FINAL SITE INSPECTION GENERIC WORK PLAN

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June 2006

U.S. Army
Corps of Engineers

TLI Solutions

FINAL
MILITARY MUNITIONS RESPONSE PROGRAM
SITE INSPECTION GENERIC WORK PLAN

Revised June 2006

Prepared For:

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SITE INSPECTION GENERIC WORK PLAN

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ACRONYMS AND ABBREVIATIONS

A/I	Active/Inactive
AOC	Area of Concern
ARS	Advance Range Survey
ASR	Archive Search Report
CCV	Continuing Calibration Verification
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CSM	Conceptual Site Model
CTT	Closed, Transferring, and Transferred
CQC	Contractor Quality Control
DERP	Defense Environmental Restoration Program
DGM	Digital Geophysical Mapping
DMM	Discarded Military Munitions
DoD	Department of Defense
DPT	Direct Push Technology
DQCR	Daily Quality Control Reports
DQO	Data Quality Objective
EDD	Electronic Data Deliverable
EM	Electromagnetic
FSP	Field Sampling Plan
FUDS	Formerly Used Defense Site
HRR	Historic Records Review
HTRW	Hazardous, Toxic, and Radioactive Waste
ICV	Initial Calibration Verification
IDW	Investigation-Derived Wastes
IRP	Installation Restoration Program
LC	Laboratory Control
LCS	Laboratory Control Sample
LQAO	Laboratory Quality Assurance Officer
MC	Munitions Constituents
MCL	Maximum Contaminant Limit
MDL	Method Detection Limit
MEC	Munitions and Explosives of Concern
MMRP	Military Munitions Response Program
MQO	Measurement Quality Objectives
MRL	Minimum Reporting Limit
MSA	Method of Standard Analysis
MS/MSD	Matrix Spike/Matrix Spike Duplicate
NFA	No Further Action
PM	Project Manager
POC	Point of Contact
POD	Pacific Ocean Division
PPE	Personal Protective Equipment

ACRONYMS AND ABBREVIATIONS (concluded)

QA	Quality Assurance
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QC	Quality Control
RAC	Risk Assessment Code
RBC	Risk Based Concentration
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation and/or Feasibility Study
RMIS	Restoration Management Information System
RPD	Relative Percent Difference
RSD	Relative Standard Deviation
SAP	Sampling and Analysis Plan
SDG	Sample Delivery Group
SSHP	Site Safety and Health Plan
SI	Site Inspection
SOP	Standard Operating Procedure
SPD	South Pacific Division
TAL	Target Analyte List
TCL	Target Compound List
TPP	Technical Project Planning
U.S.	United States
USACE	United States Army Corps of Engineers
USAEC	United States Army Environmental Center
USEPA	United States Environmental Protection Agency
UXO	Unexploded Ordnance
VOC	Volatile Organic Compound
WP	Work Plan
WP/SAP	Work Plan/Sampling and Analysis Plan
YPG	Yuma Proving Ground

1.0 PROJECT BACKGROUND

This Work Plan (WP) has been developed in support of the United States Army Corps of Engineers (USACE) and United States Army Environmental Center (USAEC) Military Munitions Response Program (MMRP) Site Inspection (SI) activities. Overall coordination of activities described within this WP is provided by USACE Sacramento District.

The National Defense Authorization Act of Fiscal Year (FY) 2002 and the finalized Department of Defense (DoD) Directive 4715.11, *Environmental and Explosives Safety Management on Department of Defense Active and Inactive Ranges within the United States*, required DoD to maintain an inventory of operational ranges and closed, transferred, and transferring (CTT) ranges, which are known or suspected to contain Munitions and Explosives of Concern (MEC), including unexploded ordnance (UXO) and discarded military munitions (DMM), as well as Munitions Constituents (MC). The Army completed their Preliminary Assessment (PA), or Army Range Inventory, in the following three phases:

1. Advanced Range Survey, Phase 1, was completed in FY2000 in response to Senate Report 106-50. Phase I was a data call that requested information on all ranges associated with each United States (U.S.) Army installation through their major command to help estimate the cost associated with range response action.

2. Operational Range Inventory, Phase 2, was completed in FY2002. Phase 2 of the inventory effort involved collecting data at each U.S. Army installation that potentially contained one or more operational ranges.

3. CTT (or "other than operational") Range Inventory, Phase 3, was completed in December 2003. Phase 3 inventoried other than operational ranges and sites with UXO, DMM, and MC at each U.S. Army installation.

The nationwide CTT Range Inventory project was executed by the following USACE District Offices: the Baltimore District in the eastern U.S. and U.S. territories, the Omaha District in the central and northwestern U.S., and the Sacramento District in the southwestern U.S., Alaska, and Hawaii (including the South Pacific and Pacific Ocean Division). The completion date for the CTT inventory project was December 30, 2003. The approximate total number of installations nationally was 442 of which 165 were inventoried by the Sacramento District. The total number of munitions sites identified by Sacramento District was 387. As a result of the CTT inventory process, the primary objective of the next phase of the program is to perform site inspections for all sites prior to the year 2010.

This work plan was developed in response to an estimate by the USACE – Sacramento District and USAEC that approximately 100 installations will require Site Inspections by the Sacramento District.

As a follow on to the CTT range inventory project, TLI Solutions, Inc. (TLI), formerly TechLaw, Inc., shall perform an SI for each site assigned to TLI by USACE. Although the scope of the SI may vary for each assigned installation, the following inspection activities may be performed:

compilation and evaluation of existing data and reports, visual and/or geophysical inspections, soil/sediment sampling and analysis, groundwater sampling and analysis, and surface water sampling and analysis. The specific data collection elements will be determined on a site by site basis.

Based upon the results and findings of the SI, TLI will provide recommended future actions on a site specific basis (i.e., whether remedial investigations and/or feasibility studies (RI/FS) will be needed for each identified site; whether an immediate response is needed; or whether the site qualifies for no further action).

This Generic Work Plan/Sampling and Analysis Plan (WP/SAP) provides project guidance and criteria that are applicable to all installations where TLI has been tasked to perform SI activities. Site-specific WP/SAPs will be prepared for each installation where an SI is to be performed. The site-specific work plan will address the basic history of each site to be addressed, the number and type of samples to be taken and the sampling locations, the locations and layouts of the visual and geophysical surveys, site specific health and safety, and all quality control issues.

1.1 Site Size and Location

TLI has been tasked with conducting SIs at various installations identified by USACE. Each site-specific WP/SAP will document relevant information regarding the range size, location, configuration, and any relevant geographical and/or topographical features of the range site. Maps noting the location, topography, and other significant features of the installation will be included.

1.2 Site History (Historical Records Review)

The history of each site to be addressed at an installation, including a description of the findings and conclusions of the Historic Records Review (HRR), will be summarized in each site-specific WP/SAP.

1.3 Purpose and Scope of Work Plan

This generic WP/SAP is intended to provide and/or reference all relevant USACE guidance and TLI Standard Operating Procedures (SOPs) necessary to conduct an SI at various installations to determine if there is evidence of UXO, DMM, or MC related to past site activities. The goal of the SI is not to confirm all types of UXO or DMM present, nor define the nature and extent of contamination at a particular site. The primary goal of the SI is to determine whether an RI/FS will be needed; whether an immediate response is needed; or whether the site qualifies for no further action.

This WP/SAP is compliant with and developed in accordance with the requirements of EM-200-1-3, *Requirements for the Preparation of Sampling and Analysis Plans* (February 2001). EM-200-1-3 was developed to be functionally equivalent to guidance promulgated by the United States Environmental Protection Agency (USEPA) for preparation of sampling plans and quality assurance plans for environmental data collection activities under the Comprehensive

Environmental Response, Compensation, and Liability Act (CERCLA) as well as the Resource Conservation and Recovery Act (RCRA).

Additional guidance documents that may be applicable to a specific SI include:

29 CFR 1910, *Occupational Safety and Health Standards*

29 CFR 1910.120, *Hazardous Waste Operations and Emergency Response*

29 CFR 1926.65, *Safety and Health Regulations for Construction*

Data Item Descriptions (DID)
MR-001, *Type I Work Plan*
MR-005-01, *Type II Work Plan*
MR-005-04, *Explosives Siting Plan*
MR-005-05, *Geophysical Investigation Plan*
MR-005-06, *Accident Prevention Plan*
MR-005-07, *Geospatial Information and Electronic Submittals*
MR-005-10, *Munitions Constituents Chemical Data Quality Deliverables*
MR-005-11, *Quality Control Plan*
OE-005-14.01, *Geographic Information System Plan*

DoD Directive 4715.11, *Environmental and Explosives Safety Management on Department of Defense (DoD) Active and Inactive Ranges within the United States*

EM-200-1-2, *Technical Project Planning (TPP) Process, August 1998*

EM-200-1-3, *Requirements for the Preparation of Sampling and Analysis Plans, February 2001*

EM-200-1-6, *Chemical Quality Assurance for HTRW Projects, October 1997*

AR 385-10, *The Army Safety Program, February 2000*

EM 385-1-1, *Safety and Health Requirements*
Environmental Data Quality Management Program Specifications, United States Army Corps of Engineers (USACE) – Sacramento District, 3 November 2003

EM-385-1-80, *Radiation Protection Manual,* May, 1997

ER 385-1-92, *Safety - Safety and Occupational Health Requirements for Hazardous, Toxic, and Radioactive Waste (HTRW) Activities, July 2003*

EP 1110-1-18, *Engineering and Design - Ordnance and Explosives Response, April 2000*

ETL 1110-1-154, *Engineering and Design - Standard Outlines for Scopes-of-Work for Investigation and Studies at Hazardous, Toxic & Radioactive Waste (HTRW) Sites, February 1994*

EM-1110-1-4000, *Monitor Well Design, Installation, and Documentation at Hazardous and/or Toxic Waste Sites, November 1998*

EM-1110-1-4001, *Soil Vapor Extraction and Bioventing, November 1995*

EM 1110-1-4009, *Ordnance and Explosives Response, June 23, 2000*

ER 1110-1-263, *Engineering and Design - Chemical Data Quality Management for Hazardous, Toxic, Radioactive Waste Remedial Activities, April 1998*

ER 385-1-92, *Safety and Occupational Health Requirements for Hazardous, Toxic, and Radioactive Waste (HTRW) Activities, July 2003*

EP 75-1-2, *Munitions and Explosives of Concern (MEC) Support During Hazardous, Toxic, and Radioactive Waste (HTRW) and Construction Activities, August 1, 2004*

EPA QA/G-4, *Guidance for the Data Quality Objectives Process, Final, August 2000*

ER 385-1-92, *Safety and Occupational Health Document Requirements for Hazardous Waste Site Remedial Actions*

ERDC/CCREL TR-02-01, *Guide for Characterization of Sites Contaminated with Energetic Materials, 2002*

Interim Guidance Document 01-02 and ER 1110-1-2, *Implementation of Technical Project Planning (TPP) for Ordnance and Explosives (OE) Formerly Used Defense Sites (FUDS) Projects, and Engineering Design Quality Management*

1.4 Work Authority

All work performed under this work plan is under the authority of the USACE Sacramento District.

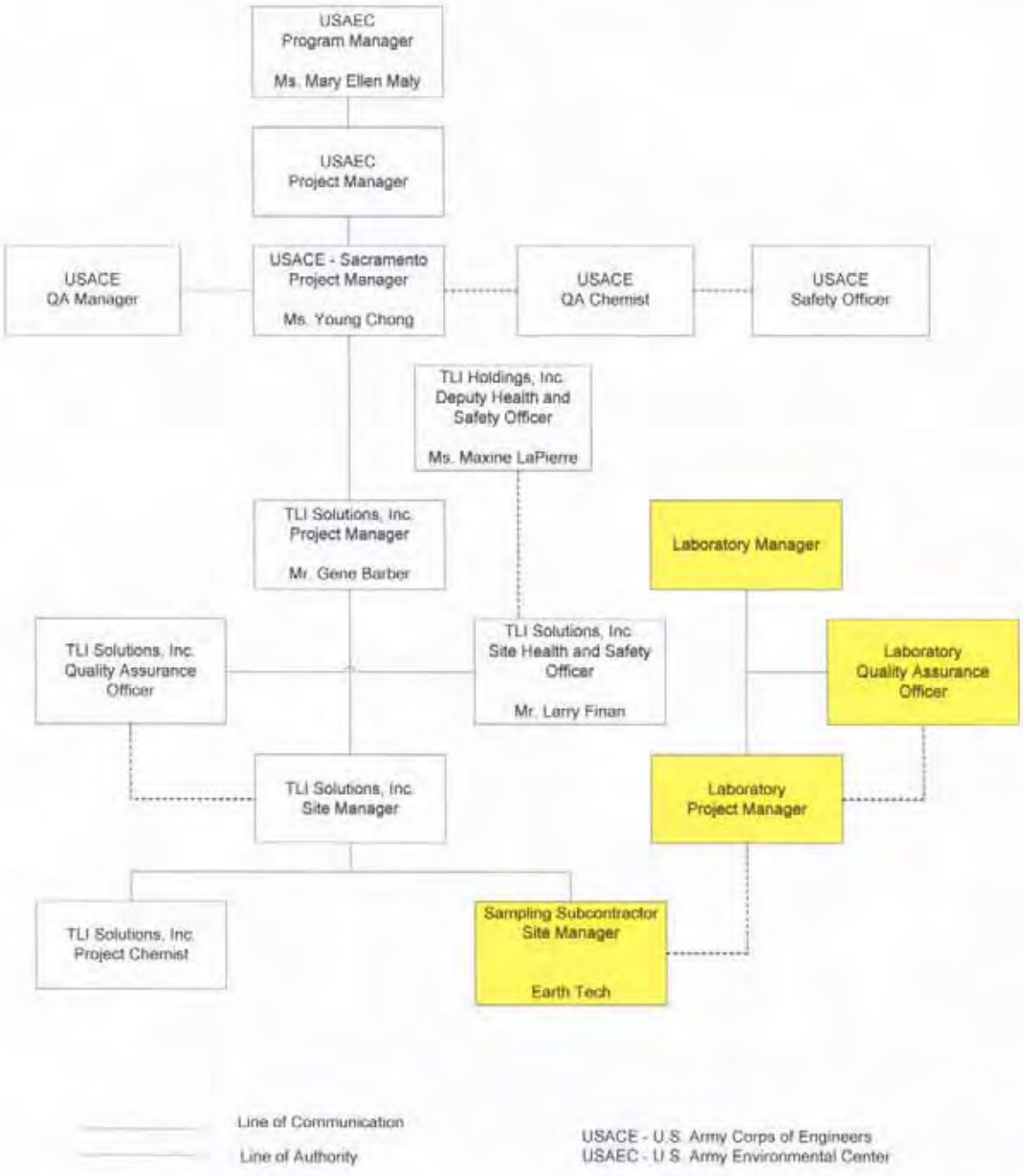
TLI's Project Manager (PM) is Mr. Gene Barber (Ph. 303-763-7188; email gbarber@tlisolutions.com). Mr. Barber is responsible for ensuring that tasks assigned to TLI by USACE are completed on schedule and within established budgets. Additional key contacts for this program are:

Ms. Young Chong, Project Manager, USACE Sacramento District (Ph. 916-557-7212; email young.s.chong@usace.army.mil)

Ms. Mary Ellen Maly, Program Manager, USAEC (Ph. 410-436-7083; email marycllen.h.maly@us.army.mil)

The project organization is presented in Figure 1 and illustrates the lines of authority and communication for the project.

Figure 1
Project Organization



Note: Sampling subcontractors may vary from site to site and, therefore, will be detailed in the Site-Specific Work Plans.

2.0 SITE DESCRIPTION AND HISTORY

The following items, among others, will be summarized in each site-specific WP/SAP.

- Site History Pertaining to Types of Ordnance Used, Period of Use and Location of Firing Points and Impact Areas
- Site Geology and Hydrogeology
- Site Soils
- Surface Water Features/Hydrology
- Annual Precipitation
- Prevailing Wind Direction and Intensities
- Buildings and Other Structures
- Site History of Former Activities, Permits, Citizen and Neighborhood Complaints, Compliance and Enforcement Violations, Reported Spills, Waste Disposal Practices
- Demography and Land Use (chronological)
- Cultural, Natural, or Archaeological Resources

The site description and history information provided in the site specific WP/SAP should be sufficient to allow a technical person unfamiliar with the site to adequately evaluate the sampling and analytical approach for the installation.

3.0 SUMMARY OF PREVIOUS INVESTIGATIONS

A summary of any previous investigations and response activities will be included in each site-specific WP/SAP. Historical data from previous sampling efforts at a site will be identified and summarized when available. An assessment of the data quality and usability in accordance with site specific Data Quality Objectives (DQOs) should be provided as well as discussion of problems previously encountered at the site. All assessment of data quality should be conducted in accordance with the following USACE guidance:

EM-200-1-6, *Chemical Quality Assurance for HTRW Projects*, October 1997

This section of the site specific WP/SAP should identify data that does not conform to standards within EM-200-1-6 or for which the analytical quality is indeterminate. This section should also indicate how non-conforming data and/or data of indeterminate quality will be used.

4.0 PROJECT OBJECTIVES

The following project objectives have been identified:

Primary Objective - Collect minimum amount of information necessary to determine whether an RI/FS will be needed; whether an immediate response is needed; or whether the site qualifies for no further action. This objective will consist of two tasks:

- Determine whether there is enough evidence to indicate that Munitions and Explosives of Concern (MEC) hazards are present at a site including: UXO; DMM; and MC.

Identification of a single MEC hazard will be sufficient to prompt further RI/FS action. For this project it will not be necessary to confirm all types of MEC present, determine MEC densities or locations, or to define the exact limits of the problem.

- Perform the minimum HTRW field activities to determine if MC contamination is present on site. Ordnance avoidance techniques as discussed in the generic Accident Prevention Plan and MEC Support Work Plan will be utilized. Primarily, samples collected at the site will be analyzed for Target Compound List (TCL) explosives and Target Analyte List (TAL) metals. At some sites, it may also be possible that perchlorates or chemical agents will be identified during the Technical Project Planning (TPP) process as contaminants of concern. In general, any contaminant of concern that exceeds Maximum Contaminant Limits (MCLs), Risk Based Concentrations (RBCs) (for the intended site land use), or background levels (as determined in previous investigations) will trigger additional RI/FS activity. Therefore, for this project it will not be necessary to determine the nature and extent of contamination or to provide sufficient information to perform a baseline risk assessment.

Secondary Objective - Collect information to complete the Munitions Response Site Prioritization Protocol and to develop better cost to complete estimates for the MMRP at each site. However, this objective will not be met at the risk of jeopardizing the primary objective of the program; or from meeting the primary project objectives in a timely and cost effective manner. Information obtained through site specific inspections may include but not be limited to:

- Determination of types of MEC constituents and possible contaminants of concern at the site.

- Possible elimination of site areas or features from further investigation; as well as clarifying areas of concern.

- Identifying potential RI/FS data gaps and minimizing duplicative studies as applicable.

Additional objectives will be determined on a site-specific basis and will be discussed in the site-specific WP/SAP. At a minimum, the site specific objectives section will identify the specific criteria for meeting the primary and secondary objectives.

5.0 DATA GAPS

The quantity and quality of historical information will vary between sites. Each of these SIs is warranted because of an identified data gap that must be filled to determine if further investigation is required. Specific data gaps, if any, will be discussed in each site-specific WP/SAP.

6.0 DATA QUALITY OBJECTIVES

Data quality objectives will be discussed in each site-specific WP/SAP based upon the constituents of concern and historical documentation that is available for the site. Site-specific DQOs will be developed in accordance with USACE guidance for developing DQOs as presented in EM-200-1-2, *Technical Project Planning (TPP) Process,* August 1998.

As indicated in Section 4.0 of this Generic WP, the purpose of the site-specific investigations is not to fully characterize the nature and extent of all MEC and MC contamination. Therefore, the DQO thresholds for this project will be lower than for a typical RI/FS project.

At a minimum, the DQO process for each range site will consist of the following steps:

- Identify Current Project
  - Identify Decision Makers who will determine whether additional RI/FS activities are required;
  - Identify specific project goals that must be considered in the SI phase of the project. For example, establishing the intended land use will determine the appropriate RBC criteria for munitions constituents;
  - Identify project budget and schedule constraints that must be considered in developing the sampling approach and establishing DQOs;
  - Gather and evaluate existing site information to determine what additional information is needed to meet project objectives;
  - Identify administrative, technical, and regulatory constraints at the site;
  - Determine project objectives in quantitative terms for MEC and MC that addresses technical and regulatory requirements for the site.

- Determine Data Needs
  - Define the data needs including number of samples to be collected, the sampling approach, and the means of collecting data (field/lab). The specific approach used will be dependent upon the available information from previous studies regarding the known nature and distribution of the MC or MEC. Appendix F of EM-200-1-2 will be utilized to guide the data needs determination process.
  - Document all rationale for determining data needs.

- Develop Data Collection Options
  - USACE has identified three basic data collection options, Basic, Optimum, and Excessive. Basic Data collection is the collection of just the data needed to meet the current project objective, Optimum Data collection is the data needed to meet all current and anticipated data needs, while Excessive Data collection is the collection of data to meet all current and future project objectives as well as the collection of data mandated or requested but that is not necessary to meet the project objectives. Based upon the requirement in the statement of work that only the minimal amount of data necessary to determine if an RI/FS or removal action is mandated will be collected. Therefore, unless otherwise requested for a

specific site, all data collection activities for this project will meet the Basic Data Collection Option requirements, as follows:

- Determine whether there is enough evidence to indicate that MEC hazards are present at a site including UXO and DMM. Positive identification of a single MEC hazard will be sufficient to prompt further RI/FS action. For this project it will not be necessary to confirm all types of MEC present, determine MEC densities or locations, or to define the exact limits of the problem.

- Perform the minimum HTRW field activities to determine if MC contamination is present on site. Ordnance avoidance techniques as discussed in the generic Accident Avoidance Plan and MEC Support Work Plan will be utilized. Primarily, samples collected at the site will be analyzed for TCL explosives and TAL metals. At some sites, it may also be possible that perchlorates or chemical agents will be identified during the TPP process as contaminants of concern. In general, any contaminant of concern that exceeds MCLs, RBCs (for the intended site land use), or background levels (as determined in previous investigations) will trigger additional RI/FS activity. Therefore, for this project it will not be necessary to determine the nature and extent of contamination or to provide sufficient information to perform a baseline risk assessment.

- Finalize Data Collection Program
  - Obtain concurrence of sampling approach from Decision Makers prior to sampling. At some sites, concurrence of regulators or other stakeholders may also be necessary, based upon specific issues at the site.
  - Document DQOs in the Field Sampling Plan (FSP) attachment to a site specific WP/SAP including rationale for selection of DQOs.

7.0 SAMPLING AND ANALYSIS PLAN

A site-specific WP/SAP will be prepared for each site. The following generic WP/SAP consists of the following documents.

- Field Sampling Plan (see Appendix A)
- Quality Assurance Project Plan (see Appendix B)
- Accident Prevention Plan (see Appendix C)
- Munitions and Explosives of Concern Work Plan (see Appendix D)
- TLI Standard Operating Procedures (see Appendix E) – please note that TLI has adopted TechLaw's SOPs until a separate set of SOPs are developed

A site-specific WP/SAP will be prepared for each SI to be conducted, based on the determination of the TPP process for each site.

8.0 ACCIDENT PREVENTION PLAN

A site-specific Accident Prevention Plan will be developed for each installation that will address all site-specific safety issues and provide specific emergency procedures for the particular installation and sites being addressed. The site-specific plan will also address issues related to environmental exposures as well as tripping and falling hazards, and issues related to vehicle safety.

Appendix C of this Generic Work Plan provides an Accident Prevention Plan that will apply globally across all installations and sites slated for the SI process. This document is intended to provide a general overview of all safety issues.

APPENDIX A
GENERIC FIELD SAMPLING PLAN (FSP)

FINAL
APPENDIX A
GENERIC FIELD SAMPLING PLAN (FSP)

MILITARY MUNITIONS RESPONSE PROGRAM
SITE INSPECTIONS

Prepared For:

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APPENDIX A
GENERIC FIELD SAMPLING PLAN

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1.0 PROJECT BACKGROUND

The project background for this FSP is presented in Section 1 of the WP. The phase of the project under the jurisdiction of this WP/SAP is to perform limited Site Inspection (SI) activities to determine the presence of Munitions and Explosives of Concern (MEC) as well as the presence of Munitions Constituent (MC) contamination above site specific minimum thresholds such as the Maximum Concentration Limits (MCL) of a constituent, the Risk Based Concentrations (RBCs), or a statistically relevant concentration above site background.

This FSP is intended to apply to several different sites and projects. Therefore, a specific FSP will be developed for each site in which site specific information and planned sampling activities will be identified based upon the historic use and specific munitions used.

1.1 Site History and Contaminants of Concern

Site history and contaminants of concern are site-specific and will be addressed in a site-specific WP/SAP that will be prepared for each site to be investigated.

1.2 Summary of Existing Site Data

Existing site data will be summarized in a site-specific WP/SAP that will be prepared for each site. An attempt will be made to collect all previously developed site specific data

1.3 Site-Specific Definition of Problems

Each site-specific WP/SAP will contain the definition of problems to be addressed, as determined during Technical Project Planning (TPP) meeting for each site. Site specific problems will vary from site to site and may include issues such

2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

TLI has been tasked to complete SIs at sites to be determined by USACE. TLI's Project Manager (PM) for this effort is Mr. Gene Barber (Ph. 303-763-7188; email gbarber@tlisolutions.com). Mr. Barber is responsible for ensuring that tasks assigned to TLI by USACE are completed on schedule and within established budgets.

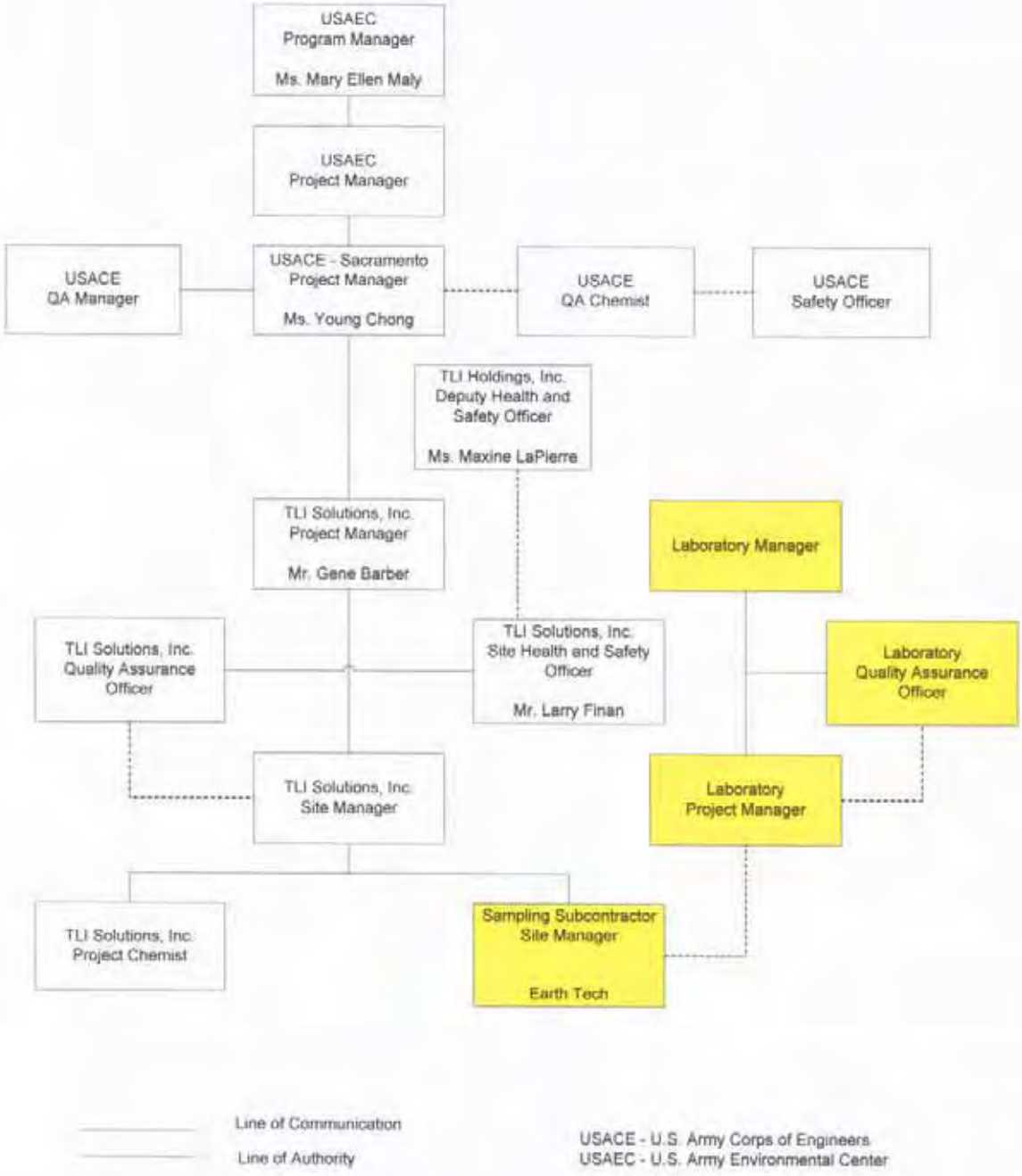
Additional key contacts for this program are:

Ms. Young Chong, Project Manager, USACE Sacramento District (Ph. 916-557-7212; email young.s.chong@usace.army.mil)

Ms. Mary Ellen Maly, Program Manager, USAEC (Ph. 410-436-1511; email maryellen.h.maly@us.army.mil)

The project organization is presented in Figure A-1 and illustrates the lines of authority and communication for the project.

Figure A-1
Project Organization



TLI Project Manager

The Project Manager will be responsible for making resources available to the project team to complete the scope of work and provide a quality assurance role. Mr. Barber's primary objectives will be to:

- Control project performance;
- Establish budgets and schedules;
- Manage project activities and execute the scope of work;
- Assign duties to project staff and orientation of the staff;
- Coordinate in-house reviews; and
- Prepare, review, and approve project plans and reports;
- Coordinate activities of subcontractors;
- Coordinate activities with USACE PM and Installation Points of Contact (POCs).

TLI Site Manager

The TLI Site Manager will be assigned on a site specific basis and will have the following primary responsibilities:

- Preparation of site specific WP/SAP documents;
- Coordinate daily on-site activities to ensure that sampling and other field activities are conducted in accordance with site FSPs and site health and safety plans;
- Coordinate activities and access with site representatives to ensure that all access and clearances are obtained prior to field activities;
- Daily coordination and communication with TLI field staff and field contractors to ensure that field and sampling activities objectives are met;
- Conduct daily reviews of field documentation to ensure that all activities occurred as planned, that all deviations are justified and documented, and that all activities are documented in accordance with the site WP/SAP;
- Implementing stop work orders as necessary;
- Prepare SI reports for delivery to the TLI Project Manager.

TLI Project Chemist

The TLI Project Chemist will be assigned on a site specific basis and will be responsible for:

- Coordinating sampling events with project laboratory to ensure that project holding time requirements are met;
- Conducting validation reviews of laboratory analytical data and field measurements and/or review of validation reports *[Note validation may be performed by subcontractor*];
- Conducting data assessment of project data and preparing Chemical Data Quality Assurance Report for each site;
- Assisting in the preparation of site specific WP/SAP;

- Conducting laboratory and field audits as assigned by TLI Project Manager or TLI Quality Assurance Officer.

TLI Quality Assurance Officer

The TLI Quality Assurance Officer (QAO) will be responsible for the following:

- Conducting independent review of field documents to ensure that all DQOs associated with field activities have been met and that all field documentation is adequately completed;
- Planning and conducting audits and surveillances of field and laboratory activities as requested by the TLI Project Manager or as scheduled in project specific audit and surveillance schedules;
- Tracking corrective action requests to ensure that corrective actions have been implemented as agreed upon by the TLI Project Manager and/or the TLI Site Manager.

TLI Health and Safety Officer

The TLI Health and Safety Officer is responsible for developing and implementing site specific health and safety requirements and plans. Specific requirements for developing Site Health and Safety Plans (SHSPs) are presented in the *Generic Site Health and Safety Plan.*

Additional TLI staff, with appropriate qualifications and experience, will be determined on an as-needed basis and used as necessary.

The use of subcontractors will also be necessary for select tasks such as geophysical investigation, drilling, among others, and will be determined on an as-needed basis for each individual site assigned to TLI.

3.0 PROJECT SCOPE AND OBJECTIVES

The primary objective of the SI is to collect the minimum amount of information necessary to determine whether an RI/FS will be needed; whether an immediate response is needed; or whether the site qualifies for no further action. This includes determining whether there is enough evidence to indicate that MEC hazards exist at each site, including UXO, DMM, and MC.

The secondary objective of the SI is to collect information to complete the Munitions Response Site Prioritization Protocol and to develop better cost to complete estimates for the MMRP at each site.

The level of effort for each SI will be highly site dependent and will be driven by the history and use of a site as well as stakeholder requirements. In general, sites with known MEC problems or containing high levels of MC contamination will require less fieldwork than sites with an unknown MEC history and less evidence of MC contamination. Therefore, SI efforts must remain focused on the primary goal of determining whether an RI/FS will be needed; whether an

immediate response is needed; or whether the site qualifies for no further action. The following additional guidance is provided for this work:

MEC: The goal of the SI for MEC is to only find sufficient evidence that UXO or DMM is present on the site. It is not anticipated that this portion of the SI will require exclusion zone impacts, engineering control requirements, clearing and grubbing efforts, and MEC disposal activities. In most cases, encountering just one MEC item will be sufficient to determine that an RI/FS is necessary for a particular MMRP site. There is no need during the SI work to confirm all types of MEC present, determine MEC density, or define the exact limits of the problem. The level of effort for the MEC SI will be determined for each MMRP site based on the following order preference:

1) No Site Visit required, there is already sufficient historical evidence that MEC is present.
2) Surface Inspection only, MEC items are clearly visible on the ground surface.
3) Magnetometer assisted Surface Sweep, MEC items are located on the surface or under vegetative cover.
4) Digital Geophysical Mapping (DGM), with no proveout and only limited grid, transect, or path survey.
5) Digital Geophysical Mapping, with proveout and only limited grid, transect, or path survey.
6) Intrusive investigation of a limited number of subsurface anomalies, as a last resort.

Munitions Constituents: The goal of the SI for MC is to only find sufficient evidence that contamination is present on the site. The conduct of this portion of the SI shall utilize anomaly avoidance techniques. Sampling and analysis should primarily be only for TCL explosives and TAL metals. For some sites perchlorates or chemical agents may be potential contaminants of concern as well. Testing for other contaminants is generally not recommended. The total number of samples shall be kept to a minimum and approved field screening/testing methods shall be used to the maximum extent practical. In most cases, contamination findings that exceed MCLs, RBCs (based on current land use), or background levels (based on previous studies) will be sufficient to determine that an RI/FS is necessary for a particular MMRP site. There is no need during the SI work to determine the nature and extent of all contaminants or to develop sufficient information for a baseline risk assessment.

The level of effort for the MC SI will be determined for each MMRP site based on the following order of preference:

1) Surface soil samples, composite samples in impact areas or where contamination is most expected.
2) Sediment samples, composite samples in accumulation or high runoff areas.
3) Groundwater samples, use existing monitoring or water supply wells to maximum extent practical.
4) Surface soil or sediment samples, discrete samples in areas of very high concern.
5) Groundwater samples, install only the minimum number of new wells (1 upgradient, 2 downgradient)

6) Subsurface soil samples, discrete samples only from new well borings or areas of very high concern.
7) Surface water samples, only in impoundment areas where high levels of explosives could accumulate.
8) Background samples, for TAL metals, only if no previous studies exist for the installation.

3.1 Task Description

As discussed in previous sections of this Generic WP/SAP, TLI has been tasked to complete SIs at sites to be determined by USACE. The identity of all sites to be inspected is not currently available. Site-specific WP/SAPs will be prepared for each site prior to initiation of fieldwork.

