

2. Project Requirements

2.1 Task 1 Preliminary Available Data Review (PR)

****
This section requires the Contractor to research, compile, and evaluate available information on the site(s). This includes information on the past activities and conditions at

the site, regulatory history of the installation or facility, and regional or background information relevant to the area.
********** *****

2.1.1 Literature Searches
2.1.2 Aerial Photographs
2.1.3 Background Data Collection
2.1.4 Interviews

2.2 Task 2 Prepare Visual Site Inspection (VSI) Plan
2.2.1 Identification of VSI Objectives

****
This section would require the Contractor to develop specific VSI objectives based on the PR in order to fulfill the following general goals.
****

2.2.1.1 Identify Evidence for Release(s)
2.2.1.2 Identify Additional SWMUs, Corrective Action Management Units (CAMUs) and OACs
2.2.1.3 Fill Data Gaps in PR
2.2.1.4 Develop Recommendations
2.2.2 VSI Plan Components

****
This section would describe for the Contractor what is expected in the VSI plan. The requirements under this topic can be prepared by any of the team members, but most likely would be prepared by the project manager.
********** **

2.2.2.1 Summary of PR
2.2.2.2 Site Boundaries, SWMUs, CAMUs and OACs Identification

****
This section should require the Contractor to present in the VSI plan the locations and approximate boundaries of SWMUs, CAMUs and OACs, as well as the boundaries of the facility.

It is imperative that the Contractor also be required to identify the CAMUS. CAMUs are important because wastes from within the CAMU can be mixed and/or consolidated without triggering the land disposal restricts of 40 CFR 268. If waste is moved outside of a CAMU, it cannot be placed in or

on the ground. If waste is placed on the ground outside the boundaries of the CAMU, this is illegal land disposal and a violation of the land disposal restrictions.
****

2.2.2.3 Other Areas to be Inspected
2.2.2.4 Identified Potential On-Site Interviews

****
This section should require the Contractor to identify in the VSI plan the personnel at the installation or facility with whom interviews are desired. This may require coordination with the installation, as discussed in Section 2.3.1 below.
********** **********

2.2.2.5 Photographs/Log Books

****
The scope should require here that the Contractor describe in the VSI plan the type of photographic and written records to be kept of the VSI.
****

2.2.3 Site Safety and Health Plan

****
The Contractor is required to have a site safety and health plan for the VSI. The topics to be addressed are listed in Section 5 with additional information in Enclosure 8. Since the VSI will be “non-intrusive” in nature, an abbreviated plan may be prepared, i.e., less detail will be required for each topic.
****

2.3 Task 3 Conduct VSI
2.3.1 Coordination with Facility

****
This section should describe the procedures and responsibilities for coordination of the VSI with the facility. This should be prepared by the project manager.
****

2.3.2 Interviews

****
This section should describe the number of interviews anticipated and any details about obtaining or conducting interviews.
****

2.3.3 Records

****
This section should describe the required records to be made and kept of the VSI and interviews.
****

2.4 Task 4 Prepare PR/VSI Report

****
The requirement for a separate PR/VSI report is optional. The PR/VSI can be documented in the RFA report instead, particularly if subsequent activities such as a sampling visit, are conducted. The installation should be consulted in preparing this section.
****

2.4.1 Summary of PR
2.4.2 Summary of VSI
2.4.3 Recommendations for Sampling Visit (SV)

2.5 Task 5 Prepare SV Plans

****
The SV may not be necessary if adequate information to support recommendations for a RCRA Facility Investigation or if no further action is recommended for the site(s) based on the PR/VSI. Sampling objectives and design for a SV should be determined in accordance with the guidance provided in the relevant RI/FS outline sections.
****

2.5.1 Workplan Development

****
This section should require the Contractor to prepare a sampling visit workplan. Special components and considerations are described below. Refer to the appropriate sections of the RI/FS outline for additional information on these topics.
****

2.5.1.1 Summary of PR/VSI
2.5.1.2 Development/Refinement of Data Quality Objectives
2.5.1.3 Data Collection Design
2.5.2 Preparation of Workplan Attachments
2.5.2.1 Chemical Data Acquisition Plan (CDAP) Attachment
2.5.2.2 Monitoring Well Installation and Drilling Plan (MWIP) Attachment
2.5.2.3 Site Safety and Health Plan (SSHP) Attachment

2.6 Task 6 Conduct SV - Field Investigations

****
Many of the field investigation activities to be done under the RFA are a small subset of the activities under an RI/FS, and is similar to a PA/SI. In most cases, the field work is very limited. NOTE: NOT ALL of the activities listed below are appropriate for every project. Only those activities appropriate for the sites under study need be required. Refer to Section 2.3, Field Investigations of the RI/FS scope-of-work outline for the information relevant to preparing these portions of the RFA scope.

Note that since the sampling locations are likely to be very dependent on the Contractor's performance of the PR and VSI, it may be best to let the Contractor recommend the locations in the SV plans based on the refinement of project objectives. Contract modifications may be needed to reflect a changed perception of the site. In any event, the project technical staff will need to be involved throughout the process.
****

2.6.1 Geophysical Surveys
2.6.2 Surface Soil Sampling
2.6.3 Surface water/Lagoon Sampling
2.6.4 Leachate Sampling
2.6.5 Soil Gas Sampling
2.6.6 Air Sampling
2.6.7 Wipe Samples
2.6.8 Subsurface Soil Sampling

****
The number and depth of any borings or test pits should be limited to those necessary to fulfill the objectives of the

SV. These would be done not to define the extent of contamination, but only to show that it exists.
****

2.6.9 Drum Sampling
2.6.10 Monitoring Well Installation and Sampling

****
This section would require the installation of monitoring wells and/or sampling of existing wells at the site. The RFA SV should be very limited in scope and monitoring well installation is not generally done under this phase. Confirming contamination from subsurface features such as tanks may require this activity. Any well installation program should be very limited.
****

2.6.11 Site Topographic and Boundary Surveys
2.6.12 Imminent Threats to Public Health or the Environment

2.7 Task 7 Sample Analyses, Data Assessment and Reporting

****
The following sections should define the analytical and data assessment/validation protocols for the completion of the RFA. Data quality objectives (DQOs) for analytical procedures and quality control requirements, should be developed based upon the requirements of a permitting process, a Federal Facilities Agreement (FFA), or a consent or an enforcement order. Only then can specific DQOs be formulated to identify and evaluate individual SWMUs and/or CAMUs. The information gathered during the RFA will then be used to provide support data toward future investigations or eliminate sites from further consideration.

The sampling and analytical approach utilized for the RFA requires the same attention to detail as the RI/FS approach, but for a less-encompassing effort toward the number of samples taken. Care must be taken to compile enough information to achieve the final goal of the RFA - to confirm or deny releases at the facility. Reference the explanatory text within the RI/FS SOW outline for additional information.
****

2.7.1 Data Review and Assessment

****
Based upon the needs of the site-specific RFA and input from the data users, the chemist should specify the level of confidence (acceptable PARCC parameters) required for each type of data (existing and new). Project specific DQOs for sample analysis and data assessment/validation, and the goal of the RFA must be maintained when reviewing existing data and when specifying Contractor requirements to generate new data. When developing the data requirements for the project, the project chemist and technical staff must balance time and resource constraints with the desired confidence level for the data.

Existing data will be reviewed within the PR portion of the RFA. The technical support team (data users and chemist) should jointly review and assess past data for it's usability. The site is then visually inspected during the VSI. The PR/VSI summary in turn helps define data gaps which may require sampling and analysis during the SV portion of the RFA.

Reference the explanatory text within the RI/FS SOW outline for additional information over the following subjects.
****

2.7.1.1 Existing Analytical Data
2.7.1.2 New Data

****
This section should define guidelines for the appropriate analytical level(s) to be used for data acquisition and corresponding PARCC parameters which will indicate acceptable data quality. Data end-use should be indicated with a table summarizing various SWMU's or OACs. Examples and suggested format for these tables are located within the Project Planning Guidance Document. The Contractor is tasked in this section to propose data review and assessment/validation protocols based on these guidelines.

Based upon the results of the PR/VSI summary, the data needs for the SV portion of the RFA can be decided. The Contractor should develop these issues on a site-specific basis.
****

2.7.2 Analytical Procedures

****
The following sections of the SOW will outline specific analytical protocols to be followed on a site-specific basis for the entire RFA. The chemist should generate tables summarizing this information. Individual tables defining specific analytical protocols and sample frequency should be generated for each SWMU/CAMU undergoing sampling activities. The chemist must be intimately aware of the project's background details (especially existing data) and knowledge of areas where data gaps exist when collaborating with data users in order to make decisions as to the most appropriate future analytical protocols. Due to the effect that the PR and VSI will have on the requirements of the SV, the technical staff will need to be involved throughout the entire project. Contract modifications may be needed to reflect a changed perception of a site.

Reference the explanatory text within the RI/FS SOW outline for additional information over the following subjects.
****

2.7.2.1 Field Screening

****
This section should define field screening methods to be used in the process of the RFA. The chemist and geologist should propose acceptable methods to the Contractor. A Contractor may also be given latitude to propose field screening applications. The Contractor must summarize all field screening in the CDAP for review and approval.

As noted in the EPA DQO guidance, proper field screening techniques can be instrumental in reducing the time it takes to perform an RFA, reduce costs, reduce "intrusive" sampling locations, and, in general, lead to more effective use of Level III and IV analyses. Field screening is primarily used to provide indications of contamination at analytical Levels I and II. Results of field screening may be used to direct soil sampling into areas of contamination or "hot spots", or to screen samples for analysis.

Methods and field test kits may be used (i.e. soil gas, organic screening (HNU, OVA), metals screening (geophysical, XRF), PCB/PCP (Clor-in-soil, amino-assay), etc.) as a criteria to screen samples for selection and submittal to a fixed laboratory for analysis, or utilized for the additional data from field monitoring.
****

2.7.2.2 Water
2.7.2.2.1 Surface
2.7.2.2.2 Ground Water
2.7.2.3 Soils/Sediments/Sludges
2.7.2.4 Drum Samples
2.7.2.5 Wipe Samples
2.7.2.6 Air Samples
2.7.2.7 Soil Gas
2.7.3 Quality Assurance/Quality Control Samples
2.7.3.1 QA Laboratory
2.7.3.2 QC Samples
2.7.4 Laboratory Internal Quality Control
2.7.5 Method Detection Limits

****
Reference the explanatory text within the RI/FS SOW outline for additional information on this subject.
****

2.7.6 Laboratory Turnaround Time
2.7.7 Sample Handling
2.7.8 Preservatives and Holding Times
2.7.9 Investigation-Derived Wastes (IDW)

****
Since this site is covered under the auspices of RCRA, all waste generated at the site related to investigations must be handled as a RCRA solid or RCRA hazardous waste. When waste is generated, the generator is responsible to determine if that waste is by definition hazardous. If the waste is hazardous, it cannot be placed back onto the ground unless you are within the confines of the CAMU. If you place waste onto the ground outside the CAMU boundaries, this is illegal disposal and a violation of the Land Disposal Restrictions. (For guidance see Federal Register, 27 July 1990, pages 30842 and 30843.) Hazardous waste may be moved or consolidated within the originating CAMU. The project team leader must require that the Contractor identify all CAMUs. The Contractor should also be required to obtain approval of the CAMU designation from the RCRA regulatory authority.

The chemist should be aware that IDW will be present both at the site and at the laboratory subsequent to sample shipping for analysis. In addition to standard analyses typically run in an RFA, waste streams generated must also be tested for RCRA characteristic waste analyses. The project chemist and the Contractor must develop some analytical protocol that

will be adequate to determine whether IDW from the subject site may be classified as non-hazardous. The contract laboratory must also be instructed whether to ship completed samples back to the site or to handle them appropriately as IDW. The chemist must be aware that the proposed analytical protocol for the site IDW must be appropriate not only to determine if the waste is hazardous, but also must generate enough information for later manifesting and shipping requirements, if necessary.

Reference the explanatory text within the RI/FS SOW outline for additional information on this subject.
****

2.8 Task 8 Data Evaluation and Recommendation Development

2.8.1 Data Evaluation

2.8.1.1 Comparison to DQOs - Establish Data Usability

****
Refer to the RI/FS outline for more information concerning this topic.
****

2.8.1.2 Refinement of Site Conceptual Model

****
Refer to the RI/FS outline for additional information concerning this topic. The site conceptual model is to be documented in the RFA report, data evaluation section.
****

2.8.1.2.1 Nature of Contamination

****
This section direct the Contractor to evaluate the data in order to refine the understanding the nature of contamination at the site. Refer to the RI/FS outline for additional information, bearing in mind the different objectives of an RFA. Careful cross referencing to the RFA report section (2.9) would be helpful in avoiding a duplication of instruction on preparing these items and double payment for the work.
****

2.8.1.2.2 Hydrogeology

****
Refer to the RI/FS outline for more information about this topic.
****

2.8.1.3 Fate and Transport Analysis

****
This section should require the simplistic analysis of the potential for transport of contaminants by all affected transport pathways; ground water, surface water, air, as originally defined by the conceptual site model. The scope should make it clear that computer modeling would not be appropriate. Refer to the RI/FS outline for more information on this topic; however, the level of detail under this task is generally much less for an RFA.
****

2.8.1.3.1 Air Transport
2.8.1.3.2 Surface Water Transport
2.8.1.3.3 Ground Water Transport

2.8.2 Recommendations for Future Actions

****
As part of this task, the Contractor should be required to develop recommendations based on the available information. This can include recommendations for further study (RFI) or perhaps some possible interim measures. The Contractor should be required to consider innovative technologies if identifying possible interim measures.

Concentrations detected in identified source areas, or projected to occur via fate and transport mechanisms may be compared with proposed action levels to determine requirements for further study and characterization through the RFI, interim/corrective action at the site, or no further action.

Whenever possible, the applicable action levels, **which are identified by the EPA or State,** are incorporated in the permit. If this is not the case, proposed action levels for a number of constituents have been established by EPA for soil, ground water, surface water, and air and are reported within the 55 FR 30798 - 30884, dated July 27, 1990. For compounds not reported within Appendix A, there is also explanatory guidance on the four criteria the EPA utilized in

their assessment of the listed constituents. Action levels derived according to these criteria represent valid, reasonable estimates of levels in media at or below which corrective action is unlikely to be necessary.
****

2.8.2.1 Further Study (RCRA Facility Investigation)
2.8.2.2 Interim Measures

****
This section would require the Contractor to identify potential interim measures for conditions identified in the RFA. Evaluation of alternatives is discussed in Enclosure 11 to the ETL, Alternative Selection. A compendium of possible alternatives/actions is included in EPA guidance and EM 1110-2-505 Guidelines for Preliminary Selection of Remedial Action for Hazardous Waste Sites.
****

2.9 Task 9 Prepare RFA Report

****
The Contractor should be required to include the PR/VSI results as well as the results of the SV. Refer the Contractor to the available guidance.
****

2.9.1 Incorporation of the PR/VSI Report
2.9.2 Results of the SV
2.9.3 RFA Report
2.9.3.1 Pre-Draft Data Package

****
Reference Section 2.7.1 of the RI/FS SOW outline for specifics on this submittal.
****

2.9.3.2 Draft RFA Report
2.9.3.3 Final RFA

2.10 Task 10 Post RFA Support

****
In a few cases, there may be a need for support beyond the RFA. This task should not include the preparation of the RFI, given the much larger scope of an RFI. A separate contract or work order would be appropriate.
****

3. Project Management

****
Refer to the RI/FS scope-of-work outline for explanatory text for this section. Advice specifically relevant to performance of project management under the RFA is included here.
****

3.1 Project Manager
3.2 Coordination with Other Entities

****
Since the RCRA corrective action process is typically part of the RCRA permitting process, it is essential that close coordination with the regulators and customer be maintained throughout this process. See Enclosure 15 of the ETL concerning regulatory matters for further discussion.
****

3.3 Conference Notes
3.4 Confirmation Notices
3.5 Government Support
- 3.5.1 Government Provided Data and Information
  - 3.5.1.1 Permits and Documentation
  - 3.5.1.2 Access to Individuals at Facility
- 3.5.2 Existing Plans/Surveys/Air Photos
- 3.5.3 Utilities
- 3.5.4 Permits
- 3.5.5 Rights of Entry
- 3.5.6 Security/Access
- 3.5.7 Equipment Storage/Staging Areas
- 3.5.8 Temporary Office
- 3.5.9 Investigation-Derived Waste Disposal

****
IDW can be legally placed within the confines of the CAMU from which it originated. All other wastes that will not be returned to the CAMU must be handled in accordance with 40 CFR 260 through 268.
****

3.6 Travel and Meetings
- 3.6.1 Facility Data Review and Interviews
- 3.6.2 Visual Site Inspection
- 3.6.3 Draft SV Workplan Meeting/Field Work Start-up Meeting

3.6.4 Sampling Visit
3.6.5 RFA Draft Report Review Meeting
3.6.6 RFA Final Report Review Meeting
3.6.7 Public Meetings

****
Public meetings are not a formal requirement during the RFA process since the RFA is typically an integral part of the RCRA permitting process. The permitting process has strict public meeting and community relations requirements that must be fulfilled.

The project manager should consult the customer and the conditions of the permit to determine if there are any community relations items he/she should put into the scope.
****

3.6.8 Additional Trips
3.7 Schedules
3.8 Submittals

****
This section summarizes the submittals expected during the course of the project. No technical requirements are presented here. Number of copies required are specified here.
****

3.8.1 General Submittal Requirements
3.8.2 Document Submittal Register
3.8.3 Workplans
3.8.3.1 Visual Site Inspection Plan
3.8.3.2 Sampling Visit Workplan
3.8.3.2.1 Chemical Data Acquisition Plan (CDAP) Attachment
3.8.3.2.2 Site Safety and Health Plan (SSHP) Attachment
3.8.4 Progress Reports
3.8.4.1 Monthly Progress Reports
3.8.4.2 Daily Quality Control Reports
3.8.5 Sampling Log Book
3.8.6 Survey Documents
3.8.7 PR/VSI Report
3.8.7.1 Draft PR/VSI Report
3.8.7.2 Final PR/VSI Report
3.8.8 RFA Report
3.8.8.1 Pre-Draft Data Package
3.8.8.2 Draft RFA

3.8.8.3 Final RFA
3.8.9 Quality Control Summary Report
3.8.10 Boring Logs

4. NEPA Compliance During the RFA

****
For the RCPA corrective action process there is no "functional equivalent" as in the CERCLA process. There are two basic ways to achieve compliance during the RARA corrective action process. The first way would be for the project manager to develop a programmatic Environmental Assessment/Impact Statement. The programmatic documentation could be developed for the entire corrective action process. The second way would be to integrate the NAPA process into the RARA corrective action process to fulfill the NAPA requirements.

The project manager should consult with the NAPA expert and the office of counsel in order to determine the proper way to meet NAPA requirements. The project manager should then develop the appropriate scoping language.
****

5. Health and Safety Technical Requirements

****
This section presents the technical requirements for health and safety. Refer to Enclosure 8 to the ECL for the suggested language for this SOW section.

Two topics, "Site Description and Contamination Characterization" and "Staff Organization, Qualifications, and Responsibilities" may be addressed as a portion of the work plan as outlined in section 2.1. In the event this material is addressed within the work plan (WP), the applicable WP sections should be referenced within these sections of the SHP. Regardless of location, these topics should address the requirements contained in Enclosure 8.
****

6. Chemistry Technical Requirements

****
This section presents the technical requirements for performance of sampling and analysis activities. Specific re-

quirements are discussed under the individual topics. Additional guidance on the typical content of this section is provided as Enclosure 13 to the ECL, Chemistry Technical Requirements. An outline of the section is provided here.
****

6.1 Introduction
6.1.1 CDAP Format and Implementation Requirements
6.1.1.1 Section 1. Table of Contents
6.1.1.2 Section 2. Project Background Data
6.1.1.3 Section 3. Chemical Requirements to Support Project Data Quality Objectives (DQOs)
6.1.1.4 Section 4. Contractor Project Organization and Functional Areas of Chemistry Responsibilities
6.1.1.5 Section 5. Field Activities:
6.1.1.5.1 Field Instrumentation and Equipment (Calibration and Maintenance)
6.1.1.5.2 Field Documentation
6.1.1.5.3 Daily Quality Control Report (DQCR)
6.1.1.5.4 QC and QA Field Samples
6.1.1.5.5 Decontamination Procedures
6.1.1.5.6 Matrix: Ground Water Samples
6.1.1.5.6.1 Field Screening
6.1.1.5.6.2 Locations
6.1.1.5.6.3 Sampling Procedure
6.1.1.5.6.4 Analytical Procedure
6.1.1.5.6.5 Sample Containers, Preservations, Holding Times
6.1.1.5.7 Matrix: Surface Water Samples
6.1.1.5.7.1 Field Screening
6.1.1.5.7.2 Locations
6.1.1.5.7.3 Sampling Procedure
6.1.1.5.7.4 Analytical Procedure
6.1.1.5.7.5 Sample Containers, Preservations, Holding Times
6.1.1.5.8 Matrix: Leachate Samples
6.1.1.5.8.1 Field Screening
6.1.1.5.8.2 Locations
6.1.1.5.8.3 Sampling Procedure
6.1.1.5.8.4 Analytical Procedure

6.1.1.5.8.5 Sample Containers, Preservations, Holding Times
6.1.1.5.9 Matrix: Soil Samples
6.1.1.5.9.1 Field Screening
6.1.1.5.9.2 Locations
6.1.1.5.9.3 Sampling Procedure
6.1.1.5.9.4 Analytical Procedure
6.1.1.5.9.5 Sample Containers, Preservations, Holding Times
6.1.1.5.10 Matrix: Sludge/Sediment Samples
6.1.1.5.10.1 Field Screening
6.1.1.5.10.2 Locations
6.1.1.5.10.3 Sampling Procedure
6.1.1.5.10.4 Analytical Procedure
6.1.1.5.10.5 Sample Containers, Preservations, Holding Times
6.1.1.5.11 Matrix: Air Samples
6.1.1.5.11.1 Locations
6.1.1.5.11.2 Sampling Procedure
6.1.1.5.11.3 Analytical Procedure
6.1.1.5.11.4 Sample Containers, Preservations, Holding Times
6.1.1.5.12 Matrix: Surface Samples
6.1.1.5.12.1 Field Screening
6.1.1.5.12.2 Locations
6.1.1.5.12.3 Sampling Procedure
6.1.1.5.12.4 Analytical Procedure
6.1.1.5.12.5 Sample Containers, Preservations, Holding Times
6.1.1.5.13 Matrix: Soil Gas Samples
6.1.1.5.13.1 Field Screening
6.1.1.5.13.2 Locations
6.1.1.5.13.3 Sampling Procedure
6.1.1.5.13.4 Analytical Procedure
6.1.1.5.13.5 Sample Containers, Preservations, Holding Times
6.1.1.5.14 Matrix: Drum / Tank Samples
6.1.1.5.14.1 Field Screening
6.1.1.5.14.2 Locations
6.1.1.5.14.3 Sampling Procedure
6.1.1.5.14.4 Analytical Procedure

6.1.1.5.14.5 Sample Containers, Preservations, Holding Times
6.1.1.6 Section 6. Sample Chain of Custody, Packing and Shipping
6.1.1.7 Section 7. Laboratory Activities:
6.1.1.7.1 Cooler Receipt Form
6.1.1.7.2 Instrument Calibration and Frequency
6.1.1.7.3 Quality Control Procedures
6.1.1.7.4 Preventive Maintenance
6.1.1.7.5 Corrective Action
6.1.1.7.6 Data Reduction, Assessment Validation, and Documentation
6.1.1.8 Section 8. Chemical Data Quality Management Deliverables
6.1.1.8.1 Daily Quality Control Reports
6.1.1.8.2 Laboratory Daily Quality Control Reports
6.1.1.8.3 Non-Routine Occurrences Reports
6.1.1.8.4 Pre-Draft Data Package
6.1.1.8.4.1 Pre-Draft Data Package Organization
6.1.1.8.4.2 Minimum Data Reporting Requirements for Pre-Draft Data Package
6.1.1.8.5 Quality Control Summary Report
6.1.1.8.6 Chemical Quality Assurance Report
6.1.2 Contractor Laboratory Approval
6.1.2.1 Commercial Laboratory Evaluation
6.1.2.2 Laboratory Quality Management Manual
6.1.2.3 Preliminary Questionnaire
6.1.2.4 Performance Evaluation Samples
6.1.2.5 Laboratory Inspection
6.1.2.6 Approval
6.1.2.7 Expiration of Validation
6.2 Miscellaneous Requirements
6.2.1 Investigation Derived Wastes

7. Geotechnical Requirements

****

All of the field investigation activities for an RFA are also often included in a remedial investigation; therefore, refer

to text in Section 6, Geotechnical Requirements of the RI/FS scope-of-work outline for typical requirements and other information for this section of the R.A. scope. Note that only those sections of Section 6 of the RI/FS scope outline that cover field work specified under Conduct Sampling Visit Field Investigation (Section 2.6) of the R.A. scope should be included in this portion of the R.A. scope-of-work.
****

7.1 General Specifications
- 7.1.1 Qualified Geologist/Geotechnical Engineer
- 7.1.2 Applicable Driller Permits and Licenses
- 7.1.3 Compliance with State Requirements
- 7.1.4 Utility Clearances
- 7.1.5 Disposal of Investigation-Derived Waste (IDW)
- 7.1.6 Explosive Ordnance Disposal
- 7.1.7 Decontamination of Equipment/Tools
- 7.1.8 Water Source and Testing
- 7.1.9 Site Restoration and Protection
- 7.1.10 Contractor Responsibility for Wells
- 7.1.11 Site Surveying

7.2 Monitoring Well Installation and Drilling Plan (MWIP) Attachment

7.3 Subsurface Soil/Rock Sampling
- 7.3.1 Drilling Method
- 7.3.2 Test Pit Excavation
- 7.3.3 Logging Requirements
- 7.3.4 Geotechnical Sampling and Analyses
- 7.3.5 Coring/Core Handling
- 7.3.6 Backfilling
- 7.3.7 Sampling Techniques
- 7.3.8 Field Screening
- 7.3.9 Location/Elevation Survey of Boreholes/Test Pits

7.4 Monitoring Well Installation
- 7.4.1 Drilling Method
- 7.4.2 Soil/Rock Sampling While Drilling
- 7.4.3 Field Screening
- 7.4.4 Casing and Screen
- 7.4.5 Gravel/Sand Pack
- 7.4.6 Grouting
- 7.4.7 Surface Completion
- 7.4.8 Well Development
- 7.4.9 Monitoring Well Construction Diagrams
- 7.4.10 Survey
- 7.4.11 In-Situ Permeability (Single Well) Testing

****

This section presents the technical requirements for performance of activities associated with air impact assessments. Enclosure 16 presents a general description of air impact assessments for those not familiar with the process.

Explanatory text is included in the RI/FS outline. The scope of activities performed in the R.A. is generally less than that of the RI/FS. Some of the topics below may not be appropriate for the R.A. but are included for completeness. The level of detail to be included in the scope depends on the project and the Contractor's experience in performing air

monitoring and modeling as well as the Contractor's experience in working with the Corps.
****

- 8.1 Ambient Air Monitoring/sampling
- 8.2 Meteorological Monitoring
  - 8.2.1 Review Available Data
  - 8.2.2 On-site Monitoring
    - 8.2.2.1 Meteorological Tower
    - 8.2.2.2 Data to be Collected
    - 8.2.2.3 Data Processing, Documentation and Reporting
- 8.3 Emission Rate Measurements
- 8.4 Emission Rate Estimates
  - 8.4.1 Uncontrolled Emission Sources
  - 8.4.2 Remedial Action Sources
  - 8.4.3 Emission Models
  - 8.4.4 Emission Factors
- 8.5 Atmospheric Dispersion Modeling
  - 8.5.1 Purpose and Rationale
  - 8.5.2 Review of Previous Models
  - 8.5.3 Input Data
    - 8.5.3.1 Source Data
    - 8.5.3.2 Receptor Data
    - 8.5.3.3 Meteorological Data
  - 8.5.4 Modeling Methodology
  - 8.5.5 Reporting Results

9. Miscellaneous Requirements

OUTLINE FOR A RCRA FACILITY INVESTIGATION (RFI) SCOPE-OF-WORK

1. Project Overview and Objectives

****
This section essentially consists of information, not directives, given to the Contractor by the project team. Refer to the RI/FS outline for more information on these topics; however, specific guidance under RCRA is provided, where appropriate.
****

1.1 Site Description
- 1.1.1 Location and Site Conditions
- 1.1.2 Site Background
  - 1.1.2.1 Site Industrial Usage
  - 1.1.2.2 Disposal Practices

****
The project manager should discuss past disposal practices/releases at the site with the customer and then put this information into the scope.
****

1.1.2.3 Types of Wastes Disposed of/Released at the Site

****
The project manager should discuss with the customer what types of hazardous wastes or hazardous constituents were disposed of at the site. If possible, the project manager should specify in the scope whether the wastes were listed, characteristic or hazardous constituents. An attempt should be made to identify the waste codes as per 40 CFR 261.
****

1.1.3 Regulatory Authorities and Enforcement History

****
In this section, the project manager should indicate which authority the RFI is proceeding under and whether or not the facility is on the NPL. This will serve several purposes. Everyone working on the project will understand which

corrective action process applies. The regulatory authorities will be clear. Reviewers will readily know the authorities and which corrective action is being undertaken.

RCRA 3004(u) requires that a facility seeking a permit undergo an investigation (RFA) to determine if there are any uncontrolled releases at the facility. Hence, typically the state or EPA will perform the RFA during the permitting process. It is very important for the project team to know whether the installation is seeking a Part B, Closure or Post-Closure Permit. Permitting is the most obvious way to determine if the RCRA Corrective Action process applies. If the facility is in the permitting process it is extremely important for the project team to know where in that process since the RFI is integrated through this permit process. The regulating agency will require that the installation perform a RFI on all SWMUs that have been identified during the RFA.

RCRA also provides for the state or EPA to issue an administrative order to the facility requiring the development of an RFI. The project team should know if this is the scenario you are working under.

Facilities that are non-NPL and require cleanup under the RCRA corrective action process will need to closely coordinate with the state since, in most instances, they are the regulatory authority.

For those sites that are on the NPL and subject to the RCRA corrective action provisions, it is necessary that the project team cease work at this point and ensure that some sort of ten-party agreement such as a Federal Facility Agreement Interagency Agreement, Consent Order,etc. has been developed to integrate the CERCLA and RCRA remediation process. If this is the case, EPA and the state will be heavily involved in the corrective action process. If this agreement is not yet available, discuss this matter with your customer.
****

1.1.4 Previous Studies and Results

1.2 Project Planning Overview and Objectives

****
While the RFI is quite similar in nature to a CERCLA RI, one major difference is that the RCRA enforcement authority is the lead agency and, as such, has control over what must be

included or what may not be included in the RFI. Unlike the CERCLA RI process, the contents of an RFI are up to the discretion of the RCRA enforcement agency. Hence, this outline may not be all inclusive, or on the other hand, this outline may be much, much more than what is required by the RCRA enforcement agency. Prior to scoping, it is essential that the project team understand the regulatory requirements, then seek to add elements to the scope on a case-by-case basis that would assist the Corps in further studies or designs at the site. The basic premise of the RFI is to further investigate the SWMUs identified in the RFA.
****

1.2.1 Site Strategy Development
1.2.2 RFI Objectives and Project Decision Statements

****
These are a series of statements indicating the specific goals of the RFI as developed by the team for the Contractor's information. In an RFI, the primary goal is to identify any Solid Waste Management Units (SWMUs) missed during the RFA, characterize the nature, extent, direction, rate, movement and concentration of releases from confirmed and newly identified SWMUs. (Confirmed through the RFA).

Determining project specific objectives is an interactive project team approach which will enable study to focus resources toward essential project requirements, and will enhance and accelerate the projected response action. Team members are discussed at length within the RI/FS SOW. Discussions include the development of project decision statements, data needs, and eventually the data collection program. Reference the RI/FS SOW outline for guidance on these subjects.
****

1.2.3 Preliminary Corrective Measures Objectives

****
This section should note for the Contractor the consideration given to development of corrective measures during the development of the scope requirements (particularly in the field investigations). Note that this process should also consider innovative technologies.
****

1.2.4 Data Quality Objectives
1.3 Summary of Required Tasks

****
This is only a superficial listing of tasks to be performed under this scope-of-work. No details are to be given here.

