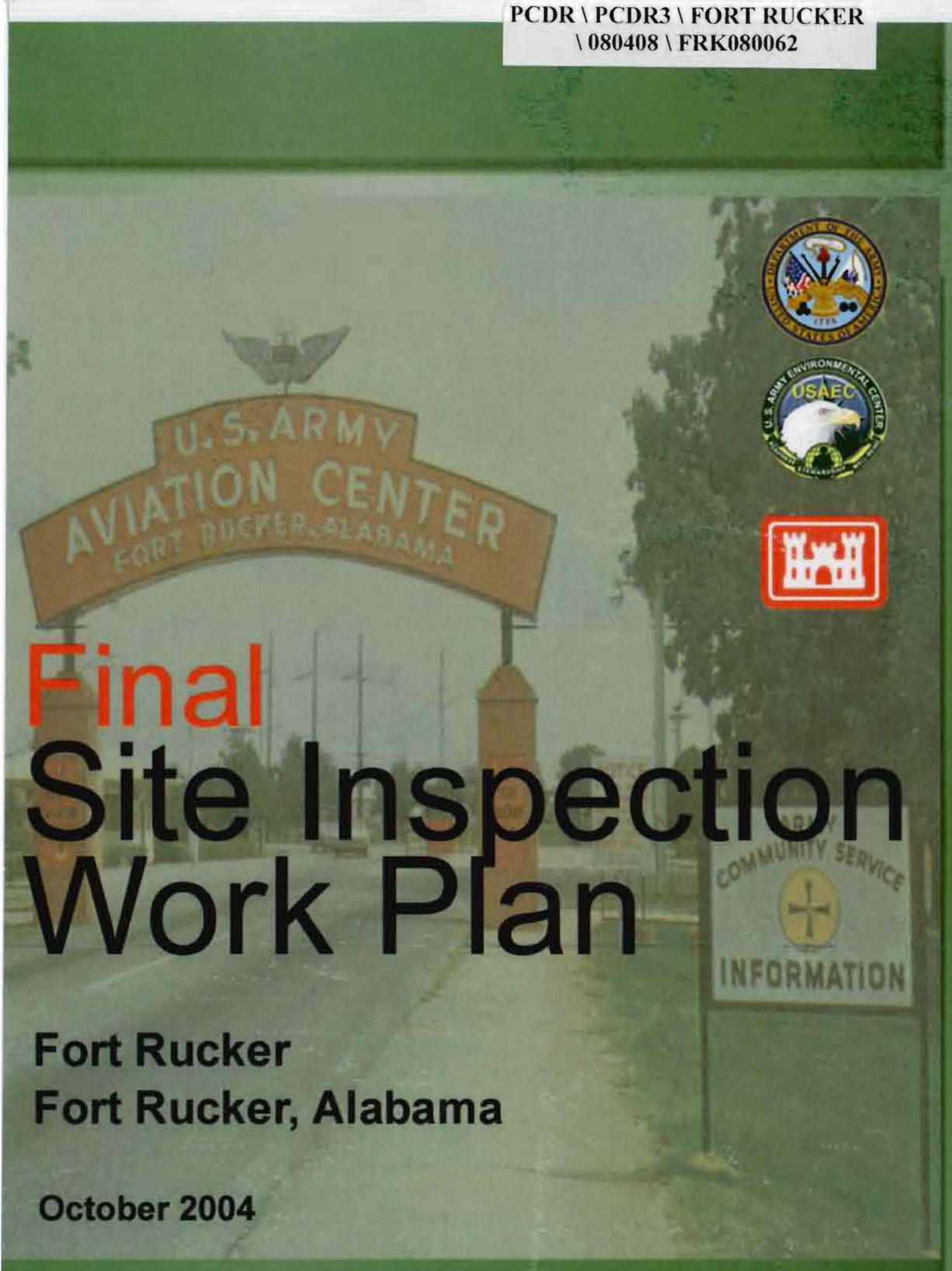

Final Site Inspection Work Plan

Fort Rucker
Fort Rucker, Alabama

October 2004

MALCOLM PIRNIE

FINAL
WORK PLAN
FORT RUCKER
FORT RUCKER, ALABAMA

OCTOBER 2004

Prepared for:

U.S. ARMY CORPS OF ENGINEERS, BALTIMORE DISTRICT
P.O. Box 1715
Baltimore, Maryland 21203-1715

Prepared by:

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300 East Lombard Street, Suite 610
Baltimore, Maryland 21202

FINAL

WORK PLAN
FORT RUCKER
FORT RUCKER, ALABAMA

DoD Contract Number: DACA31-00-D-0043

Reviewed and Approved by:

_____

Gregory P. Matthews, P.E., Vice President
Program Officer
Malcolm Pirnie, Inc.

_____

John Nocera, P.E.
Project Manager
Malcolm Pirnie, Inc.

Malcolm Pirnie, 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 the 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.

OCTOBER 2004

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ACRONYMS

AL	Alabama
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CSM	Conceptual Site Model
CTC	Cost to Complete
CTT	Closed, Transferred, and Transferring
DMM	Discarded Military Munitions
DoD	Department of Defense
DQO	Data Quality Objectives
EOD	Explosive Ordnance Disposal
ERIS	Environmental Restoration Information System
FPM	Field Project Manager
FS	Feasibility Study
FSP	Field Sampling Plan
FUDS	Formerly Used Defense Site
H&S	Health and Safety
HASP	Health and Safety Plan
HRR	Historical Records Review
HSD	Health and Safety Director
HTRW	Hazardous, Toxic, and Radioactive waste
MC	Munitions Constituents
MEC	Munitions and Explosives of Concern
MMRP	Military Munitions Restoration Program
MRS	Munitions Response Site
NFA	No Further Action
OU	Operable Unit
PARCC	Precision, Accuracy, Representativeness, Completeness, Comparability
PM	Project Manager
QA	Quality Assurance
QAPP	Quality Assurance Program Plan
QC	Quality Control
RI	Remedial Investigation
ROD	Record of Decision
ROM	Restoration Manager
SI	Site Inspection
SOW	Scope of Work
SSC	Site Safety Coordinator
SS-QAPP	Site Specific Quality Assurance Program Plan
TAL	Target Analyte List
TCL	Target Compound List
TPP	Technical Project Planning
U.S.	United States

USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
UXO	Unexploded Ordnance

1.0 INTRODUCTION

Malcolm Pirnie, Inc. (Malcolm Pirnie) has prepared the following Work Plan for the Site Inspection (SI) of Military Munitions Restoration Program (MMRP) eligible sites at Fort Rucker, Alabama, under United States Army Corps of Engineers (USACE) Contract Number DACA31-00-D-0043, Delivery Order 53.

This Work Plan has been developed to provide a description of the necessary tasks to complete this project, and to ensure that the project will be in conformance with the USACE, Baltimore District project Scope of Work (SOW), dated 29 August 2003. In addition, this Work Plan incorporates the resolutions and ideas generated during the review and development process for this project. This Work Plan includes the following project specific information:

- Site Location and History;
- Regulatory Framework and Project Objectives;
- Schedule;
- Personnel;
- Environmental Setting;
- Field Work;
- Laboratory Analyses;
- Health and Safety; and
- Project Management

A Field Sampling Plan (FSP) (Appendix A), Quality Assurance Program Plan (QAPP) (Appendix B), Health and Safety Plan (HASP) (Appendix C), Technical Project Planning (TPP) worksheets and sign in sheet (Appendix D) are incorporated in this Work Plan.

This Work Plan will be used with the understanding that unanticipated conditions may dictate a change in the plan as written. Any necessary deviations from the plan will be brought to the attention of the USACE, Baltimore District Project Manager as soon as possible and a written request for variance will be submitted to document the decision made.

1.1 Project Objectives

The purpose of this project is to determine the presence or absence of munitions and explosives of concern (MEC) and munitions constituents (MC), which may remain from activities conducted by the Department of Defense (DoD) during operation of these sites and which may pose a threat to human health and/or the environment. The primary goal of the MMRP SI is to collect information necessary to make one of the following decisions: 1) whether a Remedial Investigation/Feasibility Study (RI/FS) is required at a site 2) whether an immediate response is needed or 3) whether the site qualifies for no further action (NFA). The installation-wide SI at Fort Rucker will address both MEC as well as MC issues for the MMRP eligible sites. The secondary goal of the SI is to collect

information for building the MMRP program, to include Cost to Complete (CTC) estimates and site prioritization for the MMRP eligible sites.

A Historical Records Review (HRR) was completed to support the SI. This document expanded on the information collected during the Closed, Transferred, Transferring (CTT) Range/Site Inventory Report and provided information pertinent to identifying, verifying, and establishing the physical limits and potential MEC and MCs for each site. Historical records, aerial photos, existing site maps, and existing environmental restoration documents were reviewed, and interviews of installation personnel were performed. Available existing installation-specific background studies, including sample analysis for metals and explosives, were reviewed. The following information is provided in and can be obtained from the HRR:

- Project purpose/scope
- Regulatory framework/project drivers
- Installation description and chronological history
- Phase 3 army range inventory results
- Summary of other previous investigations
- MMRP site descriptions/HRR findings
- Draft Conceptual Site Model (CSM)
    - MMRP site profile
        - Area and Layout
        - Structures
        - Utilities
        - Boundaries
        - Security
    - Physical profile
        - Climate
        - Geology
        - Topography
        - Soil
        - Hydrogeology
        - Hydrology
        - Vegetation
    - Land use And exposure profile
        - Land use / activities (present and future)
        - Human receptors (present and future)
        - Zoning/land use restrictions
        - Beneficial resources
        - Demographics
    - Ecological profile
        - Habitat type
        - Degree of disturbance
        - Ecological receptors
    - Munitions/release profile
        - Munitions types and release mechanisms

- Maximum probable penetration depth
- MEC density
- MEC scrap/fragments
- Associated munitions constituents
- Transport mechanisms/migration routes

- Pathway analysis (MEC/MC)

1.2 Work Plan Organization

Including **Section 1.0 Introduction, the** Work Plan consists of six sections. The remaining five sections of the Work Plan are outlined below:

Section 2.0: MMRP Site Descriptions provide a detailed description of each MMRP site.

Section 3.0: Scope of Work discusses the proposed activities to be conducted by Malcolm Pirnie as part of the SI.

Section 4.0: Health and Safety outlines the health and safety procedures for the SI.

Section 5.0: Project Management outlines the project schedule and project personnel for the SI.

Section 6.0: Project Deliverables present a summary of the reporting to be completed for the SI.

2.0 MMRP SITE DESCRIPTIONS

2.1 Overview

Fort Rucker (also referred to as the "installation") is located in southeast Alabama, approximately 20 miles northwest of Dothan, in Dale and Coffee Counties. The installation is approximately 160 miles east of Mobile, Alabama, 90 miles southwest of Columbus, Georgia, 80 miles southeast of Montgomery Alabama, 10 miles east of Enterprise, Alabama and a half-mile north of Daleville, Alabama. Currently the installation encompasses nearly 98 square miles of land comprised of airfields, stagefields and tactical sites, as well as leased land for rotary-wing pads and fixed-wing airstrips. Fort Rucker is bordered to the north and west by agricultural land, to the south by the towns of Daleville and Enterprise, and to the east by the town of Ozark.

Two MMRP eligible sites, Anti-Tank Rocket/Grenade Range and Lake Tholocco Pistol Range, were identified on Fort Rucker during the Phase 3 Army CTT Range Inventory. Lake Tholocco Pistol Range was determined to be on the operational range area, and is not included in this Site Inspection. Five other sites, the Infiltration/Grenade Range, .22 Caliber Target Butt, A-Grenade and Bayonet Court, B-Grenade and Bayonet Court, C-Grenade and Bayonet Court, were identified as a result of research performed for the HRR. Each of these sites is described in this Work Plan and in the Fort Rucker HRR.

2.2 Anti-Tank Rocket/Grenade Range

The Anti-Tank Rocket/Grenade Range is located northeast of the cantonment area of Fort Rucker. The area is 66.9 acres in size. The range is made up of three distinct Sub-Sites; ATR No. 1, ATG No. 1, and Unnamed Range**.** Map 4-1 in the FSP displays detailed layout of the Anti-Tank Rocket/Grenade Range.

Munitions used at the Sub-Sites of the range include 2.36" Rocket, M9A1 Heat, M17 Fragmentation, M II A-1-MII A4 Practice, M19A1 WP Smoke, M21 Practice, for use with 2.36 Shoulder-fired rocket and the M1 Rifle with Rifle Grenade attachment.

2.3 Infiltration/Grenade Range

The Infiltration/Grenade Range is a 76.3-acre parcel located northeast of the cantonment area of Fort Rucker, adjacent to the Anti-Tank Rocket/Grenade Range. The Anti-Tank Rocket/Grenade Range is made up of three distinct Sub-Sites; IFL No. 2, GR No. 1, RG FRAG. Map 4-1 in the FSP displays the detailed layout of the Infiltration/Grenade Range.

Munitions used at the Infiltration/Grenade Range include small arms ammunition, .30-caliber, M2/MK2 Hand Grenades, M17 Fragmentation, M II A1-MII A4 Practice.

2.4 .22 Caliber Target Butt

The .22 Caliber Target Butt is a 2.4-acre parcel located within a central location of the cantonment area of Fort Rucker. Little is known about this area, as it was discovered after completion of the HRR. The location of this site was located through aerial photographs and a map received from archives. Map 4-2 in the FSP displays the location of the .22 Caliber Target Butt.

2.5 A – Grenade and Bayonet Range

The A-Grenade and Bayonet Court is a 26.8-acre parcel located within a central location of the cantonment area of Fort Rucker. Little is known about this site, as it was discovered after the completion of the HRR. The location of this site was located through aerial photographs and a map received from archives. Map 4-2 in the FSP displays the location of the A – Grenade and Bayonet Court.

2.6 B – Grenade and Bayonet Range

The B-Grenade and Bayonet Court is a 4.6-acre parcel located within a central location of the cantonment area of Fort Rucker. Little is known about this site, as it was discovered after the completion of the HRR. The location of this site was located through aerial photographs and a map received from archives. Map 4-2 in the FSP displays the location of the B – Grenade and Bayonet Court.

2.7 C – Grenade and Bayonet Range

The C-Grenade and Bayonet Court is a 7.6-acre parcel located within a central location of the cantonment area of Fort Rucker. Little is known about this site, as it was discovered after the completion of the HRR. The location of this site was located through aerial photographs and a map received from archives. Map 4-2 in the FSP displays the location of the C – Grenade and Bayonet Court.

3.0 SCOPE OF WORK

The MMRP SI will be implemented in the following manner:

HRR – consists of identifying data gaps from the Phase 3 CTT Inventory and obtaining and reviewing historical records; and

MMRP Site Technical Project Planning (TPP) – consists of planning activities to identify project objectives and designing data collection programs to meet objectives;

MMRP SI fieldwork - consists of performing investigation activities and preparing reports of findings.

3.1 Historical Records Review

The Final HRR report was submitted on July 12, 2004. Comments from the USACE Baltimore District, and the U.S. Army Environmental Center were incorporated into the Final HRR report.

3.2 TPP Process

The TPP Process is a comprehensive and systematic process that involves four phases of planning activities. It was developed for identifying project objectives and designing data collection programs for hazardous, toxic, and radioactive waste (HTRW) sites. Use of the TPP Process is consistent with the philosophy of taking a graded approach to planning that will produce the type and quality of results needed for site-specific decision making.

A TPP session was held at the installation on June 24, 2004. The TPP worksheets are provided in Appendix D. The Anti-Tank Rocket/Grenade Range, Infiltration/Grenade Range are displayed on Map 4-1 and the .22 Caliber Target Butt, A-Grenade and Bayonet Court, B-Grenade and Bayonet Court, and C-Grenade and Bayonet Court are displayed on Map 4-2 in the FSP. The results of the TPP session dictated both the MEC and MC sampling/field activities planned for the installation. Table 3-1 provides a summary of decisions made to address MEC and Table 3-2 provides a summary of decisions made to address MC.

TABLE 3-1: Summary of MEC TPP Decisions

MRS	MEC SI Activities	
	Activity	**Purpose**
Anti-Tank Rocket/Grenade Range	Magnetometer assisted site walk of a total of 6.7 acres. Site walk will avoid firing points and target areas. Anomalies found during the magnetometer assisted site walk will have locations marked by GPS.	Results will be used for NFA/RI determination for MEC. If MEC is found or multiple anomalies identified, the site will move to an RI.
Infiltration/Grenade Range	Magnetometer assisted site walk of 7.6 acres. Site walk will avoid firing points and target areas. Anomalies found during magnetometer assisted site walk will have locations marked by GPS.	Results will be used for NFA/RI determination for MEC. If MEC is found or multiple anomalies are identified, the site will move to an RI.
.22 Caliber Target Butt	Site walk of approximately 2.4 acres.	Determine location, boundaries and if possible firing points and target butts.
A-Grenade and Bayonet Court	Magnetometer assisted site walk of 26.8 acres. Anomalies found during the site walk will have locations marked by GPS.	Results will determine NFA or RI. If MEC is found or multiple anomalies are identified, the site will move to RI. Will also determine location, boundaries and if possible grenade pits.
B-Grenade and Bayonet Court	Magnetometer assisted site walk of 4.6 acres. Anomalies found during the site walk will have locations marked by GPS.	Results will determine NFA or RI. If MEC is found or multiple anomalies are identified, the site will move to RI. Will also determine location, boundaries and if possible grenade pits.
C-Grenade and Bayonet Court	Magnetometer assisted site walk of 7.6 acres. Anomalies found during the site walk will have locations marked by GPS.	Results will determine NFA or RI. If MEC is found or multiple anomalies are identified, the site will move to RI. Will also determine location, boundaries and if possible grenade pits.

TABLE 3-2: Summary of MC TPP Decisions

MRS	MC SI Activities	
	Activity	**[1]Purpose**
Anti-Tank Rocket/Grenade Range	Ten soil samples (explosives).	Results will be used for CTC, Prioritization Protocol, and for NFA/RI determination for MC.
Infiltration/Grenade Range	Ten soil samples (explosives).	Results will be used for CTC, Prioritization Protocol, and for NFA/RI determination for MC.
.22 Caliber Target Butt	None. Conduct a site inspection to determine if lead projectiles are present. Shovel test.	Results to be used for CTC, Prioritization Protocol, and for NFA/RI determination for MC. Shovel test may be performed to determine the presence of lead projectiles.
A-Grenade and Bayonet Court	Three soil samples (explosives).	Results will be used for CTC, Prioritization Protocol, and for NFA/RI determination for MC.
B-Grenade and Bayonet Court	Three soil samples (explosives).	Results will be used for CTC, Prioritization Protocol, and for NFA/RI determination for MC.
C-Grenade and Bayonet Court	Three soil samples (explosives).	Results will be used for CTC, Prioritization Protocol, and for NFA/RI determination for MC.

[1] As agreed upon during the TPP sessions, NFA determination to be made if analytical results do not exceed background levels and appropriate regulatory limits (USEPA Region 9 PRG table)

3.3 Field Activities

Field activities will be performed in accordance with the USACE, Baltimore District project SOW dated 29 August 2003. Field sampling will consist of the collection of sufficient evidence to show whether MEC or MC is present in the identified MMRP eligible sites at Fort Rucker. The Munitions Response Site (MRS) locations are provided on Maps 4-1 and 4-2 in the FSP, Appendix A.

MEC Field Activities

The goal of the field activities for MEC is to find sufficient evidence that MEC or DMM is present on the site. In most cases, encountering just one MEC item will be sufficient to determine that additional work is necessary for a particular MRS. The field activities for the SI are not intended to confirm all types of MEC present, determine MEC density, or define the exact limits of the MEC impacts. As agreed to during the TPP, the MEC field activities will focus outside of firing points and target areas to look for the presence of MEC.

MC Field Activities

The goal of the field sampling activities for MC is to determine if the site has been impacted by MC. Anomaly avoidance techniques will be utilized during the MC field sampling activities. Analytical results exceeding background levels and appropriate regulatory limits agreed on during the TPP session will be used for justification in moving the site into the RI phase. The SI field sampling activities are not intended to determine the nature and extent of all contaminants. As agreed to during the TPP session TAL metal sampling at Fort Rucker would be inconclusive due to the high concentrations of metals in the soil at Fort Rucker, therefore soils will not be sampled for metals at any of the MMRP sites.

All fieldwork will be of quality to meet the data quality objectives (DQOs) for the project as dictated in the QAPP, Appendix B and TPP Memoranda, Appendix D. The details of the planned MEC and MC field sampling activities are provided in the FSP, Appendix A.

Laboratory Analysis

The total number of samples that will be collected and the selected laboratory analysis are presented in Table 3-3 below. The analytical methods are selected on the basis of the munitions items known to have been used at the site and include standard suite of range-related analytical parameters to account for unknown items. The standard analytical method includes Target Compound List (TCL) Explosives (USEPA Method 8330).

TABLE 3-3: Sample Summary Table

MMRP Site	Number of Samples / Media
	Explosives
Anti-Tank Rocket/Grenade Range	10-soil
Infiltration/Grenade Range	10-soil
.22 Caliber Target Butt	N/A
A-Grenade and Bayonet Court	3-soil
B-Grenade and Bayonet Court	3-soil
C-Grenade and Bayonet Court	3-soil
TOTAL	**29-soil**

Chemistry Analyses

Malcolm Pirnie will meet the project-specific DQOs for sampling, analysis, and quality assurance/quality control (QA/QC) objectives by collecting the proper quantities and types of samples, using the correct analytical methodologies, implementing field and laboratory QA/QC procedures, and using various data validation and evaluation processes. The DQOs for each analytical method are provided in the QAPP, Appendix B. Laboratory requirements for the analytical methods being used for this project are provided in the FSP, Appendix A and in the QAPP, Appendix B. These procedures include requirements for sample preparation, sampling containers, preservation methods, and holding times.

The QAPP, Appendix B has been developed to support the sampling, analysis, and evaluation activities associated with this project. The QAPP, Appendix B consists of policies, procedures, specifications, standards, and documentation sufficient to produce data of quality adequate to meet the DQOs for the project, Comprehensive Environmental Response Compensation and Liability Act (CERCLA), and to minimize loss of data due to out-of-control conditions or malfunctions.

The QAPP, Appendix B has been prepared to ensure that this responsibility is met throughout the duration of this project. It addresses procedures to assure the precision, accuracy, representativeness, completeness, and comparability (PARCC) of field and laboratory data generated during the course of this project. It also provides a framework for evaluating existing data that may be used in this project. The QAPP, Appendix B defines the first stage of the QA requirements for sample and data acquisition, handling, and assessment.

QA procedures such as tracking, reviewing and auditing are implemented as necessary to ensure that all project work is performed in accordance with professional standards, USEPA and USACE regulations and guidelines, and the specific goals and requirements stated in this Work Plan.

QC of sample collection, analysis, and assessment will be performed by technical project personnel. Laboratory equipment will be maintained and calibrated, and records of these activities will be kept in accordance with established procedures. This will include laboratory oversight by Malcolm Pirnie project personnel as well as laboratory data and document review.

Per the USEPA criteria for data quality for risk-based projects, 10% of the analytical data are required to meet a comprehensive data level of QA/QC related to sample collection, laboratory analysis, and data validation techniques. Following the processes identified in the QAPP, Appendix B, final data usability will be determined by the USACE Project Chemist in coordination with the Malcolm Pirnie Project Manager, Malcolm Pirnie Project Chemist, and independent Project Data Validator.

Overall QA review of documentation, field sampling and laboratory QC will allow determination of the acceptability of these data for use in this project.

Sample chemical analyses are discussed in greater detail in the QAPP, Appendix B.

4.0 HEALTH AND SAFETY

The requirements for health and safety are contained in the HASP included as Appendix C of this Work Plan.

5.0 PROJECT MANAGEMENT

Malcolm Pirnie will provide all of the documents and will participate in all of the meetings and conference calls in accordance with the protocols stated in the USACE, Baltimore District project SOW, dated 29 August 2003.

5.1 Project Schedule

The project schedule has been established according to the performance of the following tasks as delineated by the USACE, Baltimore District project Scope of Work, dated 29 August 2003.

Task 1 – Stakeholder Involvement
Task 2 – Historical Records Review
Task 3 – Technical Project Planning
Task 4 – Site Inspection

The project schedule/status is provided in Table 5-1.

TABLE 5-1: Project Schedule

Task Status	Task	Completion Date
complete	Stakeholder Involvement	12/08/03
complete	Kick-Off Meeting	12/08/03
complete	Stakeholder Draft Historical Records Review	03/23/04
complete	Final Historical Records Review	07/12/04
complete	Host TPP Session 1	06/24/04
complete	Stakeholder Draft Work Plan/TPP Memo	08/10/04
planned	Final Work Plan/TPP Memo	10/22/04
planned	SI MEC/HTRW Field Work	11/01/04
not complete	Stakeholder Draft SI Report	01/27/05
not complete	Host TPP Session 2	03/11/05
not complete	Final SI Report	03/23/05

5.2 Project Personnel

5.2.1 Malcolm Pirnie Project Personnel

Project personnel and their responsibilities are listed in Table 5-2. In addition, staff performing sampling and instrument aided visual surveys will be accompanied by UXO Technicians.