3.2 Applicable Regulations/Standards

Numerous regulations and standards are potentially applicable to this project. A list of regulations and standards applicable to each site will be presented in the site-specific WP/SAP. The following standard will apply to all sites:

EP 75-1-2, *Unexploded Ordnance (UXO) Support During Hazardous, Toxic, and Radioactive Waste (HTRW) and Construction Activities*, November 2000.

EM-200-1-3, U.S. Army Corps of Engineers, *Requirements for the Preparation of Sampling and Analysis Plans*. February 2001.

3.3 Project Schedule

Individual site project schedules are not known at this time and will be determined on a site-specific basis.

4.0 NON-MEASUREMENT DATA ACQUISITION

Additional data from non-measurement sources such as databases, literature, and other sources may be required to be gathered during the SI. Data from these sources may be required for evaluation of geologic/hydrogeologic conditions, sensitive environments, threatened or endangered species, and future land uses, among others. Sources of non-measurement data will be examined on a site-specific basis and data gathered as necessary.

5.0 FIELD ACTIVITIES BY AREA OF CONCERN

Areas of Concern (AOC) for each site to be investigated will be determined on a site-specific basis. Therefore, this Generic WP/SAP generally discusses the various types of field activities that may be conducted during the course of the SI at any AOC.

5.1 Geophysics

Geophysical investigations may be conducted during an SI at any site, as determined during the SI planning stage. The purpose of a geophysical investigation is to record geophysical data in the form of subsurface anomalies within the AOC. The goal of the geophysical investigation will be to assist in locating subsurface UXO and DMM based on subsurface anomalies. Potential non-invasive geophysical investigation techniques that may be used include electromagnetic (EM) or magnetometer-assisted surface sweeps, seismic reflection, and seismic refraction, among others. Site-specific conditions (i.e., topography, surface obstructions, access, among others) and professional judgment will likely dictate the appropriate geophysical technique to be used. The specific technology to be used will be documented in the site-specific WP/SAP. Geophysical investigations will be conducted by a qualified subcontractor, to be determined by TLI and approved by USACE.

5.1.1 Rationale/Design

As discussed above, a variety of non-invasive geophysical investigation techniques may be used at a particular AOC. The most appropriate technique to be used will be determined during the TPP meeting.

5.1.1.1 Study Area Definition and Measurement Spacing

The study area will be determined based on evaluation of several factors, including but not limited to: size of the site, size of potential contaminant sources, known or suspected historical land use, topography, surface obstructions, subsurface utilities or other known subsurface materials, accessibility, and cost. Once the study area has been determined, a surface grid will be established prior to beginning the geophysical survey. The grid node spacing (i.e., 10-feet, 20-feet, etc.) will be determined based on site-specific conditions. Although grids will be the desired method of sampling, circumstances may warrant an approach using transects or random path sampling.

5.1.2 Field Procedures

5.1.2.1 Equipment

The specific geophysical investigation equipment to be used will be determined based on site-specific conditions and as determined during TPP with stakeholders. Equipment to be used may include, but not be limited to, EM, magnetometer, seismic reflection, and seismic refraction.

5.1.2.2 Preliminary Method Testing and Early Termination Procedures

Should initial field geophysical testing methods not prove to be adequate to meet project objectives, the initial testing method will be terminated at the discretion of the TLI Site Manager and/or Project Manager. Alternative geophysical testing methods will be evaluated and implemented accordingly.

5.1.2.3 Instrument Calibration and Quality Control Procedures

Instrument calibration and Quality Control (QC) procedures will be dependent on the type of equipment to be used. The site-specific WP/SAP addendum will include instrument calibration and QC procedures for the geophysical method to be used.

5.1.2.4 Field Progress/Interpretation Reporting

TLI will conduct oversight of the geophysical subcontractor during the geophysical investigation to ensure that work is performed in accordance with the scope of work. Field observations made by TLI will be recorded in the field logbook and on Daily Quality Control Reports. TLI will provide daily verbal updates of the geophysical investigation to USACE.

5.1.2.5 Measurement Point/Grid Surveying

The locations of subsurface anomalies that are identified during a geophysical investigation will be "flagged" or otherwise marked in the field and recorded in the field logbook. The horizontal and vertical coordinates of each anomaly location will also be surveyed by a subcontracted professional licensed surveyor to the nearest 0.1 feet. The results of the surveying will be presented on survey maps.

5.1.2.6 Data Processing

Data obtained during the geophysical investigation will be compiled by the geophysical subcontractor and presented in a report to TLI.

5.1.2.7 Potential Interpretation Techniques

The results of the geophysical investigation will be interpreted by appropriately qualified and experienced personnel. The geophysical subcontractor may use judgment based on observations and data obtained during the investigation to interpret the results.

5.2 Soil Gas Survey

A soil gas survey may be conducted at any given AOC, as determined during the TPP by the stakeholders. Soil gas surveys are generally used as a screening tool for determining if volatile organic compounds (VOCs) are present in subsurface soil (vadose zone) and/or groundwater. The CTT sites to be investigated by TLI are not likely to have a history of VOC use or disposal associated with them, and it is unlikely that soil gas surveys will be conducted. However, should site-specific information indicate the potential for VOCs in the subsurface at an AOC, a soil gas survey will be conducted as necessary. Soil gas surveys, including associated on-site laboratory analyses, will be conducted by a qualified subcontractor, to be determined by TLI and approved by USACE. Due to the invasive nature of collecting soil gas survey results, any sampling efforts must be closely coordinated with site representatives and project health and safety officers. All intrusive activities will be conducted in accordance with EP 75-1-2, *Unexploded Ordnance*

(UXO) Support During Hazardous, Toxic, and Radioactive Waste (HTRW) and Construction Activities, November 2000.

5.2.1 Rationale/Design

Should historical site information or other information indicate the need for soil gas survey sampling due to suspected subsurface VOC contamination, soil gas survey sampling will be conducted.

5.2.1.1 Soil Gas Sample Locations

Soil gas sample locations will be selected with a bias toward areas likely to have VOC contamination and will be determined on a site-specific basis. A surface grid will be established prior to beginning the soil gas survey. The grid node spacing (i.e., 10-feet, 20-feet, etc.) will be determined based on site-specific conditions such as size of the site, size of potential contaminant sources, known or suspected historical land use, topography, surface obstructions, subsurface utilities or other known subsurface materials, accessibility, and cost.

5.2.1.2 Sample Collection and Field and Laboratory Analysis

If necessary, soil gas samples will be collected using direct-push techniques and will be analyzed for VOCs by an on-site mobile laboratory using U.S. Environmental Protection Agency (USEPA) Method 8260.

5.2.1.3 Background, Quality Assurance/Quality Control, and Blank Samples and Frequency

Based on site-specific historical land use and other pertinent information, background soil gas sample locations will be selected in areas not likely to have VOC contamination. The number of background samples collected will be determined on a site specific basis and will be influenced by the complexity and size of the site. Additionally, Quality Assurance (QA) / Quality Control (QC) samples (field duplicates and field blanks) will be collected to assess field sample collection methods and laboratory analytical methods. QA/QC samples will be collected at a minimum frequency of 10 percent (%) of the total number of soil gas samples collected at each AOC.

5.2.2 Field Procedures

Field procedures for collecting Soil Vapor Samples are discussed in detail in TLI SOP, No. 07-07-00, *Soil, Soil Gas, and Groundwater Sampling Using Direct Push Technology (DPT)*, as well as in Appendix C of EM-200-1-3.

Field SOPs for soil vapor sample collection includes the following:

- Drilling Methods and Equipment
- Sampling Materials
- Installation

- Sampling Methods
- Field Measurement Procedures and Criteria
- Field Documentation.

In addition to documentation required in TLI SOPs, soil vapor results and field observations made by TLI will be recorded in the field logbook and on Daily Quality Control Reports (DQCR). TLI will provide verbal updates of the geophysical investigation to USACE.

5.3 Groundwater

There is the potential that groundwater samples will be collected during an SI to evaluate potential groundwater contamination. The need for groundwater sampling will be determined on a site-specific basis during TPP by stakeholders. All groundwater samples will be analyzed for TCL explosives, TAL metals, and select samples may be analyzed for perchlorates. A sample summary and a summary of analytical methods will be provided in the site-specific WP/SAP. Samples will be analyzed by a qualified analytical laboratory, to be selected by TLI. Groundwater sampling activities will be in accordance with the following TLI SOPs:

No. 06-01-00, *Groundwater Sampling/Monitoring and Analysis Procedures – Preparation of a Groundwater Sampling and Analysis Plan*;

No. 06-02-00, *Groundwater Sampling/Monitoring and Analysis Procedures – Well Installation and Development;*

No. 06-03-01, *Groundwater Sampling/Monitoring and Analysis Procedures – Pre-Sampling Activities;*

No. 06-04-00, *Groundwater Sampling/Monitoring and Analysis Procedures – Sampling Activities;*

No. 06-05-01, *Groundwater Sampling/Monitoring and Analysis Procedures – Well Abandonment; and*

No. 06-06-00, *Groundwater Sampling/Monitoring and Analysis Procedures – Low Flow Purging and Sampling Procedures.*

5.3.1 Rationale/Design

Each specific AOC will have site-specific requirements to be addressed during TPP. The general rationale for groundwater sampling will be to evaluate potential groundwater contamination due to site-related releases. Groundwater sampling will take place on a very limited basis and only for select sites determined by USACE and USAEC.

5.3.1.1 Monitoring Well Locations and Installation

Locations for monitoring wells will be determined on a site-specific basis. In general, locations of monitoring wells selected for sampling will be in areas with the highest potential to encounter groundwater contamination. Locations will also be selected to have the greatest probability of providing groundwater flow direction information. The installation method will be determined on a site-specific basis during TPP by stakeholders. In most instances, groundwater sampling will only take place when there are existing monitoring wells in place.

5.3.1.2 Sample Collection and Field and Laboratory Analysis

Groundwater samples may be collected by a variety of methods such as manual bailing, electric- or air-powered pumps, inertial pumps, direct collection, among others. Groundwater samples will be collected following appropriate well development and purging procedures in accordance with TLI SOP No. 06-02-00, *Groundwater Sampling/Monitoring and Analysis Procedures – Well Installation and Development*, TLI SOP No. 06-3-01.

5.3.1.3 Upgradient, QA/QC, and Blank Samples and Frequency

Based on site-specific historical land use and other pertinent information, background groundwater sample locations will be selected in areas not likely to have VOC contamination. A minimum of three background groundwater samples will be collected. Additionally, QA/QC samples (field duplicates and field blanks) will be collected to assess field sample collection methods and laboratory analytical methods. QA/QC samples will be collected at a minimum frequency of 10 percent (%) of the total number of groundwater samples collected at each AOC.

5.4 Subsurface Soil

Subsurface soil investigations may be conducted during an SI at any site, as determined during the SI planning stage. The purpose and goal of a subsurface soil investigation will be to assist in locating subsurface contamination. Potential invasive subsurface soil investigation techniques that may be used include manual hand auger, direct push and hollow-stem auger drilling, among others. Site-specific conditions (i.e., topography, surface obstructions, access, among others) and professional judgment will likely dictate the appropriate subsurface soil sampling technique to be used. The most appropriate technique will be selected based on site-specific considerations (equipment access limitations, the presence of overhead and subsurface utilities, type of contaminants, subsurface lithology, among others). Subsurface soil investigations will be conducted by a qualified subcontractor, to be determined by TLI. Subsurface soil sampling may be conducted at any site, as determined during TPP by stakeholders. Detailed subsurface soil sampling procedures are included in the following TLI SOPs:

No. 07-01-00, *Soil Sampling and Analysis Procedures – Preparation of a Soil Sampling and Analysis Plan*;

No. 07-04-01, *Soil Sampling and Analysis Procedures – Split-Barrel Sampling and Presentation Sheet;*

No. 07-05-01, *Soil Sampling and Analysis Procedures – Soil Sampling with an Auger;*

No. 07-06-01, *Soil Sampling and Analysis Procedures – Soil Sampling with a Shelby Tube; and*

No. 07-07-00, *Soil, Soil Gas, and Groundwater Sampling Using Direct Push Technology (DPT).*

5.4.1 Rationale/Design

Should historical site information or other information indicate the need for subsurface soil sampling due to suspected soil contamination, subsurface soil sampling will be conducted.

5.4.1.1 Soil and Rock Boring Locations

Locations for subsurface soil sampling will be determined on a site-specific basis and will be presented in the site-specific WP/SAP. In general, subsurface soil sampling locations will be selected in areas with the highest potential to encounter subsurface soil contamination.

5.4.1.2 Discrete/Composite Soil Sampling Requirements

Depending on the goals of the sampling to be conducted, discrete and/or composite soil sampling may be conducted. Discrete sampling involves collecting an aliquot from a discrete interval. Composite sampling involves homogenizing aliquots from one or more discrete intervals into one composite sample for laboratory analysis.

5.4.1.3 Sample Collection and Field and Laboratory Analysis

The method to be used for sample collection and the laboratory analytical methods to be used will be determined on a site-specific basis and will be presented in the site-specific WP/SAP. The most appropriate subsurface soil sampling method will be determined during TPP. Subsurface soil sample collection methods may include, but are not limited to the following: continuous core barrel, split spoon, Shelby tube, and hand auger bucket, among others.

Laboratory analytical methods may include, but are not limited to, the following: TAL metals, explosives, and perchlorates. Additional analytical parameters such as VOCs, SVOCs, may also be selected based on site-specific information.

The use of a field analytical laboratory is not anticipated. However, should the use of a field laboratory become necessary, information regarding the field laboratory procedures to be used will be presented in the site-specific WP/SAP.

5.4.1.4 Background, QA/QC, and Blank Samples and Frequency

Based on site-specific historical land use and other pertinent information, background soil sample locations will be selected in areas not likely to have site-related contamination. A minimum of three background soil samples will be collected. Additionally, QA/QC samples (field duplicates and field blanks) will be collected to assess field sample collection methods and

laboratory analytical methods. QA/QC samples will be collected at a minimum frequency of 10 percent (%) of the total number of subsurface soil samples collected at each AOC.

5.5 Surface Soil and Sediment

Surface soil and sediment investigations may be conducted during an SI at any site, as determined during the SI planning stage. The purpose and goal of a surface soil and/or sediment investigation will be to assist in locating surface or sediment contamination that is of interest. Potential invasive surface soil investigation techniques that may be used include scoop sampling, hand auger, and direct push, among others. Site-specific conditions (i.e., topography, surface obstructions, access, among others) and professional judgment will likely dictate the appropriate surface soil or sediment sampling technique to be used. The most appropriate technique will be selected based on site-specific considerations (equipment access limitations, the presence of overhead and subsurface utilities, type of contaminants, surface lithology, among others). Surface soil and sediment sampling will most likely occur in areas of suspected munitions use or disposal such as burn areas, firing points, and/or impact areas. Surface soil and/or sediment investigations will be conducted by a qualified subcontractor, to be determined by TLI and approved by USACE. Surface soil and/or sediment sampling may be conducted at any site, as determined during TPP by stakeholders. Detailed surface soil and/or sediment sampling procedures are included in TLI SOPs listed in Section 5.4 of this FSP in addition to the following:

No. 07-03-00, *Soil Sampling and Analysis Procedures – Surface/Near-Surface Soil Sampling*

5.5.1 Rationale/Design

Should historical site information or other information indicate the need for surface soil sampling due to suspected soil contamination, surface soil sampling will be conducted.

5.5.1.1 Surface Soil Sample Locations

Locations for surface soil sampling will be determined on a site-specific basis and will be presented in the site-specific WP/SAP. In general, surface soil sampling locations will be selected in areas with the highest potential to encounter surface soil contamination.

5.5.1.2 Sediment Sample Locations from Onsite and/or Offsite Drainage Channels

Locations for sediment sampling from onsite and/or offsite drainage channels will be determined on a site-specific basis and will be presented in the site-specific WP/SAP. In general, sediment sampling locations will be selected in areas with the highest potential to encounter sediment contamination.

5.5.1.3 Sediment Sample Locations from Ponds, Lakes, and Lagoons

Locations for sediment sampling from ponds, lakes, and lagoons will be determined on a site-specific basis and will be presented in the site-specific WP/SAP. In general, sediment sampling

locations will be selected in areas with the highest potential to encounter sediment contamination.

5.5.1.4 Discrete/Composite Soil and/or Sediment Sampling Requirements

Depending on the goals of the sampling to be conducted, discrete and/or composite soil and/or sediment sampling may be conducted. Discrete sampling involves collecting an aliquot from a discrete interval. Composite sampling involves homogenizing aliquots from one or more discrete intervals into one composite sample for laboratory analysis.

5.5.1.5 Sample Collection and Field and Laboratory Analysis

The method to be used for sample collection and the laboratory analytical methods to be used will be determined on a site-specific basis and will be presented in the site-specific WP/SAP. The most appropriate surface soil sampling method will be determined during TPP meetings. Surface soil and/or sediment sample collection methods may include, but are not limited to surface scoop sampling among others.

Laboratory analytical methods may include, but are not limited to, the following: TAL metals, explosives, and perchlorates. Additional analytical parameters such as VOCs, SVOCs, may also be selected based on site-specific information.

The use of a field analytical laboratory is not anticipated. However, should the use of a field laboratory become necessary, information regarding the field laboratory procedures to be used will be presented in the site-specific WP/SAP.

5.5.1.6 Upgradient, QA/QC, and Blank Samples and Frequency

Based on site-specific historical land use and other pertinent information, background surface soil and/or sediment sample locations will be selected in areas not likely to have site-related contamination. A minimum of three background soil and/or sediment samples will be collected. Additionally, QA/QC samples (field duplicates and field blanks) will be collected to assess field sample collection methods and laboratory analytical methods. QA/QC samples will be collected at a minimum frequency of 10 percent (%) of the total number of surface soil and/or sediment samples collected at each AOC.

5.6 Surface Water

There is the potential that surface water samples will be collected during an SI to evaluate potential surface water contamination. The need for surface water sampling will be determined on a site-specific basis based upon historical site use and during TPP meetings by stakeholders. All surface water samples will be analyzed for TCL explosives, TAL metals, and select samples may be analyzed for perchlorates. Surface water sampling and analysis will be conducted in accordance with TLI SOP No. 08-02-00, *Surface Water Sampling and Analysis Procedures.* A sample summary and a summary of analytical methods will be provided in each individual site-specific WP/SAP. Samples will be analyzed by a subcontracted laboratory, to be determined.

5.6.1 Rationale/Design

Should historical site information or other information indicate the need for surface water sampling due to suspected surface water contamination, surface water sampling will be conducted.

5.6.1.1 Surface Water Sample Locations

Locations for surface water sampling will be determined on a site-specific basis and will be presented in the site-specific WP/SAP. In general, surface water sampling locations will be selected in areas with the highest potential to encounter surface water contamination.

5.6.1.2 Sample Collection and Field and Laboratory Analysis

The method to be used for sample collection and the laboratory analytical methods to be used will be determined on a site-specific basis and will be presented in the site-specific WP/SAP. The most appropriate surface water sampling method will be determined during TPP. Surface water sample collection methods may include, but are not limited to the following: submersion of sample containers, plastic or stainless steel dipper or scoop, peristaltic pump, among others.

Laboratory analytical methods may include, but are not limited to, the following: TAL metals, TCL explosives, and perchlorates. Additional analytical parameters such as VOCs, SVOCs, may also be selected based on site-specific information.

The use of a field analytical laboratory is not anticipated. However, should the use of a field laboratory become necessary, information regarding the field laboratory procedures to be used will be presented in the site-specific WP/SAP.

5.6.1.3 Upgradient, QA/QC, and Blank Samples and Frequency

Based on site-specific historical land use and other pertinent information, background surface water sample locations will be selected in areas not likely to have site-related contamination. A minimum of three background surface samples will be collected. Additionally, QA/QC samples (field duplicates and field blanks) will be collected to assess field sample collection methods and laboratory analytical methods. QA/QC samples will be collected at a minimum frequency of 10 percent (%) of the total number of surface water samples collected at each AOC.

5.7 Other Matrices

Sampling of matrices not described in previous sections is possible, but not anticipated at this time. Should additional matrices be identified for sampling, these matrices will be described in the site-specific WP/SAP.

5.7.1 Rationale/Design

Should historical site information or other information indicate the need for sampling of matrices not described in this FSP, sampling of these matrices will be conducted as necessary. The rationale/design for sampling these matrices will be presented in the site-specific WP/SAP.

5.7.1.1 Sample Locations

Locations for sampling of other matrices will be determined on a site-specific basis and will be presented in the site-specific WP/SAP. In general, sampling locations will be selected in areas with the highest potential to encounter contamination.

5.7.1.2 Discrete/Composite Sampling Requirements

Depending on the goals of the sampling to be conducted, discrete and/or composite sampling of other matrices may be conducted. Discrete sampling involves collecting an aliquot from a discrete interval. Composite sampling involves homogenizing aliquots from one or more discrete intervals into one composite sample for laboratory analysis. The determination of the need for discrete and/or composite sampling of other matrices will be determined during TPP by stakeholders and presented in the site-specific WP/SAP.

5.7.1.3 Sample Collection and Field and Laboratory Analysis

The method to be used for sample collection and the laboratory analytical methods to be used will be determined on a site-specific basis and will be presented in the site-specific WP/SAP.

Laboratory analytical methods may include, but are not limited to, the following: TAL metals, explosives, and perchlorates. Additional analytical parameters such as VOCs, SVOCs, may also be selected based on site-specific information.

The use of a field analytical laboratory is not anticipated. However, should the use of a field laboratory become necessary, information regarding the field laboratory procedures to be used will be presented in the site-specific WP/SAP.

5.7.1.4 Background/Upgradient, QA/QC, and Blank Samples and Frequency

Based on site-specific historical land use and other pertinent information, background/upgradient sample locations will be selected in areas not likely to have site-related contamination. A minimum of three background/upgradient samples will be collected. Additionally, QA/QC samples (field duplicates and field blanks) will be collected to assess field sample collection methods and laboratory analytical methods. QA/QC samples will be collected at a minimum frequency of 10 percent (%) of the total number of samples collected at each AOC.

6.0 FIELD OPERATIONS DOCUMENTATION

The following subsections detail the documentation of field operations that will be maintained during the SI. Documentation of field operations and sample custody will be maintained through the use of pre-printed forms and/or in the field logbook. The field forms and logbooks will be used by onsite personnel to document all activities and information gathered in the field. Field documentation procedures shall be in accordance with TLI SOP No. 03-01-02, *Field Documentation Procedures – Maintenance of a Field Logbook.*

6.1 Daily Quality Control Reports

Daily Quality Control Reports (DQCRs) will be completed by the TLI Site Manager on a daily basis. DQCRs will summarize daily field activities associated with the SI at any site.

6.2 Field Logbook and/or Sample Field Sheets

The field logbook and/or sample field sheet entries must be legible, factual, detailed, and objective. Field logbooks and sample field sheets are the responsibility of the Site Manager and/or Site Manager's Representative. However, all field personnel must be familiar with and maintain field logbooks. The lead UXO Technician is also required to maintain a daily logbook.

6.3 Photographic Records

Photographic records shall be maintained according to TLI SOP No. 03-02-02, *Field Documentation Procedures – Taking and Documenting Photographs,* with the modification that a digital camera will be used instead of a 35mm film camera. Photographs will be taken to document visual information such as sample locations, field conditions, indications of visual contamination, among other items. All photographs of MEC items will be taken with a ruler, or similar measuring device, positioned next to the MEC item.

6.4 Sample Documentation

Sample documentation shall be maintained during any sampling events. Sample documentation shall be in accordance with applicable TLI SOPs.

6.4.1 Sample Numbering System

All samples collected by TLI or TLI subcontractors will be numbered in accordance with applicable TLI SOPs and in conjunction with installation protocols. Each type of environmental sample shall be assigned a unique sample number. The assigned number will provide a tracking procedure to allow ease of data retrieval, data reduction, and evaluation, and to ensure that sample identifiers are not duplicated. The sample identification numbers shall be maintained by the Site Manager in the field logbook and on sample field sheets.
Each sample will be given a unique sample designation by TLI field personnel. This designation will be recorded in the field logbook, on the field sheets, on the chain-of-custody records, and on the sample label or tags affixed to each sample container. Each container used to collect samples

will be properly labeled. The label will include the project number, date sampled, sample number, and analysis to be performed.

6.4.2 Sample Labels and/or Tags

All bottles will be identified by the use of sample tags with sample numbers, sampling locations, date/time of collection, and type of analysis. Sample labels will be completed for each sample using waterproof ink unless prohibited by weather conditions.

6.4.3 Chain-of-Custody Records

Whenever a sample is collected, or a measurement is made, a detailed description of the location of the station shall be recorded. The number of the photographs taken of the station, if any, will also be noted. All equipment used to make measurements will be identified, along with the sample number, time of sampling, sample description, depth at which the sample was collected, the volume and number of containers, preservative, and persons collecting the samples. Sample identification numbers will be assigned prior to sample collection. Field duplicate samples, which will receive an entirely separate sample identification number, will be noted under sample description. Refer to TLI SOP No. 02-05-01, *Field Procedures – Chain of Custody.*

6.5 Field Analytical Records

The use of field laboratory analytical procedures is not anticipated. However, should the use of field laboratory analytical procedures by required, all field laboratory data records will be maintained by the field analytical laboratory under the supervision of the TLI Site Manager.

6.6 Documentation Procedures/Data Management and Retention

As discussed in the previous sections, documentation of field activities will be maintained through the use of field logbooks and applicable field forms (i.e., field sample sheets, instrument calibration logs, among others.) All field documentation will be the responsibility of the TLI Site Manager.

7.0 SAMPLE PACKAGING AND SHIPPING REQUIREMENTS

Sample packaging and shipping shall be in accordance with TLI SOP No. 04-02-00, *Packaging and Shipping Procedures – Environmental Samples*. The Site Manager will be responsible for ensuring that TLI staff follow the appropriate packaging and shipping procedures for environmental samples.

8.0 INVESTIGATION-DERIVED WASTES

All investigation-derived wastes (IDW) will be handled in accordance with TLI SOP No. 02-04-01, *Field Procedures – Management of Investigation-Derived Wastes*. All wastes generated by TLI and/or its subcontractors during sampling activities will be managed according to the TLI

SOP or site-specific requirements. All decontamination solutions will be collected in a five-gallon, plastic bucket for transport to the appropriate on-site decontamination pad.

Personal protective equipment (PPE) used during sample collection will include Tyvek® disposable coveralls, nitrile sampling gloves, disposable boot covers, and paper towels. TLI will accumulate all PPE in a plastic trash bag for subsequent transport to the PPE accumulation point.

9.0 FIELD ASSESSMENT/THREE-PHASE INSPECTION PROCEDURES

TLI will ensure that quality is maintained throughout all fieldwork by using a three-phase control process (USACE Regulation 01450 and 01451.) Preparatory, initial, and follow-up contractor quality control (CQC) phases will be performed by TLI. Each CQC phase will be summarized in the Data Quality Control Report (DQCR) prepared by the TLI Site Manager.

9.1 Contractor Quality Control

TLI will maintain quality control through ensuring the use of SOPs, establishing minimum training requirements for job classifications, maintaining employee health and safety training, evaluating project structure and review requirements, evaluating field documentation requirements, and report content/format requirements. TLI subcontractors will operate under the guidelines established in this generic WP/SAP, as well as with any applicable site-specific WP/SAP.

9.2 Sampling Apparatus and Field Instrumentation Checklist

All sampling apparatus and field instrumentation will be inspected and calibrated, as necessary, prior to project start-up, and operated and maintained in accordance with applicable TLI SOPs and manufacturer's recommendations. Additionally, these items will be inspected to ensure that they are functional and calibrated on a daily basis. All sampling apparatus and field instrumentation inspections will be documented in the DQCRs by the TLI Site Manager or Site Manager's Representative.

Specific preventative maintenance procedures to be followed for field equipment will be based on those recommended by the manufacturer. Field instruments will be checked, calibrated daily, and calibration checks will be documented in the field logbook. Critical spare parts such as tape and batteries will be kept on-site to reduce potential downtime, and backup instruments and equipment will be available on-site or within one-day shipment to avoid delays in the field schedule.

In the event that field instrumentation is required, instruments will be calibrated daily, prior to use, and will be re-calibrated every 10 samples. Specific instruments on the calibration frequency, the acceptance criteria, and the conditions that will require more frequent re-calibration will be provided in the field instrument SOPs. The linearity of the instruments will be checked by using a two-point calibration with reference standards breaking the expected measurement. All calibration procedures performed will be documented in the field logbook and will include the date/time of calibration, name of person performing the calibration, reference

standard used, temperature at which readings were taken, and the readings. Multiple readings on one sample or standard, as well as readings on replicate samples, will likewise be documented.

10.0 NON-CONFORMANCE/CORRECTIVE ACTIONS

Corrective action resulting from all audits will be implemented immediately if data may be adversely affected due to unapproved or improper use of approved methods. If corrective actions are insufficient, work may be stopped by the TLI Site Manager, the TLI QAO, TLI Health and Safety Officer, and/or the Project Manager. If, at any time, a corrective action issue is identified which directly impacts project DQOs, the USACE COR will be notified immediately by the TLI Project Manager.

Response actions will be undertaken to correct any deficiencies noted in any system and/or performance audit. All corrective action proposed and implemented will be documented in the regular QA reports to management. Corrective action should only be implemented after approval by the TLI Project Manager. If immediate corrective action is required, approvals secured by telephone from the TLI Project Manager should be documented in an additional memorandum to all project personnel. For noncompliance problems, a formal corrective action program will be determined and implemented at the time the problem is identified.

11.0 REFERENCES

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FINAL
APPENDIX B
GENERIC QUALITY ASSURANCE PROJECT PLAN (QAPP)

FINAL
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MILITARY MUNITIONS RESPONSE PROGRAM
SITE INSPECTIONS

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Revised June 2006

FINAL
APPENDIX B
GENERIC QUALITY ASSURANCE PROJECT PLAN

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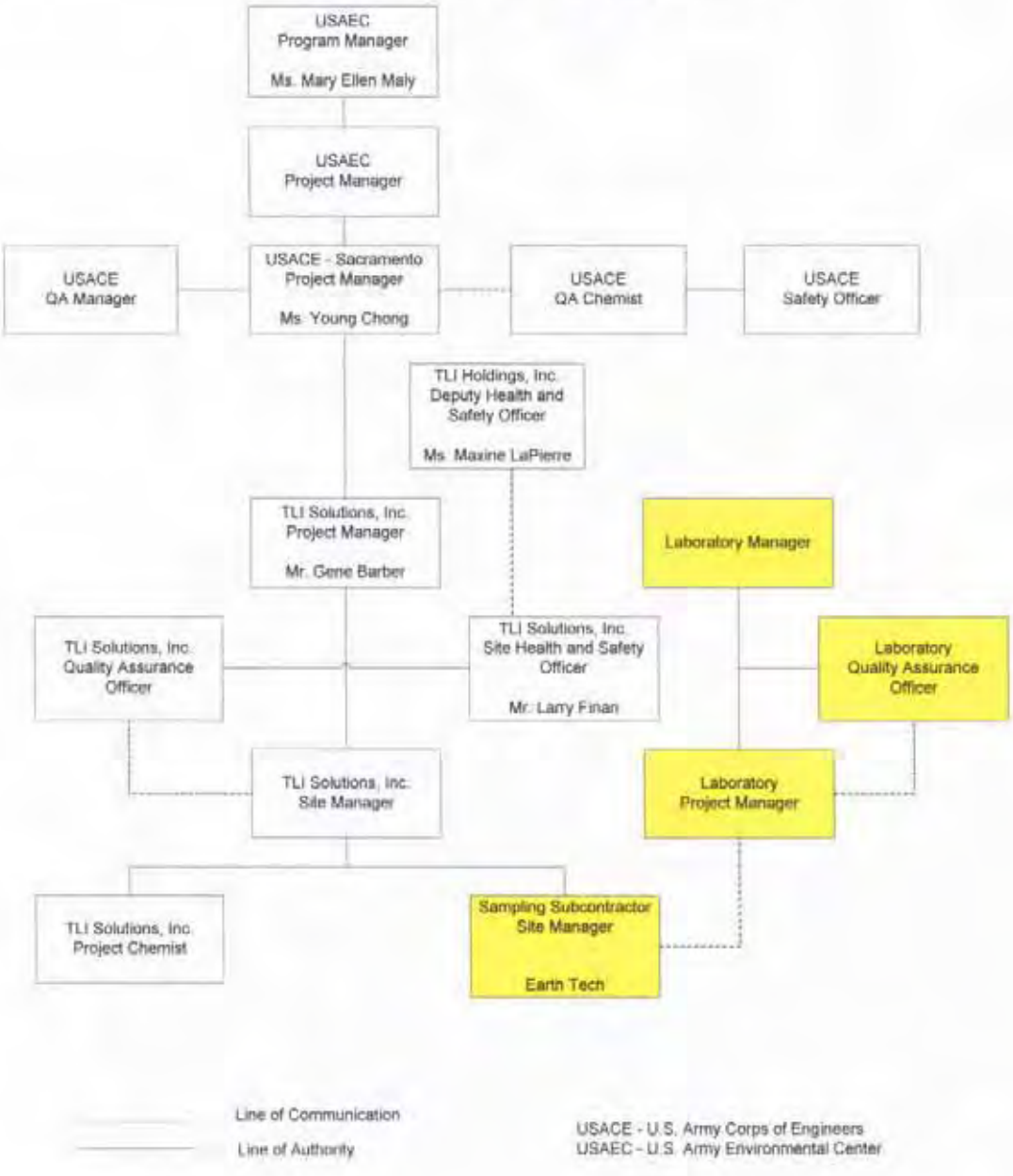
1.0 PROJECT LABORATORY ORGANIZATION AND RESPONSIBILITIES

A specific project laboratory will be designated on a site by site basis established in conjunction with the subcontractor and approved by USACE. However, the project laboratory for each site will be a USACE validated laboratory as defined in EM 200-1-1. The TLI-designated laboratory will be tasked with responsibility for analytical work and for providing data of verifiable quality. It is anticipated that the use of a QA Referee laboratory will also be required. Figure B-1 illustrates the organizational relationships, lines of authority, and lines of communication between the laboratory and other project staff.

Figure B-1
Project and Laboratory Organization



The responsibilities for the key laboratory staff are as follows:

Laboratory Manager- The Laboratory Manager is responsible for overall operation of the laboratory and for ensuring that adequate resources are available to the Laboratory Project Manager to meet laboratory obligations to the project. The Laboratory Manager is also responsible for addressing quality assurance disputes or concerns as communicated by the Laboratory Quality Assurance Officer.

Laboratory Project Manager – The Laboratory Project Manager will be responsible for ensuring that sufficient laboratory resources are available on an as-required basis to meet analytical requirements for holding times and reporting deadlines. The Laboratory Project Manager will oversee production and the final review of analytical reports. The Laboratory Project Manager is responsible for ensuring that all technical and contractual analytical, sample management, and data reporting requirements are met. The Laboratory Project Manager will report to the TLI Project Manager (through the Project Chemist) regarding project schedule technical issues. *[Note: In many cases the laboratory activities will be coordinated by the subcontractor. Therefore, communication will take place through the subcontractor Project Chemist.]*

Laboratory Quality Assurance Officer (LQAO) - The LQAO is responsible for verifying the achievement of analytical quality within the laboratory. The LQAO is responsible for establishing a quality assurance program that at a minimum includes assessments/surveillances, tracking and monitoring corrective actions, and maintaining all quality implementing documents in the laboratory.

2.0 DATA ASSESSMENT ORGANIZATION AND RESPONSIBILITIES

The project data assessment organization is established in Figure B-1 in Section 1.0 of this QAPP. Each key person in the project organization has responsibility for completing project deliverables and meeting project milestones. Although key personnel have ultimate authority for ensuring the quality of project deliverables and meeting project quality and health and safety goals, tasks and responsibilities may also be delegated as appropriate. The following data assessment responsibilities are planned as follows:

TLI Project Manager – Gene Barber. Mr. Barber will provide project management in regard to technical staffing, regulatory strategy, and scheduling. Mr. Barber will manage both on-site and off-site project activities, and will have final authority for those tasks. He will be responsible for approval and dissemination of quality implementing documents (SOPs, WP/SAP, HSP) and technical reports received from the TLI Site Manager to USACE and/or USAEC management.