Task 1 Description of Current Conditions
Task 2 Pre-Investigation Evaluation of Corrective Measures Technologies
Task 3 RFI Planning Requirements
Task 4 Field Investigation
Task 5 Sample Analyses, Data Assessment and Reporting
Task 6 Data Evaluation/Fate and Transport Analyses
Task 7 Health and Environmental Assessment
Task 8 Identification and Development of Points of Compliance and Action Levels
Task 9 Evaluation of Action Levels/Criteria for Further Action, Development of Recommendations
Task 10 Reports

1.4 References

****
Include citations of previous reports, permits, enforcement actions, site inspections, guidance documents, RCRA documentation (such as manifests, biennial reports, annual reports, waste analysis records, land ban records, etc.), and any other documents. List only those documents that the team possesses or can locate. Indicate which documents are being provided to the Contractor.
****

2. Project Requirements

2.1 Task 1 Description of Current Conditions

****
Generally, this topic requires the Contractor to investigate the facility background including location, property lines, topography, structure, past or active SWMUs, surrounding land use, location of all existing monitoring wells, maps, spill reports, past permits, past enforcement documentation, etc. The Contractor is also tasked to compile current knowledge of nature and extent of contamination, including reports of all possible sources of releases, locations of releases, quantities, type of waste (listed or characteristic hazardous

waste or hazardous constituents), monitoring data, potential pathway data, instances in which concentrations exceed action levels, potential impact, etc.
****

2.1.1 Background Data Collection

****
In this section, the project manager should require the Contractor to investigate and identify past disposal practices at each SWMU. Under RCRA, it is EXTREMELY important to determine what type of waste you are remediating. If this information is not known, the project manager should require that the Contractor investigate and identify if the waste at the SWMU is listed or characteristic hazardous waste, or contains hazardous constituents.
****

2.1.1.1 Literature Searches

****
This would require the Contractor to review available information, include previous reports, published articles, maps, government records, site records, regulatory documents, etc., concerning the site(s). In the majority of cases, the RFI will be conducted during a RCRA permitting process. The project manager should require through the scope that the Contractor research the past regulatory atmosphere associated with these SWMUs. The Contractor should be required to look at past RCRA inspection reports, past RCRA documentation (such as annual reports, biennial reports, manifests, permits, enforcement orders, etc.), past reports, etc. From this information, the Contractor shall develop a feel for the regulatory enforcement strategy at the SWMUs.
****

2.1.1.2 Interviews
2.1.1.3 Preliminary Site Boundaries Identification

****
This section would require the Contractor to estimate site boundaries based on existing information. Under RCRA remediation, it is important to identify the physical extent of the contamination early in the process. While this probably cannot be done at this point, keep this requirement in mind.
****

2.1.1.4 Municipal/Industrial/Domestic Well and Water Intake Survey
2.1.2 Preliminary Site Visit
2.1.3 Preparation of Draft Current Conditions Report (CCR)

****
This section should require the Contractor to prepare the components of a current conditions report. This would be an optional submittal. The draft report could be part of the RFI report or separate early submittal. The final CCR would be a part of the RFI report. The necessary topics are outlined in the EPA RFI guidance. These include, but are not limited to, the following.
****

2.1.3.1 Local/Regional Summary
2.1.3.2 History and Extent of Problem
2.1.3.3 History of Regulatory and Response Actions
2.1.3.4 Review of the RFA
2.1.3.5 Site Boundaries Identification

2.2 Task 2 Pre-Investigation Evaluation of Corrective Measures Technologies

****
The Contractor should be tasked with recommending any implementation of interim measures, including the objectives of any interim measures, schedules, designs, etc. The use of innovative technology should be considered in accordance with directives from EPA and HQUSACE.

See Enclosure 11 to the ETL on Alternative Selection for additional information.
****

2.3 Task 3 RFI Planning Requirements
2.3.1 RFI Workplan
2.3.1.1 Identification/Refinement of DQOs

****
Contractor should be required to evaluate and expand on DQOs listed within the scope of services, as discussed in the RI/FS SOW.
****

2.3.1.2 Data Collection Program Design
2.3.1.3 Workplan RFI Report Requirements Discussion

****
This section would serve the same purpose as the same topic in the RI/FS outline. This section would direct the Contractor to describe the RFI report format and expected general content in the workplan. This section would also allow the USACE team to specify the requirements for the RFI report format and general content. If this information is proposed in the workplan, it allows the USACE team to comment on it before the Contractor actually prepares the RFI report. This should save time and effort later. Refer to the RI/FS outline for more information. Reference the discussion of the RFI report in section 2.10.
****

2.3.2 Preparation of Workplan Attachments

****
This section requires the Contractor to prepare the following plans in accordance with technical requirements given in Sections 4, 5, and 6. The language used here for preinvestigative plans is in accordance with USACE requirements and differs from RCRA guidance. The project team may investigate with the regulating office the option to use the language and plan approach outlined within the RFI guidance. Regardless of the language used in naming of the plans, the USACE guidance for the Chemical Data Acquisition Plan (CDAP) and the Monitoring Well Installation and Drilling Plan (MWIP) encompasses the requirements of the Data Collection Quality Assurance Plan and the Data Management Plan. The USACE requirements for the Site Safety and Health Plan (SSHP) encompass the requirements of the Health and Safety Plan. The Project Management Plan required under RCRA would be included in the topics covered in the main RFI Workplan.
****

2.3.2.1 Chemical Data Acquisition Plan (CDAP) Attachment
2.3.2.2 Monitoring Well Installation and Drilling Plan (MWIP) Attachment
2.3.2.3 Site Safety and Health Plan (SSHP) Attachment
2.3.2.4 Community Relations Plan Attachment
2.3.3 Community Relations Planning

****
The project manager should contact the customer and the RCRA enforcement agency to determine specific requirements for community relations during each RFI. Note that the Community relations Plan is discussed in the previous section.
****

2.3.3.1 Establish Repository

****
Since most RFIs will be done in conjunction with the RCRA permitting process, the project manager should ask the customer to add all RFI related information to the existing repository.
****

2.3.3.2 Community Relations Support

2.4 Task 4 Field Investigation

****
This section describes the required quantities and the locations of the field activities. The variety of field investigations for an RFI is comparable to that for a remedial investigation; therefore, refer to text under Section 2.3, Field Investigations of the RI/FS scope-of-work outline for explanatory text for each of the topics listed below. NOTE: Only a subset of the activities listed below would typically be done. NOT ALL ACTIVITIES listed here are required at each site. The sections below are provided for completeness only, and should not be inferred to mean that all of these activities are to be done under the RFI for each project.

Based on the preliminary conceptual site model and project objectives, the sample design and analytical requirements are formalized within the scope of services as descriptive narratives. Reference the RI/FS SOW for guidance on this subject. This usually is presented in the Field Investigations portion of the scope. Rationale for sample design should include geostatistical analysis for sample design if appropriate, criteria for biased vs. random approach, and identification of critical samples. Rationale should extend to criteria for placement of the sampling point, depth of sample relevant to the intended use of the data, and criteria for level of uncertainty based on relevance, applicability, or usefulness to specific requirements.

Chemistry analytical requirements should be specified in Section 2.5, Sample Analyses, Data Assessment and Reporting for specific requirements such as selection of specific methods/quantification limits. Requirements in this section of the SOW generally should be cross referenced to the other sections relating to data quality objectives.
****

2.4.1 Site Topographic and Boundary Surveys
2.4.2 Geophysical Surveys
2.4.3 Soil Gas Sampling
2.4.4 Drum Sampling
2.4.5 Surface Soil Sampling
2.4.6 Surface Water/Lagoon Sampling
2.4.7 Leachate Sampling
2.4.8 Subsurface Soil Sampling
2.4.9 Fracture Trace Analyses
2.4.10 Monitoring Well Installation and Sampling
2.4.11 Air Sampling
2.4.12 Wipe Samples
2.4.13 Infiltration Testing
2.4.14 Vadose Zone Permeability Testing
2.4.15 Pump Tests
2.4.16 Tracer Tests

2.5 Task 5 Sample Analyses, Data Assessment and Reporting

****
The following sections should define the analytical and data assessment/validation protocols for the completion of the RFI. The project chemist should develop the chemistry related components of the project specific data quality objectives (DQOs) to provide sufficient data and quality in order to provide data which meets the requirements of the data users, and to determine the nature and extent of contamination at SWMU/CAMU identified through the RFA. In addition, the RFI should gather necessary data to support or deny potential treatment options to be assessed during the Corrective Measure Study (CMS).

Based on field investigations specified in Task 4, the following sections of this task will be developed by the chemist with collaboration with the data users. Analytical procedures will be specified for appropriate matrices to be collected in the field investigations.

Due to the comparability of the RFI under RCRA to the RI portion of the RI/FS under CERCLA, the chemist may reference the explanatory text in the RI/FS SOW outline for additional information on the following.
****

2.5.1 Data Review and Assessment
2.5.1.1 Existing Data
2.5.1.2 New Data

****
Based upon the data needs for the site-specific RFI which include defining the nature and extent of contamination at each site, potential migration pathways, and potential impact on human health and the environment, the chemist should specify the level of confidence required for each type of data acquired, based upon the data needs of the data users. Reference the explanatory text within the RI/FS SOW outline for specific information.
****

2.5.2 Analytical Procedures

****
The following sections of the SOW will outline specific analytical protocols to be followed on a site-specific basis for the entire RFI. The chemist should generate tables summarizing this information. Examples and suggested format for these tables is located within the Project Planning Guidance Document. Individual tables should be generated for each site with a multi-site RFI. The chemist must be intimately aware of the project background details and project specific DQOs to collaborate with the data users and other project team members in order to make decisions as to the most appropriate analytical protocol. This should include full knowledge of the previously completed data and areas where data gaps exist requiring further assessment. Reference the explanatory text within the RI/FS SOW outline for additional information over the following.
****

2.5.2.1 Field Screening
2.5.2.2 Water
2.5.2.2.1 Surface
2.5.2.2.2 Ground Water
2.5.2.3 Soils/Sediments/Sludges

****
The chemist and the project team members (data users) must consult to develop an appropriate analytical protocol. Background sample analysis is critical to every RFI, the chemist should make certain these samples are collected and analyzed on a SWMU-specific basis. In some instances, an installation-specific collection of background soil samples may be appropriate. Regulators must be consulted for each installation to determine the approach necessary. Reference the explanatory text within the RI/FS SOW outline for additional information.
****

2.5.2.4 Drum Samples
2.5.2.5 Wipe Samples
2.5.2.6 Air Samples
2.5.2.7 Soil Gas
2.5.2.8 Bench Scale Testing

****
The chemist should work jointly with a process engineer to develop specific DQOs for this section. The use of innovative technology should be considered in accordance with directives from EPA and HQUSACE when considering appropriate treatment options. The chemist will be required to define an appropriate analytical protocol for the assessment of these treatment options, and/or to define applicability of the waste to the treatment option.
****

2.5.3 Quality Assurance/Quality Control Samples
2.5.3.1 QA Laboratory
2.5.3.2 QC Samples
2.5.4 Laboratory Internal Quality Control
2.5.5 Method Detection Limits
2.5.6 Laboratory Turnaround Time
2.5.7 Sample Handling
2.5.8 Preservatives and Holding Times
2.5.9 Investigation-Derived Wastes

2.6 Task 6 Data Evaluation/Fate and Transport Analysis
2.6.1 Data Evaluation

****
The RI/FS outline contains more information related to this section.
****

2.6.1.1 Comparison to Data Quality Objectives - Establish Data Usability
2.6.1.2 Refinement of Site Conceptual Model

****
Refer to the RI/FS outline for explanatory text on this topic. Conceptual site model will be subsequently expanded further into the exposure assessment of the health assessment. The site conceptual model is to be documented in the RFI report, data evaluation section, and health assessment.
****

2.6.1.3 Nature and Extent of Contamination
2.6.1.4 Hydrogeology
2.6.2 Fate and Transport Analysis

****
Refer to the RI/FS outline for information on this topic.
****

2.6.2.1 Air Transport Analysis
2.6.2.2 Surface Water Transport
2.6.2.3 Ground Water Transport

2.7 Task 7 Health and Environmental Assessment

****
The RFI health assessment is somewhat structurally similar to the risk assessment requirements for the RI/FS. The following is an excerpt of the risk assessment instruction included in the RI/FS scope-of-work guidance, which should be used as a guideline in developing requirements for the RFI health assessment. Variations may be regarded in use of conclusions or recommendations of the health assessment, which do not require a numerical quantitative evaluation of risk to determine site action, but rather a comparative analysis of potential exposure point concentrations and/or intakes with proposed corrective action levels.

Project team and member responsible for risk assessment shall specify level of effort required for the risk assessment based on customer specific requirements and regulatory restraints. Generally, format and content should follow EPA's "Risk Assessment Guidance for Superfund, Volumes I & II", 1989.
****

2.7.1 Human Health Assessment

2.7.1.1 Identification of Chemicals of Concern

****

Data identified as required to support the health assessment in the DQOs for the project are evaluated in this section to determine if data collected was of sufficient quantity and quality as was specifically intended. If sampling design and analytical DQOs were formulated properly with the end use in mind; data to evaluate the nature and extent, which will support the fate and transport analysis and modeling, will be of sufficient quality and quantity to adequately evaluate exposure routes, exposure point concentrations, and to evaluate comparatively the potential risks associated with a specific site.

DQOS for sampling requirements to support the health assessment, take into account statistical representativeness, bounds of the data, toxicity reference concentrations in determining detection limits, spatial representativeness to properly evaluate exposure routes, and quality assurance/quality control, specific sampling and analytical requirements to assure data may be used for exposure point concentration quantification.

Selection of chemicals therefore, must evaluate data quality and quantity sufficient to support the health assessment, by evaluating data by originally intended DQOs for quality with respect to sample quantitation limits, qualifiers and codes, blanks, background samples, frequency of detection, and statistical representativeness. Contractor must then present data for chemicals selected as the range of concentrations detected, frequency of detection, and sample quantitation limits. DQOs for sample collection should take into account sufficient quantity of data is gathered to calculate a meaningful average concentration that populations may reasonably be expected to be exposed to over time. Data collected for modeling to calculate exposure point concentrations should also take into account sufficient data is collected such that the average value calculated represents a statistically meaningful value.

****

2.7.1.2 Exposure Assessment

****
The conceptual site model, preliminarily developed by the project planning team, and further refined by the Contractor in the workplan and data evaluation section of the RFI, is expanded further in this section as the basis for the exposure assessment. The source area, intermedia transport mechanisms, exposure routes, and populations are evaluated in this section to define exposure pathways develop potential exposure point concentrations. Contractor should identify and discuss all relevant exposure pathways, surface water transport, air dispersion, ground water transport developed in the fate and transport section, to calculate exposure point concentrations for current and potential future exposures to identified receptors.

Populations initially identified in the conceptual site model should be evaluated in more detail, as to those populations which may reasonably be expected to potentially come into contact with site wastes, by the identified exposure routes, both currently and in the future. Generally, "worst case" assessments should be avoided as unrealistic. Receptors should be identified with full consideration given to all potential limiting factors; institutional controls, engineering controls, transient nature of occupancy, zoning, and any reasonable expectations of maintaining or establishing ecological sanctuaries or protected areas (which will be used in the environmental evaluation), in identifying realistic potential exposure scenarios for humans. It is important that a balance be maintained in identifying receptors and potential exposure scenarios between attempting to identify all potential risks to human health, and factors that may realistically prevent those exposures.

All calculations used in the assessment should be documented within the text as well as all references used in the analysis.
****

2.7.1.3 Toxicity Assessment

****
The toxicity assessment is a descriptive section that summarizes applicable available toxicity information for identified chemicals of concern.

The descriptive sections or toxicity profiles should minimally include a summary of study used to derive RFDs and

slope factors, confidence, weight of evidence, and indicated effect, and criteria for selecting specific values for the exposure durations indicated for the risk assessment, such as acute exposures, chronic exposures, and subchronic exposures developmental effects for non-carcinogens, and chronic exposures only for carcinogenic effects.

The summaries of the toxicity assessments should be within the body of the health assessment, with any accompanying full text included in an appendix to the health assessment or RFI.
****

2.7.1.4 Risk Characterization

****
In this section, the Contractor should be required to compare exposure concentrations with proposed corrective action limits as a basis of determining relative potential for identified populations for adverse health effects or risks. Contractor should clearly identify, in a tabular format, this comparison associated with each chemical for each route of exposure.

Contractor will be expected to discuss results within the body of the text, including uncertainties and limiting factors associated with qualitation, and provide a summary of all results.

Those concentrations for specific identified receptors which are above the specified level for a media of concern, shall be used as the basis for correction action objectives. Either of these preliminary objectives shall be included in the summary of the risk assessment and will be forwarded to the corrective action study to establish corrective action goals. Additionally, the summary and conclusions of the health assessment shall be forwarded for qualitative analysis of risk associated with each alternative as compared to the "no action" or baseline alternative, in the corrective action study.
****

2.7.1.5 Uncertainty Analysis

****
An essential part of the risk assessment process is the uncertainty analysis. Numerical and non-numerical evaluations of errors and uncertainties associated with

sampling design and analysis, fate and transport, intake assessment, toxicity assessment, and risk characterization should be discussed so that customer has an indication of limitations of the results or risks calculated in making an informed decision regarding remediation. Each section of the risk assessment should include a full uncertainty analysis, which may be qualitative, but is in some cases more useful from a quantitative perspective. Evaluation should include degree of false positives expected, and false negatives, and in what manner errors may affect overall decision making and site management. DQOs originally determined should take into account acceptable error expected in the health assessment based on quality and quantity of data collected, and should be referenced in this analysis.
****

2.7.2 Environmental Evaluation

****
The environmental evaluation is less straightforward than the human health evaluation. It may be complicated by competing exposure pathway analysis for human receptors in defining potential environmental populations, and overall in determining remedial action objectives. Although not necessarily stated, neither assessment takes precedence over the other in weighing corrective action requirements. The requirement for performing the environmental evaluation finds its authority in CERCLA Section 121; however, the requirement is intended to respond to other applicable statutes including Endangered Species Act, Wild and Scenic Rivers Act, Marine Protection, Research and Sanctuaries Action, Fish and Wildlife Conservation Act, Migratory Bird Treaty Act, the Marine Mammal Protection Act, as well as state and local laws.

Some elements of the human health risk assessment are similar to the environmental evaluation in regards to selection of chemicals of concern, exposure assessment, toxicity assessment, and risk characterization; however, the information and criteria for each step in the evaluation are usually separate from the human health evaluation and original to the environmental evaluation. DQOs proposed to support the environmental assessment for sample design and analysis, may have some overlap with the human health assessment, but for the most part are unique statements.
****

2.7.2.1 Identification of Chemicals of Concern

****

DQOs developed specifically for the environmental evaluation, using the preliminary conceptual site model for environmental receptors as a guideline are restated in this section to evaluate quality and applicability of data collected to originally intended purposes.

The environmental evaluation may require unique analytical methods, such as metal speciation, dissolved and total metals, and biological and chemical oxygen demand, and unique sampling designs to properly evaluate potential exposures. Depending on site-specific regulatory requirements and customer requirements, the degree of testing may be limited to chemical testing or may involve site-specific toxicity testing. Regulatory authorities responsible for determining planning and preservation of ecological environments should be consulted to determine critical information regarding current future use of the areas and other specific concerns so that DQOs and conceptual site model may be focused for actual intended uses.

In this section, Contractor will be required to evaluate data collected for quality and usability with regard to DQOs originally formulated. Included would be evaluation of detection limits with toxicity reference concentrations, data quality indicators, and statistical representativeness. Contractor shall include acceptable data collected in tabular format indicating range of concentrations, frequency of detection and detection limits of the analytical methods. Additionally, Contractor will be required to determine the 95th percent upper confidence on the arithmetic average using standard statistical methods, if possible. DQOs for sample collection should take into account sufficient quantity of data is gathered to calculate a meaningful average concentration that populations may reasonably be expected to be exposed to over time. Data collected for modeling to calculate exposure point concentrations should also take into account sufficient data is collected such that the average value calculated represents a statistically meaningful value.

****

2.7.2.2 Exposure Assessment

****

The conceptual site model, preliminarily developed by the project planning team, and further refined by the Contractor in the workplan and data evaluation section of the RFI, is expanded further in this section as the basis for the exposure assessment. The source area, intermedia transport mechanisms, exposure routes, and populations are evaluated in this section to define exposure pathways develop potential receptor exposure point concentrations. Contractor should identify and discuss all relevant exposure pathways, surface water transport, air dispersion, ground water transport developed in the fate and transport section, to calculate exposure point concentrations for current and potential future exposures to identified receptors.

Populations initially identified in the conceptual site model should be evaluated in more detail, as to those populations which may reasonably be expected to potentially come into contact with site wastes, by the identified exposure routes, both currently and in the future. Include any identified critical habitats, threatened or endangered species in the evaluation. The most important factor in developing a valid environmental evaluation is properly determining potentially exposed populations. Project planning team should consult U.S. Fish and Wildlife, state and local resource coordinators and the National Oceanic and Atmospheric Administration to aid in determining potentially exposed environmental populations, for the preliminary conceptual site model development and DQOs. Additionally, project planning team should be sensitive to any potential overlaps in identifying receptor populations for human health and environmental populations for current and future use. It is recommended that a representative population should be chosen from the various species identified to evaluate the overall impacts for the community of plants and/or animals that could be exposed.

The combined human health and environmental assessments should be a cohesive interpretation of potential future use conditions in determining potential impacts to human health and the environment, rather than separate and detached. Conclusions of both assessments will have a direct bearing on corrective action goals and therefore, remediation requirements.

All calculations used in the assessment should be documented within the text as well as all references used in the analysis.
****

2.7.2.3 Toxicity Assessment

****
The toxicity assessment is a descriptive section that summarizes applicable available toxicity information for identified chemicals of concern. It is recommended that Contractor use information available from EPA specific toxicity studies performed for specific chemicals of concern, and information provided by regional EPA environmental assessment groups.

The descriptive sections or toxicity profiles should minimally include a summary of study used to toxicity values, indicated effect, and criteria for selecting specific values for the exposure durations indicated for the risk assessment, such as acute exposures, chronic exposures, and subchronic exposures developmental effects for non-carcinogens, and chronic exposures only for carcinogenic effects.

The summaries of the toxicity assessments should be within the body of the risk assessment, with any accompanying full text included in an appendix to the health assessment or RFI.
****

2.7.2.4 Qualitative Risk Assessment

****
A narrative discussing comparatively potential adverse health effects expected based on potential exposure point concentrations as compared to toxicity values should be included in this section.

Minimally, tabular format comparing toxicity information with expected exposure point concentrations and an explanatory analysis should be sufficient.
****

2.7.2.5 Uncertainty Analysis

****
Numerical and non-numerical evaluations of errors and uncertainties associated with sampling design and analysis,

fate and transport, intake assessment, toxicity assessment, and risk characterization should be discussed so that customer has an indication of limitations of the results or risks calculated in making an informed decision regarding remediation. Each section of the risk assessment should include a full uncertainty analysis, which may be qualitative, but is in some cases more useful from a quantitative perspective. Evaluation should include degree of false positives expected, and false negatives, and in what manner errors may affect overall decision making and site management. DQOs originally determined should take into account acceptable error expected in the risk assessment based on quality and quantity of data collected, and should be referenced in this analysis.
****

2.8 Task 8 Identification and Development of Points of Compliance and Action Levels

2.8.1 Identify Point of Compliance

****
This section requires the Contractor to identify the point of compliance. The point of compliance is a very important concept in remediating under RCRA. Guidance can be found in the Federal Register of 27 July 1990, pages 30830 - 30832. The project manager should require in the scope that the Contractor identify points of compliance that will serve to benefit the remediation. After the points are proposed, the project manager will have to send the proposed points to the RCRA authorities for approval.
****

2.8.2 Identification of Action Levels (ALs)

****
The Contractor should be tasked under this section to identify the action levels identified in the permit or by the EPA post the RFA for eventual comparison to the contaminant concentrations found at the SWMUs under investigation. Reference section 2.8.2 of the RFA SOW outline for additional explanatory text on this matter. Remember: The action levels are the limits set by the state or EPA during the permitting process. Once the owner/operator of the SWMU has a release over the action level, RCRA corrective action requirements are triggered and corrective action must be initiated. What actually must be done will be at the discretion of the RCRA authorities.
****

2.8.2.1 Soil
2.8.2.2 Ground Water
2.8.2.3 Surface Water
2.8.2.4 Air

2.9 Task 9 Evaluation of ALs and Criteria for Further Action and Development of Recommendations

****
This section would require the Contractor to evaluate the site information developed to date against the ALs in order to determine the need for further action, or the development of recommendations for further actions. Refer to Section 2.8 of this outline.
****

2.10 Task 10 Reports

****
Provide details on content and format of RFI report here. Refer to RFI guidance.
****

2.10.1 Pre-Draft Data Package

****
Reference Section 2.7 of the RI/FS SOW outline for specifics on this submittal.
****

2.10.2 Draft RFI
2.10.3 Final RFI

3. Project Management

****
For explanatory text on these topics, refer to Section 3 of the RI/FS scope outline. Any aspects unique to the RFI or RCRA process are noted here.
****

3.1 Project Manager
3.2 Coordination with Other Entities
3.3 Conference Notes
3.4 Confirmation Notices
3.5 Government Support
3.5.1 Government Provided Data and Information
3.5.2 Existing Plans/Surveys/Air Photos

3.5.3 Utilities
3.5.4 Permits

****
Since this work is being conducted under RCRA, all administrative and substantial permitting requirements are applicable.
****

3.5.5 Rights of Entry
3.5.6 Security
3.5.7 Equipment Storage/Staging Areas
3.5.8 Temporary Office
3.5.9 Grading and Site Restoration
3.5.10 Investigation-Derived Waste Disposal
3.5.11 Wetlands Determination
3.6 Travel and Meetings
3.6.1 Preliminary Site Visit
3.6.2 Workplan Review Meeting
3.6.3 Field Work Start-up Meeting
3.6.4 Draft RFI Report Review Meeting
3.6.5 Final RFI Report Review Meeting
3.6.6 Public Meetings

****
All public meetings should be tied to the permit public meetings unless otherwise requested by the customer or specified by the regulatory agency.
****

3.6.7 Progress Meetings
3.6.8 Additional Trips
3.6.9 Site Visits
3.7 Schedules
3.8 Submittals

****
This section summarizes the submittals expected during the course of the project. No technical requirements are presented here. Numbers of copies required are specified here.
****

3.8.1 General Submittal Requirements
3.8.2 Document Submittal Register
3.8.3 RFI Workplan
3.8.4 Workplan Attachments

3.8.4.2 Chemical Data Acquisition Plan Attachment
3.8.4.3 Monitoring Well Installation and Drilling Plan Attachment
3.8.4.4 Site Safety/Health Plan Attachment
3.8.4.5 Community Relations Plan Attachment

****
The language used here for pre-investigative plans is in accordance with USACE guidance. The project team may investigate with the regulating office requirements to use the language and plan approach outlined within the RFI guidance. Regardless of the language used in naming of the plans, the USACE guidance for the Chemical Data Acquisition Plan (CDAP) and the Monitoring Well Installation and Drilling Plan (MWIP) encompasses the requirements of the Data Collection Quality Assurance Plan and the Data Management Plan.
****

3.8.5 Progress Reports
3.8.6 Monthly Progress Reports
3.8.7 Drilling Logs
3.8.8 Monitoring Well Construction/Development Record
3.8.9 Survey Documents
3.8.10 Draft Current Conditions Report
3.8.11 Pre-Draft Data Package
3.8.12 Draft RFI
3.8.13 Final RFI
3.8.14 QC Summary Report

4. NEPA Compliance During RFI

****
In general, it is recommended that a programmatic EIS be prepared during the onset of the RCRA corrective action process, if not, the NEPA requirements will have to be integrated into this process.

The project manager should consult a NEPA expert and office of counsel to develop scoping requirements.

See RFA scope outline for more information on NEPA compliance.
****

5. Health and Safety Technical Requirements

****
This section presents the technical requirements for health and safety. Refer to Enclosure 8 to the ETL for the suggested language for this SOW section.

Two topics, "Site Description and Contamination Characterization" and "Staff Organization, Qualifications, and Responsibilities" may be addressed as a portion of the workplan as outlined in section 2.1. In the event this material is addressed within the workplan (WP), the applicable WP sections should be referenced within these sections of the SSHP. Regardless of location, these topics should address the requirements contained in Enclosure 8.
****

6. Chemistry Technical Requirements

****
This section presents the technical requirements for performance of sampling and analysis activities. Specific requirements are discussed under the individual topics. Additional guidance on the typical content of this section is provided as Enclosure 13 to the ETL, Chemistry Technical Requirements. An outline of the section is provided here.
****

- 6.1 Introduction
  - 6.1.1 CDAP Format and Implementation Requirements
    - 6.1.1.1 Section 1. Table of Contents
    - 6.1.1.2 Section 2. Project Background Data
    - 6.1.1.3 Section 3. Chemical Requirements to Support Project Data Quality Objectives (DQOs)
    - 6.1.1.4 Section 4. Contractor Project Organization and Functional Areas of Chemistry Responsibilities
    - 6.1.1.5 Section 5. Field Activities:
      - 6.1.1.5.1 Field Instrumentation and Equipment (Calibration and Maintenance)
      - 6.1.1.5.2 Field Documentation
      - 6.1.1.5.3 Daily Quality Control Report (DQCR)
      - 6.1.1.5.4 QC and QA Field Samples
      - 6.1.1.5.5 Decontamination Procedures
      - 6.1.1.5.6 Matrix: Ground Water Samples
        - 6.1.1.5.6.1 Field Screening
        - 6.1.1.5.6.2 Locations

6.1.1.5.12.1 Field Screening
6.1.1.5.12.2 Locations
6.1.1.5.12.3 Sampling Procedure
6.1.1.5.12.4 Analytical Procedure
6.1.1.5.12.5 Sample Containers, Preservations, Holding Times
6.1.1.5.13 Matrix: Soil Gas Samples
6.1.1.5.13.1 Field Screening
6.1.1.5.13.2 Locations
6.1.1.5.13.3 Sampling Procedure
6.1.1.5.13.4 Analytical Procedure
6.1.1.5.13.5 Sample Containers, Preservations, Holding Times
6.1.1.5.14 Matrix: Drum / TankSamples
6.1.1.5.14.1 Field Screening
6.1.1.5.14.2 Locations
6.1.1.5.14.3 Sampling Procedure
6.1.1.5.14.4 Analytical Procedure
6.1.1.5.14.5 Sample Containers, Preservations, Holding Times
6.1.1.6 Section 6. Sample Chain of Custody, Packing and Shipping
6.1.1.7 Section 7. Laboratory Activities:
6.1.1.7.1 Cooler Receipt Form
6.1.1.7.2 Instrument Calibration and Frequency
6.1.1.7.3 Quality Control Procedures
6.1.1.7.4 Preventive Maintenance
6.1.1.7.5 Corrective Action
6.1.1.7.6 Data Reduction, Assessment / Validation, and Documentation
6.1.1.8 Section 8. Chemical Data Quality Management Deliverables
6.1.1.8.1 Daily Quality Control Reports
6.1.1.8.2 Laboratory Daily Quality Control Reports
6.1.1.8.3 Non-Routine Occurrences Reports
6.1.1.8.4 Pre-Draft Data Package
6.1.1.8.4.1 Pre-Draft Data Package Organization
6.1.1.8.4.2 Minimum Data Reporting Requirements for Pre-Draft Data Package

6.1.1.8.5 Quality Control Summary Report
6.1.1.8.6 Chemical Quality Assurance Report
6.1.2 Contractor Laboratory Approval
6.1.2.1 Commercial Laboratory Evaluation
6.1.2.2 Laboratory Quality Management Manual
6.1.2.3 Preliminary Questionnaire
6.1.2.4 Performance Evaluation Samples
6.1.2.5 Laboratory Inspection
6.1.2.6 Approval
6.1.2.7 Expiration of Validation
6.2 Miscellaneous Requirements
6.2.1 Investigation Derived Wastes

7. Geotechnical Requirements

****
The variety of field investigations for an RFI is comparable to that for a remedial investigation; therefore, refer to text in the Geotechnical Requirements Section (6.) of the RI/FS scope-of-work outline for typical requirements and other explanatory information on the topics outlined below.
****

7.1 General Specifications
7.1.1 Qualified Geologist/Geotechnical Engineer
7.1.2 Applicable Driller Permits and Licenses
7.1.3 Compliance with State Requirements
7.1.4 Utility Clearances
7.1.5 Disposal of Investigation-Derived Waste (IDW)

****
A note concerning the disposal of investigation-derived waste unique to RCRA. Since the sites to be studied are covered under the auspices of RCRA, all waste generated during investigations must be handled as a RCRA solid or hazardous waste. When waste is generated, the generator (for example, the driller) is responsible for determining if the waste is by definition hazardous. If the waste is hazardous, it cannot be placed onto the ground unless it is placed within a designated CAMU. If the waste is placed outside of the CAMU, this is illegal disposal and a violation of the land disposal restrictions. (For guidance see Federal Register, 27 July 1990, pages 30842 and 30843.) Hazardous waste may be moved or consolidated within a CAMU only. The project manager

must require that the Contractor dispose of IDW within a CAMU or off-site at a permitted treatment, storage or disposal facility (TSDF).
****

7.1.6 Explosive Ordnance Disposal
7.1.7 Decontamination of Equipment/Tools
7.1.8 Water Source and Testing
7.1.9 Site Restoration and Protection
7.1.10 Contractor Responsibility for Wells
7.1.11 Site Surveying
7.2 Monitoring Well Installation and Drilling Plan (MWIP)
7.3 Subsurface Soil/Rock Sampling
7.3.1 Drilling Method
7.3.2 Test Pit Excavation
7.3.3 Logging Requirements
7.3.4 Geotechnical Sampling and Analyses
7.3.5 Coring/Core Handling
7.3.6 Backfilling
7.3.7 Sampling Techniques
7.3.8 Field Screening
7.3.9 Location/Elevation Survey of Boreholes/Test Pits
7.4 Monitoring Well Installation
7.4.1 Drilling Method
7.4.2 Soil/Rock Sampling While Drilling
7.4.3 Field Screening
7.4.4 Casing and Screen
7.4.5 Gravel/Sand Pack
7.4.6 Grouting
7.4.7 Surface Completion
7.4.8 Well Development
7.4.9 Monitoring Well Construction Diagrams
7.4.10 Survey
7.4.11 In-Situ Permeability (Single Well) Testing
7.4.12 Water Level Measurements
7.4.13 Dedicated Pumps and/or Bailers
7.4.14 Well Sampling
7.5 Existing Domestic/Industrial/Municipal Well Inventory
7.6 Aquifer Tests
7.6.1 Pump Test Plan
7.6.2 Pumping Well Installation
7.6.2.1 Drilling Method
7.6.2.2 Soil Sampling While Drilling
7.6.2.3 Field Screening
7.6.2.4 Casing and Screen

7.10.2 Ground Truth/Verification
7.10.3 FTA Report
7.11 Miscellaneous Methodologies
7.11.1 Soil Gas Survey Methodology
7.11.1.1 Probe Design and Placement
7.11.1.2 Probe Purging
7.11.1.3 Sample Recovery
7.11.1.4 Decontamination of Equipment
7.11.1.5 Blank, Background, and Duplicate Samples
7.11.2 Tracer Studies
7.12 Geographic Information Systems (GIS)

8. Air

****
This section presents the technical requirements for performance of activities associated with air impact assessments. Enclosure 16 presents a general description of air impact assessments for those not familiar with the process.