TABLE 5-2: Project Personnel	
NAME	**TITLE**
Stephen Woods	USACE, Baltimore District Project Manager
Gregory Matthews, PE	Malcolm Pirnie Program Manager
Mark McGowan, CIH	Malcolm Pirnie Health and Safety Director
John Nocera, P.E.	Malcolm Pirnie Project Manager
Al Larkins	Deputy Project Manager/Field Project Manager
Dan Hains, UXO	Malcolm Pirnie Site Safety Coordinator
John Logigian	Malcolm Pirnie Project Chemist
Jen Buckels and Afton Hess, Bobby Aitkenson, UXO	Field Personnel- MC sampling Field Personnel- MEC Survey
GPL Laboratories	Subcontractor

Malcolm Pirnie Program Manager – Gregory Matthews

The Malcolm Pirnie Program Manager oversees the Malcolm Pirnie Project Manager and reports directly to the USACE, Baltimore District Project Manager. Any issues or problems the USACE, Baltimore District may experience with the Malcolm Pirnie Project Manager may be addressed to the Malcolm Pirnie Program Manager. The Malcolm Pirnie Program Manager has full authority over the performance of the project and can direct changes in project implementation.

Malcolm Pirnie Corporate Health & Safety Director – Mark McGowan

The Malcolm Pirnie Corporate Health and Safety (H&S) Director (HSD) maintains the organizational freedom and authority for ensuring full implementation of the SSSHP and Malcolm Pirnie's corporate H&S policy. The HSD can direct how the SSSHP is implemented. This can include delegating authority to other personnel and directing the enforcement of the SSSHP, including removing individuals from the project for non-compliance.

Malcolm Pirnie Project Manager (PM) – John Nocera

The Malcolm Pirnie PM has ultimate responsibility for all aspects of the project and reports directly to the Malcolm Pirnie Program Manager, Malcolm Pirnie Corporate HSD, and the USACE, Baltimore District Project Manager. The Malcolm Pirnie PM is also responsible for project personnel safety and health, including correction of all identified unsafe acts or conditions, and enforcement of procedures and regulations.

Malcolm Pirnie Deputy/Field Project Manager (FPM) – Al Larkins

The Malcolm Pirnie FPM is the primary contact for performance of field activities. The FPM is responsible for work with field staff for the implementation of the Work Plan, including the project QA/QC requirements. The FPM will be on site during field activities.

Malcolm Pirnie Site Safety Coordinator (SSC) – Dan Hains

The Malcolm Pirnie SSC reports to the Malcolm Pirnie PM for all aspects of the fieldwork and is responsible for enforcing all aspects of safety and health rules, policies, and procedures on behalf of Malcolm Pirnie.

Malcolm Pirnie Project Chemist – John Logigian

The Project Chemist is responsible for the day to day management of the data at all stages to ensure that all project activities related to analytical data are performed to meet the project DQOs.

5.2.2 Other Project Personnel

Table 5-3 lists the individuals and associated agencies/organizations also involved with this project. They are also included in the document distribution list:

TABLE 5-3: Other Project Personnel

Name	Org Code (m/s)	Title	Work Phone
AEC			
Thomas Symalla	SFIM-AEC-CDP	MMRP Program Manager	410-436-7105
Rick O'Donnell	SFIM-AEC	Fort Rucker Restoration Manager (ROM)	410-436-6836
USACE-Baltimore District			
Stephen C. Wood	CENAB-EN-HM	Project Manager	410-962-3506
Fort Rucker			
Jim Swift	ATZQ-DPW-EN	Program Manager	334-255-1899
ADEM			
James W. Grassiano		ADEM	334-271-7738
Mark D. Harrison		ADEM	334-270-5610

5.2.3 Subcontractors

Subcontractors report to the Malcolm Pirnie FPM and SSC during the performance of the tasks associated with their fieldwork and are responsible for complying with the project Work Plan while on-site. The following have been hired as subcontractors to Malcolm Pirnie to help complete this project:

- GPL Laboratories of Frederick, Maryland

Laboratory qualifications are provided in the QAPP.

6.0 PROJECT DELIVERABLES

In addition to this Work Plan, Malcolm Pirnie will develop and submit the following project deliverable:

Site Inspection Report, which will include the following data elements/information:

- Final CSM;
- Analytical data; and
- Results of instrument assisted site walk.

In accordance with the SOW, all the analytical data generated during this field effort will be uploaded into the Army's Environmental Restoration Information Systems (ERIS) web-based data base.

The data from the MMRP SI will be maintained in the database which includes the following information for each sample collected: sample ID; preservation; date sampled; media type; site location; chemical analyses; and validation review. The format requirements for the ERIS database are in the QAPP, Appendix C.

If the ERIS database format is revised during MMRP investigations, the newly established database format shall be included as an appendix in the site specific QAPP (SS-QAPP) documents.

Appendix A: Field Sampling Plan

FINAL
FIELD SAMPLING PLAN
FORT RUCKER
FORT RUCKER, ALABAMA

OCTOBER 2004

Prepared for:

U.S. ARMY CORPS OF ENGINEERS, BALTIMORE DISTRICT
P.O. Box 1715
Baltimore, Maryland 21203-1715

Prepared by:

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Baltimore, Maryland 21202

FINAL

FIELD SAMPLING PLAN
FORT RUCKER
FORT RUCKER, ALABAMA

DoD Contract Number: DACA31-00-D-0043

Reviewed and Approved by:

_____

Gregory A. Matthews, P.E., Vice President
Program Officer
Malcolm Pirnie, Inc.

_____

John Nocera, P.E.
Project Manager
Malcolm Pirnie, Inc.

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LIST OF ATTACHMENTS

ACRONYMS

AL	Alabama
bgs	Below Ground Surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	Chain of Custody
DI	Deionized
DMM	Discarded Military Munitions
DoD	Department of Defense
DQCR	Daily Quality Control Report
EOD	Explosive Ordnance Disposal
FPM	Field Project Manager
FSP	Field Sampling Plan
GPS	Global Positioning System
HASP	Health and Safety Plan
HCl	Hydrochloric Acid
HNO_3	Nitric Acid
IDW	Investigation Derived Waste
MC	Munitions Constituents
MEC	Munitions and Explosives of Concern
MMRP	Military Munitions Restoration Program
MRS	Munitions Response Site
NCP	National Contingency Plan
NFA	No Further Action
NOAA	National Oceanic and Atmospheric Administration
PM	Project Manager
POC	Point of Contact
PPE	Personal Protective Equipment
PTFE	Polytetrafluroethylene
PVC	Polyvinylchloride
QA	Quality Assurance
QAPP	Quality Assurance Program Plan
QC	Quality Control
RBCs	Risk Based Concentrations
RI	Remedial Investigation
ROD	Record of Decision
SI	Site Inspection
SSC	Site Safety Coordinator
SS-QAPP	Site Specific Quality Assurance Program Plan
TAL	Target Analyte List
TCL	Target Compound List
TD	Time Domain
TPP	Technical Project Planning
U.S.	United States

USACE	United States Army Corps of Engineers
USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Agency
UXO	Unexploded Ordnance

1.0 INTRODUCTION

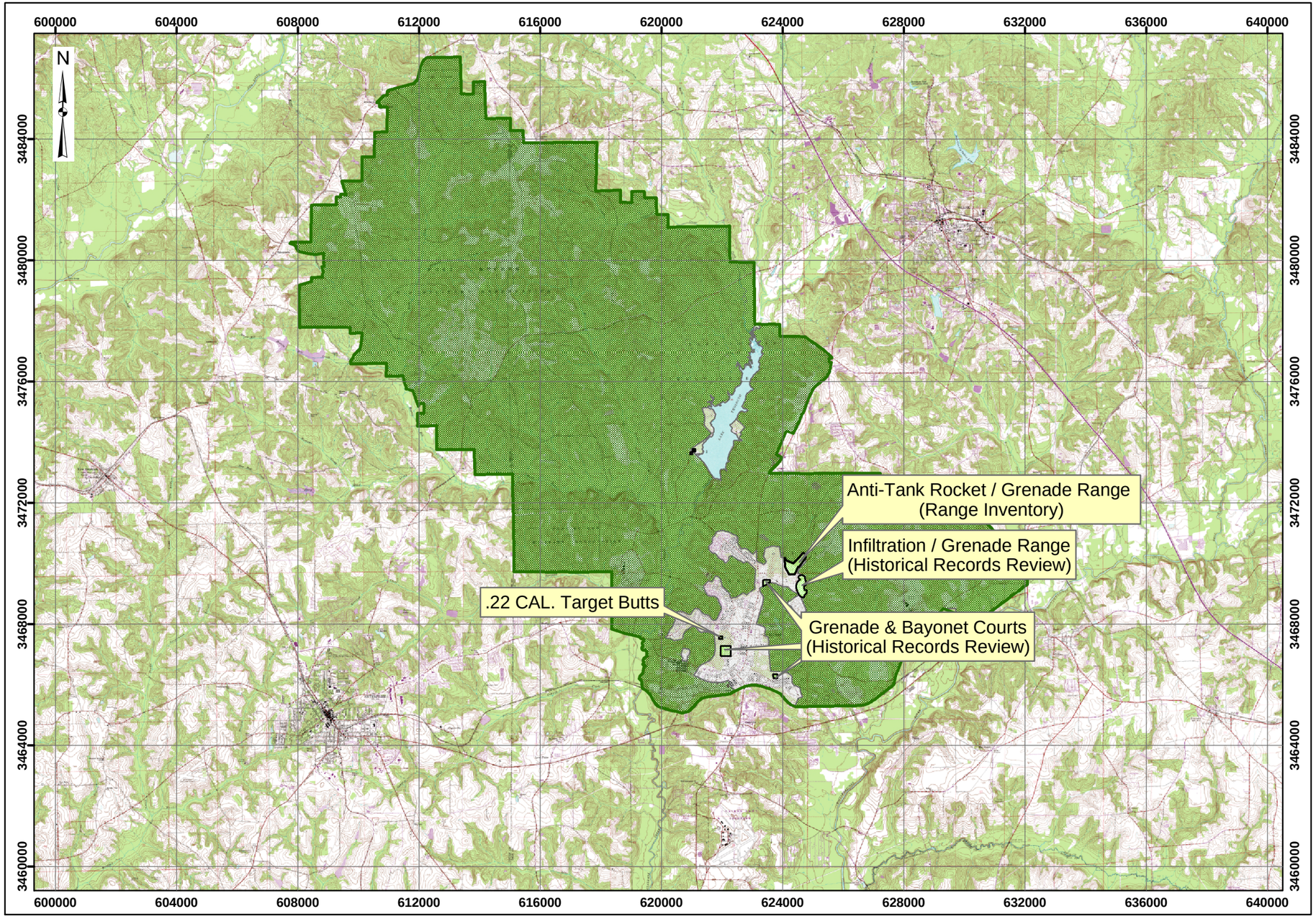
1.1. Project Background

Under Contract Number DACA31-00-D-0043, Delivery Order 53 Malcolm Pirnie, Inc. (Malcolm Pirnie) has been tasked by the United States Army Corps of Engineers (USACE), Baltimore District to perform site inspections (SI) of munitions response sites (MRS) at Fort Rucker, Alabama (AL). As part of this study, Malcolm Pirnie will obtain explosive samples from the identified MRS at Fort Rucker in accordance with the agreed upon decisions made during the Technical Project Planning (TPP) session held on June 24, 2004 and documented in the TPP memos attached as Appendix D to the Work Plan.

Fieldwork for this project includes the collection of surface soil samples for munitions constituents (MC) of concern. Fieldwork will also include munitions and explosives of concern (MEC) surveys to locate surface evidence of MEC through instrument assisted visual surveys and subsurface burial areas through magnetometer assisted site walks. The sample and survey locations will be approximated using handheld field Global Positioning Systems (GPS).

Malcolm Pirnie has prepared this Field Sampling Plan (FSP) for the fieldwork being performed for the Fort Rucker SI to provide plans and procedures that will be employed by Malcolm Pirnie during performance of the field activities for this project. This FSP will be used with the understanding that field conditions may dictate a change in the plan as written.

Field Sampling Plan
Fort Rucker, AL



MALCOLM PIRNIE

Map 1-1
Area Location Map

Legend

- Installation Boundary
- Operational Range Area
- Non Range, Non UXO-DMM-MC Area

CTT Ranges (Historical Records Review)

- MMRP Site

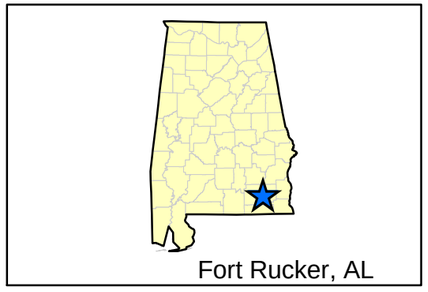
2,000 0 2,000 4,000 6,000 Meters

Data Source: USGS. 7.5 Minute Series
Topographic Survey Map

Victoria, AL, 1981	New Brockton, AL, 1981
Goodman, AL, 1960	Brundidge, AL, 1981
Enterprise NE, AL, 1981	Enterprise, AL, 1981
Ariton, AL, 1981	Ozark, AL, 1981
Daleville, AL, 1980	Skipperville, AL, 1969
Ewell, AL, 1969	Pinckard, AL, 1981

Coordinate System: UTM Zone 16N
Datum: NAD 1983
Units: Meters

Contract: DACA31-00-D-0043
Edition: Final Field Sampling Plan
Date: October 2004



2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

Project Personnel and their responsibilities are listed in Section 5.2 of the Work Plan.

3.0 PROJECT SCOPE AND OBJECTIVES

The goal of this project is to determine the presence or absence of MEC and MC, which may remain from activities conducted by the Department of Defense (DoD) during operation of these sites and which may pose a threat to human health and/or the environment.

During the field sampling event, qualified team members (Unexploded ordnance [UXO] Technicians) will inspect the surface for MEC. Samples will be collected to analyze for metals and explosives as dictated by historical site activities, quantities are listed in Table 3-1. The fieldwork will take place during October 2004 and will last approximately five days.

It is anticipated that 29 surface soil samples will be collected for analytical laboratory testing. The analytical methods were selected on the basis of the types of munitions known to have been used at the site and include the standard suite of range-related analytical parameters to account for unknown items. The standard analytical method includes TCL explosives (Environmental Protection Agency (EPA) Method 8330). All field and laboratory work will be of the quality to support the screening against USEPA Region 9 PRG Tables. Table 3-1 shows the quantity and type of samples and their locations for this project.

Table 3-1 – Quantity and Types of Sample Locations

MMRP Site	Number of Samples / Media Explosives
Anti-Tank Rocket/Grenade Range	
Firing Point Area	3 – soil
Down Range (Impact Area)	7– soil
Infiltration/Grenade Range	
Firing Point Area	3 – soil
Down Range (Impact Area)	7 – soil
.22 Caliber Target Butt	
None	None
A –Grenade & Bayonet Court	
Target Areas	3 – soil
B –Grenade & Bayonet Court	
Target Areas	3 – soil
C –Grenade & Bayonet Court	
Target Areas	3 – soil
TOTAL	**29 - soil**

4.0 FIELD ACTIVITIES

4.1. Rationale/Design

The sampling rationale/design for this study is to collect sufficient data to confirm the presence/absence of MEC or MC within the areas of concern. Based upon the objectives of this study, the following items have been incorporated into the sampling program rationale/design.

4.2. Technical Project Planning

The USACE TPP process was used to gain a consensus. Based on the discussions at the TPP meeting, the following strategy is being implemented for MEC and MC activities at each of the MMRP sites on Fort Rucker:

4.3. Anti-Tank Rocket/Grenade Range

MEC Activities: MEC presence is unknown; therefore, activities associated with MEC presence will be performed, including a magnetometer assisted site walk of approximately 6.7 acres of the total 66.9 acre site. The magnetometer assisted site walk will focus on areas inside the site that are outside of firing points and target areas to determine the presence of MEC in these locations. Map 4-1 shows the approximate path of the magnetometer assisted site walk by field team personnel. Field team personnel may deviate from the path illustrated on Map 4-1 to focus on areas outside of firing points and target areas, as agreed to during the TPP session. Attachment A will be filled out if MEC, munitions debris, subsurface anomalies are detected with the Schonstedt, or potential burial sites are found during the site walk. Results of the site walk will be used to determine a NFA or RI for MEC at this site. The installation POC will be notified if any MEC item is encountered during the field work.

MC Activities: Ten composite surface soil samples will be collected from biased locations throughout the site; three samples will be collected at the firing point(s), and seven samples from target areas, if they can be determined. Soil samples will be analyzed for TCL explosives using EPA Method 8330.

4.4. Infiltration/Grenade Range

MEC Activities: The historical use of this range is similar to the Anti-Tank Rocket/Grenade Range, therefore the same methodology for MEC Activities are being applied to the Infiltration/Grenade Range.

MEC presence is unknown; therefore, activities associated with MEC presence will be performed, including a magnetometer assisted site walk of approximately 7.6 acres of the total 76.3 acre site. The magnetometer assisted site walk will focus on areas inside the site that are outside of firing points and target areas to determine the presence of MEC in these locations. Map 4-1 shows the approximate path of the magnetometer assisted site walk by field team personnel. Field team personnel may deviate from the path illustrated on Map 4-1 to focus on areas outside of firing points and target areas, as agreed to during the TPP session. Attachment A will be filled out if MEC, munitions debris, subsurface anomalies are detected with the Schonstedt, or potential burial sites are found during the site walk. Results of the site walk will be used to determine a NFA or RI for MEC at this site.

MC Activities: Ten composite surface soil samples will be collected from biased locations throughout the site; three samples will be collected at the firing point(s), and seven samples from target areas, if they can be determined. Soil samples will be analyzed for TCL explosives using EPA Method 8330.

4.5. .22 Caliber Target Butt

MC Activities: This site is approximately 2.4 acres and was identified after the Historical Records Review was completed, therefore very little is known about this site. Additional data collection will be attempted for this site during the SI field work to collect data about the use and the sites exact location on Fort Rucker. Map 4-2 shows the approximate location of the site.

No soil samples will be collected from this site as agreed to during the TPP session. However, as discussed during the TPP a site walk will be conducted over this site to determine where the back stop berm is located and if lead projectiles are present within this berm. If the field team can locate the back stop berm, up to ten hand held shovel test pits will be performed to determine if lead projectiles are present.

4.6. A, B, and C-Grenade & Bayonet Courts

MEC Activities: As with the .22 Caliber Target Butt, these sites were identified after the Historical Records Review was completed, therefore very little information is known about these sites.

Table 4-1 - Grenade & Bayonet Courts

Range	Size
A-Grenade & Bayonet Court	26.8 acres
B-Grenade & Bayonet Court	4.6 Acres
C- Grenade & Bayonet Court	7.6 Acres

MEC presence is unknown at all three sites; therefore, activities associated with MEC presence will be performed, including a magnetometer assisted site walk of all three sites. The acreage for each Grenade & Bayonet Court is listed in table 4-1. The magnetometer assisted site walk will focus on areas inside the site that are outside of firing points and target areas to determine the presence of MEC in these locations. Map 4-2 shows the approximate path of the magnetometer assisted site walk by field team personnel. Field team personnel may deviate from the path illustrated on Map 4-1 to focus on suspect areas observed during the site walk. Attachment A will be filled out if MEC, munitions debris, subsurface anomalies are detected with the Schonstedt, or potential burial sites are found during the site walk. Results of the site walk will be used to determine a NFA or RI for MEC at this site. The installation POC will be notified if any MEC item is encountered during the field work.

MC Activities: A total of nine composite surface soil samples will be collected from the Grenade & Bayonet Courts, three from each site. The three composite samples will be taken from random locations from within each site to determine the presence of MC. Soil samples will be analyzed for TCL explosives using EPA Method 8330.

4.7. MEC Activities

The goal of the SI is to collect sufficient data to confirm the presence/absence of MEC on the site. This portion of the fieldwork should be such that exclusion zone impacts, engineering control requirements, clearing and grubbing efforts, and MEC disposal activities are not required. In some cases, encountering just one MEC item will be sufficient to determine that further investigation is necessary for a particular MMRP site. Map 4-1 through Map 4-2 display the proposed MEC activities at the Anti-Tank Rocket/Grenade Range and Infiltration/Grenade Range and .22 Caliber Target Butt and A, B, and C Grenade & Bayonet Courts.

MEC that is discovered during sampling activities will not be removed, disturbed, or otherwise interacted with. The sampling team will make a photographic record of the MEC item and make field notes indicating the general location of the item, its conditions, and any other pertinent information. The location of the MEC item shall be recorded with GPS equipment. This information will be recorded on the MEC/Multiple Anomaly Form located in Attachment A. The field crew shall notify the USACE, Baltimore District Project Manager of any MEC items encountered at the completion of field activities for that day.

4.7.1. Instrument Assisted Visual Survey

A limited instrument assisted visual survey of the suspected MEC sites listed in the above paragraphs will be performed to locate MEC and to document any subsurface anomalies found during the site walk. Field team personnel will conduct the visual survey while being escorted by an UXO Technician. This activity will be limited to a surface walkover to identify materials and/or surface features that provide information on the areas and activities in question.

A Schonstedt, a handheld magnetometer, will be used to conduct the limited survey, to detect surface MEC and significant subsurface anomalies (primarily used for MEC safety avoidance). A transect-type or meandering search approach will be used to search the site, depending on the terrain. The width of each transect will be five feet. A perimeter survey may also be conducted for visual evidence of munitions impacted areas or release of other constituents off-site. It is assumed that the visual survey will cover between ten and 50% of the MEC and/or MC site (based on decisions made and documented in the TPP memo).

The following steps are recommended to conduct a site walk:

- Prior to entering an area requiring ordnance avoidance, the UXO technician will conduct a tailgate safety brief. This brief will cover emergency procedures, operations, and ordnance avoidance procedures.
- The UXO technician will enter the site first and will conduct a surface sweep of the path as the survey team follows behind in a single file. The team will identify target areas containing MEC, to include MEC and DMM, Munitions debris and masses of buried materials.
- Target areas containing MEC will be marked and documented.

- Survey of firing points (where appropriate) will be documented, the GPS locations will be recorded, and the areas will be photographed. A thorough search for evidence of former munitions storage areas will also be conducted.
- The survey team will observe the area for pits, craters, and unusual holes—these could indicate impact areas, demolition sites or burial pits. These areas will be documented, the GPS locations will be recorded, and the areas will be photographed using the MEC/Multiple Anomaly Discovery Form, Attachment A.
- If MEC is discovered, the UXO technician will mark the item, GPS coordinates for the item will be recorded, and the ordnance item will be logged as to its description, size, color, and any other distinguishable marks. Pertinent data will be entered on a MEC/Multiple Anomaly Discovery Form. A digital photograph of the item will be taken, and the photo number and item description will be noted in the logbook. At no time will the ordnance item be moved or disturbed. After collecting the necessary data, the team will proceed with its survey.
- If any live or suspected live MEC are encountered during the limited visual survey, they will be marked for positive identification, and an immediate response trigger evaluation described in section 4.8 will be performed.

4.7.2. Function Checks

The following procedures will be used to perform function tests on the equipment:

Hand-held metal detectors (i.e. Schonstedt,) will be swept across known selected items within an area outside of the site to demonstrate consistent effectiveness.

Instruments and equipment used to gather and generate data will be tested with sufficient frequency and in such a manner as to ensure that accuracy and reproducibility of results are consistent with the manufacture's specifications. Instruments or equipment failing to meet the standard will be repaired, recalibrated or replaced. Replaced instruments or equipment must meet the same specifications for accuracy and precision as the item removed from service.

4.8. Triggers for Immediate Response

MEC removals will not be conducted as part of the SI. However, the field team may encounter MEC and munitions debris during site reconnaissance. During site reconnaissance, a UXO Technician III will accompany the data collection team and provide MEC escort services for all data collection personnel. Any MEC and munitions debris that is encountered will be identified to help characterize the MEC and/or MC at the site. Under no circumstances will MEC be handled, moved, or disturbed during the MEC and/or MC visual survey.

If an explosives safety hazard is present, there are five basic courses of action that can be undertaken: an emergency response, a time-critical removal action, a non-time-critical removal action, a remedial action, or no further action. The remedial action and no further action alternatives are typical after finishing the SI under the Comprehensive Environmental Response, Compensation, and Liabilities Act (CERCLA) process. An emergency response action for MEC is typically conducted by active-duty EOD personnel. A removal or response action can range

from physical extraction of the hazard (e.g., removal or blow-in-place procedures) to implementing institutional controls. Removal actions can be time-critical in nature, which requires that planning be completed in six months or less, or non-time critical. The SI fieldwork is not intended to include removal or disposal actions; however, if identified, a MEC or explosives hazard must be reported, and a decision must be made about its disposition, if any. The DoD has not issued any policy or guidance regarding the selection process for a response action at a MEC and/or MC site. Draft directives and policy indicate that decisions should follow the National Contingency Plan (NCP) and CERCLA process. The decision is based on the overall threat to human health and the environment. The level of threat is based on an overall understanding of the situation and its risk based on site-specific data and the factors discussed in Table 4-2.

Table 4-2 - MEC Factors for Immediate Response Actions

MEC FACTORS	STATUS QUESTIONS
Accessibility of the MEC	Is it in an area that is restricted to the public with engineering controls that preclude entry, such as fences, security guards, and posted hazards signs? Is the MEC in an area that is accessible to the public, and does this create an imminent hazard to people or the environment?
Type of MEC	What is the condition, fuzing type, net explosive weight and specific hazards of the item? Does the MEC pose an immediate threat?
Site Assessment	Do the MEC and/or MC site conditions require using protective measures such as tamping, shielding, or focusing of the heat, blast, and shockwave to mitigate the explosive effects? What is the maximum fragmentation range and over-pressure distance of the MEC?
Other considerations	Can the hazard be moved? Can the area within the fragmentation and blast distance withstand a detonation, and are there critical habitats or facilities located nearby?