TLI Site Manager – To be determined on a site by site basis. The TLI Site Manager will be responsible for coordinating and executing daily activities during an SI at a particular site. The TLI Site Manager will have responsibility for developing site specific quality implementing documents (Site Specific WP/SAP, Site Specific HSP) The TLI Site Manager will coordinate site activities with TLI staff and subcontractors (Sampling and Laboratory); as well as with site representatives. The TLI Site Manager has the obligation and authority to stop work if substantive quality and/or health and safety concerns are identified. The TLI Site Manager will

utilize field data and laboratory data (following data validation by TLI or its subcontractor) to develop technical reports.

The TLI Quality Assurance Officer (QAO) will be responsible for auditing the implementation of the QA program in conformance with the demands of specific investigations, TLI policies, and USACE requirements. The TLI QAO will remain independent of direct job involvement and day-to-day operations, and have direct access to corporate executive staff, as necessary, to resolve any QA dispute. The TLI QAO has sufficient authority to stop work on the investigation, as deemed necessary, in the event of serious quality assurance/quality control (QA/QC) issues.

TLI Site Health and Safety Officer - To be determined on a site by site basis. The TLI Site Health and Safety Officer will be responsible for developing and implementing an approved site health and safety plan. The TLI Site Health and Safety Officer has the responsibility and authority to stop work when safety compromising non-conformances or concerns are identified.

TLI Project Chemist – To be determined on a site by site basis. The TLI Project Chemist has responsibility for participating in the development of project quality implementing documents as appropriate under the direction of the TLI Site Manager. The TLI Project Chemist will be responsible for data review and validation following receipt of field and laboratory data. In conjunction with the TLI Site Manager, data usability assessments and limitations on project data will be determined. The TLI Project Chemist will also provide assistance in verifying the extent to which project DQOs are met. The TLI Project Chemist will be the primary contact with the Laboratory Project Manager to ensure that project quality goals and schedule milestones are met. *[Note: In many cases the Field Subcontractor will oversee laboratory activities. In these cases, the* TLI *Project Chemist will coordinate all noted activities through the subcontractor Project Chemist.]*

The specific personnel assigned to this project may fluctuate depending on schedule and technical requirements, availability, among other factors including the number of sites being addressed concurrently. TLI will ensure that personnel are fully qualified for the tasks to which they are assigned.

3.0 DATA QUALITY OBJECTIVES (DQO)

As specified in previous sections of the WP, the primary objective of this project is to determine on a site specific basis whether additional site investigation is necessary due to either the presence of MEC or munitions constituent contamination. The development and implementation of approved procedures and plans for field sampling, laboratory and field analysis, data reporting, data validation and assessment, and sample integrity increases the technical and evidentiary adequacy of the study. DQOs are quantifiable and verifiable quality goals that serve to demonstrate that the data generated under approved plans and procedures were of sufficient quality and quantity to allow appropriate decisions to be made within allowable decision error limits. EM-200-1-2, Appendix F has identified nine specific DQOs that must be determined as part of every USACE sponsored data collection activity. Table 3-1 presents the nine DQOs for

which definitive quality objectives must be determined. Although several of the DQOs will be applicable to all sites, there are also DQOs that must be defined on a site specific basis.

Table 3-1
Project DQOs

DQO Element Number	DQO Element Description	Site Specific DQO Statement
1	Project Objectives Met	Sufficient information was collected to determine if RI/FS is needed as a result of Munitions and Explosives of Concern (MEC) and/or Munitions Constituent (MC) Contamination at a range site
2	Data User Perspective	The Basic amount of data was collected to meet the primary project objectives. Collection of additional data to meet secondary objectives will be established on a site specific basis.
3	Contaminant or Characteristic of Interest	Unless otherwise specified in Site Specific WP/SAP, the primary MC contaminants of interest are TCL Explosives and TAL Metals. Other contaminants of concern at a site will be identified in Site Specific WP/SAP Unless otherwise specified in Site Specific WP/SAP, presence of MEC will be evaluated. Specific ordnance types or explosives may be identified in site specific WP/SAP.
4	Media of Interest	Unless otherwise specified in Site Specific WP/SAP, the primary media of interest will be Surface Soils. Other media of interest are specified in the Site Specific WP/SAP as applicable
5	Required Sampling Locations or Areas and Sampling Depths	MEC/MC contaminants: Identified in Site Specific WP/SAP
6	Number of Samples Required	Identified in Site Specific WP/SAP for MEC and MC contaminants. The number of samples collected to determine the presence of munitions constituents will be established by use of statistical comparison to project action levels to ensure that adequate samples are collected to determine site Munitions Constituents contamination present at a minimum of the 90% Confidence Level.

DQO Element Number	DQO Element Description	Site Specific DQO Statement
7	Reference Concentration Level or Performance Criteria	The MEC threshold level is the identification of a single ordnance device or identification of explosives. The reference concentration level for munitions constituent contamination is specified in the site specific WP/SAP. The use of the MCLs, detection above established background or use specific RBCs will be determined on a site specific basis.
8	Sampling Methods	Unless otherwise specified in the Site Specific WP/SAP, the primary sampling method will be surface soil sampling. The use of composite or grab sampling will be established in the Site Specific WP/SAP. Application of additional sampling methods of alternate media for a site will be identified in site specific WP/SAP.
9	Analytical Method(s)	MEC: Identified in Site Specific WP/SAP as limited by site ordnance disturbance concerns. MC Contamination: SW-846 6010 Metals SW-846 8330 Explosives Specific contaminants of concern as well as other required analytical methods are identified in the Site Specific WP/SAP

The SOPs that will be utilized to complete project activities for sampling, sample management, chain-of-custody, laboratory instrument calibration, laboratory analysis, internal QC, audits, preventative maintenance of field equipment, and corrective action are described or referenced within this WP/SAP. Laboratory analytical methods will be listed in the site-specific WP/SAPs. The analytical laboratory will be responsible for performing laboratory instrument calibration, laboratory analysis, internal laboratory analysis, internal laboratory QC, audits, preventative maintenance of laboratory equipment, analytical corrective action, and reporting of data.

3.1 Data Use Background

As a follow on to the CTT ranges inventory project, TLI, Incorporated (TLI) shall perform an SI for each site assigned to TLI by USACE. Recommended actions will be determined by TLI based on the findings of each SI (i.e., whether remedial investigations and/or feasibility studies (RI/FS) will be needed for each identified site; whether an immediate response is needed; or whether the site qualifies for no further action).

3.2 Measurement Quality Objectives for Chemical Data Measurement

Measurement Quality Objectives (MQOs) are method specific key quality indicators that are used to evaluate and ensure the chemical data quality. For each method, data quality indicators

are provided for precision, accuracy, and sensitivity. Appendix I of EM 200-1-3 provides MQOs for key methods. To facilitate the preparation of site specific WP/SAPs, the MQOs for SW-846 Method 6010/7470 (Metals and Mercury) as well as SW-846 Method 8330 (Explosives) are provided in Table 3-2 and Table 3-3. MQOs for additional methods required on a site specific basis may be obtained from EM-200-1-3 and/or the appropriate analytical methods.

Table 3-2
Analytical Quality Control Limits for Metals Method 6010/7000 Series

Analysis Type	Analyte	Control Limits	Frequency
Initial calibration verification (independent reference) (ICV)	All ICP GFAA/CVAA	90-110% 85-115%	Once for each time instrument is calibrated
Continuing calibration verification (CCV)	All ICP GFAA/CVAA	90-110% 85-115%	One for every 10 analyses and following the last sample analysis
Continuing calibration blank	All	<MDL	One for every 10 analyses and following the last sample analysis
Preparation blank	All	< ½ MRL	One per batch or one per 20 samples of similar matrix, whichever is more frequent
Matrix spike (predigestion spike)	All ICP GFAA/CVAA	75-125%	One per batch or one per 20 samples of similar matrix, whichever is more frequent
Laboratory control samples	All	80-120%	One per batch or one per 20 samples of similar matrix, whichever is more frequent
Laboratory duplicates	All	25 RPD (Water) 35 RPD (solid)	One per batch or one per 20 samples of similar matrix, whichever is more frequent
Graphite Furnace Atomic Adsorption Spectrometry (GFAA) instrument duplicate	All GFAA /CVAA elements	≤ 20% RSD	Every GFAA analysis, except during method of standard analysis (MSA)
Analytical spike (post-digestion spike)	All ICP elements GFAA /CVAA	75-125% 85-115%	One per batch or one per 20 samples of similar matrix, whichever is more frequent, when matrix spike does not meet control limit. Every sample, blank, and LCS

Analysis Type	Analyte	Control Limits	Frequency
GFAA MSA analysis	GFAA/CVAA elements	$r \geq 0.995$	MSA is run on every sample when GFAA analytical spike does not meet control limits
ICP serial dilution	All ICP elements	+ / - 10% Difference	One per batch or one per 20 samples of similar matrix, whichever is more frequent
ICP interference check sample	All ICP elements	+ / - 20% True Value	Before and after each analysis run, after the ICV, or a minimum of twice per 8-hour working shift, whichever is more frequent
Correlation coefficient	All	$r \geq 0.995$	Once for each time the instrument is calibrated

Table 3-3
Analytical Quality Control Limits for TCL Explosives

Analysis Type	Analyte	Control Limits	Frequency
Initial Calibration Verification	TCL Explosives	85-115% Recovery	Once per day of sample analysis in which instrument is calibrated
Continuing Calibration Verification	TCL Explosives	15% Difference or 15% Drift	Once every day of sample analysis in which instrument is not calibrated
Linearity Criteria	TCL Explosives	RSD + / - 20% $r \geq 0.995$	Once for each time the instrument is calibrated
Surrogate Standard	TCL Explosives	50-150% (Soil) 60-140% (Water)	Added to each sample, matrix spike, matrix spike duplicate, blank, and standard
Laboratory control samples	TCL Explosives	60-120% (Soil and Water)	One per batch or one per 20 samples of similar matrix, whichever is more frequent
Matrix Spike	TCL Explosives	50-140% (Soil and Water) Note: Expanded criteria for Tetryl of 45-140% may be used	One per sample of similar matrix, per case, per 20 samples, or per similar concentration level, whichever is more frequent
Matrix Spike Duplicate	TCL Explosives	RPD $\leq$ 50 (Soil and Water)	One per sample of similar matrix, per case, per 20 samples, or per similar concentration level, whichever is more frequent

Analysis Type	Analyte	Control Limits	Frequency
Method blank	TCL Explosives	< ½ MRL	One per batch or one per 20 samples of similar matrix, whichever is more frequent
Target Analyte Confirmation	TCL Explosives	RPD < 40%	As required for detected results

4.0 SAMPLE RECEIPT, HANDLING, CUSTODY, AND HOLDING TIME REQUIREMENTS

All samples collected for this project will be generated under strict chain of custody protocols as specified in EM-200-1-3 Appendix F. The custody requirements for this project are as follows:

- The sample is in the sampler's possession.
- The sample is in the sampler's view after being in possession.
- The sample was in the sampler's possession and then was locked up to prevent tampering.
- The sample is in a designated secure area.

Field Custody requirements are specified in the FSP portion of this WP/SAP. Laboratory sample receipt, handling, and custody procedures will be documented in the project laboratory procedures and the laboratory quality assurance project plan. Figure B-2 illustrates the generalized laboratory custody sequence for samples associated with this project.

Sample container and preservation requirements as well as analytical and preparation holding times for analytical methods are found in Appendix I of EM 200-1-3 as well as in SW-846.

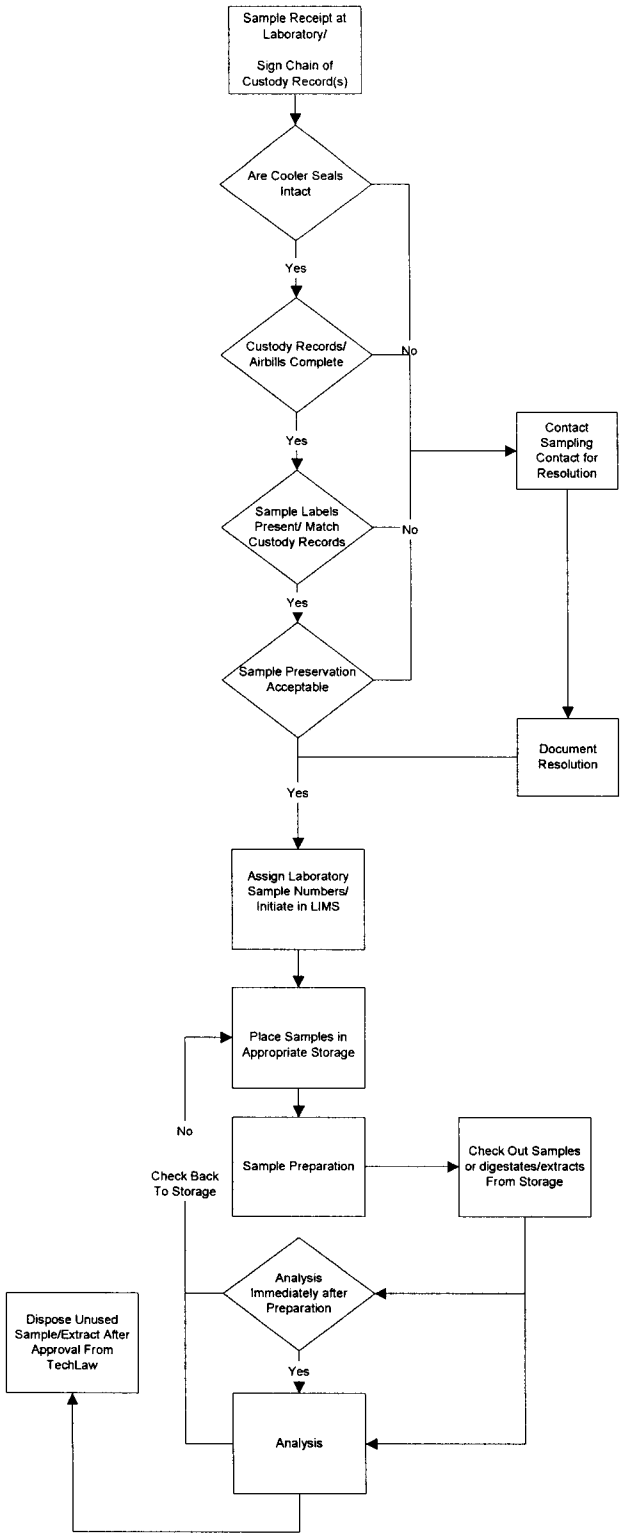
4.1 Verification/Documentation of Cooler Receipt Condition

Laboratory sample receipt personnel will inspect the cooler condition upon receipt. The cooler will be inspected to ensure that samples were properly packaged and arrived at the analytical laboratory in acceptable condition without tampering or damage. Custody seals will be inspected to determine if the cooler seal was broken during transport from the field to the analytical laboratory; the temperature of the samples will be measured and recorded to verify the internal cooler temperature range of 2º to 6º C; the sample containers will be inspected to look for leakage or breakage; the sample containers will be compared against the chain-of-custody to verify the number, descriptions, analytical requirements, and to verify the date/time of sample collection.

The following are general procedures that will be conducted by analytical laboratory sample receiving personnel.

- Receive and inspect the incoming sample coolers and sample containers;
- Record the condition of the incoming sample coolers and sample containers;
- Verify chains-of-custody;
- Verify temperature preservation and pH as appropriate;

Figure B-2
Laboratory Custody Sequence



- Notify laboratory manager and laboratory supervisor of sample receipt and inspection;
- Assign a unique identification number and customer number, and enter each into the sample receiving log;
- Initiate transfer of the samples to appropriate laboratory storage areas; and
- Control and monitor access/storage of samples and extracts/digestates.

4.2 Corrective Action for Incoming Samples

Should the condition of samples or coolers upon receipt by the laboratory require corrective action due to container breakage, missing or incomplete sample labels, among other items, the laboratory will notify the TLI or subcontractor Site Manager immediately to resolve the issue. Any corrective actions taken will be recorded by the TLI Site Manager and will be noted in the laboratory data report.

5.0 ANALYTICAL PROCEDURES

Laboratory analytical methods that may be performed include TAL metals, TCL explosives, and perchlorates. Laboratory analytical measurements will be conducted in accordance with the procedures detailed in *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, Third Edition* (June 1997) (SW-846). Additionally, USACE has issues method specific considerations in EM 200-1-3 Appendix I as well as EM-200-1-6. A complete listing of site-specific target compounds, minimum detection limits, and reporting limits will be provided in the site-specific WP/SAP.

5.1 Preventative Maintenance

Laboratory preventative maintenance is the responsibility of analytical laboratory and is reflected in their SOPs. At a minimum, the laboratory must meet the preventative maintenance requirements of their laboratory approval from USACE and as specified in EM 200-1-1. At a minimum the laboratory will be required to perform the following maintenance activities:

- Prepare and implement Preventative Maintenance and Corrective Maintenance SOP
- Prepare and implement preventative maintenance schedule
- Document maintenance activities in dedicated laboratory logbooks
- Maintain adequate spare part inventories to prevent prolonged instrument down time

5.2 Calibration Procedures and Frequency

Laboratory instrumentation will be calibrated in accordance with requirements specified in instrument manufacturer instructions and/or applicable TLI Field Instrumentation Procedures. At a minimum, laboratory instruments will be calibrated or calibration will be verified daily prior to use; and calibration will be verified after conclusion of the last sample analyzed for the day. Specific instruments calibration frequency, the acceptance criteria, and the conditions that will require more frequent re-calibration will be provided in the laboratory instrument and analytical method SOPs. All calibration procedures performed will be documented in the logbook and the Daily Quality Control Report. The documentation for each calibration activity will include the

name and identification of the instrument, date/time of calibration, name of person performing the calibration, reference standard identification and concentrations, temperature at which readings were taken, and the readings to include units of measure. Multiple readings on one sample or standard, as well as readings on replicate samples, will likewise be documented.

Calibration requirements, frequencies, and acceptance criteria for analytical methods are specified in SW-846, EM 200-1-3 Appendix I, as well as laboratory SOPs. Requirements are specified for calibration as well as calibration verification activities. In the site specific WP/SAP specific standard components and concentration requirements may be specified based upon the identified contaminants of concern and project sensitivity requirements. In all cases, the initial calibration will be verified using an independently-prepared calibration verification solution.

5.3 Laboratory Quality Control Procedures

The required laboratory QC procedures associated with each analytical method are specified in Appendix I of EM 200-1-3 as well as the appropriate SW-846 analytical method. Site specific WP/SAPs will document the frequency and acceptance criteria for each laboratory QC check. At a minimum each method will have QC tests to verify the sensitivity of the instrument, the precision of the method, and the accuracy of the method. The validity of instrument or method detection limits are verified through the use blanks. Consistent presence of blanks may indicate that reported detection limits may not be achievable. Precision is typically evaluated thorough the use of sample or matrix spike duplicates. Matrix spike duplicates are often preferred for organic methods because the presence of detectable levels of organics in field samples is not often assured. Accuracy may be evaluated on a sample specific basis for some methods or on a batch basis for other methods. The analytical laboratory maintains a QC program to ensure the reliability and validity of the analysis performed at the laboratory. All analytical procedures are documented in writing as SOPs which include a QC section addressing the minimum QC requirements for the procedure. The internal QC checks differ slightly for each individual procedure, but, in general, the QC requirements may include some of the following information:

- Method blanks;
- Calibration blanks applicable to inorganic analysis;
- Matrix spikes;
- Surrogate spikes for organic methods;
- Analytical spikes applicable to graphite furnace;
- Laboratory duplicates of field samples or spiked samples;
- Laboratory control samples;
- Internal or external standard areas;
- Mass tuning for MS analysis.

All data obtained will be properly recorded in instrument printouts and/or laboratory logbooks, and the final data package will allow the recipient to reconstruct QC information and compare it to project QC criteria. Specific analytical methods identify critical criteria that must be met as part of the successful analytical process. Any samples analyzed in non-conformance with the method specified critical QC criteria will be re-analyzed by the laboratory. It is expected that sufficient volumes/weights of samples will be collected to allow for re-analysis, when necessary.

5.3.1 Analytical Sequence QC

Analytical sequencing QC will be conducted by the analytical laboratory. The analytical sequence for each method is specified in Appendix I of EM 200-1-3 as well as specific analytical methods. At a minimum, the following analytical sequence requirements are established for this project:

- Calibration or calibration verification will occur each day of use and prior to the analysis of any field or QC samples.
- When continuing calibration and ending calibration is required, all samples must be bracketed by a calibration verification sample.
- Batch specific QC must be analyzed with the samples included in the same batch.
- Initial analysis of samples must occur at dilution factors that will allow all project detection limits to be made. Ideally, all samples will be analyzed undiluted. If the laboratory determines that samples must be initially diluted prior to analysis, the TLI Site Manager must be notified and provided with a justification for performing the dilution and for identifying any constituent required detection limits that would not be met. The rationale for dilution must be included in the data package case narrative. Results must be reported from the lowest diluted result within the instrument analytical range.

5.3.2 Batch/Matrix-Specific/Performance-Based QC

Batch/matrix-specific/performance-based QC will be conducted by the analytical laboratory. For this project all batch QC samples such as spikes, duplicates, laboratory control samples must be prepared and analyzed with the samples. All batch and matrix specific QC in which a field sample is utilized must be based upon a field sample associated with the project and that is included in the same batch as the QC samples.

5.4 Performance and System Audits

Performance and system audits of both field and laboratory activities may be conducted to verify that sampling and analysis is performed in accordance with the procedures established in the FSP and the QAPP. The audits of field and laboratory activities include two independent parts: internal audits and external audits.

Internal Field Audits

One or more internal audits may be undertaken by the TLI QAO. The audits may consist of an examination of field sampling records, sampling collection activities, sample handling and packaging, maintenance of QA procedures, and sample chain-of-custody procedures. TLI intends to conduct an initial field audit on all sampling records and sample coolers before the initial samples are delivered to Laboratory for analysis. Follow-up internal audits may be conducted to correct deficiencies, and to verify that QA procedures are maintained throughout

the project. Any findings identified during the audit process will be introduced into our internal corrective action system, in which the finding, root cause, remedial action, and action to prevent reoccurrence, and date of corrective action implementation closeout will be documented.

External Field Audits

External field audits may be conducted by USACE, or their designee. External field audits may be conducted any time during the field operations. These audits may or may not be announced and are at the discretion of USACE. The external field audit process can include a review of sampling equipment decontamination procedures, sample bottle preparation procedures, sampling procedures, examination of field sampling and safety plans, sample vessel cleanliness, QA procedures, and procedures for verification of field duplicates. Any findings identified during the audit process will be introduced into our internal corrective action system, in which the finding, root cause, remedial action, and action to prevent reoccurrence, and date of corrective action implementation closeout will be documented.

Internal Laboratory Audits

Because TLI intends to only use USACE validated laboratories proficient in the methods required for this project, it is anticipated that TLI will not be required to conduct additional internal laboratory audits. However, at the direction of USACE, TLI will perform independent, internal system audits of the analytical laboratory as necessary. The audits will be conducted by the TLI QAO or designee.

The internal system audits may include any or all of the following: review of laboratory analytical procedures, review of laboratory records and logbooks, and laboratory on-site visits. Internal laboratory audits may be conducted to identify systemic laboratory quality issues as identified in the validation process. An onsite review can consist of: sample receipt procedures, custody and sample security and log in procedures, sample tracking procedure, review of instrument calibration records, instrument logs and statistics (number and type), review of QA procedures, log books, sample preparation procedures, sample analytical SOP review, instrument (normal or extends quantitation report) reviews, personnel interviews, review of report preparation and glassware preparation, and a closeout to offer potential corrective action. It is common practice when conducting an internal laboratory audit to review one or more data packages from sample lots recently analyzed by the laboratory. This review may include but not be limited to the following:

- Comparison of resulting data to the SOP or method, including coding for deviations;
- Verification of initial/continuing calibrations control limits;
- Verification of surrogate recoveries and instrument timing results, where applicable;
- Review of extended quantitation reports for comparisons of library spectra to instrument spectra, where applicable;
- Recoveries on control standard runs;
- Review of run logs with run times, ensuring proper order of runs;
- Review of spike recoveries/QC sample data;

- Review of suspected manually integrated laboratory control (LC) data and its cause (where applicable);
- Review of LC peak resolution for isolated compounds as compared to reference spectra, where applicable; and
- Assurance that samples are run within holding times.

Internal, independent performance audits of the analytical laboratory may be conducted by TLI. The performance audits may involve preparing blind, SRM samples and submitting them along with project samples to the laboratory for analysis throughout the project. The TLI QAO may evaluate the analytical results of these blind performance samples to ensure the laboratory maintains acceptable QC performance.

External Laboratory Audits

TLI will only use laboratories that have been previously validated by USACE in accordance with EM 200-1-1. Additional external audits are not anticipated. Additional external audits may be required in the event that a non-standard contaminant of concern is identified or if the site DQO requires additional compounds for a method or lower sensitivity requirements. An external audit may be conducted, as required, by appropriate USACE QA personnel. These audits may or may not be announced and are at the discretion of USACE.

5.5 Non-conformance/Corrective Actions

The need for corrective action may be identified through internal or external audits; data validation results; and through observations of project staff/management, USACE, USAEC, and regulators. All issues requiring corrective action will immediately be introduced into the TLI Corrective Action System. For each corrective action request entered into the system, the TLI QAO will assign a corrective action tracking number and coordinate a corrective action response with the TLI Site Manager for a particular site. If the corrective action request is programmatic in nature, the TLI Project Manager will be responsible for replying to the corrective action. For each corrective action request the impact of the condition must be described to include affected samples and/or analytical results, the remedial action taken to correct non-compliant conditions must be identified and implemented, the root cause of the quality assurance failure must be identified, and the proposed action taken to prevent reoccurrence must be implemented. Implementation dates must be documented and the implementation of corrective action must be verified by the TLI QAO prior to closeout of the corrective action.

The TLI QAO has the authority to stop work if corrective actions are insufficient and the quality of the data collection process is negatively impacted. The TLI QAO also has the authority to stop work if a significant condition adverse to quality is identified that requires immediate attention. The TLI Health and Safety Officer has the authority to stop work if a significant health and safety issue is identified. Additionally, the TLI Project Manager and the v Site Manager have the authority to stop work if a significant condition adverse to quality is identified or if insufficient corrective actions are implemented in response to corrective action requests.

If, at any time, a corrective action issue is identified which directly impacts project DQOs, the USACE POC will be notified immediately by the TLI Project Manager.

Corrective action in the laboratory may occur prior to, during, and after initial analyses. A number of conditions such as broken sample containers, multiple phases, low/high pH readings, potentially high concentration samples may be identified during sample log-in or just prior to analysis. Following consultation with lab analysts and section leaders, it may be necessary for the implementation of corrective action. These conditions may include dilution of samples, additional sample extract cleanup, and automatic re-injection/re-analysis when certain QC criteria are not met.

During analysis, the laboratory bench chemist may identify the need for corrective action. The laboratory QA Manager, in consultation with the staff, will approve the required corrective action to be implemented by the laboratory staff. The laboratory QA Officer will ensure implementation and documentation of the corrective action. If the nonconformance causes project objectives to not be achieved, it will be necessary to inform all levels of project management to concur with the corrective action, including the USACE POC. These corrective actions are performed prior to release of the data from the laboratory. The corrective action will be documented in the laboratory corrective action log, will be signed by the analyst and the laboratory QA Manager, and the narrative data report will be sent to the TLI QAO. If corrective action does not rectify the situation, the laboratory will contact the TLI Project Manager.

Response actions will be undertaken to correct any deficiencies noted in any system and/or performance audit. All corrective action proposed and implemented will be documented in the regular QA reports to management. Corrective action should only be implemented after approval by the TLI QAO. If immediate corrective action is required, approvals secured by telephone from the TLI QAO should be documented in an additional memorandum to all project personnel. For noncompliance problems, a formal corrective action program will be determined and implemented at the time the problem is identified.

6.0 DATA REDUCTION/CALCULATION OF DATA QUALITY INDICATORS

The analytical laboratory is responsible for laboratory data reduction. Following are general data reduction procedures. In general laboratory practice, all manually recorded analytical data will be recorded in numerically-identified laboratory notebooks. Data are recorded in this notebook along with other pertinent information, such as the sample identification number and the sample tag number. Other details will also be recorded in the laboratory notebook, such as the analytical method used, the laboratory SOP number, name of analyst, the date of analysis, matrix sampled, reagent concentrations, instrument settings, and the raw data. Each page of the notebook is signed and dated by the analyst. Periodic reviews of these notebooks by the laboratory QA Manager takes place prior to final data reporting, with records of notebook entry inspections being maintained by the laboratory QA Manager. In addition to laboratory notebooks, all instrument software printouts are kept on file by the laboratory.

The equations that will be employed in reducing data make pertinent allowances for matrix type. All calculations are checked by the laboratory. Errors are noted, corrections are made, but the

original notations are crossed out legibly. Analytical results for soil samples shall be calculated and reported on a dry weight basis. All QC data (*e.g.*, laboratory duplicates, surrogates, MS/MSDs) will be compared to the method acceptance criteria and/or laboratory limits. Data considered to be acceptable will be reported by the laboratory. Unacceptable data will be appropriately qualified in the project report. Case narratives will be prepared which will include information concerning data that fell outside acceptance limits, and any other anomalous conditions encountered during sample analysis. After the laboratory data has been reduced, it is then considered ready for data validation.

6.1 Precision

Precision is a measure of the degree to which two or more measurements are in agreement.

Field Precision Objectives

Field precision is assessed through the collection and measurement of field duplicates at a rate of one duplicate per 10 field samples collected. The total number of field duplicates collected at each site will be specified in the site specific FSP.

Laboratory Precision Objectives

Precision in the laboratory is assessed through the calculation of relative percent differences (RPD) and relative standard deviations (RSD) for three or more replicate samples. Precision control limits for all methods are specified in Appendix I of EM 200-1-3 or SW-846.

For inorganic analyses and other specified analytes that may be either common in the background or a likely pervasive contaminant at a site, laboratory precision shall be assessed through the analysis of sample/sample duplicate pairs. For organic analyses and other analytes that are not expected to be found in field samples, laboratory precision shall be assessed through the analysis of matrix spike/matrix spike duplicates (MS/MSD).

Precision Assessment

The RPD between the spike and matrix spike, or matrix spike and sample duplicate in the case of metals, and field duplicate pair or laboratory duplicate pair is calculated to compare to precision DQOs. The precision MQOs for this project will be provided in the site specific WP/SAP and will be consistent with those presented for specific analytical methods in Appendix I of EM 200-1-3. The RPD is calculated according to the following formula.

$$RPD = \frac{(\text{Amount in Sample 1} - \text{Amount in Sample 2})}{0.5(\text{Amount in Sample 1} + \text{Amount in Sample 2}) \times 100}$$

6.2 Bias

Bias (accuracy) is the systemic or persistent distortion of a measurement process that causes errors in one direction. Bias is measured as the degree of agreement between an observed value

and an accepted reference or true value. Bias may also be attributable to specific sample conditions that cause error in the measurement in a single direction, such as holding time violations or demonstrated matrix effects.

Field Accuracy Objectives

Accuracy in the field is assessed through the collection and analysis of field and trip blanks. Analysis of field blanks and trip blanks is used to identify systemic introduction of contaminants into the analytical process that may cause a positive bias and the potential for false positives.

Laboratory Accuracy Objectives

Laboratory accuracy is assessed through the analysis of MS/MSD, laboratory control samples (LCS) and surrogate compounds, as well as the analysis of method and calibration blanks. Accuracy control limits and blank acceptance criteria are presented in Appendix I of EM 200-1-3 and will be specifically identified in the site specific WP/SAP.

Bias Assessment

Bias is measured typically as a percent recovery (%R) according to the following basic formula

$$\%R = \frac{\text{Measured reference concentration}}{\text{Actual reference concentration}} \times 100$$

6.3 Sample Quantitation/Reporting Limits (Limit of Detection)

Once site-specific analytical requirements are determined, tables will be prepared and submitted with the site-specific WP/SAPs detailing the various relevant detection limits. The detection limits requirements for a specific site are established to ensure that the sensitivity of the analysis is appropriate to determine the presence of a constituent at a site. Therefore the following limits of detection will be documented and defined on an analyte specific basis in this section of each specific WP/SAP:

- Method Detection Limit (MDL) – The statistically derived detection limit denoting the lowest concentration at which an analyte can be reliably detected and reported

- Minimum Reporting Limit (MRL) – The minimum detection limit for purposes of making project decisions. This MRL must be equal to or less than any project specified action levels. All analyte MDLs must be less than the respective MRL for the analyte

- Project Action Level – The appropriate action level to meet project objectives. For this project, the action level for munitions constituents will be set as either the MCL, RBC, or the established site background. The specific criteria will be established in the site specific WP/SAP.

6.4 Completeness

Completeness is a measure of the amount of valid or usable data obtained from a measurement system compared to the amount that was expected to be obtained under normal conditions. For this project, TLI has identified Field Completeness, Sampling Completeness, and Data Completeness goals that must be met. Additional sampling or analysis may be required in the event a completeness goal is not met.

Field Completeness Objectives

Field completeness is a measure of the amount of valid measurements obtained in comparison to all planned measurements that are documented in a site specific WP/SAP. A valid field measurement is defined as:

Field completeness will be calculated for each field measurement type.

The field completeness objective for this project will be 95 percent.

Sampling Completeness Objectives

Sampling completeness is a measure of the number of valid samples obtained in comparison to all planned samples that are documented in a site specific WP/SAP. A valid sample is defined as:

- A sample collected at the location and depth indicated in the WP/SAP for all methods specified in WP/SAP
- A sample collected for the media specified for the location and depth indicated in the WP/SAP
- A sample collected using the appropriate sampling method as specified in the WP/SAP
- A sample maintained under chain of custody in the field and laboratory and for which the sample identity is clearly associated with a valid sampling location
- A sample that remains unbroken during shipment and until the completion of analysis

The sampling completeness will be evaluated for each analytical method; and is set at 95 percent at each site for this project.

Laboratory Completeness Objectives

Laboratory completeness is a measure of the amount of valid measurements obtained from all the measurements taken in the project. Valid measurements are defined as:

- Analytical measurements that have no associated data qualifiers from the validation process
- Analytical measurements with associated accuracy or precision bias that does not affect the project objective
- Analytical measurements that meet sensitivity requirements for the method

The laboratory completeness objective for this project will be 90 percent or greater.

Completeness Assessment

Completeness is the ratio of the number of valid sample results to the total number of samples collected or analyzed with a specific matrix and/or analysis. After analytical testing, the percent completeness (% C) will be calculated by the following equation:

$$\% C = \frac{\text{(number of valid samples/measurements)}}{\text{(number of samples/measurements planned)}} \times 100$$

7.0 LABORATORY OPERATIONS DOCUMENTATION

The analytical laboratory will maintain documentation of laboratory operations in accordance with the laboratory-specific QAPP that was validated and approved as part of the USACE laboratory approval process. The laboratory QAPP is available upon request.

7.1 Sample Management Records

Sample management records will be maintained by the analytical laboratory and also by the TLI Project Manager, in the TLI Denver, Colorado office.

For this project the following records are considered to be Sample Management Records:

- Chain of Custody Records
- Analytical Requests
- Communication Records between Laboratory and TLI

7.2 Data Reporting Procedures

Laboratory data reporting will be conducted according to the following sections.