Explanatory text is included in the RI/FS outline. The scope of activities performed in the RFI is comparable to the RI. Some of the topics below may not be appropriate for the RFI but are included for completeness. For example, measurement and estimate of emissions from remedial alternatives might be included in the CMS instead of the RFI. The level of detail to be included in the scope depends on the project and the Contractor's experience in performing air monitoring and modeling as well as the Contractor's experience in working with the Corps.
****

8.1 Ambient Air Monitoring/Sampling
8.2 Meteorological Monitoring
8.2.1 Review Available Data
8.2.2 On-site Monitoring
8.2.2.1 Meteorological Tower
8.2.2.2 Data to be Collected
8.2.2.3 Data Processing, Documentation and Reporting
8.3 Emission Rate Measurements
8.4 Emission Rate Estimates
8.4.1 Uncontrolled Emission Sources
8.4.2 Remedial Action Sources
8.4.3 Emission Models
8.4.4 Emission Factors
8.5 Atmospheric Dispersion Modeling
8.5.1 Purpose and Rationale

OUTLINE FOR CORRECTIVE MEASURES STUDY (CMS) SCOPE-OF-WORK UNDER RCRA

1. Project Overview and Objectives

****
This section provides the Contractor with useful general information about the site. Refer to the RI/FS outline for more general information on the content of this section.
****

- 1.1 Site Description
  - 1.1.1 Location and Site Conditions
  - 1.1.2 Site Background
    - 1.1.2.1 Site Usage
    - 1.1.2.2 Disposal Practices
    - 1.1.2.3 Previous Studies and Results
    - 1.1.2.4 Regulatory Authorities

****
The project manager should state what RCRA authority this CMS is proceeding under. See "Regulatory Authority" section of the RFI.
****

- 1.2 Project Planning Overview and Corrective Measures Study Objectives

****
This section should describe for the Contractor the details of the USACE project planning process for the CMS. Refer to the RI/FS scope outline for additional information on these topics. In general, the basic purpose of a CMS is to develop and evaluate corrective action alternative(s) and to recommend the corrective measure(s) to be taken at the SWMU.

A CMS is very similar to a CERCLA FS but the actual requirements of the CMS are up to the RCRA regulators. The regulators may ask for more or less information than is provided herein. Thus, the project manager must discuss requirements of the CMS with the customer and the RCRA authorities prior to initiating a scope for the CMS.
****

1.2.1 Site Strategy
1.2.2 Project Objectives and Project Decision Statements
1.2.3 Preliminary Corrective Action Objectives

****
This section describes the general corrective action objectives based on team input and/or previous studies.
****

1.2.4 Data Quality Objectives
1.3 Summary of Required Tasks

****
This is only a superficial listing of tasks to be performed under this scope-of-work. No details are to be given here.
****

Task 1 CMS Workplan Preparation
Task 2 Community Relations
Task 3 Development of the Corrective Measure Alternatives
Task 4 Treatability Studies and Treatability Study Reports
Task 5 Justification and Recommendation of the Corrective Measure(s)
Task 6 Development of Media Clean Up Standards, Evaluation of Criteria for Further Action, and Recommendations
Task 7 CMS Report
Task 8 Post CMS Support

1.4 References

****
Include citations of previous reports, guidance documents, permits, RCRA documentation, enforcement orders/compliance agreements, site inspections, etc. List only those documents that the team possesses or can locate. Indicate which documents are being provided to the Contractor.
****

2. Project Requirements
2.1 Task 1 CMS Workplan Preparation

****
This section will require the preparation of a CMS workplan. Refer to the RI/FS outline for more information on the gen-

eral approach to project planning and contractor-prepared workplans.

2.1.1 Available Data Review
2.1.1.1 Review Previous Reports
2.1.1.2 Background Data Collection and Literature Searches
2.1.1.3 Site Boundaries Identification

****
This section would require the Contractor to identify the site boundaries if not previously established in the RFI.
****

2.1.2 Preliminary Site Visit
2.1.3 Refinement/Development of Data Quality Objectives
2.1.4 Treatability Study Sample Collection Design
2.1.5 Preparation of CMS Workplan
2.1.6 Preparation of Workplan Attachments

****
There may be necessary attachments to the CMS workplan. See technical requirements in Sections 4 and 5 for information on the Treatability Study Workplan Attachment (TSWP/CDAP), and SSHP. If no treatability study or field pilot test is necessary, but additional sampling is required to support the CMS, the preparation of other workplan attachments such as a Site Safety and Health Plan (SSHP), Monitoring Well Installation and Drilling Plan (MWIP) and a Chemical Data Acquisition Plan (CDAP) would be required. Refer to the RFI scope outline, Section 2.3.2, for scope format.
****

2.1.3.1 Treatability Study Workplan and Chemical Data Acquisition Plan (TSWP/CDAP) Attachment

****
Refer to Enclosure 12, Treatability Studies and the Chemistry Technical Requirements (Section 5.) of this scope-of-work for further requirements for this submittal. Also refer to Section 6. for requirements on drilling and well installation, if applicable.
****

2.1.3.2 Site Safety and Health Plan (SSHP) Attachment

****

Refer to Section 4 and Enclosure 8 for further requirements for this submittal.

****

2.1.3.3 Community Relation Plan (CRP)

****

Reference Task 2.

****

2.2 Task 2 Community Relations

****

Community Relation requirements are tied directly to the permitting process. The project manager should discuss with the customer and the RCRA regulators any requirements for community relations. The project manager can then put these requirements into the scope.

****

2.2.1 Preparation of Community Relations Support
2.2.2 Responsiveness Summary

****

One item that may be required of the Contractor after a public meeting on the proposed corrective measure(s) is a Responsiveness Summary. This should be coordinated with the user and RCRA regulators and identified in the scope. This document provides responses to each of the significant comments, criticisms, and any new data submitted on the proposed corrective measure(s). Refer also to the RI/FS SOW outline for general requirements/explanatory text related to these topics. Note that the RI/FS is prepared under CERCLA.

****

2.3 Task 3 Development of the Corrective Measure Alternatives

2.3.1 Development of Suitable Alternatives

****

See Enclosure 11, Alternative Development and Selection for additional information.

****

2.3.2 Cost Estimates

****
Unlike CERCLA, RCRA does not require alternatives to be screened on a cost effective basis. Cost information may be needed for programming purposes. Refer to the RI/FS outline for general information about this section.
****

2.3.2.1 Construction Costs
2.3.2.2 Other Project Markups

2.3.3 Plans/Schematics/CADD

****
See RI/FS outline for information on this topic.
****

2.3.4 NEPA Compliance Activities

****
See National Environmental Policy Act (NEPA) compliance discussion presented in the RFA and RFI scope outline. In addition, once a corrective action is selected, the programmatic NEPA documentation will have to be amended or NEPA documentation will have to be prepared for the selected corrective action. The project manager should discuss this matter with the NEPA experts and Office of Counsel in order to acquire scoping language and requirements.

Refer to the RI/FS scope outline for explanatory text on the NEPA compliance topics listed below.
****

2.3.4.1 Wetlands Determination
2.3.4.2 Flood Frequency/Flood Plain Analysis
2.3.4.3 Assessment of Cultural Resources

2.4 Task 4 Treatability Studies and Treatability Study Reports

****
See Enclosure 12, Treatability Studies and Treatability Study Reports for additional information. Omit if no treatability studies are performed. Treatability studies workplan development is covered in Section 2.1.3.1. Cross reference that section.

As an option, the Sample Collection Section and the Sample Analysis and Validation Section can be broken out as separate tasks. This may be appropriate if sampling is required for reasons other than treatability studies. Given the limited nature of the sampling in many studies and the important role of chemical analysis in many treatability studies, they are discussed under the treatability study task.
****

2.4.1 Treatability Studies
- 2.4.1.1 Screening Tests
- 2.4.1.2 Bench Scale Tests
- 2.4.1.3 Pilot Tests

2.4.2 Treatability Studies Sample Collection and Field Testing
- 2.4.2.1 Surface Soil Sampling
- 2.4.2.2 Surface Water/Lagoon Sampling
- 2.4.2.3 Leachate Sampling
- 2.4.2.4 Subsurface Soil Sampling
- 2.4.2.5 Water Level Measurement
- 2.4.2.6 Ground Water Sampling
- 2.4.2.7 Vadose Zone Permeability/Infiltration Testing
- 2.4.2.8 Aquifer Tests
- 2.4.2.9 Air Sampling

2.4.3 Treatability Sample Analyses, and Data Assessment

****
The following sections contain project specific information directing the Contractor as to analytical protocols for the treatability studies. General chemistry requirements are detailed in the Chemistry Technical Requirements Section (5.) to this SOW. That section provides specifications for the implementation of project activities related to chemistry. Work specified in this section of the SOW must be summarized by the Contractor in the treatability study workplan and the CDAP. The review of these submittals, assuring project goals are being met, is the duty of the USACE project team.
****

2.4.3.1 Data Review and Assessment

****
This section should specify functional guidelines for data assessment/validation procedures which the Contractor is responsible to perform. These specifications are divided into existing data and new data applications. The chemist, based

on project-specific needs, should define acceptable PARCC parameters (existing and newly acquired data) in tabular form. The chemist, industrial hygienist, and process engineer should contribute to specifications in these sections. DQOs and the goal of the CMS must be kept in mind when reviewing existing data and when specifying Contractor obligations to generate new data.
****

2.4.3.1.1 Existing Analytical Data

****
This section should include guidelines to the Contractor as to what constitutes acceptable analytical data. The chemist should define acceptable PARCC parameters for each treatability study and environmental assessment. Task the Contractor to submit a data review and assessment/validation plan for existing analytical data in the CDAP.

Information should be obtained from the RFI, EPA technical and enforcement files, state/local regulatory agency files, U.S. Geological Survey files, government installations, and other relevant sources in order to describe the current situation at the site(s). Quality of data should be analyzed to determine its usability.
****

2.4.3.1.2 New Data

****
This section should define guidelines for the appropriate analytical level to be used and corresponding PARCC parameters which will indicate acceptable data quality. A table should be prepared summarizing this information. The Contractor is tasked in this section to propose a data review and assessment/validation plan in the CDAP based on these guidelines. The chemist, process engineer, and industrial hygienist should develop this section of the SOW.

Chemical specific action levels should also be summarized to the extent possible. The Contractor will be responsible for reviewing and assessing the data resulting from the investigation.

Depending upon the project needs, external QA samples may be sent to a USACE QA laboratory. The chemist and process engineer should decide whether a USACE division QA laboratory needs to perform a review of the Contractor data in com-

parison with USACE QA samples. Reference the RI/FS SOW outline for explanatory text on the pre-draft data package which will be submitted to the division QA laboratory for review.

Refer to the RI/FS scope outline for explanatory text on the following sections.
****

2.4.3.2 Analytical Procedures
2.4.3.2.1 Water
2.4.3.2.1.1 Surface Water
2.4.3.2.1.2 Ground Water
2.4.3.2.2 Soils/Sediments/Sludges

****
The chemist, the process engineer and specific data end-users must consult to develop an appropriate analytical protocol based on treatability study needs.
****

2.4.3.2.3 Air Samples
2.4.3.3 Quality Assurance/Quality Control Samples
2.4.3.3.1 QA Laboratory
2.4.3.3.2 QC Samples
2.4.3.4 Laboratory Internal Quality Control
2.4.3.5 Method Detection Limits
2.4.3.6 Laboratory Turnaround Time
2.4.3.7 Sample Handling
2.4.3.8 Preservatives and Holding Times
2.4.3.9 Investigation-Derived Wastes
2.4.4 Data Evaluation

****
This section would require the Contractor to evaluate the results of the treatability studies in light of the objectives. This section would be developed with input from the process engineer, chemist, and other team members depending on the nature of the anticipated studies.
****

2.4.4.1 Comparison to Data Quality Objectives - Establish Data Usability

****
Refer to the corresponding section (2.5.1.1) of the RI/FS scope outline for explanatory text on this topic.
****

2.4.4.2 Refinement of Site Conceptual Model

****
Where applicable (depending on the amount of data generated which characterizes the site), the Contractor should be required to refine the site conceptual model. This effort would be documented in the Treatability Study Report or the CMS Report. Refer to the corresponding section (2.5.1.2) of the RI/FS scope outline for additional explanatory text on this topic.
****

2.4.5 Treatability Study Report

****
The draft treatability study report should be submitted prior to dismantling the study and prior to completion of the QA evaluation. The possibility of needing additional runs should always be anticipated. The final treatability study report should be presented as a part of the CMS Report. See Enclosure 12, Treatability Studies and Treatability Study Reports for more information.
****

2.4.5.1 Pre-Draft Data Package

****
This section would require the submittal of a pre-draft data package. Reference Section 2.4 of the RI/FS outline for the applicability of this report, and Section 2.7 of the RI/FS SOW outline for specifics on this submittal.
****

2.4.5.2 Draft Treatability Study Report

2.5 Task 5 Justification and Recommendation of the Corrective Measure(s)

****
Require the Contractor to recommend a corrective measure based on the analyses of alternatives per attachment K.

The recommendation should be justified on the factors listed below. This section would be developed by the technical manager or other team member with a familiarity with the EPA guidance for performing a CMS.
****

2.5.1 Justification Based on Technical Factors
2.5.1.1 Performance
2.5.1.2 Reliability
2.5.1.3 Implementability

****
Cost effectiveness may be a consideration in implementability.
****

2.5.1.4 Safety
2.5.2 Justification Based on Protection of Human Health
2.5.3 Justification Based on Protection of Environment

2.6 Task 6 Development of Media Clean Up Standards (MCS), Evaluation of Criteria for Further Action, and Recommendations.
2.6.1 Develop Media Cleanup Standards (MCSs)

****
Post review of the CMS final report by the regulating office, the EPA or state will set the Media Clean Up Standards (MCSs). Reference the 55 FR 30825 - 30834 for additional information. The Contractor should be tasked under this section to identify the action levels that may be appropriate for the site. Remember: You may have some influence over the MCSs set by the regulating agency depending on the health assessment conducted during the RFI. While these standards are the levels the site owner must achieve through the cleanup, demonstrating to the RCRA authorities through risk documentation that these levels are too stringent may impact the final MCSs set.
****

2.6.1.1 Soil
2.6.1.2 Ground Water
2.6.1.3 Surface Water
2.6.1.4 Air
2.6.2 Evaluation of Further Action and Recommendations

****
This section would require the Contractor to evaluate the site information developed to date against the action levels

(ALs) and MCSs in order to develop recommendations for further actions.
****

2.7 Task 7 CMS Report

****
Provide details on content and format of CMS Report here. Refer to EPA CMS guidance.
****

2.7.1 Draft CMS Report

****
The Treatability Study Report may be required as an appendix to the CMS Report.
****

2.7.2 Final CMS Report

2.8 Task 8 Post CMS Support

****
This could include many items, including support to the Corps and the customer in dealing with the regulators, or the development of the full cost estimate for the selected alternative.
****

3. Project Management

****
Refer to the explanatory text in the RI/FS scope outline for information regarding these topics.
****

3.1 Project Manager
3.2 Coordination with Other Entities
3.3 Conference Notes
3.4 Confirmation Notices
3.5 Government Support
3.5.1 Government Provided Data and Information
3.5.2 Existing Plans/Surveys/Air Photos
3.5.3 Utilities
3.5.4 Permits

****
The project manager should require through the scope that the Contractor submit a letter discussing all permits required to undertake the recommended corrective action.
****

3.5.5 Rights of Entry
3.5.6 Security
3.5.7 Equipment Storage/Staging Areas
3.5.8 Grading and Site Restoration
3.6 Travel and Meetings
3.6.1 Site Walkover
3.6.2 CMS Pre-Draft Report Review Meeting
3.6.3 CMS Draft Treatability Study Report Review Meeting
3.6.4 CMS Draft Report Meeting
3.6.5 CMS Final Report Review Meeting
3.6.6 Public Meetings

****
The project manager should contact the customer and RCRA authorities to determine if public meetings are required. Since the CMS is typically part of the permitting process, additional public meetings may not be required by the regulators.
****

3.6.7 Other Site Visits
3.6.8 Additional Trips
3.7 Schedules
3.8 Submittals

****
This section summarizes the submittals expected during the course of the project. No technical requirements are presented here. Number of copies required are specified here.
****

3.8.1 General Submittal Requirements
3.8.2 Document Submittal Register
3.8.3 CMS Workplans
3.8.3.1 Treatability Study Workplan and Chemical Data Acquisition Plan (TSWP/CDAP)
3.8.3.2 Site Safety and Health Plan (SSHP)
3.8.3.3 Community Relations Plan (CRP)
3.8.4 Progress Reports
3.8.4.1 Monthly Progress Reports

3.8.4.1 Daily Quality Control Reports
3.8.5 Survey Documents
3.8.6 Treatability Study Report
3.8.6.1 Pre-Draft Data Package
3.8.6.2 Draft Treatability Study Report
3.8.6.3 Final Treatability Study Report

****
This is optional. The final report can be presented as part of the CMS report.
****

3.8.7 CMS Report
3.8.7.1 Draft CMS Report
3.8.7.2 Final CMS Report
3.8.8 Cost Estimates
3.8.9 Quality Control Summary Report

4. Health and Safety Technical Requirements

****
This section presents the technical requirements for health and safety. Refer to Enclosure 8 to the ETL for the suggested language for this SOW section.
****

5. Chemistry Technical Requirements

****
This section presents the technical requirements for performance of sampling and analysis activities. Specific requirements are discussed under the individual topics. Additional guidance on the typical content of this section is provided as Enclosure 13 to the ETL, Chemistry Technical Requirements. An outline of the section is provided here.
****

5.1 Introduction
5.1.1 CDAP Format and Implementation Requirements
5.1.1.1 Section 1. Table of Contents
5.1.1.2 Section 2. Project Background Data
5.1.1.3 Section 3. Chemical Requirements to Support Project Data Quality Objectives (DQOs)
5.1.1.4 Section 4. Contractor Project Organization and Functional Areas of Chemistry Responsibilities
5.1.1.5 Section 5. Field Activities

****
Note that treatability studies require much greater sample volumes than ordinary investigations. Therefore, collaboration with the primary laboratory is required to define required volumes, and containment necessary.
****

5.1.1.5.1 Field Instrumentation and Equipment (Calibration and Maintenance)
5.1.1.5.2 Field Documentation
5.1.1.5.3 QC and QA Field Samples

****
The requirement for acquisition of field QA/QC samples may be applicable only at the beginning of the treatability study to ensure an accurate characterization of the wastestream.
****

5.1.1.5.4 Decontamination Procedures
5.1.1.5.5 Matrix: Groundwater Samples
- 5.1.1.5.5.1 Field Screening
- 5.1.1.5.5.2 Locations
- 5.1.1.5.5.3 Sampling Procedure
- 5.1.1.5.5.4 Analytical Procedure
- 5.1.1.5.5.5 Sample Containers, Preservations, Holding Times

5.1.1.5.6 Matrix: Surface Water Samples
- 5.1.1.5.6.1 Field Screening
- 5.1.1.5.6.2 Locations
- 5.1.1.5.6.3 Sampling Procedure
- 5.1.1.5.6.4 Analytical Procedure
- 5.1.1.5.6.5 Sample Containers, Preservations, Holding Times

5.1.1.5.7 Matrix: Leachate Samples
- 5.1.1.5.7.1 Field Screening
- 5.1.1.5.7.2 Locations
- 5.1.1.5.7.3 Sampling Procedure
- 5.1.1.5.7.4 Analytical Procedure
- 5.1.1.5.7.5 Sample Containers, Preservations, Holding Times

5.1.1.5.8 Matrix: Soil Samples
- 5.1.1.5.8.1 Field Screening
- 5.1.1.5.8.2 Locations

5.1.1.5.8.3 Sampling Procedure
5.1.1.5.8.4 Analytical Procedure
5.1.1.5.8.5 Sample Containers, Preservations, Holding Times
5.1.1.5.9 Matrix: Sludge / Sediment Samples
5.1.1.5.9.1 Field Screening
5.1.1.5.9.2 Locations
5.1.1.5.9.3 sampling Procedure
5.1.1.5.9.4 Analytical Procedure
5.1.1.5.9.5 Sample Containers, Preservations, Holding Times
5.1.1.6 Section 6. Sample Chain of Custody, Packing and Shipping

****
It is important to collaborate with the project regulatory specialist on correct manifesting and shipping requirements.
****

5.1.1.7 Section 7. Laboratory Activities
5.1.1.7.1 Cooler Receipt Form
5.1.1.7.2 Instrument Calibration and Frequency
5.1.1.7.3 Quality Control Procedures
5.1.1.7.4 Preventive Maintenance
5.1.1.7.5 Corrective Action
5.1.1.7.6 Data Reduction, Assessment / Validation, and Documentation
5.1.1.8 Section 8. Chemical Data Quality Management Deliverables
5.1.1.8.1 Laboratory Daily Quality Control Reports
5.1.1.8.2 Quality Control Summary Report
5.1.2 Contractor Laboratory Approval
5.1.2.1 Commercial Laboratory Evaluation
5.1.2.2 Laboratory Quality Management Manual
5.1.2.3 Preliminary Questionnaire
5.1.2.4 Performance Evaluation Samples
5.1.2.5 Lab Inspection
5.1.2.6 Approval
5.1.2.7 Expiration of Validation
5.2 Miscellaneous Requirements
5.2.1 Investigation Derived Wastes

****
Treatability studies require much greater volumes than ordinary investigations. Therefore, the remaining laboratory sample may be substantial and require additional cost for disposal by the laboratory, or returning to the site for disposal via the chosen remedial alternative. It is important to collaborate with the project regulatory specialist on correct manifesting and shipping requirements.
****

6. Geotechnical Requirements

****
It is anticipated that only limited field sampling or testing will be necessary to support the CMS. Those activities which may commonly be required are listed below. The variety of potentially required field investigations for treatability studies or modeling efforts under a CMS are a subset of those that may be required under a RI or RFI; therefore, refer to text in the Geotechnical Requirements Section (6.) of the RI/FS scope-of-work outline for general and typical requirements and other information on these topics.
****

- 6.1 General Specifications
  - 6.1.1 Qualified Geologist/Geotechnical Engineer
  - 6.1.2 Applicable Driller Permits and Licenses
  - 6.1.3 Compliance with State Requirements
  - 6.1.4 Utility Clearances
  - 6.1.5 Disposal of Investigation Derived Waste (IDW)
  - 6.1.6 Explosive Ordnance Disposal
  - 6.1.7 Decontamination of Equipment/Tools
  - 6.1.8 Water Source and Testing
  - 6.1.9 Site Restoration and Protection
  - 6.1.10 Contractor Responsibility for Wells
  - 6.1.11 Site Surveying
- 6.2 Monitoring Well Installation and Drilling Plan (MWIP) Attachment

****
This would be required if drilling was associated with obtaining treatability study samples or performing pilot tests of ground water or soil vapor extraction.
****

6.3 Subsurface Soil/Rock Sampling
- 6.3.1 Drilling Method
- 6.3.2 Test Pit Excavation
- 6.3.3 Logging Requirements
- 6.3.4 Geotechnical Sampling and Analyses
- 6.3.5 Coring/Core Handling
- 6.3.6 Backfilling
- 6.3.7 Sampling Techniques
- 6.3.8 Field Screening
- 6.3.9 Location/Elevation Survey of Boreholes/Test Pits

6.4 Monitoring Well Installation
- 6.4.1 Drilling Method
- 6.4.2 Soil/Rock Sampling While Drilling
- 6.4.3 Field Screening
- 6.4.4 Casing and Screen
- 6.4.5 Gravel/Sand Pack
- 6.4.6 Grouting
- 6.4.7 Surface Completion
- 6.4.8 Well Development
- 6.4.9 Monitoring Well Construction Diagrams
- 6.4.10 Survey
- 6.4.11 In-Situ Permeability (Single Well) Testing
- 6.4.12 Water Level Measurements
- 6.4.13 Dedicated Pumps and/or Bailers
- 6.4.14 Well Sampling

6.5 Aquifer Tests
- 6.5.1 Pump Test Plan
- 6.5.2 Pumping Well Installation
  - 6.5.2.1 Drilling Method
  - 6.5.2.2 Soil Sampling While Drilling
  - 6.5.2.3 Field Screening
  - 6.5.2.4 Casing and Screen
  - 6.5.2.5 Gravel/Sand Pack
  - 6.5.2.6 Grouting
  - 6.5.2.7 Surface Completion
  - 6.5.2.8 Well Development
  - 6.5.2.9 Well Construction Diagram
  - 6.5.2.10 Well Survey
  - 6.5.2.11 Initial Water Level Measurements
  - 6.5.2.12 Pump
  - 6.5.2.13 Initial Well Sampling
- 6.5.3 Observation Well Construction
  - 6.5.3.1 Location(s) and Depth(s)
  - 6.5.3.2 Drilling Method
  - 6.5.3.3 Soil Sampling While Drilling
  - 6.5.3.4 Field Screening

****
This section presents the technical requirements for performance of activities associated with air impact assessments. Enclosure 16 presents a general description of air impact assessments for those not familiar with the process.

Explanatory text is included in the RI/FS outline. The scope of activities performed in the CMS is comparable to the FS. The level of detail to be included in the scope depends on the project and the Contractor's experience in performing air monitoring and modeling as well as the Contractor's experience in working with the Corps.
****

HEALTH AND SAFETY SCOPE-OF-WORK LANGUAGE

NOTE TO USERS

Users of Enclosure 8 are requested to keep the following points in mind when using this generic safety and health scope of work (SOW) language:

1) This generic SOW language is provided to assist the user in drafting site-specific scopes of work tailored to specific investigative projects. The generic SOW language should be reviewed by the user and modified according to the unique requirements of the project.

2) Appendix B of ER 385-1-92, is the only part of that regulation intended to be provided to the Contractor with the SOW package. The principal text of ER 385-1-92, which delineates internal USACE HTRW responsibilities, is of no concern to the Contractor, and is NOT to be provided with the SOW package.

3) The user of the generic SOW language has the responsibility to provide the Contractor with the latest versions of the referenced USACE regulations.

4) The need for a Contractor Safety and Health Program (discussed in paragraph 1.c.(1) of the generic SOW language) is an Occupational Safety and Health Administration (OSHA) requirement for any employer engaged in HTRW work, and is not a unique USACE project specific requirement. Contractor Safety and Health Programs are required by law to already be in place. The language used in the generic SOW serves as a reminder to the Contractor of the OSHA requirement. The language does not require Contractors to develop unique Safety and Health Programs for USACE projects.

5) Paragraph 1.d. of the generic SOW language addresses ordnance and explosive waste (OEW). The language is to be utilized whenever information about the site indicates the potential presence of OEW.

**HEALTH AND SAFETY SCOPE-OF-WORK LANGUAGE
(HTRW SITE INVESTIGATIVE ACTIVITIES)**

1. SAFETY AND HEALTH

a. General. The Contractor shall review all available site information and develop the necessary safety and health documents sufficient to protect on-site personnel, the environment, and potential off-site receptors. The Contractor shall utilize the services of qualified personnel, as defined in Appendix B of ER 385-1-92, to oversee the development and implementation of required safety and health documents.

b. Regulatory Requirements. All site investigation activities and safety and health documents required by this SOW shall comply with pertinent sections of the following regulations and reflect the following guidance publications:

(1) Federal Acquisition Regulation, F.A.R. Clause 52.236-13: Accident Prevention.

(2) U.S. Army Corps of Engineers (USACE), Safety and Health Requirements Manual, EM 385-1-1.

(3) U.S. Army Corps of Engineers (USACE), ER 385-1-92, Appendix B, Safety and Occupational Health Document Requirements for Hazardous, Toxic, and Radioactive Waste (HTRW) Activities.

(4) Nuclear Regulatory Commission Standards, 10 CFR 19 — 171.

(5) Occupational Safety and Health Administration (OSHA) General Industry Standards, 29 CFR 1910, and Construction Industry Standards, 29 CFR 1926; especially 29 CFR 1910.120 / 29 CFR 1926.65 - "Hazardous Waste Site Operations and Emergency Response".

(6) NIOSH/OSHA/USCG/EPA, "Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities", October 1985. (DHHS (NIOSH) publication No.85-115)

(7) Other applicable federal, state, and local safety and health requirements.

c. Documents. The following safety and health documents are required.

(1) Safetv and Health Program. The Occupational Safety and Health Administration (OSHA) requires all employers performing on-site activities at hazardous waste sites to develop and maintain an ongoing written Safety and Health Program in compliance with OSHA Standard 29 CFR 1910.120(b)/29 CFR 1926.65(b). The program, including updates, shall be made available upon request.

(2) Site Safetv and Health Plan (SSHP). The SSHP required by 29 CFR 1910.120(b)(4)/29 CFR 1926.65(b)(4), and as defined by this SOW, shall be prepared and submitted. On-site activities shall not commence until the plan has been reviewed and accepted. The SSHP shall describe the site-specific safety and health procedures, practices, and equipment to be implemented and utilized in order to protect affected personnel from the potential hazards associated with the site-specific tasks to be performed. The level of detail provided in the SSHP shall be tailored to the type of work, complexity of operations to be accomplished, and hazards anticipated. The Contractor shall address all elements contained in Appendix B of ER 385-1-92 in preparing the SSHP. Where the use of a specific topic is not applicable to the project, the Contractor shall provide a negative declaration to establish that adequate consideration was given the topic, and give a brief justification for its omission. Information readily available in standard texts shall be repeated only to the extent necessary to meet the requirements of this scope. The SSHP shall not duplicate general information contained in the Safety and Health Program which is not specifically related to this project.

d. Ordnance and Explosive Waste (OEW). If explosives or chemical surety and warfare materiel (CSM/CWM), or unexploded ordnance (UXO) are discovered at any time during operations, the Contractor shall immediately stop operations in the affected area, mark the location, have all on-site personnel notified of the OEW hazard and the area's restrictions, and notify the CO. The Government will make appropriate arrangements for evaluation and proper disposal of the device(s). The SSHP shall specifically address procedures to be followed should known or potential CSM/CWM, UXO, or other such items be encountered during any phase of field work.

CHECKLISTS FOR GEOPHYSICS AT HTRW SITES

A. Scope Development Checklist:

****

This is a checklist for scoping geophysics at HTRW sites. These are questions the geologist preparing the scope-of-work should ask concerning language in the geophysical surveying task. Not all of these items will be applicable for a given geophysical method or a given site. Many of the items can be left to the Contractor. The Contractor should be allowed flexibility for methodology based on their experience and equipment; however, it is important that the work be quantifiable. Topics that should be included in each scope are indicated by "Required"; those items that are not always necessary but should be considered in each scope are indicated by "Recommended"; and those items that may be considered in some cases are indicated by "Optional".

If the geologist is uncertain of the appropriate survey aspects, consult with the Waterways Experiment Station (WES) or the HTRW Mandatory Center of Expertise (HTRW-MCX) . EPA has an manual on geophysical techniques; "Geophysical Techniques for Sensing Buried Wastes and Waste Migration, EPA 600/7-84-064, June, 1984. The U.S. Geological Survey has developed a geophysical method selection expert system for EPA (U.S.G.S. Open File Report 88-399); an IBM-compatible computer is required. Contact the U.S.G.S or the HTRW MCX for more information.

[1]Waterways Experiment Station, CEWES-GG-F, 3909 Halls Ferry Rd., Vicksburg, MS 39180-6199
[2]Hazardous, Toxic, and Radioactive Waste Mandatory Center of Expertise, CEMRD-ED-TG, P.O.Box 103 DTS, Omaha, NE 68102-0103.

****

1. Is objective clear? (Required)

****

It is recommended that the objective be discussed with others including the potential Contractor and Corps experts.

****

2. Is site described? (Required to extent known)

****
This should include all man-made features that may affect the geophysical survey, such as fences, buildings, debris, etc. and natural features such as bedrock outcrops or surface water. Much of this information needs to be provided to the Contractor, if possible. See explanatory text for item B.2.
****

a. Are site surface features described?
b. Are site utilities known?

****
Include utilities that are present but no longer in use.
****

c. Are contaminants/containers described?
d. Are soil types/stratigraphy described?

****
Include well logs and locations.
****

e. Is site land use described?
f. Ground water depth and flow direction described/estimated?
g. Is topography/accessibility described?
h. If these factors are unknown, is Contractor tasked to determine these?
i. Have references been completely cited and will these be offered to the Contractor?
h. Are potential worker hazards identified?

3. Is the suggested method described? (Optional)

****
It is desirable to choose the method before finalizing the contract. If the method is obvious, the scope developer has the background and familiarity necessary to make the choice, and/or if preliminary discussions with the Contractor have led to a consensus on the technique, this item can be specified. Otherwise, the choice can be proposed by the Contractor. The Contractor must have the successful experience in doing the type of geophysical work chosen or must be able to

subcontract a firm that has. If the method is specified in the scope, then the scope must address the issues of calibration, data processing, and quality assurance.
****

a. Are the methods suggested appropriate for the site conditions and objectives?
b. Is flexibility provided on actual instrument (unless common or Contractor is known to have it available)? (Recommended)
c. Is more than one geophysical method allowed? (Recommended)

4. Survey scope defined? (Required)
a. Area to be surveyed defined or limits set?
b. Is the resolution of the target or number of line/grid/shotpoint measurement points estimated for bidding purposes and is a rationale provided?

****
The number of measurements can be specified. The required resolution of the geophysical survey must be considered and described in the scope. For example, the scope could require the determination of the depth to bedrock +1- 15% on 50-foot centers over a 3.5 acre site. The contrast between the target and the surrounding material should also be considered. These issues can be discussed with the potential Contractor prior to scope finalization.
****

c. Is a procedure provided for a test of the method to assure the method can achieve the objective?

****
There should be a provision for an "early termination procedure" where the Contractor tests the method(s) to see if the objectives could be achieved. This can be used to eliminate inappropriate methods from the survey or to terminate the contract for the survey before the entire site is covered. The Contractor is still paid for the testing work. Good quality assurance oversight is required to assure the test is performed properly and the decisions made as a result are reasonable. Mobilization costs proposed by the Contractor for the test should not be excessive.
****

d. Is forward modeling required for planning the geophysical surveys? (Recommended)

****
For certain geophysical methods, such as seismic, modeling of the probable field response based on inferred conditions and target may assist in planning the survey. This may need to be a separate scope task.
****

5. Is instrument calibration specified? (Required)
a. Is the instrument drift to be monitored?
b. Is instrument response calibrated at known occurrence of phenomenon of interest or standard?
c. Is the Instrument to be properly calibrated to manufacturer' 5 requirement?