For the purposes of the SI, Malcolm Pirnie will immediately report to the USACE, Baltimore Project Manager and Installation point of contact (POC) the presence of MEC and information needed to answer the questions in Table 4-2 for determination of the appropriate action.

4.9. MC Activities

4.9.1. Soil Sampling

Soil samples shall be composite samples based on the Cold Regions Research Engineering Laboratory seven-sample wheel approach (as described in Engineering Research and Development Center SR96-15). Sample locations will be biased towards areas where MEC were

identified during the visual survey or areas where the highest density of munitions are expected. Random sampling will only be performed if no MEC or known high density areas are identified.

Surface soil samples will be collected with a disposable scoop or similar equipment while wearing Nitrile gloves. New scoops and gloves will be used at each sampling location. The analytical samples will be collected and placed directly into the appropriate sample containers, labeled, and placed in an ice chest chilled to a maximum temperature of 4 degrees Celsius (°C). A portion of the sample will be set aside and used to log a description of the soil characteristics using the Unified Soil Classification System (USCS) on a sample log form. After a sample is put into the ice chest, the chain of custody (COC) and Daily Quality Control Report (DQCR) forms will be filled out. Reusable sampling equipment will be decontaminated before moving to the next sampling location. Surface sample locations will be recorded using a handheld GPS unit.

4.10. Utility Clearance

Malcolm Pirnie will attempt to locate utilities in the area by coordinating with the installation public works department and by physically looking for any signs of underground utilities in the area, such as natural gas pipeline markers. In addition, any overhead power lines observed in the area will be avoided. No intrusive investigations requiring formal utility clearance will be performed.

4.11. GPS Surveying

Each sample location will be surveyed to document the location. The GPS unit proposed for use is a Trimble GeoExplorer CE, Geo XT handheld unit. Pathfinder Office software us used to download and post process the data to achieve submeter horizontal accuracy. Field conditions, such as the number of satellites available at the reading time and density of the tree canopy dictate the amount of time needed to acquire a reading. Coordinates will be established for each sample location to an accuracy of one meter.

4.12. Field Equipment

A variety of equipment will be used to perform the field activities for this project. Table 4-3 lists the field equipment that will be used:

Table 4-3 - Field Equipment

CATEGORY	EQUIPMENT
Surface Sampling	Disposable scoops (or similar) Mixing Bowls for composite sampling Plastic sheeting
Health and Safety Equipment	Hard hats, safety boots, safety glasses, first aid kit, fire extinguisher, protective clothing, Nitrile gloves
Shipping	Packaging tape, labels, seals, COC forms, ice, zip top bags, coolers, bubble wrap, packaging material

Table 4-3 - Field Equipment

CATEGORY	EQUIPMENT
Documentation	DQCR forms, field log book, boring logs, all applicable health and safety forms
Sample Containers	See Table 4-1 in the QAPP.
Decontamination Supplies	Liquinox or Alconox Detergent Potable Water Deionized Water Scrub Brushes Decon Tubs/buckets

4.13. Laboratory Analysis

The analytical methods are selected on the basis of the munition items known to have been used at the site and include the standard suite of range-related analytical parameters to account for unknown items. The standard analytical method includes TCL explosives (EPA Method 8330). The MDLs for these methods are included in the Quality Assurance Project Plan (QAPP), which is included in the Work Plan as **Appendix C**. Table 4-4 details the quantities of analyses to be tested.

4.14. Quality Assurance/Quality Control (QA/QC) Samples

QA and QC procedures are documented in the QAPP. QA and QC samples are samples analyzed for the purpose of assessing the quality of the sampling effort and of the analytical data. QC samples include equipment/rinsate blanks, temperature blanks, and matrix spike/matrix spike duplicates.

4.14.1. QC Samples

Sample QC for analytical samples will be provided in the field through the use of equipment blanks, trip blanks, background samples, and samples collected for matrix spikes. The QC samples will be handled as regular samples. In order for distinctions to be determined between study areas, the different types of samples will be submitted in separate batches for laboratory analysis. Calibrations and associated QC samples are not mixed between sample types.

The following QC samples will be collected for analytical samples:

Equipment Blanks — In the event that non-disposable equipment is used, samples will be taken during each sampling episode to verify that decontamination procedures being employed are effective. The samples will be collected by pouring laboratory provided deionized (DI) water through decontaminated sampling equipment into the appropriate sample container. The samples will be held and not analyzed, pending any anomalous contamination issues.

Matrix Spikes — Samples will be collected to be split in the lab and run as matrix spike/matrix spike duplicate in an amount equal to at least 5% of the study area samples for laboratory analysis.

4.14.2. QA Samples

Sample QA for the analytical samples will be provided in the field through the use of duplicate samples. QA samples are used to evaluate the contractor's laboratory performance. Duplicate samples are collected as a single sample, which is divided into two equal parts. As shown in Table 4-4, QA samples will be collected at a rate of at least 10% of the field samples collected. Sample collection and preservation requirements are outlined in the QAPP**.**

Table 4-4 - Quantities of Analyses

Analysis	Media	Baseline Samples			
		Field Samples	Spikes (1)	Field Duplicates	Total number of analyses
TCL Explosives	Soil	29	4	4	37

(1) Two samples indicate one MS/MSD pair.

(2) If equipment decontamination is performed, then equipment blank samples must also be collected at a rate of one per day.

4.15. Sampling Equipment Decontamination

In an effort to achieve the highest level of QC, one time use, and disposable sampling equipment will be used whenever feasible. This type of equipment includes sampling gloves, scoops, and pre-cleaned sample jars. Applicable equipment will be decontaminated as discussed in the remainder of the section.

4.15.1. Decontamination Procedures / Sample Contaminant Sources

This section provides instruction on deciding on an appropriate decontamination scheme(s) for the project field sampling equipment in order to prevent or reduce cross-contamination of project samples. The applicability of each step in a decontamination protocol will depend upon factors such as the contaminants present on-site, the subsequent analysis to be performed, and the composition of the sampling devices. The appropriateness of a decontamination protocol is vital to the eventual validity of the analytical results and decisions made based upon those results. All

sampling equipment that has come in contact with a potentially contaminated media must be cleaned prior to the subsequent use of that device. Devices may include bailers, pumps, shovels, scoops, split spoons, tube samplers, and augers. Another approach to minimizing the potential for cross-contamination may be to dedicate or use disposable sampling equipment.

4.15.2. Reagents

The detergent wash is a non-phosphate detergent solution used with brushing or circulating techniques to remove gross contamination and/or used as a mild neutralizing agent. Tap water is considered a rinse-water, preferably from a water system of known chemical composition. Acid rinses are used as the inorganic solubilizing agent or as a mild neutralizing agent. These rinses are a 10% to 1% hydrochloric acid (HCl) or nitric acid (HNO_3) solution prepared from reagent grade acids and DI water, respectively. Solvent rinses are used as an organic solubilizing agent. Requirements for solvent types vary depending upon the nature of known organic contamination requiring solubilization and any impurities present within the rinse that may potentially interfere with or contribute to the subsequent analysis. All solvent rinses used must be of pesticide grade quality. Finally, the DI water is organic-free reagent water. Analyte-free water may be used as deemed appropriate.

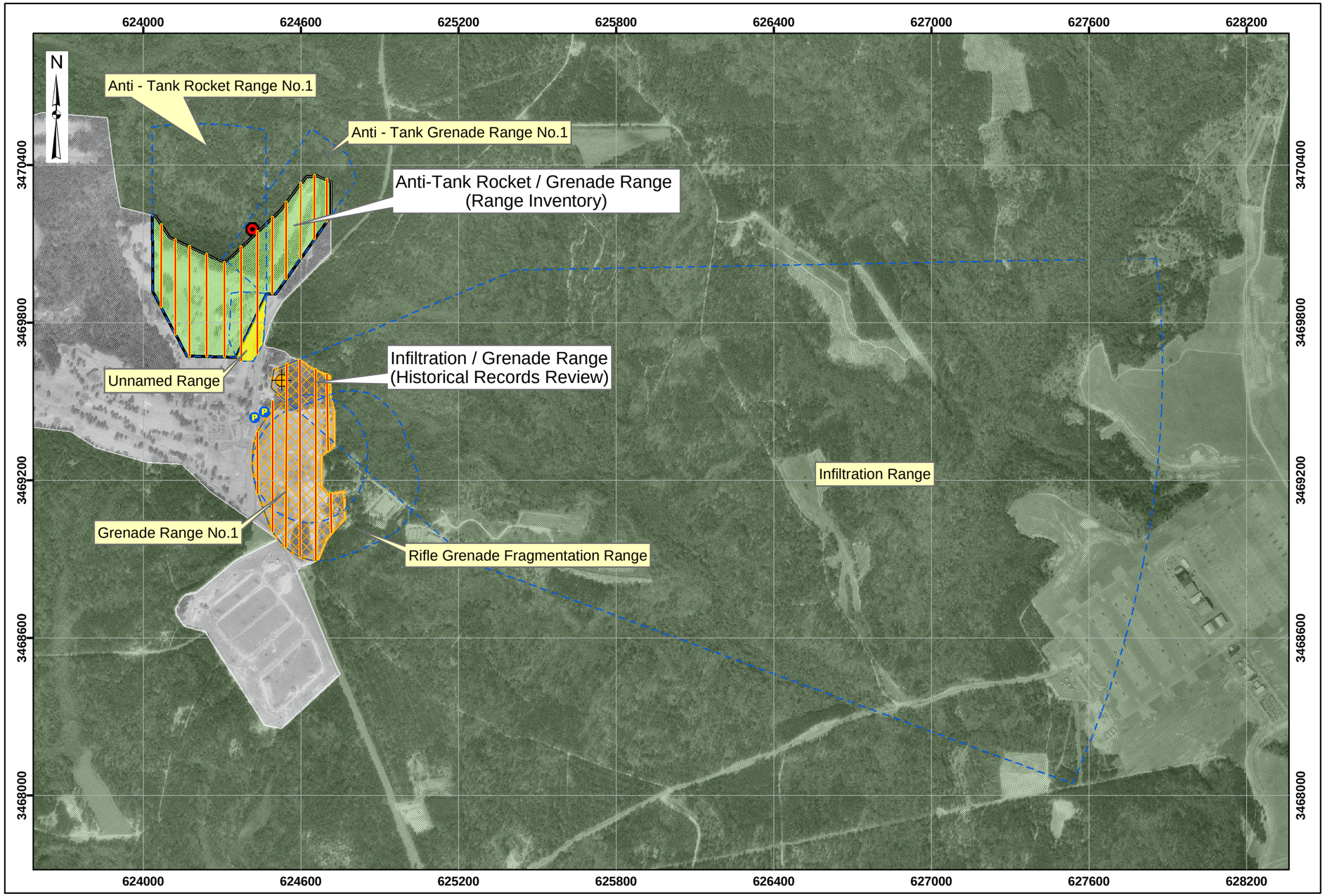
4.15.3. Sample Contaminant Sources and Other Potential Problems

Contaminant carryover between samples and/or from leaching of the sampling devices is very complex and requires special attention. Decisions concerning the appropriateness of the device's material composition must account for these carryover or leaching potentials and whether these contaminants are of concern on the project. Equipment blanks may be used to assess contamination of this nature.

Field Sampling Plan
Fort Rucker, AL

MALCOLM PIRNIE

Map 4-1
Anti-Tank Rocket/Grenade Range &
Infiltration/Grenade Range
Detail Map



Legend

- Installation Boundary
- Operational Range Area
- Non Range, Non UXO-DMM-MC Area

CTT Range Area (Range Inventory)

- MMRP Site (Anti-Tank Rocket / Grenade Range)

CTT Ranges (Historical Records Review)

- MMRP Site (Anti-Tank Rocket / Grenade Range)
- MMRP Site (Infiltration / Grenade Range)
- Range Firing Fans
- Expanded CTT Area
- Firing Point
- Ordnance Find Location
- Photograph Location
- Path of Magnetometer Assisted Site Walk

200 0 200 400 600 Meters

Data Source: USGS. 7.5 Minute Series
Digital Orthophoto Quadrangle
Ozark, AL, 1998
Daleville, AL, 1998

Coordinate System: UTM Zone 16N
Datum: NAD 1983
Units: Meters

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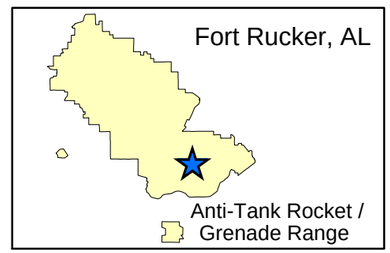
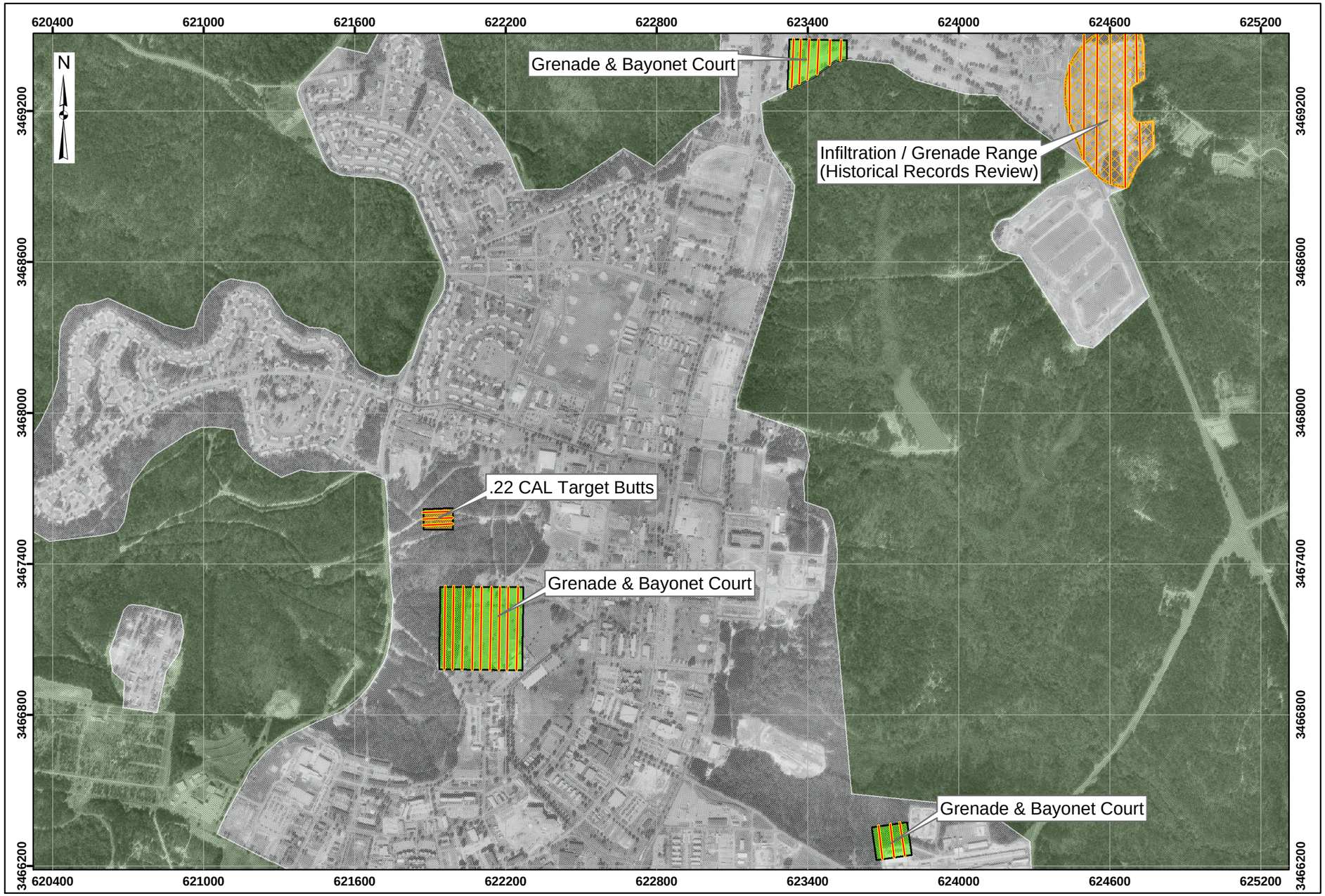


Field Sampling Plan
Fort Rucker, AL



Map 4-2
Grenade & Bayonet Courts
.22 CAL Target Butts
Detail Map

Legend

- Installation Boundary
- Operational Range Area
- Non Range, Non UXO-DMM-MC Area

CTT Ranges (Historical Records Review)

- Grenade & Bayonet Courts
- .22 CAL. Target Butts
- MMRP Site (Infiltration / Grenade Range)
- Path of Magnetometer Assisted Site Walk

200 0 200 400 600 Meters

Data Source: USGS. 7.5 Minute Series
Digital Orthophoto Quadrangle
Ozark, AL, 1998
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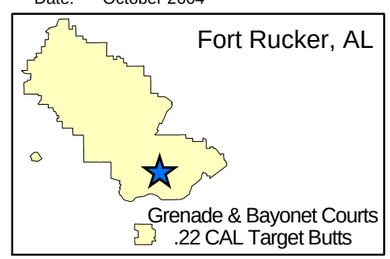

5.0 FIELD OPERATIONS DOCUMENTATION

Field documentation of the samples taken is of the utmost importance in assuring QC. Field documentation will include DQCR, field notebooks, sample labels, and COC forms. All field documentation will be completed in indelible ink. Corrections will be made by drawing a single line through the text and legibly writing the correction.

5.1. Daily Quality Control Report (DQCR)

As described in the QAPP, the DQCR will be prepared by the FPM each day that fieldwork is performed, commencing with the first day work is performed on-site. All workdays will be documented in this report throughout the duration of the fieldwork. Malcolm Pirnie will provide DQCRs to the USACE, Baltimore District Project Manager in the SI report. A sample DQCR form is included as Figure 10-1 in **Appendix C** of the QAPP.

5.2. Field Note Books

Field notes regarding all sampling and field activities will be kept in a bound notebook with pre-numbered pages. Indelible ink will be used for all entries. The field notes will be filled out while the fieldwork is taking place and will include all of the information that is reported on the DQCR forms.

5.3. Sample Numbering Scheme

All samples taken will employ the USACE Laboratory numbering system. This system assures that QC checks originating from the field are blind to the laboratory and that a uniform and consistent numbering system is employed in the field.

All soil samples collected as part of this SI will utilize the following standard designation format:

RUCK - [Sample media] - [Location designation] - [sample date (month)(day)(year)]

The following designations will used for each media:

SS = Soil sample
SD = Sediment sample
SW = Surface water sample
DW = Drinking water sample

e.g., RUCK-SS22-080104

All duplicate samples collected will utilize the following standard designation format:

RUCK - [Sample media] - [Location designation/DUP] - [sample date(month)(day)(year)]

e.g., RUCK-SS22/DUP-080104

All matrix spike/matrix spike duplicate samples collected will utilize the following standard designation format:

RUCK - [Sample media] - [Location designation/MSD] - [sample date(month)(day)(year)]

e.g., RUCK-SS22/MSD-080104

All equipment blank samples collected will utilize the following standard labeling format:

RUCK - [Sample media] - [Location designation/EB] - [sample date(month)(day)(year)]

e.g., RUCK-SS22/EB-080104

5.4. Sample Labels

Correct sample labeling and the corresponding notation of the sample identification numbers in the field notebook, DQCR, and on the COC forms will be utilized to prevent misidentification of samples and their eventual results. All sample labels will be completed legibly with indelible ink. The labels will be affixed to the sample bottle and covered with clear tape.

The sample labels will include the following at a minimum:

a. Project name

b. Company name

c. Name/initials of the collector

d. Date and time of collection

e. Sample location and depth

f. Analysis required

g. Preservatives added

5.5. Chain-of-Custody (COC)

The COC procedures will be in accordance with USACE Sample Handling Protocol and USEPA procedures. COC procedures are used to document and track samples from collection through reporting of analytical results and to serve as permanent records of sample handling and shipment. Strict COC protocol will be maintained for all samples collected during this project. The COC forms will be filled out with indelible ink by the FPM, and any mistakes made will be crossed out with a single line and initialed and dated.

The information on the COC form will include the following:

a. Sample identification numbers

b. Date and time of sample collection

c. Project name and number

d. Number of sample containers

e. Analyses required

f. Turn around time required

g. Preservatives used

h. Signatures of all parties who had possession of the samples

COC forms will be completed for every cooler and will be sealed in a resealable bag and taped to the inside of the lid of the cooler. The FPM will keep one copy of the COC form. The laboratory will then sign the COC upon accepting the samples for analysis. Copies of the COCs will be included in the SI Report as an appendix and given to the USACE, Baltimore District Project Manager upon completion of the field sampling effort.

6.0 SAMPLE PACKAGING AND SHIPPING REQUIREMENTS

Custody of samples must be maintained through out the shipment of samples to the selected laboratory.

The following procedures will be used to send samples to be analyzed for explosive and metals to the laboratory:

- Use waterproof high-strength plastic ice chests or coolers only.
- After filling out the pertinent information on the sample label and tag put the sample in the container and screw on the lid. Secure the bottle lid with strapping tape.
- Tape cooler drain shut.
- Place about three inches of inert cushioning material, such as vermiculite or styrofoam "popcorn", in the bottom of the cooler.
- Enclose the containers in clear plastic bags through which sample labels are visible, and seal the bag. Place containers upright in the cooler in such a way that they do not touch and will not touch during shipment.
- Put in additional inert packing material to partially cover sample containers (more than half-way). Place bags of ice or ice-gel packs around, among, and on top of the sample containers.
- Fill the remaining space in the cooler with cushioning material.
- If sending the samples by common carrier, sign the COC under "Relinquished by", enter the carrier name and air bill number, retain a copy for field records, put the COC record in a waterproof plastic "Ziploc" bag and tape it with masking tape to the inside lid of the cooler.
- If sending the samples by courier or field team shipper, follow the above procedures, but also have the receiving carrier sign under "Received by".
- Apply custody seals to the front and back of the cooler, across the lid.
- Secure lid by taping. Wrap the cooler completely with strapping tape at a minimum of two locations. Do not cover any labels.
- Attach completed shipping label to top of the cooler. The shipping label shall have a return address.
- Ship the cooler by overnight express or courier to the respective laboratory.

The primary laboratory address and POC are noted below:

GPL Laboratories
7210A Corporate Court
Frederick, MD 21703
ATTN: David Howell/Sample Custodian
Phone (301) 694-5310
Fax (301) 620-0731

A secondary laboratory (i.e., back-up) has been selected for the MMRP investigations, which can meet the analytical requirements of this program. The secondary laboratory, which is noted below, will analyze samples ONLY in instances when GPL cannot.

STL Savannah
5102 LaRoche Avenue
Savannah, GA 31404
ATTN: Linda Wolfe/Sample Custodian
Phone (912) 354-7858
Fax (912) 351-3673

Split samples typically collected and sent to the USACE Chemical Quality Assurance Laboratory in Omaha, Nebraska, will not be performed as part of the MMRP investigations.

7.0 INVESTIGATIVE DERIVED WASTES

IDW will not require containerizing or special disposal procedures. Soil cuttings and excess sample material will be returned to the sample hole or boring for backfill purposes immediately after completion of sampling.

Decontamination fluids are not expected since dedicated/disposable field sampling equipment will be used. Used gloves, core liners, and any other disposable sampling equipment or PPE will be double bagged and disposed of off-site as non-hazardous waste.

Attachment A - Project Field Forms

MALCOLM PIRNIE

SOIL SAMPLING LOG

ADMINISTRATIVE DATA			
Project Number		**Date**	
Project Name		**Time**	
Site Location		**Sampler(s)**	
Site Contact		**Others Present**	
Weather Conditions (Temperature, Wind, Humidity, Sky):			

SAMPLE LOCATION DESCRIPTION	
Random / Biased (describe)	
Depth of Sample	
Location Description (GPS?)	
Grab or Composite Sample?	

SOIL SAMPLE	
Sample No.	
Lab Analysis Required	
Sample Collection Time	
Sample Collection Depth	
Sample Collection Device	
Grab or Composite Sample?	

SAMPLE LOG REVIEW INFORMATION
REVIEWED BY: **DATE/TIME:**
NOTES:

MALCOLM PIRNIE

MEC/MULTIPLE ANOMALY DISCOVERY FORM

UXO Safety Supervisor:_____ **Date:**_____

Anomaly ID No. (i.e. FAR A-001)	
Anomaly Longitude X/Latitude Y (Northing and Easting) Feet	
Object length	Inches
Object Diameter/Thickness	Inches
Object Weight (Estimated)	**Lb**
Slope of terrain (Check one box)	☐ **<10°** ☐ **10° to 30°** ☐ **>30**
Vegetation cover (Check one box)	☐ Clear ☐ vegetation ☐ Swamp
Soil type (Check one box)	☐ Sand ☐ Clay ☐ Rock
Inclination	**0° 45° 90° 135° 180°**
Orientation	**N-S NW-SE E-W SW-NE**

Item Description/Justification/Comments

Anomaly type categories (Check Appropriate Box)

☐ **UXO** ☐ **DMM** ☐ **Munitions Debris** ☐ **Practice Ordnance** ☐ **Inert Ordnance**

☐ **Other** ☐ **Metal Waste** ☐ **Sub Surface Anomaly**

Was photo taken? ☐ **Yes** ☐ **No** **File Name:**

Ordnance Positive Identification (If Known, Record Below and record fuze condition and disposition)

Quantity:	**Ordnance Mark/Mod:**	**Nose Fuze Mark/Mod:**	**Tail Fuze Mark/Mod:**

Ordnance Filler: ☐ Explosive ☐ Propellant ☐ Pyrotechnic ☐ Other N.E.W.