7.2.1 Data Package Format and Contents

Laboratory data reporting will be performed through the transmission of case narratives and chemistry data packages from the laboratory to TLI. The analytical data packages submitted to TLI will include the following:

Case Narrative

i. Date of issuance
ii. Laboratory analysis performed
iii. Any deviations from intended analytical strategy
iv. Laboratory batch number
v. Numbers of samples and respective matrices

vi. Analytical Methods utilized and also references to the acceptance criteria
vii. Laboratory report contents
viii. Project name and number
ix. Condition of samples 'as-received' and resolution of any sample non-conformances
x. Discussion of whether or not sample holding times were met
xi. Discussion of technical problems or other observations which may have created analytical difficulties
xii. Discussion of any laboratory QC checks which failed to meet project criteria
xiii. Signature of the appropriate manager

Chemistry Data Package[1]

i. Case narrative for each analyzed batch of samples
ii. Summary page indicating dates of analyses for samples and laboratory quality control checks
iii. Cross referencing of laboratory sample to project sample identification numbers
iv. Laboratory Data qualifiers to be used should be adequately described
v. Sample Summary Results
vi. Calibration Summary Results (Initial and Continuing)
vii. QC Summary Results
viii. Raw data for sample results, calibration activities, and laboratory QC results
ix. Sample preparation raw data and/or logbooks
x. Chain of Custody Records
xi. Laboratory communications with TLI

The data package submitted to TLI will be in CLP format or equivalent. Following receipt of the data package from the laboratory, the TLI Project Manager or his/her designee may perform an independent review of the results prior to data validation.

7.2.2 Electronic Deliverables

The analytical laboratory will submit electronic data deliverables (EDD) to TLI. The EDD will be in a format compatible with TLI and USACE data management systems. The EDD will match all data reported on the hard copy analytical report, and include the information as summarized below.

Laboratory information - laboratory name, client name, laboratory work order number, client project number, and date received.

[1] Order of elements may vary between analytical methods

Sample information – client sample identification, laboratory sample identification, date sampled, time sampled, matrix, beginning and ending depth of sample interval, if applicable, pH, and percent moisture.

Analytical data – Sample Delivery Group (SDG), test code, test name, analyte, analyte type, sample type, Chemical Abstracts Service number, date and time prepared, date and time analyzed, preparation batch identification, analytical batch identification, result, laboratory qualifiers, method detection limit, reporting limit, and dilution factors.

QC data – Items listed for analytical data will also be provided for method blanks, surrogates for all samples, laboratory control samples, matrix spike/matrix spike duplicates, and laboratory replicates. QC sample data will also include QC sample type, recoveries, relative percent differences, control limits, and any associated qualifiers.

7.3 Data Management Procedures

Data management procedures track samples and results from work plan implementation through final report. The analytical laboratory will assign a project manager who will coordinate data management in the laboratory and with TLI. Specific laboratory data management procedures are contained in laboratory SOPs not included in this generic WP/SAP.

7.3.1 Laboratory Turnaround Time

TLI anticipates that preliminary analytical laboratory results will be provided to TLI within 30 days of each sampling event. Data validation will be conducted by TLI. TLI anticipates that complete validated data packages will be available within 30 to 45 days of each sampling event. TLI will complete data validation and prepare individual data validation reports of the analytical data within 10 days of receiving the complete analytical data package from each sampling event. Chemical Data Quality Reports summarizing the data validation and data usability results will be prepared within 45 days of the completion of sampling at a particular site. Procedures and criteria for preparing data validation reports and Chemical Data Quality Reports are provided in EM 200-1-6.

7.3.2 Data Archival/Retention Requirements

The analytical laboratory will retain all electronic and hard copy data records for three years from the date of analyses. Prior to disposition, the laboratory will notify TLI and provide TLI with the opportunity to obtain records prior to laboratory disposal.

8.0 DATA ASSESSMENT PROCEDURES

All analytical results and field measurements will be validated and assessed by TLI according the applicable method detailed in EM 200-1-6. Additionally, validators may also use appropriate *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, Third Edition* (June 1997) (SW-846) and applicable field measurement SOPs and methods as references for obtaining method criteria not addressed in EM 200-1-6.

Individual data validation reports will be prepared for each analytical batch or data packages as the packages are received by the TLI Project Chemist. Individual Daily Quality Control Summaries will be reviewed to determine if field sampling procedures and sampling location specifications were followed adequately; and to assess if all field measurements were obtained using instruments that were calibrated in accordance with project requirements. At the conclusion of the data collection effort, a summary Chemical Data Quality Assurance Report will be generated that assesses the data for the entire site to determine if project MQOs and DQOs have been met and to determine if any additional sampling and/or analytical activities are warranted.

8.1 Data QC Review

Data generated will be reviewed for conformance with this generic WP/SAP, site-specific WP/SAPs, and project requirements. Field record QC review will include Daily Quality Control Summary Reports, instrument calibration logs, sampling logs, chain-of-custody forms, field notes, and field parameter results. The field information assessment will evaluate the potential for impact to sample integrity and chemical data quality. Field QC data will be evaluated daily by the TLI Site Manager to ensure that project objectives for the daily sampling activities were met. Any anomalies in the documentation, procedures, and/or data can then be adjusted and corrected if necessary to prevent recurrence of any nonconformances with the field data.

Laboratory analytical data will be reviewed and qualified using methods established in USACE guidance and SW-846 analytical methods as specified in Section 8.0. Validation of laboratory reports will be completed within 2 weeks of receipt of the data from the project laboratory. Reports will be made available to the TLI Site Manager upon completion of the reports. Any systemic data conditions as the result of field or laboratory activities that negatively impact the ability to meet DQOs or MQOs for the project will be brought to the attention of the TLI Site Manager by the TLI Project Chemist. Issues should be communicated via separate written or verbal communication to ensure that issues are made known to the TLI Site Manager.

8.2 Data Verification/Validation

All field data and observations will be documented in field log books and Daily Data Quality Summary Reports immediately after measurements are taken. If errors are made, results will be legibly crossed out with a single line, with the correction noted in the space adjacent to the original entry, and all corrections initialed and dated by the field member. The TLI Project Manager or designee will review the forms on a daily basis to determine whether any errors have been made by the field crew.

Field data validation includes checking for transcription errors and reviewing field logs for compliance with this QAPP. Specifically, the field validation will consist of the following activities:

- Verifying that all field measurements were made using instruments calibrated in accordance with project requirements and for which all field QC measurements are within acceptance criteria

- That calibration activities include the identification of the instrument calibrated, the date and time of calibration, the reference standards used, the true value of all reference standards, and the name of the individual performing the calibration

- Verifying that the daily Data Quality Summary Reports are completed and accurately reflect the sampling activities

- Verifying that sampling occurred in accordance with specified SOPs, that all sampling locations are documented and associated with a specific field measurement identification number.

- Verifying that all custody documentation is appropriate and that samples were maintained under custody.

This task will be the responsibility of the TLI QAO, who will otherwise not participate in making any of the field measurements, or in adding notes, data, or other information to the log book.

Laboratory data review and validation will be undertaken by TLI to ensure that the project MQOs and DQOs are met. One hundred percent of all laboratory data will be subject to full validation against to full data package.

Level III validation consists of full review of sample custody records, and validation of the results in comparison to quality control summary data in the data package. Level IV validation will address the following: technical holding times, instrument performance check sample results, results of initial and continuing calibration, and results of surrogate spikes, MS/MSDs, laboratory control samples, and target compound identification and quantitation results. One hundred percent of the analytical results will be validated.

8.3 DQO Reconciliation

The TLI Project Manager and USACE COR (or designee) will determine whether the data are of the appropriate quality, quantity and representativeness to support the project objectives. The affect of the loss of data deemed unacceptable for use, for whatever reason, on the project objectives will be discussed between the TLI QAO and the TLI Project Manager. Only data generated in association with QC results meeting these objectives will be considered useable for decision making purposes. In addition, the data obtained will be both qualitatively and quantitatively assessed on a project-wide, matrix-specific, parameter-specific and unit-specific basis. This assessment will be performed by the TLI QAO, and the results presented and discussed in detail in the SI report. Factors to be considered in this assessment of field and laboratory data will include, but not necessarily be limited to, the following:

- Were all samples obtained using the methodologies and SOPs proposed in the QAPP;
- Were all proposed analyses performed according to the SOPs provided in the QAPP;
- Were samples obtained from all proposed sampling locations and depths;

- Do any analytical results exhibit elevated detection limits above project action levels due to matrix interferences or contaminants present at high concentrations;
- Were all field and laboratory data validated according to the validation protocols, including project-specific QC objectives, proposed in the QAPP;
- Which data sets were found to be unusable (qualified as "R") based on the data validation results;
- Which data sets were found to be usable for limited purposes (qualified as "J") based on the data validation results;
- What affect do qualifiers applied as a result of data validation have on the ability to implement the project decision rules;
- Can valid conclusions be drawn for all matrices at each unit and/or area under investigation;
- Were all issues requiring corrective action, as presented in the monthly QA Reports to management fully resolved;
- Were the project-specific decision rules used as proposed during the actual investigation;
- For any cases where the proposed procedures and/or requirements have not been met, has the affect of these issues on the project objectives been evaluated;
- Have any remaining data gaps been identified and summarized in the final Sampling and Analysis Report; and
- Based on the overall findings of the investigation and this assessment, were the original project objectives appropriately defined and, if not, have revised project objectives been developed.

Corrective action may be needed during either the data validation or data assessment. Potential types of corrective action may include re-sampling by the field team or re-injection/re-analysis of samples by the laboratory. These actions are dependent upon the ability to mobilize the field team, whether the data to be collected is necessary to meet the required QA objectives (e.g., the holding time for samples is not exceeded). If the TLI QAO identifies a corrective action situation, the TLI Project Manager will be responsible for approving the implementation of corrective action, including re-sampling, during data assessment. All corrective actions of this type will immediately be communicated to the USACE COR for concurrence and will be documented by the TLI Project Manager.

8.4 Project Completeness Assessment

A project completeness assessment will be conducted by TLI following receipt and review of all laboratory and field analytical data to evaluate data usability, and data quality objective attainment. Items that will be evaluated include, but are not limited to, the following: DQCRs, field logbook notes, field parameter data, and laboratory analytical data. The assessment includes comparing analytical results to screening values and background concentrations to determine whether site-related contamination is present.

FINAL
APPENDIX C
ACCIDENT PREVENTION PLAN

FINAL
APPENDIX C
ACCIDENT PREVENTION PLAN

MILITARY MUNITIONS RESPONSE PROGRAM
SITE INSPECTIONS

Prepared For:

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FINAL
APPENDIX C
ACCIDENT PREVENTION PLAN

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1.0 INTRODUCTION

The following Accident Prevention Plan (APP) is intended to be a supplement to the Generic Work Plan developed for the Military Munitions Response Program (MMRP) Site Inspections (SIs) to be performed for the US Army Corps of Engineers – Sacramento District (USACE) and the US Army Environmental Center (USAEC). A site-specific health and safety plan will be developed for each installation where SIs are to be completed to address all issues specific to the installation and the sites to be evaluated.

2.0 PURPOSE

The purpose of this APP is to provide TLI Policies to eliminate or significantly reduce the occurrence of accidents and injuries at field operations work sites.

3.0 SCOPE

This APP is applicable to all TLI personnel.

1. TLI believes strongly that our people are the company's most important and valuable asset. The actions of the personnel, working together as a team, determine ultimately the success of the endeavors of the company. Accidental injuries can cause needless pain and suffering of employees and their families, as well as increasing costs and decreasing productivity and morale among employees. TLI is committed to providing a safe and healthful work environment for all of our employees in all locations. TLI's ultimate goal is an accident-free work environment. TLI is committed to doing all in its power to make this a reality.

2. In order to achieve the goal of accident free work places there are numerous significant areas of concern that must be addressed. These areas are noted and explained below:
    a. Vehicle Operations at work sites
    b. Use of Equipment at work sites
    c. Observing precautions for Biological Hazards
    d. Observing precautions for hazards inherent to project execution

3. Vehicle Operations: Since work site topography, access and project performance goals can and do vary from site to site it is imperative that TLI employees operate motor vehicles (private or rental) in the safest manner possible. Some examples of safe operating procedures are:
    a. Insure seat belts are properly worn by all passengers and operators
    b. Inspect vehicles daily for safety features (i.e., tire pressure and condition, lights, brakes, etc.)
    c. Operate vehicles only at legal and posted speed limits. Appropriate operating speed is extremely critical when operating vehicles in an off road capacity, especially in rough terrain
    d. Use headlights during periods of reduced visibility (fog, dusk, etc.)

While these procedures are not all-inclusive they do provide an example of proper and safe vehicle operations.

4. Use of Equipment at Work Sites: The types of equipment that is used at work sites will vary by the type of operations to be performed. It is imperative that TLI employees pay strict attention to insuring that all equipment use is conducted in the safest manner possible. Listed below are some examples of safe performance:
    a. Always use equipment and tools only for the purpose for which they were designed
    b. Read and review the manufacturer's manual for Operation and Maintenance
    c. Review the project-specific work plan to insure your compliance with specific operating procedures for tools and equipment

5. Observing precautions for Biological Hazards: TLI work sites can vary from populated industrial centers to isolated wilderness. Each work area will have specific animal and plant hazards that employees must we aware of. The easiest means to learn about hazardous plants and animals at any given work site is to read and review the site-specific work plan. Some points of interest that should be addressed are:
    a. Types of Poisonous plants and animals in your specific work area or zone
    b. First aid for bites, cuts and scrapes
    c. Emergency medical information in the event of a serious injury or accident

6. Observing Precautions For Hazards Inherent To Project Execution: Due to the extensive expertise of TLI employees in numerous fields it is entirely possible that, when performing support activities for various projects, employees may come into contact with unknown or new materials. Commercial chemicals, military chemicals and unexploded ordnance are just a few of the potential hazardous materials that can be involved on TLI job sites. Listed below are some important suggestions to assist employees in safely operating in various work environments:
    a. Read and periodically review the site-specific work plan, specifically the Health and Safety Plan to learn about the hazardous materials at your work site
    b. Insure that Personal Protective Equipment (PPE) is inspected, in good condition and properly worn during work periods.
    c. Insure that good housekeeping policies are carried out to remove unwanted obstacles or hazards from work areas

7. General: The Accident Prevention Plan can be a useful tool in maintaining a safe work environment. For the APP to be successful every TLI employee must help insure that any variance from safety policies and procedures is immediately reported and corrected. It is also important that TLI employees provide input to the APP whenever new information or processes are developed that need to be part of the APP.

4.0 UXO SAFETY WORK PRACTICES

Unexploded ordnance (UXO) safety work practices are defined below and are further detailed in the MEC Support Work Plan (Appendix D):

All UXO/Munitions and Explosives of Concern (MEC) operations will be conducted in accordance with the requirements of the U.S. Army Corps of Engineers, EP 385-1-95a, Basic Safety Concepts and Considerations for Ordnance and Explosives (OE) operations (29 June 2001).

Plans are to be based upon the minimum number of personnel, exposed for the minimum amount of time, to the minimum amount of UXO consistent with efficient operations and maximum safety. Only those personnel absolutely necessary to the operation will be allowed in the exclusion zone (EZ) during UXO activities.

All personnel engaged in UXO operations will be thoroughly trained in explosives safety and be capable of recognizing hazardous explosive exposures. Only personnel who are U.S. citizens and graduates of one of the schools or courses outlined in DID OE-025.01 are authorized to handle UXO.

All non-UXO qualified personnel will follow the safe work practices listed below:

1. Non-UXO qualified personnel will receive site-specific UXO recognition training prior to participation in site activities.
2. No soil-penetrating activities will be allowed without the area first being cleared by UXO qualified personnel.
3. Non-UXO qualified personnel will be escorted on-site by UXO qualified personnel, until such time as the area is cleared.
4. Non-UXO qualified personnel will not touch or disturb any fused object that could potentially be UXO/MEC related, and will immediately notify the nearest UXO qualified person of the presence of the object.
5. The greatest hazard to a UXO technician is complacency. It is imperative that team members are constantly reminded of the inherent dangers associated with UXO. This will be accomplished at the Tailgate Safety Briefings.
6. No UXO will be destroyed until it has been positively identified. Any destruction of UXO will be addressed by the explosive ordnance disposal (EOD) unit.
7. If an unidentifiable MC item is found, or suspected toxic chemical munitions are found, the on-site USAESCH MEC Safety Specialist will request EOD support.
8. Do not handle, use, or remain near explosives during the approach or progress of an electrical storm, sandstorm, dust storm, snowstorm, or during any limited-visibility condition. All personnel should retire to the enclosed TLI site vehicles until the storm has passed or the TLI site office.
9. Intrusive activities must be preceded by a magnetometer survey to ensure the safety of the crew.

10. Use sand to smother incendiary fires. Water may induce a violent reaction or be completely ineffective, depending on the mixture. Sand will be available on-site for this purpose.

4.1 Ordnance Avoidance Techniques

All project personnel will conduct continuous visual surface sweeps of all support zones, staging areas, and access routes to support soil sampling and geophysical investigation activities.

A team of UXO technicians will investigate for surface MEC and munitions related items using transects and magnetometers, and their course will be tracked by a global positioning system (GPS) accurate to within 8 inches, if feasible based upon site conditions. Any munitions related materials discovered will be captured as GPS points, if possible, and recorded in a field log. Digital photographs will also be taken of any munitions related material identified. No removal actions will be taken as part of this survey. In the event a UXO item is discovered the Senior UXO Supervisor (SUXOS) will be notified and will verify the type of munition and fuze by function and condition. This information will then be given to the Project Manager who will notify the local EOD unit or local law enforcement agency for appropriate action.

During soil sampling procedures, after surface clearance actions are completed and safe corridors are established, soil samples will not be collected until the UXO Technician has checked the point of excavation with the appropriate magnetometer. Once the magnetometer check has been conducted, soil will be collected only at the cleared point of excavation.

FINAL
APPENDIX D
MUNITIONS AND EXPLOSIVES OF CONCERN SUPPORT WORK PLAN

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MUNITIONS AND EXPLOSIVES OF CONCERN SUPPORT WORK PLAN

June 2006

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MUNITIONS AND EXPLOSIVES OF CONCERN SUPPORT WORK PLAN

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Date

TLI Solutions, Inc. (formerly TechLaw, Inc.) prepared this report at the direction of the U.S. Army Corps of Engineers (USACE). This document should be used only with the approval of USACE. This report is based, in part, on information provided in other documents and is subject to the limitations and qualifications presented in the referenced documents.

June 2006

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ACRONYMS AND ABBREVIATIONS

APP	Accident Prevention Plan
bgs	Below ground surface
COR	Contracting Officer Representative
CWM	Chemical Warfare Material
DDESB	Department of Defense Explosive Safety Board
DQO	Data Quality Objective
EM	Electromagnetic
EOD	Explosive Ordnance Disposal
EP	Engineering Pamphlet
EZ	Exclusion Zone
GPS	Global Positioning System
HTRW	Hazardous, Toxic, and Radioactive Waste
MC	Munitions Constituents
MD	Munitions Debris
MEC	Munitions and Explosives of Concern
MR	Munitions Response
MSD	Maximum Separation Distance
OZ	Operational Zone
PM	Project Manager
POC	Point of Contact
PPE	Personal Protective Equipment
PZ	Piezoelectric
SI	Site Inspection
SOW	Scope of Work
SSO	Site Safety Officer
SUXOS	Senior UXO Supervisor
SZ	Support Zone
TM	Technical Manual
TP	Technical Pamphlet
USACE	United States Army Corps of Engineers
USAESCH	U.S. Army Engineering and Support Center – Huntsville
UXO	Unexploded Ordnance
UXOSO	Unexploded Ordnance Safety Officer
WP	White Phosphorus

1.0 MEC SITE INSPECTION SUPPORT WORK PLAN

TLI Solutions, Inc. [TLI (formerly TechLaw, Inc.)] has been assigned to conduct Site Inspections (SIs) of numerous Munitions Response (MR) sites at installations nationwide. This Munitions and Explosives of Concern (MEC) Support Work Plan identifies the approach, methods, and operational procedures to be used to perform unexploded ordnance (UXO) support during the SI activities. This plan was developed in accordance with U.S. Army Corps of Engineers (USACE) Engineering Pamphlet (EP) 75-1-2, *Munitions and Explosives of Concern (MEC) Support during Hazardous, Toxic, and Radioactive Waste (HTRW) and Construction Activities, 01 August 2004.*

1.1 PROJECT REQUIREMENTS

This plan defines the work requirements and procedures for UXO support during the SI activities.

1.1.1 Regulatory Guidance

The primary guidance document for this plan is the USACE EP 75-1-2, *Munitions and Explosives of Concern (MEC) Support during Hazardous, Toxic, and Radioactive Waste (HTRW) and Construction Activities, 01 August 2004.*

1.1.2 Chemical Warfare Material

In the event that suspected Chemical Warfare Material (CWM) is encountered, the following standard procedures will be followed:

- The discoverer will immediately notify the Senior UXO Supervisor (SUXOS).
- The SUXOS will immediately direct the work team to stop work and evacuate the site along cleared paths in an upwind direction. The initial exclusion zone for CWM is 450 meters upwind.
- The SUXOS will mark the location of the suspected CWM as a waypoint with a Global Positioning System (GPS) instrument to help with its identification and relocation.
- The SUXOS will designate a minimum of two UXO-qualified individuals to position themselves upwind as far as possible to prevent unauthorized personnel from accidental exposure.
- The UXO Safety Officer (UXOSO) will account for all field personnel.
- The SUXOS will immediately notify the UXOSO and the TLI Project Manager (PM). The TLI PM or the UXOSO will request support from the installation Point of Contact (POC).
- The UXOSO will ensure that the area is secured until properly relieved by active duty Explosives and Ordnance Disposal (EOD) personnel or local authority. The UXOSO will direct TLI and any subcontractor personnel to support such personnel, as appropriate.

- The UXOSO will submit a Suspect CWM report to the USACE UXO Safety Specialist that contains the following information:
  - Date and time of event
  - Location
  - Preliminary identification of suspect CWM including quantity and type of munition(s) or container(s)
  - Description of the incident
  - Description of any property damage, personnel casualties and/or injuries
  - Description of whether medical services or facilities were required
  - List of immediate notification and support requirements identified during initial emergency response assessment
  - Any other pertinent information
- Before work can resume, the site plans will be reviewed for adequacy in consideration of this newly discovered hazard.

1.1.3 MEC Items

The location of all MEC items will be marked as a waypoint on a GPS instrument and with flagging ribbon. The item will be reported to the UXOSO or the TLI PM. The UXOSO will document information regarding the MEC item including location, type of MEC, and condition. If the MEC item is located on installation property, the UXOSO will provide the information to the installation POC or a contact that the installation POC designates prior to the commencement of field activities. EOD will be notified following procedures outlined by the installation POC. If the MEC item is located on property not owned by the installation, the UXOSO will first provide the information to the local law enforcement agency and to the installation POC. The local law enforcement agency will be responsible for implementing their procedures for addressing the item.

2.0 TECHNICAL SCOPE

The objectives of the SI to be conducted by TLI is to identify the presence of MEC or Munitions Constituents (MC) at the MR sites by conducting visual and/or geophysical surveys and collecting surface soil samples. Visual surveys will be conducted by three person teams with each team member walking individual transects, nominally spaced at 10 to 100-foot separation distance dictated by site conditions (e.g., terrain and vegetation cover). The Visual Survey Team will identify, locate, and record all MEC, Munitions Debris (MD), or other evidence of military munitions and activities observed along their path.

Areas at some of the SI project sites may be geophysically mapped to identify, locate, and define potential subsurface MEC. Mapping will be completed with meandering paths throughout these areas. Collection of data will be biased toward known areas of interest.

Shallow subsurface composite soil samples (less than 6 inches below ground surface [bgs]) will be collected from areas suspected of being impacted by military munitions.

Based on visual site inspections, soil sample locations will be selected in the field to target these areas. Soil sampling locations will be biased to try and capture "worst case scenario" sites. The worst-case scenario sites will consist of locations where munitions were used and drainage areas where MC may have accumulated. Therefore, only locations suspected to have had MEC, MD, or other munitions related items present or areas known to have had high levels of military munition activities will be selected for sampling.

2.1 PROJECT PERSONNEL, ORGANIZATION, COMMUNICATION, AND REPORTING

The duties and responsibilities of members of the project team are described below.

2.1.1 Key Personnel

The following positions will be regarded as key personnel. Descriptions of responsibilities for each key personnel as well as other project team members are included in the following sections. Qualifications of all key personnel will meet or exceed the requirements outlined in Department of Defense Explosive Safety Board (DDESB) Technical Paper (TP) 18, dated 20 December 2004. The need for subcontractor personnel will be determined on a site-by-site basis and will be documented in the Site-Specific Work Plan.

- TLI Project Manager
- Subcontractor Project Manager
- UXO Safety Officer
- Senior UXO Supervisor

2.1.1.1 *TLI Project Manager*

The TLI PM, Gene Barber, or his designee, will provide project management and administrative support during field operations. The TLI PM will prepare or approve all USACE required reports and documents. TLI will have overall responsibility for the health and safety of site personnel operating under the Scope of Work (SOW) for the SI. The TLI PM will be the POC on all project-related issues with USACE.

2.1.1.2 *Subcontractor Project Manager*

The Subcontractor PM will provide project management and administrative support during the conduct of field operations and will report to the TLI PM. As noted above, the need for subcontractors will be determined on a site-by-site basis.

2.1.1.3 *TLI Unexploded Ordnance Safety Officer*

The TLI UXOSO, Larry Finan, reports directly to the TLI PM. Mr. Finan's UXO Technician Identification Number is 1501. The TLI UXOSO will serve as the Site Safety Officer (SSO) for this effort. The UXOSO will be responsible for implementing and enforcing the requirements of this MEC Support Work Plan. Any changes in operations or conditions requiring changes will be coordinated through the TLI PM and the TLI Safety Office.

The UXOSO will coordinate closely with the SUXOS regarding all safety matters on the site. He will be authorized to stop work at any time for safety and health reasons and will immediately notify the SUXOS and the USACE Safety Specialist of the stop work and explain the cause of the stoppage.

The UXOSO will provide safety training to on-site employees and subcontractors through mobilization training sessions, daily tailgate safety briefings, daily debriefings, weekly supervisor safety meetings, visitor training, and personal protective equipment (PPE) training, as well as any other training needs that may arise during the course of operations. The UXOSO will enforce the proper levels of PPE in accordance with the Accident Prevention Plan (APP) provided as an appendix to each Site-Specific Work Plan and will coordinate with the TLI Safety Office prior to making any changes in PPE requirements.

The UXOSO will conduct daily safety inspections, weekly safety audits, and maintain all required safety forms (as well as the safety log). In addition, the UXOSO will follow up on any discrepancies noted until a correction has been verified. The UXOSO will investigate all on-site accidents, incidents, and near misses.

2.1.1.4 *Senior Unexploded Ordnance Supervisor*

The SUXOS will enforce all MEC Support Work Plan requirements. The SUXOS will provide direct supervision of on-site personnel and will coordinate activities with subcontractor personnel. The SUXOS will coordinate closely with the subcontractor PM regarding site activities.

The SUXOS will work closely with the TLI UXOSO to ensure that all employees on the site are adequately trained and continue to follow safe operating procedures. The SUXOS is the primary POC for the UXOSO regarding resolution of on-site safety issues. The SUXOS will discuss on-site incidents, emergencies, injuries, and illnesses, as appropriate, with the UXOSO, who will in turn report these incidents to the TLI PM.

2.1.1.5 *USACE Safety Representative*

If a USACE Safety Representative is present at the site, this individual will ensure that TLI complies with this MEC Support Work Plan and all relevant Army procedures and regulations. This is a quality assurance role and the USACE Safety Representative will report to the Contracting Officer or Contracting Officer Representative (COR). In

addition, the USACE Safety Representative may provide expertise in addressing issues regarding incidents at the site. The USACE Safety Representative will be responsible for reporting any accidents or incidents to the U.S. Army Engineering and Support Center – Huntsville (USAESCH). If a USACE Safety Representative is not present at the site, this reporting will be the responsibility of the TLI PM.

2.1.1.6 *Responsibilities of All Site Personnel*

All TLI, USACE, and subcontractor personnel and visitors who will be involved in on-site activities are responsible for the following:

- Taking all reasonable precautions to prevent injury to site personnel and being alert to potentially harmful situations.
- Performing only those tasks that can be done safely with proper training provided.
- All on-site personnel have stop-work authority when imminent safety or environmental hazards are found or identified.
- Notifying the TLI UXOSO of any special medical conditions (e.g., allergies, contact lenses, diabetes, recent injuries, etc.) that may be impacted by site operations. TLI team members accomplish this by completing a Medical Data Sheet prior to the commencement of field activities.
- Notifying the TLI UXOSO of any prescription and/or nonprescription medication that a worker may be taking that might cause drowsiness, anxiety, or other unfavorable side effects. TLI team members accomplish this by completing a Medical Data Sheet prior to the commencement of field activities.
- Preventing spillage and splash of materials to the greatest extent possible.
- Practicing good housekeeping by keeping the work area and vehicles, neat, clean, and in order.
- Immediately reporting all injuries, no matter how minor, to the TLI UXOSO.
- Complying with the MEC Support Work Plan and all safety and health recommendations, precautions, and properly using the PPE as determined by this MEC Support Work Plan and/or the TLI UXOSO.

2.1.2 Composition and Management of UXO Teams

This plan has been developed to address the foreseeable potential scenarios for encountering MEC in support of the SI activities. TLI will mobilize two UXO-qualified individuals. Staffing will include a UXO Technician III and UXO Technician I personnel. Staffing of UXO personnel will be in accordance with EP 75-1-2. Specific responsibilities are delineated below.

2.1.2.1 *UXO Technician III*

Also referred to as the SUXOS and the UXOSO, the UXO Technician III is responsible for the safety and efficiency of the performance of the UXO Team. The UXO Technician III can temporarily stop work in order to bring an unsafe condition or procedure. The UXO Technician III directs the actions of a project UXO team in accordance with an

approved work plan or MEC site safety plan. Mr. Larry Finan will serve as the UXOSO and an additional UXO technician will serve as the SUXOS. The responsibilities of the UXO Technician III include, but are not limited to, the following:

- Exercise stop-work authority
- Comply with all Federal and State regulations
- Maintain equipment and on-site vehicles
- Maintain explosive safety
- Inspect emergency equipment daily
- Supervise and direct MEC/UXO field activities for assigned tasks

2.1.3 Project Administration

The TLI PM will oversee contract administration and project management for the SI activities.

2.1.4 Subcontractor Responsibilities

All subcontractor personnel working on this site will be required to follow the requirements of this MEC Support Work Plan. In addition, the subcontractor will prepare an internal document (Safe Work Procedures) to be used by on-site personnel. The subcontractor Safe Work Procedures will be available on-site during all field activities.

All TLI subcontractors will be responsible for providing medically approved and properly trained site personnel with certifications provided in their APP and updated as necessary. Current training certificates (i.e., 40-hour, 8-hour refresher, and 8-hour supervisor) and medical clearance certifications will be maintained on-site with the UXOSO.

All subcontractors will be responsible for providing equipment, including PPE that is safe for operation and free from any obvious hazards.

2.2 PRE-MOBILIZATION/MOBILIZATION/DEMOBILIZATION AND PROJECT SETUP

The following sections outline the steps necessary before, during, and after the field work, as well as the project set up.

2.2.1 Pre-Mobilization

Prior to mobilization, the following actions will be required:

- Finalize procurement actions for items and services needed during the mobilization
- Coordinate with the installation POC for approvals or notifications to other installation offices and other local agencies

- Submit and obtain approval of Final SI Work Plan

2.2.2 Mobilization

After approval of the Work Plan by USACE, TLI will mobilize the requisite personnel, equipment, and logistical support to conduct visual surveys and surface soil sampling. Most of the required equipment will be shipped to the site with the balance to be procured locally upon the team's arrival.

2.2.2.1 *Field Office*

TLI will use the UXOSO's vehicle as a field office during this work effort due to the short duration of the effort. All personnel will meet at the vehicle each morning for the daily health and safety briefing, as well as a discussion of the activities to be conducted for the day. The vehicle will be the central point of communication for all team members. The UXOSO will maintain files in the vehicle that contain all relevant health and safety records and project documents.

2.2.2.2 *Kickoff/Safety Meeting*

On the first day of mobilization, a kickoff meeting will be held with the installation POC, the field team, and any other relevant parties. During this meeting, the schedule for the field activities will be discussed, as well as any relevant information regarding safety and site-specific procedures. [Note: The requirements for the kickoff meeting may vary from installation to installation. The specifics regarding this meeting will be documented in the Site-Specific Work Plan.]

2.2.2.3 *Outbriefing Meeting*

At the completion of the field activities, the TLI PM will meet with the installation POC to discuss initial site findings, any outstanding issues, and the schedule for production of the SI report.

2.2.3 Demobilization

Demobilization may occur for several reasons: (1) the project may be completed with all work accomplished; (2) weather conditions may lead to demobilization; or (3) conflicts have arisen with endangered species. Whatever the reason, the Government, through its Contracting Officer or the COR, must convey officially to the contractor its decision to demobilize from the project site.

2.2.3.1 *Demobilization Upon Project Completion*

Upon completion of visual surveys and soil sampling, field equipment and personnel will remain in place at the site until the determination has been made by the TLI PM that no additional visual and/or geophysical survey work or soil sampling is necessary. After this

determination, the survey team will demobilize, and equipment and samples will be shipped from the site.

2.2.3.2 *Unscheduled Demobilizations*

Due to the high cost of demobilizations and remobilizations, the PM will closely monitor the rate of expenditures versus the rate of progress to determine whether the work can be completed with allocated funding. Due to the short duration and limited scope of this effort, unscheduled demobilizations are not anticipated.

If weather conditions threaten to force an unscheduled demobilization, the decision to demobilize will be based on an analysis of the cost to stay on the project until the weather clears versus cost to demobilize. If the number of predicted productive days during the poor weather conditions is sufficient to show a benefit by staying on site, the work will continue.

3.0 SURFACE MEC PREPARATION

Anomaly avoidance procedures will be used during all field activities associated with this SI. No removal of obstructions or brush will be conducted by the field team at any time.

Any munitions-related materials discovered will be marked as GPS waypoints and recorded in a field log. The location of the item will be marked with flagging to facilitate relocating the item and to avoid further contact. Digital photographs will be taken of any identified munitions-related material. No UXO/MEC removal actions will be conducted as part of this SI. In the event a UXO item is discovered, the SUXOS will be notified, who will verify the type of munitions and fuze type by function and condition. At no time will any team member, including the SUXOS, attempt to handle, rotate, or excavate an item. This information will be reported to the UXOSO and the TLI PM who will notify the installation POC or a contact that the installation POC designates prior to the commencement of field activities. EOD will be notified following procedures outlined by the installation POC. If a UXO item is discovered on off-installation property, the SUXOS will notify the UXOSO and the TLI PM, who will contact the local law enforcement agency, as well as the installation POC. Appropriate action for addressing the UXO item will be determined by the local law enforcement agency. Information regarding MEC identified during SI field activities will be documented on an Ordnance Contact Report (Attachment A). The information on the form will assist EOD or the local law enforcement agency in locating and identifying the MEC item. Forms will be provided to the installation POC as needed.

3.1 MAGNETOMETER/METAL DETECTOR PLOT

Hand-held electromagnetic (EM) detectors or magnetometer metal detectors, such as Schonstedts, will be used to assist in identifying non-ferrous and ferrous metals. All equipment will be operated as specified in the appropriate operator's manual. All

equipment will be function-tested prior to each daily use, in accordance with the operator's instructions.

3.1.1 Cultural Feature Removal

It is not anticipated that metallic cultural features will interfere with the completion of the visual surveys or surface soil sampling. Therefore, removal of existing metallic objects will not be necessary.

3.1.2 Vegetation Removal

It is not anticipated that vegetation will interfere with the completion of the visual surveys or surface soil sampling. Removal of vegetation is not included in the SOW for the SI and is not anticipated to be necessary. If it is determined that vegetation removal is required for a specific MR site, this will be addressed in the Site-Specific Work Plan.

3.1.3 Utility Clearance

No intrusive work will be conducted during the field activities. Therefore, a utility clearance will not be necessary.

3.2 STATISTICAL SAMPLING

The purpose of surface soil sampling is to collect, analyze, and evaluate soil samples to determine if soil contamination from previous military munition activities in the form of MC has occurred.