6. Are locations of lines/points to be surveyed in? (Required)

****
The level of the survey, reference coordinate system should be described. Consult with in-house survey section staff, if available, for more information.
****

7. Is an evaluation of the need for post-collection processing requested? (Optional)

****
Some geophysical methods inherently need office processing, while others are presumed directly quantitative. Even the latter procedures would benefit from geostatistical evaluation that may be best resolved in the office.
****

a. Has a data correction for instrument drift requested? (Required)
b. Is digital filtering of data to be evaluated?

****
If in-house expertise is not available to evaluate the appropriateness of this requirement, contact WES or the HTRW-MCX.
****

c. Is the correlation with "ground truth" to be evaluated? (Recommended)

****
The results should be compared to known conditions, if possible. For example, the survey should be tied to an existing well or boring or the geophysical survey could include a known tank location. Anomalies should be confirmed or verified by other field techniques, though this can be performed in a later phase. This would include borings, wells, test pits, etc.
****

d. Quantitative interpretation to be done? (Recommended if appropriate)

****
This could include quantitative calculation of depth to bedrock, mass of buried metal, etc.
****

8. Submittal requirements stated? (Required)

a. Workplan topics listed? Recommend:

Objectives
Site Description/History
Methods/Equipment Proposed and Rationale
Study Area Definition and Measurement Spacing
Preliminary Method Testing and Early Termination Procedures
Instrument Calibration and Quality Control Procedures
Field Progress/Interpretation Reporting
Measurement Point/Grid Surveying
Data Processing
Potential Interpretation Techniques

b. Report topics listed? Recommend:

Objectives
Site Description including survey conditions
Field Methodology
Calibration and Data Quality Evaluation
Data Processing
Results (including sections/maps)
Interpretation
Conclusions

c. Form and content of data recording specified? (Recommended)

****
The Government should be provided all data. It is recommended that digital recording be supplemented by paper copy and both magnetic media/paper copy be submitted with report. The record keeping must include a description of visual observations of features of interest to problem, including other features which may indicate site contamination or affect the measurements.
****

B. Workplan Review Checklist

****
These topics are meant to be used as a checklist of items the Contractor should cover in the workplan. See explanation of topics under Scope Development Checklist.
****

1. Are objective stated clearly? (Required)

2. Is site adequately described? (Required)

****
If some of the information is not available while the Contractor prepared the plan, this should be stated. For example, nothing may yet be known regarding ground water or site stratigraphy. Previous reports, existing literature, etc. should be provided to the Contractor by the Government or the Contractor should be able to gather the information from simple literature review. The Contractor may be required by other portions of the scope-of-work to provide other site activities that will add to the site data, but the geophysical work is often done as one of the first activities at the site. These topics should only be discussed to the extent that they are at least indirectly related to the geophysical work.
****

a. Are site surface features described?
b. Are site utilities known and shown on map?
c. Is the contaminant/container described?
d. Are soil types/stratigraphy described?
e. Is the site land use described?
f. Is the ground water depth and flow direction described/estimated?
g. Is the topography/accessibility described?
h. Is a good site map provided?

3. Is the method described? (Required)

a. Is/Are the geophysical method(s) proposed by the Contractor appropriate for the site conditions and objectives?

****
The proposal should include a rationale for the choice of technique, if it was not specified in the scope. USGS Geophysics Expert Program can be used to help evaluate the appropriateness of the proposed method).
****

b. Is the equipment make/model and catalog information provided? (Required)

c. Is more than one method proposed (Optional)?

d. Is a detailed description of the sequence of measurement and recording provided?

****
This varies drastically for various methods. The emphasis must be on detail - a step-by-step description for each line and measurement should be provided.
****

e. Are instrument settings and field filtering techniques adequately described?

****
This item is relatively advanced and specifying this is often not necessary. This is particularly applicable for seismic and ground penetrating radar methods. The control settings and filter settings and rationale should be described. If expertise is not readily available in-house for evaluating the proposed item, contact WES or the HTRW MCX.
****

f. Is modeling done to plan the survey described?

4. Are the geophysical measurement locations defined? (Required)

****
This section refers to the locations of the measurement stations, not the location surveying required to tie the location into the coordinate system.
****

a. Is the area to be surveyed defined?
b. Is a rationale providedfor line/grid/shot-point spacing or number of measurement points.

****
This should include a discussion of how the proposed number or spacing of points will achieve the objective with the required resolution.
****

c. Are lines/grid/shotpoint locations shown on a map

5. Is the instrument performance to be verified and calibrated? (Required)

****
This topic must address the issue of quality control. There should be quality assurance oversight performed on the part of the Government to assure that proper calibration and interpretation is performed in the field.
****

a. Is Instrument drift (or noise) to be monitored?
b. Will there be attempts to verify instrument response at known occurrence of phenomenon of interest or standard?
c. Has the Contractor described the procedures to test the method for achievement of the required resolution and the basis for early termination?
d. Is the instrument to be properly calibrated to manufacturer' 5 requirement?
e. Is the form and content of field reports to the Government described?

****
The Contractor should provide reports from the field on the performance of the survey, including documentation of the interpretations made in the field.
****

6. Are the locations of lines/points to be surveyed in? (Required)

****
The geophysical measurement stations must be tied to an existing coordinate system to allow the sites to be relocated.
****

7. Are possible/required post-collection processing techniques adequately described? (Optional)

a. Is the correction to the data for instrument drift described? (Recommended)

b. Any planned digital filtering of data described? (Optional)

****
If in-house expertise is not available to evaluate the appropriateness of this requirement, contact WES or the HTRW-MCX. There are many data processing techniques that can be used for the various data to reduce noise, enhance signals of interest, and facilitate interpretation. These would include band-pass frequency filtering, upward/downward continuation, deconvolution, migration (for seismic), vertical gradient determination, simple moving averaging, or just taking the differences between the measurements taken at different instrument orientations (say for an EM survey).
****

c. Correlation with "ground truth" to be evaluated? (Recommended)

8. Are possible interpretation techniques described?

****
Interpretation techniques are very dependent on the geophysical technique. The interpretation techniques for seismic refraction are far different than the interpretation for resistivity surveys or magnetics. Refer to geophysical texts or EM 1110-1-1802 Geophysical Exploration.
****

a. Are the references for the interpretation techniques provided? (Required, if interpretation discussed)

b. Are sample geophysical signatures of the items/features of interest provided?

****
For example, do they show what anomaly should be generated by a drum or tank, or a sample seismic record showing a refraction at the bedrock interface?) (Optional)
****

c. Are the theoretical bases for the interpretations described? (Required, if Interpretation discussed)

d. Are procedures for verifying interpretations in the field provided or proposed? (Optional)

****
This may include borings, test pits, well installation, etc. This may be outside the scope of the project, and may be handled under other phases of work.
****

9. Is a proposed topic list for the final report provided? (Optional)

****
This should be similar to the table of contents for the work-plan shown in the scope, but would include information on field changes, actual processing and interpretation techniques used and conclusions and recommendations. It should also include an Executive Summary, a list of personnel involved in the geophysical survey, and appendices containing field data and notes.
****

10. General
    a. Is a Table of Contents provided?
    b. Do maps/plans/figures have both north arrow and scale provided, and do they show locations of permanent reference markers?
    c. Are units consistent?

****
Consistent units, (e.g. System Internationale [SI]) should be used.
****

CHECKLISTS FOR GROUND WATER MODELING AT HTRW SITES

A. Scope Development Checklist

****
This enclosure provides a checklist of topics to be addressed in a scope-of-work (SOW) for various ground water modeling efforts. Refer to section 6.9 of the RI/FS scope outline for scope topic headings. Many of the items can be left to the Contractor. The Contractor should be allowed flexibility for methodology based on their experience and software and equipment; however, it is important that the work be quantifiable. Topics that should be included in each scope will be indicated by "Required"; those items that are not always necessary but should be considered in each scope will be indicated by "Recommended"; and those items that may be considered in some cases will be indicated by "Optional".
****

1. Are the modeling objectives stated? (Required)

****
Establish whether the model is to be used for prediction (for risk assessment and remedial design), hydrogeologic system interpretation (to assist in planning remedial investigations), or as a generic study of flow and transport in hypothetical hydrogeologic conditions. Be as specific as possible.
****

2. Are previous studies referenced and summarized? (Recommended)

****
Previous field and modeling studies and sources of data are helpful in preparing for new modeling efforts. Provide the full reference for any previous known modeling studies or reports prepared for the site.
****

3. Is the development of a site conceptual model specified? (Required)

****
The conceptual model scope should include requirements to define geometric structure of the site (aquifer thickness, lithology distribution, heterogeneities, etc.), physical and chemical processes involved at the site (recharge/discharge, evapotranspiration, etc.), and boundary conditions imposed on the model.
****

4. Is the type of model specified? (Recommended)

****
1-, 2-, 3-dimensional? Ground water flow only or contaminant transport model? Steady-state or transient? Consider the amount of data known to exist at the site and whether it will support the model envisioned. Also consider the objectives of the modeling effort. It may be appropriate to discuss this with the potential Contractor during negotiations. Additional support can be obtained from the HTRW-MCX, waterways Experiment Station, the Hydrologic Engineering Center, and the Army Environmental Center.
****

5. Is the area to be studied defined? (Required)

****
The scope needs to describe the area of interest for the problem. It may be the site, the immediate vicinity of the site or regional in nature. This depends on the objectives of the model, the outside influences on ground water and contaminant flow, and the spatial distribution of data.
****

6. Is model verification specified? (Required)

****
The model should be or have been tested with a sample set of data and compared to (verified with) analytical solutions. In most cases, the Contractor should use a well accepted and documented code, such as those developed by the U.S. Geological Survey and Environmental Protection Agency.
****

7. Is calibration required by the scope? (Required)

****
The model must be calibrated to existing site conditions. If

the site is currently being stressed (e.g. by an extraction system), calibration should be to prestressed conditions if data are available.
****

8. Is a sensitivity analysis specified? (Required)

****
The scope should require the Contractor to determine the effect varying model parameters has on model results.
****

9. Are scenarios to be evaluated described? (Recommended

****
If the designer has specific modeling scenarios in mind they should be described in this section. If specific scenarios are not included, the objectives of the modeling effort MUST be explicit to allow the Contractor to determine appropriate simulation scenarios.
****

10. Is a modeling workplan specified? (Required)

****
This would be part of the overall project workplan. Is the format specified? See companion checklist for suggested topics/format.
****

11. Modeling report required? (Required)

****
This report would be most appropriate as a technical appendix to the overall project report (RI report, PA/SI report, etc.) rather than a separate submittal. A format should be specified. The scope should discuss the types of graphics, etc. that will be required. A suggested report format is discussed in Chapter 9 of Applied Groundwater Modeling: Simulation of Flow and Advective Transport, by Anderson and Woessner, Academic Press, 1992.
****

B. Workplan Review Checklist

****
These topics are meant to be used as a checklist of items the Contractor should cover in the workplan. See explanation of topics under Scope Development Checklist. The modeling workplan could be prepared as a separate part of the overall project workplan.
****

1. Are modeling objectives clear and adequate background information provided?

****
Workplan should define purpose of modeling effort in specific terms, present an evaluation of previous studies, and describe the relevant site conditions. Some or much of the site background information may be included elsewhere in the overall project workplan.
****

2. Is the site conceptual model and analysis approach described?

****
In addition to items listed in the Scope guidance (part A-3 of this checklist), the following should also be addressed. Are saturated or unsaturated conditions being analyzed? Is single-phase or multi-phase flow being modeled? How many contaminants are being modeled? Are steady-state or transient conditions being modeled?
****

3. Is the modeling computer code selected by the Contractor described and justified? Are the assumptions inherent in its use clearly described?

****
Is the code selected consistent with the conceptual model developed for the site, with the data available for input, and with the objectives of the study? The plan should directly discuss this in detail.
****

4. Is a code validation history provided?

****
This is most applicable for proprietary codes or for codes not previously encountered by the USACE technical staff. Has the code been verified against analytical solutions? Is a benchmark or other test provided to verify proper installation and operation on the user's computer system? Even if a widely accepted model is proposed, if the code has been modified to any extent, for example for graphical output or simulation of site-specific processes, it must be fully validated and documented.
****

5. Is the model geometry described?

****
This would include the area to be modeled (including sufficient excess area on all sides of the site to avoid boundary effects of the model), node or grid spacing, and grid orientation (for finite difference models). This would include vertical as well as horizontal aspects for 3-D applications.
****

6. Are model input parameters described?

****
The necessary input should be described along with an overview of the sources of data for these parameters. Uncertainty involved with assignment of parameter values should also be discussed. For contaminant transport simulations, source, history, concentration, and areal extent data should be presented. The plan should identify what, if any, steps are being taken as part of the overall scope-of-work to gather additional data to support the modeling.
****

7. Are boundary conditions defined and justified?

8. Is the calibration procedure described?

****
At a minimum this should include comparison with field data, including water levels and contaminant concentrations (for transport modeling). This should also discuss the procedure to be used for sensitivity analysis.
****

9. Is a procedure described for dealing with uncertainty in input data?

****
Procedures include use of a "safety factor" or conservative approach to scenarios, parameter estimation routines, probabilistic analysis of parameter variation, etc. Note that larger uncertainties may be acceptable for parameters to which the model is less sensitive.
****

10. Are the proposed scenarios described in detail?

****
The level of detail need not be extreme because this often changes based on preliminary results and calibration. Are the simulation times proposed for the scenarios meaningful for the study being performed?
****

11. Is the modeling report described?

****
This should include an outline of the report at a minimum. The report submission should include the data files. Depending on the code (proprietary or public domain, negotiated costs for purchasing the model for this project, etc.), it may be appropriate for the Corps to be provided the code as well.
****

ALTERNATIVE DEVELOPMENT AND SELECTION

****
This enclosure is intended to guide scoping of the development of the optimum combination of technologies and controls for each specific contaminated area.

This section can also assist the project team in developing a preliminary list of applicable remedial technologies which would be useful in developing data quality objectives.
****

1. Type of Action
   1.1 Removal Action(s) under CERCLA

****
Removal actions should contribute to efficient performance of the long-term remedial action to the extent practicable. All removal actions are required to be consistent with the final site remediation.

Time-critical removal actions are those actions where there is less than 6 months available for planning prior to under taking the removal action. At the discretion of the lead agency, an EE/CA may be performed for time-critical removal actions.

An EE/CA is required for non time-critical removal actions. Non time-critical removal actions are defined as those actions where there is at least a six-month planning period prior to the removal action. See the EE/CA outline for additional document requirements.

Examples of removal actions are given below.
****

1.1.1 Alternate Water Supply(ies)
1.1.2 Drum Removal and Disposal
1.1.3 Excavation of "Hot Spots" to Prevent the Spread of Contamination

****
Material may be placed in secure storage or taken to a licensed treatment, storage, and disposal facility.

1.1.4 Fencing and Other security Measures to Limit Site Access.
1.1.5 Hazardous Waste storage Pond or Lagoon Pump-out with Off-site Disposal of Liquids and sludges.
1.1.6 Underground storage Tank (UST) Removal and Disposal
1.1.7 Vapor Extraction and/or Groundwater Pumping to Prevent the Dispersal or Migration of Spilled Material

1.2 Operable Unit(s) under CERCLA

****
Operable units are part of a larger remedial action. They may address specific sub-sites or portions. Operable units are required to be consistent with the final remediation but may be implemented early with available funds. Examples of operable units are given below.
****

1.2.1 Caps and/or Covers
1.2.2 Slurry Walls and/or Hydraulic Barriers that Contain and Prevent Spread of Contaminants
1.2.3 Subsite Remediation

1.3 Interim Remedial Measure(s) under RCRA

****
Interim remedial measures are required to be consistent with the final corrective measures. RCRA interim remedial measures are equivalent to the CERCLA removal action. They are responses for the reduction or control of hazards. Examples of RCRA interim remedial measures are given below.
****

1.3.1 Fencing and Other Security Measures to Limit Site Access
1.3.2 Grading and Revegetation to Control Drainage on to and off of Contaminated Areas
1.3.3 Repairs to Existing Contaminant Control Systems, Such as Caps and Leachate Collection Systems
1.3.4 Slurry Walls and/or Hydraulic Barriers that Contain and Prevent the Spread of Contaminants
1.3.5 Temporary Caps and/or Covers

1.4 Remedial Action(s)

****
Remedial actions are the long term clean up of CERCLA/Superfund sites. See the RI/FS SOW outline for additional document requirements. Examples of remedial actions are given below.
****

1.4.1 In-situ Treatment Systems
1.4.2 Biological Treatment Systems
1.4.3 Incineration of Organic Materials
1.4.4 Pump and Treat Systems

1.5 Corrective Measure(s)

****
Corrective measures are the final clean up under RCRA and are required to comply with terms of the permit, enforcement order, and/or statement of basis. See the CMS SOW outline for additional document requirements. Examples of corrective measures are given below.
****

1.5.1 Permanent Isolation of the Materials by Barrier, Cap, and Cover Systems
1.5.2 Site Excavation and Redeposition of Materials in an Approved RCRA Landfill
1.5.3 Treatment to Render the Site and Materials Non-hazardous and Non-toxic

2. Identification of ARARs

****
Input for this section of the scope should be obtained from Office of Counsel and an environmental regulatory specialist. ARARs will be solicited for removal actions and remedial actions.

There are no ARAR considerations in the RCRA process. All laws and regulations are applicable. Permits must be secured as required by various laws such as the Clean Water Act., the Clean Air Act, etc.
****

2.1 Site Based ARARs
2.1.1 Chemical-specific ARARs
2.1.2 Project/Action-specific ARARs
2.1.3 Site Location-specific ARARs
2.2 Governmental Unit ARARs
2.2.1 Federal ARARs

2.2.2 State ARARs
2.2.3 Regional/Local ARARs

3. Identification of Alternatives/Appropriate Technologies

****
Appropriate technologies depend more on the contaminated media; construction materials, rock, soil, sludge, groundwater, surface water, or air than the contaminants. Site conditions and location affect the technologies being considered.

Require the Contractor to identify alternatives including innovative technologies for removal action or remedial action. The Contractor should be required to provide necessary, defensible criteria to determine basis for action levels and for clean up requirements or for selection of the no further action alternative.

A compendium of possible alternatives/actions is included in EM 1110-2-505 Guidelines for Preliminary Selection of Remedial Action for Hazardous Waste Sites.
****

3.1 Innovative Technology(ies)

****
Consideration of innovative and alternative treatment technologies is mandated by EPA policy and the Office of the Chief of Engineers. Innovative technologies are favored by the National Contingency Plan (NCP). OSWER Directive 9380.0-17 "Furthering the Use of Innovative Technologies in OSWER Programs" provides some guidance for implementation of innovative technologies.

In-situ processes other than solidification/stabilization are considered to be innovative. Most soil treatment methods other than incineration and solidification/stabilization are considered to be innovative.
****

3.2 Alternatives that Recover Product
3.3 Alternatives that Immobilize, Destroy or Convert Hazardous or Toxic Compounds
3.4 Alternatives that Concentrate or Minimize Waste Materials

****
Include a description of the degree to which the alternative treats or recycles materials.
****

3.5 Alternatives to Land Disposal

****
Removal program policy encourages the use of alternatives to land disposal where practicable. The land ban mandates alternatives to land disposal under certain conditions.
****

3.6 Off-site Disposal

****
The cost of transportation to an off-site treatment occasionally appears to be excessive in the initial screening. This happens when the costs for on site treatment have not been fully explored. A combination of on site pre-treatment and off-site treatment in a publicly owned treatment works or a licensed treatment, storage and disposal facility may work out to be most cost effective when the preliminary screening indicated otherwise.
****

3.7 Onsite Disposal

****
Cost of site maintenance and long term O&M should be carefully considered for non-destructive technologies.

New transportable and portable equipment and processes are constantly under development that may work out for small sites with limited areas for set up of treatment systems.
****

3.8 Most Cost Effective

****
Funding uncertainties dictate retention. The most cost effective process may initially be unpopular with the management involved. The most cost effective process should be retained as a safety net above the no action alternative, even if public acceptance and political considerations rank the least cost alternative very low. Cost effectiveness is not a primary evaluation consideration under RCRA. Wise

management of limited resources dictates examination of costs and cost reduction measures. Implementation of any alternative, including no action, requires funding.
****

3.9 No Action

****
The no action alternative is required by the National Contingency Plan (NCP) on projects constructed with federal funds. For practical purposes, the no action alternative is used for a base line for risk assessment and cost. A "no action" alternative is not required for RCRA compliance.

Cost of the no action alternative should include costs for securing the site from public access and periodic monitoring in perpetuity.
****

4. Alternative Development

****
Detailed scope of alternative development is difficult and inappropriate prior to identification and quantification of contaminated media and contaminants. It is good engineering practice to include options for alternative development in investigative scopes.

Require complete development of multiple alternatives to the point that the cost of resolving difficult steps can be identified.
****

4.1 Rough Material Balance(s)
- 4.1.1 Off Gassing Potential
- 4.1.2 Intermedia Transfer
- 4.1.3 Refractory Contaminant(s)
- 4.1.4 Side Stream(s)

****
Side streams from treatment of HTRW contaminated waste materials are environmentally and economically significant. Generally, HTRW contaminants are more concentrated in the bleed streams than they were in the original waste.
****

4.2 Flow Diagrams/Plans/Schematics/CADD

****
This section would present requirements for the preparation of any drawings necessary for the FS as well as describe compatibility requirements for computer aided design and drafting (CADD).
****

4.3 Performance Modeling

****
This section describes modeling required to assist in the analysis of the alternatives. See Enclosure 10 on Ground Water Modeling and section 7 of the RI/FS outline for air modeling. General objectives of the modeling are noted here. The Contractor should be directed to elaborate on the objectives depending on the alternatives. This section should be developed with input from the process engineer, the geologist, the chemist, and the industrial hygienist (particularly for air dispersion modeling). This section should refer to the Geotechnical Requirements and the Air Section (f or air transport modeling) of the SOW for modeling protocols and other requirements.
****

4.3.1 Air Quality Modeling/Air Transport Modeling
4.3.2 Ground Water Modeling
4.3.3 Contaminant Transport Modeling
4.3.4 Geochemical Modeling
4.3.5 Process Modeling
4.3.6 Surface Water Modeling

4.4 Wetlands Restoration

****
Mitigation of habitat loss must be considered. Close coordination with the appropriate persons from the regulatory community is vital to accomplishment of the project. Federally funded environmental projects have not been exempt from the habitat restoration requirements on the basis that they are for the purpose of restoration of the environment. Preliminary scope and cost documents should include the cost of restoration or replacement of wetlands on an acre of restored or replacement wetlands per acre destroyed. See 2.10 of the RI/FS outline for additional information.
****

4.5 Life-Cycle Cost/Total Cost/Present-Worth Analysis of Each Alternative

****
Include direct capital costs, indirect capital costs, and any post-removal site control costs. The proposed removal action cost should reflect the total project cost of the remediation. Be sure the costs of connection to the nearest utilities adequate to support the remediation effort are included.

Furnish the A-E/Contractor with the discount rate to be applied.
****

4.5.1 Cost Estimates

****
This section should require cost estimates for feasibility studies which are detailed to a level commensurate with the level of design, with appropriate design contingencies applied to relevant cost items. The section should note that alternative estimates for feasibility studies, however, do not always include all the costs necessary for remediation of an HTRW project. If the sole purpose of estimating alternatives is the selection of the method of remediation, and not the total construction or project cost, some items may not require pricing. Costs which are minor, or costs which don't vary between alternatives but are common to all are frequently not included since they would not impact the selection of an alternative. This is not a problem as long as there is documentation in the report that identifies which costs are and which are not included in the estimate. The SOW should require this documentation. The selected alternative however, should reflect the total project cost of the remediation. The scope should require the Contractor to prepare estimates which consider all the following costs associated with the selected alternative. These must be considered if a total construction cost is needed for budgetary and/or programming purposes.

This section should be prepared with input from the appropriate cost engineering staff.
****

4.5.1.1 Construction Costs

****
The project leader should consult a construction representative in preparing this section.
****

4.5.1.1.1 Off-site Utility Connections and Fees
4.5.1.1.2 Mobilization/Demobilization
4.5.1.1.3 Health and Safety
4.5.1.1.4 Permits and Fees
4.5.1.1.5 Testing and Analyses
4.5.1.1.6 Operation and Maintenance
4.5.1.1.7 Transportation Costs
4.5.1.1.8 Disposal Costs
4.5.1.1.9 Contractor's Overhead
4.5.1.1.10 Contractor's Profit
4.5.1.1.11 Performance Bond
4.5.1.2 Markups

****
The SOW should require the Contractor to consider standard percentages as established in Army technical cost engineering guidance. The following markups should be applied to the construction cost to determine the total project cost:
****

4.5.1.2.1 Cost Growth-Constr. Midpoint
4.5.1.2.2 Construction Contingency
4.5.1.2.3 Supervision/Administration
4.5.1.2.4 Engineering and Design During Construction
4.5.1.2.5 Additional Lab Testing

5. Screening/Comparative Analysis of Alternatives

5.1 Technical Feasibility
5.1.1 Determination of Whether Identified ARARs Can be Met or a Waiver is Appropriate

****
Permit waivers will not be applicable to sites remediated under RCRA. All environmental laws are directly applicable and are not considered to be ARARs.
****

5.1.2 Ability to Meet Performance Goals

****
Require the Contractor to evaluate alternatives according to the likelihood of meeting performance goals. This may require modeling of the performance of the alternative. It may be appropriate to require models of the various transport

mechanisms. Reference sections 6 and 7 of the RI/FS scope for modeling protocols and other requirements.
****

5.1.3 Ability to Meet Process Efficiencies
5.1.4 Environmental Considerations/Conditions

****
Impact of environmental conditions, such as terrain and climate. For example, biological treatment is hindered by cold and enhanced by warm temperatures. Enhancements should be considered. A site located in a valley may pose a problem for a technology if surrounding air currents provide insufficient dispersion of particulates.
****

5.2 Implementability of Alternatives
5.2.1 Demonstrated Technology Performance

****
Evaluation of maturity of technology and whether it has been used under similar conditions for similar wastes.
****

5.2.1.1 Operation and Maintenance
5.2.1.1.1 Cost
5.2.1.1.2 Downtime
5.2.1.1.3 Operator License Requirements
5.2.1.1.4 Operator Skill Requirements
5.2.1.2 Requirements for Monitoring, Analyses, and Record Keeping

5.2.2 Availability.
5.2.2.1 Equipment, Materials and Personnel
5.2.2.2 Off-site Treatment, Storage, and Disposal Capacity
5.2.3 Post Removal Site Control Requirements
5.2.4 Potential for Failure of the Alternative
5.2.5 Need for Replacement
5.2.6 Description of Potential Threats from Such Failure or Replacement

****
Address the reliability of engineered components of the alternative (cap, treatment system), non-engineered components (fences), and any institutional controls (deed notices), as appropriate.
****

5.3 Institutional Considerations and Other Compliance Issues

****
Innovative and alternative technologies are encouraged. Cross media transfer without neutralization of the toxicity is discouraged by the National Contingency Plan. Compliance with SARA requirements is required. Assure that all actions are consistent with the long-term remedy for the site.
****

5.3.1 NEPA/NCP Issues
5.3.1.1 Historical Preservation
5.3.1.2 Archaeological Preservation
5.3.1.3 Natural Resource Preservation
5.3.2 Likelihood of Public Acceptance of the Alternative
5.3.2.1 Public Interaction
5.3.2.1.1 Public Meetings
5.3.2.1.2 Public Notices
5.3.2.1.3 Public Acceptance
5.3.2.2 State concerns
5.3.2.3 Regional/Local Concerns
5.3.3 Administrative Feasibility/Institutional Issues
5.3.3.1 Coordination with EPA Region
5.3.3.2 Coordination with Other Federal Agencies
5.3.3.3 Coordination with State Agencies
5.3.3.4 Coordination with Regional Air/Water Quality Boards
5.3.3.5 Coordination with Local Agencies
5.3.3.5.1 County Government
5.3.3.5.2 City/Municipal Government
5.3.3.5.3 Local/Neighborhood Groups
5.3.3.6 Required Permits or Approvals

****
The RCRA permit shall be amended to account for all actions taken on site. Permits are not required for CERCLA actions conducted onsite. Substantive compliance with permit requirements is required.
****

5.3.4 Other Compliance Issues
5.3.4.1 Criteria
5.3.4.2 Advisories

5.3.4.3 Guidance

****
Description of compliance with other criteria, advisories or guidances that are not ARAR, but could appropriately be applied to the site. For example, if PCB contaminated soil would be excavated in the alternative, compare the cleanup level the alternative will achieve (the level described under "threat reduction" above) with the cleanup levels established in the EPA PCB Spill Cleanup Policy.
****

5.4 Effectiveness of Alternatives

****
Require the Contractor to evaluate the effectiveness of the alternative for risk reduction and the time frame for this protection to be achieved. In some cases this may involve modeling of the action. If appropriate, refer to the modeling protocols presented in section 7 of the RI/FS scope.
****

5.4.1 Protection of the Community during Removal
5.4.2 Protection of Workers during Removal
5.4.3 Risk/threat Reduction.

****
In accordance with the National Contingency Plan, alternative screening and analysis shall include numerical analysis of risk to human health and environment engendered by the alternative compared to the risk developed by the baseline risk assessment. Risk attenuation may be measured qualitatively or quantitatively (e.g. cleanup levels or cancer risk levels achieved), as appropriate.
****

5.4.3.1 Time Until Protection is Achieved
5.4.3.2 Potential Exposure to Remaining Risks
5.5 Environmental Impacts

****
This section would require the Contractor to evaluate each alternative for the impacts to the environment to meet the equivalency requirements under National Environmental Policy Act. Emergency and time-critical removal actions are exempted from compliance with the Environmental Impact Statement (EIS) requirements of NEPA based on statutory

conflict. All non-time-critical removal actions require environmental review of the EE/CA and public comment. An EE/CA performed under EPA Guidance may be considered a "functional equivalent" to a NEPA EIS if the following items at a minimum are included in the EE/CA report:

- Site characterization.
- Identification of objectives.
- Identification of removal action alternatives.
- Initial screening of alternatives based on various factors.
- Analysis of remaining alternatives based on various selection criteria.
- Recommended removal action.
- Opportunity for public comment.
- Decision documentation.

Input for this section of the scope should be obtained from the environmental regulatory specialist, a team member familiar with NEPA requirements, Office of Counsel, and possibly from environmental resource specialists (normally found in Planning Divisions in the Corps).

Refer to RI/FS or EE/CA guidance for appropriate content for this section. Additional relevant explanatory text can be found in the RI/FS scope outline under NEPA Compliance Activities (section 2.10).
****

6. Comparative Analysis

****
Qualitative assessment of strengths and weaknesses of each alternative relative to the others. Summary tables would be helpful, with alternatives along one axis and evaluation criteria along the other axis. Use total cost instead of construction cost.
****

7. Recommended Alternative

****
Final selection to propose to the regulators is the responsibility of the customer after consideration of input from the concerned parties and the public. The regulators have approval/disapproval authority under most conditions.

Designer and/or design agency recommends alternative to the user. The selected alternative is not necessarily the least

cost and does not always meet all of the ARARs. The report should go no farther than a recommendation. Discussion of the bases for selection is included with the recommendation.

Consider all of the ultimate disposal requirements for all phases and side streams.

As required by 40 CFR 300.70 selection shall be based on a combination of life cycle cost, technical, and environmental/social concerns. RCRA corrective measures do not consider cost. The RCRA cost estimate is needed for budget and programming purposes.

TREATABILITY STUDIES AND TREATABILITY STUDIES REPORTS

****
Treatability studies are performed as necessary and appropriate for the waste materials and evaluation of treatment options. If any treatability studies are performed, the report should be completed and submitted, even if the recommendation is not to use the process. Contracting for treatability studies is difficult and inappropriate before the contaminants and contaminated media are identified and quantified. It is a good idea to include an option for treatability studies in most predesign scopes. Treatability studies are not always required.

See the EPA "Guidance for Conducting Treatability Studies Under CERCLA," EPA/540/R-92/071a October 1992 for general guidelines.

The process engineer (either an environmental engineer with process design experience or a chemical engineer with design experience), the geologist (if the treatability study would be testing the withdrawal of ground water or soil vapor), the geotechnical engineer (if the contaminated media is soil), and the chemist need to be involved in development of the scope of any treatability study.
****

1. Identifying Sources for Results of Previous Treatability Studies on Similar Materials
   1.1 Literature Search/Expert Judgment

****
Reports and Documents
Guidance for Conducting Remedial Investigations and Feasibility Studies
Superfund Treatability Clearinghouse Abstracts
The Superfund Innovative Technology Evaluation Program: Technology Profiles
Summary of Treatment Technology Effectiveness for Contaminated Soil
****

1.2 Electronic Data Bases

****
Alternative Treatment Technology Information Center (ATTIC)
Computerized On-Line Information System (COLIS)
OSWER Electronic Bulletin Board System (BBS)
RREL Treatability Data Base
****

1.3 EPA Personnel Consultations through EPA RPM

****
Robert S. Kerr Environmental Research Laboratory Ground-Water Fate and Transport Technical Support Center at Ada, OK
Risk Reduction Engineering Laboratory Engineering Technical Support Center Cincinnati, OH
****

2. Treatability Study Workplan Outline

****
The treatability study workplan should be submitted and approved before initiation of the sampling for treatability studies. Chemists, geologists, geotechnical engineers, industrial hygienists, process design engineers, and regulatory personnel should review the workplan for a treatability study. This plan would be considered an attachment to the project workplan and would not, to the extent practical, reiterate information presented in the project workplan.
****

2.1 Background

2.1.1 Project Description

****
This should be presented in the project workplan unless the treatability study is scoped separately. Refer to the RI/FS outline, section 2.1.
****

2.1.2 Remedial Technology Description and Process Flow Diagrams

****
Consider the consequences if the sequence of unit process is rearranged. Consider the ultimate disposal requirements of all phases and all side streams. Cross media transfer without

neutralization of the toxicity is discouraged by the National Contingency Plan.
****

2.1.3 Previous Results with Similar Influent Materials

****
List references and describe the limitations of similarity.
****

2.2 Treatability Test Objectives

****
Refer to section 1 of the RI/FS outline for the appropriate approach to determining objectives. Also refer to section 2.1 of the RI/FS for information on scoping Contractor involvement in developing objectives. See Enclosure 11, Alternative Development and Selection.
****

2.2.1 Remedy Screening - Qualitative
2.2.2 Remedy Selection - Quantitative
2.2.3 Establishing Data Quality Objectives (DQOs) - Precision, Accuracy, Representativeness, Completeness, and Comparability (PARCC)
2.3 Approach
2.4 Reporting Requirements
2.5 Schedule and Level of Effort
2.5.1 Schedule

****
The draft treatability study should be submitted for review and comment before disassembly of the equipment. Bench scale tests should be performed before the ROD is prepared.