Ordnance Category:

☐ **Bombs**	☐ **Clusters/Dispensers**	☐ **Grenades**	☐ **Guided Missiles**
☐ **Land Mines**	☐ **Misc. Explosive Devices**	☐ **Mortars**	☐ **Projectiles**
☐ **Rockets**	☐ **Pyrotechnics and Flares**	☐ **Small Arms**	☐ **Underwater Ordnance**

Fuzing Types

☐ Piezo-Electric	☐ Proximity (VT)	☐ Impact	☐ Base Detonating
☐ All-ways Acting	☐ Electric	☐ Point Detonating (PD)	☐ Influence
☐ Mech long delay	☐ Point-initiating, Base-detonating	☐ Mechanical Time	☐ Pressure
☐ Powder Train Time Fuze (PTTF)	☐ MT Superquick		

Status of MEC/UXO ☐ Armed ☐ Unarmed

Physical Condition of MEC/UXO (Check all that apply) ☐ Broken Open ☐ Filler Visible ☐ Soil Staining ☐ Soil Sample Taken

FOR SUXOSS USE

Disposition: (**Clarify Under Remarks**) ☐ Transport ☐ Leave In Place ☐ Other		**Date:**
Notifications To Installation By:	**Signature:**	**Date**
Transported By:	**Signature:**	**Date:**
Transferred To:	**Signature:**	**Date:**
Storage Location:		
Destroyed By:	**Signature**	**Date:**

Remarks:_____

_____

Signature: _____
SUXOSS

UXO – Ordnance fuzed, armed or otherwise prepared for action and fired or placed in such a manner that it constitutes a hazard
DMM – Ordnance that was disposed of by abandonment; may have been fuzed or armed, but was not employed
Inert – Same physical features as an ordnance item but does not and never did contain energetic material
Munitions Debris – Ordnance material that contained or was in contact with energetic material, which has been expended (e.g., fragments from projectile)

Appendix B: Quality Assurance Project Plan

FINAL
QUALITY ASSURANCE PROGRAM PLAN
MILITARY MUNTIONS RESPONSE PROGRAM
SITE INSPECTIONS

AUGUST 2004

Prepared for:

U.S. ARMY CORPS OF ENGINEERS, BALTIMORE DISTRICT
P.O. Box 1715
Baltimore, Maryland 21203-1715

Prepared by:

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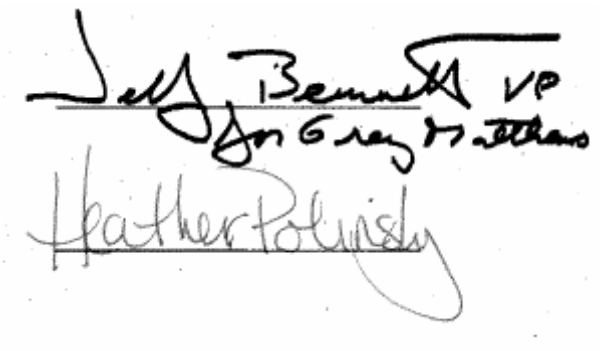
Baltimore, Maryland 21202

FINAL

QUALITY ASSURANCE PROGRAM PLAN
MILITARY MUNITIONS RESPONSE PROGRAM
SITE INSPECTIONS

DoD Contract Number: DACA31-00-D-0043

Reviewed and Approved by:



Gregory P. Matthews, P.E., Vice President
Program Officer
Malcolm Pirnie, Inc.

Heather Polinsky
Project Manager
Malcolm Pirnie, Inc.

Malcolm Pirnie, 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 the 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.

AUGUST 2004

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LIST OF FIGURES
(All located in Appendix B)

LIST OF APPENDICIES

ACRONYMS

CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CRQL	Contract Required Quantitation Limit
CSM	Conceptual Site Model
DoD	Department of Defense
DQCR	Daily Quality Control Report
DQO	Data Quality Objectives
ERIS	Environmental Restoration Information System
FS	Feasibility Study
FSP	Field Sampling Plan
HRR	Historical Records Review
IDL	Instruction Detection Limit
IDW	Investigation Derived Waste
MC	Munitions Constituents
MDL	Method Detection Limit
MEC	Munitions and Explosives of Concern
MMRP	Military Munitions Restoration Program
NELAP	National Environmental Accreditation Program
NFA	No Further Action
PARCC	Precision, Accuracy, Representativeness, Completeness, Comparability
PM	Project Manager
PQL	Practical Quantitation Limit
QA	Quality Assurance
QAO	Quality Assurance Objectives
QAPP	Quality Assurance Program Plan
QC	Quality Control
QCSR	Quality Control Summary Report
RI	Remedial Investigation
RL	Reporting Limit
RPD	Relative Percent Difference
SI	Site Inspection
SOW	Scope of Work
SSC	Site Safety Coordinator
SS-QAPP	Site Specific Quality Assurance Program Plan
TPP	Technical Project Planning
U.S.	United States
USACE	United States Army Corps of Engineers
USAESCH	US Army Engineering and Support Center, Huntsville
USEPA	United States Environmental Protection Agency
WP	Work Plan

1.0 INTRODUCTION

Malcolm Pirnie, Inc. (Malcolm Pirnie) has prepared the following Quality Assurance Program Plan (QAPP) for the Military Munitions Response Program (MMRP) Site Inspection (SI) of MMRP eligible sites at various Army Installations across the United States (US), under US Army Corps of Engineers (USACE) Baltimore District, Contract Number DACA31-00-D-0043.

This QAPP provides general information and standard operating procedures applicable to sampling and analytical activities to be performed at all installations that MMRP SIs are being conducted by Malcolm Pirnie (within USACE, North and South Atlantic Divisions). The information includes definitions and generic goals for data quality and minimum requirements for quality assurance/ quality control (QA/QC) samples. The procedures address sampling and decontamination protocols; geophysical investigation; field documentation; sample handling, custody, and shipping; instrument calibration and maintenance; field and laboratory auditing; data reduction, validation, and reporting; corrective action requirements; and quality assurance reporting. It should be noted that QAPP may include discussions on procedures or methods that are not applicable to a specific site since it is intended to encompass all sites. A Site Specific QAPP (SS-QAPP) will be prepared for each individual installation where a Site Inspection is being conducted by Malcolm Pirnie. The SS-QAPP will serve as addendums to this QAPP and is included as Appendix E of this QAPP. Per the contract, it is intended that once the QAPP is finalized, it will not be modified (except for programmatic changes) and will serve as a programmatic document. Site-specific sampling information and any exceptions or proposed changes to the QAPP will be addressed and included in the SS-QAPP. The majority of information contained in this QAPP should not be repeated in the SS-QAPP. The appropriate EPA Region and State Regulatory Agency method specific reporting limits will be included in each SS-QAPP to ensure that the analytical methods selected can achieve State reporting requirements. The methods specific to each site should specify the appropriate detection limit and reporting limit information. Any deviations from this QAPP (e.g., holding times, detection limits, sampling methods, etc.) should be brought to the attention of the USACE Project Manager.

The SS-QAPP should not be a stand-alone document from this QAPP. The QAPP will provide the majority of the QA/QC information; the SS-QAPP should simply supplement this information by providing for site-specific condition requirements.

2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

Project specific personnel responsibilities will be identified and discussed in detail in the site specific Work Plan. Malcolm Pirnie project personnel and their responsibilities are discussed in Section 5.2 of the Work Plan.

The primary laboratory selected to perform analyses for samples collected at MMRP eligible sites is capable of providing complete environmental analytical services consistent with USEPA protocols, certified under the National Environmental Accreditation Program (NELAP), and validated by the USACE. Detailed information regarding the laboratory personnel, facilities and procedures are presented in Appendix A of this QAPP. In instances when the primary laboratory cannot conduct the analyses, the secondary laboratory (i.e., back-up) personnel, facilities and procedures will be identified in the SS-QAPP.

3.0 QUALITY ASSURANCE AND CONTROL OBJECTIVES

3.1 Introduction

This section discusses quality assurance objectives (QAOs) for the MMRP SI. QAOs are the requirements specifying the quality of the environmental data needed to support the decision-making process. The uncertainty must be maintained at levels that will allow the resultant data to be used for its intended purposes.

The primary goal of the MMRP SI is to collect information necessary to make one of the following decisions:

1. Whether a Remedial Investigation/Feasibility Study (RI/FS) is required at a site,
2. Whether an immediate response is needed, or
3. Whether the site qualifies for no further action (NFA).

3.2 TPP Process

Technical Project Planning (TPP) is used to identify project objectives and design data collection programs to help ensure that the requisite type, quality, and quantity of data are obtained so that informed decisions can be made for site closeout. The TPP process is a critical component of the U.S. Army Corps of Engineers (USACE) quality management system and meets the American National Standard for planning the collection and evaluation of environmental data.

The TPP Process is a comprehensive and systematic process that involves four phases of planning activities. Use of the TPP Process is consistent with the philosophy of taking a graded approach to planning that will produce the type and quality of data needed for site-specific decision making.

3.2.1 Data Quality Objectives

Data Quality Objectives (DQOs) are qualitative and quantitative statements which specify the quality of the data required to support decisions, and are developed to achieve the level of data quality required to meet project goals. DQOs are implemented so the data is legally and scientifically defensible. The development of DQOs for a specific site and measurement takes into account project needs, data uses and types and needs, and data collection. These factors determine whether the quality and quantity of data are adequate for its end use. Sampling protocols have been developed and sample documentation and handling procedures have been identified to realize the required data quality.

The TPP session conducted for each SI is intended to establish the site-specific DQOs. The results of the TPP are incorporated into the Field Sampling Plan (FSP), SS-QAPP, and the Work Plan (WP) for the site location (TPP memo is Appendix I of the WP). The DQOs discussed below will be developed for the SI, either as an element of the HRR, TPP, or during completion of the Work Plan.

3.2.2 Identify Decision Types

Stage 1 of the DQO process should identify and involve the data users, evaluate all available information, and specify investigation goals and decisions.

3.2.2.1 Data Users

Due to the interdisciplinary nature of environmental investigations and/or sampling, it becomes important that all personnel involved with the investigation be identified, including individuals associated with collecting and analyzing environmental samples, and individuals at the regulatory agencies that will review investigative results. The SS-QAPP will identify the individuals responsible for data collection and data quality.

3.2.2.1.1 Data Quality for Sample Analysis

A number of factors relate to the quality of data and its adequacy for use in the corrective action process, including the following considerations:

Age of the data;
Analytical methods used;
Detection limits of method; and
QA/QC procedures and documentation.

3.2.2.1.2 Data Quality for Sample Collection

Methods used for sample collection are as important to consider as the methods used for sample analysis. These considerations fall into two broad categories: statistical and SOPs. The statistical considerations relate to the representativeness of the data and the level of confidence that may be placed in conclusions drawn from the data.

Following SOPs ensure sample integrity and data comparability and reduces sampling and analytical error. Typical issues to consider include the following:

Sampling objective and approach;
Sample collection methods;
Chain-of-Custody documentation;
Sample preservation techniques;
Sample shipment methods; and
Holding times.

If limited or no information exists on sample collection, preservation techniques, or holding times, the data should be interpreted with caution, if they can be accepted at all.

3.2.2.1.3 Data Adequacy

The uncertainty associated with each data measurement activity should be considered when data are evaluated. Although data may be validated analytically, the level of precision of a particular data point may not provide sufficient certainty for use in a

decision. The uncertainty associated with a decision is a function of the statistical distribution of the factors that were used in reaching the decision. Assessment of data adequacy has two steps. The first step is data validation. The second step is determining if the data is sufficient to reduce the uncertainty surrounding a decision to an acceptable level.

Data validation identifies invalid data and qualifies the usability of the remaining data. The output of data validation is qualitative or quantitative statements of data quality. Once the quality of individual measurements is known, a compilation of all data points into a cohesive statement can be made. The confidence associated with a statement incorporates both the confidence in individual measurements as well as in the decision.

3.2.2.1.4 Conceptual Model

Conceptual site models (CSMs) describe a site and its environs and present hypotheses regarding the contaminants present, their route of migration, and their potential impact on sensitive receptors. For the Army SIs, a CSM is developed as a component of the HRR. The hypotheses are tested, refined and modified throughout the investigation.

3.2.3 Identify Data Uses and Needs

Stage 2 of the DQO process defines data uses and specifies the types of data needed to meet the project objectives. This process begins when the project objectives are established. The CSM and TPP become the basis for determining data uses and data needs. Stage 1 determines if existing data meet the project objectives. If the existing data are sufficient, there is no need to collect additional data. If the data are insufficient, the types, quality, and quantity of data that must be collected are determined in Stage 2.

3.2.3.1 Identifying Data Quality Needs

The identification of data uses and data types must be defined during the initial phases of the investigation. As the project proceeds and more data becomes available, data types may change.

3.2.3.1.1 Appropriate Analytical Levels

The following analytical levels can be used as a guidance to help achieve data types:

Level I - field screening or analysis using portable instruments. Results are often not compound specific and not quantitative but results are available in real-time.

Level II - field analyses using more sophisticated portable analytical instruments (i.e., mobile or on-site lab). There is a wide range in the quality of data that can be generated, depending on such factors as suitable calibration standards, sample preparation equipment, and the training of the operator. Results are available in real-time or several hours.

Level III - SW-846 routine analytical parameters. All analyses are performed in an off-site laboratory following SW-846 protocols. Level III is characterized by rigorous QA/QC procedures and documentation.

Level IV - analytical analysis by pre-approved non-standard methods. All analyses are performed in an off-site approved analytical laboratory. Method development or method modification may be required for specific constituents or detection limits. Level IV should be characterized by rigorous QA/QC procedures and documentation.

Level V - physical property and engineering material analysis by approved standard or non-standard methods. All analyses are performed in an off-site laboratory. QA/QC protocols and documentation may be required for some analyses.

The following analytical types can also be used as a guidance to help achieve data types, and are defined by the USACE as follows:

a. Screening Data with Definitive Confirmation – Screening data are generated by rapid, less precise methods of analysis with less rigorous sample preparation. Sample preparation steps may be restricted to simple procedures such as dilution with a solvent, instead of elaborate extraction/digestion and cleanup. Screening data provide analytical identification and quantification, although the quantification may be relatively imprecise. At least 10% of the screening data are confirmed using analytical methods and QA/QC procedures and criteria associated with definitive data. Screening data without associated confirmation data are not considered to be data of known quality. The QA/QC elements of screening data include the following: sample documentation; chain-of-custody; sampling design approach; initial and continuing calibration; determination and documentation of detection limits; analyte identification; analyte quantification; analytical error determination; and definitive confirmation of at least 10% of the samples.

b. Definitive Confirmation – Definitive data are generated using rigorous analytical methods, such as EPA reference methods. Data are analyte-specific, with confirmation of analyte identity and concentration. Methods produced are tangible raw data (e.g., chromatograms, spectra, digital values) in the form of paper printouts or computer-generated electronic files. Data may be generated at the site or at an off-site location, as long as the QA/QC requirements are satisfied. For the data to be definitive, either analytical or total measurement error must be determined. The QA/QC elements of definitive data include the following: chain-of-custody; sampling design approach; initial and continuing calibration; determination and documentation of detection limits; analyte identification; analyte quantification; QC blanks; matrix spike recoveries; performance evaluation sample results (when specified); analytical error determination (precision of analytical method); and total measurement error determination (over all precision of measurement system).

For each generic data use, several of the analytical levels may be appropriate, and the decision maker needs further criteria to select the most appropriate level. Important criteria driving the decision are the contaminants of concern and the level of concern for each contaminant.

Engineering design typically requires information beyond analytical levels for chemical analyses. Physical property data (viscosity, soil organic carbon, etc.) may be necessary for engineering design, and in all likelihood would require more than one analytical level.

3.2.3.1.2 Action and Target Levels

The action level specifies a concentration above which some form of corrective action may need to be taken. The action level is defined by the regulatory agency to be a health and environmental standard or criteria value. The action level is intimately linked with a target level that defines the level of cleanup for corrective action. Project-specific action levels for activities conducted under the MMRP investigations are specified in the SS-QAPP.

A rough estimate of a target level is necessary to ensure that the chosen analytical methods are accurate at the target level. In addition, knowledge of the target level can influence the number of samples required and the selection of the analytical method.

3.2.3.1.3 Detection Limit Requirements

The action level can directly affect data quality requirements. The sampling and analysis methods used must be accurate at the detection limit. Since sampling accuracy is hard to evaluate or control, it is extremely important that the analytical technique chosen has a detection limit well below the action level. This must be considered when evaluating analytical options.

3.2.3.1.4 Critical Samples

Critical samples are those for which valid data must be obtained to satisfy the objective of the sampling and analysis program. Critical samples may be taken in duplicate, or as appropriate.

3.2.3.1.5 Identify Data Quantity Needs

In the absence of available data, the data users and decision makers will be required to develop a rationale for selecting sampling locations. Questions to guide the data users in selecting appropriate locations could include the following:

a. Do source materials still exist on the soil surface?
b. Is there evidence of soil disturbance or vegetative stress based upon review of aerial photographs?
c. Do geologic features in the area control ground water and surface water flow patterns?

d. Do site conditions favor surficial soil erosion or wind erosion?
e. Are sensitive receptors located in the vicinity of the site?

In situations where data are available, or as new data are added to a database, statistical techniques may be utilized in determining the number of data required.

3.2.4 Design Data Collection Program

Stage 3 of the DQO process entails design of the detailed data collection program for the investigation. The process of addressing elements in Stages 1 and 2, all of the components required for the completion of Stage 3, are available.

3.2.4.1 Assemble Data Collection Components

During Stage 2, specific DQOs were developed by media or sampling activity. The intent of Stage 3 is to compile the information and DQOs developed for specific tasks into a comprehensive data collection program. A detailed list of all samples to be obtained should be assembled in a format which includes phase, media, and sample type, number of samples, sample location, analytical methods, and QA/QC samples (type and number). In addition, a schedule for all sampling activities should be developed in bar chart or critical path method format.

3.2.4.2 Develop Data Collection Documentation

The output of the DQO process is a well defined SS-QAPP. The DQO process provides a framework to ensure that all the pertinent issues related to the collection of data with known quality are addressed. The DQO levels for sampling will be outlined in SS-QAPP documents.

4.0 FIELD SAMPLING TECHNIQUES

4.1 Overview

The following section describes the standard operating procedures (SOPs) that will be followed for sample collection in order that representative samples will be collected. The number of samples for each sample location, including QA and QC samples is provided in the SS-QAPP. Table 4-1, provided below, outlines the types of sample containers and preservatives required for sample collection. All field teams will be required to strictly adhere to the procedures provided in the Work Plan, FSP, QAPP, SS-QAPP, and the Health and Safety protocols provided in the Site Safety and Health Plan. Prior to commencement of field activities, all on-site personnel will be trained in health and safety techniques and site-specific operations.

Each site-specific FSP shall include a project description, sampling rationale, sampling strategy, sample collection and procedures, decontamination of field equipment, and sample documentation.

Note: The sampling procedures outlined below are a generic collection of sampling procedures. The fact that these sampling methods are listed in this document does not mean particular sampling event will be performed under this contract. However, the following SOPs will be followed in the event that such sample collection is necessary.

TABLE 4-1: Analytical Procedure, Holding Times, Preservatives, and Sample Containers

Media / Parameter	Preparation Procedure	Analytical Procedure	Holding Time	Preservative	Container
Water:					
Perchlorate	SOP No. L.13	314.0 / GPL SOP No. L.13 if MCL is 1 ppb. If MCL is less than 1 ppb, sophisticated LC/MS/MS should be used (no EPA Method is assigned yet).	28 days	4 deg C	1L HDPE
Explosives	GPL SOP No. H.8	SW-846 8330 GPL SOP No. S.1	7 days – extraction 40 days - analysis	4 deg. C	(2) 1 Liter amber glass
Metals	GPL SOP No. H.8	SW-846 6010A GPL SOP No. H.10	6 months	HNO_3 to pH < 2 4 deg. C	500 mL HDPE
Soil / Sediment:					
Explosives	GPL SOP No. H.8	SW-846 8330 GPL SOP No. S.1	14 days – extraction 40 days - analysis	4 deg. C	6 ounce wide mouth jar

Metals	GPL SOP No. H.21	SW-846 6010A GPL SOP No. H.10	6 months	HNO_3 to pH < 2 4 deg. C	6 ounce wide mouth jar
Propellants	GPL SOP No. J.28, S.4, and S.7	SW8330, SW8332, and Nitrocellulose (IAAP Method)	14 days	None	6 ounce wide mouth jar

[1]Containers for metals analyses pre-preserved from GPL.

4.2 Sample Collection

Unless otherwise stated, the order of sample collection for groundwater samples will be:

1. Perchlorates.
2. Explosives.
3. Total Metals.

Unless otherwise stated, the order of sample collection for soil samples will be:

4. Explosives.
5. Total metals.
6. Propellants.

Samples collected for perchlorate analysis will be kept separate for other parameters collected; perchlorate samples MUST be kept from temperature extremes and packed in an insulated container using pick "N" pluck foam sections or similar polyurethane insulation.

Samples collected for explosive and metal analyses will be immediately placed in a cooler and held at 4°C. Disposable gloves will be worn by the sampling personnel and changed between sampling points. The information presented in Section 4.2 shall be recorded in the field logbook at the time of sampling.

Sampling equipment will be decontaminated as discussed in Section 4.11. While performing any equipment decontamination, phthalate-free gloves (neoprene or natural rubber) will be worn in order to prevent phthalate contamination of the sampling equipment by interaction between the gloves and the organic solvent(s).

4.3 Geophysical Survey Procedures

The FSP will include a description of the procedures, the advantages and limitations to the technique chosen, the instrumentation, survey design, and data reduction and interpretation.

4.4 Surface Soil and Sediment Sampling Procedures

Please reference the FSP for details on soil and sediment sampling procedures.

4.5 Surface Water Sampling Procedures

Please reference the FSP for details on water sampling procedures.

4.6 Potable Water Sampling

Please reference the FSP for details on potable water sampling procedures.

4.7 Decontamination Procedures / Sample Contaminant Sources

This section provides instruction on deciding an appropriate decontamination scheme (s) for the project field sampling equipment in order to prevent or reduce cross-contamination of project samples. The applicability of each step in a decontamination protocol will depend upon the contaminants present onsite, the subsequent analysis to be performed, the composition of the sampling devices, etc. The appropriateness of a decontamination protocol is vital to the eventual validity of the analytical results and decisions made based upon those results. All sampling equipment that has come in contact with a potentially contaminated media must be cleaned prior to the subsequent use of that device. Devices may include bailers, pumps, shovels, scoops, split spoons, tube samplers, augers, etc. Another approach to minimizing the potential for cross-contamination may be to dedicate or use disposable sampling equipment.

4.7.1 Reagents

The detergent wash is a non-phosphate detergent solution used with brushing or circulating techniques to remove gross contamination, and/or as a mild neutralizing agent. Tap water is considered a rinse-water, preferably from a water system of known chemical composition. Acid rinses are used as the inorganic solubilizing agent, or as a mild neutralizing agent. These rinses are a 10-percent to 1-percent Hydrochloric Acid (HCl) or Nitric Acid (HNO_3) solution prepared from reagent grade acids and deionized water, respectively. Solvent rinses are used as an organic solubilizing agent. Requirements for solvent types vary depending upon the nature of known organic contamination requiring solubilization; and any impurities present within the rinse which may potentially interfere or contribute to the subsequent analysis. All solvent rinses used must be of pesticide grade quality. Finally, the deionized water is organic-free reagent water. Analyte-free water may be used as deemed appropriate.

4.7.2 Procedure clarifications/exceptions

The detergent wash is used in conjunction with scrubbing for gross contamination removal, followed by the appropriate rinses. For cleaning of pumping equipment or devices with inaccessible internal mechanisms, suggest circulating/flushing the system with the applicable solutions in the order given below. Solvent rinses for pumping equipment should be limited to a 10-percent dilution (vol./vol.) of acetone or isopropyl alcohol in water. Tubing used with peristaltic pumps may be flushing with hexane or dilute HCl, followed by a distilled water rinse depending on contaminants noted onsite. The decontamination of low carbon steel sampling devices should limit the acid rinse to a dilute 1-percent acid solution. All sampling equipment should be allowed to air dry prior to the next use. For this reason it is important to have sufficient sampling devices onsite which may be alternated. This practice will allow a thorough air drying of equipment without increasing sampling downtime. Alternatively, larger equipment (e.g., drill rig

components, power augers, etc.) may be cleaned with a portable power washer or a steam cleaning machine in lieu of the protocols outlined above. Finally, depending upon the project, it may be appropriate to contain spent decontamination fluids and arrange for eventual disposal as investigation derived wastes (IDW). In these cases, it is important that these containers be suitable for the eventual disposition of the materials, and therefore complies with any potentially applicable regulations.

4.7.3 Sample Contaminant Sources and Other Potential Problem

4.7.3.1 Carryover and leaching

Contaminant carryover between samples, and/or from leaching of the sampling devices, is very complex and requires special attention. Decisions concerning the appropriateness of the device's material composition must account for these carryover or leaching potentials, and whether these contaminants are of concern on the project. Equipment blanks may be used to assess contamination of this nature.