The location of sampling events will be determined in the field by applying the Data Quality Objective (DQO) process presented in the Field Sampling Plan that will be included as an appendix to the Site-Specific Work Plan. Samples will be collected from each of the following general areas:

- Shallow subsurface composite soil samples (less than 6 inches bgs) will be collected from areas suspected of being impacted by military munitions. Based on visual site inspections, soil sample locations will be selected in the field to target these areas. Soil sampling locations will be biased to try and capture "worst case scenario" sites. The worst-case scenario sites will consist of locations where munitions were used and drainage areas where MC may have accumulated. Therefore, only locations suspected to have had MEC, MD, or other munitions related items present or areas known to have had high levels of military munition activities will be selected for sampling.

- Shallow subsurface composite soil samples (less than 6 inches bgs) will be collected from the bottom of drainage areas transecting and exiting the range areas. Soil sample locations will be determined in the field to target these areas.

3.3 UNEXPLODED ORDNANCE PROCEDURES

This section outlines the procedures that will be performed by UXO-qualified personnel during SI activities.

3.3.1 Responsibilities of Personnel

General responsibilities of personnel are discussed in Section 2.1 of this document.

3.3.2 Overall Safety Precautions

The general work practices defined by the USACE will be followed. This includes limiting the work periods for field UXO personnel to 10 hours per day and 40 hours per week. Exceptions to this requirement will be made only in the event that public safety is at imminent risk and with concurrence of the USACE UXO Safety Representative and Contracting Officer. Detailed safety procedures will be provided in the APP included as an appendix to the Site-Specific Work Plan.

4.0 ANOMALY AVOIDANCE

The field activities will be conducted using anomaly avoidance procedures. Anomaly avoidance refers to techniques used by personnel at sites with known or suspected MEC. The purpose of anomaly avoidance is to avoid any potential surface MEC and subsurface anomalies during sampling activities. SI activities that have the potential for encountering MEC include geophysical and visual surveys, and surface soil sampling. Intrusive anomaly investigation is not permitted during anomaly avoidance operations.

For anomaly avoidance during SI field activities on MR sites, compliance with anomaly avoidance procedures will be the responsibility of the UXOSO. The UXOSO will be responsible for conducting safety briefings for all site personnel and visitors. In addition, a SUXOS will provide support to the UXOSO and the field teams.

Prior to the initiation of SI field activities, the UXOSO will provide the field teams with information to aid in the recognition of items that may be anticipated at each site. The UXOSO will emphasize that although the potential for certain MEC items may exist at a site, the field teams must be prepared to recognize all potential MEC. Additionally each field team leader will be provided with a field guide that contains data sheets and photos for potential MEC.

SI field activities will be conducted by a field team consisting of a minimum of two members. One of these members will be a UXO Technician III, who will act as the team leader. The other members of the team may consist of UXO-qualified personnel, geophysicists, or any other team member. The UXO technician is responsible for providing MEC recognition, location, and safety functions during geophysical and visual surveys and surface soil sampling. Team members must be escorted by the UXO technician at all times. Hand-held EM devices or magnetometer metal detectors will be

used to enhance visual sweep procedures and to identify potential MEC items to ensure worker safety. The specific device to be used will be documented in the Site-Specific Work Plan. Transect courses will be tracked using a hand-held GPS instrument. If GPS initialization is lost or horizontal error exceeds acceptable accuracy due to lack of satellites, poor radio link to the base, or poor satellite geometry, visual survey activities will cease until the issue is resolved.

Any munitions-related materials discovered will be marked as GPS waypoints and recorded in a field log. The location of the item will be marked with flagging to facilitate relocating the item and to avoid further contact. Digital photographs will be taken of any identified munitions-related material. No UXO/MEC removal actions will be conducted as part of the SI. In the event a UXO item is discovered, the SUXOS will be notified, who will verify the type of munitions and fuze type by function and condition. At no time will any team member, including the SUXOS, attempt to handle, rotate, or excavate an item. This information will be reported to the installation POC or a contact that the installation POC designates prior to the commencement of field activities. EOD will be notified following procedures outlined by the installation POC. If a UXO item is discovered on off-installation property, the SUXOS will notify the UXOSO and the TLI PM, who will contact the local law enforcement agency, as well as the installation POC. Appropriate actions for addressing the UXO item will be determined by the local law enforcement agency. Information regarding MEC identified during SI field activities will be documented on an Ordnance Contact Report (Attachment A). The information on the form will assist EOD or the local law enforcement agency in locating and identifying the MEC item. Forms will be provided to the installation POC as needed. All procedures regarding MEC items will be performed in conjunction with HNC OE-CX-IGD 06-05, Procedure for PA and SI Teams that Encounter UXO, dated 16 March 2006.

If MEC items are identified, the survey will be halted and the UXO technician will select an alternate route around the item.

Prior to surface soil sampling, the UXO technician will visually survey the proposed sampling site for indication of MEC. In addition, the area will be swept with the hand-held device to identify potential MEC. If anomalies are detected within the proposed sampling location, an alternate location will be selected. Soil sampling procedures will be conducted after surface clearance actions are completed and safe corridors are established. Once the intended soil sample site has been determined to be clear of anomalies, soil will be excavated from the cleared point.

5.0 WORK ZONES

In order to control site access, site work zones will be established by the UXOSO prior to initiating operations. Establishment of site work zones will be based upon site conditions, activities, and exposure potentials. Whenever possible, site work zones will be clearly marked using placards or signs and enclosed using hazard tape, ropes, chains, or fences. The UXOSO will control access to each work zone and will ensure that all site workers and visitors have received the proper training and medical surveillance required

before entering a specific zone. Access will be denied to any potential entrant not meeting these requirements.

5.1 OPERATIONAL ZONE

The Operational Zone (OZ) boundaries will be established for the work site by the UXOSO. This is the area where hazards or contamination could exist and will include all areas where PPE is required to control worker exposure to physical hazards.

5.2 SUPPORT ZONE

The Support Zone (SZ) is the area outside the OZ where site support activities are conducted. This zone includes the break areas.

Persons desiring entrance into the OZ must first meet with the UXOSO and receive the appropriate safety briefing in the SZ before gaining admittance to the OZ.

The UXOSO, in conjunction with the SUXOS, will identify staging areas outside the Maximum Separation Distance (MSD) for the various work areas on the site. These staging areas will be identified on the site map and will be communicated each morning to workers during the daily tailgate safety briefings. In the event of the need to suspend operations and evacuate the work site, all personnel will proceed to the staging areas where personnel shall be accounted for. MSDs will be identified on a site-by-site basis and will be provided in the Site-Specific Work Plan.

6.0 MEC IDENTIFICATION AND DISPOSAL

UXO Technicians will make every effort to identify MEC through visual examination of the item for markings and other identifying features such as shape, size, and external fittings. Items will not be moved during the inspection/identification until the fuze condition can be ascertained. If the condition is questionable, the fuze will be considered to be armed. The fuze is considered the most hazardous component of a MEC, regardless of type or condition. The UXOSO and the SUXOS will agree on the positive identification of the item. The following general ordnance safety guidelines will be followed:

- In general, a projectile containing a base-detonating fuze will be considered armed if the projectile has been fired
- Arming wires and pop-out pins on unarmed fuzes will be secured by taping in place prior to movement
- Color-coding of MEC will NOT be used for positive identification of contents. Munitions having incomplete or improper color-coding have been encountered. (This is especially true with regard to the 40-mm family of ordnance.)
- Personnel will avoid the area forward of the nose of a munition until it can be ascertained that the item does not contain a shaped charge. The explosive jet

can be fatal at great distances forward of the longitudinal axis of the item. Any shaped charge munitions will be assumed to contain a piezoelectric (PZ) fuzing system until the fuzing system is positively identified. A PZ fuze is extremely sensitive, can function at the slightest physical change, and may remain hazardous for an indefinite period of time.

- Projectiles will be examined for the presence or absence of an unfired tracer
- Items will also be examined for the presence or absence of a rotating band and its condition
- Practice MEC will be assumed to contain a live charge until it can be determined otherwise. Expended pyrotechnic/practice devices may contain red/white phosphorus residue. Due to incomplete combustion, phosphorous may be present and re-ignite spontaneously if subjected to friction or if the crust is broken and the contents exposed to air.
- Personnel will not approach smoking white phosphorus (WP) UXO. Burning WP may detonate the burster or dispersal explosive charge at any time.
- Procedures in Chapter 13, Technical Manual (TM) 9-1300-214, Military Explosives, or other approved explosives analysis shall be used to identify the explosives

6.1 TRANSPORTATION

Decisions regarding the transportation of MEC found at the MR sites will be the responsibility of the EOD unit or local law enforcement unit that responds to the site.

6.2 DEMOLITION OPERATIONS

No demolition will be performed by TLI UXO personnel during the SI field activities.

6.3 DISPOSITION OF ORDNANCE AND EXPLOSIVES SCRAP

No demolition or disposal of MD will be performed by TLI UXO personnel. Any significant MD will be recorded as a waypoint on a GPS instrument and this data will be provided to the installation POC.

7.0 UXO SAFETY

If during the field activities a hazardous MEC item is identified, an exclusion zone (EZ) for unintentional or accidental detonations will be established based on that item.

7.1 PERSONAL PROTECTIVE EQUIPMENT

At a minimum, the protective clothing worn by all personnel will meet the requirements for Level D PPE, modified to include non-steeled-toed protective boots. Level D clothing should also be worn only if the activity in which personnel are engaged does not have the potential for splash, immersion or any other contact with hazardous substances. Level D involves the use of the following PPE:

- Work clothes or coveralls (cotton)
- Leather work gloves will be worn when performing work tasks (i.e. using shovels, scrappers or other hand tools), when utilizing detection instruments and for any other activities which may produce scrapes, scratches or punctures to the hands or fingers
- Nitrile gloves will be worn when collecting soil samples
- Over the ankle leather work or hiking boots (note that steel-toed boots are not required because steel-toed boots may interfere with operations of EM devices and create an unsafe condition)
- Eyewear providing protection against ultraviolet light and glare will be provided for protection if working around bodies of water. This will assist in protecting against the reflective glare of sunlight off the surface of the water.
- Safety glasses or goggles (when working in high winds, dusty environments, or when directed by SUXOS or UXOSO)
- Hearing protection (when working in a noise hazard area)
- Head protection will be worn when working in a field environment that presents hazards that could potentially cause head injuries

7.2 CHECKOUT PROCEDURES FOR HAND-HELD METAL DETECTION DEVICES

The following list provides the checkout procedures to be followed for hand-held metal detection devices:

- Prior to field use, all hand-held EM devices will be set up following the guidelines in the manufacturer's operating manual for the specific instrument being used. The operating manual for each of the instruments used on site will be available for use with the equipment.
- Once the instrument has been determined to be working according to the manufacturer's operating manual, the operator will perform a function test using the detection methods described in the manual. A function test will consist of using the instrument over a known test source. The test source would consist of a common metallic item that can easily be found at a local hardware store (e.g., rebar and piping) and that would be of similar dimension and density of MEC items anticipated to be found at the MR sites to be investigated. The same source will be used during each function test to ensure consistency.
- Instruments that fail to reproduce a detection indication consistent with previous tests will be checked to ensure that the power supply or batteries are sufficient. If the power supply is determined to be sufficient and the operator cannot find a fault in accordance with the operator's manual, the instrument will be tagged and removed from service.
- Function tests will be performed each morning before the equipment is put into service
- If an instrument is determined to be working improperly, the UXOSO and SUXOS will be immediately notified. Any activities performed using that

instrument since its last positive test procedure will be considered invalid and will require re-evaluation.
- Upon completion of the function test, the Daily Field Log Book and the equipment log book will be filled out.

7.3 VISITORS

All non-UXO qualified personnel requiring access to the project work sites must be escorted by the UXOSO. Each individual requiring escort will sign the Visitor Log and receive the Visitor Site Safety Briefing from the UXOSO. A record of all employees and visitors coming onto the site will be recorded and retained in the project files. Since there is a potential for unrecovered UXO/MEC within the project site, all visitors will be escorted and within sight at all times.

7.4 GENERAL SAFETY CONCERNS AND PROCEDURES

All UXO/MEC operations will be conducted in accordance with the requirements of the *U.S. Army Corps of Engineers, EP 385-1-95a, Basic Safety Concepts and Considerations for Munitions and Explosives of Concern (MEC) operations (27 August 2004).*

Plans are to be based upon the minimum number of personnel, exposed for the minimum amount of time, to the minimum amount of UXO consistent with efficient operations and maximum safety. Only those personnel absolutely necessary to the operation will be allowed in the OZ during UXO activities. Hazards associated with each task to be completed during field activities and recommendations for control are outlined in the Activity Hazard Analysis contained in Attachment B to this document.

All personnel engaged in UXO operations will be thoroughly trained in explosive safety and be capable of recognizing hazardous explosive exposures. Only personnel who are U.S. citizens and graduates of one of the schools or courses outlined in *DDESB TP-18* are authorized to handle UXO; however, the scope for this SI does not permit handling of any UXO.

All personnel will follow the safe work practices listed below:

- Non-UXO-qualified personnel will receive site-specific UXO recognition training prior to participation in site activities
- No soil-penetrating activities will be allowed without the area first being cleared by UXO-qualified personnel
- Non-UXO-qualified personnel will be escorted on-site by UXO qualified personnel, until such time as the area is cleared
- Non-UXO-qualified personnel will not touch or disturb any fused object that could potentially be UXO/MEC related and will immediately notify the nearest UXO-qualified person of the presence of the object
- The greatest hazard to a UXO technician is complacency. It is imperative that team members are constantly reminded of the inherent dangers

associated with UXO. This will be accomplished at the Tailgate Safety Briefings.

- No UXO will be destroyed until it has been positively identified. Any destruction of UXO identified within the installation boundary will be addressed by the local EOD direct support unit for the installation. Destruction of UXO identified outside the installation boundary will be addressed by the procedures of the local law enforcement agency.
- The location of all MEC items will be marked as a waypoint on a GPS instrument and with flagging ribbon. The item will be reported by the UXOSO or the TLI PM to the installation POC or a contact that the installation POC designates prior to the commencement of field activities. EOD will be notified following procedures outlined by the installation POC. Should CWM be found, the area immediately upwind of the munition will be marked with flagging ribbon and the location will be recorded with a GPS. Team personnel will be evacuated to a safe area upwind of the item. The item will be reported to installation POC or a contact that the installation POC designates prior to the commencement of field activities. EOD will be notified following procedures outlined by the installation POC.
- During the approach or progress of an electrical storm (within 10 miles), sandstorm, dust storm, snowstorm, or during any limited-visibility condition, explosives will not be handled or used. All personnel will return to the site vehicles, or a site office until the storm has passed.
- Areas requiring intrusive activities must be checked with a magnetometer prior to sampling activities. No sub-surface activities will take place during this effort.
- In the event of an incendiary fire, the area will be evacuated immediately. Water will not be used on the fire, as this may produce a violent reaction or be completely ineffective. If the incendiary fire is extremely small, sand will be used to smother the fire.

7.5 OTHER POTENTIAL CONTAMINANTS

Other contaminants present a minimal health risk at a low concentration. Chemical hazards may include the following substances: incinerator ash, dioxins/furans, volatile organic compounds, and metals (primarily lead).

Should any nonstandard event occur (e.g., discovery of leaking drums or paint cans, soil with abnormal consistency and discoloration, sealed glass containers, or unknown and unidentified materials), field work will be stopped at the event location and the site superintendent. The UXO Team Leader will identify potential concerns and implement requirements before MEC activities continue.

Biological hazards include ticks, poisonous plants, snakes, stinging insects, spiders, wild animals, and bloodborne pathogens. Safety protocols applying to these scenarios will be defined in the APP which will be provided as an appendix to the Site-Specific Work Plan.

7.6 TAILGATE SAFETY BRIEFINGS

Tailgate Safety Briefings consist of providing short training sessions in various subjects that give the site worker knowledge and confidence in performing duties in a potentially hazardous environment. The Tailgate Safety Briefing will be given prior to commencing work each day and will include such items as:

- Expected weather conditions
- General site hazards
- UXO hazards
- PPE required at each site
- Emergency evacuation procedures
- Heat/cold stress precautions
- Buddy system procedures
- A review of any safety violations from the previous day

Additional briefings will be provided, as needed, concerning the use of safety equipment, emergency medical procedures, emergency assistance notification procedures, accident prevention, the Work Plan, and site orientation to ensure that accomplishment of the project can be carried out in a safe and effective manner.

8.0 COMMUNITY RELATIONS

The project team will perform community relations only when requested by the COR for a specific task/project. When approached by any person or entity requesting information about a project, site personnel will defer to the installation POC or the USACE PM. TLI and its subcontractors will not make available or publicly disclose any data generated or reviewed under this contract or any subcontract unless specifically authorized by the COR. Reports and data generated under this task order will become the property of the Government, and distribution to any other source is prohibited unless authorized by the COR.

ATTACHMENT A

ORDNANCE CONTACT REPORT

MILITARY MUNITIONS RESPONSE PROGRAM
SITE INSPECTION
ORDNANCE CONTACT REPORT

DATE:

TO:

FROM: TLI Solutions, Inc.
Larry Finan, Senior Ordnance Safety Specialist
(707) 688-5579

CC: Young Chong, Project Manager, USACE – Sacramento District
(916) 557-7212

Gene Barber, Project Manager, TLI Solutions, Inc.
(303) 763-7188

SUBJECT: Potential Ordnance Hazard

TLI Solutions, Inc. (TLI) has been scoped to conduct a Site Inspection (SI) at Munitions Response (MR) sites at [Installation Name]. The scope of work for this effort requires that ordnance avoidance procedures be utilized while performing the SI field work. As a result, TLI cannot perform any intrusive operations on partially buried ordnance items found during the SI. Ordnance is identified to the best of our abilities based on the experience of our ordnance specialists and available historic information. All available information for the identified item(s) will be provided to the installation point of contact in the table below. Decisions regarding the severity of the hazard and the need to call for support from the local Explosive Ordnance Disposal (EOD) unit are the responsibility of the installation. The location of ordnance items are marked using bright pink flagging ribbon and recorded in the team's global positioning system. Ordnance type, locations, quantity, and MGRS (Military Grid Reference System) coordinates are listed below. If additional information is required please contact the TLI ordnance safety specialist as noted below.

MR SITE	ORDNANCE ITEM	LOCATION	QTY	MGRS GRID COORDINATE	DESCRIPTION

ATTACHMENT B

ACTIVITY HAZARD ANALYSIS

Table 1: Project Activity Hazard Analysis

Task	Operation	Hazards
Location, Survey, and Mapping Operations	• Escort Land Surveyors to conduct survey activities • Use a hand-held electromagnetic (EM) device to insure there are no anomalies where survey stakes are to be driven or where soil samples will be taken • Drive marking stakes to mark the area corners	• Slips, trips, and falls hazards • UXO/MEC hazards • Biological hazards • Heat/cold stress hazards • Eye hazards
Performing UXO/MEC Inspection Activities	• Thorough inspection of surface UXO/MEC items • Use of hand-held EM device to locate anomalies • Live UXO/MEC items will be marked and, if possible, a GPS location noted. EOD will be notified.	• Slips, trips, and fall hazards • UXO/MEC hazards • Biological hazards • Heat/cold stress hazards • Eye Hazards • Cuts and Abrasions Hazard
Performing Quality Control Activities	• Insure there are no surface UXO/MEC anomalies • Insure all sampling is conducted within the guidelines of the SOW • Investigate surface anomalies found	• Slips, trips, and fall hazards • UXO/MEC hazards • Biological hazards • Heat/cold stress hazards • Eye hazards
Performing Motor Vehicle Operations	• Inspect vehicles to insure proper working condition • Insure that vehicles are properly equipped • Conduct motor vehicle operations	• Accident • UXO/MEC hazards when operating vehicle in work zones
Operating Geophysical Instruments	• Using a hand-held EM device to ensure there are no anomalies where stakes are to be driven or soil samples collected • Using geophysical detection instrument to assist in locating surface anomalies during surface investigation • If required, fiberglass pin flags will be used to mark UXO/MEC material for EOD	• Slips, trips, and fall hazards • UXO/MEC hazards • Biological hazards • Heat/cold stress hazards • Eye hazards

Table 1: Project Activity Hazard Analysis (concluded)

Task	Operation	Hazards
Avoiding UXO/MEC at Sample Locations	• Using a hand-held EM device to ensure there are no anomalies where the soil samples are to be collected	• Slips, trips, and falls hazards • UXO/MEC hazards • Biological hazards • Heat/cold stress hazards • Eye hazards • Cuts and abrasion hazards
Performing Sampling and Analysis Activities	• Collecting soil samples for analysis to determine need for further investigation • Cleaning of sampling tools if required, using appropriate method to prevent cross-contamination of samples	• Slips, trips, and falls hazards • UXO/MEC hazards • Biological hazards • Heat/cold stress hazards • Eye hazards

Table 2: Location, Surveying, and Mapping Operations

Activity Hazard Analysis		
Activity: Location, Surveying, and Mapping Operations		
Principal Steps	**Potential Safety / Health Hazards**	**Recommended Controls**
1. Escort Land Surveyors to conduct activities 2. Use a hand-held EM device to ensure there are no anomalies where stakes are to be driven and soil samples taken 3. Drive Marking stakes into the ground	• Slips, trips, and fall hazards • UXO/MEC hazards • Biological hazards • Cold and Heat Stress hazards • Eye hazards • Cuts and abrasion hazards • Arm, Leg, and Back strain from carrying equipment	• Personnel will be made aware of the area they will be working in and be instructed to be observant for obstacles which may present a trip hazard; they will wear slip resistant work boots or hiking boots with reinforced leather sides that extend above the ankle (UXO Technicians will not wear steel toed boots) • Personnel will be trained to recognize UXO/MEC/CWM hazards and will be familiar with procedures to follow if UXO/MEC/CWM is found on the surface • Personnel will observe all precautions for biological hazards • Personnel will observe all precautions for cold and heat stress including monitoring and hydration • Safety glasses rated ANSI Z87.1 will be worn on the job site • Hand protection will be worn by all personnel on the job site • Observe proper lifting techniques
EQUIPMENT TO BE USED	**INSPECTION REQUIREMENT**	**TRAINING REQUIREMENTS**
• Hand-held EM device • Level D PPE o work clothes o leather gloves o over the ankle leather work boots or hiking boots (no steel-toed boots) o Safety glasses rated ANSI Z87.1 o Fluorescent orange safety vests if required. • Survey equipment	• All equipment inspected daily • Equipment will be calibrated according to manufacturer specifications and those established for detection equipment	• Operators will be trained in the used of proper equipment, PPE, • UXO personnel are required to be graduates of one of the schools or courses outlined in *DDESB TP-18, Dated 20 December 2004* • All operators will be trained in performing field calibration tests of all metal detectors • Personnel will receive site specific training for UXO/MEC/CWM recognition for those items anticipated at the site • All operators will have OSHA/HAZWOPER Training • Employees working on site will have HAZWOPER medical clearance

Table 3: Performing UXO/MEC Inspection Activities

Activity Hazard Analysis		
Activity: Performing UXO/MEC Inspection Activities		
Principal Steps	**Potential Safety / Health Hazards**	**Recommended Controls**
1. Thorough inspection of UXO/MEC items found within sample area 2. Use a hand-held EM device to locate anomalies 3. Isolate and mark UXO/MEC found in area and notify EOD	• Slips, trips, and fall hazards • UXO/MEC hazards • Biological hazards • Cold and Heat Stress hazards • Eye hazards • Cuts and abrasion hazards	• Personnel will be made aware of the area they will be working in and be instructed to be observant for obstacles which may present a trip hazard; they will wear slip resistant work boots or hiking boots with reinforced leather sides that extend above the ankle (UXO Techs will not wear steel-toed boots) • Personnel will be trained to recognize UXO/MEC/CWM hazards and will be familiar with procedures to be followed if UXO/MEC/CWM is found on the surface • Personnel will observe all precautions for biological hazards • Personnel will observe all precautions for cold and heat stress including monitoring and hydration • Safety glasses rated ANSI Z87.1 will be worn on the job site • Hand protection will be worn by all personnel on the job site • Observe proper lifting techniques
EQUIPMENT TO BE USED	**INSPECTION REQUIREMENT**	**TRAINING REQUIREMENTS**
• Hand-held EM device • Level D PPE o work clothes o leather gloves o over the ankle leather work boots or hiking boots (no steel-toed boots) o Safety glasses rated ANSI Z87.1 • Fluorescent orange safety vests (if required)	• All PPE will be inspected prior to use	• UXO personnel are required to be graduates of one of the schools or courses outlined in *DDESB TP-18, Dated 20 December 2004* • Personnel will receive site specific training for UXO/MEC/CWM recognition for those items anticipated at the site • All operators will have OSHA/HAZWOPER Training • Employees working on site will have HAZWOPER medical clearance • Personnel will be trained in the used of proper equipment, PPE

Table 4: Performing Quality Control Activities

Activity Hazard Analysis		
Activity: Performing Quality Control Activities		
Principal Steps	**Potential Safety / Health Hazards**	**Recommended Controls**
1. Insure no surface anomalies exist in sampling area 2. Investigate discovered anomalies with SUXOS 3. Notify EOD of all UXO/MEC materials encountered	• Slips, trips, and fall hazards • UXO/MEC hazards • Biological hazards • Cold or Heat Stress hazards • Eye hazards • Cuts and abrasion hazards	• Personnel will be made aware of the area they will be working in and be instructed to be observant for obstacles which may present a trip hazard; they will wear slip resistant work boots or hiking boots with reinforced leather sides that extend above the ankle (UXO Techs will not wear steel-toed boots) • Personnel will be trained to recognize UXO/MEC/CWM hazards and will be familiar with procedures to be followed if UXO/MEC/CWM is found on the surface • Personnel will observe all precautions for biological hazards • Personnel will observe all precautions for cold or heat stress including monitoring and hydration • Safety glasses rated ANSI Z87.1 will be worn on the job site • Hand protection will be worn by all personnel on the job site • Observe proper lifting techniques
EQUIPMENT TO BE USED	**INSPECTION REQUIREMENT**	**TRAINING REQUIREMENTS**
• Level D PPE o work clothes o leather gloves o over the ankle leather work boots or hiking boots (no steel-toed boots) o Safety glasses rated ANSI Z87.1 o Fluorescent orange safety vests (if required)	• All PPE will be inspected prior to use	• UXO personnel are required to be graduates of one of the schools or courses outlined in *DDESB TP-18, Dated 20 December 2004* • Personnel will receive site specific training for UXO/MEC/CWM recognition for those items anticipated at the site • All operators will have OSHA/HAZWOPER Training • Employees working on site will have HAZWOPER medical clearance • Personnel will be trained in the used of proper equipment, PPE.

Table 5: Performing Motor Vehicle Operations

Activity Hazard Analysis		
Activity: Performing Motor Vehicle Operations		
Principal Steps	**Potential Safety / Health Hazards**	**Recommended Controls**
1. Inspect vehicles to ensure proper working conditions 2. Insure vehicles are properly equipped 3. Conduct motor vehicle operations	• Accidents and collisions • Slips and falls when securing equipment	• Complete Motor Vehicle Inspection Form. If the vehicle is not working properly it will be returned to the rental agency for repair or replacement. All operators are required to have a valid driver's license. The driver will observe all posted speed limits. The vehicle will have radio or telephone communications available in the vehicle • Drivers will maintain vehicles so there is no obstruction and blocking of windows and mirrors.
EQUIPMENT TO BE USED	**INSPECTION REQUIREMENT**	**TRAINING REQUIREMENTS**
• Level D PPE o work clothes o leather gloves o over the ankle leather work boots or hiking boots (no steel-toed boots) o Safety glasses rated ANSI Z87.1 o Fluorescent orange safety vests if required • Vehicle: seat belts, two-way radios or cellular phones, first aid kits, eye wash kit, BBP kit, one fire extinguisher rated at 1A:10B:C, Haz-Mat spill response kit, roadside emergency markers	• Vehicles will be inspected daily prior to use • Any hazardous condition noted will be repaired prior to use • Inspect interior for equipment	• Vehicles operators are required to have a valid driver's license from their state of residence • All operators and passengers will be trained in the use of fire extinguishers • Personnel will receive site-specific training for UXO/MEC/CWM hazards that may be found on site • All operators will have current OSHA HAZWOPER Training • Employees working on site will have HAZWOPER medical clearance • Personnel will be trained in the used of proper equipment, and PPE.

Table 6: Avoiding UXO/MEC at Sample Locations

Activity Hazard Analysis		
Activity: Avoiding UXO/MEC at Sample Locations		
Principal Steps	**Potential Safety / Health Hazards**	**Recommended Controls**
1. Establish work area 2. Investigate sample locations for potential UXO/MEC material with a hand-held EM device 3. If UXO/MEC is located on the surface of the work area, terminate soil sampling efforts, mark location, evacuate all personnel, and notify EOD	• Slips, trips, and fall hazards • UXO/MEC hazards • Biological hazards • Cold and Heat Stress hazards • Eye hazards • Cuts and abrasion hazards	• Personnel will be made aware of the area they will be working in and be instructed to be observant for obstacles which may present a trip hazard; they will wear slip resistant work boots or hiking boots with reinforced leather sides that extend above the ankle (UXO Techs will not wear steel-toed boots) • Personnel will be trained to recognize UXO/MEC/CWM hazards and will be familiar with procedures to be followed if UXO/MEC/CWM is found on the surface • Personnel will observe all precautions for biological hazards • Personnel will observe all precautions for cold and heat stress including monitoring and hydration • Safety glasses rated ANSI Z87.1 will be worn on the job site • Hand protection will be worn by all personnel on the job site
EQUIPMENT TO BE USED	**INSPECTION REQUIREMENT**	**TRAINING REQUIREMENTS**
• Hand-held EM device • Level D PPE o work clothes o nitrile gloves o over the ankle leather work boots or hiking boots (no steel-toed boots) o Safety glasses rated ANSI Z87.1 o Fluorescent orange safety vests (if required)	• All equipment inspected daily • Equipment will be calibrated according to manufacturer specifications and those established for detection equipment	• Operators will be trained in the used of proper equipment, and PPE. • UXO personnel are required to be graduates of one of the schools or courses outlined in *DDESB TP-18, Dated 20 December 2004* • All operators will be trained in performing field calibration tests of all metal detectors • Personnel will receive site specific training for UXO/MEC/CWM recognition for those items anticipated at the site • All operators will have OSHA/HAZWOPER Training • Employees working on site will have HAZWOPER medical clearance

Table 7: Performing Sampling and Analysis Activities

Activity Hazard Analysis		
Activity: Performing Sampling and Analysis Activities		
Principal Steps	**Potential Safety / Health Hazards**	**Recommended Controls**
1. Collect soil sample 2. Cleaning of sampling tools 3. Disposal of sampling waste 4. Labeling of waste container 5. Preparing labels for shipping	• Slips, trips, and fall hazards • UXO/MEC hazard • Biological hazards • Cold and Heat stress hazards • Eye hazards • Cuts and abrasions hazards	• Personnel will be made aware of the area they will be working in and be instructed to be observant for obstacles which may present a trip hazard; they will wear slip resistant work boots or hiking boots with reinforced leather sides that extend above the ankle (UXO Techs will not wear steel-toed boots) • Personnel will be trained to recognize UXO/MEC/CWM hazards and will be familiar with procedures to be followed if UXO/MEC/CWM is found on the surface • Personnel will observe all precautions for biological hazards • Personnel will observe all precautions for cold and heat stress including monitoring and hydration • Safety glasses rated ANSI Z87.1 will be worn on the job site • Hand protection will be worn by all personnel on the job site • Observe proper lifting techniques
EQUIPMENT TO BE USED	**INSPECTION REQUIREMENT**	**TRAINING REQUIREMENTS**
• Level D PPE o work clothes o nitrile gloves o over the ankle leather work boots or hiking boots (no steel-toed boots) o Safety glasses rated ANSI Z87.1 o Fluorescent orange safety vests (if required)	• Sampling equipment to be inspected daily and results noted in log book	• Sampling technicians will be trained in the proper use of required sampling and monitoring equipment, and PPE. • Sampling technicians will receive site-specific training for UXO/MEC/CWM hazards that may be found on site • Sampling Technicians will have current OSHA HAZWOPER Training • Employees working on site will have HAZWOPER medical clearance

FINAL
APPENDIX E
TLI STANDARD OPERATING PROCEDURES

FINAL
APPENDIX E
TLI STANDARD OPERATING PROCEDURES

MILITARY MUNITIONS REPSONSE PROGRAM
SITE INSPECTIONS

Prepared For:

U.S. Army Corps of Engineers
Sacramento District
1325 J Street
Sacramento, California 95814-2922

Prepared By:

TLI Solutions, Inc.
560 Golden Ridge Road, Suite 130
Golden, Colorado 80401

Revised June 2006

The following Standard Operating Procedures (SOPs) have been referenced in previous sections and are included herewith. Please note that TLI Solutions, Inc. has adopted TechLaw's SOPs until a separate set of SOPs are developed.

No. 02-04-01, *Field Procedures – Management of Investigation-Derived Wastes*

No. 02-05-01, *Field Procedures – Chain of Custody*

No. 03-01-02, *Field Documentation Procedures – Maintenance of a Field Logbook*

No. 03-02-02, *Field Documentation Procedures – Taking and Documenting Photographs*

No. 04-02-00, *Packaging and Shipping Procedures – Environmental Samples*

No. 06-01-00, *Groundwater Sampling/Monitoring and Analysis Procedures – Preparation of a Groundwater Sampling and Analysis Plan*

No. 06-02-00, *Groundwater Sampling/Monitoring and Analysis Procedures – Well Installation and Development*

No. 06-03-01, *Groundwater Sampling/Monitoring and Analysis Procedures – Pre-Sampling Activities*

No. 06-04-00, *Groundwater Sampling/Monitoring and Analysis Procedures – Sampling Activities*

No. 06-05-01, *Groundwater Sampling/Monitoring and Analysis Procedures – Well Abandonment*

No. 06-06-00, *Groundwater Sampling/Monitoring and Analysis Procedures – Low Flow Purging and Sampling Procedures*

No. 07-01-00, *Soil Sampling and Analysis Procedures – Preparation of a Soil Sampling and Analysis Plan*

No. 07-03-00, *Soil Sampling and Analysis Procedures – Surface/Near-Surface Soil Sampling*

No. 07-04-01, *Soil Sampling and Analysis Procedures – Split-Barrel Sampling and Presentation Sheet*

No. 07-05-01, *Soil Sampling and Analysis Procedures – Soil Sampling with an Auger*

No. 07-06-01, *Soil Sampling and Analysis Procedures – Soil Sampling with a Shelby Tube*

No. 07-07-00, *Soil, Soil Gas, and Groundwater Sampling Using Direct Push Technology (DPT)*

No. 08-02-00, *Surface Water Sampling and Analysis Procedures*

TECHLAW STANDARD OPERATING PROCEDURES

FIELD PROCEDURES — MANAGEMENT OF INVESTIGATION DERIVED WASTE (IDW)

SOP Number: 02-04-01
Effective Date: 05/01/2002

Technical Approval: _____ Date: 5-13-02

QA Management Approval: _____ Date: 5/20/02

SOP Description

This Standard Operating Procedure (SOP) describes the internal and regulatory guidelines required for the management of materials, wastes, and/or media generated during site investigations. This SOP is to be followed by the TechLaw project managers or designee to develop a plan to manage the investigation derived waste (IDW) potentially generated during site investigations, sampling visits, RCRA oversights, and other investigative activities for private clients and regulatory agencies. This SOP describes various activities that generate IDW, the types of IDW commonly generated, and the regulatory guidelines available to develop an adequate IDW plan.

The IDW plan is incorporated as part of the site-specific Health and Safety Plan (HASP) (See SOP 09-02-XX) for a project. Each client, or regulatory agency may have specific requirements for the proper management of IDW. The IDW plan should be discussed with the clients and regulatory agencies, as applicable, prior to initiating field activities that may generate IDW.