Bench scale test: laboratory validation of treatment processes. Tests are normally batch or equilibrium adaptations of the steady state processes. Tests may be performed on actual or simulated waste material. Spiking of actual waste or simulation is frequently necessary to test for worst conditions.

Screening tests should be performed early in the alternative development process. There are some new, quick and inexpensive, methods and facilities available for preliminary screening at EPA RREL in Cincinnati. If these EPA facilities

are considered, RREL may have an SOP that is adequate for the scope. Ask for a copy and review it to see if it meets the needs of the project.

Other batch tests should be performed after the site has been characterized, late in the RI or early in the FS, for appropriate sample selection.

Analyses for interferences are easily performed in the batch mode. Most divalent metal ions interfere with continuous operation of oxidation processes and air stripping. Accuracy of plus or minus 0.05 ppm is appropriate for the prevalent cations and hardness.

Pilot tests are demonstration tests that simulate a process closely enough to determine design parameters for full scale unit operations. A pilot test is normally conducted on actual waste material, although some spiking is used to determine capacity or to simulate worst anticipated field conditions. Pilot tests often attempt to simulate worst conditions. Pilot studies may be performed to determine equipment capacity and range of operation parameters (i.e. concentration, temperature, contact, residence, or detention time) required to obtain the performance objectives.
****

2.5.2 Level of Effort

****
Remedy screening
Study scale: bench
Data generated: qualitative
Process type: batch
Waste stream volume: small
Number of replicates: single/duplicate
Time required: days
Cost range: $10,000-$50,000

Remedy selection
Study scale: bench-full
Data generated: quantitative
Process type: batch or continuous
Waste stream volume: medium to large
Number of replicates: duplicate/triplicate
Time required: days/months
Cost range: $50,000-$250,000
****

2.5.3 Budget
2.6 Experimental Design and Procedures

****
Treatability studies should be designed to obtain the data that is needed to assess the effectiveness of a specific process in remediation.
****

2.6.1 Experimental Design
2.6.2 Detailed Outline of the Procedures

****
The treatability study workplan should include step-by-step detail of the procedures to be used in performing the treatability study.
****

2.6.2.1 Methods
2.6.2.2 Procedures
2.6.2.3 Sample Material Handling
2.6.2.4 Treated Material Handling
2.6.2.5 Process Residuals Handling
2.7 Equipment and Materials

****
Equipment and instrumentation to be used in the treatability study should be completely identified.)
****

2.7.1 Equipment
2.7.2 On-line Monitors
2.7.3 Other Instrumentation.

****
Field type instrumentation is satisfactory for most pilot scale work with full laboratory data quality management implemented only on selected samples before and after treatment. The workplan should indicate the instrumentation to be used.

Measure parameters that affect field implementation; ultimate disposal; mechanical stability of residual solids; effects of freeze thaw cycles; dust generation; water absorption or loss pH and pH changes; temperature and temperature changes; heat loss; heat gain
****

2.8 Chemical Data Acquisition Plan/Sampling and Analysis Plan (SAP)

****

This does not replace the RI/FS sampling requirements, it merely cites special considerations for treatability studies. This plan will essentially incorporate the elements of the EPA's Field Sampling Plan, Quality Assurance Project Plan, and Data Management Plan. Depending on the nature of the field activities needed for the treatability study, a Monitoring Well installation and Drilling Plan may be required.

The handling of gross samples should be as similar as possible to the handling of the analytical samples. See Enclosure 13: Chemistry Technical Requirements.

As an option, the sample collection section and the sample analysis and validation sections can be broken out as separate tasks. Given the limited nature of the sampling in many studies and the important role chemical analysis may have in treatability studies, they are discussed under the treatability study task.

The chemist should consult with the process engineer to determine what analytical parameters are to be monitored during the treatment process. Analytical levels II, III, IV, or V may apply to these studies. Data reporting format and turnaround time may need to be specified in this section, depending upon users needs.

Field samples may not represent the predicted worst case. Analyze portions of the samples before shipment to the treatability study laboratory. At a minimum, treatability testing should be performed under worst case conditions and under typical or average conditions. It may be necessary to provide supplemental contaminants.

Volume estimates on the amount to be treated should be provided or a cross reference to the appropriate part of the treatability study plan be provided.

Field sample waste streams for characterization and testing, conduct treatability tests, analyze samples of treated materials and residuals

The SOW should have the Contractor estimate the projected volume of material to be treated to determine equipment capacity.

For appropriate sample selection, pilot tests should be performed after overall site characterization (QA/QC documentation need not be complete), concurrent with alternative selection and ROD development, before initiation of design.

Final Treatability Study Reports may be submitted concurrently with the RI/FS or separately.

For Quality Assurance issues, coordinate with and refer to the project workplan quality assurance section. Quality assurance needed for remedy screening is the least stringent; for remedy selection, moderately stringent QA is appropriate.

For data analysis and data interpretation, see Enclosure 11: Alternative Development and Selection for a discussion of alternatives.
****

2.9 Site Safety and Health Plan/ Health and Safety Plan

****
The site safety and health plan for the RI characterization activities may cover all of the types of activities required. Append new procedures to the existing plan.
****

2.10 Residuals Management and Compliance with the Regulatory Requirements

2.10.1 Residuals Management

2.10.1.1 On Site

2.10.1.2 Off Site

****
The regulatory specialist must confirm that off-site lab facility to run treatability tests is permitted or plans to operate under the RCRA treatability exclusions in 40 CFR 261.4 (e) and (f). If the treatability exclusion is to be used, state regulations must be considered and the CFR must be carefully read to minimize adverse impacts on the project. Some impacts can be handled through scoping.
****

2.11 Community Relations

****
The community relations plan for the pilot study must be in concert with the project community relations plan. Remedy screening: low profile/few activities
Remedy selection of f site: generally not controversial and low profile/few activities

An onsite remedy selection may be controversial and high profile/significant activities
****

2.12 Management and Staffing
2.13 Outline for the Treatability Study Report

3. Treatability Study Report Format Outline
- 3.1 Introduction
  - 3.1.1 Site Description
  - 3.1.2 Waste Stream Description
  - 3.1.3 Treatment Technology Description
  - 3.1.4 Previous Treatability Studies at the Site
- 3.2 Conclusions and Recommendations
  - 3.2.1 Conclusions
  - 3.2.2 Recommendations
- 3.3 Treatability Study Approach
  - 3.3.1 Test Objectives and Rationale
  - 3.3.2 Experimental Design and Procedures
    - 3.3.2.1 Design
    - 3.3.2.2 Procedures
    - 3.3.2.3 Discussion of any Variations from the Work plan.
  - 3.3.3 Equipment and Materials
  - 3.3.4 sampling and Analysis
    - 3.3.4.1 Analyses or Reference to the Appropriate Report.
    - 3.3.4.2 A/QC Report or Reference to the Appropriate Report.
  - 3.3.5 Data Management
  - 3.3.6 Derivatives from the Work plan
- 3.4. Results and Discussion
  - 3.4.1 Data Analysis and Interpretation
  - 3.4.2 Quality Assurance/Quality Control
  - 3.4.3 Identification of additional testing needs
  - 3.4.4 Cost/Schedules for Performing the Treatability Study
  - 3.4.5 Key Contacts

****
All Superfund/N.L. treatability reports are submitted to the RREL Treatability Data Base Repository, organized by the EPA Office of Research and Development.
Attn: Mr. Glenn Schaul
REEL Treatability Data Base
U.S. EPA ORD Risk Reduction Engineering Laboratory
26 West Martin Luther King Drive
Cincinnati, OH 45268
****

3.4.6 References
3.4.7 Standard Operating Procedures
3.4.8 Data Summaries
3.4.9 All Side Notations from Laboratory Books

****
These notes may have significant value
****

4. Appendices to the Treatability Study
- 4.1 Sample Calculations Showing
  - 4.1.1 Use of generated Data
  - 4.1.2 Identification of all Variables
    - 4.1.2.1 Measured
      - 4.1.2.1.1 Range of Experimentally Determined Values for the Variables.
      - 4.1.2.1.2 Sensitivity to variation.
    - 4.1.2.2 Calculated
    - 4.1.2.3 Assumed
    - 4.1.2.2 Unknown
- 4.2 Process Flow Diagrams
  - 4.2.1 Flow Diagram
  - 4.2.2 Material Balance Showing Average Values
- 4.3 Summary of the Data
- 4.4 Scale-up Considerations
  - 4.4.1 Performance
  - 4.4.2 Operation and Maintenance
- 4.5 Identification of the Limits of the Process as Indicated by the Results

5. Specific Process Recommendations
- 5.1 Air Stripping

****
General water quality parameters and tower scaling

parameters, etc., should be evaluated.
- pH
- hardness
- cations
- alkalinity

Bench scale tests typically do not yield useful data for design of full scale stripping systems. More useful data can be obtained from literature searches and packing manufacturers' technical data sheets.
Pilot scale tests are generally not necessary. Adequate data is available.
Design should maximize effluent VOC concentration in the exhaust gas to lower off gas treatment cost.
****

5.2 Biological Treatment

****
Pilot work should consider variations in the site.
Ensure that analyses cover all required parameters.
Monitor VOC emissions.

"Guide for Conducting Treatability Studies under CERCLA: Aerobic Biodegradation Remedy Screening" published by EPA REEL in Cincinnati is a good resource document. It is not a stand alone set of instructions for all biological treatment studies.

Consider the effects of pre-treatment, particularly on pH.
****

5.3 Carbon Adsorption

5.3.1 Vapor Phase

****
Ideal gas behavior is approximated, but data on removals to reach the low levels to meet ambient air standards is not generally available and is difficult to measure under dynamic conditions. Vapors from vapor extraction sites are normally saturated or super saturated. Of f gas from strippers is near saturation. If the humidity is not reduced, the water vapor condenses in the adsorber and consumes carbon capacity.
****

5.3.2 Liquid Phase

****
Isotherms do not simulate steady state conditions. Dynamic testing is required to evaluate the required time of contact to reach the requirement limit. It is difficult to achieve breakthrough in mini columns.
****

5.4 Dechlorination/Soil Washing

****
Dechlorination affects the soil structure. Structural stability characteristics of the treated material are critical to final placement.
****

5.5 Solidification/Stabilization

****
Solidification/stabilization treatability study scopes are covered by a separate ETL.
Considerations:
- Physical properties
- Materials handling characteristics
- Generic mix design.
- Proprietary additives.

****

5.6 Thermal Desorption/Incineration

****
CEWES has a low temperature pilot unit and will perform treatability studies. Obtain a copy of the WES protocol to get an understanding of how they will do the study and what the report will be like. The Contractor and the design district process engineer both need to understand what WES will do and if the information will be adequate for design.
If there are any Contractor requested changes to the WES protocol the district process engineer should be involved in the changes.

"Guide for Conducting Treatability Studies under CERCLA: Thermal Desorption Remedy Selection" is being prepared by EPA contract.

Obtain an adequate and representative sample. The Contractor should be responsible for sample collection,

packaging and shipping to WES if WES does the study.

Characterize/analyze a sample of the sample prior to shipment
Consider parameters that affect VOC removal rates.
- Undisturbed moisture content of sample
- BTU content of sample
- Temperature
- Air and/or oxygen flow
- Residence time
- Time and temperature curves
- Consider problems
  - Slag formation
  - Partitioning of the metals: Keep track of where the metals are.

Materials handling: Soil characterization including liquid limit, plastic limit, etc.

If the feed material contains significant amounts of heavy metals, produce enough ash for solidification/stabilization tests while the incineration test is going. Provide adequate material for the unit to achieve steady state before measurements are made to determine the operating parameters. Enough samples to represent the entire site should be processed.
****

5.7 Soil Vapor Extraction

****
Additional criteria are under development.
****

5.8 Floating Product Recovery

****
Additional criteria are under development.
****

5.9 Catalyzed Oxidation

****
Additional criteria are under development.
****

5.10 Adsorption and Ion Exchange

****
Additional criteria are under development.
****

5.11 Emerging Technologies

****
Additional criteria are under development.
****

5.12 Solvent Extraction

****
"Guidance for conducting Treatability Studies Under CERCLA: Solvent Extraction Remedy Selection" is being prepared under EPA contract.
****

5.13 Other Treatment Processes

****
Additional criteria are under development.
****

CHEMISTRY TECHNICAL REQUIREMENTS

1. Introduction. This attachment provides general information on chemical analysis to USACE and architect and engineering firms (A-E) for investigative projects where chemical analyses are being conducted. Projects considered as investigative include: PA/SI, RI/FS, EECA, RFA, RFI, and CMS. Information is summarized in subsequent sections for the Chemical Data Acquisition Plan (CDAP), requirements for primary (contractor) laboratory approval, and other miscellaneous requirements. The purpose of the CDAP is to assure that the A-E understands the sampling and analysis requirements (including chemical quality management details) of the scope of services and the Government approves of the A-E's implementation procedures as per contract.

2. CDAP Format and Implementation Requirements. The following is a guideline of elements to be included in the CDAP (as a minimum) and guidance on their implementation. Additional requirements are outlined in appropriate sections of the accompanying Scope of Services.
(In many cases the project is being conducted under the authority of the USEPA. The language used for submittals may differ depending on the applicable regulatory program. Under CERCLA, guidance may require the preparation of a Sampling and Analysis Plan (SAP) or Field Sampling Plan (FSP), and a Quality Assurance Project Plan (QAPjP); or under RCRA a Data Collection Quality Assurance Plan and Data Management Plan may be requested. In either case, the state or federal substantive requirements of the document(s) must be investigated to assure that all are being incorporated. One may investigate with the regulating office the option to use the language and plan approach outlined within USACE guidance (i.e. CDAP), or use the format and content as outlined by the regulatory program. Regardless of the approach taken, the USACE guidance set forth for the Chemical Data Acquisition Plan (CDAP) is considered the functional equivalent to the Data Collection Quality Assurance Plan and the Data Management Plan under RCRA, as well as the SAP (FSP) and QAPjP under CERCLA.)

Section 1. Table of contents.
Prepare a serial listing and page location of the CDAP elements.

Section 2. Project Background Data.
Project background data may be addressed as a portion of the workplan as outlined in section 2.1. In the event this material is addressed within the workplan (WP), the applicable WP sections should be referenced within this section of the CDAP. Regardless of location, this topic should include a summary of past chemical data of significance, emphasizing any site specific problems encountered, identify data gaps, and briefly state an overview of the multi-media sampling to be carried out in the present work effort, and expected future work at the site.

Section 3. Chemistry Requirements to Support Project Data Quality Objectives (general).
The general chemistry requirements of sampling and analytical to be performed may be addressed as a portion of the workplan as outlined in section 2.1. In the event this material is addressed within the workplan, the applicable WP sections should be referenced within the CDAP. Regardless of location, these objectives must be defined in terms of project requirements, not just in terms of the capabilities of the test methods used. Define the general chemistry requirements to support project specific Data Quality Objectives (what questions must be answered and what decisions must be made). Chemistry-specific requirements are formulated as a result of the data needs and project specific DQOs and should be addressed within the CDAP by matrix. These chemistry-specific requirements include choosing methods of sampling, sample preparation, chemical analysis, by specifying the minimum quality of data required to draw valid conclusions which support the project data needs to finalize the project decision statements. Each of the matrices in the SOW section 5: Field Activities, and each of the analytical parameters in the SOW section 7: Laboratory Activities, must include the detailed discussions of chemistry-specific requirements for sampling and analyses required for the CDAP.
In addition, any relevant Chemical specific ARARs should be summarized to verify the specified methods are applicable and are able to confidently achieve quantitation limits below the maximum contaminant levels promulgated. Reference section 2.1. for incorporation of this information within the workplan, and reference applicable WP sections within the CDAP.

Section 4. Contractor Project Organization and Functional Areas of Chemistry Responsibilities.
The project organization for the A-E and any subcontractors as

related to analytical activities should be clearly defined, including a discussion of quality control responsibilities. The A-E's Quality Assurance (QA) Officer should report to a responsible senior officer of the company (i.e., QA management should be separate from project management). A list of all individuals should be provided and it should include QC officers for the various project components (those responsible for initiating and carrying out corrective actions and those involved in the data reporting sequence) and all analytical laboratory personnel (supervisors, chemists, and technicians). For laboratory personnel that are not included in the Lab Quality Management Manual, resumes listing education and experience are required. Resumes listing education and experience are required for all (non-laboratory) personnel collecting samples. Also include information about the anticipated primary (contract) laboratory with a brief description of name, location, facilities, and capabilities.

Section 5. Field Activities:
This section of the CDAP is critical because collecting representative samples in both time and space is crucial to subsequent decision making and legal defensibility of the data. Good analytical results on non-representative samples are worthless, and lead to incorrect decisions and/or invalidation of the data. Selecting appropriate sampling locations and schemes is contingent upon the project specific DQOs developed for the project and / or site. This section should summarize field activities while emphasizing chemistry-specific requirements related to the project's DQOs.

(l)Field Instrumentation and Equipment.
This section should itemize all sample screening and analytical equipment to be used (brand, model) and outline the corresponding calibration procedures and required frequency. In the event equipment is purchased for use during a project, final disposition of this equipment should be addressed. Describe non-standard or modified methods fully. List the required sample handling equipment for the work effort. Also specify the composition of the sampling devices (stainless steel, teflon, PVC, high-carbon steel, etc.) necessary.

(2) Field Documentation.
Daily Quality Control Reports (DQCRs, see section (3) below) should be prepared, dated, signed by the site manager, and sent to the Contracting Officer Representative (COR) at a

rate approved by the contract. Due to the brevity of these forms, additional documentation requirements are advised, especially when field analytical or screening is occurring. This may include documentation within a field logbook encompassing (1) a system for identifying and tracking the samples acquired that day which describes the location (by sketch), the physical description of each sample, identification of samples taken as replicate (field QA/QC) samples, and any pertinent information which may affect the sample; (2) details of the calibration, and results of field analytical or screening performed; (3) and any deviations performed from the procedures outlined in the CDAP. All information should be recorded in permanently bound notebooks with indelible ink. It may also be advisable to require a daily review for completeness and sign off of this logbook by the field QA officer or senior sample technician / chemist. Special emphasis should be placed on documenting field control samples to their respective field samples as noted in (4) below. The logbook pages should be copied and included in the Final Report with chain-of-custody sheets and the analytical data. This will allow the reviewer a chronological confirmation of the samples origin, transfer, and analysis. This section of the CDAP should define specifically the sample identification system to be employed in the field for all samples, including field QC/QA duplicates, rinsates, and trip blanks (if required). Examples of the chain-of-custody form and sample label(s) should also be included in the CDAP. As noted, this section should cross-reference (and be consistent with) section 6 of the CDAP. All field documentation generated must become part of the project files.

(3) Daily Quality Control Report (DQCR)

During the field investigation activities DQCRS should be prepared daily, dated, signed by the site manager, and sent to the Government (COR) at a rate specified in the SOW. This section of the CDAP should summarize how the A-E will prepare DQCRs. These reports should include (at a minimum, with respect to chemistry) weather information at the time of sampling, samples taken with reference given to appropriate sections of the CDAP, field instrument measurements, calibrations, departures from the approved CDAP, problems identified, corrective actions, and verbal/written instructions from Government personnel. Any deviations which may affect DQOS must be conveyed to USACE personnel (TM, project chemist, etc.) immediately. Project-specific DQCR requirements, as noted in the SOW, should also be included in this section of the CDAP. All field documentation generated must become part of the project files.

(4) Field QC and QA Samples.
ER 1110-1-263 requires that Field Quality Control (QC) and Quality Assurance (QA) samples be collected and analyzed by the primary (A-E's contract) laboratory and the secondary (USACE QA) laboratory, respectively. The QC samples are used by the A-E and the primary (A-E's contract) laboratory to identify and diagnose problems related to sampling and analysis. QA samples are sent to a secondary (USACE QA) laboratory by overnight delivery for Government monitoring of sample handling and of the performance of the primary laboratory. These QC and QA samples include splits or replicates of field samples taken at a minimum rate of 10% per matrix for each analytical parameter prescribed. However, the frequency of QA/QC sample acquisition is also dependent on project specific DQOS. If there is a possibility of litigation, a higher rate should probably be implemented. It may also be advised that the contractor split samples likely to exhibit contamination, or specifying particular locations or other criteria where field control samples should be generated. The frequency of QA/QC sample acquisition is best displayed in tabular form for each analytical parameter, matrix, and site under investigation. This clarifies between the A-E and the COR the exact the number of anticipated samples to be acquired. The USACE QA (secondary) laboratory designated for project should be indicated in this section of the CDAP. The A-E should be responsible for adding the appropriate project identification information to the sample labels and chain of custody records for all samples shipped to the contractor and QA laboratories. It is also advised to require field replicate samples sent blind to the primary (contractor's) laboratory. This requires the designation of a unique sample ID number to all field QC duplicates. The A-E should notify the secondary (QA) laboratory one (1) week prior to the first delivery of samples and at least 24 hours notice should be given for Saturday sample deliveries. The secondary (QA) laboratory must also be notified when the final shipment of samples has been sent at the completion of sampling activities. An important consideration within this section includes the documentation and matching of field QA/QC duplicate samples, and any other quality control samples to their respective field samples. Designation of critical samples should also be integrated in this section.

(5) Decontamination Procedures.
Describe decontamination of the sampling devices and itemize necessary decontamination supplies. Handling procedures and disposal of spent decontamination fluids (characterized as

investigation-derived wastes) must also be detailed. Specify the projected end-fate of decontamination fluids.

(6) Matrix: Groundwater Samples

This section of the CDAP should express the chemistry-specific requirements for groundwater samples to support project-specific DQOs. The project-specific DQOs for this section should be developed by a project team with potential input from a chemist, hydrologist, geologist, process engineer, and risk assessor. Chemistry-specific requirements are then formulated by the chemist in order to achieve the quality of data required in light of the DQOs. Tables are to be used whenever possible to clearly present information. Critical measurements taken while purging monitoring wells, and prior to groundwater sampling should be discussed in light of fulfilling DQOs. Discussion should also include qualitative QA objectives of sampling (maintenance of sample integrity, representativeness of media, comparability, others as applicable) and how not meeting the QA objectives will affect decision making and possible litigious actions. The goal of this section of the CDAP is an appropriate sampling strategy that ensures attainment of a representative sample which achieves the quality required by project management to make valid conclusions for project-specific decisions or regulatory actions.

(6)(a) Field Screening.

Field screening is primarily used to provide indications of contamination at analytical levels I and II. This general information may be used for a variety of reasons including: (1) to select samples for analyses at analytical levels III and IV, (2) to indicate "hot spot" contamination, (3) to direct soil boring or monitoring well installation and/or (4) to provide "general" data on sample contamination, or physical characteristics. Due to the diversity of field screening techniques, the project team may allow the contractor flexibility in prescribing the particular field screening application in light of the project specific DQOs. The contractor must then specify the details, within the CDAP, on the field screening technique proposed. All protocols are subject to USACE approval. Specific information required within the CDAP should include at a minimum: (1) a discussion of method-specific DQOs for the field data acquired, and how that data will effect project decisions, or the sampling approach, (2) details on the field methodology and required field equipment (its calibration and use), (3) required QA/QC to be implemented (onsite and

offsite), and (4) all documentation requirements. The project chemist, geologist, and/or geologist should propose the use of field screening techniques and at a minimum, outline its applicability to the project. Due to the limitations inherent to field screening data, any additional analytical requirements (levels III and IV) should also be discussed.

(6)(b) Sample Locations.

Summarize chemistry-specific requirements for sampling including analyte concentrations of interest. Describe the statistical method or scientific rationale to be implemented sampling sites and sampling frequencies. This should include a discussion of the sampling approach proposed (biased, random, sytematic, etc.) and the reasons supporting the decision. The project chemist should work with other data implementors to define an appropriate sampling approach or approaches used on a project. This is based upon many factors. Initially, the intent of the data (identification, characterization, confirmation, etc.) must be defined. This is then extrapolated to the type of approach necessary to acquire samples to make the required project decisions. Describe how site and/or sample selection will affect the validity of the resulting data and the project objectives. Provide the location of each sampling point on a site map. The A-E may have full discretion in locating sampling points or may be instructed by USACE (in the SOW) as to each specific sampling location. In either event, the A-E must ensure DQOS are met. This section of the CDAP should include tables and site maps listing sample locations, matrix, number of field samples, number of split/replicate samples, and the number of required rinsate, and/or trip blank samples. Sampling of background or upgradient samples is strongly recommended if contaminants of concern possibly occur naturally or information about other potential sources is being gathered. The background sample location strategy should also be developed with appropriate input from a geologist in light of site aquifer depth and flow conditions.

(6)(c) Sampling procedure(s).

This section should detail sampling methods, required sample volumes necessary for each analysis, and preservation requirements. Special attention and specification within the SOW should be given to unique sampling requirements. The necessity of sampling and analyzing any source water used in the well drilling / installation / development process' needs to be defined. Field parameters of pH, conductivity, and temperature are monitored and should meet the minimum criteria as follows before sampling: +/- 0.2 pH units, +/-

0.5°C, +/- 10% specific conductance readings. This section should include well sampling procedures to reflect the DQO's of the project, especially those chemistry-specific requirements based upon the selected analytical parameters. For example, containers for all volatile (VOAs) samples should be filled first with as little agitation of the water as possible. Preservatives (if applicable) should be added to the VOA bottles before filling and care should be taken not to overfill the containers. VOA samples must be filled completely with no headspace within the sealed vial. It should be emphasized that the contractor is responsible for implementing correct sample handling procedures, and deviations performed may be subject to resampling. SOPs should be outlined in the CDAP for field personnel on preservation procedures for each analytical method specified, and any sample manipulation required (i.e. filtration of water samples prior to preservation).

(6)(d) Analytical procedures.
Project specific analyses as related to DQOs should be specified in this section of the CDAP. The analytical procedures required for a project are developed by the data needs of the data users. The project chemist should work with other data users to define an appropriate analytical protocol for each site / subsite of the project. This is based upon many factors. Initially, the operations which lead to the "potential" contamination must be investigated to define potential constituents of interest. The acquisition of purchase inventories, or wastestream and/or disposal practices identification may help with this task. Potential breakdown products should be considered. Based upon input from other data users an appropriate protocol will be defined. The contractor may be given the flexibility to propose additional analytical requirements based upon experience, with eventual implementation based upon USACE approval. The chemistry-specific requirements of selected analytical parameters are then developed based upon the protocol identified. Each method should be specified exactly and in detail by one of the following: (1) reference to an EPA SW-846 method (2) reference to another EPA method (3) reference to an ASTM method (4) reference to another accepted published method (5) reference to an accepted published method with a description of any deviations from the published procedure or (6) complete description of the procedure. EPA SW-846 methods should be used where possible. Nonstandard methods are generally not allowed. In special cases that require the consideration of nonstandard methods (analytical level V), the primary laboratory must provide validation and/or provide data showing equivalency to a

standard method to the COR for approval. Analytical methods along with appropriate sample preparatory (digestion/extraction) methods identified must be appropriate for all analyses in the specific matrix at the anticipated concentrations. AGARS and DOS must be considered for they directly effect the identification of appropriate analytical methods and the requirements of sensitivity, precision, accuracy, and completeness of the prescribed procedures. This may include specifying a particular “low concentration" extraction method to be performed. Summarize all groundwater analytical procedures in this section of the CAP., including any field methods (analytical level I and/or II) employed. Include a table summarizing the required concentration range and sensitivity (detection limit), precision, and accuracy for chemical data to be collected. Guidance on quality control may be referenced within SW-846, Chapter One or within individual methods. This section should also define the required turn around time (TAT) for completed data reports, or any "preliminary" data submission. The required TAT is determined by the project specific DOS, and must be agreed to by the A-E, the primary (contractor's) laboratory, and the CAR. TAT necessary may differ between field generated data and fixed laboratory data, and should be addressed separately. Expedited data analysis and reporting from a fixed laboratory may incur additional charges, therefore all decisions must be made by all team members of the USAGE. The agreed TAT for results is not to be confused with the holding time requirements for sample analysis. It should be emphasized within the CAP. that the contractor is responsible for all analyses to be completed within the stated holding times for each analytical method.

(6)(e) Sample containers, preservations, holding times, transportation.

Sample containers, volumes, preservatives, and holding times for the project specific analyses should be presented in tables in this section of the CAP.. Any modifications to the standard methods must be approved by the CAR (may require concurrence from the secondary (USAGE A) laboratory) prior to their use. If a standard method is not available, the A-E contractor or subcontractors should propose a nonstandard method (with supporting validation data showing equivalency) and specifications on sample containers and preservatives for approval by the CAR. This section should also specify how samples will be labeled, packaged, and transported/shipped to the respective laboratories while maintaining chain of custody and holding times. Section 6 of the CAP. also includes general information regarding sample chain of custody, packing and shipping. Appendix F to ER 1110-1-263

(10/90) contains detailed information appropriate to this section. It should also be noted that one trip blank should be included per shipping cooler containing water samples to be analyzed for volatile organics. A temperature blank (VOA vial filled with water) may also accompany the shipment for ease of monitoring at the receiving laboratories.

(7) Matrix: Surface Water Samples

This section of the CAP. should develop chemistry requirements for liquid impoundment or surface water samples in light of the project DOS. These project specific DOS should be developed by a project team with potential input from a chemist, hydrologist, geologist, process engineer and risk assessor. Tables are to be used whenever possible to clearly present information. Critical measurements within surface water sampling should include qualitative A objectives (representativeness, comparability, others, as applicable) and how not meeting the A objectives will affect decision making and possible litigious actions. The goal of this section is the same as stated in section (6).

(7)(a) Field Screening.

See section (6) (a) above.

(7)(b) Sample Locations.

See section (6) (b) above.

(7)(c) Sampling procedure(s).

This section should specify sampling procedures used to acquire a representative liquid impoundment or surface water sample for chemical analysis. The actual procedures required depend on the nature of the liquid being sampled and may vary greatly. Items to be considered and described may include stratification, flow conditions, access, sampler design, and volume requirements for the planned analyses.
A discussion of surface water sampling in relation to chemistry-specific requirements must also be included in this section of the CAP.. The CAP. should also specify equipment (dipper, weighted bottle, bacon bomb, etc.) to be used in the field in light of the DOS expressed.

(7)(d) Analytical procedure(s).

See section (6) (d) above.

(7)(e) Sample containers, preservations, holding times, transportation.

See section (6) (e) above.

(8) Matrix: Leachate Sampling Methodology

This section of the CAP. should further develop DOS as required for leachate samples. The project specific DOS for this section should be developed by a project team with potential input from a chemist, hydrologist, geologist, chemical engineer, process engineer and risk assessor. The discussion should describe the procedures used to obtain samples of leachate emanating from a landfill, stream bank, or excavation side wall. Because of the wide range of settings and contaminant properties, additional subtopics are not discussed here; however, when preparing this section, the chemist and geologist should consider requiring recording information such as weather conditions, flow rates, volume requirements, sample disturbance effects, among others. In many cases it may be possible to allow the contractor the flexibility to propose sampling details within the CAP..

(8)(a) Field Screening.

See section (6) (a) above.

(8)(b) Sample Locations.

See section (6) (b) above.

(8)(c) Sampling procedure(s).

See section (6)(c) above.

(8)(d) Analytical procedure(s).

See section (6) (d) above.

(8)(e) Sample containers, Preservations,holding times, transportation.

See section (6) (e) above.

(9) Matrix: Soil Samples

This section of the CAP. should develop chemistry-specific requirements to support project specific DOS as required for soil samples. The project specific DOS for this section should be developed by a project team with potential input from a chemist, geologist, and risk assessor. Tables are to be used whenever possible to clearly present information. Critical measurements for possible field screening of soil samples should be discussed in light of fulfilling DOS. For example, screening may define which soil samples are submitted for fixed laboratory analysis, or taken in replicate. Discussion should also include qualitative A objectives (maintenance of sample integrity, representativeness of media, comparability, others as applicable) and how not meeting the A objectives will affect

decision making and possible litigious actions. The goal of this section of the CAP. is an appropriate sampling strategy that ensures attainment of a representative sample which achieves the quality required by project management to make valid conclusions for project-specific decisions or regulatory actions.

(9)(a) Field Screening.
See section (6) (a) above.

(9)(b) Sample Locations.
Include discussions for soil samples as outlined in section (6) (b) above. In addition to specifying sample location rationale (random, systematic, biased, etc.), soil sampling should include any relevant sample depth designations required. Special attention must be addressed to attain background soil concentrations, where appropriate.