4.7.3.2 Adsorption

Contaminant adsorption is another problem which must be considered when deciding on an applicable sampling device or the appropriate composition material. This phenomenon is more critical when sampling an aqueous or gaseous media, due to the capability of lower levels of contaminant detection and the fact that the fluid matrix is more apt to potential contaminant transfer. PVC and other plastics are known to sorb organics and to leach plasticizers and phthalate esters. Polypropylene, and other thermoplastics, have been shown to sorb organics and environmental mercury efficiently, and should therefore be avoided in sampling devices, especially tubing. For these reasons, PTFE is commonly chosen over the PVC and plastics when working with organic or mercury contaminants. In addition, some pesticides and halogenated compounds preferentially adsorb to glass surfaces. For this reason, it is recommended that when taking aqueous samples, the sample container NOT be rinsed prior to sample collection; and the same container be rinsed with the extraction solvent after the sample has been quantitatively transferred to an extraction apparatus. Inorganics (metals) adsorption to containers is dependant upon the specific metal element, the concentration, pH, contact time, complexing agents present, and container composition. This is believed to be nominal and proper preservation of samples should prevent this. In deciding appropriate tubing to be used for aqueous sample acquisition, it is important to decide applicable material composition and diameter based upon the contaminant and the purpose of the data. Adsorption is less likely to occur when there is an increase in tubing diameter.

5.0 GEOPHYSICAL INVESTIGATION

5.1 Navigation

Positional precision and accuracy is required for geophysical investigations at MMRP eligible sites. Since detection and removal of buried MEC is a multi-stage process, it is important that positional information gathered at one stage be useable at the next stage. This means that all data collected at each stage must be tied to a common positional system. The positional system can either be temporary or permanent. The use of temporary or assumed location systems is strongly discouraged. U.S. Army Engineering and Support Center, Huntsville (USAESCH) recommends that all navigation be based on the local State Grid Plane system. For investigations conducted at MMRP sites, navigation is accomplished either using ropes (traditional method) or GPS. The traditional method is referenced to grid corner stakes surveyed on centers. Marked survey ropes are then placed laterally across each survey grid at evenly spaced intervals. Alternating colored markers on the ropes facilitate straight-line profiling and identify locations for the placement of fiducial marks within the recorded data. The second method of navigation is GPS. It is accomplished with a single GPS sensor mounted over the center of the coil to provide real-time positional tracking capabilities

5.2 Quality Management

The general objective of geophysical investigations during MMRP SI field activities is to efficiently locate buried MEC so that it can be properly evaluated. Specific geophysical investigation objectives of a project are defined by the project team and must be risk-based, measurable, and attainable.

There are two elements which are subject to QA/QC: processes and products. Processes are the project-specific geophysical planning and data collection/data analysis procedures and methods that must be performed. Products are the final project-specific deliverables and results that must be achieved. Both the project processes and the project products must be part of a formal quality management process in order to demonstrate that project quality objectives are met. For investigations conducted at MMRP sites, the data collection and analysis, data storage and preliminary and post processing of the data is described in detail in the subcontractors SOP located in Appendix A of this QAPP.

To ensure process quality management the project team must periodically check the geophysical data provided by the project team to assure positional accuracy, proper instrument calibration, and analysis confirmation.

6.0 SAMPLE RECEIPT, HANDLING, AND CUSTODY PROCEDURES

6.1 Overview

Sample custody during the field investigations will be performed in three phases. The first phase encompasses sample collection, pre-laboratory treatment procedures (preservation), packaging, and shipping field custody procedures. The second custody phase involves sample shipment, where mode of shipment, airbill numbers, dates and times are documented. The third phase involves the custody procedures employed by the laboratory. All three phases of sample custody will be performed to provide that:

- All samples are uniquely identified;
- The correct samples are tested and are traceable to their source;
- Important sample characteristics are preserved;
- Samples are protected from loss, damage, or temperature extremes; and
- A record of sample integrity is established and maintained through the entire custody process.

6.2 QA/QC Requirements

6.2.1 Field Notebook -Corrections to documentation

All original data recorded in field logbooks and on sample labels, chain of custody records, and receipt for samples forms are written in waterproof ink. If an error is made on an accountable document, corrections should be made simply by crossing out the error and entering the correct information. The erroneous information should not be obliterated. Any error discovered on a document should be corrected by the person who made the entry. All corrections must be initialed and dated.

6.2.2 Photographs

The photographer should review the photographs and compare them with the photographic log to confirm that the log and photographs match.

6.2.3 Sample Labels - Potential Problems

Although most sample labels are made with water-resistant paper and are filled out using waterproof ink, inclement weather and general field conditions can affect the legibility of sample labels. It is recommended that after sample labels are filled out and affixed to the sample container, the label should be covered with wide clear tape. This will preserve the label and keep it from becoming illegible. In addition to label protection, chain of

custody and analysis request forms should be protected when samples are shipped in iced coolers. Typically, these forms should be placed inside a Ziploc bag or similar waterproof protection and taped to the inside lid of the secured shipping container with the samples.

6.2.4 Corrective Action

Corrective actions are those measures taken to rectify a laboratory or field measurement system that does not comply with this QAPP. The need for corrective action may be identified by system or performance audits or by standard QC procedures. The essential steps in the corrective action system are:

- Identifying and defining the problem.
- Assigning of responsibility for investigating the problem.
- Investigating and determining the cause of the problem.
- Determining a corrective action to eliminate the problem.
- Assigning and accepting responsibility for implementing the corrective action.
- Implementing the corrective action and evaluating its effectiveness.
- Verifying that the corrective action has eliminated the problem.

6.3 Field Corrective Action

At the end of each sampling day, the sampling team shall report any problems requiring corrective action which were encountered during the day. Corrective action will be undertaken when a non-conforming condition is identified. A non-conforming condition occurs when QA objectives for precision, accuracy, completeness, representativeness or comparability are not met, or when procedural practices or other conditions are not acceptable. A report shall be filed which documents the problems encountered and the corrective action implemented. A stop-work order may be issued by the Project QA/QC Coordinator, upon authorization by the Project Manager, if corrective action does not adequately address a problem, or if no resolution can be reached.

6.4 Laboratory Corrective Action

If a particular analysis is deemed "out-of control," corrective action will be taken to ensure continued data quality. Actions which may be taken include, but are not limited to:

- Rechecking calculations;
- Checking QC data on other samples;
- Auditing laboratory procedures;
- Reanalyzing the sample if the holding time requirements have not been exceeded;

- Accepting data with the acknowledged level of uncertainty; and
- Discarding data.

The coordinator of the laboratory's analytical section will be responsible for initiating laboratory corrective action when necessary. Recommendations for corrective actions outside the laboratory will be made by the laboratory QA Manager to the Project Manager within 48 hours of corrective action. Corrective action procedures specific to GPL are described in the LQAM located in Appendix A of this QAPP.

7.0 ANALYTICAL PROCEDURES

7.1 Preventative Maintenance

A preventative maintenance program is necessary to help prevent delays in project schedules, poor output performance or erroneous results in investigative operations. Preventative maintenance on laboratory analytical equipment used in this program will be performed contractually by qualified personnel. Maintenance of field equipment will be performed routinely for sampling events. More extensive maintenance will be performed based on hours of use, by a qualified servicing organization. Repairs, adjustments and calibrations will be recorded.

7.1.1 Field Equipment

The three elements of the field equipment maintenance program include normal upkeep of equipment, service and repair (when required), and formalized record-keeping of all work performed on each piece of equipment. This section addresses the normal equipment upkeep element of the maintenance program. For most of the equipment, normal maintenance will consist of cleaning outside surfaces, lubrication of all moving parts, and, if applicable, a battery level check and recharge or replacement as necessary. This program will include the maintenance of all monitoring, measuring, and test equipment returning from use or any equipment used on a daily basis. The frequency of maintenance checks will be dependent on the individual needs and use of each piece of equipment. Maintenance procedures will be only those necessary for keeping an instrument in service or in preparation for everyday use. It is beyond the scope of this document to cover repair procedures for each piece of equipment. Repair problems will be referred to the manufacturer or other qualified servicing organization.

The Project QA/QC Coordinator, or the designated task leader, will be responsible for keeping all maintenance records, making sure all equipment used is maintained properly, informing field team members of any specific maintenance requirements for equipment used at the site and shipping any instrument in need of repair to the correct source.

The field personnel responsibilities include maintaining each piece of equipment located at the site and the maintenance of equipment after use. A record of equipment maintenance and repair will be kept in the field logbook.

Equipment used during the geophysical investigations will be in accordance with maintenance procedures outlined in the geophysical SOP documented located in Appendix B of this QAPP.

7.1.2 Rental Equipment

Rental equipment used on the project will be obtained only from a certified rental supplier. The equipment will require a pre-receipt to verify accuracy, maintenance and up-keep of the equipment. A receipt indicating that the equipment has been checked upon return will be required as well.

7.1.3 Laboratory Equipment

An important factor in maintaining accuracy and precision, achieving required holding times, and addressing contract schedule is preventive maintenance. As part of the laboratory's maintenance program, service contracts are held on critical analytical instruments. Information regarding routine maintenance performed on laboratory equipment is described in the GPL SOP documents located in Appendix A of this QAPP.

7.2 Calibration Procedures & Frequency

Measuring and test equipment shall have an initial calibration and shall be recalibrated at scheduled intervals against certified standards that have known and valid traceability to recognized national standards. Calibration intervals for each item shall be, at a minimum, in accordance with manufacturer's recommendations as defined in the equipment manual. Test equipment used for calibration of sensors shall themselves be recalibrated at least once a year or when maintenance or damage indicates a need for recalibration.

Calibration standards shall be maintained and used in an environment with temperature, humidity, and cleanliness controls that are compatible with the accuracy and operating characteristics of the standards. An inspection will be made during the equipment calibration to evaluate the physical condition of the equipment. The purpose of the inspection is to detect any abnormal wear or damage that may affect the operation of the equipment before the next calibration. Equipment found to be out of calibration or in need of maintenance or repair will be identified and removed from service.

The Project QA/QC Coordinator shall be notified if the test equipment is found to be out of tolerance during inspection and calibration. The corrective actions to be taken include evaluating the validity of previous inspection or test results; evaluating the acceptability of the items inspected or tested since the last calibration check; and repeating the original inspections or tests using calibrated equipment when it is necessary to establish the acceptability of previous inspections or tests. Specifics regarding QC checks and verification of field equipment stability are located in Appendix A of this QAPP.

Each item of measuring and test equipment in the calibration program shall be identified in such a way as to show its calibration status and calibration expiration date. Equipment history records for measurement and test equipment shall be used to indicate calibration status and conditions, corrections to be applied, results of in-service checks, and repair history. This will provide a basis for establishing calibration frequencies and for remedial action if the instrument is found out of calibration.

Laboratory instrumentation calibration procedures, frequency, and standards will be consistent with the requirements of the applicable analytical method. Information regarding laboratory calibration procedures is presented in the GPL SOP documents located in Appendix A of this QAPP. If the secondary (i.e., back-up) laboratory is used, that laboratories analytical SOPs will be included as an attachment to the SS-QAPP documents.

7.3 Laboratory QC Procedures

This section should identify the specific internal QC measures to be used by the laboratory when performing the analytical tests. Type and frequencies of specific QC samples performed by the laboratory are dependent upon analytical requirements specific to the method analyzed. Internal QC methods require performance on a sample batch basis and include analyses of method blanks, laboratory control samples, and actual environmental samples as duplicates, matrix spikes, and matrix spike duplicates. Additional QC is incorporated into the analytical sequence. All analyses shall include the following QC procedures, where applicable:

TABLE 7-1: QC Procedures

Procedure	Frequency
Calibration	As required
Standards	Daily
Method Blanks	Daily
Duplicates	5%, per batch, or per analytical run
Matrix Spikes	5%, per batch, or per analytical run
Surrogates	Each sample
QC Check Samples	Daily

7.4 Field Quality Control

The QC checks employed for field instruments include the following:

TABLE 7-2: QC Checks

QC Method	Purpose	Frequency
Calibration Check	Ensures proper working order of field instrument.	Daily
Field Duplicate Sample	Measures accuracy and sensitivity.	One per ten samples
MS/MSD	Measures instrument precision.	One per twenty samples (minimum of 1 MS and MSD per site)
Field Rinsate Blanks	Measures cross-contamination	Daily as required*

*In the event that non-disposable/dedicated equipment is used equipment rinsate samples will be collected at a rate of one per day.

7.5 Quality Control Samples

The QA/QC samples that will be required for the sampling program shall be identified in the FSP documents. The types of QA/QC samples are described below:

Field Sample - The total sample collected at a specific site location. This sample may be any matrix and may be divided to provide material for QA/QC analysis.

Quality Control (QC) Samples - Samples analyzed to help identify potential problems related to sample collection or analysis. QC samples include replicate and split samples, trip blanks, rinsate blanks and filtration blanks.

Quality Assurance (QA) Samples - Split samples sent to the secondary (i.e., back-up) laboratory for analysis to evaluate the primary laboratory's performance. QA samples represent approximately 10% percent of the field samples. The collection of QA samples is not anticipated.

Matrix Spike/Matrix Spike Duplicates - Aqueous VOC and extractable organic samples collected at three times their standard volume at the frequency of approximately five percent (5%) of the field samples. After sample analysis, the additional sample volume is spiked with a known quantity and reanalyzed. The percent recovery will be used to calculate accuracy. The relative percent difference (RPD) for each component will be used to calculate precision.

Split Samples - Samples collected as a single sample, homogenized, divided into two or more equal parts and placed into separate containers. The sample shall be split in the field prior to delivery to the laboratory. Split samples will be taken at a frequency of approximately 10% per matrix.

Replicate (duplicate, triplicate, etc.) Samples - Multiple grab samples, collected separately, that equally represent a medium at a given time and location. This is the type of co-located sample required for volatile organic analyses and most ground water and surface water samples. Replicate samples will be taken at a frequency of approximately 10% per matrix.

Filtration Blank - When groundwater samples are filtered prior to collection and analysis, a filtration blank is collected. Deionized water is run through a clean filter and submitted as a blank sample to assess the potential for contamination by the filter/filtration process. The filter shall be identical as those used for the field sample filtering.

Field Rinsate Blank - Samples collected from a final rinse of sampling equipment with deionized demonstrated analyte-free water after the decontamination procedure has been performed. The purpose of the field rinsate blank is to determine whether the sampling equipment is causing cross-contamination of samples. The frequency of field blank collection is dependent on the number of decontamination events; i.e., one field blank per decontamination event per equipment type. The number of field blanks should not exceed one per day. Field blanks must be preserved in the same manner as aqueous environmental samples.

Deionized Demonstrated Analyte-Free Water - Deionized demonstrated analyte-free (DI) water is water of a known quality which has been demonstrated through analysis not to possess any contaminants of concern at levels greater than the CLP contract required quantitation limits (CRQLs), as defined in the current CLP Statements of Work (SOW). DI water is used in the final rinse step of decontamination and in the preparation of field rinsate blanks.

7.6 Performance And System Audits

Audits will include a careful evaluation of both field and laboratory quality control procedures and will be performed before or shortly after systems is operational. The audits will be conducted by an individual who is technically knowledgeable about the operation(s) under review. Systems audits provide a quantitative measure of the quality of the data produced by one section or the entire measurement process. Performance audits are conducted by introducing control samples into the data production process. These control samples may include performance evaluation samples, field samples spiked with known amounts of analyte, and split field samples that are analyzed by two or more analysts within or without the organization. Systems audits are onsite qualitative inspections and reviews of the quality assurance system used by some part of or the entire measurement system. The audits are performed against a set of requirements, which may be a quality assurance project plan or work plan, a standard method, or a project statement of work. The primary objective of the systems audits is to ensure that the QA/QC procedures are being followed.

7.6.1 Field Audit Procedures

Field performance audits will be conducted on an ongoing basis during the project as field data are generated, reduced, and analyzed. All numerical manipulations, including manual calculations, will be documented. All records of numerical analyses will be legible, of reproduction-quality, and sufficiently complete to permit logical reconstruction by a qualified individual other than the originator.

Indicators of the level of field performance include the analytical results of the blank and replicate samples. Each blank analysis will be considered an indirect audit of the effectiveness of measures taken in the field to ensure sample integrity (e.g., field decontamination procedures). The results of the field replicate analyses are an indirect audit of the ability of each field team to collect representative sample portions of each matrix type.

System audits of site activities will be accomplished by an inspection of all field site activities. During this audit, the auditor(s) will compare current field practices with standard procedures. The following elements will be evaluated during a field system audit:

- All activities conducted in accordance with the Work Plan;
- All procedures and analyses conducted according to procedures outlined in the QAPP;
- Sample documentation;
- Working order of instruments and equipment;
- Level of QA conducted per each field team;
- Contingency plans in case of equipment failure or other event preventing the planned activity from proceeding;
- Decontamination procedures;
- Level of efficiency with which each team conducts planned activities at one site and proceeds to the next; and
- Sample packaging and shipment.

After completion of the audit, any deficiencies will be discussed with the field staff and corrections identified. If any of these deficiencies could affect the integrity of the samples being collected, the auditor(s) will inform the field staff immediately, so that corrections will be implemented immediately. The audit will be performed by the Project QA/QC Coordinator or the Site Field Manager. The audit form is presented as Figure 7-4 located in Appendix B of this QAPP.

7.6.2 Laboratory Audit Procedures

7.6.2.1 Systems/Internal Audits

As part of its Quality Assurance Program, the Laboratory Quality Assurance Manager shall conduct periodic checks and audits of the analytical systems. The purpose of these is to ensure that the analytical systems are working properly and that personnel are adhering to established procedures and documenting the required information. These checks and audits will also assist in determining or detecting where problems are occurring.

The Quality Assurance Manager will periodically review laboratory control samples. These samples will check the entire analytical method, the efficiency of the preparation method and the analytical instrument performance. The results of the control samples are

reviewed by the Quality Assurance Manager. The Quality Assurance Manager reports the results to the analyst and the Laboratory Manager. When a problem is indicated, the Quality Assurance Manager will assist the analyst and laboratory management in determining the reason and in developing solutions. Rechecking of systems will be conducted by the Quality Assurance Manager as required.

7.6.2.2 Performance and External Audits

In addition to conducting internal reviews and audits, as part of its established Quality Assurance program, the laboratory is required to take part in regularly scheduled Performance Evaluations and laboratory audits from State and Federal agencies. These are conducted as part of certification processes and to monitor the laboratory performance. These provide an external quality assurance check of the laboratory and provide reviews and information on the management systems, personnel, SOPs, and analytical measurement systems. Acceptable performance on evaluation samples and audits is required for certification and accreditation. The laboratory shall use the information provided from these audits to monitor and assess the quality of its performance. Problems detected in these audits shall be reviewed by the Quality Assurance Manager and laboratory management and corrective action shall be instituted as necessary.

7.7 Nonconformance And System Audits

A nonconformance is defined as an identified or suspected deficiency in an approved document (e.g., technical report, analysis, calculation, computer program); an item where the quality of the end item itself or subsequent activities using the document or item would be affected by the deficiency; or an activity that is not conducted in accordance with the established plans or procedures. Any staff member engaged in project work that discovers or suspects a nonconformance is responsible for initiating a nonconformance report (see Figure 7-5 in Appendix B). The Project QA/QC Coordinator shall evaluate each nonconformance report and shall provide a disposition, which describes the actions to be taken. The Project Manager shall ensure that no further project work dependent on the nonconforming item or activity is performed until approval is obtained and the nonconformance report is closed out. If the nonconformance is related to material, the Project Manager shall be responsible for marking or identifying, with the nonconformance report number, the nonconforming item (if practical) and indicating that it is nonconforming and is not to be used.

Samples that are analyzed prior to the resolution of a nonconforming event will be resampled, and/or reanalyzed once the corrective action has been demonstrated to be effective.

A copy of each closed nonconformance report shall be included in the quality assurance file. Copies of all nonconformance reports shall be maintained by the Project QA/QC Coordinator.

7.8 Routine Laboratory Analyses

The analytical procedures for samples collected will follow those specified in Figures 7-1 through 7-3 provided in Appendix B. The sample holding time requirements are noted on Table 4-1. The proposed analytical methods shall be identified in the SS-QAPP documents. Test Methods for Evaluating Solid Waste, USEPA Office of Solid Waste, SW-846, 3rd Edition, Revision No. 2, June 1990; Methods for Chemical Analysis of Water and Wastes, USEPA Office of Research and Development, March 1983; and American Society for Testing Materials, Annual Book of ASTM Standards are incorporated by reference into this QAPP for the purpose of describing the standard analytical methods. The instrument and method detection limits and reporting limits specific to GPL laboratory is included in Appendix A of this QAPP. In instances where detection and/or reporting are revised due to updates, modifications to GPLs SOPs, and/or changes in instrumentation, the revised detection and reporting limit information will be included in the Site-Specific SS-QAPP documents.

Laboratories providing analytical support must be certified by the State Regulatory Department, NELAP, and USACE validation programs. If the laboratory's state or federal certifications expire during MMRP investigations, the laboratory must follow the appropriate procedures to maintain certifications.

In the event that analytical parameters are not validated by either the State Regulatory Department and/or the USACE through the performance of proficiency samples and on-site audits, laboratory SOPs will be forwarded to the USACE chemist and state regulatory personnel for review during the stages of the work plan development.

7.9 Extraction Efficiencies

The method chosen for analyses are the standard analytical methods used within the laboratory industry. The analytical data generated by these standard methods provide information used to make critical decisions at the site. As part of the method, sample preparation or extraction techniques prepare the sample prior to analysis. A way to measure the "integrity" of the method is to introduce known amounts and concentrations of known compounds and subject them to the extraction and analysis procedures outlined in the method. These added compounds are measured after analysis and represent the response of the unknown compounds in the sample. The analytical results provide a tool to measure the extraction efficiency of a particular analysis.

7.10 Method Detection Limits And Quantitation Limits

Analyte and associated detection and quantitation limits are presented by method in Appendix A of this QAPP. Actual detection and quantitation limits for specific samples will vary depending on the amounts and types of compounds present in the sample. A significant concentration of one compound may require that the sample be diluted, which increases the detection limits and sample quantitation limits accordingly. In addition, the occurrence of one compound may interfere with the detection of other compounds.

The Method Detection Limit (MDL) is a level at which the analytical procedure referenced is capable of determining with a 99% probability that the constituent is present. The procedure for determining the MDL includes the complete analytical procedure, including any sample preparation such as extractions and digestions. This procedure involves the replicate analysis (seven replicates as a minimum) of a sample with an analyte concentration near, but greater than zero. The standard deviation at this concentration is then calculated.

The Instrument Detection Limit (IDL) establishes the noise level of the instrument under routine operating conditions.

The Practical Quantitation Limit (PQL) establishes a limit with a higher level of precision than associated with the detection limit, but does not represent the lowest achievable detection limit. The PQL is usually the laboratories reporting limit.

The current detection and reporting limit information is presented in Appendix A of this QAPP. In instances where detection and reporting limits are revised due to updates, modifications to GPLs SOPs, and/or changes in instrumentation, the current detection and reporting limit information will be included in the Site-Specific SS-QAPP documents.

8.0 DATA REDUCTION / CALCULATION OF DATA QUALITY INDICATORS

8.1 Data Reduction

8.1.1 Field and Technical Data Reduction

Field personnel will record all field data in bound field notebooks and on standard forms. After checking the validity of the data in the field notes, the Site Field Manager or his designee will reduce the data to tabular form, when possible, by entering the data into data files. Where appropriate, the data files will be set up for direct input into the project database. Subjective data will be filed as hard copies for later review by the Project Manager and incorporation into technical reports, as appropriate.

8.1.2 Laboratory Data Reduction

Data reduction is the process by which raw analytical data generated from laboratory instrument systems is converted into usable concentrations. The raw data, which may take the form of area counts, instrument responses or observations, is processed by the lab and converted into concentrations expressed in the parts-per-million (ppm) or parts-per-billion (ppb) range. Raw data from these systems include compound identifications, concentrations, retention times, and data system print-outs. Raw data is usually reported in graphic form, bar-graph form, or tabular form. The laboratories will follow SOPs consistent with the data handling requirements of the applicable methods.

The Laboratory Reporting Limits (RLs) must be less than or equal to those stipulated in the published methods and must be significantly less than the action levels developed for the site investigations. The GPL RLs are presented in Appendix A of this QAPP. In instances where RLs are revised due to updates, modifications to GPLs SOPs, and/or changes in instrumentation, the current RL information will be included in the Site-Specific SS-QAPP documents.

8.2 Precision

Precision is a measure of mutual agreement among individual measurements of the same property, usually under prescribed conditions. Assessing precision measures the random error component of the data collection process. Precision is determined by measuring the agreement among individual measurements of the same property, under similar conditions, and is calculated as an absolute value. The degree of agreement, expressed as the relative percent difference (RPD), is calculated using the formula below.

$$\text{RPD} = \frac{(V_1 - V_2)}{\frac{(V_1 + V_2)}{2}} \times 100$$

where: V1 = value 1
V2 = value 2

Analytical precision is assessed by analyzing matrix spike/matrix spike duplicate pairs and laboratory duplicate samples. Field precision is assessed by measurement of field duplicate samples. The objective for precision is to equal or exceed the precision demonstrated for similar samples and should be with the established control limits for the methods. Precision control limits and QC RPD limits are presented as part of the SS-QAPP documents.