General Procedures

Related SOPs

This SOP is to be used in conjunction with the other or applicable SOPs found in the following SOP categories:

Section No.	Section Title
01	General Procedures
02	Field Procedures

03	Field Documentation Procedures
06	Groundwater Sampling/Monitoring and Analysis Procedures
07	Soil/Sediment Sampling and Analysis Procedures
08	Surface Water Sampling and Analysis Procedures
09	Health and Safety Procedures
11	Quality Assurance Procedures
13	Waste Sampling & Analysis Procedure

Related Documentation and Apparatus

The following documentation can be used in developing an IDW plan:

- Project-specific Quality Assurance Project Plan (QAPP);
- Relevant site information such as previous sampling data, waste characterization data; regulatory agency files; and
- Regulatory specific documents or guidelines related to the management of IDW (i.e., *Management of Investigation-Derived Wastes During Site Inspections, OERR Directive 9345.33-02, May 1991, U.S. EPA; and Guide to Management of Investigation-Derived Wastes, Publication: 9345.3-03FS, April 1992*).

Investigation Derived Waste: Activities and Types

IDW are wastes generated during the conduct of field sampling investigation or remediation activities at RCRA, CERCLA or other sites that potentially contain hazardous wastes or substances. IDW can be hazardous or non-hazardous wastes.

When conducting field operations, such as RCRA investigations and other sampling activities, intrusive field investigative operations (e.g., soil sampling or well installation) may be conducted. These activities could generate field derived wastes.

Wastes can be in the form of liquid and/or solids. Some of the more common field activities and the types of IDW generated are:

Activity	Type of Wastes
Well Installation	Soil cuttings, purge water, grout, muds
Groundwater sampling	Purge water, decontamination fluids, PPE
Soil Sampling	Decontamination fluids, PPE, solids
Waste Sampling	PPE, decontamination fluids, waste residuals, disposable sampling equipment

To handle IDW properly, the project manager must determine the types, characteristics and quantity of anticipated IDW.

Tasks Associated with IDW management

The following outlines the factors that should be taken into consideration when planning for proper management of IDW, prior to the field work.

1. Review relevant facility information. Obtain from the client all relevant analytical data that will provide information on the potential characteristics of the waste generated during the field operations. Review previous analytical data, waste management plans, history of spills, permits, inspection results, and product and waste characteristics.

2. Identify field activities generating IDW. Review the proposed site-specific field investigation operations. *Will IDW be generated by any of the proposed investigation activities?*

   For example- If well installation is a planned field operation, various types of IDW will be generated. These could include but not be limited to - liquids (purge water) or solids (drill cuttings, or PPE).

3. Identify quantity and type of IDW. Based on the proposed IDW generating activities, determine the type and quantity of wastes that need to be managed.

Determine the quantity of each waste type per activity. A single field operation can generate multiple types of IDW (i.e., well installation activity could generate: 30 gallons of purge water, 15 gallons of decontamination fluids, 1 drum of PPE, 2 drums of cuttings).

4. Identify the potential waste characteristics. Use the relevant facility file information available about the site. *Will wastes generated be hazardous or non-hazardous?*

   To properly manage IDW, the project manager must know whether the IDW contains CERCLA hazardous substances, RCRA hazardous wastes, contaminants regulated under other statutes, or is non-hazardous. This information can be obtained from previous analytical data, waste management plans, history of spills, and product and waste characteristics. EPA guidance encourages, when applicable, the use of "generator knowledge" to determine waste characteristics. The level of such knowledge required to make a determination must take into account considerations of practicability and should reflect the scope of the field activities. Additionally, the sampling plan or objectives of the investigation may provide information toward determining the potential waste constituents. (See Attachment A and B for more specific information regarding waste characterization). Limited field screening may also be used to assist in determining the waste characteristics (e.g., pH readings, or Hazcatting ™).

5. Identify specific facility, state or Federal IDW management requirements. Discuss the generation of IDW with the facility and any state or federal agencies involved in the project. Determine any agency specific requirements and include this information in the IDW plan. The U.S. EPA document, *Management of Investigation-Derived Wastes During Site Inspections*, OERR Directive 9345.33-02, May 1991, can be useful in determining the appropriate management of IDW. See the discussion below- *Selecting IDW Management Methods.*

6. Subcontractors. Discuss the responsibility of IDW management with any and all subcontractors that will be part of the field operation team. Ensure that

subcontractors are familiar with IDW management procedures, prepared to properly manage IDW, and qualified to support the field operations.

Selecting IDW Management Methods

Upon designating IDW either RCRA hazardous or RCRA nonhazardous, the project manager should determine the appropriate handling method. Attachment A to this SOP provides an IDW Management Decision Tree that provides an overview to selecting the best approach for IDW management and the steps involved in executing the approach. This Decision Tree is from the U.S. EPA document, *Management of Investigation-Derived Wastes During Site Inspections, OERR Directive 9345.33-02, May 1991.*

Using the planning steps described in the above-referenced decision tree and the relevant EPA or other IDW management documents, the project manager should determine the most appropriate IDW management for the site-specific field operations. **It is critical that all aspects of IDW management be considered in the pre-planning stages of all investigations, prior to any field activities that may generate IDW.**

IDW Management Options

There are two basic management options for IDW: on-site and off-site. The following provides a brief discussion of the two options. Always consult the most current regulatory guidance and requirements to determine the most appropriate management methods. The facility, EPA and/or State agency should be consulted as needed to comply with appropriate IDW management options.

On-site IDW Management can include, but are not limited to the following:

(These are examples. Site-specific methods will be determined based on site-specific information.)

Non-hazardous IDW

- Leave IDW with the facility for proper handling and management. This method has been a common method of IDW management. Most facilities will accept the non-hazardous IDW. Permission must be obtained from the facility prior to leaving any IDW at a facility.

- Spread soils around boring and cover with surface soil, discharge liquids onto the ground area or next to the well. As with leaving the wastes onsite, Permission must be obtained from the facility prior to placement on the land.

Hazardous IDW

- Hazardous IDW may be left with the facility representative for proper handling and management. Prior arrangements must be made with the facility before the field activities begin. If working for a governmental agency, approval of this form of IDW management must be obtained from the regulatory agency as well.

- Contain IDW and leave on-site for future disposal. Many times, it may be necessary to contain IDW for a short term storage period at the facility. Analytical testing may be required to further characterize the IDW. All parties involved should be consulted (i.e., facility, governmental agencies), prior to leaving IDW at the facility. Special considerations may apply if this method is used, including but not limited to: fencing to secure drums of IDW.

- IDW can be left on-site in an area designated as an Area of Contamination (AOC). The AOC concept applies only to contaminated soil (and sediments) from the inspected site. The AOC concept does not apply to wastes that did not originate from the AOC, such as PPE, decontamination fluids and groundwater. EPA requirements are specific for designating these areas. All relevant EPA and State regulations must be consulted before designating any area as an AOC.

Off-site IDW Management can include, but not be limited to:

Non-Hazardous IDW

- Arrangements can be made for the delivery of nonhazardous IDW to the nearest industrial or municipal landfill or local Publicly Owned Treatment Works (POTW). Prior arrangements should be made with the off-site disposal facility before field activities begin. Off-site facilities may require some form of waste characterization or bill of lading.

Hazardous IDW

- Immediate containment and removal. Depending on the investigation circumstances, it may be necessary to contain and remove IDW immediately upon completion of the field activities. Extensive pre-planning is necessary. Consult with facility and governmental agencies to discuss the IDW plan. Arrangements with transporters and disposal facilities must be coordinated in advance of any field activities. Allow for at least two full weeks of coordination.

Other methods may be appropriated. Pre-planning is essential to IDW management. The use of this SOP, the attachments and other resources on IDW management, should be consulted prior to initiation or implementation of any IDW plan.

Implementation of IDW Management

The IDW management plan should be flexible to allow slight modifications due to unexpected and unforseen field conditions. There are several items that should always be included in the implementation of IDW plan. These include at a minimum, the proper handling and labeling of containers, and documentation of IDW management activities. Also consult Attachment B for other considerations.

Container Selection. If containerization of IDW is necessary, consider the type, quantity and characteristics of the IDW when selecting the proper container. When selecting the container, consider the compatibility of the container with the waste, size of container, and

overall appropriateness of the container for the field activities (i.e., if waste is corrosive, steel containers would not be appropriate because of the incompatibility of the waste with the container). The potential disposal method will also influence container selection, as many disposal facilities have limitations on the volume(s) and container types they will accept.

Handling and Labeling of Containers. Hazardous IDW in containers, must be marked and labeled according to all applicable RCRA generator requirements of 40 CFR 262.30-262.34. All marking and labels must be applied before leaving the site. Marking and labeling must be made with indelible ink or self affixing labels.

Documentation of IDW Management. Document all IDW management activities in a field logbooks and with photo documentation. See SOPs 03-01-XX and 03-02-XX (Field Documentation Procedures- Maintenance of Field Logbook and Field Documentation Procedures-Taking and Documenting Photographs).

Manifests/Bill of Lading. If hazardous IDW needs to be disposed off-site, a Uniform Hazardous Waste Manifests must be completed. **TechLaw staff must never sign a hazardous waste manifest**. Coordinate the manifest requirements with the client and receiver/transporter used to remove the IDW. The client will be notified that they are designated as the generator on all shipping papers and are required to sign all shipping papers unless other contractual arrangements have been made. Off-site disposal companies require some form of waste profile before waste pick-up. If the generator's knowledge is not acceptable for the waste profile, analysis of IDW for disposal should be included with the other project scheduled sampling and analysis. These issues should be considered in all pre-field planning activities.

If non-hazardous IDW will be disposed off-site, a bill of lading may be required by the facility selected to accept the wastes. Coordination with these facilities of waste acceptance requirements should be done before activities are initiated.

Copies of manifests or bill of lading must be maintained for TechLaw's project file. The generator copy should be provided to the client or signatory authority on the manifest.

Disposal Facilities. During the pre-planning phase, disposal arrangements made with the off-site facility should be obtained in writing. Before signing any contracts, coordinate with the Regional Manager and Legal Counsel for review and approval of any contract agreements.

Health and Safety

It is TechLaw's policy to maintain an effective program for control of employee exposure to chemical, radiological, and physical stress which is consistent with the EPA, DOE, and OSHA established standards and requirements.

All field personnel will be provided with appropriate protective clothing and safety equipment. At a minimum, this will include steel-toed shoes, safety glasses or splash shield and chemical resistant gloves. Specific protective equipment required for handling IDW must be addressed in the site-specific HASP.

QA/QC

None at this time

Comments/Notes

The time required to prepare IDW Management plans should be built into the appropriate project budget.

Attachments

Attachment A — IDW Management Decision Tree; EPA OERR Directive 9345.3-02, May 1991.

Attachment B — Guide to Management of Investigation-Derived Wastes, EPA Publication 9345.3-03FS, April 1992.

References

Code of Federal Regulations (CFR) 40, Parts 260-280, Protection of Environment

Code of Federal Regulations (CFR) 40, Part 300, National Oil and Hazardous Substances Pollution Contingency Plan

U.S.EPA, Office of Emergency and Remedial Response Hazardous Site Control Division, Guide to Management of Investigation-Derived Waste, Publication 9345.3-03FS, April 1992.

U.S. EPA, Office of Emergency and Remedial Response, Management of Investigation-Derived Wastes During Site Inspections, OERR Directive 9345.3-02, May 1991

United States
Environmental Protection
Agency

Office of Research and
Development
Washington, DC 20460

EPA/540/G-91/009
May 1991

Superfund

EPA

Management of Investigation-Derived Wastes During Site Inspections

Attachment A

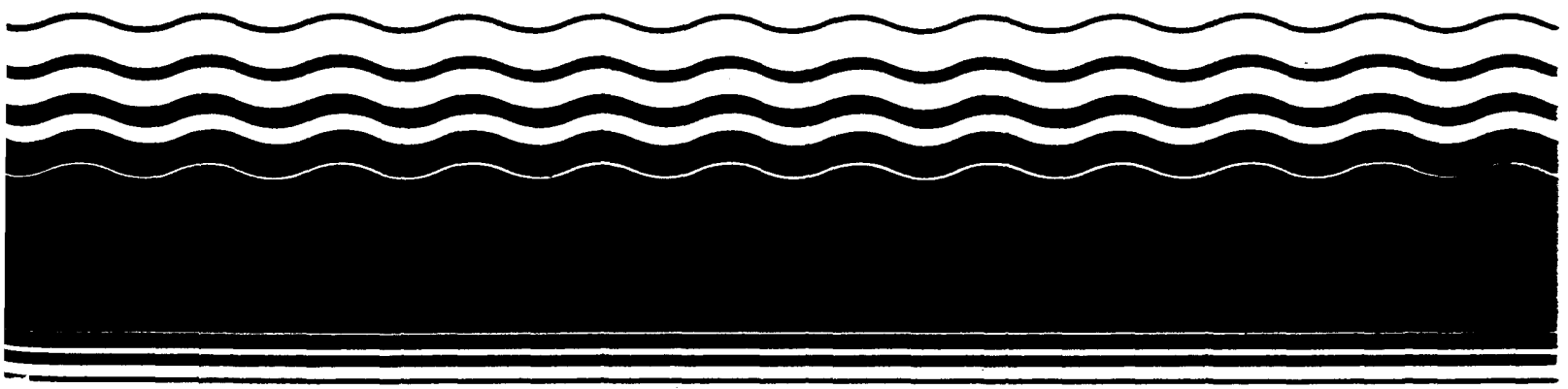
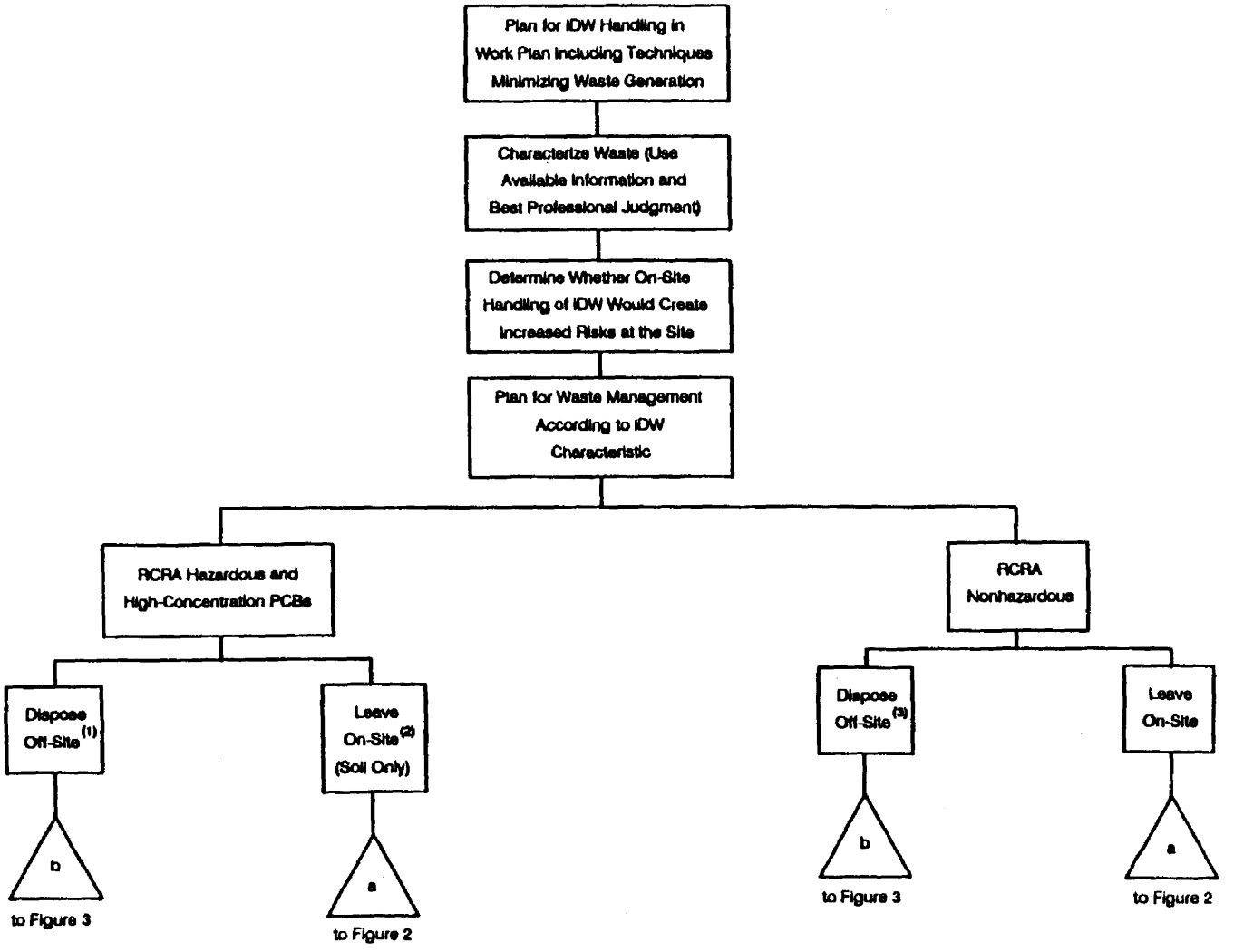


Figure 1

IDW Management Decision Tree



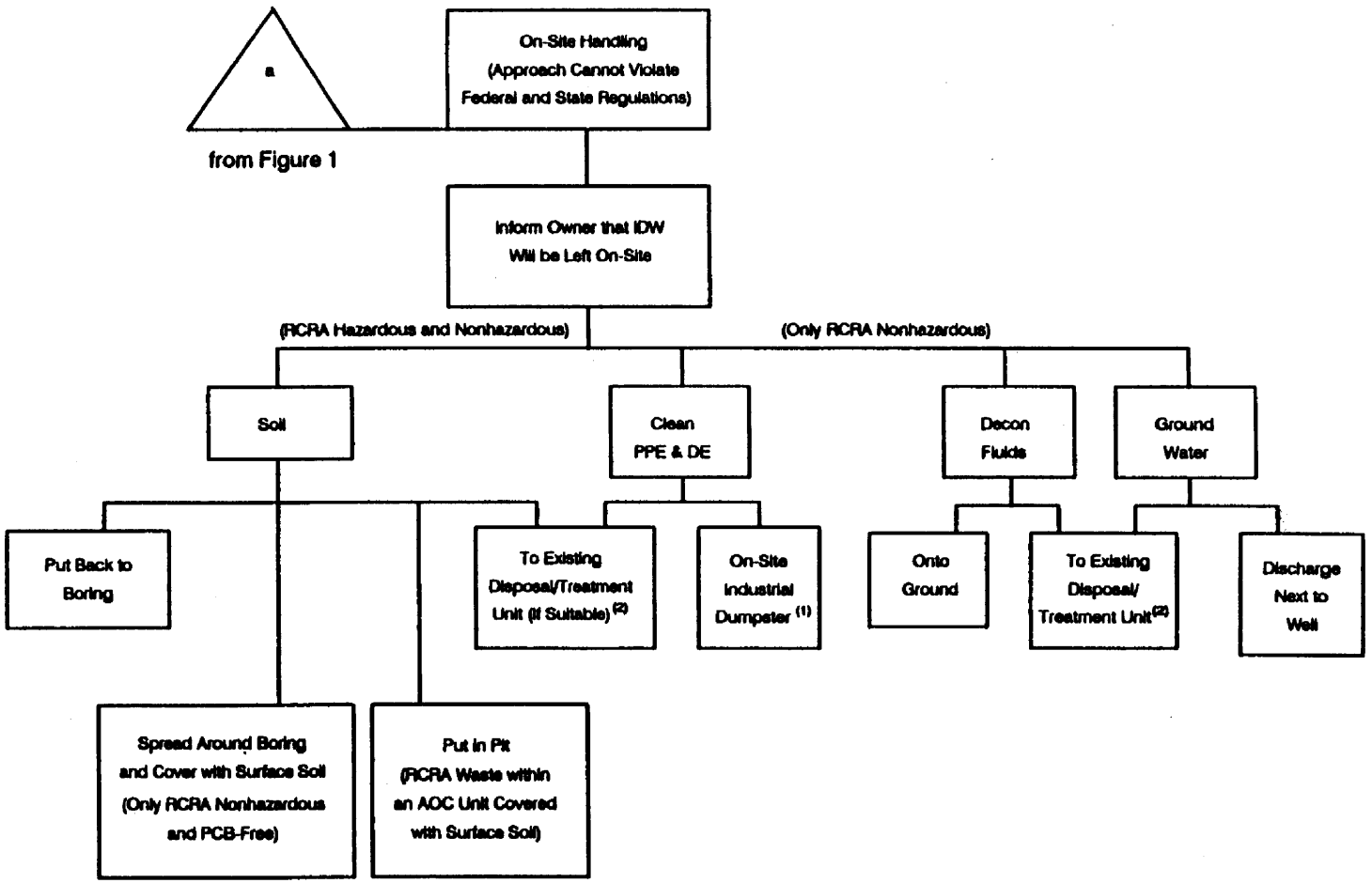
(1) Soil cuttings, ground water, and decontamination fluids creating increased hazards at the site should be disposed off-site. Before and after the SI, determine anticipated waste quantity and applicable regulations for waste generators.

(2) If not prohibited by other legally enforceable requirements such as state ARARs.

(3) Justified only in rare circumstances when a RCRA nonhazardous waste is a state hazardous waste and state legally enforceable requirements call for waste removal, or if leaving the waste on-site would significantly affect human health and the environment.

Figure 2

IDW Management Decision Tree

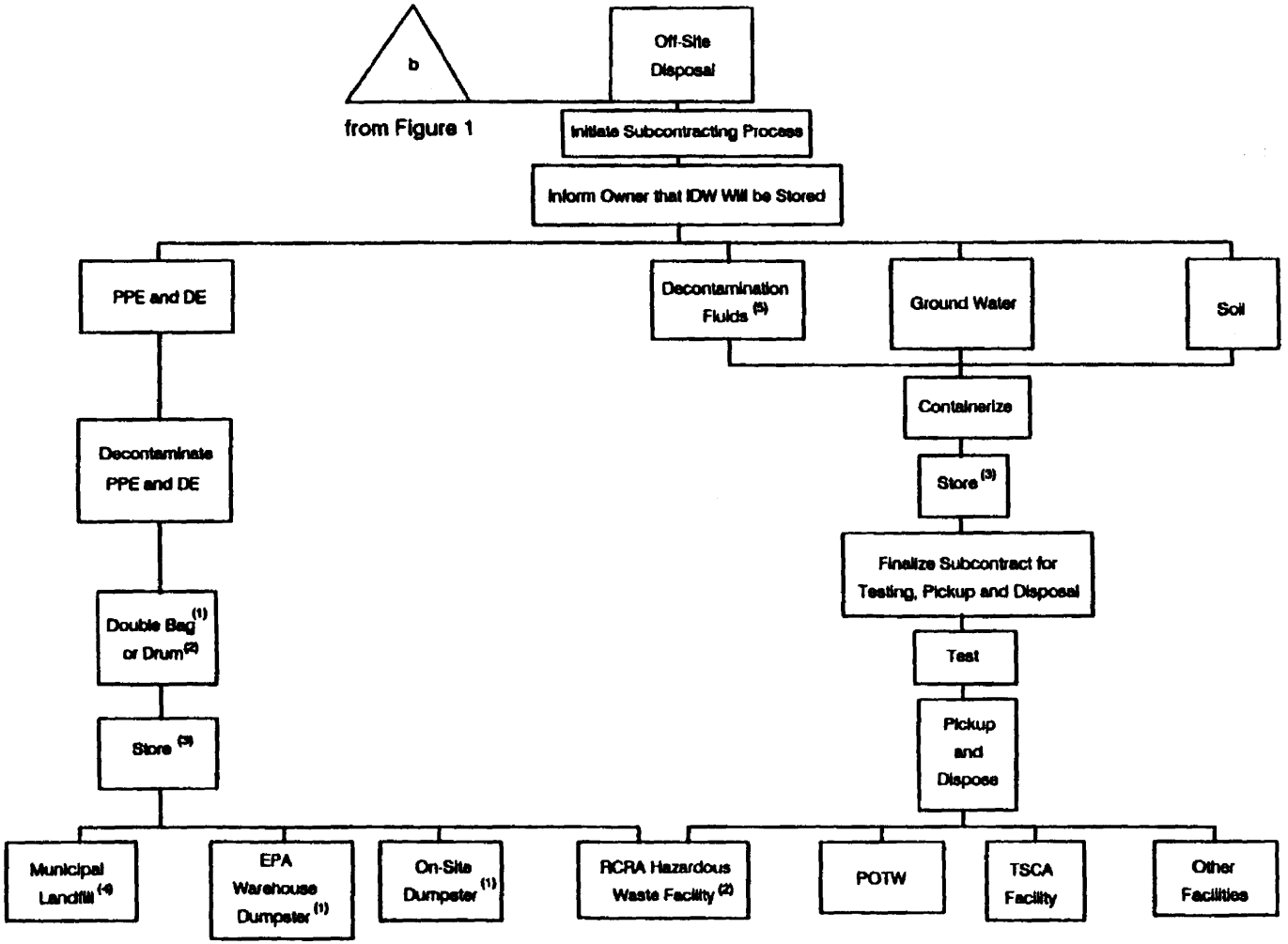


(1) Clean PPE and DE may also go to the nearest landfill or to an EPA warehouse dumpster.

(2) If the receiving unit meets the off-site policy acceptability criteria.

Figure 3

IDW Management Decision Tree



(1) Only RCRA nonhazardous waste.

(2) Only RCRA hazardous waste generated in quantities greater then 100 kg/month when sent off-site.

(3) In accordance with accumulation requirements for RCRA hazardous wastes.

(4) Only if the conditionally exempt small quantity generator exception applies.

(5) If the conditionally exempt small quantity generator exception applies, off-site disposal of decon fluids may not require subcontracting.

United States Environmental Protection Agency | Office of Solid Waste and Emergency Response | Publication: 9345.3-03FS April 1992

EPA

Guide to Management of Investigation-Derived Wastes

Office of Emergency and Remedial Response
Hazardous Site Control Division OS-220W

Quick Reference Fact Sheet

CERCLA field investigation activities (e.g., remedial investigation/feasibility studies and remedial designs) may result in the generation of waste materials that may pose a risk to human health and the environment. These investigation-derived wastes (IDW) may include drilling muds, cuttings, and purge water from test pit and well installation; purge water, soil, and other materials from collection of samples; residues (e.g., ash, spent carbon, well development purge water) from testing of treatment technologies and pump and treat systems; contaminated personal protective equipment (PPE); and solutions (aqueous or otherwise) used to decontaminate non-disposable protective clothing and equipment. The management of IDW must ensure protection of human health and the environment and comply with (or waive) regulatory requirements that are applicable or relevant and appropriate requirements (ARAR). **This fact sheet presents an overview of possible IDW management options, discusses the protectiveness requirements and ARARs associated with these options, and outlines general objectives established for IDW management under Superfund.**[1]

The general options for managing IDW (see **Highlight 1**) are collection and either (1) immediate disposal or (2) some type of interim management. Interim management may include storage or other temporary measures. As discussed below, the specific option selected will depend on the type of waste produced, its relative threat to human health and the environment, and other site-specific conditions.

IDW MANAGEMENT REQUIREMENTS

When managing IDW, site managers are required to choose an option that: (1) is protective of human health and the environment and (2) complies with (or waives) ARARs, as described below.

Protectiveness

In determining if a particular management/disposal option is protective, site managers should consider the following:

- The contaminants, their concentrations, and total volume of IDW;
- Media potentially affected (e.g., ground water, soil) under management options;
- Location of the nearest population(s) and the likelihood and/or degree of site access;
- Potential exposures to workers; and
- Potential for environmental impacts.

As a general rule, it will be necessary to use best professional judgment, in light of the site-specific conditions, to determine whether an option is protective of human health and the environment. For example, a site manager may determine that storing IDW temporarily until the final action or returning IDW to its source is protective, based on knowledge that the material poses low risk and/or that the final action will address any risks posed by the wastes and there will be no unacceptable risks in the interim.

Alternatively, if the site includes or is near residential areas, the site is unsecured, and/or contaminants appear to be present at unacceptable levels, it may not be protective to return excavated soil to the source. Storing IDW in containers in an on-site, secure location, or sending it off site immediately may be more appropriate.

Site managers also need to consider the potential effects of IDW management-related activities on environmental media. For example, pouring contaminated purge water on the ground around a well may not be prudent, because such an action could mobilize any hazardous constituents present in the soil or introduce contaminants into clean soil.

Compliance with ARARs

Remedial Investigation/Feasibility Study (RI/FS) and Remedial Design (RD) actions must comply with ARARs "to the extent practicable, considering the exigencies of the situation" (NCP, 55 FR 8756, emphasis added); therefore, it generally will not be necessary to obtain a waiver if an ARAR cannot be attained during these actions. If a site manager determines that, based on site-

[1] Management of treatability study and treatment pilot wastes is discussed in Guide for Conducting Treatability Studies Under CERCLA, Interim Final, December 1989, EPA/540/2-89/058. Information on management of IDW generated during Preliminary Assessments and Site Investigations is provided in Management of Investigation-Derived Waste During Site Investigations, May 1990, EPA/540/G-91/009.

Highlight 1: IDW MANAGEMENT OPTIONS

Type of IDW	Generation Processes*	Management Options
Soil	• Well/test pit installation • Borehole drilling • Soil sampling	• Return to boring, pit, or source immediately after generation • Spread around boring, pit, or source within the AOC+ • Consolidate in a pit (within the AOC) • Send to on-site TDU+ • Send to TDU off site immediately • Store for future treatment and/or disposal
Sludges/sediment	• Sludge pit/sediment sampling	• Return to boring, pit, or source immediately after generation • Send to on-site TDU • Send to TDU off site immediately • Store for future treatment and/or disposal
Aqueous liquids (ground water, surface water, drilling fluids, other wastewaters)	• Well installation/development • Well purging during sampling • Ground water discharge during pump tests • Surface water sampling	• Discharge to surface water • Pour onto ground close to well (non-hazardous waste) • Send to on-site TDU • Send to off-site commercial treatment unit • Send to POTW+ • Store for future treatment and/or disposal
Decontamination fluids	• Decontamination of PPE+ and equipment	• Send to on-site TDU • Evaporate (for small amounts of low contamination organic fluids) • Send to TDU off site immediately • Store for future treatment and/or disposal
Disposable PPE	• Sampling procedures or other on-site activities	• Send to on-site TDU • Place in on-site industrial dumpster • Send to TDU off site immediately • Store for future treatment and/or disposal

* The generation processes listed here are provided as examples. IDW may also be produced as a result of activities not listed here.

+ AOC: Area of Contamination (AOCs at a site may not yet have been identified at the time of the RI/FS); TDU: Treatment/disposal Unit; POTW: Publicly Owned Treatment Works; PPE: Personal Protective Equipment

specific factors, compliance with an ARAR is practicable but an ARAR waiver is warranted for an RI/FS or RD action, an interim action waiver may be available if the final remedy will attain the ARAR. An action memorandum should be prepared for the waiver, the state given an opportunity to comment, and the decision document placed in the administrative record.

Potential ARARs for IDW at CERCLA sites include regulations under the Resource Conservation and Recovery Act (RCRA) (including both Federal and State underground injection control (UIC) regulations), the Clean Water Act (CWA), the Clean Air Act (CAA), the Toxic Substances Control Act (TSCA), and other State environmental laws. How these various requirements may direct or influence IDW management decisions is described below.

Resource Conservation and Recovery Act (RCRA). Certain sections of the RCRA Subtitle C hazardous waste regulations (e.g., land disposal restrictions and storage restrictions) may be ARARs for IDW should RCRA hazardous waste be identified at a site. (Note that RCRA may be relevant and appropriate even if the IDW is not a RCRA hazardous waste.) A waste is hazardous under RCRA if it is listed as such in 40 CFR 261.31 - 261.33 or if it exhibits one of four characteristics: ignitability, corrosivity, reactivity, or toxicity.

Site managers should not assume that a waste considered to pose a potential risk at a CERCLA site is a listed or characteristic RCRA hazardous waste. **Until there is positive evidence (records, test results, other knowledge of waste properties) that the IDW is a RCRA hazardous waste, site managers should manage it in a protective manner (but not necessarily in accordance with Subtitle C requirements).** Business records or facility processes should be examined to determine whether RCRA listed wastes were generated and are present in the IDW. For characteristic wastes, site managers should rely on testing results or on knowledge of the material's properties. If best professional judgment and available information indicate that, for protectiveness reasons (or because RCRA requirements are relevant and appropriate), IDW is best managed as a "hazardous waste," management in accordance with Subtitle C requirements is prudent, regardless of whether it is known to be a RCRA waste.

If aqueous liquid IDW is considered a RCRA hazardous waste, the site manager should determine whether the Domestic Sewage Exclusion (DSE) applies to the discharge of that IDW to a POTW. The RCRA DSE exempts domestic sewage and any mixture of domestic sewage and other wastes that passes through a sewer system to a POTW for treatment from classification as a solid waste and, therefore, as a RCRA hazardous waste (40 CFR 261.4).

- Land Disposal Restrictions

If IDW is determined to be a RCRA hazardous waste and subject to the land disposal restrictions (LDRs), "land disposal" of the IDW will be prohibited unless specified treatment standards are met (see Superfund LDR Guides #5 and #7, Determining When LDRs Are Applicable to CERCLA Response Actions and Determining When LDRs Are Relevant and Appropriate to CERCLA Response Actions, OSWER Directive 9347.3-05FS and 9347.3-08FS, June 1989 and December 1989 and the NCP, 55 FR 8759, March 8, 1990). "Land disposal" occurs when wastes from different AOCs are consolidated into one AOC; when wastes are moved outside an AOC (for treatment or storage) and returned to the same or a different AOC; or when wastes are excavated, placed in a separate hazardous waste management unit such as an incinerator or tank within the AOC, and then redeposited into the AOC.

Storing IDW in a container ("a portable device in which a material is stored, transported, treated, disposed of, or otherwise handled" (40 CFR 260.10)) within the AOC and then returning it to its source, however, is allowable without meeting the specified LDR treatment standards. Under the definition of "hazardous waste management unit" (40 CFR 260.10), EPA states that "a container alone does not constitute a unit; the unit includes the containers and the land or pad upon which they are placed." Therefore, returning IDW that has been stored in containers (not tanks or other RCRA-regulated units) within the AOC to its source does not constitute land disposal, as long as containers are not managed in such a manner as to constitute a RCRA storage unit as defined in 40 CFR 260.10. In addition, sampling and direct replacement of wastes within an AOC do not constitute land disposal.

- Storage

Subtitle C outlines the storage requirements for RCRA hazardous wastes. Under RCRA, "storage" is defined as "the holding of hazardous waste for a temporary period, at the end of which the hazardous waste is treated, disposed of, or stored elsewhere" (40 CFR 260.10).

On-site Superfund actions are only required to comply with the substantive standards of other laws (see 40 CFR 300.5, definitions of applicable or relevant and appropriate requirements). Superfund sites are also exempt from permit requirements under CERCLA §121(e). Therefore, site managers are not required to comply with administrative requirements triggered by RCRA storage deadlines (e.g., contingency planning, inspections, recordkeeping). Generally equivalent administrative activities are undertaken at Superfund sites, however, under existing Superfund management practices.

Site managers storing known RCRA hazardous waste must comply with the substantive, technical requirements of 40 CFR Parts 264 and 265 Subparts I (containers), J (tanks), and L (waste piles), to the extent practicable. (See Highlight 2 for a summary of these technical requirements for each type of unit). In addition, the ground-water monitoring requirements of 40 CFR Parts 264 and 265 Subpart F are potential ARARs, and to the extent they are determined to be ARARs at a site, they should be attained to the extent practicable (or waived). (In many cases, ground-water monitoring conducted during the RI/FS will provide protection equivalent to the Subpart F requirements.)