(9)(c) Sampling procedure(s).
This section should detail sampling methods, required sample volumes necessary for each analysis, preservation requirements, and decontamination procedures for sampling equipment. Special attention and specification within the SOW should be given to unique sampling requirements. Using stainless steel or Teflon sampling equipment, enough solid material should be collected at one time from the specified depth interval for all containers. Volatile organic samples, including any duplicates, should be collected first, with as little mixing and delay as possible. Due to the inherent heterogeneity of soils, homogenizing procedures are conducted prior to containerizing the remaining analytical samples. The remaining material from the soil core should be placed in a clean stainless steel bowl and mixed thoroughly with stainless steel implements (spoon, spades, etc.), quartered, then approximately equal aliquots taken from each quarter to fill the required sample containers. QC and/or A sample containers should be filled from the same mixture as the "original" field samples. Any compositing of discreet sample locations or depths should be defined explicitly within the CAP.. Other methodologies, as warranted by the DOS, must be clearly defined in the CAP.. This section of the CAP. should include a table and site map listing sample location, matrix, number of field samples, number of split or replicate samples, and number of rinsate samples (if appropriate). It should be noted that rinsates are typically not required for soil sampling unless grossly contaminated media is anticipated, thereby increasing the chance of contaminant carry-over.

(9)(d) Analytical procedure(s).
See section (6) (d.) above.

(9)(e) Sample containers, preservations, holding times, transportation.
See section (6) (e) above.

(10) Matrix: Sludge/Sediment Samples.

(10)(a) Field Screening.
See section (6) (a) above.

(10)(b) Sample Locations.
See sections (6) (b) and (8) (b) above. Special attention must be given to establishing upgradient or background levels of contaminants in sediments on a site-specific basis.

(10)(c) Sampling procedure(s).
See section (8)(c) above.

(10)(d) Analytical procedure(s).
See section (6)(d) above.

(10)(e) Sample containers, preservations, holding times, transportation.
See section (6) (e) above.

(11) Matrix: Air Samples.
This section of the CAP. should develop chemistry requirements to support project specific DOS for air sampling. The project specific DOS for this section should be developed by a project team with potential input from a chemist, industrial hygienist, process engineer, and a risk assessor, and possibly an air monitoring expert and meteorologist. Air monitoring requirements identified here are not related to health and safety, but may include the determination of background concentrations of airborne contaminants at undisturbed sites and determination of emission rates from various remedial activities and alternatives. Concerns generally focus on gaseous emissions of volatile and semivolatile organics and particulate emissions of semivolatile organics and inorganics. The project team should collaborate with relevant regulatory authorities to develop analytical protocols which address potential regulatory requirements. This is especially important when method deviation is necessary. Modeling is utilized with the ambient air analytical results for eventual uses (DOS) within a risk assessment, engineering design and

controls, or ambient air regulatory requirements.

(11)(a) Sample Locations.
This section must summarize the scientific and regulatory objectives for the sampling of compounds of interest, as well as, fugitive emission components. In light of the DOS, this section must describe the statistical method and scientific rationale for choosing sampling sites and how these relate to site meteorology, and/or site task performance, as well as sampling frequency. Sampling sites will also be discussed in relation to the risk assessment requirements and/or contingency sampling. Describe how site sampling selections will affect the validity of the resulting data and the DOS. It should be made clear in this section who has decision authority for specifying sampling locations and frequencies.

(11)(b) Sampling procedure(s).
This section should detail the minimum required sampling for regulators and risk assessment requirements. The sample locations decision logic should include meteorological requirements and the criteria for relocating samplers to achieve the required DOS. This section should also provide the mobility requirements of the apparatus' and the number of concurrent potential sampling locations. Describe within this section each parameters specific constraints to be implemented with anticipated ranges (flow rate, run time, etc.), keeping in mind specific DOS (minimization of contaminant breakthrough) Reference individual analytical methods for guidance on this subject.

(11)(c) Analytical procedure(s).
Analytical methods should be chosen after considering data needs and uses. Methods may include both field screening techniques and in-depth laboratory analyses. Since many methods describe requirements for sample collection in addition to analytical procedures, this section should be carefully cross referenced with section 2.3.11 as well as additional requirements in the chemistry and air section (7). Analytical methods should be referenced from EPA Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air (TO-l through TO-14), 40 CFR Parts 50 and 60, or other EPA reference. A USEPA bulletin board containing the most current method of analysis is available through the U.S.EPA Ambient Monitoring Technology Information Center (AMTIC). Information about the bulletin board may be requested from AMTIC at the following address:

US EPA
AMTIC, OAQPS
TSD/MRB (MD-14)
Research Triangle Park
North Carolina 27711

In addition, alternative methods may be referenced from the National Institute of Occupational Safety and Health (NIOSH) - Manual of Analytical Methods. Care must be taken when adapting the NIOSH methods to perimeter air monitoring. The project chemist and industrial hygienist should collaborate with any regulating authority on the applicability of the analytical method prior to its implementation. This section will describe all required analytical methods and the specific analyses as related to DOS. Each analytical method will be described in detail as the EPA Compendium Methods have not been published as fully validated and approved. The method description must also include detailing the A/QC to be implemented, since not all methods have standard A/QC established. Since neither EPA or USAGE has a laboratory validation procedure for these methods, the primary (A-E contract) laboratory must demonstrate the necessary background and expertise to perform the required analyses. The laboratory must have a well established SOP for each sample method preparation, recovery, and analysis. The laboratory must show previous experience with each method of concern including applications to air toxic compound analyses.

(11)(d) Sample containers, preservations, holding times, transportation. The chemist should verify within individual methods for sample container requirements. This should include a discussion of collection media requirements, submission of blank sample requirements, etc. All chain-of-custody procedures should be maintained as outlined. The laboratory must have a well established SOP for decontamination of sample containers (summa canisters) or media, as well as quality control screening to verify cleanliness.

(12) Matrix: Surface Samples (Wipe / Chip)

This section of the CAP. should develop chemistry requirements to support DOS as required for surficial wipe, chip, and/or bore samples. Surficial sampling (wipe / chip / bore) procedures are utilized to determine the presence of contaminants on surfaces, or structural matrices, such as the interiors/exteriors of buildings, metal surfaces, concrete pads, etc. The procedures described depend again on the contaminant and the surface conditions. For wipe samples,

the chemist and risk assessor preparing this section should consider the size of the area to be wiped, the appropriate solvent for the wipe, sample handling and packaging, among others. wipe or chip sampling is often incorporated in project specifications to determine if buildings, containers, or structures are contaminated prior to demolition/removal. If appropriate for the project, the chemist must review the past history of the site and specify the chemical parameters of interest. The risk assessor and industrial hygienist should be consulted as to potential analytical concerns and probable sample numbers necessary to characterize contamination in each specific application. Additional information on wipe sampling may be found in EPA 600/2-85-028 entitled "Guide for Decontamination of Buildings, Structures, and Equipment at Superfund Sites", and in EPA 560/5-85-026 entitled "Verification of PCB Spill Cleanup by Sampling and Analysis". The contractor typically proposes for review and approval the specific procedure to collect and analyze each wipe sample. Tables are to be used whenever possible to clearly present information.

(12)(a) Field Screening.

See section (6) (a) above. Few field screening techniques are applicable to surficial samples, with the exception of PCB screening.

(12)(b) Sample Locations.

See section (6) (b) above. In addition, the area (i.e. 10cm X 10cm) to be wiped, as well as A/QC sample acquisition must be delineated.

(12)(c) Sampling procedure(s).

The chemist should be aware that with wipe sampling, no action levels exist with the exception of PCBs. It is also not clear as to what solvent types are appropriate for various wipe-sampling schemes. This is dependent on the required analyses. The chemist may consult with the appropriate laboratory personnel to decide the appropriate liquid media to be used with that wipe. It is necessary to supply the laboratory with individual wipes for each analytical parameter run, as well as, sending a blank wipe sample for each parameter to allow quantification of any interferences from the filter (or gauze) or the liquid media used. Chip and bore samples require physically removing the media with a chisel or coring bit. Care must be taken to achieve as representative a sample as possible and identify alternative sampling procedures based upon the prescribed analytical methods; for this sampling procedure is not applicable to all analytical methods.

(12)(d) Analytical procedure(s).
See section (6) (d) above, as well as consulting with appropriate laboratory personnel on the applicability of an analytical method to this media.

(12)(e) Sample containers, Preservations, holding times, transportation. See section (6) (e) above.

(13) Matrix: Soil Gas Samples.
Soil gas analytical methods may be incorporated into a sampling scheme to determine the presence of volatile organics in the soil pores. Soil gas surveys are typically used to supplement or direct conventional soil and groundwater sampling and analyses. The utility of soil gas analytical methods vary depending upon the nature of the contaminant and the soil environment at a particular site. The chemist should be aware of the different types of soil gas methodologies (active or passive), and decide, if applicable, which best suits the needs of the project specific DOS. The chemist and geologist should collaborate in determining the pros and cons associated with available soil gas options, resources available, the extent of soil gas sampling to occur at the site, and the level of analytical testing best serving the project. Contractors should have significant input in proposing soil gas analytical approaches based on capabilities in-house or which may be subcontracted. The topics listed below are only typical for an active system. This section should be developed jointly by the geologist and the chemist and careful cross-referencing is necessary to the other chemistry-related sections for definition of the analytical procedures to complement these requirements for sampling procedures. Again the team should keep in mind that physical site properties, including soil types and surface features, can affect the applicability of soil gas sampling.

* Probe Design and Placement
* Probe Purging
* Sample Recovery
* Decontamination of Equipment
* Blank, Background, and Duplicate Samples

(13)(a) Field Screening.
See section (6) (a) above.

(13)(b) Sample Locations.
See section (6) (b) above.

(13)(c) Sampling procedure(s).
See section (6)(c) above as it pertains to soil gas samples. It is advised to allow the contractor the flexibility to propose details for sampling within the CAP..

(13)(d) Analytical procedure(s).
See section (6) (d) above. The chemist should be aware that compound-specific analyses are available compared to total analyses. If compound-specific analyses are being performed on-site, the chemist should consider specifying off-site laboratory confirmation at some frequency. A consideration should also be given when developing a soil gas study to monitor background levels of analyses of concern.

(13)(e) Sample containers, Preservations, holding times, transportation.
See section (6) (e) above as it pertains to soil gas samples, as well as consulting with appropriate laboratory personnel.

(14) Matrix: Drum/Tank Samples.
This section describes the procedures to be used for sampling containerized waste, including drums (both intact and perforated) and above- or below-ground tanks. Again, the number of combinations of site conditions and contaminant makes a detailed list of scoping requirements difficult to develop. This section would require input not only from the chemist and possibly the geologist, but also the industrial hygienist because of the significant safety threats while sampling these containers. Considerations may include sampler designs, the need for compositing and/or eventual bulking for disposal, remote drum opening/puncturing, potential stratification of the contents, among others. In many cases it may be possible to leave many of the details to be proposed in the plans by the contractor.

(14)(a) Field Screening.
See section (6) (a) above as it pertains to screening physical and hazardous characteristics testing of drummed material.

(14)(b) Sample Locations.
See section (6) (b) above. This section may be applicable if drum staging is to be done.

(14)(c) Sampling procedure(s).
See section (6) (c) above as it pertains to drum / tank sampling. With drum sampling, typical procedures include performing a preliminary assessment of drum markings, and

physical state of drums (avoid bulging drums). Remote drum punching is advised, with continuous monitoring for organic and explosive vapors while sampling.

(14)(d) Analytical procedure(s).
Analytical protocols for drums must be based upon suspected contents, applicable regulatory specifications, and final disposal. Past records or information should prove useful. If the waste is to be moved off-site, RCRA characterization should be performed. Used oil, or PCB-containing waste may require other analytical approaches. The projected end-fate of the drummed contents should be considered when the chemist develops the analytical approach. Compatibility testing protocols may be used at sites with drums to minimize the number of wastestreams requiring disposal. Field screening versus off-site laboratory analyses are two considerations for implementing the analytical program for drums. Input from the project regulatory expert should be obtained to assist the chemist in decisions regarding drum analytical protocols. The analytical testing to be run on the bulked wastestreams may fully depend on the ultimate fate of the wastes. The contractor should be given liberal input in this aspect of the project.

(14)(e) Sample containers, Preservations, holding times, transportation.
See section (6) (e) above.

Section 6. Sample Chain of Custody, Packing and Shipping.
This section of the CDAP will contain a complete description of all custody procedures, forms, documentation, and personnel responsible for implementation as needed to ensure both the scientific credibility and the legal defensibility of data obtained for all project samples. There may be project- specific variations on sample chain of custody (COC) requirements based on DQOs. Sample custody discussions in this section of the CDAP should include both field and laboratory operations. At a minimum, all sample labeling, packaging, transportation, and chain of custody procedures should follow the USACE Sample Handling Protocol (Appendix F of ER 1110-1-263).
Samples collected for most projects are to be considered as low concentration environmental samples for packaging and shipping purposes, unless otherwise stated within the SOW. Note that no chemical analytical samples should be held on site for more than 24 hours.

Section 7. Laboratory Activities:

(1) Cooler Receipt Form

This section should describe the details to be implemented by the primary (and secondary) laboratories for logging in the incoming samples. The information should be gathered on the Government "Cooler Receipt Form" or equivalent to verify the condition of the samples upon receipt at the laboratory. This information is used to assess the quality of the field sampling, sample handling, label and chain of custody accuracy *I* completeness, and shipping procedures. This section should also include specifics of the chain of custody and storing procedures necessary for the project's samples from the field through the laboratory. In order to verify that all samples are received at 4 degrees Celsius, all laboratories should measure the surface temperature of the incoming samples. An option to this method would be to accompany the shipment with a temperature blank. This may consist of an additional VOA vial filled with water within the cooler during shipment for temperature measurement at the receiving laboratory. All preserved (acidic or alkaline) water matrices (except VOA) should be checked with pH paper or other means upon receipt. In the event samples are received unsatisfactorily at either the primary or secondary laboratories (e.g. insufficient cooling or preservation, incorrect sample volumes or bottles used, broken bottles, etc.), a mechanism should be in place to notify the field personnel as well as the USACE project manager and project chemist. The USACE should be notified immediately to decide whether resampling (at no cost to the Government) is warranted.

(2) Instrument Calibration and Frequency.

Description of the procedures used for calibration (including pre- and post- calibrations) and frequency of calibration checks is required for each instrument or method (including field instruments). These should be consistent with the requirements of the contract and the analytical method.

(3) Quality Control Procedures

Quality control checks are necessary to evaluate performance reliability for each measured parameter. Describe procedures to assess the precision, accuracy, and completeness of each measurement. State clearly the proposed number and type of internal laboratory QC checks and samples (e.g., blanks, duplicates, splits, spikes, surrogates, and reference standards, as applicable). At a minimum, these should be run at the rates prescribed within the individual methods. In

some cases, the precision and accuracy criteria published within the analytical methods may be sufficient for the data end use and should be referenced for each analytical method specified. Specify the applicable quality control tables from within the methods for criteria to be maintained during sample analysis. For methods which do not publish quality control criteria, the chemist should specify the criteria to be maintained individually. Guidance on this subject may be referenced from SW-846 Chapter One, and Contract Laboratory Program (CLP). State the primary laboratory's established practice for including laboratory control samples (LCS) among the samples analyzed, and any additional controls required by the project. Describe the feedback systems used to identify problems by means of the results obtained from these control samples. Limits of data acceptability should be included. Results from the primary laboratory internal quality control checks should be reported with the analytical data.

(4) Preventive Maintenance

The instruments, including manufacturer, model, accessories, etc. should be specified and preventive maintenance should be described. Records of repairs, adjustments, and calibrations should be maintained and available for inspection by the Government upon request.

(5) Corrective Action

This section of the CDAP will include a project-specific contingency plan for corrective actions to be taken by the primary laboratory when results appear unusual or trigger points are violated. Trigger points or unusual results are pre-specified conditions which will automatically require corrective action. This applies to both in-house analytical methodologies and to the condition of samples upon receipt at the lab. The CDAP should specify personnel responsible to initiate, approve, implement, evaluate, and report corrective actions. Describe how reestablishment of control is demonstrated and documented. Specific responses and procedures must also be specified when corrective action is needed. When QA/QC problems are identified, the A-E should notify the USACE PM as soon as possible. This notification should be expected to occur within 48 hours after the problem is identified.

(6) Data reduction, assessment/validation, and documentation.

The main purpose of this section of the CDAP is to show how the A-E and contract labs plan to maintain good data quality throughout data reduction, transfer, storage, retrieval, and

reporting. The names of individuals responsible (analyst, section leaders, QA officers, etc.) , and critical control points for each step should be summarized.
The A-E should include equations (including units) required to calculate the concentration or value of the measured parameter. Describe the data management systems which collect raw data, store data, and document quality control data. If statistical procedures are used for data review before reporting, include descriptions. Data assessment/validation procedures and organization should be specified, or task the Contractor to propose data review and assessment details in the CDAP based on these guidelines. In the event an independent full validation of the data is warranted by project DQOS, guidance may be referenced within the User's Guide to Contract Laboratory Program, Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses, and Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses. The primary (A-E's contract) laboratory, and/or the A-E should hold (and make available to the Government) all project raw data for a (minimum) period of seven (7) years after the project samples have been analyzed.

(7) Quality Control Summary Report (QCSR).
A report by the A-E contractor at the conclusion of a project. This report is outlined within section 8 Chemical Data Quality Management Deliverables, paragraph (5).

(8) Method Specific DQO's.
Summarize with a table the quantitative objectives for PARCC parameters and sensitivity. This includes practical quantitation limits, precision (both within (lab duplicate) and between samples (field duplicate), accuracy, completeness (as required to achieve a specific statistical level of confidence), comparability, and representativeness. Discuss how data quality indicators will affect the legal defensibility of the data. DQO's for accuracy and precision, established for each measurement parameter, will be based on prior knowledge of the specific measurement system used and method validation studies employing replicate analyses, spikes, standards, calibrations, recoveries, control charts, and project specific requirements. Completeness refers to the amount of valid data obtainable from sample acquisition to the measurement system compared to the expected amount of data, and is usually expressed as a percentage. Comparability expresses the confidence with which one data set can be compared to another. Representativeness is the degree to which the data accurately and precisely portrays the environmental condition being studied.

Section 8. Chemical Data Quality Management Deliverables.
The A-E should address the frequency and content of chemical data quality control reports that should be submitted during the project in this section of the CDAP.

(1) A-E Daily Quality Control Reports (A-E DQCRs). During the field investigation activities, the A-E should provide Daily Quality Control Reports (DQCRs) to the COR. These reports should be compiled and submitted at least once every week, or as specified in the SOW. These reports should include, but not be limited to, the minimum information listed in ERl1lO-l-263 plus any additional information requested within pertinent sections of the SOW.

(2) Laboratory Daily Quality Control Reports.
The A-E should provide Daily Quality Control Reports from the primary laboratory (as appropriate).

(3) Non-routine Occurrences Reports.
The A-E should send written reports of all significant problems resulting from non-routine occurrences to the USACE PM within 48 hours of the non-routine occurrence event(s). These reports should include problems identified, corrective actions, and verbal/written instructions from USACE personnel for sampling or re-analysis.

(4) Pre-draft Data Package.
As stated within the memorandum entitled "Minimum Chemistry Data Reporting Requirements for DERP and Superfund HTW Projects", dated 16 August 1989 a pre-draft final report will be submitted to the secondary (QA) laboratory for comparison between the data generated from the contractor's QC and the USACE QA laboratories. This review also encompasses an assessment of the internal quality control and method requirements, allowing a determination on the usability of the data generated during the project. This package of data should be submitted within 30 calendar days after the primary laboratory receives the last analytical samples from the field. A definitive schedule must be agreed upon between the COR and the A-E. This schedule is subject to change based upon the number of samples taken during the work effort, the turn around times required for analysis, etc. However, the timeliness of the USACE generated Chemical Quality Assurance Report (CQAR) (formerly QA/QC report) will be contingent upon the punctual release of this material and completeness of the data compilation. For these reasons, the USACE District project chemist may require the opportunity to

review the submittal for completeness and verification that DQOs were met prior to or concurrent with the release to the secondary laboratory.
This deliverable should contain at a minimum all of the items described below to allow the secondary (USACE QA) laboratory to review PARCC parameters.

(4)(a) Pre-draft Data Package Organization.
The data package should include a compilation of the following: Tables corresponding field samples to their respective QA/QC samples, and / or other batch quality control sample results, analytical results into subsections divided by analytical parameters, all project chain-of-custody papers, and project cooler receipt forms. The organization should be defined based upon the data user and volume requirements.

(4)(b) Minimum Data Reporting Requirements for the Pre-draft Data Package.
The data package should include all sample and internal quality control results such as method blanks, spike and surrogate recoveries, and replicate analyses which should meet or exceed the HTRW minimum data reporting requirements. (Interim data reports may be requested from the A-E if the project warrants.) The following are minimum data reporting requirements for the Pre-draft Data Package:

(4)(b)(1) Sample Identification.
The A-E should prepare a tabular presentation which matches the primary (A-E's contract) laboratory sample identifications to the secondary (QA) laboratory sample identifications. This table should identify all field duplicates and field blanks as such and should match their corresponding field samples where applicable.

(4)(b)(2)Cooler Receipt Forms.
The A-E should include copies of "Cooler Receipt Forms" or equivalent for all sample shipments to the primary (A-E's contract) laboratory. The A-E should complete and retain these forms for purposes of noting problems in sample packaging, chain-of-custody, and sample preservation. An example form is available from the secondary (Government QA) laboratory.

(4)(b)(3)Chain-of-Custody Papers.
The A-E should include copies of all chain-of-custody papers for all sample shipments to the primary (A-E's contract) laboratory. The primary laboratory should sign and date these forms upon receipt of the shipment, and retain them for

verification of sample transfer and receipt. An example form is available from CEMRD-ED-EC.

(4)(b)(4)General Organic and Inorganic Reporting.
For each analytical method run, the A-E should report all analytes for each sample as a detected concentration or as less than the specific limits of quantitation. Each sample's data sheets should be clearly identified as belonging to a specific analytical batch and corresponding QC data reported. Generally, all samples with out-of-control spike recoveries should be reanalayzed, at no cost to the government, to verify matrix interferences. Only after reanalysis and verification that the out-of-control situation shows the same constituent resulting in the same bias direction and magnitude, should data be flagged accordingly. A summary all data flags to be used in data reporting should also be presented (note: CLP flags are acceptable). The event of flagging data should be rare. All soil and sediment samples should be reported on a dry-weight basis with percent moisture also reported, unless otherwise approved. The A-E should report any dilution factors for each sample as well as the date of extraction (if applicable) and analysis.

(4)(b)(5)Internal Quality Control Reporting.
A complete set of Quality Control results should be reported for each analytical batch even if some of the QC was not performed on samples from the USACE project. At a minimum, internal quality control samples should be analyzed at rates specified in the methods or at higher rates if required to meet project-specific Data Quality Objectives. The following is the minimum internal quality control to be submitted:

(4)(b)(5)(A) Laboratory Blanks (Method Blanks and Instrument Blanks).
All analytes should be reported for each laboratory blank. All sample results should be designated as pertaining to a particular laboratory blank through the corresponding analytical batch.

(4)(b)(5)(B) Surrogate Spike Samples.
Surrogate spike recoveries should be reported for all organic method reports, where appropriate (i.e. when the method requires surrogate spikes). The report should also specify the control limits for surrogate spike results as well as the spiking concentration. Any out-of-control recoveries, as defined within the specified method, should result in the

sample being re-analyzed (with both sets of data reported), and the data being flagged (if applicable).

(4)(b)(5)(C) Matrix Spike Samples.
Matrix spike recoveries should be reported for all organic and inorganic analyses. All general sample results should be designated as corresponding to a particular matrix spike sample. The report should indicate what field sample was spiked, even if it was not a USACE project sample. This procedure does not give any information about the matrix being sampled, however. It is better to require the primary laboratory perform the method-required matrix spikes on USACE samples. The report should also specify the control limits for matrix spike results and each method and matrix. Out-of-control occurrences are treated the same as surrogate spike recoveries outlined above.

(4)(b)(5)(D) Laboratory Duplicates and/or Matrix Spike Duplicate Pairs.
Relative Percent Difference should be reported for all duplicate pairs as well as analyte/matrix-specific control limits.

(4)(b)(5)(E) Laboratory Control Samples.
When run for a method's internal quality control, Laboratory Control Sample (LCS) results should be reported with the corresponding project sample data. Control limits for LCSs should also be specified within this presentation.

(4)(b)(5)(F) Field Duplicates and Field Blanks.
The A-E should identify field duplicates, reported as any other field sample. Relative Percent Differences should be reported for all field duplicate pairs.

(5) Quality Control Summary Report (QCSR).
In this document the A-E addresses quality control practices employed and summarizes the DQCRs. For investigation activities, the QCSR may be included in the Investigation Report. The project requirements for this deliverable should be defined within the SOW whether this is a separate submittal or incorporated into another. Issues covered in this report should include a discussion of all data points which may have been influenced or compromised and their impact on the Data Quality Objectives or remedial decisions. An example of the elements required for this level of effort are presented below, but are not limited to the following items:

(5)(a) Project Description.
Elements of this item include report organization, background information, and site description.

(5)(b) Laboratory Quality Control Activities.
Elements of this item include a summary of laboratory analytical methods, detection limits, quality control activities, a summary of any deviations from planned activities, and a summary of the evaluation of the data quality for each analysis and matrix.

(5)(c) Field Quality Control Activities.
Elements of this item include a summary of field sampling techniques for all matrices sampled. Include a summary of containers, preservation and transportation procedures, decontamination and cleaning procedures, calibration of field equipment, quality control activities, a summary of any deviations from planned activities, and a summary of the evaluation of the quality of the sampling.

(5)(d) Data Presentation and Evaluation.
Elements of this item include an assessment of sampling and analysis techniques, an evaluation of the data quality of each matrix and parameter, and an evaluation of the usability of the data.

(5)(e) Lessons Learned.
A summary of field or analytical procedures that could be changed or modified to better characterize chemical contamination in future work efforts.

(5)(f) DQCR Consolidation.
Daily Quality Control Reports are to be consolidated and summarized.

(5)(g) Conclusions/Recommendations.

3. Contractor Laboratory Validation. The following items are part of the contract laboratory validation process.

a. Commercial Laboratory Evaluation. The form "Evaluation of Commercial Laboratory" will be filled out by the project manager from a USACE District or Division and submitted to CEMRD-ED-EC for the proposed laboratory approval process. An example of the form is located in Appendix B of ER 1110-1-263. A memorandum may be substituted for this form provided it includes the following: (l)name of the project, (2)the contract number, (3)analytical methods to be used,

(4)numbers of samples for each matrix, (5)estimated dates of sampling, and (6)any additional certification requirements of the project.

b. Laboratory Oualitv Management Manual (LQMM) CEMRD-ED-EC should contact the laboratory requesting a copy of an off-the-shelf quality management manual or equivalent. The following information should be included in this submittal:

(1) Lab name, address, POC, phone No., lab age, number of employees, square footage.

(2) Type of analytical work routinely performed.

(3) Organizational chart and floor plan.

(4) Special capabilities.

(5) Previous evaluation/validation program and most recent results.

(6) List the EPA and USACE contracts held in the last two years.

(7) Copies of laboratory results and certificates for other environmental programs (USEPA WP / WS programs) or states.

(8) Chart of employees training and experience or chronological resumes.

(9) Copies of QA manual and/or in-house SOPs for analyses to be conducted for the contract including all internal quality control practices.

(10) List of the instruments to be used for the contract and dates of purchase.

c. Preliminary questionnaire. CEMRD-ED-EC will also send out a Preliminary Questionnaire for the laboratory to complete. The laboratory should return the questionnaire to CEMRD-ED-EC within 10 working days from the date of receipt. Many of the topics listed above are addressed within the questionnaire.

d. Performance Evaluation Samples. The LQMM and Preliminary Questionnaire will be reviewed to determine the laboratory's capability to perform the contract work. If the Government determines that the contract laboratory's capabilities appear to meet the project requirements, the Government will provide the contract laboratory with performance evaluation (PE) samples through CEMRD-ED-EC. The results will be submitted as directed within the shipment and within 20 calendar days after receipt of the PE samples. Failure to analyze these samples

correctly and within the required time frame may result in termination of the validation process. If any of the results are unacceptable, a second set of PE samples may be allowed. The performance evaluation samples are method and matrix specific. The results are considered passing if a particular method has no results outside three standard deviations as determined by the USACE, and no more than two constituents outside two standard deviations for multi-constituent analysis. Often a laboratory will be contacted if problems such as dilution or calculation errors can be identified.

e. Laboratory Inspection.

When the "Evaluation of the Commercial Laboratory" form, the LQMM, and the Preliminary Questionnaire have been reviewed and the PE sample have been successfully completed, the USACE will conduct an onsite laboratory inspection. The entire inspection normally takes approximately 8-hours. Post laboratory inspection, an exit interview will be held with laboratory personnel during which any problems identified are discussed. The laboratory will then have ten (10) working days to respond to deficiencies found during the inspection.

f. Approval.

A letter and a copy of the inspection report will be sent to the Government project manager and to the proposed contract primary laboratory. Ordinarily the letter will specify the methods and matrices, the project(s), and time period for which the validation is granted (usually 18 months). Centralized records of validations and laboratory performances are kept at CEMRD-ED-EC. If a primary laboratory obtains a second contract within the eighteen month period, previous performances will be checked. If different analytes/matrices are involved in the second contract, only those performance evaluation samples will be sent. If work done for the Government by the laboratory has been satisfactory, no further action will be necessary. A validated primary laboratory may not subcontract USACE samples to a second laboratory without the knowledge and approval of the Government AND unless the second laboratory is validated for the parameters concerned.

g. Expiration of Validation.

Towards the close of the eighteen month period CEMRD-ED-EC will notify USACE users of laboratories of pending validation expiration. After considering use of the laboratory and previous performance, CEMRD-ED-EC will determine which of the validation steps are needed to revalidate the laboratory.

4. Miscellaneous Requirements

a. Investigative Derived Wastes (IDW). Waste materials generated as a result of field investigations may potentially pose a threat to human health and the environment. For this reason, an approach toward management of these materials must be implemented to ensure protectiveness and compliance with potential ARARS (Applicable or Relevant and Appropriate Requirements) or regulations. The following is a list of types of IDW which may be encountered:

-Soil drill cuttings
-Drilling muds
-Groundwater from well development and purging
-Disposable sampling equipment
-Personal Protective Equipment (PPE)
-Decontamination fluids generated from sample equipment and personnel cleaning
-Laboratory IDW (sample remnants, aqueous / organic solvent wastes from analysis, etc.)

b. The waste management options available will depend on whether the project is being conducted under the auspices of CERCLA or RCRA. Reference EPA Guidance for the applicable ARARs in EPA/540/G-91/009, Management of Investigation-Derived Wastes During Site Inspections, May 1991 for guidance on this subject.

SUGGESTED SCOPE-OF-WORK BOREHOLE LOGGING REQUIREMENTS

****
These logging requirements are suggested for use in scopes-of-work requiring drilling and sampling. The geologist should carefully consider each requirement as it applies to the project at hand and modify each as appropriate. Additional requirements may be necessary for a specific project. Consult USACE guidance on monitoring well installation for detailed guidance.
****

1. Logs shall be prepared in the field, as borings are drilled, by a qualified, experienced geologist or geotechnical engineer. Each log shall be signed by the preparer.

2. All log entries shall be legibly written. Photo reproductions shall be clear and legible. Illegible or incomplete logs will not be accepted. Original logs shall be submitted to USACE as borings are completed.

3. Borehole depth information shall be from direct measurements accurate to 0.10 feet.

4. Logs shall be prepared on the appropriate log forms (ENG 1836 or HTW version of the ENG 1836, unless the Contractor's forms are approved by the USACE project geologist). Forms are available from the USACE.

5. All relevant information blanks in the log heading shall be completed. Drilling location (referenced by measured distances from prominent surface features) shall be described on the log.

6. Log scale shall be 1 inch = 1 foot.

7. Each and every material type encountered shall be described on the log form.

8. The characteristics of the unconsolidated materials shall be described as per ASTM D 2488 and EM 1110-1-1804 Geotechnical Investigations:

    a. descriptive USCS classification, including percentages

of primary and secondary components (i.e. 80% sand, 20% silt)

b. plasticity and consistency of cohesive materials or apparent density of non-cohesive materials;

c. moisture content assessment, e.g., moist, wet, saturated, etc.;

d. color;

e. other descriptive features (grain angularity, bedding characteristics, organic materials, macrostructure of fine-grained soils; e.g., root holes, fractures, etc.);

f. depositional type (alluvium, till, bess, etc.).

9. Rock materials shall be described in accordance with standard geologic nomenclature, including:

a. rock type and formation name;

b. relative hardness and degree of cementation;

c. density;

d. texture;

e. color;

f. weathering;

g. bedding;

h. fractures, joints, bedding planes, and cavities, including any filling material and whether open or closed; and

i. other descriptive features (fossils, pits, crystals, etc.).

10. Stratigraphic/lithologic changes shall be identified by a solid horizontal line at the appropriate scale depth on the log which corresponds to measured borehole depths at which changes occur, measured and recorded to the nearest 0.1 foot. Gradational transitions, changes identified from cuttings or methods other than direct observation and measurement shall be identified by a horizontal dashed line at the appropriate scale depth based on the best judgment of the logger.

11. Logs shall clearly show the depth intervals from which all samples are retained.

12. Logs shall identify the depth at which water is first encountered, the depth to water at the completion of drilling and the stabilized depth to water. The absence of water in borings shall also be indicated. Stabilized water level data shall include time allowed for levels to stabilize.

13. Logs shall show borehole and sample diameters and depths at which drilling or sampling methods or equipment change.

14. Logs shall show total depth of penetration and sampling. The bottom of the hole shall be identified on the log with the notation "bottom of hole."

15. Logs shall identify any drilling fluid losses including depths at which they occur, rate of loss and total volume lost.

16. Logs shall show drilling fluids used including, as appropriate:

a. source of make-up water;

b. drill fluid additives, if allowed by this contract, by brand and product name, and mixture proportions; and

c. type of filter for compressed air.

17. Logs shall show depths and types of any temporary casing used.

18. Logs shall identify any intervals of hole instability.

19. Intervals of lost bedrock core shall be shown. Intervals of intact soil sampling attempts shall also be shown, including depths from which attempts were made and length of sample recovered from each attempt. Bedrock coring information shall be recorded in consecutively numbered runs and shall include the following:

a. depth to top and bottom of each core run;

b. length of core recovered from each run;

c. size and type of coring bit and barrel; and

d. measured depth to the bottom of the hole after core is removed from each run.