8.3 Accuracy

Accuracy is the degree of agreement of a measurement with an accepted reference or true value. Accuracy measures the bias or systematic error of the entire data collection process. Sources of these errors include the sampling process, field and laboratory contamination, sample preservation and handling, sample matrix interferences, sample preparation methods, and calibration and analytical procedures. To determine accuracy, a reference material of known concentration is analyzed or a sample which has been spiked with a known concentration is reanalyzed. Accuracy is expressed as a percent recovery and is calculated using the following formula:

$$\% \text{ Recovery} = 100 \times \frac{\text{measured value}}{\text{true value}}$$

Recoveries are assessed to determine method efficiency and matrix interference effects. Analytical accuracy is measured by the analysis of calibration checks, system blanks, quality control samples, surrogate spikes, matrix spikes, and other checks required by the selected analytical methods. Sampling accuracy is assessed by evaluating the results of field and trip blanks. Sampling accuracy is also maintained by frequent and thorough review of field procedures. The objective is to meet or exceed the demonstrated accuracy for the analytical methods on similar samples and should be within established control limits for the methods. Accuracy control limits and MS/MSD and surrogate recovery limits are presented as part of the SS-QAPP documents.

8.4 Representativeness

Representativeness expresses the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition. Representativeness is achieved through proper development of the field sampling program. The sampling program must be designed so that the samples collected are as representative as possible of the medium being sampled and that a sufficient number of samples will be collected. The objective of obtaining representativeness of samples will be met through the implementation of the work plan and SS-QAPP documents.

8.5 Sensitivity

Sensitivity is the capability of a method or instrument to discriminate between small differences in analyte concentration. The sensitivity and detection limits for methods applicable to MMRP investigations are presented in Appendix A of this QAPP.

8.6 Comparability

Comparability expresses the confidence with which one data set can be compared to another. Comparability cannot be described in quantitative terms, but must be considered in designing the sampling program. Thus, this objective will be met by using standard methods for sampling and analyses and by following techniques and methods set forth in the project specific work plan and SS-QAPP documents.

8.7 Completeness

Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under normal conditions. Data is complete and valid if it meets all acceptance criteria including accuracy, precision, and any other criteria specified by the particular analytical method being used. Completeness is calculated as follows:

$$\% \text{ Completeness} = 100 \times \frac{V}{n}$$

where: V = number of measurements judged valid
n = total number of measurements

The objective is to generate a sufficient database with which to make informed decisions. To help meet the completeness objective, every effort must be made to avoid sample loss through accidents or inadvertence. The completeness objective for each project is stated in the SS-QAPP documents.

9.0 DATA ASSESSMENT PROCEDURES

9.1 Data Verification/Validation

9.1.1 Field and Technical Data Validation

Validation of objective field and technical data will be performed at two different levels. The first level of data validation will be performed at the time of collection by following standard procedures and quality control checks. The Site Field Manager who will review the data to ensure that the correct codes and units have been included will complete the second level of data validation. After data reduction into tables and arrays is complete, the Field Manager will review data sets for anomalous values. The Project Manager, who will review field reports for reasonableness and completeness, will validate subjective field and technical data. In addition, the Field Manager and/or Site QA/QC Coordinator will make random checks of sampling and field conditions.

9.1.2 Analytical Data Validation

The laboratory shall review data prior to its release from the laboratory. The analytical method performance will be determined by an examination of precision, accuracy, and completeness, as discussed in Section 8.0, as well as a review of the following quality controls:

- Method Blanks: Measure of laboratory contamination and accuracy.
- Laboratory Duplicates: Measure of laboratory precision.
- Field Duplicates: Measure of field sampling and laboratory precision.
- Matrix Spikes: Measure of laboratory accuracy and any sample matrix effects.
- Surrogate Spike Recoveries: Measure of laboratory accuracy.
- Laboratory Control Samples: Measure of laboratory accuracy.

The laboratory is required to evaluate their ability to meet these objectives. Outlying data shall be flagged in accordance with laboratory SOPs and corrective action shall be taken to rectify the problem. The laboratory case narratives shall describe how the data did or did not meet the method criteria and must describe the overall quality of the data and whether or not the data are valid and usable.

In order to ensure the analytical data generated by the laboratory are accurate, members of the project team will review the electronic data deliverable from the laboratory to ensure that the data submitted electronically correspond to the hard copy results in the laboratory data deliverable. The SS-QAPP shall address the project team members responsible for the electronic data review.

10.0 QUALITY ASSURANCE REPORTING

10.1 Daily Quality Control Report

A Daily Quality Control Report (DQCR) will be completed for each day of field activities. An in-house inspection of these reports will be reviewed as they are generated field personnel. A sample report is presented as Figure 10-1 provided in Appendix B.

10.1.1 Daily Quality Control Report Procedures

During field investigation activities, DCQR will be completed, dated, and signed by the sampling technician at the end of each workday. Copies will be distributed to the field supervisor and project chemist on a daily basis. These DQCR shall include, but are not limited to the following information:

a. Weather conditions at the time of sampling.
b. Level of Personal Protective Equipment.
c. Sample collected including reference to applicable QAPP sections.
d. Field instrument measurements and calibrations.
e. Any deviations from the QAPP, problems identified, and corrective actions taken.

10.1.2 DCQR Corrective Action

If a significant problem occurs during sampling, the DQCR will be provided to the project chemist within 48 hours accompanied by a corrective action report. The DQCR will be written by the sampling technician and will be cross checked against the field logbook for completeness at the end of each day. A sample DQCR form is shown in Figure 10-1.

10.2 Data Report – Split Sample Analyses

The data of QA/QC (split) samples is not anticipated for MMRP investigations; however, in the event split samples are collected, the data from the initial and confirmation analyses will be evaluated using the data quality element of precision. Data packages form the secondary laboratory will include the following information: all blank sample and internal quality control results such as spike, surrogate recoveries, and replicate analyses.

10.3 Quality Control Summary Report

A Quality Control Summary Report (QCSR) will be submitted as part of the report of investigation activities. The QCSR may be incorporated into the field investigation report. The QCSR will address:

- Project Scope,
- Project Description,
- Sampling Procedures (planned vs. implemented),
- Field Quality Control Activities (planned vs. implemented),
- Analytical Procedures,

- Significant Problems with Analytical Procedures,
- Data Presentation and Evaluation,
- Quality Control Activities including Discussion of Data Reliability,
- Lessons Learned, and
- DQCR Consolidation.

The report will also discuss any corrective actions implemented in response to problems encountered during the project. Data packages and data assessment reports will be summarized.

10.4 MMRP Databases

Analytical results will require input in the Environmental Restoration Information System (ERIS) Database. The data from MMRP investigations will be maintained in the database which includes the following information for each sample collected: sample ID; preservation; date sampled; media type; site location; chemical analyses; and validation review. The format requirements for the ERIS database are located in Appendix D of this QAPP.

If the ERIS database format is revised during MMRP investigations, the newly established database format shall be included as an appendix in the SS-QAPP documents.

11.0 REFERENCES

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Appendix A: Laboratory Documents

Laboratory QAPP
Standard Operating Procedures for Analytical Methods

GPL Laboratories, LLLP

Quality Assurance Program Plan

Document Version No: 10

Document Control No: _____

Date Issued: March 2004

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Document Title: Laboratory Quality Assurance Program Plan
GPL Laboratories, LLLP

Document Version Number: 10

Document Control Number: _____

Organization Title: GPL Laboratories, LLLP
Address: 7210A Corporate Court
Frederick, MD 21703-8386

Phone: (301) 694-5310
Fax: (301) 620-0731

Responsible Officials:

Signature: _____ Date: 3/15/04
Paul Ioannides, General Manager

Signature: _____ Date: 03/15/04
Yemane Yohannes, Lab Director

Signature: _____ Date: 3/15/04
Elsa Tai, Quality Assurance Manager

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TABLE OF CONTENTS

1.0 Introduction

GPL Laboratories, LLLP is committed to providing the highest quality laboratory data available. All laboratory analyses are performed in full compliance within applicable State, Federal, or CLP Quality Control guidelines. The Quality Assurance (QA) and Quality Control (QC) program is defined in the Laboratory Quality Assurance Program Plan (QAPP) and the Laboratory Standard Operating Procedure (SOP) Manual. The QA program plan meets or exceeds EPA recommended guidelines with quality control samples accounting for at least 20% of the total number of samples analyzed. The Quality Assurance Manager ensures that facilities, equipment, personnel methods, records and Quality Control procedures are in conformance with GPL Standard Operating Procedures (SOPs) as well as with applicable EPA QC guidelines.

Each laboratory project is monitored through application of a QA/QC program, which includes the following elements:

- Centralized Project files
- Written Standard Operating procedures
- Rigorous Chain-of-Custody procedures
- Documentation of nonconformance events and corrective actions taken
- QC of data by analysis of reference samples, spiked samples, duplicates and surrogate spikes
- Periodic inspections of projects in progress
- Frequent equipment calibration and maintenance inspections
- Archiving of project records under controlled access

GPL has implemented a quality assurance program that is an integrated system of activities involving planning, quality control, quality assessment, reporting and quality improvement to ensure that our services meet our standards of quality with stated level of confidence.

2.0 Quality Assurance Policy Statement

Statement of Authority and Responsibility

This document is the QAPP for GPL Laboratories, LLLP. This Plan describes the activities necessary to meet or exceed the data quality objectives of GPL clients. The policies and operational procedures are established in order to meet the NELAC standards.

The Management of GPL is dedicated to the quality assurance program described in this Plan, and procedures as defined in the SOP manuals. Each manager, and supervisor as well as their staff members, as assigned accordance with the Plan, are obligated to comply with its stated requirements, responsibilities, and objectives throughout all data generating and processing operations.

The QAPP has been prepared by the Quality Assurance Manager (QAM), who shall be responsible for revisions as necessary to ensure all reportable data are of uncompromising quality. The QAM has the additional responsibility and authority to terminate nonconforming work.

Approvals:

Paul Ioannides, General Manager	3/15/04 Date
Yemane Yohannes, Laboratory Director	03/15/04 Date
Elsa Tai, Quality Assurance Manager	3/15/04 Date

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3.0 Quality Assurance Management

3.1 Introduction

An organizational chart, which depicts the management structure at GPL, is provided on the following page. As shown, the QAM is independent of the data generating. Project Management and analytical groups.

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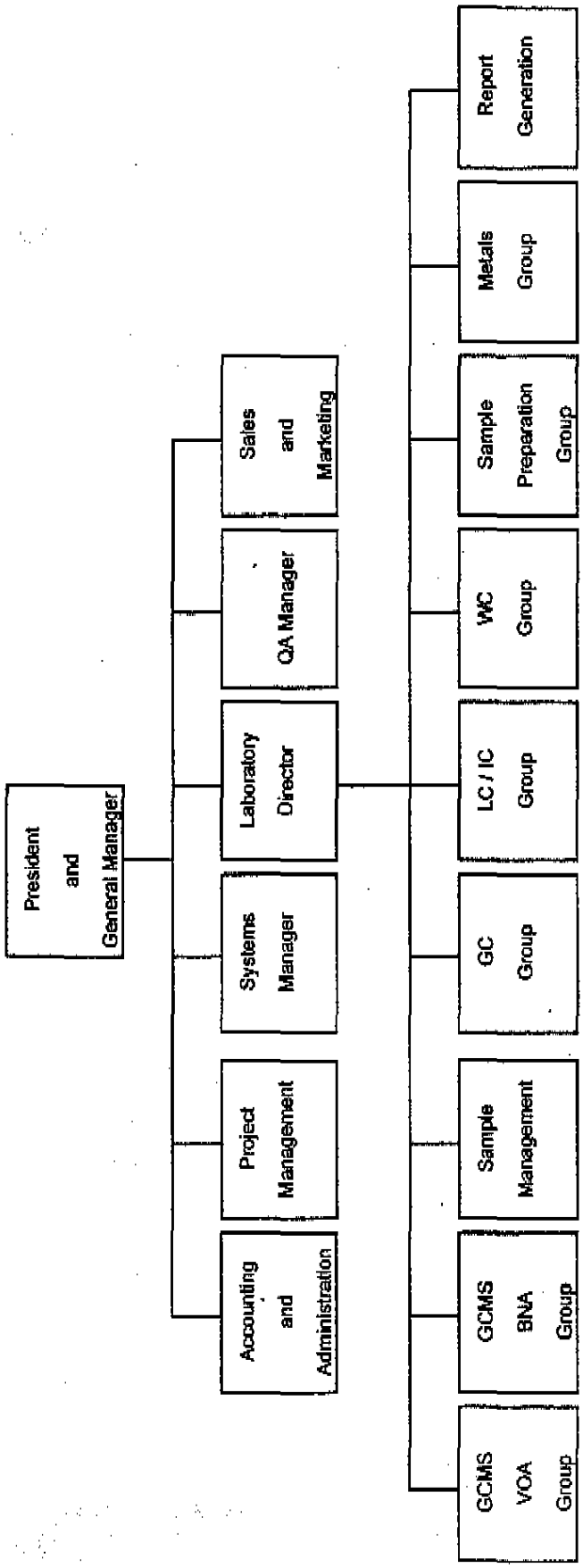
ORGANIZATION CHART



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3.2 Assignment of Responsibilities

The QAM operates independently of all data generating areas. The QAM reports directly to the President.

Roles and Responsibilities

The goal of the QA Program is to assure that data generated by GPL Laboratories, LLLP is of the highest quality available. To reach this goal the program seeks to develop policies and procedures to monitor, maintain and improve data quality, and maintain the necessary documentation of laboratory performance. A listing of QA responsibilities is detailed below.

Quality Assurance Manager

The QAM has overall responsibility for the development and administration of the QA Program. This effort is supported by the President, Laboratory Director, Laboratory Staff, and Administration Staff. QAM oversees and is responsible for the review of the entire technical operation of the laboratory. An analytical quality control program is conducted to ensure the production of valid data. The QAM supervises implementation of the analytical QC Program and interacts with the project staff in determining corrective action procedures.

Additionally, the QA Manager duties include:

- Preparation of written documents defining QA/QC Procedures.
- Review and approval of SOPs.
- Maintaining copies of all current procedures.
- Scheduling and performance of quality audits.

- Employee training in QA/QC techniques.
- Maintaining current knowledge of approved methods and other regulatory requirements.
- Oversight of inter-laboratory and Performance Evaluation testing programs.
- Serving as a liaison to regulatory agencies in QA matters.
- Reviewing Nonconformance Reports and corrective actions to assure that operations have been appropriately corrected.
- Informing management of the status of the QA Program.
- Continually assessing the QA program.
- Checking the outcome of QC Samples on a routine basis to assure that control limits are being met and internal SOPs for control chart analyses are followed.
- Performance of inspections of lab operations and records to assess compliance with SOPs and contract requirements.
- Reviewing and approving performance evaluation sample results prior to submission to regulatory agencies.

The QAM evaluates data and performs assessment objectively. The QAM has the final authority to stop or change any incorrect or improper sampling or analytical procedure to assure data quality.

President

The President is responsible for administrative oversight and overall operation of the laboratory. The President supervises the quality assurance officer to ensure the production and quality of all results reported by the laboratory.

Laboratory Management

The laboratory management has the responsibility for the direction of the laboratory sections to follow the QA/QC program. This obligation is met through the following steps:

- Recruiting, hiring, and training of suitably qualified personnel.
- Allocation of sufficient resources including staff, time, materials and equipment, to complete required tasks.
- Integration of Quality Control measures into the Job Descriptions of laboratory personnel so that each employee is responsible for the quality of the work they produce.
- Effective response to corrective action requirements identified by QA.
- Assignment of SOP development as required by QA.
- Review and approval of SOPs.
- Review and approval of final reports.

Laboratory Supervisors

Laboratory Section Supervisors are an integral part of the implementation of the QA/Quality Control program. Each Supervisor is responsible for the quality of the data generated by their group. All activities performed in the lab section must comply with the internal SOPs and individual contract requirements. It is the responsibility of the Supervisor to train analytical personnel, prepare and update SOPs for each operation, and instruct analysts to perform QC checks at the appropriate intervals. The Supervisor reviews data and assures that all QC criteria for each data set have been met before releasing results for reporting. Additionally, it is the responsibility of the Supervisor to document nonconformance events and corrective action taken.

Chemists and Lab Technicians

It is the responsibility of the individual analysts to follow the appropriate methods, documenting the activities and results concisely, and implementing the QC checks as required by the contract and/or SOP manual. The analyses are expected to produce data of measurable quality and, therefore, must evaluate the outcome of QC samples as part of the regular analytical procedure. Individual analysts, as the first line of quality control, must identify quality problems and initiate a Nonconformance Report.

Temporary Absence of Key Personnel

In the absence of key personnel, the President assigns the backup who will take over the responsibilities of the temporarily absent employee.

If the President is temporarily absent, the Laboratory Director takes over the responsibilities.

3.3 Communications

The QAM communicates with other laboratory sections in two predominant methods, by scheduled meetings and by memorandum or report.

Production meetings are held daily; the attendees of these meetings are the Project Managers, Laboratory Section Managers, and Supervisors. The QAM attends the meetings when QA concerns or issues need to be addressed. Production planning, marketing efforts, and laboratory management issues are discussed. This forum provides immediate access to responsible individuals for the resolution of QA concerns.

In addition, on a monthly basis, a meeting is held with the President, QA Manager, Laboratory Management and Senior Project Managers to evaluate all QA related issues.

Reports are issued to document findings of audits, inspections, and data reviews performed by the QAM. Reports are issued to supervisors responsible for the work reviewed, and to lab management. The Supervisor responds to each of the findings and documents corrective actions. The report is then reviewed by the lab managers. QA verifies that corrective actions have been implemented and then files the report in QA files.

Communicating project specific requirements will be accomplished by issuing "project outlines" to each department manager, detailing the differences from standard methods. Changes in work requirements will be handled in the same manner.

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3.4 Document Control

QA reports are maintained in locked file cabinets which are separate from other study records. QA records are often direct and forthright in addressing problems and to allow these records to become public knowledge would hinder the performance of the QA Program. Thus, these records are considered most confidential and are not available for inspection by persons outside the company, without the consent of the client.

Original copies of SOP documents are maintained in the QA files. Additionally, a historical file of obsolete SOPs is also maintained. When a SOP document is revised and replaced by a new version, the original is marked "Obsolete". The document is then placed in the historical file while the new version is placed in the current SOP file. New versions of SOPs are distributed to the laboratory, while old versions are removed. Distribution lists of SOP documents are maintained by the QA.

Document control of QAP and SQAP are basically the same as that described for the SOP documentation described above. A current and historical file system, distribution list and limited copies of the document are used in the production of the QAP and SQAP to maintain its integrity.

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3.5 QA Program Assessment

The QAM conducts assessments of the total QA Program. The review shall take account of reports from managerial and supervisory personnel, the outcome of recent internal audits, assessments by external bodies, the results of interlaboratory comparisons or proficiency tests, any changes in the volume and type of work undertaken, feedback from clients, corrective actions and other relevant factors. Based upon these assessments, and an annual review of the QA Program Plan, an annual written status report of QA activities and progress is forwarded to the President. This report is used to define areas of focus for the coming year and will determine changes required in the QA Program Plan. This report shall include such information as:

- Status of or changes to QA Program Plans.
- Status of QA project plans, if any.
- Measures of data quality.
- Significant QA problems, accomplishments, and recommendations.
- Results of performance audits.
- Results of systems audits.
- Summary of QA training, if applicable.

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4.0 Personnel Qualifications

4.1 Introduction

GPL has over 60 employees within the Laboratory having the scientific and technical expertise needed to serve the analytical needs of our clients. These employees have been chosen based upon their education, training and experience to successfully perform their assigned tasks.

GPL provides its employees with opportunities for continuing education and training to enhance employee growth within the company. The benefits of supplying continuing education and training, and on the job experience are not only for the individual employee. The company benefits also, since it profits by the stability of the work force and the internal promotion of its employees. Finally, the benefits to the clients are that GPL provides confidence in the precise and accurate performance of contracted analyses.

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4.2 Qualifications

GPL has minimum education and experience qualifications for all job grades within the laboratory. In-house training programs and policies augment these basic education and experience requirements by supplying additional information about technical subjects, safety, corporate policy, quality assurance, and supervisory and managerial techniques.

Documentation of personnel qualifications and training is accomplished through the use of a standardized qualification system. For each position critical training and skills requirements have been identified including: organizational orientation, safety training, quality control procedures training, technical training and analytical skill requirements. Completion of each of these requirements is documented in the employees training, experience, and qualifications file by the signature of the trainer. The employee must have acceptable training and, where necessary have shown proficiency in each area before the trainer or supervisor documents qualification. The training and qualifications files are maintained by the QA and permanently archived in our on-site storage location.

Resumes of laboratory personnel are available upon request.

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4.3 Training

New employees are trained on a one-on-one basis by their supervisor or assigned individual. Training is initiated by discussion of the applicable method document for a particular analysis. The procedures as described in the methods are then demonstrated by the trainer, to be repeated by the new employee, on a set of trial samples. Results of the trainee's analysis, and an appraisal of techniques used are reviewed by the trainer. Successful results and suitable techniques are the basis for determining the qualification of an analyst in performing a particular procedure. Failure in either of these areas must result in additional one-on-one training. Until the trainer is satisfied with the overall performance of the new employee, the new employee may not perform analysis on client supplied samples.

After initial training, an employee's performance is monitored by the supervisor for compliance with quality, production and safety goals.

Documentation of employee training procedures is accomplished through the employees training, experience, and qualifications files as described in Section 4.2. Additionally, training is routinely performed upon the introduction of new instruments into the laboratory. Generally, these courses are provided by the instrument manufacturer who may issue training certificates upon successful completion of the course. Copies of such certificates are to be placed in the employees' qualification files.

Training is sometimes provided in the form of seminars presented to explain new methods, techniques and procedures. These seminars, in most cases, are presented by senior level personnel to benefit employees.

Each employee is trained under the Maryland Right-to-Know statute. We believe that employees well trained in safety issues, while working in a safe environment produce a better quality product.

Each employee is also trained in ethics, confidential information and conflict of interest, with special emphasis in data fraud and inappropriate practices. The information is documented in the "Ethics and Data Integrity Agreement", which is accepted and signed by all employees, and kept as part of their training records.

SOP E.8 "Laboratory Personnel Training and Qualifications" is the procedure for establishing that personnel are adequately experienced in the duties they are expected to carry out or receive any needed training.

SOP E.8 "Laboratory Personnel Training and Qualifications" also documents the required training such as safety, general laboratory procedure, laboratory quality assurance program and demonstration of capability. The overall performance of each employee is re-evaluated at a minimum of at least once a year.

5.0 Facilities, Equipment and Services

5.1 Introduction

GPL is located in Frederick, Maryland (north of Washington, DC) along the I-270 technology corridor. The facility encompasses nearly 18,732 square feet and includes laboratories, private offices, a data processing area, a copy and graphics area, and an administrative area. Electrical power is supplied by Allegheny Power, with a service capacity of 1600 amperes at 480/277 3-phase volts. All entrances to the facility are locked and alarmed after hours. Access is controlled by the use of cipher locks on doors leading to critical areas and by magnetic keylocks for exterior doors. Visitors are escorted while in the facility by members of the staff after the visitor has signed-in. The entire facility is provided with a sprinkler system for fire protection. Additionally, there are fire extinguishers throughout the building and emergency showers, fire blankets, and eyewash stations located in the laboratories.

The laboratory has a full complement of support equipment and instrumentation, such as hoods, refrigerators, freezers, ovens, autoanalyzers, a Type II water system, etc. All instruments are maintained by trained employees, and by manufacturer service personnel, in some cases, working under service contract for critical equipment. The support equipment maintenance is described in the appropriate SOP for each piece of equipment. Acceptance criteria are also listed within each SOP. Instrument logbooks are maintained for each individual instrument in each of the laboratories.

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5.2 Laboratory Facilities

The analytical laboratories adjoin the administrative offices In order to provide close interaction between management and the analytical staff. Figure 1 presents a floor plan of the facility. Laboratory environmental aspects, which could affect the quality of data generated, are discussed below.

Environmental Control

The facility is divided into sixteen (16) zones, each with separate air handler and electronic control systems. The office and support areas are served by five of the units while the lab areas are served by the remaining eleven. These units are maintained by a local HVAC contractor who has a service agreement with the landlord. Filters on the units are replaced on a quarterly basis to reduce dust and pollen infiltration into the facility. Temperature is maintained between 68°F and 72°F to prevent temperature induced artifacts in the data obtained from the instrumentation. Laboratory hoods are required to have a face velocity of at least 60 linear feet per minute flow at all points across the hood face. The individual section shall be responsible for the maintenance of those compliance check records. General housekeeping is provided by a full time employee. Wet mopping of all floors is required at least twice weekly to provide for additional dust control. All technical employees have an unencumbered work area to ensure that adequate working conditions are available for the tests. All labs and office areas are adequately lighted with fluorescent-type lighting. Emergency battery powered lighting is installed in all areas in the event of total power failure.

Electrical Power

Power is supplied to the facility via underground cable by Allegheny Power. Service capacity is 1200 amperes at 460 volts. Transformers are used to provide the proper voltages needed for the instrumentation and mechanical systems; i.e., 115 volts, 230 volts, and 208 volts 3 phase. Dedicated circuits supply power to the instrumentation to limit inter-instrument interferences often seen with computer-controlled instruments, which use switching-type power supplies. Three-stage surge and spike suppression equipment is employed on instrumentation sensitive to this type of power problem.

Laboratory Utilities

The laboratory benches are supplied with electrical power, compressed air, vacuum, hot and cold potable water, and Type II reagent water utilities. Compressed air and vacuum systems are maintained by the supervisor. Hot water is supplied by an electric water heater.