[NOTE: Under the LDRs, restricted RCRA hazardous waste may not be stored at a site unless the storage is solely for the purpose of accumulating sufficient quantities of the waste to facilitate proper disposal, treatment, or recovery (see 40 CFR 268.50). **Generally, storing IDW until a final disposal option is**

Highlight 2:
EXAMPLES OF RCRA TECHNICAL STORAGE REQUIREMENTS*

RCRA storage requirements, applicable to both less-than-90-days generators and permitted or interim status storage facilities, may include the following substantive requirements:

Containers 40 CFR 264 Subpart I and 265 Subpart I

- Containers must be in good condition
- Wastes must be compatible with container
- Container must be closed during storage
- Container storage areas must have a containment system that can contain 10 percent of the volume of containers or of the largest container
- Spilled or leaked waste must be removed from the collection area as necessary to prevent overflow

Tanks 40 CFR 264 Subpart J and 265 Subpart J

- Tanks must have a secondary containment system that includes a liner, a vault, a double-walled tank, or an equivalent device (applies only to certain tanks)

Waste Piles 40 CFR 264 Subpart L and 265 Subpart L

- Waste piles must have a liner and a leachate collection and removal system
- Owners/operators must have a run-on control system to prevent flow onto the active portion of the pile during peak discharge from at least a 25-year storm
- Owners/operators must have a run-off management system to collect and control at least the water volume resulting from a 24-hour, 25-year storm

- This is a partial list of substantive requirements. For more detail, see 40 CFR Part 264 and 265.

selected in a Record of Decision (ROD) and implemented during the remedial action is allowable storage under the RCRA LDR storage prohibition.]

- Recordkeeping and Manifesting

If hazardous wastes are sent off site, the site manager must comply with both administrative and substantive elements of the RCRA generator requirements of 40 CFR Part 262 and LDR notification and certification requirements of Part 268. (For example, a site manager must prepare an LDR notification and certification when restricted wastes are sent off site to a land disposal facility.) These standards include requirements such as manifests for shipping waste that list all hazardous waste listings and characteristics applicable to the waste (see 40 CFR 262.11), packaging and transport requirements, and recordkeeping requirements.

If the LDRs are applicable, the following information should be collected and available before the removal of wastes to an off-site disposal facility: EPA hazardous waste number, LDR treatment standards, manifest number for the waste shipment, and waste analysis data.

- Underground Injection Control (UIC) Program

Under the UIC regulations, RCRA hazardous wastes may be injected into Class I permitted wells. In some cases, hazardous liquids, such as extracted ground water from pump and treat operations, may be injected into a Class IV UIC well. For example, ground water contaminated with RCRA hazardous wastes may be injected into Class IV permitted wells if it is part of a CERCLA response action or a RCRA corrective action and if it has been treated to "substantially reduce hazardous constituents prior to such injection..." (RCRA § 3020(b)). (See Applicability of Land Disposal Restrictions to RCRA and CERCLA Ground Water Treatment Reinjection, OSWER Directive #9234.1-06, December 1989.)

- Non-RCRA Hazardous Wastes

Some non-RCRA hazardous waste may be subject to management requirements under Subtitle D of RCRA as solid wastes. Subtitle D regulates disposal of solid waste in facilities such as municipal landfills. Therefore, non-RCRA hazardous IDW, such as decontaminated PPE or equipment, may need to be disposed of in a Subtitle D facility (depending on State requirements).

Clean Water Act (CWA). Discharges of aqueous IDW to surface water and publicly owned treatment works (POTWs) may be required to comply with CWA Federal, State, and local requirements. Requirements to be met may include water quality criteria, pre-treatment standards, State water quality standards, and NPDES permit conditions. Direct discharges to on-site waters are subject only to substantive requirements, while discharges to POTWs and other off-site discharges must comply with both substantive and administrative CWA requirements (including permitting requirements). (See Guide to Discharging CERCLA Aqueous Wastes to POTWs, June 1991 and CERCLA Compliance with the CWA and SDWA, #9234.2-06FS, January 1991.)

Toxic Substances Control Act (TSCA). If IDW contains PCBs, TSCA treatment and/or disposal requirements may apply during its management. TSCA requirements regulate the disposal of material contaminated with PCBs at concentrations of 50 ppm or greater as found on site (i.e., based on sample analysis and not the PCB concentration of the source material (e.g., transformer fluid)). (See PCB Guidance Manual, EPA/540/G-90/007, August 1990.) In addition, TSCA storage requirements may apply that limit the time that PCBs may be stored to one year. Furthermore, if PCB materials are mixed with a RCRA hazardous waste, they may be regulated by the LDR California list prohibitions. (See RCRA sections 3004(d)(2)(D) and (E).)

Department of Transportation (DOT) requirements. Where IDW will be disposed of off site or transported on public roads to a site,

DOT requirements for containerizing, labeling, and transporting hazardous materials and substances may apply.

State requirements. Promulgated State regulations that are legally enforceable, timely identified, and more stringent than Federal regulations may be potential ARARs for IDW managed on site. Substantive requirements of State law that may be ARARs for IDW management include State water quality standards, direct discharge limits, and RCRA requirements (including underground injection control regulations) promulgated in a State with an authorized RCRA hazardous waste management program (as well as programs authorized by State laws). Off-site, substantive and administrative requirements of State law may apply.

Off-Site Policy. In addition to complying with requirements of Federal and State laws, all off-site disposal of wastes must comply with CERCLA section 121(d)(3) and the CERCLA Off-Site Policy (OSWER Directive No. 9834.11 (November 13, 1987)). The Off-Site Policy establishes criteria for selecting an appropriate treatment, storage, or disposal facility (TSDF), including release criteria for all facilities that receive wastes from CERCLA-authorized or funded response actions. In addition, receiving facilities must be in compliance with all "applicable laws."

Before shipping wastes off site, approval should be obtained for the proposed disposal facility from EPA's Regional Off-Site Policy Coordinator. In addition, EPA has adopted a policy for Superfund wastes shipped out of State that written notification should be provided to receiving States (OSWER Directive 9330.2-07, September 14, 1989).

GENERAL OBJECTIVES FOR IDW MANAGEMENT

In addition to the two requirements of protectiveness and compliance with ARARs to the extent practicable (on site) or compliance with applicable law (off site), EPA has identified two general objectives that Superfund site managers should consider when managing IDW: (1) minimization of IDW generation; and (2) management of IDW consistent with the final remedy for the site. The extent to which these objectives can be achieved is highly dependent on site-specific circumstances.

IDW Minimization

Site managers should strive to minimize the generation of IDW to reduce the need for special storage or disposal requirements that may result in substantial additional costs yet provide little or no reduction in site risks relative to the final remedial action. Generation of IDW can be minimized through proper planning of all remedial activities that may generate IDW, as well as through use of screening information from the site inspection. The potential problems of managing IDW should be a factor in choosing an investigative method. Site managers may wish to consider techniques such as replacing solvent-based cleaners with aqueous-based cleaners for decontamination of equipment, reuse of equipment (where it can be decontaminated), limitation of traffic between clean and hot zones, and drilling methods and sampling techniques that generate little waste. Examples of such techniques include using gridding techniques to minimize the number of test pits or using soil borings instead of test pits. Alternative drilling and subsurface sampling methods may include the use of small diameter boreholes, as well as borehole testing methods such as a core penetrometer instead of coring. Site managers should also be careful to keep hazardous wastes separate from nonhazardous wastes.

Management Consistent with Final Remedy

Most IDW (with the exception of non-indigenous IDW) generated during the course of an investigation are intrinsic elements of the site. If possible, IDW should be considered part of the site and should be managed with other wastes from the site, consistent with the final remedy. This will avoid the need for separate treatment and/or disposal arrangements.

Because early planning for IDW management can prevent unnecessary costs and the use of treatment or disposal capacity, IDW management should be considered as early as possible during the remedial process. A key decision to be made is whether the waste will best be treated/disposed of immediately or addressed with the final remedy. If addressed with the final remedy, IDW volumes should be considered in the FS. In addition, when IDW is stored on site, it should be managed as part of the first remedial action/operable unit that addresses the affected media.

SELECTION OF IDW DISPOSAL OPTIONS

The following sections present the Agency's presumptions for IDW management that have been established based on the above considerations. The actual option selected should be based upon best professional judgment and should take into account the following factors:

- The type and quantity of IDW generated (sludge/soil, aqueous liquid, non-indigenous IDW);
- Risk posed by managing the IDW on site (e.g., based on site access controls, contaminant concentrations);
- Compliance with ARARs, to the extent practicable (on site);
- IDW minimization; and
- Whether the final remedy is anticipated to be an off-site or on-site remedy (or this information is unknown) and whether IDW can be managed consistent with the final remedy.

Off-site Final Remedies

If a site manager believes that the final remedy will involve off-site disposal of wastes, EPA's presumption is to manage the IDW as part of the remedial action addressing the waste/medium. Thus, until the final action, the IDW may be stored (e.g., drummed, covered waste pile) or returned to its source. However, the management option selected should also take into account any protectiveness concerns, ARARs, and other relevant site-specific factors (e.g., weather, storage space, and public concern/ perceptions).

There are several potential reasons why it may be advisable to store IDW until the final action. First, because wastes at the site will be shipped off site eventually, returning IDW (especially sludges and soil) to its source would require that it be excavated again. Thus, site managers may consider it practical to containerize IDW as soon as it is generated. Second, storing IDW in containers may be more protective than returning it to its source. Third, because off-site actions may trigger such requirements as the LDRs, temporary storage will eliminate the need to meet these additional requirements until the final remedy.

In some cases, circumstances may lead site managers to choose to return the IDW to its source. This may be appropriate if it is determined that returning IDW to the source is protective and that storage at the site is not possible or practicable (i.e., given State or community concerns). In other cases, long-term storage may not be protective, and immediate off-site disposal may be a better option.

Off-site Remedy

Example: A site involves volatile organic RCRA hazardous wastes that will likely be sent off site for final treatment and disposal. Site conditions are such that temporary storage of IDW is considered protective until the remedial action begins. Because off-site disposal will trigger RCRA disposal requirements such as the LDRs and immediate containerization would be more protective than redepositing into the source area at the time of sampling, the site manager decides to containerize the IDW (and comply with RCRA substantive technical tank and container standards) until the final action is initiated.

On-site Final Remedies (or Final Management in an Unknown Location)

When final management of wastes is likely to occur on site, the management presumptions vary depending on the type of IDW produced.

Sludge/soil

Generally, the Agency expects sludge or soil IDW will be returned to its source if short-term protectiveness is not an issue. The reason behind this presumption is that IDW that may pose a risk to human health and the environment in the long term will be addressed by the final action. **Storage of RCRA hazardous IDW in containers within the AOC prior to returning it to the source will not trigger the LDRs, as long as the containers are not managed in such a way as to constitute a RCRA storage unit as defined in 40 CFR 260.10.** Therefore, it may be possible to store IDW temporarily before redisposing of it. However, EPA believes that, in many cases, returning sludges and soils to their source immediately will be protective and will avoid potentially increased costs and requirements associated with storage. Site-specific decisions on how to manage sludge and soil IDW may ultimately vary from the presumption based on protectiveness, ARARs, and/or community concerns.

Sludge/Soil

Example 1: The soil at a site contains wastes that are expected to be stabilized on site during the final remedial action. The site manager determines that sending soil IDW off site is not cost-effective, because off-site disposal would involve testing and transport costs for a relatively small amount of waste. Instead, knowing that the site is secure and that redisposing the waste at the source will not increase site risk or violate ARARs, the site manager decides to return soil IDW to the source area from which it originated.

Example 2: A site manager determines that returning highly contaminated PCB wastes to the ground at a site is not protective because of the potential risks associated with the material; instead, the site manager chooses to drum the waste and send it off site (in compliance with TSCA). (Off-site disposal may occur immediately or at a later date.)

Example 3: Soil IDW contaminated with a RCRA hazardous waste is generated from a soil boring. The site manager decides to put the IDW back into the borehole immediately after generation, but ensures that site risks will not be increased (e.g., the contaminated soil will not be replaced at a greater depth than where it was originally so that it will not contaminate "clean" areas) and that the contamination will be addressed in the final remedy.

Aqueous liquids

EPA has not established a presumption for the management of aqueous liquid IDW (e.g., ground water). Site managers should determine the most appropriate disposal option for aqueous liquids on a site-specific basis. Parameters to consider, especially in making the protectiveness decision, include the volume of IDW, the contaminants present in the ground water, the presence of contaminants in the soil at the site, whether the ground or surface water is a drinking water supply, and whether the ground-water plume is contained or moving. Special disposal/handling may be needed for drilling fluids because they may contain significant solid components. Examples of aqueous liquid management decisions considering these factors are presented in the box on the next page.

Non-indigenous IDW

Non-indigenous IDW (e.g., sampling materials, disposable PPE, decontamination fluids) should be stored until the final remedy or disposed of immediately. If contaminated, such waste may not be disposed of onto the ground because such an action would add contamination that was not present when activities began at the site (e.g., solvents used for decontamination). If non-indigenous IDW is contaminated with RCRA hazardous waste, it must be managed in accordance with RCRA Subtitle C requirements. Otherwise, site

Aqueous Liquids

Example 1: A site manager has large volumes of ground water IDW and does not know if it is contaminated. Pouring this IDW on the ground would not be protective, because it may contaminate previously uncontaminated soil or may mobilize contaminants that are present in the soil. Therefore, the site manager stores the water in a mobile tank until a determination is made as to whether the water and soil are contaminated or until the final action.

Example 2: IDW is generated from the sampling of background, upgradient wells. Because there are no community concerns or evidence of any soil contamination from other sources, the site manager decides to pour this presumably uncontaminated IDW on the ground around the well.

Example 3: Purge water from a deep aquifer is known to be contaminated with a RCRA hazardous waste. At this site, if this water were poured on the ground, it could contaminate a previously uncontaminated shallow aquifer that is a potential drinking water source and would have to comply with the LDRs. The site manager decides to containerize the water within the AOC and store it until the final remedy.

managers may generally dispose of it in an on-site dumpster (for PPE).

Non-Indigenous IDW

Example 1: Disposable PPE (e.g., gloves, shoe covers) becomes contaminated with RCRA hazardous waste during the field investigation. The site manager containerizes and disposes of this IDW in compliance with RCRA Subtitle C requirements.

Example 2: Disposable equipment becomes contaminated during a field investigation. The site manager decontaminates them and sends them to a Subtitle D facility.

COMMUNITY CONCERNS

Residents of communities near a CERCLA site, local governments, or States may have concerns about certain disposal methods or long-term storage of IDW at the site. As with all CERCLA activities, site managers should evaluate community concerns regarding disposal of IDW in deciding what action to take. For example, if a community is concerned about the direct discharge of IDW water to surface water on site, site managers may want to consider sending the water to a POTW, if one is located nearby. In some instances, it may be appropriate to prepare fact sheets, include options in other community relations documents, or explain IDW management decisions at public meetings prior to actions.

FIELD PROCEDURES - CHAIN-OF-CUSTODY

SOP Number: 02-05-01
Effective Date: 03/02/99

Technical Approval: _____ Date: 8/19/99

QA Management Approval: _____ Date: 8/26/99

SOP Description

This Standard Operating Procedure (SOP) describes the steps that are to be taken to ensure a correct Chain-Of-Custody (COC) program is followed for every Techlaw project involving sampling activities. The program allows for the tracking of possession and handling of individual samples from the time of field collection through laboratory analysis. Because samples collected during an investigation could be used as evidence in litigation, possession of the samples must be traceable from the time each is collected until analytical results are introduced as evidence in legal proceedings.

This SOP must be used in conjunction with the procedures for packaging and shipping samples as discussed in SOP No. 04-03-XX, Environmental Samples, and SOP No. 04-04-XX, Waste Samples (Dangerous Goods).

General Procedures

Related SOPs

This SOP is to be used in conjunction with the other relevant or applicable SOPs found in the following SOP categories:

Section No.	Section Title
01	General Procedures
02	Field Procedures
03	Field Documentation Procedures
04	Packaging and Shipping Procedures
05	Field Equipment Operation and Maintenance Procedures
06	Groundwater Sampling/Monitoring and Analysis Procedures
07	Soil/Sediment Sampling and Analysis Procedures
08	Surface Water Sampling and Analysis Procedures
09	Health and Safety Procedures

10	Regulatory Compliance Procedures
11	Quality Assurance Procedures
12	Incineration/BIF Sampling and Analysis Procedures
13	Waste Sampling and Analysis Procedures

Equipment and Apparatus

- Sample identification labels
- Sample tags (with strings attached)
- Custody seals
- Chain-Of-Custody Records
- Receipt For Samples forms
- Ice chests and ice for sample shipment
- Nylon-reinforced strapping tape
- Clear (packing/strapping) tape
- Plastic zip-lock storage bags
- Pens with permanent water-proof ink

Definitions

Sample under Custody

A sample is considered to be under custody if one or more of the following criteria are met:

- The sample is in the sampler's or the transferee's actual possession,
- The sample is in the sampler's or transferee's view after being in his/her possession,

- The sample was in the sampler's or transferee's possession and then was locked up in a secure place to prevent tampering, and
- The sample is placed in a designated secure area.

Sampler

The sampler is defined as the person responsible for the collection of the samples. Any person on the sampling team may serve as the sampler.

Transferee

The transferee is the person designated to receive and maintain custody of the samples and coordinate shipment of the samples from the site of collection to the analytical laboratory. Any person on the sampling team may serve as the transferee. In addition, the role of the transferee may be filled by several different people throughout the course of the sampling activities. The basic function of the transferee is to assume the responsibility of custody of the samples from the time the samples are collected until they are relinquished to the shipping company or the analytical laboratory.

Description of Chain-Of-Custody Forms

The COC process requires that specific COC forms and paperwork be prepared to document custody of the samples from the time they are collected in the field until received by the analytical laboratory. A brief description of each of the forms and/or paperwork follows:

- **Sample Identification Label** - A sample identification label is affixed to each sample container to prevent misidentification of the samples after collection. The labels are usually self-adhesive and are affixed to the sample containers by placing them directly on the container exterior. Information to be provided on each label includes the site name, date, time, preservative used (if any), type of analysis to be performed, name of sampler, and sample control number. The information should be recorded using permanent water-proof ink. The sample labels can be affixed to the sample containers either immediately before or after the sample collection activities. However, care must be taken to ensure that the containers are not mislabeled if the labels are applied after the samples are collected.

Sample identification labels are usually provided along with the shipment of sample containers, however, they can also be purchased separately. Sample containers and labels may be acquired from either the laboratory contracted to perform the analytical work, or from an independent source (e.g., I-Chem or Eagle Picher). Examples of sample identification labels are provided in Attachment A.

- **Sample Tag** - A sample tag may also be used to identify samples collected in the field. Although only one identification method is required (i.e., sample identification label or sample tag), it is recommended that both be used (if practical) because the sample could be identified from the sample tag if the ink on the sample label were to smear from water contact or if the sample container were to break during shipment. A sample tag consists of a tyvek identification label which is tied to the neck of the sample container. Information to be provided on each sample tag includes the project code, sample station number, the date and time of sample collection, type of sample (i.e., grab or composite), sample station location, the samplers' signatures, whether or not a preservative was added, type of analysis to be performed, tag number, and lab sample number. A copy of a sample tag is provided in Attachment B.

- **Custody Seal** - A custody seal is affixed over each sample container and lid to provide evidence that the sample was not tampered with during transport to the analytical laboratory. The custody seals are self-adhesive and should be placed such that they cover the sample containers and lids and sample tag strings, but not the writing on the sample labels. At a minimum, the custody seals must contain the date and signature of the sampler; however, some seals also provide space to include the sample number, the name of the individual who breaks the seal, and the date that the seal is broken. Care must be taken to ensure that all sample identification characters are transcribed correctly on all related documents. Custody seals are also used to secure the sample shipping containers and lids. Examples of custody seals are provided in Attachment C.

- **Chain-Of-Custody Record** - A COC Record is used to track and document sample possession from the time of collection until receipt at the analytical laboratory. A completed form must be filled out to accompany each shipment of samples to the laboratory. Information to be recorded on the form may include the project number, project name; name and address of analytical laboratory; samplers' names and signatures; date and time of sample collection; sample identification numbers; sample description; type of preservative; grab or composite; number of containers included in the shipment; analytical parameters requested; and sample tag number. The bottom portion of the form contains blocks for the signatures of the persons involved in the chain of

possession, inclusive dates of possession, and any pertinent remarks. A copy of a COC Record form is provided in Attachment D.

- **Receipt For Samples Form** - RCRA Section 3007 and CERCLA Section 104 require that a "receipt" for all facility samples collected during inspections and investigations be given to the owner/operator of each facility before the field investigator departs the premises. A Receipt For Samples form may be used to satisfy these requirements. In addition, the form may also be used to document that split samples were offered to, and were accepted or rejected by, the owner/operator of the facility, as well as documenting this in the field logbook. A COC Record may also be used to document the collection of split samples. Information to be entered on the form includes the project number and name; facility name and location; samplers' signatures; sample station number and description; date and time of sample collection; type of samples collected (e.g., groundwater or soil; grab or composite); sample tag numbers; number of containers; any pertinent remarks; and the signatures of the persons involved in the chain of possession. A copy of a Receipt for Samples form is included as Attachment E.

Chain-Of-Custody Procedures

The field sampling team is responsible for the care and custody of all field samples from the time of collection until shipment to the analytical laboratory. The specific COC procedures to be followed for each sampling event are listed below.

- The sampling team should collect samples in the field such that the most sensitive parameters are addressed before the less sensitive parameters (e.g., volatile organic samples should be collected prior to metals, cyanide, and other parameters). Refer to the SOP "06-," "07-," and "08-," "12-", and "13-" series for specific sampling procedures for groundwater, soil/sediment, surface water, incineration/BIF, and waste respectively.

- Each sample container should be filled with the sample, and then placed in an ice chest which contains either bagged ice or "blue ice."[1] All environmental sample containers must be placed in the ice chest immediately after collection to preserve the integrity of the

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[1] Only environmental samples should be preserved with ice; waste samples are never shipped with ice. Refer to SOP No. 04-03-XX for more information regarding the packaging and shipping procedures for environmental samples.

sample parameters. [2] The ice chest with the samples must remain in view of the samplers in order for the samples to remain in custody.

- After all sample parameters have been collected at a specific sample location, the sampling team travels back to the central staging area, relinquishes control of the samples to the transferee for safekeeping, and prepares for the next sampling location.

- Upon receiving the samples from the sampling team, the transferee removes the samples from the field ice chest and places them in a sample storage ice chest located at the central staging area. This ice chest must remain under the control of the transferee at all times.

- The transferee (or other field team members as appropriate) should inspect the sample containers to ensure they were properly filled and secured. Any problems observed with the sample containers (e.g., broken glass containers, sample bottles not adequately filled, loose lids) should be completely documented in the field logbook.

- If not already affixed, the transferee/field team members should apply sample identification labels and/or sample tags to the sample containers. A layer of clear (packing/strapping) tape may be placed directly over each sample label to prevent the ink from smearing and slippage of the label due to condensation on the outside of the container. After the sample containers have been labeled/tagged, the transferee secures each sample with custody seals and places them into plastic zip-lock bags. Large sample containers (e.g., one-gallon amber glass jugs) do not need to be placed into plastic bags. The sample containers are then returned to the sample storage ice chest.

- After all samples have been collected and the containers appropriately labeled, the transferee then completes the COC Record. The transferee and/or sampling team members transfer the sample containers from the sample storage ice chest into the sample shipping container (which may be a different ice chest). The transferee/team members

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[2] During sample collection activities, it is recommended that the sample containers from only one sample location be stored in the field ice chest at any one time. This procedure reduces the potential for cross-contamination between samples, which is more likely to occur when several samples are stored in the ice chest simultaneously. Samples should be commingled in the field ice chest only when the sampling locations are separated by great distances and the collection times would be substantially increased.

must ensure that the samples are properly packaged within the shipping container. Refer to SOP No. 04-03-XX for sample packaging and shipping procedures.

- The original and one copy of the COC Record must be placed inside a plastic zip-lock storage bag and taped to the underside (interior) of the shipping container lid. One copy of the COC Record must be retained by the transferee for placement into the engagement/project files. Either pre-printed multiple copy forms or carbon paper may be used to make the required copies.

- The sample shipping container should then be closed and secured it with several layers of nylon reinforced strapping tape at each end of the shipping container. At least two custody seals must be placed along the front and back edges of the container, where the container body and lid meet. The custody seals should be affixed such that the shipping container cannot be opened without tearing or disturbing the seals. Secure the seals by covering them with tape. The seals should be secured to prevent their accidental removal during shipment. Only one layer of tape should cover the seals to ensure that they remain visible through the tape.

- The shipping airbill should then be completed and attached to the shipping container. The transferee (or other sample team member as designated by the transferee) must personally deliver and release the shipping container to the shipping company or the analytical laboratory.

- If it is not possible to release the sample shipment to the shipping company, or if the samples must be retained overnight, the transferee or designated custodian must maintain custody of the samples until the shipment can be accomplished. Custody is maintained provided the samples:

  - Remain in the transferee's actual possession,
  - Remain in the transferee's view after being in his/her possession,
  - Are locked up in a secure place to prevent tampering, and
  - Are placed in a designated secure area.

  Samples retained overnight must remain in the control of the transferee or designated custodian to the greatest extent possible (e.g., the samples must be stored in the transferee's hotel room instead of the trunk of a car). If the shipping delay is of a short duration, the shipping container should remain closed and sealed. The actual release time to the shipping company should then be entered in the field logbook. If the delay time is

of a longer duration, the shipping container should be re-opened and additional ice added to the container. In addition, the laboratory should be contacted and informed of any pending shipping delays.

- Prepare a Receipt For Samples form or a COC form and present it to the facility representative prior to departing the facility. Document in the field logbook whether split samples were offered to, and were accepted or rejected by, the facility representative. The transferee must keep one copy of the Receipt For Samples form or COC form for inclusion in the engagement/project files.

- Document all field sampling and shipping activities, and COC procedures in the field logbook and photographic record. In addition, any COC deviations from the SAP or this SOP must be documented and justified in the field logbook. Field logbook and photographic log documentation procedures can be found in SOP Nos. 03-01-XX and 03-02-XX, respectively.

Health and Safety Section

It is TechLaw's policy to maintain an effective program for control of employee exposure to chemical, radiological, and physical stress which is consistent with OSHA and other applicable and appropriate established standards and requirements.

All field personnel will be provided with appropriate personal protective clothing and safety equipment. At a minimum, this will include a hardhat, hearing protection, full-face respirator, steel-toed safety shoes, and safety glasses. Personnel are required to inspect their PPE prior to entering any job site and replace any damaged items.

A site-specific health and safety checklist/plan must be developed by the field team leader or designee and approved by the TechLaw Health and Safety Director prior to implementation in the field. This checklist/plan must be reviewed with the EH&S field team members prior to beginning work.

Any deviation(s) from an approved site-specific health and safety checklist/plan must be documented in the field logbook.

QA/QC Section

None at this time.

Comments/Notes

None at this time.

Attachments

Attachment A - Sample Identification Labels (examples)

Attachment B - Sample Tag

Attachment C - Custody Seals (examples)

Attachment D - Chain-Of-Custody Record

Attachment E - Receipt For Samples Form

References

TechLaw Inc., Health and Safety Program, 1999.

TechLaw Inc., Quality Assurance Program Plan (as amended for the RCRA Enforcement, Permitting, and Assistance Contract).

US EPA Office of Research and Development, Characterization of Hazardous Waste Sites - A Methods Manual: Volume I - Site Investigations, EPA/600/4-84/075, April 1985.

US EPA Office of Research and Development, Characterization of Hazardous Waste Sites - A Methods Manual: Volume II - Available Sampling Methods, Second Edition, EPA-600/4-84-076, December 1984.

US EPA Office of Emergency and Remedial Response, A Compendium of Superfund Field Operations Methods, EPA/540/P-87/001, NTIS Report Number PB88-181557, December 1987.

US EPA Region IV Environmental Services Division, Environmental Compliance Branch Standard Operating Procedures and Quality Assurance Manual (ECBSOPQAM), February 1, 1991.

US EPA Office of Solid Waste, RCRA Ground-Water Monitoring: Draft Technical Guidance, EPA/530-R-93-001, NTIS Report No. PB93-139350, November 1992.

US EPA Office of Solid Waste and Emergency Response, RCRA Ground-Water Monitoring Technical Enforcement Guidance Document (TEGD), OSWER-9950.1, September 1986.

Attachment A
SOP Number: 02-05-01

EAGLE PICHER
ENVIRONMENTAL SERVICES
36 B. J. TUNNELL BLVD. - MIAMI, OK 74354
1-800-331-7425

Specially Cleaned
Sample Container

LOT NO.:

DATE: | TIME: | COLLECTED BY:

SAMPLING SITE:

SAMPLE TYPE:
☐ Grab ☐ Composite ☐ Other _____

TESTS REQUIRED: | PRESERVATIVE

Client _____

Project _____

Location _____

Station _____

Collected by _____

Date _____ Time _____

Preservative(s) A PEST

EA 0447 3/22/89

Attachment B
SOP Number: 02-05-01

Designate: Grab / Comp.	Samplers (Signatures)	**Preservative:** _____ **Yes** ☐ **No** ☐		
Time		Volatile Organics (VOA)		
Month/Day/Year		Semi Volatiles (ABN)		
Station No.		Pesticides/PCB		
Project Code CLP Case No.	Station Location	_____Metals		
		Cyanide		
		Alkalinity/Hardness		
		TCLP		
		☐ VOA		
		☐ ABN		
		☐ METALS		
		Asbestos		
		Dioxin		
		Oil and Grease		
		Remarks:		
		Concentration: ☐ L ☐ M ☐ H		
		Tag Number **6-215951**	Lab Sample No.	

☆U.S.GPO:1996–761-527

Attachment C
SOP Number: 02-05-01

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY OFFICIAL SAMPLE SEAL	SAMPLE NO.	DATE	SEAL BROKEN BY	DATE	EPA FORM 7600-2 (R7-78)
	SIGNATURE				
	PRINT NAME AND TITLE *(Inspector, Analyst or Technician)*				

CUSTODY SEAL
Date
Signature

CUSTODY SEAL
Date
Signature

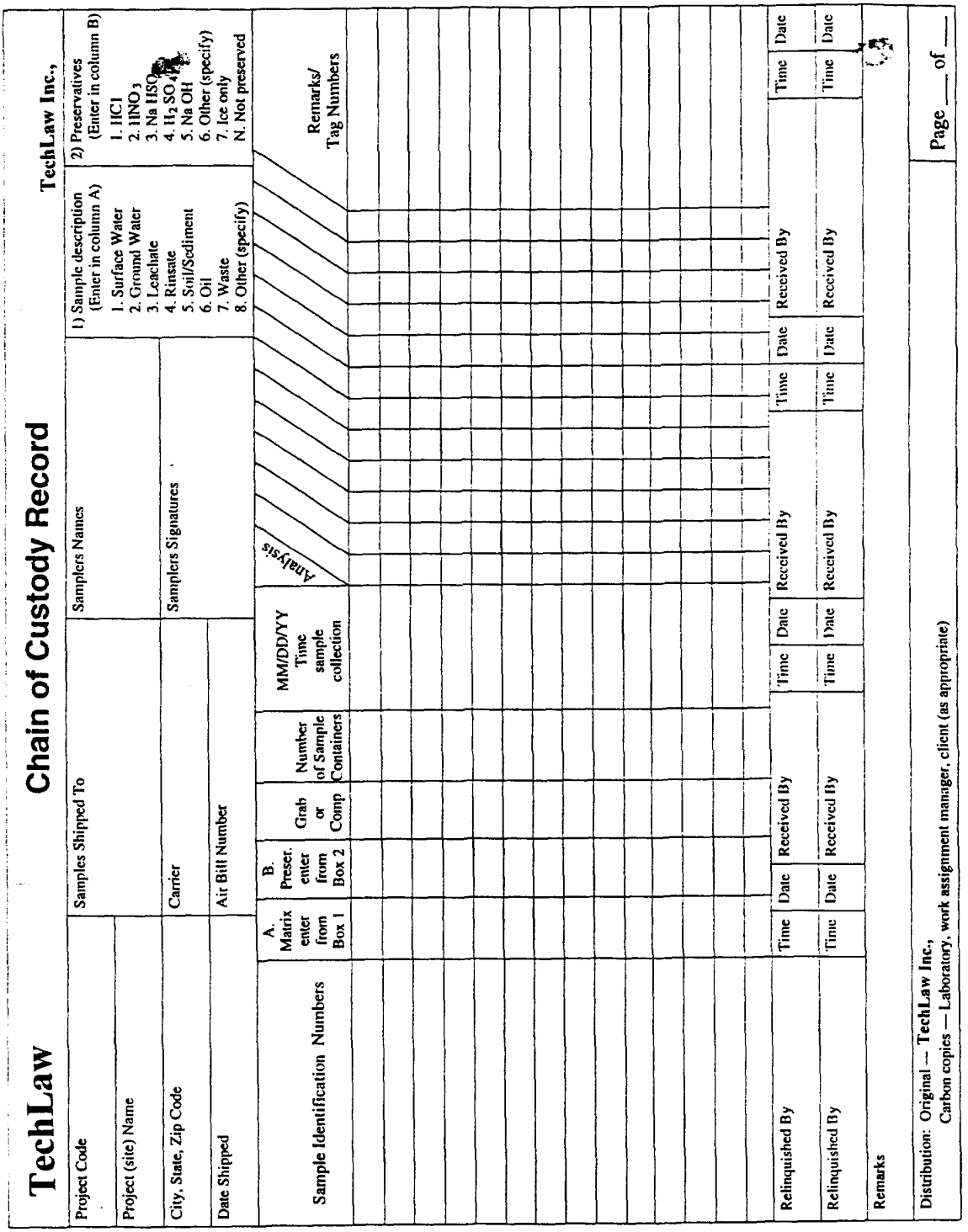
CUSTODY SEAL

DATE _____

SIGNATURE _____

CHEM
(800) 443-1689
(800) 553-3696
Specialty Cleaned Containers

Attachment D
SOP Number: 02-05-01



TechLaw

Chain of Custody Record

TechLaw Inc.,

Project Code | Samples Shipped To | Samplers Names | 1) Sample description (Enter in column A) 1. Surface Water 2. Ground Water 3. Leachate 4. Rinsate 5. Soil/Sediment 6. Oil 7. Waste 8. Other (specify) | 2) Preservatives (Enter in column B) 1. HCl 2. HNO_3 3. Na HSO 4. H_2SO_4 5. NaOH 6. Other (specify) 7. Ice only N. Not preserved

Project (site) Name

City, State, Zip Code | Carrier | Samplers Signatures

Date Shipped | Air Bill Number

Sample Identification Numbers	A. Matrix enter from Box 1	B. Preser. enter from Box 2	Grab or Comp	Number of Sample Containers	MM/DD/YY Time sample collection	Analysis	Remarks/ Tag Numbers

Relinquished By	Time	Date	Received By		Time	Date	Received By		Time	Date	Received By		Time	Date	Time	Date
Relinquished By	Time	Date	Received By		Time	Date	Received By		Time	Date	Received By		Time	Date	Time	Date

Remarks

Distribution: Original — TechLaw Inc.,
Carbon copies — Laboratory, work assignment manager, client (as appropriate)

Page ___ of ___

(FORM HAS BEEN REDUCED FOR SOP)

TechLaw

Receipt For Samples

TechLaw Inc.,

Proj No	Project Name	Name of Facility/Site
Samplers: *(Signature)*		Facility/Site Location
Split Samples Offered ( ) Accepted ( ) Declined		

Station No.	Date	Time	Comp	Grab	Split Samples	Tag Numbers	Station Description	No. of Containers	Remarks

Transferred by: *(Signature)*	Telephone	Received by: *(Signature)*	Telephone	
Date	Time	Title	Date	Time

(FORM HAS BEEN REDUCED FOR SOP)

FIELD DOCUMENTATION PROCEDURES - MAINTAINING A FIELD LOGBOOK

SOP Number: 03-01-02
Effective Date: 02/01/99

Technical Approval: _____ Date: 3/30/99

QA Management Approval _____ Date: 4/5/99

SOP Description

This Standard Operating Procedure (SOP) establishes general practices and requirements for the use of field logbooks during environmental field activities, including but not limited to soil/sediment sampling, groundwater sampling, well installations, surface water sampling, environmental assessments, and environmental audits. SOPs for the use of field logbooks during RCRA Visual Site Inspections and oversight of RCRA Facility Investigations and Remedial Investigations are provided in SOP Nos. 03-03-XX and 03-04-XX, respectively.