20. Any special drilling or sampling problems shall be recorded on logs, including descriptions of problem resolutions.

21. Logs shall include all other information relevant to a particular investigation, including but not limited to

a. odors;

b. HNu/OVA measurements or other field screening or test results; and

c. any observed evidence of contamination in samples, cuttings or drilling fluids.

REGULATORY RESPONSE AUTHORITIES

1. Background

1.1 Our Nation's Major Environmental Response Programs

National programs to clean up the environment and protect the public have seen considerable growth since the 1970's. When Congress enacted the National Environmental Policy Act in 1969, the Clean Air Act in 1970 and the Clean Water Act in 1972 it did so with the premise that, by slowing the rate at which contaminants were added to the Nation's air and surface waters, natural attenuation would eventually produce clean air and water.

In order to begin to understand the waste problems in the United States, Congress created the Solid Waste Disposal Act of 1965. The goal of the legislation was to provide funding so that each State could study and compile information on its waste disposal problems and practices, and to assist States in dealing with the problem of open, burning dumps. Additionally, funding was available for the development of State solid waste management plans. By the mid 1970's, Congress recognized that the careless disposal of waste products was contaminating surface and groundwater and contributing to air pollution. In order to combat the problem, Congress virtually rewrote the Solid Waste Disposal Act and created the Resource Conservation and Recovery Act (RCRA) which was passed in 1976.

The goal of RCRA is to promote the protection of health and environment and to conserve valuable material and energy resources. RCRA has kept in stride with current waste management issues and problems by way of Congressional amendments, the most notable of which occurred in 1984 with the passage of the Hazardous and Solid Waste Act Amendments (HSWA). Under one of the provisions of HSWA, Congress established the Corrective Action program. Promulgation of these regulations under RCRA sent a message to industry and the government that they were expected to remediate hazardous wastes sites at facilities they owned and operated before the EPA would allow existing hazardous waste operations to continue.

RCRA was enacted to require proper management of waste generated at existing facilities. However, incidents such as Love Canal soon made it abundantly clear that another statute was

needed to clean up the nation's abandoned hazardous waste sites.

Thus, in December 1980, Congress enacted the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). This was the first major response to the problem of abandoned waste sites throughout the nation resulting from the past improper management of hazardous wastes. In order to carry out the provisions of the law, congress authorized $1.6 billion over 5 years. The amount of money, and subsequently the law, became known as the "Superfund". EPA is responsible for managing the program, including site investigations and cleanup, and enforcement activities.

In 1986, Congress enacted the Superfund Amendments and Reauthorization Act (SARA). One of the more outstanding features of SARA was that it significantly increased the size of the Fund and strengthen the authorities under CERCLA. The passage of SARA had a considerable effect on DOD activities related to hazardous waste site remediation. With its enactment, EPA took a formal role in the DOD implementation of installation remediation activities for sites on the National Priorities List (NPL). For sites not on the NPL, SARA fundamentally requires DOD installations to comply with state removal and remedial action laws and to use the same NCP regulations for site evaluation and remediation processes as those used by other Federal and non-governmental entities.

1.2 **Purpose of the CERCLA Remedial Action Program**

CERCLA was originally enacted in an effort to remediate the country's worst abandoned hazardous waste sites. EPA may itself remediate such sites or require Potentially Responsible Parties who had contributed to the contamination at the site to effect such remediation.

1.3 **Purpose of the RCRA Corrective Action Program**

The RCRA Corrective Action program was established to remediate facilities where a current owner/operator of the facility was present and responsible for cleaning up the site.

2. Regulatory Authorities

2.1 Federal and State Regulatory Authorities for CERCLA

CERCLA is administered by the EPA. For non-governmental sites undergoing a CERCLA remediation, the EPA is the lead enforcement agency.

E.O. 12088 specifies that the DOD is the lead federal agency for its own CERCLA sites. For sites on the National Priorities List (NPL), the EPA must concur with the remedy selected by DOD. For non-NPL sites, CERCLA section 120 (a) (4) states that:

> "State laws concerning the removal and remedial action, including state laws governing enforcement, shall apply to removal and remedial action at facilities owned or operated by a department, agency, instrumentality of the United States when such facilities are <u>not</u> included on the NPL."

Hence, for federal sites not on the NPL, the state may have a removal or remedial action law that applies to the site, which must be complied with during remediation.

It should also be noted that CERCLA does not have transfer provisions as do some other laws like RCRA or the Clean Water Act (CWA). The broad authorities granted to EPA in carrying out CERCLA cannot be transferred to states. Thus, states may promulgate their own "mini" Superfund-type law, however it should be recognized that this is strictly a state law and does not preempted the authorities of EPA under CERCLA.

2.2 Federal and State Regulatory Authorities for RCRA

Unlike CERCLA, RCRA has transfer authority provisions. RCRA contains provisions for states to develop programs that are at least as stringent as the federal RCRA law. States submit their state hazardous management plan to the EPA and EPA then may grant the states varying levels of authorities based on their ability to administer RCRA. Most states currently have base RCRA authority. With each amendment of RCRA, Congress and the EPA determines if the states will automatically get the authorities to administer the respective amendment or if they will have to apply to EPA for approval for the amendments.

Since RCRA does have state transfer provisions, the project manager will have to contact the state to determine the state's RCRA authorities. The project manager can also contact the EPA for this information.

2.3 Dual Regulatory Authorities

It may be quite possible that two or more regulatory agencies have authority at the site.

For cases where the site is on the NPL, yet the EPA and state feel the site should be remediated under RCRA, the federal EPA CERCLA office and the federal/state RCRA office may want to exercise control at your site. The mutually agreed upon lines of authority should be determined early in the remediation in order to avoid conflict at a later date.

3. Overview of the CERCLA Remediation Process (See Figure 1)

3.1 Initiating a CERCLA Action

Congress required EPA to develop a list of all federal facilities that ever generated, stored, treated, disposed of or released/spilled or potential released/spilled hazardous wastes. The list, which EPA maintains, is called the Federal Facilities Docket. The NCP requires that a Preliminary Assessment and Site Inspection be performed on all federal sites that have been listed on the Federal Docket within six months of listing. Currently, Formerly Used Defense Sites (FUDS) are not routinely included on the Federal Docket. Inclusion on the Federal Docket is the most common way of Federal Facilities being brought into the CERCLA remediation process.

Another way to be brought under the CERCLA umbrella is for the EPA to issue a CERCLA section 104 order to initiate a removal action.

3.2 Overview of the CERCLA Process

Once a federal facility is listed on the docket, a Preliminary Assessment (PA) must be conducted at the facility. If, after completing the PA and consulting the NCP requirements, it is determined that further action is required, the facility must perform a Site Inspection (SI). Upon completion of the PA and SI, the EPA will numerically rank the site

utilizing the Hazard Ranking System (HRS). The resulting numerical score aids the EPA in determining whether or not the site will become a NPL site. If the site is determined to be an NPL site, no later than six months after inclusion on the NPL, the facility must initiate a Remedial Investigation and Feasibility Study. (RI/FS). The process outline in the NCP must be followed. After the RI/FS has been completed, a Record of Decision (ROD) will be signed. At this time, remedial design followed by remedial action can commence.

If the site is not an NPL site, the NCP does not require preparation of a RI/FS. For non-NPL sites, one should first determine if there are other federal regulations besides the NCP that apply to the site. A good example is if the facility has a RCRA permit. In this case, the RCRA corrective actions may be applied at the site. If you are remediating an Underground Storage Tank (UST), the UST provisions of RCRA may apply. Or, the state may have a groundwater remediation law that dictates the cleanup. In all cases where the site is non-NPL, CERCLA section 120(a) (4) states that state removal and remediation action laws apply.

If there are no state authorities that apply to the remediation of the site, then you are required to follow the NCP. (You still are not required to perform a RI/FS, but may do so due to the extent of contamination or for political reasons.) If you have at least six months to plan a remediation, you must prepare an Engineering Evaluation/Cost Analysis (EE/CA), then you can begin remediation or perform a removal action. The EE/CA can be made a part of the Plans and Specifications. If you have less than six months, you can perform a Time-Critical Removal Action and begin remediation immediately without any prior documentation. You will be required to document all actions taken at the site.

Figure 1 illustrates the process.

4. Overview of the RCRA Corrective Action Process - Figure 2

4.1 Initiating a RCRA Corrective Action

Section 3004(u) of RCRA requires that prior to permit issuance to a hazardous waste treatment, storage, or disposal facility (TSDF) corrective action for all releases of hazardous waste and constituents from solid waste management units (SWMUs) must be initiated. The provisions also allow schedules of compliance to be used in permits where the corrective

action cannot be completed prior to permit issuance.

Section 3008(h), the enforcement corrective action authority, vests broad discretion with EPA or an authorized state to compel corrective action wherever necessary to protect human health and the environment whenever EPA determines, based on any information, that there is or has been a release of hazardous wastes or constituents from an interim status TSDF.

Under the provisions of section 7003(a), EPA is authorized to mandate corrective actions in any situation where it has evidence that there is a significant problem (imminent hazard) which has resulted from past waste management practices.

4.2 Overview of the RCRA Process

RCRA corrective action provisions can be triggered when a facility decides to apply for a RCRA permit to store hazardous waste over 90 days, or to treat or dispose of hazardous waste on site. In any of these cases, the facility will submit a RCRA Permit Application to the state and/or EPA for a RCRA Part B permit.

Once the permit application has been submitted to the state or EPA, the RCRA Corrective Action process may begin. The state or EPA (whichever has RCRA authority) will perform the RCRA Facility Assessment (RFA). During the RFA the appropriate regulatory agency will identify Solid Waste Management Units (SWMUs). The agency will develop the Schedule of Compliance as well as identify action levels at this point. Action levels are those levels at which when exceeded will trigger initiation of a RCRA Facility Investigation (RFI). Once these action levels are set, the regulatory agency will draft the Part B permit. The public will have an opportunity to comment on the draft permit and associated schedule of compliance for corrective action. Once the SWMUs have been identified in the RFI, the facility will have to investigate these SWMUs in the RFI. [The RFI is analogous to the Remedial Investigation prepared under CERCLA.) Upon completion of the RFI, the Corrective Measures Study (CMS) will be initiated. (The CMS is much like the Feasibility Study under CERCLA.] The CMS will be prepared by the facility. During this time the regulatory agency will set Media Cleanup Standards (MCS). The regulatory agency will then prepare a Statement of Basis which is similar to the ROD under CERCLA. The regulatory agency does select the remedy. Once the remedy has been selected, the regulatory agency will issue a permit modification to modify the Schedule of Compliance to

incorporate the remedy. The facility will then begin remedial design, then remedial construction.

5. Comparison of the CERCLA and RCRA Programs

The investigatory procedures for CERCLA and RCRA remedial action programs are quite similar in nature. Figure 3 illustrates the similarities and differences between the actual processes.

While the steps in the remediation processes are quite similar, there are some differences in methodology:

5.1 The RCRA legislation provides a provision whereby EPA can delegate the authority for RCRA regulations to an approved state. A state so delegated then has the power to implement all programs including the Corrective Action program under RCRA. CERCLA and SARA amendments contain no state authority provision similar to RCRA. As a consequence, a state may enact a Superfund-type law whose provisions are similar to or more stringent than those of CERCLA, but the basic provisions of CERCLA will always take precedence under conditions where both apply.

5.2. The RCRA corrective action procedures usually apply to specifically identified facilities, such as TSDFs under 3004(u) and 3008(h). The application of CERCLA is much broader. Any facility on the Federal Docket is required to at least initiate the CERCLA Process through a PA/SI.

5.3 CERCLA is commonly thought of as regulating past activities while RCRA regulates the present management of hazardous wastes. While that statement is generally true, the response processes for the two statutes can overlap.

5.4 CERCLA has the NPL, with its associated formal ranking program for prioritizing work. RCRA has no comparable ranking system.

5.5 CERCLA has certain statutory preferences regarding the selection of remedies that are not included in RCRA. For example, CERCLA has a built-in preference for permanent remedies and requires that the remedies comply with ARARs. RCRA has no comparable requirements.

5.6 One of the remedy selection criteria under CERCLA is cost. Cost is not a factor when selecting a remedy under RCRA.

5.7 Section 121 of CERCLA establishes permit provisions for CERCLA remediation. There are no such permit provisions under RCRA.

5.8 There is no statutory preference for an onsite remedy under RCRA as there is under CERCLA. The appropriate regulatory agency will choose the final remedy at a federal facility under RCRA. The federal facility chooses the remedy under CERCLA with full concurrence from the EPA.

5.9 The way in which cleanup levels are set differ. RCRA establishes two levels; the action level and the media cleanup standards (MCS). The action level is the level at which corrective actions are required if this level is exceeded. The MCS is an EPA/State established cleanup standard that must be achieved during the Corrective Measures Implementation (CMI). Under CERCLA the cleanup levels are set on a case-by-case basis through risk analysis and ARARs review. The levels are typically decided among all parties, and may not necessarily be consistent from site-to-site or from state-to-state.

5.10 There is no public comment period related directly to the RCRA investigation process. However, all Part B permit modifications go to public comment. So, the corrective action public participation requirements are met at this time.

6. Pitfalls in Choosing a Remediation Process

In determining under which particular process to remediate a site, several non-tangible factors must also be taken into consideration such as the potential threat to the environment, health and safety concerns, response time, public perception, etc.

6.1 Non-NPL RI/FS

As discussed above, an RI/FS is not necessarily required on non-NPL sites. On non-NPL sites, CERCLA section 120 (a) (4) states that "state remedial/removal action laws and regulations apply." However, in the event there are no state removal/remedial action laws that apply, and there is suf-

ficient contamination, the project manager may choose to perform a CERCLA RI/FS in order to investigate the site. Also, at sites where there is much public participation, the project manager may choose to execute a RI/FS and all the associated public participation requirements.

6.2 Mini-RI/PB

There is no regulatory provision for a “mini-RI/FS”. If the site is non-NPL and one still wants to perform a RI/FS, the RI/FS should be performed under the auspices of the NCP. If one seeks to scale down the effort, it is recommended that an EE/CA be performed in lieu of an RI/FS assuming there are no state removal/remedial action authorities that apply. There is no such thing as a "mini-RI/FS".

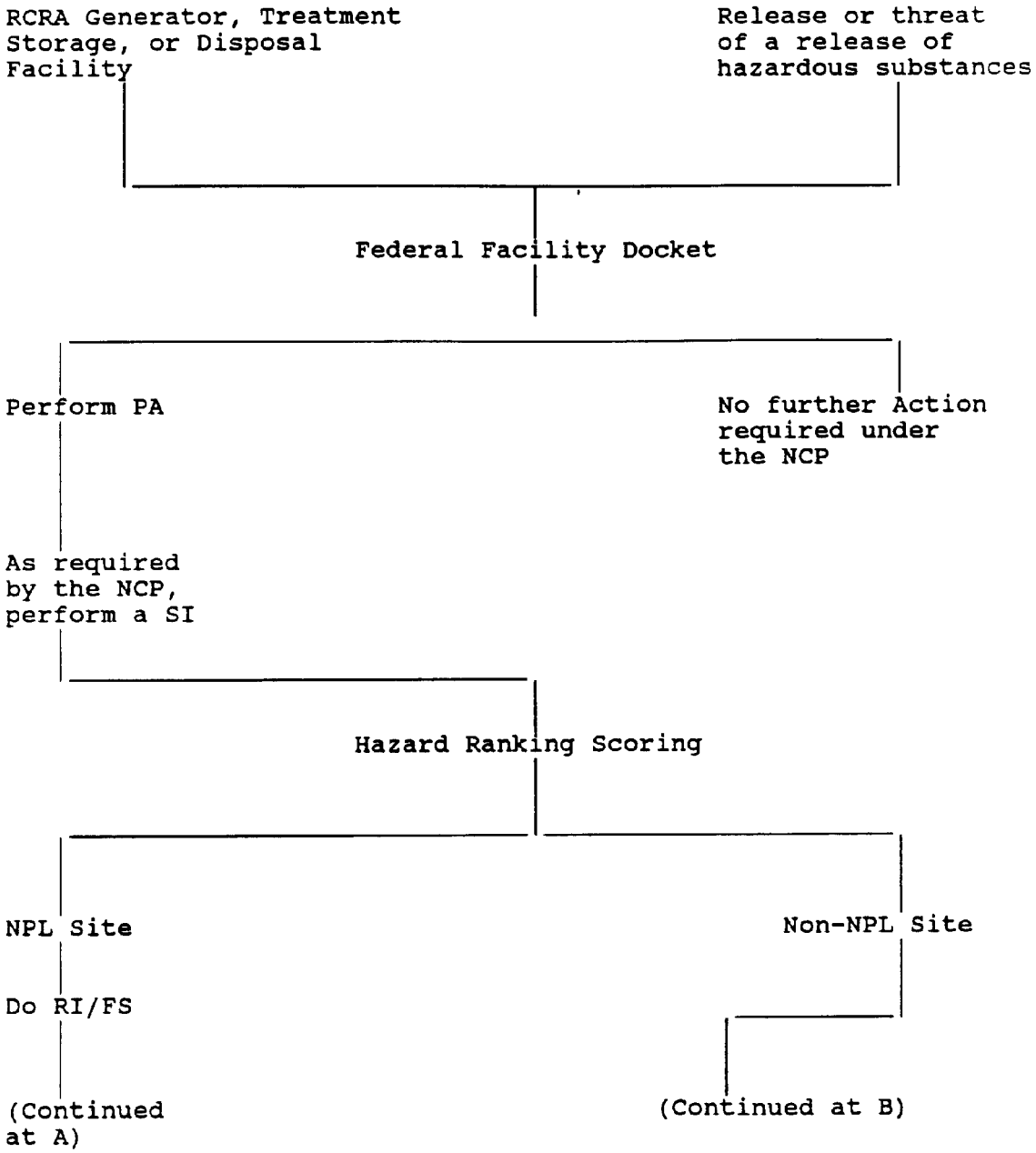
6.3 Petroleum Contaminated Sites

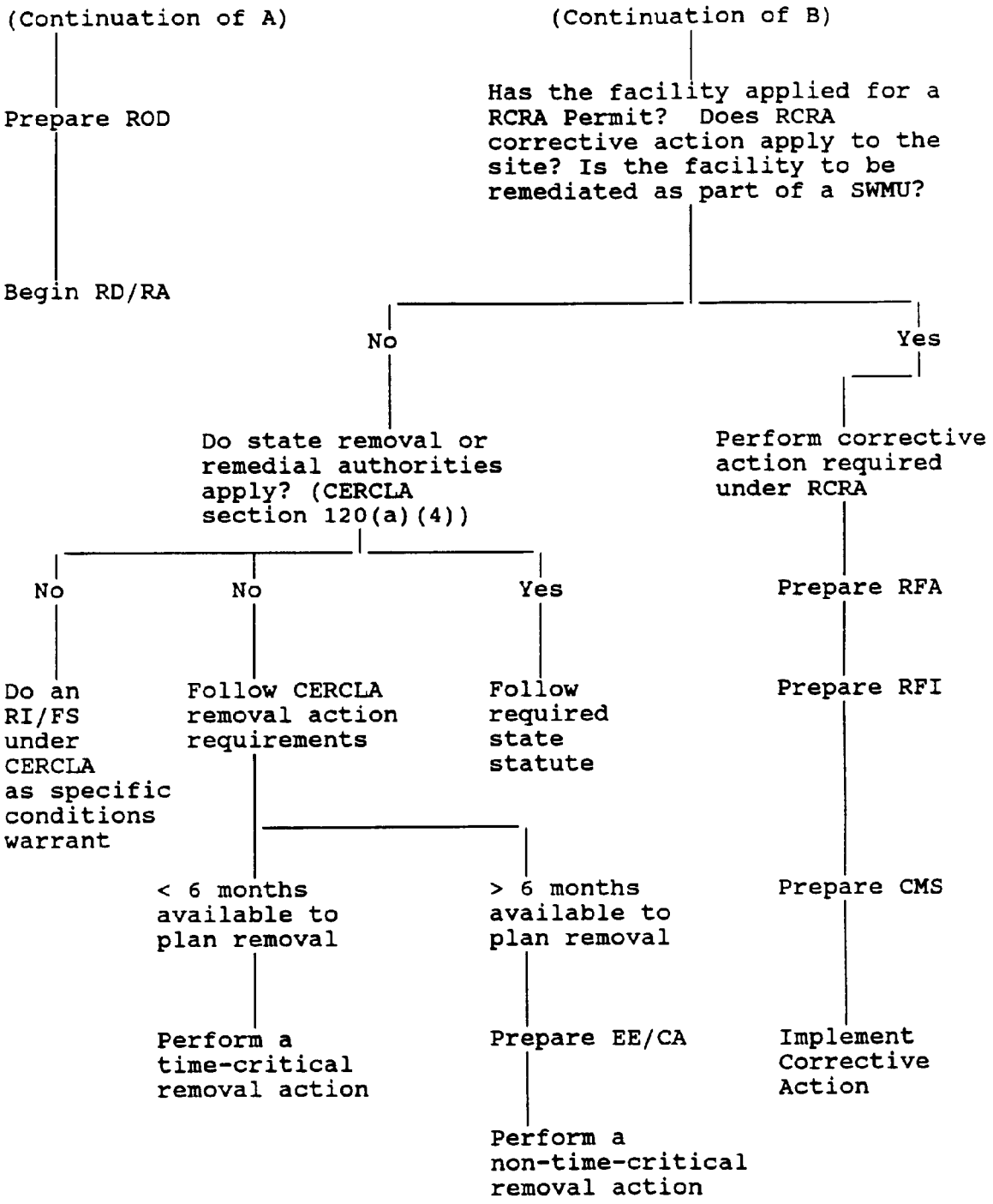
CERCLA specifically excludes petroleum products and constituents thereof from the definition of a hazardous substance. Hence, if the contamination is solely petroleum, the site should be remediated under a different authority than CERCLA. One should look at state groundwater regulations, underground storage tank regulations and possibly hazardous waste regulations for alternative remediation processes.

7. Summary

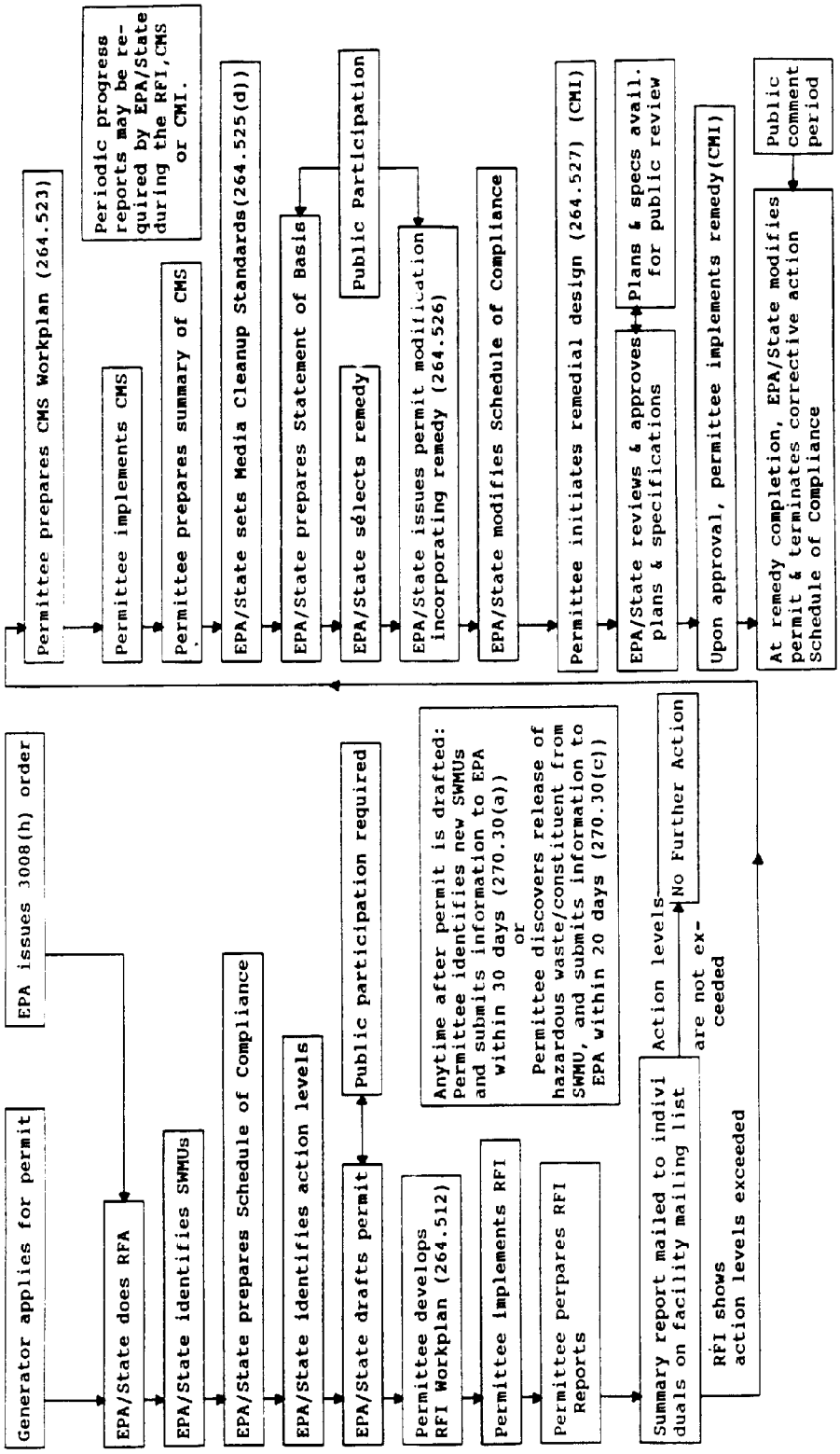
The RCRA and CERCLA remediation processes are both complex means to investigate and remediate HTRW sites. Each process has its specific applicability. When planning a remediation project, the first best step is to meet with all applicable federal, state and local regulators to develop a project plan which considers all regulatory authorities. This meeting and the results should be negotiated and formalized into an agreement.

The RCRA & CERCLA Processes
Figure 2.

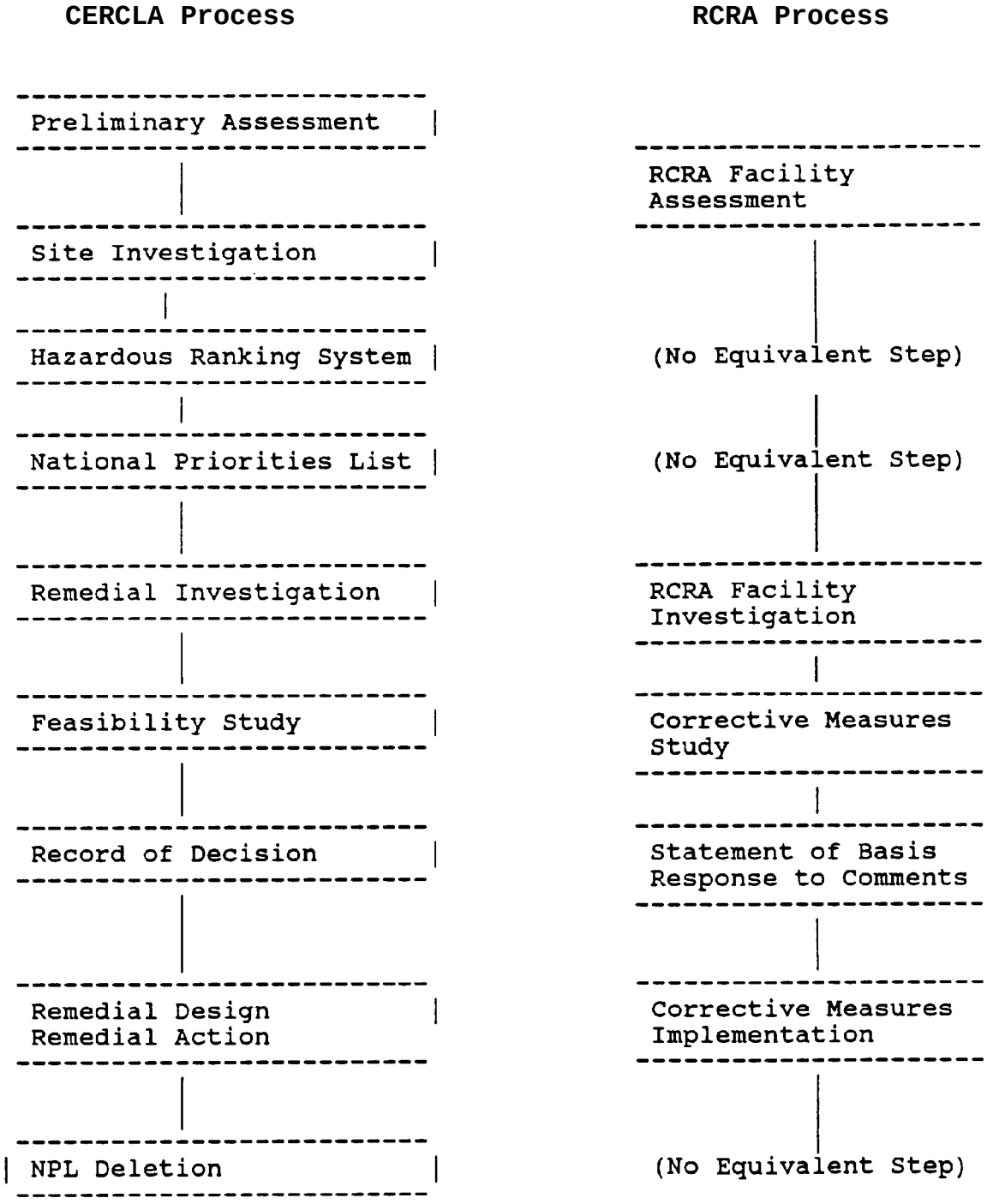



(Continuation of A)
Prepare ROD
Begin RD/RA
(Continuation of B)
Has the facility applied for a RCRA Permit? Does RCRA corrective action apply to the site? Is the facility to be remediated as part of a SWMU?
No
Yes
Do state removal or remedial authorities apply? (CERCLA section 120(a)(4))
Perform corrective action required under RCRA
No
No
Yes
Prepare RFA
Do an RI/FS under CERCLA as specific conditions warrant
Follow CERCLA removal action requirements
Follow required state statute
Prepare RFI
< 6 months available to plan removal
> 6 months available to plan removal
Prepare CMS
Perform a time-critical removal action
Prepare EE/CA
Implement Corrective Action
Perform a non-time-critical removal action

The RCRA Corrective Action Process
Figure 2



Comparison of the CERCLA and RCRA Process
Figure 3



AIR PATHWAY ASSESSMENT

This enclosure provides general information related to air pathway assessments. An air pathway assessment is not a separate task but is an integral part of investigations and studies. Team members that should be involved in scoping aspects of air pathway assessments include the chemist, industrial hygienist, air modeler, risk assessor, process engineer, and possibly a meteorologist. Sources of additional guidance and information are listed at the end of this enclosure.

Definition of Air Pathway Assessment (APA):

An air pathway assessment (APA) is a systematic evaluation of the potential or actual effects on air quality of an emission source such as a hazardous waste site. The APA may involve modeling or monitoring to estimate these effects. The primary components of an APA are:

- characterization of air emission sources;
- determination of the effects of atmospheric processes such as transport and dilution; and
- evaluation of the exposure potential at receptors of interest.

Why APA's are necessary:

During site characterization activities, all contaminant migration pathways, including groundwater, surface water, direct contact, and air, are to be evaluated. Often, air pathways are overlooked because baseline emissions at undisturbed sites may be almost imperceptible and air pathways do not appear significant. Even low-level emissions may be of concern if toxic or carcinogenic compounds are present. Due to the type of activities, emissions during site remediation are often much higher than baseline emissions. Failure to perform an adequate air pathway assessment may result in an underestimate of the risk from the site and possibly work stoppages, cost increases and public relation problems during remediation.

Goals of APA:

The overall goal of an air pathway assessment is to evaluate the site's actual or potential effects on air quality. Specific goals are to evaluate the exposure of on-site workers, the exposure of the off-site populace, or to evaluate environmental impacts.

APA Activities:

Activities associated with air pathway assessments may be necessary during all phases of investigations, studies, designs, and remedial actions. Typical activities at hazardous waste sites can be divided into the following four categories:

1) Qualitative (screening) evaluation of site emissions and impacts on air quality under baseline or undisturbed conditions;

2) Quantitative evaluation of site emissions and their effect on air quality under baseline or undisturbed conditions;

3) Quantitative evaluation of emissions and their effect on air quality from pilot-scale remediation activities;

4) Quantitative evaluation of the effects on air quality of full-scale remediation activities.

Although this scope guidance does not address design activities directly, the intent is to provide adequate information to select the best remedial alternative and perform the subsequent design. Evaluation of potential impacts of full-scale remediation activities on air quality may have significant implications when evaluating costs and implementability of alternatives.

As an aid to team members, air pathway assessment activities typically performed during various stages of investigations and studies are briefly described below:

APA activities during CERCLA Site Inspections (SI) and RCRA Facility Assessments (RFA):

Goal: Demonstrate what emissions, if any, are coming from the site and what areas may be affected by these emissions.

Monitoring: Surveys of site emissions to 1) determine worker exposure, 2) determine general levels of pollutants present in ambient air, and 3) identify any emission "hot spots."

Modeling (if any): Screening study to determine areas of maximum impact from site emissions. Results are used to aid in design of an ambient air monitoring network for subsequent phases and to determine whether an emergency response action is warranted.

APA activities during CERCLA Remedial Investigations (RI) and RCRA Facility Investigations (RFI):

Goal: Obtain a more detailed knowledge of the potential air contaminants that are present and determine the risk potential of the site (to on-site workers and off-site receptors).