The laboratory complex is equipped with a water system capable of supplying the laboratory with Type II reagent water. The system is located in the cylinder/DI water area and distributes water throughout the laboratory to the following areas: glassware preparation, wet chemistry, organic sample preparation, metals sample preparation, and organic and inorganic instrumentation. The system has incoming municipal water which is filtered, softened, and processed through a reverse osmosis membrane for storage in the permeate water tank. Water drawn from the tank for distribution to the users is passed through carbon beds, mixed resin deionizing beds, an ultra filter and finally sterilized by UV radiation before being circulated to the laboratories. Water returning from the recirculation system is reintroduced to the system at the carbon bed filtration point. The systems are maintained by service contract personnel.

Laboratory Facility Safety Engineering

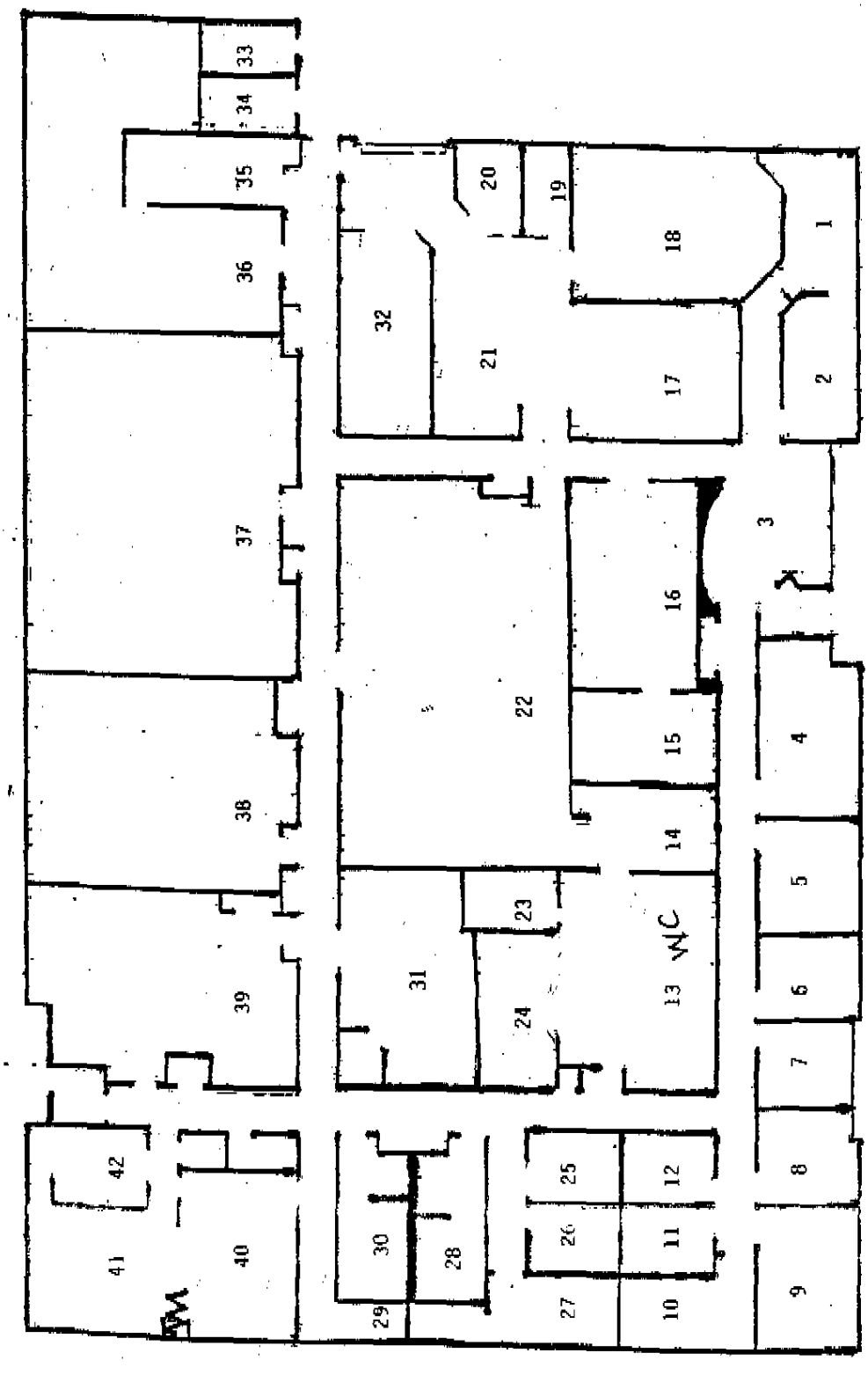
Laboratory safety is regarded as a serious responsibility. The laboratory maintains special solvent storage and waste storage areas.

- Solvents are stored in the solvent storage cabinet, of which is power ventilated to the out-of-doors. Bulk solvents are stored here while small quantities of solvents for immediate use are stored in flammable solvent lockers beneath the laboratory hoods. Corrosive liquids are stored separately in corrosive liquid storage lockers.

- Waste solvents are placed in waste solvent containers for transfer to 55-gallon drums in the waste storage facility. This facility provides an area, which is designated, for the accumulation and storage of laboratory wastes prior to shipment.

- The laboratory is equipped with dry chemical, carbon dioxide, and halon fire extinguishers strategically placed throughout the lab. Locations for eye wash stations and emergency showers are VOA, Metals, Metals Digestion, Wet Chem/Organic Extraction areas. Safety glasses are issued to each employee for use in the laboratory.

Figure 1
Facility Floor Plan



1 -Office
2 -Office
3 -Reception Area
4 -Conference Room
5 -Office
6 -Office
7 -Office
8 -Office
9 -Office
10 -Office
11 -Office
12 -Office
13 -Wet Chemistry Laboratory
14 -Office
15 -Archive Storage
16 -Reporting Department
17 -Walk-In Cooler
18 -Waste Disposal
19 -Geotechical Laboratory
20 -Bottle Storage Area
21 -Sample Management
22 -Extraction Laboratory
23 -Glassware Preparation Area
24 -Office
25 -Office
26 -Office
27 -Server Room
28 -Restroom (Ladie's)
29 -Custodial Storage
30 -Restroom (Men's)
31 -Metals Digestion Area
32 -Cylinder Storage Area
33 -Tel/Gas Area
34 -Sprinkler Area
35 -Electrical Room
36 -GC/MS VOA Laboratory
37 -GC/MS SVOC/GC Laboratory
38 -HPLC/IC Laboratory
39 -Metals Laboratory
40 -Conference Room
41 -Break Room
42 -Kitchen

5.3 Instrument Maintenance

In an effort to reduce unexpected instrument failure, ensure reliable and accurate data generation, and control the costs associated with non-routine maintenance and down time, the laboratory has implemented a preventative maintenance system. Routine preventative maintenance is performed as suggested by the manufacturer. When discovering that maintenance is required more frequently or that additional maintenance is required, the information must be documented.

A written SOP entitled, "Instrument Maintenance", documents laboratory equipment information for all instruments. The SOP describes the methods for routine inspection, cleaning, maintenance, testing, calibration and/or standardization. Materials and standards required to perform these operations are specified and are kept in stock.

The temp. monitoring SOP addresses the monitoring of ovens, freezers, refrigerators and incubators. Temperature logs (including acceptance criteria) are assigned and are monitored and documented daily. SOPs for balances and pipettes also exist and are monitored and documented daily which constitutes a significant part of the overall QA Plan. In addition, corrective action forms are routinely completed, documenting the performance of each support piece of equipment, within the lab.

Written records are maintained to document all inspection, preventative and non-routine maintenance, test, calibration and/or standardization procedures. The documentation must include:

- Name of item;
- Manufacturer name;
- Model and serial number;
- Manufacturer's instructions;

- Date received;
- Date placed in service;
- Current physical location.

The records include date, description of activity, actual findings, the name of the person performing the operation and a statement as to whether the maintenance operations were routine or unscheduled. Non-scheduled repairs performed as a result of equipment malfunction are documented in the instrument logbook to show the nature of the problem, when the problem was discovered and remedial actions taken. Repairs made by the manufacturers instrument repair technicians must also be documented and the service reports filed in the instrument logbook. Following major maintenance activities, instrumental return to analytical control must be demonstrated in the maintenance records prior to analysis of samples.

On-site instrumentation service is available on and as needed basis usually within 24 hours. The on-site service includes hardware support for all GC, GC/MS, ICP, AA, and other analytical instruments.

5.4 Laboratory Materials Procurement

Each chemical purchased for laboratory use is ordered by specifying the grade required for the intended use. Persons who place the orders are not permitted to make any substitutions without authorization from the Section Manager. This restriction is intended to avoid inadvertent purchase of materials of substandard quality. The grades typically used include the following:

- Technical – used for cleaning or non-quantitative purposes.
- Purified – used for some qualitative analytical work where purity is not critical and specific contamination is noted to be absent.
- ACS Reagent – used for analytical work.
- Spectrograde – used in IR, AA, and UV applications.
- Pesticide Grade – used for pesticide determinations and other GC applications.
- Primary Standard – used for preparation of standards, calibration, quality control, and standardization.

Standards for organic compounds are typically obtained as concentrated solutions from a commercial source. Metals standards are obtained from commercial sources as 1,000 or 10,000ppm certified solutions. Standard materials for inorganic parameters are typically primary standard grade, when available, or analytical grade. Independent quality control standards are from a commercial source also. QC standards must be certified when obtained from a commercial source and must not originate from the same lot as materials used for calibration.

All reagents, acids, solvents, standards, and other chemicals are dated upon receipt and when opened by the technician. If an expiration date is supplied by the manufacturer, the material is discarded after that date. If manufacturer's expiration dates are not provided, the laboratory must assign an appropriate expiration date, based on professional judgement and in consideration of the shelf life for similar materials at similar concentrations. The technical basis for each such determination must be documented by the section supervisor or a senior chemist. If a specific method of analysis requires a shorter lifetime, then the specific method is followed accordingly. As part of the regular laboratory inspections performed by the QA, reagents, acids, solvents, standards, and other chemicals in the laboratory will be randomly checked for expiration date. If materials are found which are past the expiration date, the section supervisor will be immediately notified to institute corrective actions.

Solvents are stored in a locked solvent cabinet, which is vented to the outside of the building. Individual bottles of solvents may also be stored in the "flammable" cabinets located under the laboratory hoods. Acids are stored in a safety cabinet for corrosives and in "corrosives" cabinets located under fume hoods. Dry chemicals are held on designated shelves at ambient lab temperature. Organic compound standards are stored in several small freezers, which are dedicated to standards only. Standards for inorganic compound analysis are stored under refrigeration, while standards for metals analysis are maintained in room temperature cabinets.

To control quality of purchased chemicals, the oldest supply is used before a new bottle is opened ("first in, first out"). Analysts are responsible for checking the appearance of the chemical prior to use to assure that the physical state of the material is correct. Purity and stability of reagents are monitored by performing blank determinations and QC samples along with analytical batches. Additionally, each manufacturer's lot of solvent is checked for potential

contaminants by analyzing the solvent through the appropriate method. If a lot has not been accepted based on this prescreening check, it is not released from the solvent storage room.

The procedure for laboratory glassware cleaning is defined in SOP, "Glassware Washing Procedures".

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6.0 Data Generation

6.1 Quality Assurance Project Plans

Large contracts for selected projects require the development of and the adherence to a Quality Assurance Project Plan. The USEPA document, "EPA Requirements for Quality Assurance Project Plans" EPA QA/R-5, Nov. 1999, is used as general instruction for writing the Quality Assurance Project Plan. Specific requirements of the client are incorporated into the document. This Quality Assurance Project Plan contains the elements as follows:

- Title and Approval Sheet
- Table of Contents
- Project/Task Description
- Project/Task Organization
- Documentation and Records
- Quality Objectives and Criteria for Measurement Data
- Sample Handling and Custody
- Instrument/Equipment Calibration and Frequency
- Analytical Methods
- Data Review/Verification and Validation
- Quality Control
- Assessments and Response Actions
- Instrument/Equipment Testing, Inspection, and Maintenance
- Reports to Management

Quality Assurance Project Plans provide for the review of all activities, which could directly or indirectly influence data quality, and the determination of those operations, which must be covered by SOPs. Activities to be reviewed may include:

- General Project Management Design
- Specific Sampling Site Selection
- Sampling and Analytical Methodology
- Probes, Collective Devices, Storage Containers, and Sample Additives or Preservatives
- Special Precautions, such as heat, light, reactivity, combustibility, and holding times
- Federal Reference, Equivalent or Alternate Test Procedures
- Instrument Selection and Use
- Calibration and Standardization
- Preventive and Remedial Maintenance
- Replicate Sampling
- Blind and Spiked Samples
- Collated Samplers
- QC Procedures, such as intra-laboratory and intra-field activities and inter-laboratory and inter-field activities
- Documentation
- Sample Custody
- Transportation
- Safety
- Data Handling Procedures
- Service Contracts
- Measurement of Precision, Accuracy, Completeness, Representativeness, and Comparability
- Document Control

Quality Assurance Project Plans are prepared in document control format, with provision for revision, as needed, and with a record of the official distribution.

The quality requirements of proposal requests from prospective customers shall be identified upon the initial review and evaluation of the requests. When the quality requirements have been identified, the designated QA staff member shall ensure that they are adequately addressed in the Project Plan.

The following are QA Program Objectives to be met as a project becomes operational:

- Development of a Quality Assurance Project Plan for the project, if required by the customer, or upon management request.
- Assignment of responsibilities for achieving the required quality of materials, services, and quality assurance.
- Organizing and staffing appropriately to implement quality assurance activities.
- Development of working plans and procedures to implement the QA Project Plan.
- Implementation of the Quality Assurance Project Plan.
- Coordination of QA activities with the customer, subcontractors, suppliers, etc.

The contractual requirement for a Quality Assurance Project Plan will be identified by the project management group at the initial review stage of the Request for Proposal (RFP). The Quality Assurance Project Plan will be prepared by a team consisting of the project management group and the section managers. Necessary personnel from each of these groups will review the final document to assure that it is accurate and complete. After approval, copies of the Quality Assurance Project Plan are distributed to all laboratory personnel with supervisory responsibilities involved with the project. The Project Management group coordinates contract with the client regarding development and implementation of the Quality Assurance Project Plan. Any variance of standard methods will be reported to the client prior to the analysis. The approval or acceptance of methods will be determined by the client.

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6.2 Standard Operating Procedures

Standard Operating Procedures (SOPs) are utilized by GPL to define exact routines to be followed in each section. There are SOP documents covering all aspects of the laboratory operation, from sample receipt and analytical methodology through data review and archiving. The entire SOP Manual is available for review during client visits. A copy of the SOP Manual Index is provided as Appendix F.

Each SOP document is individually reviewed and approved. A Document Control System has been designed for SOP documentation and a historical file is maintained. SOPs are identified by a SOP numbering, revision identification system and an effective date administered by QAM. Obsolete documents are maintained in a historical file where they are marked obsolete. Standard Operating Procedure documents are reviewed at least annually to determine if updating is required.

SOP documents may be initiated by the lab director or section manager/supervisor. The proposed document is submitted to QA, which, after review, circulates the draft document to the department management and the lab director for comments. The draft document and management comments are returned to the originator for resolution. The revised document is then circulated by the QA for approval signatures. Each SOP must be signed by the originator, the section supervisor and manager, and the lab director.

Each laboratory is furnished with a SOP Manual. Additionally, the SOPs that are specific to a particular area may be prepared as a quick reference; i.e., glassware washing procedure.

The QAM has a critical role in the establishment and maintenance of the SOP documentation program. The QAM prepares or assists others in the preparation of many SOP documents, is responsible for the circulation and review of draft SOPs, for maintenance of the SOP document control system, including the historical file, and the distribution of the SOP manuals to the lab. All laboratory employees are responsible for reading, understanding and following SOPs particular to their designated job function.

6.3 Sample Chain-of-Custody

All incoming samples are delivered to the Sample Control office for inspection, log-in, and storage. Immediately upon receipt, the sample set is unpacked and checked versus any accompanying client paperwork. All the documents, like the field COC, the courier airbill, etc. become part of the client file for the said sample batch. If a field chain-of-custody sheet is received with the samples, it is the responsibility of the Sample Coordinator to sign for laboratory custody.

The Sample Control inspection of the samples include the following checks:

- Custody seal status
- Sample container integrity
- Cooler temperature at time of receipt
- Type of container (plastic or glass)
- pH of sample if chemical preservation is required (not applicable for VOA analysis)
- Volume of sample
- Sample identity

The procedures for inspection of samples and EPA requirements concerning sample preservation and holding times are detailed in SOP "Sample Receipt, Inspection, Preservation, and Storage Condition Requirements". Procedures utilized in the logging of samples are detailed in SOP "Sample Logging and Record Keeping" and SOP "Secure Sample Storage".

GPL normally provides all sample bottleware and containers from its laboratory facility. All sample containers are Class I (I-Chem 300 or equivalent), precleaned, tested and are accompanied by the batch certificate of analytis. The GPL SOP titled "Sample Container Quality Assurance Program" clearly describes a program whereby the laboratory provides fully traceable, properly documented sampling bottles of known quality to field sampling operations.

The results of the incoming sample inspection are documented on the Sample Receipt Form. The Sample Receipt Form is the basis of the sample management system, which is described in detail in Section 6.4 of this Plan.

Samples are assigned a unique, sequential number during the logging process. GPL utilizes an internally developed LIMS software package over client/server network. The system generates individual sample labels, which list the GPL sample number, the client's sample ID, test to be performed, sample location and sampled date. These labels are placed upon each sample bottle.

The samples are stored in locked sample storage areas by Sample Control. Distribution of samples to the laboratory and corresponding return of samples is documented via signatures on a system-generated chain-of-custody form. The Sample Control Staff is responsible for the documentation.

Commercial samples are kept for at least 90 days from the date that the samples are received. After 90 days the samples are disposed of unless otherwise specified by the client. Disposal of all samples must be recorded in the waste disposal logbook.

The extracts and digestates are under internal COC procedures. When extracts and digestates are transferred, the digestate/extract transfer form is completed, both by the person relinguishing custody, and the person assuming custody. Extracts and digestates submitted after the analyses of the digestate/extract is completed, the extract/digestate will be retained for the period of time specified by the method, project or program. If requirements are not specified, the default retaining time is 90 days following data submission. At which time, the extract is transferred to sample management for disposal, the digestate is disposed by the lab technician. The internal COCs of digestates/extracts are kept on file after disposal.

SOP "Laboratory Waste Handling and Storage Program" details the procedures used to handle, label, store and dispose of both hazardous and non-hazardous laboratory wastes including sample, sample byproducts, waste chemicals and spent solvents.

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6.4 Sample Management

GPL uses two techniques as part of its complete sample management program, LIMS generated printouts of assignments, work backlog and a centralized project filing system. Each function will be described in detail below.

As discussed in Section 6.3 of the QAP, the Sample Receipt Checklist Preservation Form for documenting incoming sample inspections is completed by the sample control personnel. After this step, the Sample Receipt Form and a copy of the field paperwork or client paperwork, which arrived with samples, is used for initial login into LIMS system. Project Management compares the submitted information to the client requirements to assure that the sample set agrees with the work arranged via previous communication. Project Management then checks the test codes required for each sample, if not previously established. Special instructions communicated to the lab regarding report due date, sample preparation, QC requirements or special handling procedures are also recorded by project management. The initial login paperwork, after being examined, is returned to Sample Control for distribution of the sample set.

Each set of samples, which is received from a client, during the same time period, is assigned to a Work Order.

Work Order numbers consist of a set of numbers as follows:

102004

Where: 1 signifies the year – 2001
02 signifies the month – February
004 signifies the fourth Work Order assigned in that month

In cases where more than 999 samples sets are entered into the system within a given month the system automatically changes the first digit of the three digit Work Order number to the letter A and increments through the alphabet.

Individual samples are labeled with the work order number and a suffix code of three digits. In the suffix, the three digit (001) number indicates a sample identification and the next figure (01, 02, 03) denotes a sample fraction.

Example:
1 02 004 – 001-01
001-02
001-03
1 02 004 – 002 (different sample)

After log-in, hard copy printouts are generated from the database. Sample Control maintains a printout of the Work Order and Chain-of-Custody form.

Project management initiates the project file by placing the sample receipt form, original client paperwork, and corresponding LIMS printouts of work orders into a file folder labeled by Client and Work Order number. The project manager places the project file in the controlled access active central file location. This allows supervisors access to this file for additional information during normal work hours. File security is maintained through restricted access.

Worksheets generated by the LIMS system is electronically transmitted to the section supervisors. The LIMS system has been programmed to create a separate Work Sheet for each department. The Work Sheet contains essential information such as sample identification, test required, due date to comply with both methods required holding times and the date which results are due to the client.

Each supervisor is responsible for assigning analytical batches for processing. The supervisor distributes a list of samples to be analyzed, the name of the tests to be performed, and the analytical protocol to be followed including quality control samples and any special instructions. The actual documentation used to prepare the batch assignments may vary according to the type of test performed.

All study data are filed in the central project file. As each test is completed, the LIMS database is updated to close out the test. Each day, a printout is obtained from LIMS, which lists, by test, all samples received but not yet analyzed. These reports are used by department supervisors to coordinate work assignments.

Reports of analytical results are tabulated and placed in the central project file. All correspondence, verbal or written, internal or external, is documented in the central file. The Project Manager monitors the progress of each project and reviews the final report. All reports are reviewed and signed by the Lab Director. A copy is placed in the central project file. As work is completed, its status is changed to complete and thus removed from the work schedule. When the work is actually reported its status will once again be changed to reported to indicate that no further work is required.

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6.5 Additional Procedural and Calibration Requirements to Achieve QA Objectives

6.5.1 Organics

6.5.1.1 Sample Preparation

Three (3) surrogate standard compounds are added to each organic sample requiring GC/MS volatiles analysis as per methods SW846 8260 and 40 CFR624. When the methods require a different number of surrogates (such as 524.2) the analyses are performed as per the method. Six (6) surrogate compounds are used for semivolatile analyses (SW846 8270 and 40 CFR625). CLP and its revisions, require eight (8) surrogates, which are utilized when the method is performed. For pesticide and herbicide analysis at least one (1) surrogate is utilized as per the method. The laboratory may also use two (2) surrogates when specified in the methodology. For explosive residue analysis one (1) surrogate is utilized. These surrogate compounds are quantitatively analyzed in the GC/MS, GC or HPLC phases. Control limits for surrogate compounds are maintained. This data forms the statistical basis upon which preparation techniques are monitored. Surrogate recoveries must meet acceptance criteria before the analytical data will be released. In some instances, the sample matrix may produce interferences, which adversely affect recoveries. These interferences must be confirmed by a re-analysis and/or re-preparation of the samples. Affected data are qualified in the report.

One method blank is prepared and analyzed for each analytical/prep batch. A batch consists of 20 samples undergoing simultaneous processing. The purpose of the method blank is to ensure that contaminants are not introduced by the glassware, reagents, personnel, sample preparation or sample analysis environment.

6.5.1.2 Standards

Calibration standards are traceable to the National Institute of Standards and Technologies (NIST) or EPA whenever such standards are available. Commercial sources of standards and reagents are checked for purity, and approved prior to use. All standards prepared for use throughout the organics laboratory are logged into solutions manager, which gives a unique identification. This unique identification, along with receipt date is written on the Certificate of Analysis, and on the bottle. The Solutions Manager prints out a receipt report with the manufacturer, vendor, catalogue number, receipt date, expiration date and lot number.

6.5.1.3 Instrumentation

- Gas Chromatography/Mass Spectrometer (GC/MS)

  The Gas Chromatograph/Mass Spectrometer analyses are an integral part of the analytical services provided by GPL. The analyses involve very sophisticated instrumentation, which is operated by a highly trained staff. To assure that the results from this phase area of the highest quality, a rigorous program of calibration and quality assurance has been established.

Prior to the utilization of the instrumentation, the instrument performance is adjusted to assure that all manufacturer's and accrediting body's performance criteria are met. The instrument's performance is monitored and control charts exhibiting instrumental response have been established. The instrument is continually monitored and is adjusted on an as needed basis (specified in the Standard Operating Procedures).

When needed, the mass spectrometer is adjusted to meet the method defined tune criteria, using FC-43. Every 12 hours Bromofluorobenzene (BFB) or Decafluorotriphenylphosphone (DFTPP) is then used to confirm that the instrument meets this criteria. The BFB ion abundance criteria is outlined within the particular methods and must be satisfied for all volatile organic analyzes. The DFTPP ion abundance criteria is also outlined within the applicable methods and must be satisfied for all semivolatile organic analyses. After confirming that the tuning criteria have been satisfied, the instrument is calibrated for the analytes of interest.

The analytical procedures followed for analyses for both volatile and semivolatile organic compounds involve an initial and continuing calibration of the instrument. This calibration is performed using multiple concentrations of standards as specified in the appropriate method. The validity of the calibration standard is confirmed using an EPA traceable standard mix containing known concentrations of each analyte. On a daily basis, the instrument calibration is confirmed to be unchanged by

analysis of a single standard. The standard must meet the criteria as outlined in the method.

After calibration, a method blank is analyzed to demonstrate that the system is virtually free of any of the analytes of interest. The method blank consists of organic free water for volatile analyses and an extraction blank for semivolatile analyses. After demonstration that the system is free of contamination, sample analyses are begun. Maximum allowable levels of contamination are less than or equal to the contract required quantitation limit (CRQL) for most organic compounds and up to 5X the CRQL for common laboratory contaminants as defined in the EPA Statement of Work for CLP analysis. For non-CLP methods, the acceptance criteria should be at least one half of the method reporting limit.

- Gas Chromatography (GC)

Pesticide, Herbicide, Polychlorinated Biphenyl (PCB), TPH and selected CSM degradation compound analyses are performed using a gas chromatograph equipped with the appropriate detectors. These analyses often are performed on complex matrices, which require an experienced staff for the interpretation of the results. The analysts also must determine the clean-up requirements for each individual sample, when necessary.