Field logbooks are used by personnel to document all activities and information gathered in the field. The field logbook entries must be legible, factual, detailed and objective. Proper field documentation is crucial in the logbook because the logbook ultimately may become part of the public record and may be used in future legal actions. The field logbook must provide sufficient documentation to enable participants to reconstruct events that occurred and to refresh the memory of the field personnel if called upon to give testimony during legal proceedings.

General Procedures

Related SOPs

This SOP is to be used in conjunction with other relevant or applicable SOPs found in the following SOP categories:

Section No.	Section Title
01	General Procedures
02	Field Procedures
03	Field Documentation Procedures
04	Packaging and Shipping Procedures
05	Field Equipment Operation and Maintenance Procedures
06	Groundwater Sampling/Monitoring and Analysis Procedures

07	Soil/Sediment Sampling and Analysis Procedures
08	Surface Water Sampling and Analysis Procedures
09	Health and Safety Procedures
11	Quality Assurance Procedures
12	Incineration/BIF Sampling and Analysis Procedures
13	Waste Sampling and Analysis Procedures

Equipment and Apparatus

- Field logbooks (Minimally one per person.)
- Black or Blue pens with waterproof ink (preferably)
- Compass
- Watch
- Thermometer

Type of Field Logbook

The field logbook must be bound and preferably waterproof. A standard surveyor's notebook or the "Rite in the Rain"® Weatherproof Transit Book No. 300, J.L. Darling Corporation, Tacoma, Washington, are acceptable notebooks which can be used by TechLaw personnel. Other notebooks are acceptable, provided that they are bound prior to use in the field. A supply of field notebooks is kept in each office location.

Maintenance of Field Logbook

The field team leader is responsible for the field logbooks. Each field team member may be required to maintain a field logbook; in addition, the field team leader may designate a team member as the official record keeper. To assure consistency in documentation, each logbook is to be maintained by the same person for the duration of the project, if feasible. The field team leader must review the logbooks during the environmental field activities to check that the procedures in this SOP are being followed and that the information is entered correctly. Additionally, it is the responsibility of the field team leader to ensure that RCRA CBI procedures are followed if confidentiality is requested by the facility representative.

Notations in Field Logbook

- All notations in field logbooks should be made in waterproof ink. A standard ball-point pen is acceptable. No erasures may be attempted. Any corrections or deletions are to be made by drawing a single line through the unwanted notation, so that the notation is still legible. The writer then places his/her initials and the date near the deletion. Under no circumstances are pages to be removed from a field logbook.

- All field logbook notations must be legible.

- A separate field logbook must be used for each project. More than one logbook may be used for a single project if the complexity of the site requires that two separate field teams are active on different parts of the facility simultaneously. If more than one logbook is used, each is to be numbered sequentially (e.g., 1 of 3, 2 of 3, 3 of 3). If two or more separate field teams are maintaining logbooks, each team's logbooks are to be numbered sequentially and clearly identifiable (e.g., TeamA Book1 of 2, TeamA Book 2 of 2, TeamB Book2 of 2). Each page of the field logbook must be numbered in the upper right-hand corner. Each page also must be dated and signed by the writer. For pages only partially filled with text, a diagonal line must be drawn from the end of the text to the bottom of the page. When field activities last more than one day, the next day's documentation begins on the next page of the field logbook. Relevant site information (e.g., weather, site personnel [personnel could change during the course of the field work], strategies) must be listed at the beginning of each day's activities. Also, more than one team member may maintain a logbook at the discretion of the team leader. The maintenance of a logbook is discussed in more detail in the appropriate Field Documentation SOP (e.g., VSI, Corrective Action Oversight).

- The individual maintaining the logbook must put his/her name, associated office, and address on the inside cover or the first (title) page of the logbook. The first page must include the title of the project, project number, facility name, facility location, EPA Identification Number (if appropriate), date(s) of activity, names and companies of the team members and any other appropriate identifying information. If more than one field logbook is used at a facility, each must contain the required project information on the inside cover or the first (title) page of the logbook.

- Information is generally listed in chronological order in the field logbook and by the time of day. All times are to be entered in a 24-hour format (e.g., 7:00 p.m. is 1900). All factual information obtained during field activities must be recorded in the logbook. Information that is not in or referred to in the logbook may not be used in deliverables associated with the field work. The field logbook contains only factual information--no conclusions are placed in the logbook. Weather conditions are documented at least twice a day and must be noted immediately with any significant weather change (e.g., thunderstorm).

  Often, sketches are preferred to written descriptions (or used in conjunction with), especially where photographs will not be taken. Sketches must include a north arrow, a rough scale and position of buildings, and any other notable features, such as landmarks (trees, streets etc.).

  When photographs are taken, the photograph number (i.e., roll number and film number) is entered into the logbook as well as time of day, compass direction, and a description of what was photographed. Document relevant features such as cracks and staining. See SOP No. 03-02-XX, Taking and Documenting Photographs, for further details.

- The field logbook is the property of the client[1]. The project manager is the custodian of the field logbook for the duration of the project. It must remain in the custody of the project manager (or a designated person) until the conclusion of the project. The field logbook is then turned over to the official project file.

Health and Safety

It is TechLaw's policy to maintain an effective program for control of employee exposure to chemical, radiological, and physical stress which is consistent with OSHA and other applicable and appropriate established standards and requirements.

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[1] Work products such as field logbooks that are generated during the performance of government contracts are considered the property of the government client. See SOP No. 11-07-XX for further details regarding document control requirements.

All field personnel will be provided with appropriate protective clothing and safety equipment. At a minimum, this will include steel-toed shoes, safety glasses, and chemical-resistant gloves.

A site-specific health and safety checklist/plan must be developed by the Field Team Leader or designee and approved by the TechLaw Health and Safety Director prior to implementation in the field. This checklist/plan must be reviewed prior to beginning work.

Any deviation(s) from an approved site-specific health and safety checklist/plan must be documented in the field logbook.

QA/QC

The Field Team Leader or designee is to conduct periodic QC reviews during a site visit to ensure documentation procedures and administrative requirements have been met.

Comments/Notes

None at this time.

Attachments

None at this time.

References

TechLaw Security Plan for the Control and Security of RCRA Confidential Business Information, August 8, 1994.

TechLaw, Inc., Health and Safety Project Plan, 1999.

U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, A Compendium of Superfund Field Operations Methods, EPA/540/P-87/001, OSWER Directive 9355.0-14, Washington, D.C., December 1987.

U.S. Environmental Protection Agency, Office of Solid Waste, RCRA Facility Assessment Guidance, October 1986.

FIELD DOCUMENTATION PROCEDURES - TAKING AND DOCUMENTING PHOTOGRAPHS

SOP Number: 03-02-02
Effective Date: 03/25/99

Technical Approval: _____ Date: 3/29/99

QA Management Approval _____ Date: 4/5/99

SOP Description

This Standard Operating Procedure (SOP) establishes the practice and requirements for documenting and taking photographs during field activities including RCRA Visual Site Inspections (VSIs), oversight of RCRA Facility Investigations (RFIs), oversight of Remedial Investigation/Feasibility Studies (RI/FSs), compliance enforcement inspections (CEIs), comprehensive groundwater monitoring evaluations (CMEs), conduct of sampling activities, and property transfers.

The purposes of these activities are to gather sufficient information and documentation to relay observations to the client and to provide the basis for suggestions for further action or recommendations.

Photographs are taken to obtain visual information concerning unit characteristics, waste characteristics, pollutant migration pathways, releases, and exposure potential. Critical documentation is important because these photographs may eventually be used in enforcement/defense cases, legal actions (as evidence of past releases), or as a basis for property transactions. The photographs could be used months or even years later and must be thoroughly documented.

This SOP indicates the types of information that must be recorded in the field logbook in conjunction with the types of things that must be photographed. The photograph log serves as a visual record of what was seen during the field activities.

General Procedures

Related SOPs

This SOP is to be used in conjunction with other relevant or applicable SOPs found in the following SOP categories:

Section No.	Section Title
01	General Procedures
02	Field Procedures
03	Field Documentation Procedures
04	Packaging and Shipping Procedures
06	Groundwater Sampling/Monitoring and Analysis Procedures
07	Soil/Sediment Sampling and Analysis Procedures
08	Surface Water Sampling and Analysis Procedures
09	Health and Safety Procedures
11	Quality Assurance Procedures
12	Incineration/BIF Sampling and Analysis Procedures
13	Waste Sampling and Analysis Procedures

Equipment and Apparatus

- 35 mm camera and operating instructions (If it is a large facility, two cameras may be necessary.)
- Extra batteries
- 200 ASA speed film, 24 exposures (minimum)
- Compass
- Watch
- Ruler/pen/coin (to illustrate scale)

Permission to Take Photographs

When conducting field activities under government contracts (e.g., REPA), obtain permission to take photographs from the facility representative prior to the field activities. If there is an appearance of resistance from the facility representative, inform the client (e.g., EPA) and together develop a course of action/strategy to obtain resolution prior to the field activities. In addition, it is the responsibility of the field team leader to ensure that RCRA CBI procedures are followed if confidentiality is requested by the facility representative.

Maintenance of the Camera

The following generic operating and maintenance activities must be performed in accordance with specific directions provided with the camera.

- Routine inspection and cleaning are to be conducted prior to the field activities. If unfamiliar with the type of camera, review the general directions provided by the manufacturer. However, prior to field activities, ensure familiarity with such "how to" procedures as:

  - Insert and check the battery,
  - Load and rewind the film,
  - Set the film speed, and
  - Set the clock.

- Routine testing of batteries must be conducted prior to the field activities and at the beginning of each day in the field. Additional spare camera batteries should be on hand.

- Remedial action in the event of failure or malfunction must be in accordance with the camera warranty (if applicable) and directions for troubleshooting. A malfunction can be caused by shock, humidity, salt, etc. If a camera has been used in the presence of chemicals, it is to be wiped clean. Also, the camera must not be placed near strong magnetic fields (e.g., televisions).

General Information Regarding Cameras and Film

Camera Types

Each TechLaw field ready office location should have a 35 mm automatic-focusing/automatic-winding camera or access to one. See SOP No. 02-02-XX for details regarding equipment requisition and return if more than one camera is needed. These cameras are relatively simple to use since they do not require manual focusing or shutter speed adjusting. This is advantageous since the photographer may also be tasked with recording the photo description and negative number as well as asking questions regarding the purpose of the unit being photographed. These cameras should have an internal clock which records the date and/or time the photograph was

taken. Setting the clock is important because it provides additional documentation and also helps in organizing the photographs. The date is a priority. If you can include both settings (i.e., date and time), this is preferred. Telephoto lenses are not to be used as they can distort the scale of an image.

Types and Quantities of Film Needed

The recommended film is Kodak Gold® film, 200 ASA speed for 24 exposures (minimum). A sufficient number of rolls of film must be taken on field activities. Since the film rolls are small, a good rule of thumb is to take two rolls for every 10 units or SWMUs identified prior to the field activities. Alternatively, take two rolls for every 25 acres of the site. For sampling visits, one roll for every 6 samples may be sufficient. This would allow for 4 pictures per sample location using a 24 exposure roll. Typical photos would include one overview, one closer view of the sample collection, one of the filled sample containers, and one extra for other documentation needs. Take as many rolls as you think you will need and then add two as a safety margin. The unused film must be returned to the office.

Treatment and Shipment of Camera and Film

Contrary to rumor, film generally is not affected by the X-ray machines at airport security check stations. However, the X-ray machine will have an effect if the film speed is 1000 ASA or if the film is repeatedly exposed to the X-rays (going through the X-ray machine more than four times).

There are no special shipment procedures for the camera or film. The camera and unexposed film can be packed and checked in the suitcase of the field personnel or shipped in an ice chest with other field equipment.

In order to prevent loss, the exposed film rolls must be carried onto the plane and kept in one's possession at all times. Do not check any exposed film with luggage.

Commonly, there will be unexposed photographs on the last roll of film in the camera. Automatic cameras typically do not allow for rewinding the film until all photographs are taken. One option is to open the shutter, place your hand over the lens and shoot the remaining photographs. These will appear as black negatives and usually there is no charge for processing these. Alternatively, photographs of

surrounding areas, such as waterways and residences, or overviews of the facility can be taken in order to complete the roll.

Types and Subjects of Photographs

- During field activities, the field team leader selects one team member to take photographs and record the appropriate information in the field logbook. Photographs must be taken of each unit or SWMU identified unless the facility representative denies permission for that particular unit. In these cases, the refusal is to be documented in the field logbook.

- Photographs are taken to document conditions at the facility or sampling activities. The types of pictures taken must include:

  - Representative overall pictures of the facility or site;
  - Posted signs identifying ownership of the facility or site;
  - Evidence of releases (e.g., leachate seeps, pools of liquid, discolored water, and stained soils);
  - Individual units such as lagoons, drums, and landfills;
  - Visual evidence of poor facility maintenance;
  - Examples of typical facility operation;
  - Adjacent land use;
  - Sample locations/activities; and
  - Areas that unauthorized persons can easily access.

- Information that must be recorded in the field logbook in conjunction with each photograph includes:

  - Photographer's name;
  - Type of camera and lens (e.g., 35mm) and camera identification number;
  - Type of film;
  - Photograph number;
  - Date and time;
  - Name and identification number of unit or SWMU;
  - Location of unit or SWMU;
  - Orientation of photograph (i.e., direction photographer is facing);
  - Observed evidence of release (e.g., staining, overflow);

- Notable features of unit or SWMU that may provide evidence of release (e.g., cracking, obvious lack of integrity of unit);
- Information to help characterize the unit, or picture; and
- Other comments (e.g., weather).

- When photographs are taken of objects that are small or close up, a ruler, pen or coin is to be included in the frame to illustrate the scale so one will be able to more easily explain or describe the dimensions or proportions.

- During sampling activities, photographs are to be taken of actual sample collections, conditions of sampling location (e.g., monitoring well head and pad, soil sampling location with respect to surroundings), filled sample containers, and the chain-of-custody seals on the closed and sealed ice chests.

- For engagements conducted for regulatory agencies or in the case of property transactions, permission to take photographs must be obtained from the owner/operator of the facility. Inform the owner/operator that you will point out or explain what you would like to photograph before you actually take the photographs.

  Listed below are three possible scenarios, in order of preference, by which photographs are taken and processed:

  - You take the photographs and leave with the roll(s) of film at the end of the field activities.
  - If permission for you to take the photographs is denied, negotiate with the owner/operator to have them take the photographs, but let you leave with the roll(s) of film.
  - The least desirable approach is when permission to take the photographs is denied, or the facility allows you to take the photographs but will not let you leave with the roll(s) of film. In these cases, negotiate with the owner/operator to have the photographs developed at a 1 hour process lab, review them, and provide the required number of copies and negatives to you. In these cases, the client (e.g., EPA) must be aware of these arrangements and approve them. Note: There have been instances where photographs were taken by the owner/operator, but were never provided to TechLaw.

Development/Handling of Photographs and Negatives

Commercial developing facilities may be utilized for the processing of the 35 mm film. A minimum of two 4x6 copies of each photograph must be requested - one for submittal to the client and the other for the TechLaw engagement/contract files. Prior to developing the film, determine how many copies of the photographs are needed through discussions with the client, or Project Manager. For example, some clients require two copies; therefore, in order to have a set for the TechLaw files, three copies must be made. On occasion, the facility will request a copy of the photographs. If the client is a regulatory agency (e.g., EPA), this must be approved by the regulator prior to providing the photographs to the facility. Under no circumstances must the negatives be sent to or left with the facility. Financial reimbursement must be agreed to prior to photographic duplication. At the end of the assignment, the negatives are forwarded to the Program Manager for inclusion in the engagement/contract files.

In instances where a facility requests that the photographs be treated as RCRA CBI (or some other form of confidentiality), the photographs and negatives must be designated, logged, handled, stored, and transmitted in the same manner as any other RCRA CBI material.

Photo Log

The purpose of a photo log is to present the photographs taken during field activities along with brief documentation describing them. Each write-up is to provide the name and number of the unit (e.g., Storage Tank 11, SWMU 3), a description of the unit or activity, and the compass direction. Note any particular background items that should be brought to the attention of the reader (e.g., note the absorbent materials on the floor around the drum). Notations should be limited to pertinent facts. The photo log format may vary depending upon the client's instructions. Three examples are provided in Attachment A.

In addition, maps and drawings (which contain a scale and compass points) can be appended to provide further clarification of the photographs and field logbook entries. Notations can be made on the maps showing where the photographs were taken and in what compass direction, as well as the number on the roll of film.

Health and Safety

It is TechLaw's policy to maintain an effective program for control of employee exposure to chemical, radiological, and physical stress which is consistent with OSHA and other applicable and appropriate established standards and requirements.

All field personnel will be provided with appropriate protective clothing and safety equipment. At a minimum, this will include steel-toed shoes, safety glasses, and chemical-resistant gloves.

A site-specific health and safety checklist/plan must be developed by the Field Team Leader or designee and approved by the TechLaw Health and Safety Director prior to implementation in the field. This checklist/plan must be reviewed prior to beginning work.

Any deviation(s) from an approved site-specific health and safety checklist/plan must be documented in the field logbook.

QA/QC

None at this time.

Comments/Notes

Upon project completion, the logbook(s), one set of photographs and all negatives must be forwarded to the engagement/contract files.[1]

Attachments

Attachment A - Photograph Log Examples

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[1] Work products such as photographs and negatives that are generated during the performance of government contracts are considered the property of the client. See SOP No. 11-07-XX for further details regarding document control requirements.

References

TechLaw, Inc., Health and Safety Project Plan, 1999.

TechLaw, Security Plan for the Control and Security of RCRA Confidential Business Information, August 1994.

K.W. Brown, Ph.D.; "The whole truth and nothing but... The soil scientist as the expert witness;" Soils: Analysis, Monitoring, Remediation; September-October 1991.

U.S. Environmental Protection Agency, A Compendium of Superfund Field Operations Methods, EPA/540/P-87/001, OSWER Directive 9355.0-14. Washington, D.C., 1987.

U.S. Environmental Protection Agency, Environmental Monitoring Systems Laboratory, Characterization of Hazardous Waste Sites - A Methods Manual, Volume 1 - Site Investigations, EPA/600/4-84/075, Las Vegas, NV.

U.S. Environmental Protection Agency, Office of Solid Waste, RCRA Facility Assessment Guidance, October 1986.

U.S. Environmental Protection Agency, Region IV, Environmental Service Division, Engineering Support Branch Standard Operating Policies and Procedures, Georgia, February 1991.

Attachment A - Photograph Log Examples

1. Overview of finished monitoring well LF-2, facing southwest. Note drums containing drill cuttings are in contact with the soil.

2. Facing northeast towards finished monitoring well LF-2. Note the well casing has not been grouted around the surface. The drums contain drill cuttings.

3. View (looking east) of the Torit Dust Collector. Note the 55-gallon drums which receive the particulates that are removed from the indoor air. This is a representative unit for the other cyclones in the plant.

4. Close-up view of the Former Oil/Water Separator No. 13. This unit is presently operating as a catch basin for oily wastewater prior to piping to the Building 29-N 40,000-Gallon Oily Wastewater Tank (SWMU A-5).

5. View (looking east) of the removal pipe for Tank W-82. The Waste Oil Vacuum Truck (SWMU L-46) collects the waste oil/jet fuel at this point. Note the staining on and poor condition of the asphalt. The stained building in the background is a test cell.

6. View of Underground Waste Storage Tanks W-89 and W-92 after being exhumed. The hole was cut in the side of the tank to examine the metal for value as scrap. This is not the original location of these tanks.

7. View of surface access area to Underground Waste Oil Storage Tank W-50. Note the oil-stained pavement and absorbent in the area.

8. View (looking north) of the manhole and bermed access area to underground Waste Storage Tank W-53. Note oil staining on berm and in containment area.

9. View of rinsing split spoon sampler, in foreground, with the drill rig in the background. Note the driller in the background is not wearing gloves.

10. Underground Discharge Pipe. Close-up of the asphalt road covering the underground discharge pipe. The location of the pipe is indicated by the parallel cracking. Note: In the background are the former lagoons. View is facing west.

Example No. 2:

TECHLAW, INC.

Contract No. XX-XX-XXXX

PHOTO #

SITE NAME\EPA ID # _____

SITE LOCATION _____

PHOTOGRAPHER/WITNESS _____

DATE _____ **TIME** _____ **DIRECTION** _____ **WA#** _____

COMMENTS _____

Example No. 3:
A third procedure for photograph logs is by using Avery Labels #5163. To setup the format for the labels in WordPerfect select format. Go down the screen to labels. A popup screen will appear. Scroll down to 5163 and then press the select button.

The completed photograph log labels are peeled and placed on the back of the appropriate photograph. The photographs are then placed into a clear plastic photograph storage sheet. An example of the photograph log labels format is on the following page.

Photo #T1-01 **City:** Tulsa, OK
Site: Name Industries, Inc. **Time:** 1325

Tank 901A, labeled "Used Alkaline Storage".

Photo By: Photographers Name **Date:** February 24, 1998
Witness: Witness Name **Direction:** SE

Photo #T1-02 **City:** Tulsa, OK
Site: Name Industries, Inc. **Time:** 1405

Tank 901A. Note: dark material in secondary container. Location for Sample SUI01.

Photo By: Photographers Name **Date:** February 24, 1998
Witness: Witness Name **Direction:** SW

Photo #T1-03 **City:** Tulsa, OK
Site: Name Industries, Inc. **Time:** 1410

Drum located next to Tank 901A (just north). Note: no label is observed on the drum. Sample SUI05 collected from this drum.

Photo By: Photographers Name **Date:** February 24, 1998
Witness: Witness Name **Direction:** SE

Photo #T1-04 **City:** Tulsa, OK
Site: Name Industries, Inc. **Time:** 1440

Photo of sample jar of sample SUI05. Note: The sample jar is an amber color and does not reflect the color of the material inside.

Photo By: Photographers Name **Date:** February 24, 1998
Witness: Witness Name **Direction:** SE

Photo #T1-05 **City:** Tulsa, OK
Site: Name Industries, Inc. **Time:** 1445

Photo of sample jar for sample SUI01. Note: The sample jar is an amber color and does not reflect the color of the material inside.

Photo By: Photographers Name **Date:** February 24, 1998
Witness: Witness Name **Direction:** SE

Photo #T1-06 **City:** Tulsa, OK
Site: Name Industries, Inc. **Time:** 1513

Photo of "Used Cyanide Storage" Tank 901B. This is the sample location of Samples SUI02 and SUI03.

Photo By: Photographers Name **Date:** February 24, 1998
Witness: Witness Name **Direction:** SW

Photo #T1-07 **City:** Tulsa, OK
Site: Name Industries, Inc. **Time:** 1515

Photo of Acid Tank. Sampling location for sample SUI04.

Photo By: Photographers Name **Date:** February 24, 1998
Witness: Witness Name **Direction:** NE

Photo #T1-08 **City:** Tulsa, OK
Site: Name Industries, Inc. **Time:** 1540

Photo of southern portion of the Covered Hazardous Waste Storage Area.

Photo By: Photographers Name **Date:** February 24, 1998
Witness: Witness Name **Direction:** SE

Photo #T1-09 **City:** Tulsa, OK
Site: Name Industries, Inc. **Time:** 1540

Photo of the northern portion of the Covered Hazardous Waste Storage Area.

Photo By: Photographers Name **Date:** February 24, 1998
Witness: Witness Name **Direction:** SE

PACKAGING AND SHIPPING PROCEDURES - ENVIRONMENTAL SAMPLES

SOP Number: 04-02-00
Effective Date: 04/06/99

Technical Approval: _____ Date: 7/6/99

QA Management Approval _____ Date: 7/15/99

I. SOP Description

This Standard Operating Procedure (SOP) describes the procedures involved in the packaging and shipping of environmental samples.

It is the field team leader's responsibility to determine whether the samples meet the definition of environmental or dangerous goods samples and to follow the appropriate packaging and shipping procedures - SOPs and related guidances. Assistance in determining sample categories can be obtained from senior TechLaw staff/managers.

Definitions: Environmental samples normally include drinking water, most ground water and ambient surface water, soil, sediment, and any samples not containing high levels of hazardous materials or hazardous waste. These types of samples generally are not considered a hazardous waste in 40 CFR 261.3 or hazardous materials under the DOT regulations 49 CFR 171. These sample are taken from areas where high concentrations of constituents are not likely to be found.

Hazardous materials (Dangerous Goods) samples are regulated for transportation under 49 CFR and the International Air Transport Association (IATA) regulations. These types of samples may be classified as a hazardous waste under 40 CFR 261 (Characteristic, i.e., corrosive; or a Listed waste, i.e., K147-tar storage tank residues from coal tar refining). They may also be classified under the DOT and IATA regulations as one of 9 hazard classes (see Sample Category Determination below).

Every effort should be made to determine the category of the sample (environmental or dangerous goods) prior to collection of samples. Use available file information about the site or areas to be sampled. Review any existing analytical data from previous samples collected at the site. Review waste generation data, where wastes have been disposed on site and any waste characteristic information provided by the facility or other sources (e.g., EPA or State agency).

Sample Category Determination:

When making a determination whether samples can be shipped as Environmental samples, ask the following questions:

Does the sample pose an unreasonable risk to health, safety or property when transported in commerce (e.g., is it shock sensitive, does it emit toxic or noxious gases)?;

Does the sample meet the criteria of one or more of 9 UN hazard classes (Attachment A provideS definitions for each class):
Class 1 - Explosive;
Class 2 - Gas;
Class 3 - Flammable liquid;
Class 4 - Flammable solid;
Class 5 - Oxidizer;
Class 6 - Poisonous (toxic);
Class 7 - Radioactive;
Class 8 - Corrosive; and
Class 9 - Miscellaneous dangerous goods

Is the sample material collected on the list of hazardous material in 49 CFR 172.101 Hazardous Materials Table or the IATA List of Dangerous Goods (IATA Regulations Chapter 4); and,

If samples are collected from a drum, tank, impoundment, or other type of source area where hazardous waste/materials are known to be or highly suspected to have been disposed, these samples **DO NOT** qualify as environmental samples. **STOP** and proceed to SOP No. 04-03-XX.

If any of these cases are true, samples must be shipped as a Dangerous Goods. Refer to SOP 04-03-XX for Dangerous Goods Shipping Procedures.

Otherwise proceed with shipping the environmental samples according to the following procedures.

II. General Procedures

Environmental samples of solid waste, soil, air or water collected for the sole purpose of testing to determine its characteristics or composition, are excluded from the requirements of 40 CFR 261-270 when: the sample is being transported to a laboratory for purpose of testing; and the shipper complies with DOT, IATA or other applicable shipping requirements.

The appropriate shipping procedures for Environmental samples are detailed in this SOP.

A. Related SOPs

This SOP is to be used in conjunction with the other relevant or applicable SOPs found in the following SOP categories.

Section No.	Section Title
01	General Standard Operating Procedures
02	General Field Procedures
03	Field Documentation Procedures
04	Packaging and Shipping Procedures
05	Field Equipment Operation and Maintenance Procedures
06	Groundwater Sampling/Monitoring and Analysis Procedures
07	Soil/Sediment Sampling and Analysis Procedures
08	Surface Water Sampling and Analysis Procedures
10	Regulatory Compliance Procedures
11	Quality Assurance Procedures
12	Incineration/BIF Sampling and Analysis Procedures
13	Waste Sampling and Analysis Procedures

B. Related Documentation

The following documents should be used in conjunction with this SOP regarding the packaging and shipment of environmental samples.

- Field Logbook;
- Facility Sampling and Analysis Plan;

- Health and Safety Plan;
- Other relevant facility/site information; and,

III. Procedures for Packaging and Shipping Environmental Samples

The procedures for packaging and shipping environmental samples is split into four sections: Pre-field preparation of the coolers; preparation of sample containers for shipment; preparation of coolers for shipment; and preparation of the shipping documentation.

Prior to any field activities requiring shipments of samples via FedEx or other transportation service (e.g., UPS), contact the shipping company and determine the following: nearest location of the transporters drop-off office to the field activities; and operating hours of the nearest office.

Pre-field Cooler Preparation

(1) Ensure that a sufficient number of coolers have been acquired to allow all samples to be shipped. Use clean insulated coolers and remove all tape, markings, labels, and custody seals remaining on the outside of the coolers. If possible, the coolers should be washed inside and out prior to use.

As a guide, the approximate number of bottles fit in a 54-quart cooler:

Organic Water			***Inorganic Water***
1 liter ambers --	12	or	500 ml poly and/or -- 18 to 20
and 40 ml vials -	6		1 liter poly
	18		

or

Soils
8 oz. glass and 120 ml glass -- 30 to 35

Sample Container Preparation

Once samples have been collected the following steps should be taken in preparing samples for shipment.

(2) Ground-water and surface water environmental samples must be preserved prior to shipment to the laboratory. Refer to SOPs No. 06 and 08 for sample preservation techniques and the project specific Quality Assurance Project Plan (QAPP). Soil and sediment samples do not require preservation (other than ice) prior to shipment.

(3) Label all samples according to the procedures outlined in SOP No. 02-04-XX. Either sample container labels or sample tags may be used.

(4) Place a custody seal on each sample container such that the seal covers both the container lid and the upper portion of the container. This provides for a method of detection of any tampering with the sample.

(5) Wrap each glass bottle with bubble wrap or use bubble wrap bags. Measure out a piece of bubble wrap large enough to surround the entire bottle. The bubble wrap helps protect the sample containers from breakage during transport. Use tape, preferably masking tape, to secure the bubble wrap around the bottle. There is no need to wrap plastic sample containers with bubble wrap.

For VOA sample containers (40 ml vials), spread out a sheet of bubble wrap one or two sheets long. Two vials will be wrapped together using the prepared sheet. Place a vial on each top corner, horizontally, on the width end of the bubble wrap. Starting from the vial end, roll the bottles into the remaining bubble wrap. When complete, bend the long roll into a V, and tape the package with masking tape.

(6) Then, place each sample container (with the exception of very large containers, e.g., one-gallon amber jugs) inside a resealable Ziplock plastic bag (two resealable Ziplock bags may be utilized for the one-gallon amber jars). Custody seal tape may be placed around the bag if additional security is desired. For large containers, if a large Ziplock is not available, wrap the bottle in bubble wrap and place the container in a clean, unused

garbage bag. Tape the opening of the bag closed. A custody seal may be place around the bag if additional security is desired.

Cooler Preparation

(7) Secure and tape the drain plug on the outside of the cooler with fiber or duct tape to prevent leakage from the plug should a sample container or ice bag leak inside the cooler. Then line the cooler with a large heavy duty plastic bag; large plastic garbage bags are commonly used.

(8) Fill the plastic bag with an approximate two inch thick layer of an absorbent packing material, such as asbestos-free vermiculite or perlite. Although commercial packing materials such as styrofoam beads (popcorn) provide for sufficient cushioning, they do not provide ample absorbency in the event of a sample leak and should not be used.

(9) Place each labeled, wrapped and bagged sample container in the cooler in an upright position. The sample bottles should be spaced several inches apart in the cooler so that additional vermiculite can be poured around the bottles. Cardboard separators may also be placed between the sample jars at the discretion of the shipper.

(10) Fill several large (quart or gallon size) plastic bags (e.g., Ziplock bags) with ice and place each bag of ice within a second Ziplock bag. Place the Ziplock side of the ice filled bag, down into the second bag. (Ice bags are double-bagged to prevent water leakage when the ice melts during transit.) Alternatively, 'Blue Ice' (ice packs) may be used to cool the samples. Dry ice should not be used to cool the samples since it is a regulated dangerous good. If dry ice is required for shipment (as in the case of biological tissue sample shipment), the IATA Dangerous Goods Regulations or SOP 04-03-XX should be consulted for the proper packing and shipping instructions.

Place the ice bags around the sample containers inside the large outer plastic (garbage) bag to keep the samples cool during shipment. Fill the remainder of the cooler with vermiculite. Remember to place a temperature blank into the cooler prior to sealing and shipping (see project specific QAPP for applicability). Twist the top of the plastic bag and tape

shut with strapping tape or duct tape to prevent spillage of vermiculite during shipment.

(11) Complete the Chain-of-Custody form and place it along with the necessary sample documentation forms (i.e., chain-of-custody, Contract Laboratory Program Traffic reports etc.,) inside a Ziplock plastic bag. The procedures for completing the Chain-of-Custody paperwork are discussed in SOP Nos. 02-05-XX. Tape the plastic bag containing the paperwork to the underside of the cooler lid. Close the cooler lid and tape the cooler latch shut to prevent accidental opening during shipment.

(12) Then wrap each end of the outside of the cooler with filament strapping tape such that it cannot be opened during shipment. Normally, the tape is wound around the outside of the cooler for a total of three (3) turns, at both ends of the cooler. Up to two custody seals should be affixed to each side of the cooler across the lid opening so that the cooler cannot be opened without breaking the seals. Place the seals over the last wind of the strapping tape. To prevent the accidental tearing of the seal during shipment, it is advisable to place clear packaging tape over the seal. This ensures that the custody seal is firmly affixed to the cooler, yet it can be seen through the thin layer of tape.

Shipping Paperwork Preparation

(13) If shipping by air, obtain a standard FedEx airbill. If shipping samples for a government client, use a TechLaw Government FedEx account number.

(14) Attach a label marked as FROM:, containing the name and address of the shipper to the outside of the cooler lid in the upper left hand corner. In the right hand upper or lower corner of outside cooler lid, place another label marked as TO:, containing the name, address and contact person of the recipient of the cooler. These labels are attached to the cooler as added security incase the FedEx label becomes separated from the cooler. See Diagram A for a visual example.

(15) Complete the shippers airbill with the appropriate information. Be sure to include a TechLaw Work Assignment task or job number in the FedEx

box labeled for 'Internal Billing Reference Information'. See Attachment B for an example. FedEx will complete the information related to the weight of the package. Once completed, affix a FedEx plastic Airbill pouch to the outside, center of the cooler lid. (FedEx now has airbills that that affix to cooler handles.) Slip the completed FedEx airbill into the pouch. Do not seal the pouch. Make sure you pull the top copy of the FedEx airbill before relinquishing the cooler to FedEx.

IV. Health and Safety Section

It is TechLaw's policy to maintain an effective program for control of employee exposure to chemical, radiological, and physical stress which is consistent with the EPA, DOE, and OSHA established standards and requirements.

All field personnel will be provided with appropriate protective clothing and safety equipment. At a minimum, this will include steel-toed shoes, safety glasses, and chemical-resistant gloves.

Refer to a site-specific health and safety plan for detailed health and safety procedures. This plan should be reviewed prior to beginning any work.

V. QA/QC Section

Prior to sealing coolers, the Team Leader should check all paperwork, address labels and shipping documents for accuracy.

Any deviations in preservation techniques should also be documented in the field logbook and justified. Deviations are to be sufficiently documented to allow repetition of the activity as acutally performed.

VI. Comments/Notes

Prior to commencing field activities, ensure that appropriate equipment is readied for the activities. In addition, obtain the location, phone number and office hours of the FedEx office nearest to the field activity site.

VII. Attachments

Attachment A: UN Class Definitions.
Attachment B: Sample FedEx Airbill
Diagram A: Visual example of labled cooler.

VIII. References

International Air Transport Association (IATA), Dangerous Goods Regulations, Effective from 1/1 to 12/31 of each year.

U.S. Environmental Protection Agency, A Compendium of Superfund Field Operations Methods, EPA/540/P-87/001, Washington, D.C., 1987.

U.S. Environmental Protection Agency, Characterization of Hazardous Waste Sites - A Methods Manual, EPA/600/4-84/075, April 1985.

U.S. Environmental Protection Agency, Region IV, Environmental Services Division Environmental Compliance Branch Standard Operating Procedures and Quality Assurance Manual (ECBSOPQAM), February 1, 1991.

U.S. Environmental Protection Agency, RCRA Groundwater Monitoring Technical Enforcement Guidance Document, OWSER-9950.1, September 1986.

TechLaw, Inc., Quality Assurance Program Plan (as amended for the RCRA Enforcement, Permitting and Assistance Contract).