Monitoring: Similar to monitoring described under SI/RFA but speciation of compounds and location of emission sources are studied in greater detail. Involves fenceline ambient air monitoring at undisturbed sites to determine background concentrations of airborne contaminants and ambient air monitoring just downwind of the emission source to develop emission rate or flux estimates, also monitoring to determine the exposure of on-site workers.

Modeling: Performed as part of the fate and transport analysis and for use in the baseline risk assessment or as an aid in siting an ambient air monitoring network.

APA activities during CERCLA Feasibility Studies (FS) and RCRA Corrective Measures Studies (CMS):

Goal: As the possible remediation alternatives are developed and evaluated, determine emission rates that will probably be encountered during the remedial action.

Monitoring: Performed to investigate emission rates from various remedial activities and alternatives. If pilot scale tests are performed, emission rates may be measured to assist in evaluating impacts from full scale operations.

Modeling: Performed as part of the detailed analysis of alternatives to evaluate the air impacts from full-scale remedial activities or as an aid in siting an ambient air monitoring network.

Sources of Information

Much of the information presented in this enclosure has been summarized from an EPA guidance document, "Air/Superfund National Technical Guidance Study Series, Volume I - Overview of Air Pathway Assessments for Superfund Sites (Revised)", EPA-450/l-89-001a. This is one in a series of manuals dealing with air pathway assessments for hazardous waste sites. Team members involved in air pathway assessments are urged to utilize this guidance document. It contains an

excellent summary of sources of information and guidance for APA work. Some of the topics included are:

- Ambient air monitoring
- Meteorological monitoring
- Emission Rate measurements
- Emission Rate estimates
- Atmospheric dispersion modeling

For in depth information about these topics team members are urged to consult available sources of current information outlined in Volume I.

CHECKLIST FOR REVIEW OF WORKPLANS

****
This is a checklist for the project hydrogeologist to use during review of the plans for drilling and sampling at hazardous and toxic waste sites. The checklist represents a general list of considerations for typical projects; not all items are always appropriate.
****

OBJECTIVES

General

1. Are objectives of sampling clear? Y___N___N/A___

2. Is rationale for sampling locations and analyses presented? Y___N___N/A___

3. Is overall level of effort consistent with objectives? Y___N___N/A___

4. Are all media addressed which are involved in objectives? Y___N___N/A___

5. All obvious data gaps are addressed? Y___N___N/A___

6. Is the potential for other sources addressed? Y___N___N/A___

Ground Water

1. Are upgradient wells included? Y___N___N/A___

2. Will well locations address the plume's horizontal extent? Y___N___N/A___

3. Do well locations address determination of vertical extent/gradients? Y___N___N/A___

4. Are samples taken for screen slot size design? Y___N___N/A___

5. Does the Plan address TDS/cations/anions? Y___N___N/A___

6. Are existing production wells utilized? Y___N___N/A___

Soils

1. Are background concentrations addressed? Y___N___N/A___

2. Are the soil sampling depths adequate to define vertical extent? Y___N___N/A___

3. Are the soil sampling locations adequate to determine lateral extent? Y___N___N/A___

4. Are soil samples taken for geotechnical analyses? Y___N___N/A___

5. Are soil geotech testing requirements specified? Y___N___N/A___

6. Are soil TOC values addressed? Y___N___N/A___

SITE BACKGROUND

General

1. Is regional geology presented (stratigraphy)? Y___N___N/A___

2. Is regional hydrogeology presented? Y___N___N/A___

3. Is climate/precipitation/evaporation presented? Y___N___N/A___

4. Are previous sampling points shown on maps? Y___N___N/A___

5. Is an adequate site history presented?
   Include: Y___N___N/A___
   dates of use? Y___N___N/A___
   chemicals used? Y___N___N/A___
   locations of use/disposal? Y___N___N/A___

6. Have air photos been used? Y___N___N/A___

7. Is a good site location map presented? Y___N___N/A___

Ground Water

1. Are ground water contours presented or

depth to water presented? Y___N___N/A___

2. Are estimates of permeability given? Y___N___N/A___

3. Are vertical gradients discussed? Y___N___N/A___

4. Are previous well sampling results presented? Y___N___N/A___

5. Are water concentrations given graphically? Y___N__N/A___

6. Are existing production wells known? Y___N___N/A__

7. Is relationship between aquifer(s) being investigated and other (shallow or deep) aquifers described? Y___N___N/A__

Soils

1. Are previous soil sampling results presented? Y___N___N/A___

2. Are results given graphically? Y___N___N/A___

Organization

1. Are project personnel listed? Y___N___N/A___

2. Are project responsibilities defined? Y___N___N/A___

3. Will a geologist/geotechnical engineer be on site for logging and well installation? Y___N___N/A___

IMPLEMENTATION

General

1. Is the drilling method specified? Y___N___N/A___

2. Are field monitoring equipment calibration procedures addressed? Y___N___N/A___

3. Are sampling utensils to be decontaminated between samples? Y___N___N/A___

4. Is auger/drill stem and rig to be decontaminated between holes? Y___N___N/A___

5. Are sample numbers explained adequately? Y___N___N/A___

6. Are QA/QC samples taken and will they to be blind to the analyst? Y___N___N/A___

7. Are samples properly labelled and packaged? * * Y___N___N/A___

8. Are chain-of-custody procedures adequately defined? Y___N___N/A___

9. Does the plan indicate adequate amounts of ice? Y___N___N/A___

10. Is disposal for wastes generated during drilling or sampling operations adequately addressed? Y___N___N/A___

11. Is an equipment list provided for field crew? Y___N___N/A___

Drilling and Soils Sampling

1. Are duplicate soils samples taken in an appropriate manner to give representative data? Y___N___N/A___

2. Is field screening done consistently? Y___N___N/A___

3. Are volatiles samples taken first and not composited or homogenized? Y___N___N/A___

4. Are wide mouth jars used for soils? Y___N___N/A___

5. Is settlement of sandy soils in the jars addressed? Y___N___N/A___

6. Are stainless steel split spoons used? Y___N___N/A___

7. Are borings properly abandoned/decommissioned? Y___N___N/A___

8. Are rock core to be properly boxed and photographed? Y___N___N/A___

9. Are core logging parameters described? Y___N___N/A___

10. Will boring/sampling location coordinates be determined by survey? Y___N___N/A___

Well Installation

1.	Is screen placement consistent with contaminant type?	Y___N___N/A___
2.	Are slug tests planned (no water added?)?	Y___N___N/A___
3.	Is data reduction methodology described for slug tests/pump test?	Y___N___N/A___
4.	Are screen and casing materials compatible with the contaminant type?	Y___N___N/A___
5.	Filter pack extend 2-3' above the screen?	Y___N___N/A___
6.	Bentonite seal to be adequately hydrated or fine sand placed to prevent grout intrusion?	Y___N___N/A___
7.	Screen slot size appropriate for the site?	Y___N___N/A___
8.	Casing/screen joined properly?	Y___N___N/A___
9.	Is there a minimum of 2" of annular space all around screen?	Y___N___N/A___
10.	Is casing schedule adequate for anticipated pressures/tension in installation?	Y___N___N/A___
11.	Is grout placed appropriately and to the proper level?	Y___N___N/A___
12.	Are wells to be developed by surging or bailing?	Y___N___N/A___
13.	Is an amount of water equal to water loss to be removed in development?	Y___N___N/A___
14.	Will post-development well water be photographed?	Y___N___N/A___
15.	Are the wells adequately protected?	Y___N___N/A___
16.	Are locks keyed alike?	Y___N___N/A___
17.	Are there internal mortar collar and drain	

holes in protective casing? Y___N___N/A___

18. Are well abandonment procedures described? Y___N___N/A___

19. Is well sump provided? (sump not recommended) Y__N__N/A__

20. Is the concrete/gravel pad described and adequate? Y___N___N/A___

21. Are the wells coordinates and elevations determined? Y___N___N/A___

Well Sampling

1. Is purging pump-bailer type specified? Y___N___N/A___

2. Is purge volume reasonable and calculated correctly? Y___N___N/A___

3. Is the stagnant water above the top of the screen adequately purged? Y___N___N/A___

4. Is sampling pump/bailer described? Y___N___N/A___

5. Is water level taken before purging? Y___N___N/A___

6. Is floating product measurement technique described? Y___N___N/A___

7. Are water levels taken in a single round? Y___N___N/A___

8. Are sample preservatives clearly described? Y___N___N/A___

REPORTING

1. Are boring log forms shown (preference for COE)? Y___N___N/A___

2. Are logs to be presented at adequate scale? Y___N___N/A___

3. Are all standard parameters to be recorded? Y___N___N/A___

4. Is a hard bound log book kept? Y___N___N/A___

5.	Are geotechnical transmittals described?	Y___N___N/A___
6.	Are daily quality control reports described?	Y___N___N/A___
7.	Are chain of custody forms described?	Y___N___N/A___
8.	Are all sampling points adequately surveyed and mapped?	Y___N___N/A___
9.	Are sample well construction diagrams provided?	Y___N___N/A___
10.	Are all proper well installation details to be shown?	Y___N___N/A___
11.	Are sample well development forms given?	Y___N___N/A___
12.	Any provisions for data management (data base for site data)?	Y___N___N/A___

GENERAL

1.	Do figures have scale, north arrow?	Y___N___N/A___
2.	Is a table of contents provided?	Y___N___N/A___
3.	Has the work plan met all requirements of the scope-of-work?	Y___N___N/A___

**According to the Sample Handling Protocol in ER 1110-1-263

SUMMARY OF ACRONYMS

ACRONYM	DEFINITION
** A	
A-E	ARCHITECT ENGINEER
AA	ATOMIC ABSORPTION
AA	ASSISTANCE ADMINISTRATOR (EPA TERMINOLOGY)
AAL	ACCEPTABLE AMBIENT LEVELS
AAR	ASSOCIATION OF AMERICAN RAILROADS
ACE	U.S. ARMY CORPS OF ENGINEERS (EPA TERMINOLOGY)
ACE	ASSISTANT CHIEF OF ENGINEERS
ACGIH	THE AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS
ACS	AMERICAN CHEMICAL SOCIETY
AEHA	ARMY ENVIRONMENTAL HYGIENE AGENCY
AF	AIR FORCE
AHERA	ASBESTOS HAZARD EMERGENCY RESPONSE ACT
AICE	AMERICAN INSTITUTE OF CHEMICAL ENGINEERS
AIHA	AMERICAN INDUSTRIAL HYGIENE ASSOCIATION
AIPP	AMERICAN INSTITUTE OF POLLUTION PREVENTION
AMC	ARMY MATERIAL COMMAND
AMPRS	AUTOMATED MANAGEMENT AND PROGRESS REPORTING SYSTEM
ANPRM	ADVANCE NOTICE OF PROPOSED RULEMAKING
AOAC	ASSOCIATION OF OFFICIAL ANALYTICAL CHEMISTS
API	AMERICAN PETROLEUM INSTITUTE
AQCR	AIR QUALITY CONTROL REGION
ARAR	APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
ARCS	ALTERNATIVE REMEDIAL CONTRACTS STRATEGY (EPA TERMINOLOGY)
ASA(CW)	ASSISTANT SECRETARY OF THE ARMY FOR CIVIL WORKS
ASD	ASSISTANT SECRETARY OF DEFENSE
AST	ABOVE-GROUND STORAGE TANK
ASTM	AMERICAN SOCIETY FOR TESTING AND MATERIALS
ATA	AMERICAN TRUCKING ASSOCIATIONS
ATS	ACTION TRACKING SYSTEM
ATSDR	AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY
AWQC	AMBIENT WATER QUALITY CRITERIA
** B	
BAT	BEST AVAILABLE TECHNOLOGY
BD	BASE DETONATING (ORDNANCE)
BD/BR	BUILDING DEMOLITION/DEBRIS REMOVAL
BFB	BROMFLUOROBENZENE
BIP	BLOW-IN-PLACE (ORDNANCE)

BOD	BIOCHEMICAL OXYGEN DEMAND
BCE	BUREAU OF EXPLOSIVES
BTU	BRITISH THERMAL UNIT

** C

CA	COOPERATIVE AGREEMENT
CAA	CLEAN AIR ACT
CADD	COMPUTER AIDED DESIGN AND DRAFTING
CAER	COMMUNITY AWARENESS AND EMERGENCY RESPONSE
CAM	CONTINUOUS AIR MONITORS
CAMU	CORRECTIVE ACTION MANAGEMENT UNIT
CAR	CORRECTIVE ACTION REQUEST
CAS	CHEMICAL ABSTRACTS SERVICE
CBD	COMMERCE BUSINESS DAILY
CD	CONSENT DECREE
CDAP	CHEMICAL DATA ACQUISITION PLAN
CDC	CENTERS FOR DISEASE CONTROL
CDQM	CHEMICAL DATA QUALITY MANAGEMENT
CECERL	CONSTRUCTION ENGINEERING RESEARCH LABORATORY
CECW-EG	U.S.ARMY CORPS OF ENGINEERS, DIRECTORATE OF CIVIL WORKS, GEOTECH & MATERIALS BRANCH
CESO-ZA	U.S.ARMY CORPS OF ENGINEERS, SAFETY & OCCUP HEALTH OFFICE
CEHND	U.S.ARMY CORPS OF ENGINEERS, HUNTSVILLE DIVISION
CEMP-R	U.S.ARMY CORPS OF ENGINEERS, DIRECTORATE OF MILITARY PROGRAMS, ENVIRON RESTORATION DIV
CEMRD	U.S.ARMY CORPS OF ENGINEERS, MISSOURI RIVER DIVISION
CEPP	CHEMICAL EMERGENCY PREPAREDNESS PROGRAM
CERCLA	COMPR ENVIRON RESPONSE, COMPENS & LIAB ACT OF 1980 (SUPERFUND)
CERCLIS	CERCLA INFORMATION SYSTEM
CETHAMA	U.S. ARMY CORPS OF ENGINEERS TOXIC & HAZARDOUS MATLS AGENCY (NOW ARMY ENVIRONMENTAL CENTER)
CEWES	WATERWAYS EXPERIMENT STATION
CFC	CHLOROFLUOROCARBON
CFR	CODE OF FEDERAL REGULATIONS
CIH	CERTIFIED INDUSTRIAL HYGIENIST
CLP	CONTRACT LABORATORY PROGRAM
CMA	CHEMICAL MANUFACTURERS ASSOCIATION
CMS	CORRECTIVE MEASURES STUDY
OMS	CASE MANAGEMENT SYSTEM
CO	CONTRACTING OFFICER
CCC	CHAIN OF CUSTODY
COE	U.S. ARMY CORPS OF ENGINEERS
CQAR	CHEMICAL QUALITY ASSURANCE REPORT
CQCP	CONTRACTOR QUALITY CONTROL PLAN
CRDL	CONTRACT REQUIRED DETECTION LIMIT
CRP	COMMUNITY RELATIONS PLAN

CRQL	CONTRACT REQUIRED QUANTITATION LIMIT
CRT	CATHODE RAY TUBE
CWA	CLEAN WATER ACT OF 1972
CWE	CURRENT WORKING ESTIMATE
CWTI	CHEMICAL WASTE TRANSPORTATION INSTITUTE
** D	
DASD(E)	DEPUTY ASSISTANT SECRETARY OF DEFENSE, ENVIRONMENT
DERA	DEFENSE ENVIRONMENTAL RESTORATION ACCOUNT
DERP	DEFENSE ENVIRONMENTAL RESTORATION PROGRAM
DESOH	DEPUTY ASST SECY OF THE ARMY FOR ENVIR, SAFETY & OCCUP HEALTH
DFTPP	DECAFLUOROTRIPHENYLPHOSPHINE
DNAPLS	DENSE NON-AQUEOUS PHASE LIQUIDS
DOD	U.S. DEPARTMENT OF DEFENSE
DOE	U.S. DEPARTMENT OF ENERGY
DOI	U.S. DEPARTMENT OF THE INTERIOR
DOL	U.S. DEPARTMENT OF LABOR
DOT	U.S. DEPARTMENT OF TRANSPORTATION
DPM	DEFENSE PRIORITY MODEL
DQO	DATA QUALITY OBJECTIVES
DQCR	DAILY QUALITY CONTROL REPORT
DRE	DESTRUCTION AND REMOVAL EFFICIENCY
DSMOA	DEFENSE-STATE MEMORANDA OF AGREEMENTS
** E	
EA	ENDANGERMENT ASSESSMENT
EDF	ENVIRONMENTAL DEFENSE FUND
EE/CA	ENGINEERING EVALUATION/COST ANALYSIS
EED	ELECTROEXPLOSIVE DEVICE
EERU	ENVIRONMENTAL EMERGENCY RESPONSE UNIT (EPA TERMINOLOGY)
EFARS	CORPS OF ENGINEERS FEDERAL ACQUISITION REGULATION SUPPLEMENT
EHS	EXTREMELY HAZARDOUS SUBSTANCES
EM	ELECTROMAGNETIC
EMSL	U.S. EPA ENVIRONMENTAL MONITORING SYSTEMS LABORATORY
EO	EXECUTIVE ORDER
EO	EXPLOSIVE ORDNANCE
EOC	EMERGENCY OPERATING CENTER
EOD	EXPLOSIVE ORDNANCE DISPOSAL
EP	EXTRACTION PROCEDURE
EP TOXIC	EXTRACTION-PROCEDURE TOXICITY
EPA	U.S. ENVIRONMENTAL PROTECTION AGENCY
ER	ENGINEERING REGULATION
ERCS	EMERGENCY RESPONSE CLEANUP SERVICES (EPA TERMINOLOGY)
ERD	EMERGENCY RESPONSE DIVISION (EPA TERMINOLOGY)
ERA	EXPEDITED RESPONSE ACTION
ERNS	EMERGENCY RESPONSE NOTIFICATION SYSTEM (EPA

	TERMINOLOGY)
ERT	ENVIRONMENTAL RESPONSE TEAM (EPA TERMINOLOGY)
ESAT	ENVIRONMENTAL SERVICES ASSISTANCE TEAM (EPA TERMINOLOGY)
ESD	ENVIRONMENTAL SERVICES DIVISION
** F	
FAD	FUNDING AUTHORIZATION DOCUMENT
FAR	FEDERAL ACQUISITION REGULATIONS
FDE	FINDINGS AND DETERMINATION OF ELIGIBILITY
FEMA	FEDERAL EMERGENCY MANAGEMENT AGENCY
FFA	FEDERAL FACILITIES AGREEMENT
FFP	FIRM FIXED PRICE
FHA	FEDERAL HIGHWAY ADMINISTRATION
FIFRA	FEDERAL INSECTICIDE, FUNGICIDE AND RODENTICIDE ACT
FID	FLAME IONIZATION DETECTOR
FIT	FIELD INVESTIGATION TEAM (EPA TERMINOLOGY)
FR	FEDERAL REGISTER
FRA	FEDERAL RAILROAD ADMINISTRATION
FS	FEASIBILITY STUDY
FSP	FIELD SAMPLING PLAN
FTA	FRACTURE TRACE ANALYSIS
FTC	FEDERAL TRADE COMMISSION
FTE	FULLTIME EQUIVALENT
FUDS	FORMERLY USED DEFENSE SITE
FY	FISCAL YEAR
** G	
GAD	GRANTS ADMINISTRATION DIVISION (EPA TERMINOLOGY)
GAO	GOVERNMENT ACCOUNTING OFFICE
GC	GAS CHROMATOGRAPH
GC/MS	GAS CHROMATOGRAPHY/MASS SPECTROMETER
GDQM	GEOTECHNICAL DATA QUALITY MANAGEMENT
GLP	GOOD LABORATORY PRACTICES
GOB	GRANTS OPERATION BRANCH (EPA TERMINOLOGY)
GPR	GROUND PENETRATING RADAR
GSA	GENERAL SERVICES ADMINISTRATION
** H	
HAZMAT	HAZARDOUS MATERIALS
HDPE	HIGH DENSITY POLYETHYLENE
HE	HIGH EXPLOSIVE
HEAT	HIGH EXPLOSIVE ANTITANK
HHS	U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
HIT	HAZARDOUS INFORMATION TRANSMISSION
HMAC	HAZARDOUS MATERIALS ADVISORY COUNCIL
HMCRI	HAZARDOUS MATERIALS CONTROL RESEARCH INSTITUTE
HMTA	HAZARDOUS MATERIALS TRANSPORTATION ACT

HND	HUNTSVILLE DIVISION
HQUSACE	HEADQUARTERS, U.S. ARMY CORPS OF ENGINEERS
HRS	HAZARDOUS RANKING SYSTEM
HSCD	HAZARDOUS SITE CONTROL DIVISION
HSDA	HEALTH AND SAFETY DESIGN ANALYSIS
HSWA	HAZARDOUS AND SOLID WASTE AMENDMENTS
HTRW	HAZARDOUS, TOXIC & RADIOACTIVE WASTE
HTRW-MCX	HAZARDOUS, TOXIC & RADIOACTIVE WASTE MANDATORY CENTER OF EXPERTISE
HTW	HAZARDOUS & TOXIC WASTE
HWERL	U.S. EPA HAZARDOUS WASTE ENGINEERING RESEARCH LABORATORY
HWTC	HAZARDOUS WASTE TREATMENT COUNCIL
** I	
lAG	INTERAGENCY AGREEMENT
IATA	INTERNATIONAL AIR TRANSPORT ORGANIZATION
ICAO	INTERNATIONAL CIVIL AVIATION ORGANIZATION
ICP	INDUCTIVELY COUPLED PLASMA
ICS	INCIDENT COMAAND SYSTEM
ID	INSIDE DIAMETER
IDLH	IMMEDIATELY DANGEROUS TO LIFE AND HEALTH
IDO	INDEFINITE DELIVERY ORDER
IDTC	INDEFINITE DELIVERY TYPE CONTRACT
IDW	INVESTIGATION DERIVED WASTE
lED	IMPROVISED EXPLOSIVE DEVICES
IFB	INVITATION FOR BIDS
IG	OFFICE OF THE INSPECTOR GENERAL
IH	INDUSTRIAL HYGIENIST
IND	IMPROVISED NUCLEAR DEVICES
IP	INSTRUMENT PROCEDURE
IPR	INVENTORY PROJECT REPORT
IRP	INSTALLATION RESTORATION PROGRAM
ITA	INNOVATIVE TECHNOLOGY ADVOCATE
** K	
KIC	KEY INDICATOR COMPOUND
** L	
LCCA	LEAD CONTAMINATION CONTROL ACT
LCPM	LIFE CYCLE PROJECT MANAGEMENT
LCS	LABORATORY CONTROL SAMPLE
LEL	LOWER EXPLOSIVE LIMIT
LEPC	LOCAL EMERGENCY PLANNING COMMITTEE
LIR	LINE ITEM REVIEW
LOIS	LOSS OF INTERIM STATUS
LUST	LEAKING UNDERGROUND STORAGE TANKS

** M

MCL	MAXIMUM CONTAMINANT LEVEL
MCLG	MAXIMUM CONTAMINANT LEVEL GOALS
MCS	MEDIA CLEANUP STANDARD
MEK	METHYL ETHYL KETONE
MFR	MEMORANDUM FOR RECORD
MOA	MEMORANDUM OF AGREEMENT
MOU	MEMORANDUM OF UNDERSTANDING
MPC	MAXIMUM PERMISSIBLE CONCENTRATION
MRD	MISSOURI RIVER DIVISION
MS	MASS SPECTROGRAPH
MS	MATRIX SPIKE
MSD	MATRIX SPIKE DUPLICATE
MSDS	MATERIAL SAFETY DATA SHEET
MSHA	MINE SAFETY AND HEALTH ADMINISTRATION
MSL	MEAN SEA LEVEL
MSW	MUNICIPAL SOLID WASTE
MT	MECHANICAL TIME (ORDNANCE)
MTSQ	MECHANICAL TIME SUPERQUICK (ORDNANCE)
MWIP	MONITORING WELL INSTALLATION PLAN
MWTA	MEDICAL WASTE TRACKING ACT OF 1988

** N

NAAQS	NATIONAL AMBIENT AIR QUALITY STANDARDS
MBS	NATIONAL BUREAU OF STANDARDS
NCP	NATIONAL CONTINGENCY PLAN
NEIC	NATIONAL ENFORCEMENT INVESTIGATION CENTER
NEPA	NATIONAL ENVIRONMENTAL POLICY ACT
NESHAP	NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS
NETAC	NATIONAL ENVIRONMENTAL TECHNOLOGY APPLICATIONS CORP.
NIMBY	NOT IN MY BACKYARD
NIOSH	NATIONAL INSTITUTE OF OCCUPATIONAL SAFETY AND HEALTH
NOAA	NATIONAL OCEANOGRAPHIC AND ATMOSPHERIC ADMINISTRATION
NPDES	NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM
NPL	NATIONAL PRIORITIES LIST
NPRM	NOTICE OF PROPOSED RULEMAKING
NRC	U.S. NUCLEAR REGULATORY COMMISSION
NRC	NATIONAL RESPONSE CENTER
NRDC	NATIONAL RESOURCES DEFENSE COUNCIL
NRT	NATIONAL RESPONSE TEAM
NSF	NATIONAL SCIENCE FOUNDATION
NSF	NATIONAL STRIKE FORCE
NSSS	NATIONAL SEWAGE SLUDGE SURVEY
NSWMA	NATIONAL SOLID WASTE MANAGEMENT ASSOCIATION
NTP	NATIONAL TOXICOLOGY PROGRAM
NWA	NATIONAL WATER ALLIANCE

** 0

O&M	OPERATION AND MAINTENANCE
OERR	OFFICE OF EMERGENCY AND REMEDIAL RESPONSE
OEW	ORDNANCE AND EXPLOSIVE WASTE
OEX MCX	ORDNANCE AND EXPLOSIVE WASTE MANDATORY CENTER OF EXPERTISE
OHMTADS	OIL AND HAZARDOUS MATERIAL TECHNICAL ASSISTANCE DATA SYSTEM
0MB	OFFICE OF MANAGEMENT AND BUDGET
OOASO(E)	OFFICE OF THE DEPUTY ASST SECY OF DEFENSE FOR ENVIRONMENT
OPM	OFFICE OF PROGRAM MANAGEMENT
ORD	OFFICE OF RESEARCH AND DEVELOPMENT
OSC	ON-SCENE COORDINATOR
OSD	OFFICE OF THE SECRETARY OF DEFENSE
OSHA	OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION
OSW	U.S. EPA OFFICE OF SOLID WASTE
OSWER	OFFICE OF SOLID WASTE AND EMERGENCY RESPONSE
OTA	OFFICE OF TECHNOLOGY ASSESSMENT
OU	OPERABLE UNIT
OVA	ORGANIC VAPOR ANALYZER
OWPE	OFFICE OF WASTE PROGRAMS ENFORCEMENT
OWNS	OFFICE OF WATER REGULATIONS AND STANDARDS

** P

PA	PERFORMANCE AUDIT
PA	PRELIMINARY ASSESSMENT
PA DER	PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL RESOURCES
PA/SI	PRELIMINARY ASSESSMENT/SITE INSPECTION
PAC	POWDERED ACTIVATED CARBON
PARCC	PRECISION, ACCURACY, REPRESENTATIVENESS, COMPLETENESS, & COMPARABILITY
PCB	POLYCHLORINATED BIPHENYL
PD	POINT DETONATING (ORDNANCE)
PE	PERFORMANCE EVALUATION
PEL	PERMISSIBLE EXPOSURE LIMIT
PES	POTENTIAL EXPLOSION SITE (ORDNANCE)
PI	POINT INITIATING (ORDNANCE)
PIAT	PUBLIC INFORMATION ASSIST TEAM
PIBD	POINT INITITATING BASE DETONATING (ORDNANCE)
PICS	PRODUCTS OF INCOMPLETE COMBUSTION
PID	PHOTOIONIZATION DETECTOR
POHC	PRINCIPAL ORGANIC HAZARDOUS CONSTITUENT
POTW	PUBLICLY-OWNED TREATMENT WORKS
PPB	PARTS PER BILLION
PPE	PERSONAL PROTECTIVE EQUIPMENT
PPM	PARTS PER MILLION
PQAM	PROJECT QUALITY ASSURANCE MANAGER

PQL	PRACTICAL QUANTITATION LEVELS
PR	PRELIMINARY DATA REVIEW
PRAC	PREPLACED REMEDIAL ACTION CONTRACT
PRP	POTENTIALLY RESPONSIBLE PARTIES
** Q	
QA	QUALITY ASSURANCE
QA/QC	QUALITY ASSURANCE/QUALITY CONTROL
QAPP	QUALITY ASSURANCE PROJECT PLAN
QC	QUALITY CONTROL
QCP	QUALITY CONTROL PLAN
QCSP	QUALITY CONTROL AND SAMPLING PLAN
QCSR	QUALITY CONTROL SUMMARY REPORT
** R	
RA	REMEDIAL ACTION OR REMOVAL ACTION
RAC	RESPONSE ACTION CONTRACTOR
RAC	RISK ASSESSMENT CODE
RAG	RISK ASSESSMENT GUIDANCE
RAS	ROUTINE ANALYTICAL SERVICES
RC	REMEDIAL CONSTRUCTION
RCMS	REMOVAL COST MANAGEMENT SYSTEM
RCRA	RESOURCE CONSERVATION AND RECOVERY ACT OF 1976
RD	REMEDIAL DESIGN
RE	REAL ESTATE
REM	REMFDIAL PLANNING
REM II	EPA HAZARDOUS WASTE REMEDIAL CONTRACT
RFA	RCRA FACILITY ASSESSMENT
RFI	RCRA FACILITY INVESTIGATION
RFP	REQUEST FOR PROPOSAL
RI	REMEDIAL INVESTIGATION
RI/FS	REMEDIAL INVESTIGATION AND FEASIBILITY STUDY
RMCL	RECOMMENDED MAXIMUM CONTAMINANT LEVELS
ROD	RECORD OF DECISION
ROE	RIGHT OF ENTRY
RPD	RELATIVE PERCENT DIFFERENCE
RPM	REMEDIAL PROJECT MANAGER (EPA TERMINOLOGY)
RQ	REPORTABLE QUANTITIES
RRC	REGIONAL RESPONSE CENTER
RRT	REGIONAL RESPONSE TEAM
RS	RESPONSIVENESS SUMMARY
RSD	RELATIVE STANDARD DEVIATION
RSPA	RESEARCH AND SPECIAL PROGRAMS ADMINISTRATION
RTS	REMOVAL TRACKING SYSTEM
** S	
S&A	SUPERVISION AND ADMINISTRATION
SAMS	SUPERFUND AUTOMATED MANAGEMENT SYSTEM

SARA	SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986
SAS	SPECIAL ANALYTICAL SERVICES
SCAP	SUPERFUND COMPREHENSIVE ACCOMPLISHMENTS PLAN
SCBA	SELF-CONTAINED BREATHING APPARATUS
SDWA	SAFE DRINKING WATER ACT
SERA	SUPERFUND EMERGENCY RESPONSE ACTIONS
SERC	STATE EMERGENCY RESPONSE COMMISSION
SHP	SAFETY AND HEALTH PROGRAM
SI	SITE INSPECTION
SITE	SUPERFUND INNOVATIVE TECHNOLOGY EVALUATION
SMOA	SUPERFUND MEMORANDUM OF AGREEMENT
SMP	SITE MANAGEMENT PLAN
SOH	SAFETY AND OCCUPATIONAL HEALTH
SOP	STANDARD OPERATING PROCEDURE
SOW	SCOPE OF WORK
SPCC	SPILL PREVENTION CONTROL AND COUNTERMEASURE
SPMS	STRATEGIC PLANNING AND MANAGEMENT SYSTEM
SPP	SAMPLE PREPARATION PROCEDURE
SQG	SMALL QUANTITY GENERATOR
SSC	SCIENTIFIC SUPPORT COORDINATOR
SSHP	SITE SAFETY AND HEALTH PLAN
STEL	SHORT TERM EXPOSURE LIMIT
SV	SAMPLING VISIT
SW-846	TEST METHODS FOR EVALUATING SOLID WASTES (EPA, 1986B)
SWDA	SOLID WASTE DISPOSAL ACT
SWMU	SOLID WASTE MANAGEMENT UNIT

** T

TAG	TECHNICAL ASSISTANCE GRANTS
TAL	TARGET ANALYTE LIST
TAT	TECHNICAL ASSISTANCE TEAM (EPA TERMINOLOGY)
TBC	TO BE CONSIDERED
TCE	TRICHLOROETHYLENE
TCL	TARGET COMPOUND LIST
TCLP	TOXICITY CHARACTERISTIC LEACHING PROCEDURE
TDS	TOTAL DISSOLVED SOLIDS
TLV	THRESHOLD LIMIT VALUE
TPQ	THRESHOLD PLANNING QUANTITY
TRC	TECHNICAL REVIEW COMMITTEE
TSCA	TOXIC SUBSTANCES CONTROL ACT (1976)
TSDF	TREATMENT, STORAGE, DISPOSAL FACILITY
TSP	TOTAL SUSPENDED PARTICULATES
TSWP	TREATABILITY STUDY WORK PLAN
TTU	TRANSPORTABLE TREATMENT UNIT
TWA	TIME WEIGHTED AVERAGE

** U

U.S.C.	U.S. CODE
UEL	UPPER EXPLOSIVE LIMIT
US EPA	UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
USACE	U.S. ARMY CORPS OF ENGINEERS
USATHAMA	U.S. ARMY TOXIC AND HAZARDOUS MATERIALS AGENCY
USCG	U.S. COAST GUARD
USCS	UNIFIED SOIL CLASSIFICATION SYSTEM
USGS	U.S. GEOLOGICAL SURVEY
UST	UNDERGROUND STORAGE TANK
USWAG	UTILITY SOLID WASTE ACTIVITIES GROUP
UXO	UNEXPLODED EXPLOSIVE ORDNANCE
** V	
VOC	VOLATILE ORGANIC COMPOUNDS
VSI	VISUAL SITE INSPECTION
VT	VARIABLE TIME (ORDNANCE)
** W	
WAD	WORK AUTHORIZATION DOCUMENT
WAD	WORK AUTHORIZATION DIRECTIVE
WES	WATERWAYS EXPERIMENT STATION
WP	WHITE PHOSPHORUS
WQC	WATER QUALITY CRITERIA