Prior to all analyses, the elution time and elution order for each analyte of interest is determined. They are determined by analyses of several standards. The retention windows allowable for the identification of the

target analytes are then calculated and defined as stated in the different methodology.

The instrument is calibrated by analysis of a standard mixture, which contains the analytes of interest. The number of standards and their concentration are method specific, but all assure an accurate determination of the concentration of an analyte in the sample. The instrument's sensitivity is adjusted so that all standards are integratable and are also within the instruments linear response range.

After calibration, a method blank is analyzed to demonstrate that the system is optimized. The method blank consists of an extraction blank and must not contain any analytes of interest at or above half of the reporting limit. After demonstration that the system is free of contamination, sample analyses are begun.

- High Performance Liquid Chromatography (HPLC)

Explosive residues, nitroglycerine, and Polynuclear Aromatic Hydrocarbons (PAH) compound analyses are performed using a high performance liquid chromatograph equipped with UV and fluorescence detectors. These analyses require analysts experienced in the use of HPLC instrumentation and skilled in the interpretation of HPLC chromatograms.

Prior to all analyses, the elution time and elution order for each analyte of interest is determined. They are determined by analyses of several standards. The retention windows allowable for the identification of the target analytes are then calculated and defined as stated in the different methodology.

The instrument is calibrated by analysis of a standard mixture, which contains the analytes of interest. The number of standards and their concentration are method specific, but all assure an accurate determination of the concentration of an analyte in the sample. The instrument's sensitivity is adjusted so that all standards are integratable and are also within the instruments linear response range.

After calibration, a method blank is analyzed to demonstrate that the system is optimized. The method blank consists of an extraction blank and must not contain any analytes of interest at or above half of the reporting limit. After demonstration that the system is free of contamination, sample analyses are begun.

6.5.2 Metals

6.5.2.1 Standards

Calibration standards must be prepared fresh each time an analysis is to be made and discarded after use for cold vapor. Calibration standards are prepared monthly for ICP and ICPMS analysis methods.

For trace ICP and ICPMS, two standard and blank are required. A daily low level calibration verification at the method reporting limit would also be required. Source identification, analysis date and preparation procedure must be documented.

6.5.2.2 Instrumentation

ICP, ICPMS, CV

The analyses performed on the ICP, ICPMS, and CV instrumentation are an extremely important part of the analytical services provided by GPL. The analyses involve very sophisticated instrumentation, which is operated by a highly trained staff. To assure that the results from this phase of the operation are of the highest quality, a rigorous program of calibration and quality assurance has been established.

Prior to the utilization of the instrumentation, the instrument performance is adjusted to assure that all manufacturer's and accrediting body's performance criteria are met. The instrument is continually monitored and is adjusted on an as-needed basis (specified in the Standard Operating Procedures).

Instruments must be calibrated daily, once every 24 hours or each time the instrument is set up. The instrument standardization date and time must be included in the raw data.

- Initial Calibration Verification

Immediately after each of the ICP, ICPMS and CV systems have been calibrated, the accuracy of the initial calibration shall be verified and documented for every analyte by the analysis of Initial Calibration Verification Solution(s) at each wavelength/mas used for analysis. When measurements exceed the control limits, Initial and Continuing Calibration Verification Control Limits for Inorganic Analyses, the analysis will be terminated, the problem corrected, the instrument re-calibrated, and the calibration re-verified.

The initial calibration verification solution(s) must originate from a different source other than those being utilized in the standards for the instrument calibration.

For ICP, the Initial Calibration Verification Solution(s) must be run at each wavelength used for analysis. For ICPMS, the initial calibration verification solution must be run at each mas.

- Continuing Calibration Verification (CCV)

To ensure calibration accuracy during each analysis, one of the following standards is used for continuing calibration verification and must be analyzed and reported for every wavelength/mass used for the analysis of each analyte, at a frequency of 10% or every 2 hours during an analytical sequence, whichever is more frequent. The standard must

also be analyzed and reported for every wavelength/mass used for analysis at the beginning of the sequence and after the last analytical sample. The analyte concentrations in the continuing calibration standard must be one of the following solutions at or near the mid-range levels of the calibration curve:

1. EPA Solutions
2. NIST SRM 1643a
3. A Contractor-prepared standard solution

The same continuing calibration standard must be used throughout the sequence for that particular case of samples received. If the deviation of the continuing calibration verification is greater than the control limits, the analysis must be stopped, the problem corrected, the instrument must be re-calibrated, the calibration verified and the reanalysis of preceding 10 analytical samples or all analytical samples analyzed since the last acceptable calibration verification must be performed for the analytes affected.

- Initial Calibration Blank (ICB) and Continuing Calibration Blank (CCB) Analyses

A calibration blank must be analyzed at each wavelength used for analysis immediately after every initial and continuing calibration verification, at a frequency of 10% or every 2 hours during the run, whichever is more frequent. The blank must be analyzed at the beginning of the run and after the last analytical sample. Note: A CCB must be

run after the last CCV that was run after the last analytical sample of the run. If the absolute value blank result exceeds more than the reporting limits, terminate analysis, correct the problem, recalibrate, verify the calibration and reanalyze the preceding 10 analytical samples or all analytical samples analyzed since the last good calibration blank.

- Preparation Blank (PB) Analysis

At least one preparation blank (or reagent blank), consisting of deionized distilled water processed through each sample preparation and analysis procedure must be prepared and analyzed with every sample batch. This blank is to be reported for each sample batch, if required, and is used in all analyses to ascertain whether sample concentrations reflect contamination in the following manner.

- If the absolute value of the concentration of the blank is less than or equal to one half of the reporting limit no correction of sample results is performed.

- If any analyte concentration in the blank is above one half of the reporting limit, the lowest concentration of that analyte in the associated samples must be 10X the blank concentration. Otherwise, all samples associated with the blank with the analyte's concentration less than 10X the blank concentration and above the DL, must be re-

digested and re-analyzed for that analyte (except for an identified aqueous soil field blank). The sample concentration is not to be corrected for the blank value.

When performing SW846 procedures, the matrix of the preparation blank is acceptable if the concentration of any analyte of concern is no higher than the highest of either: one half of the reporting limit, or ten percent of the measured concentration of the sample.

- If upon investigation, the stated criteria is unacceptable, all samples associated with the blank are re-digested and reanalyzed for that analyte.

- Spike Sample Analysis

The spike sample analysis is designed to provide information about the effect of the sample matrix on the digestion and measurement methodology. The spike is added before the digestion (i.e., prior to the addition of other reagents) and prior to any distillation steps. At least one spike sample analysis must be performed on each group of samples of a similar matrix type (i.e., water, soil) and concentration (i.e., low, medium) or for each sample batch.

If the spike analysis is performed on the same sample that is chosen for the duplicate sample analysis, spike calculations must be performed using the results of the

sample designated as the "original sample". The average of the duplicate results cannot be used for the purpose of determining percent recovery. Samples identified as field blanks cannot be used for spiked sample analysis. The analyte spike must be added in the method-required amount for each element analyzed or as requested by the client. If two analytical methods are used to obtain the reported values for the same element within a sample batch (i.e., ICP, ICPMS), spike samples must be run by each method used.

If the spike recovery is not at or within the control limits the data of all samples received associated with that spike sample and determined by the same analytical method shall be noted in the report. An exception to this rule is granted in situations where the sample concentration exceeds the spike concentration by a factor of four or more. In such an event, the data shall be reported unflagged even if the percent recovery does not meet the recovery criteria.

- Duplicate Sample Analysis

One duplicate sample must be analyzed from each group of samples of a similar matrix type (i.e., water, soil) or for each sample batch.

Duplicate sample analyses are required for percent solids. Samples identified as field blanks cannot be used for duplicate sample analysis. If two analytical methods are used to obtain the reported value for the same element for a sample batch (i.e., ICP, ICPMS), duplicate samples must

be run by each method used. The relative percent differences (RPD) for each component are calculated as follows:

$$RPD = \frac{S - D}{(S+D)/2} \times 100$$

Where:

RPD = Relative Percent Difference
S = First Sample Value (original)
D = Second Sample Value (duplicate)

A control limit of RPD = 20% shall be used for original and duplicates sample values greater than 5X DL (Table 6). If the duplicate sample results are outside of the control limit, the data shall be flagged on the final report.

- Instrument Detection Limit Determination

The instrument detection limits shall be determined for each instrument and performed at a frequency of once every three calendar months. The established limits must be equal to or below the levels specified the method.

The Instrument Detection Limits shall be determined by multiplying by 3 the average of the standard deviations obtained on three nonconsecutive days from the analysis of a standard solution (each analyte in reagent water) or for ICPMS reagent water only at a concentration 3x – 5x

the instrument manufacturer's suggested IDL, with seven consecutive measurements per day. Each measurement must be performed as though it were a separate analytical sample (i.e., each measurement must be followed by a rinse and/or any other procedure normally performed between the analysis of separate samples). IDL's must be determined and reported for each wavelength/mass used in the analysis of the samples.

Instrument Detection Limits are measured primarily for metals analyzed by Cold Vapor Atomic Absorption spectrophotometry (CV), and Inductively Coupled Plasma (ICP) and mass spec. The IDL should be determined when new equipment is acquired, after major instrument repairs, and when required by specific contracts. The IDL is obtained by the following procedure:

1. A standard is prepared at 3-5 times the level of the estimated detection limit.

2. On 3 non-consecutive days, 7 consecutive measurements on the standard are obtained. The standard is treated as a sample, with rinses or blanks run between each replicate.

3. The average of the daily standard deviation is multiplied by three to obtain the IDL.

The quarterly determined IDL for an instrument must always be used as the IDL for that instrument during that quarter. If the instrument is adjusted in any way that may affect the IDL, the IDL that instrument must be re-determined and the results submitted for use as the established IDL, for that instrument, for the remainder of the quarter. Instrument detection limits are retained and are available for inspection.

- Linear Range Analysis

For all ICP and ICPMS analyses, a linear range verification check standard must be analyzed daily. The analytically determined concentration of this standard must be within ± 10% of the true value. This concentration is the upper limit of the ICP linear range beyond which results cannot be reported without dilution of the analytical sample.

- Laboratory Control Sample (LCS) Analysis

Aqueous and solid Laboratory Control Samples (LCS) must be analyzed for each analyte using the same sample preparations and analytical methods as the samples being analyzed. One LCS must be prepared and analyzed for every batch of samples digested. If the percent recovery exceeds the internal limits, or contractor supplied control intervals, the analysis will be terminated, the problem corrected and the samples associated with that LCS re-digested and reanalyzed. The stated control limits are utilized until laboratory derived control limits are established.

On an annual basis, background correction factors are determined for ICP and ICPMS analysis using single element standards. This measure determines the potential false analyte signals caused by the presence of high levels of certain commonly occurring elements found in environmental samples.

6.5.3 Any variances from analytical methods are discussed in each analytical method SOPs. The detailed calibration acceptance criteria and reference material used are also documented in the analytical method SOPs. The analytical methods and the associated preparation methods are all referenced in the Sop Index Manual which is listed as Appendix F.

7.0 Data Processing

7.1 Collection

Accuracy and completeness of data records are essential in maintaining the quality of laboratory results. Black ink is used for all entries. All entries are signed and dated. Corrections are made with a single line through the error, and it must be initialed and dated.

Data records are maintained for all transfers and processing of each sample from the time the sample is received until the results are reported and the sample is disposed of. The records kept for receipt, log-in, and sample custody have been discussed in Sections 6.3 and 6.4. Preparation of standard solutions is documented in solutions manager programs. Each stock material and solution is assigned a unique number. Prepared solution identification numbers are recorded on the analysis data sheets. The standard solution preparation log contains entries regarding the source material, which includes:

- Compound name
- Purity
- Manufacturer and lot number
- Date received
- Concentration, if in solution form
- Solvent, when appropriate
- Date consumed or disposed of
- Expiration date
- Solution identification number

The solution preparation is documented by the following information:

- Compound identification
- Source material (by number)
- Assigned solution number
- Date prepared
- Quantity weighed out or measured by volume
- Final volume after preparation
- Solvent used
- Final concentration
- Expiration date
- Date disposed of

Data for inorganic (nonmetal) compound analyses are recorded in bound notebooks assigned to each test. The required information for each analysis includes, but is not limited to: the analytical procedure; any procedure changes required; internal sample number; raw analytical data; standard solutions used; preparation of reagents when appropriate; signature and date. If an instrument printout is obtained for the analyses, the printouts are signed, dated and reviewed.

For metals analysis, a digestion log is maintained in a separate notebook in the digestion lab. The digestion is documented by record of internal sample number, client ID, analysis required or method quantity and identity of spiking solution used, initial sample volume, final sample volume initials of technician and date.

Printouts of results are obtained for graphite furnace, flame, cold vapor, and ICP analysis. For cold vapor work, a separate calculation page is prepared electronically to reference the analysis date, instrument identification, internal sample ID, concentration corrected final results, identity of QC or spiked

samples, percent recovery obtained and any comments. Final calculation of results for ICP are recorded directly on the data system printout. Each data set is filed in the metals raw data file cabinet.

Data for organics extractions are recorded in bound notebooks. All details regarding the extraction are recorded on this form. The data includes the following entries: extraction method, sample matrix, extraction date, surrogate spiking solution number and concentration, matrix spiking solution numbers and concentration, internal sample identification number, sample amount, quantity of surrogate and matrix spike added, final extract volume, extract storage location and signature of chemist.

Analytical data from GC, GC/MS and HPLC instruments is generated by the computer data system. Data outputs include identification of the sample, identifications of compounds retention times, and comparisons to standards. Outputs are in tabular form (retention times, areas, mass listings, etc.) and in graphic form (chromatograms, spectran, etc.). Outputs are in a standard format specified for each analysis type. Data produced are compared to information concerning the sample history, sample preservation, QC data, etc., to judge the validity of the results.

Paper Record Entries

Only laboratory analysts, department supervisors and the laboratory director are authorized to make record entries in the laboratory notebooks and logbooks. All entries must be made in black ink. All entries must be made in accordance with the applicable method SOP. Any corrections that need to be made in any laboratory notebook/logbook must be made by crossing out, with a single line, the old entry, and incorporate the new entry next to it. The old entry must remain readable, and the persons initials and the date of the correction must appear in the logbook. Only laboratory analysts, department supervisors and the lab

director (or his designee) are authorized to make corrections in laboratory logbooks.

Electronic Data Entry

All electronic data must be stored in well functioning, well maintained and routinely backed up data systems. All electronic data entries must be performed using the software specified in the applicable method SOP. Only laboratory analysts, department supervisors and the lab director (or his designee), are authorized to make electronic data entries and/or corrections.

When electronic data entry corrections are made by authorized personnel, the person making the correction must log in with their individual, unique, computer account using their unique password. Upon completion of the correction, a hard copy must be produced, showing the individuals unique computer account identification on the pages that the correction took place. The updated packages must be included in the applicable data package. Writing over data files is not an acceptable corrective action.

The Software Quality Assurance Plan (SQAP) is under separate cover which describes policies and practices of GPL for the development, procurement, modification, maintenance and use of all computer software used for generation, compilation, reduction or reporting of laboratory results. The SQAP is available upon request.

7.2 Data Review and Verification

GPL performs data review and verification on all data packages generated. Information concerning the sample history, sample preparation, quality control data and other factors are used in determining the validity of the results. Each sample's history from sample receipt to reporting must be documented. Procedures implemented in this documentation are described in the SOPs designated for chain-of-custody and document control. Dated and signed entries by appropriate personnel on all worksheets and logbooks are required. The progress of the samples is traced through the laboratory by use of the sample tracking system. Finally, quality control information is judged against set criteria, the criteria used are dependent upon the methodology, the client's requirements, and the eventual use of the data. For environmental analysis performed under Contract Laboratory Program protocol, whether for EPA or commercial clients, all quality control parameters including method blanks, surrogate spikes, matrix spikes and duplicates, sample duplicates, laboratory control samples (QCs), field blanks, trip blanks and storage blanks must meet CLP acceptance criteria. Where applicable, sample flags or qualifier codes shall be used to qualify data.

All data receive a 100% review by either the supervisor or a second analyst of equal or higher experience and responsibility, in accordance with written procedures and guidelines. This review ensures that the following requirements have been appropriately met.

GC/MS Section

The analyst and GC/MS supervisor review data to ensure the laboratory provides the following where appropriate:

- Calculates the recoveries of surrogate spikes and verifies that criteria are not exceeded
- Verifies that there are no contaminants in associated blanks outside acceptable limits
- Compares samples and duplicates for precision in data results
- Verifies calibration performance for acceptability
- Reviews and verifies instrument tuning
- Reviews internal standard areas response for acceptability
- Verify that holding time criteria have been met
- Ensure surrogate recovery has been completed and acceptance limits are not exceeded
- Ensure that all analyte compounds have been properly recorded
- Ensure accuracy of calculations on compound quantities, and
- Ensure spectra are included and have been correctly interpreted

The reviewer examines the entire sample data file to ensure that all data transcription and documentation included meet customer requirements. The organic section manager performs a final technical review to verify that the completed package conforms to all quality control criteria.

Upon completion of review, the sample data files are forwarded to the reporting group for compilation of the entire data package and the project manager performs the final review.

All Other Sections

- Verify that holding time criteria have been met
- Calibration met or exceeded a correlation coefficient of 0.997 (metals and inorganics = .995). If an average calibration factor was used for calculations, the relative standard deviation of the average was ≤25%. Standards used in the calibration curve cover the expected concentration ranges of the samples including the reporting limit. The lowest calibration standard should be at least 5-10 times higher than the MDL for any given techniques. All sample results were extrapolated within the range of the standard curve. Initial and continuing calibration verification checks conforms to the acceptance criteria defined in the method requirements.
- Method blanks were processed with each analytical batch and were acceptable.
- Results of duplicate samples and matrix spike duplicates were within the laboratory or contract-established precision control limits.
- Matrix spike recovery was within acceptable control limits.
- Laboratory control samples were analyzed according to frequency specified in the SOP or contract and the results obtained were within control limits.
- For organic compound analyses, surrogate spike recovery was within control limits.
- For GC and HPLC analyses, the compounds identified fell within the method defined retention time window. This retention time window is established as outlined in Section 6.5 and per the individual methods.
- Calculations have been accurately performed.

Data for the analyses provide a complete audit trail. Data notebooks and data sheets correctly reference the analytical method, the standard solutions used, internal numbers, original data values, sample results in correct units, calculation

formula for all conversions, signature of the analyst, and date. Instrument printouts must identify the person responsible for the data generation and the date of the run. The supervisor or other data reviewer signs the data sheet to document approval. If the complete review was performed by someone other than the supervisor, a spot check is performed by the supervisor. The supervisor checks a minimum of 10% of the data. No data may be reported without supervisor approval evidenced by signature on the data page. The section manager performs a final technical review to verify that the completed package conforms to all quality control criteria.

A tabulation of results is prepared by the supervisor or analyst and placed in the central project file. The tabulation is transcribed into the report format by assigned report writers. The report and complete project file go to the section manager for final check. The section manager's review covers the following points:

- Transcriptions are checked for accuracy and use of appropriate units.
- QC data are reviewed to assure that internal specification and contract requirements have been met.
- Nonconformance reports, if any, are reviewed for completion of corrective action and impact upon results. Information contained in the nonconformance report may need to be included in the narrative report to the client.
- Results seem reasonable when compared to historical information associated with the site and results for other parameters tested at the same time.

Upon completion of review, the report folders are forwarded to the reporting group for compilation of the entire data package. The project manager performs the final review, as based upon client requirements. A copy of the signed report package is retained in the project file for archiving.

According to the EPA Contract Laboratory Program Statements of Work under certain circumstances data must be qualified. Qualification of data may occur for a number of reasons including blank contamination, inability to accurately quantitate the analyte, confirmation of previous results and others. Qualification of data performed by CLP Protocol shall follow the data flagging procedures as stated in the Statement of Work. Additionally, EPA CLP deliverable packages may be validated after submission to the client, by an independent contractor, as part of the overall Contract Laboratory Program.

Data evaluation, sample flagging procedures and method blank evaluation procedures are usually discussed in each analytical method SOPs.

The procedures for reporting analytical results are detailed in SOP G.12 "Standard Operation Procedure for Reports Generation".

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7.3 Record Storage

Data notebooks, instrument printouts, instrument log, sample chain-of-custody logs, files, and contracts are retained for a period of 5 years. If contract requirements deviate from this procedure, the lab will retain the data for the duration specified in the contract, but not less than five years. All data reports that are EPA CLP data will be retained for 10 years. Original SOPs, current and outdated, are archived on-site storage location. In the event that the laboratory transfers ownership or goes out of business, all the laboratory records will be either maintained or transferred according to clients' instructions.

All laboratory reports are archived by the Report Generation in either on-site or off-site storage locations. Reports are submitted to the archives in archive boxes. Each box is numbered. A cross-index of documents by workorder is maintained for expedient retrieval of information.

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7.4 Transcription

Transcription is a potential source of error. Therefore, all transcriptions are checked by a second person.

Two types of transcriptions are most common:

- Transcription of a value from a chromatogram or instrument printout to a data sheet for further calculation of a result. This transfer is checked by the data reviewer's supervisor prior to release of results.

- Transcription in the report preparation and typing stage. This transfer is checked by the project manager.

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7.5 Data Reduction

Data reduction includes all processes, which change either the form of expression or quantity of data values. The size or dimensionality of the data set is reduced.

To validate all reduction operations, all calculations or manipulations of data are recorded in the data. A description of the formula used must be provided.

GPL uses stand alone computers, computer data systems, and microprocessor controlled instrumentation to reduce raw data to final form, such as:

- Lachat omnion data system
- Hewlett-Packard chemstation used in conjunction with Enviroquant operating on the laboratory's network system
- The "ADAMS" data reduction system for metals data
- Thermo Jarrell Ash data system

Calculation of results is performed by these systems based on standard curve responses and is printed with each sample response and/or summarized in tabular form at the end of each analysis set.

When data calculations using linear regression are performed, the correlation coefficient, slope, and y-intercept values are recorded in the data.

The procedure for correct use of significant figures and rounding of numbers is defined in a SOP. The rounding rules cited in the USEPA Handbook of Analytical Quality Control in Water and Waste Water Laboratories are followed for all manual rounding of numbers.

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8.0 Data Quality Assessment

8.1 Introduction – Definition of Terms

Accuracy

Accuracy is defined as the degree of agreement of a measurement, X with an accepted true value, T. Two types of accuracy check samples are used, Laboratory Control Samples (blank spike) and the matrix spike. The formula used to calculate accuracy for the Laboratory Control Sample is:

$$\text{Accuracy} = (A / B) \times 100$$

Where A = Concentration measured; and
B = Concentration spiked

which is the same formula as used for percent recovery. For calculating accuracy in matrix spike analysis, a correction for background concentration found in the unspiked sample must be performed. The formula is:

$$\text{Accuracy} = ((A - B) / C) \times 100$$

where A = Spiked concentration measured
B = Unspiked concentration measured
C = Concentration spiked

Precision

Precision is a measure of the mutual agreement among individual measurements of the same property, usually under prescribed similar conditions. Analysis

precision is assessed through comparison of duplicate samples or duplicate matrix spike samples. The term expressing precision is Relative Percent Difference (RPD) and is calculated as follows:

$$RPD = ((A_1 - A_2) / ((A_1 + A_2) / 2)) \times 100$$

where A_1 = Rep1; and
A_2 = Rep2

where Rep1 and Rep2 are replicate analyses of the same sample; and,

$$RPD = ((MS - MSD) / ((MS + MSD) / 2)) \times 100$$

where MS = the Matrix Spike sample result; and
MSD = the Matrix Spike Duplicate result

where the matrix spike and matrix spike duplicate analyses are performed upon the same sample.

Representativeness

Representativeness expresses the degree to which data accurately and precisely represent an environmental or process condition.

Field sampling operations have a major impact on data representativeness. Factors including site selection, sampling tools, equipment cleaning procedures, sample preservation, and many others must be considered. Similarly, laboratory operations could impact representativeness if there were day-to-day fluctuations.

Accuracy and precision results of the daily quality control samples provide a measure of representativeness associated with laboratory operations.

Completeness

Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount expected under correct normal conditions. To maximize completeness of laboratory analysis, it is essential to obtain a sufficient quantity of each sample to provide for original and repeat analyses should the original analysis fail to meet acceptance criteria. Our goal for completeness is 95%.

Comparability

Comparability expresses the confidence to which one data set can be compared with another. This indicator of quality is enhanced at GPL by the following controls:

- Standardized EPA approved methodology for sample preservation, holding and analysis.
- Consistent reporting units for each parameter in similar matrices.
- EPA- or NIST-traceable standards, when available.
- Frequent analysis of USEPA QC samples.

Sensitivity

The term sensitivity is used broadly here to describe the contract method detection/reporting limits established to meet project specific DQOs; and not limited to the definition which describes the capability of a method or instrument to discriminate between measurement responses. Several limits have been established to describe sensitivity requirements (i.e., IDL, MDL, PQL, CRDL, CRQL, etc.). Normally, instrument detection limits (IDLs), and method detection limits (MDLs) reported are typically based upon a reagent water matrix or purified solid and ignore sample matrix interferences and the resulting effects

on the limits. The CRDLs and CRQLs published within CLP methodologies are contractually based levels.

- Method Detection Limit. The method detection limit (MDL) is the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix containing the analyte. Method Detection Limits are determined annually and are performed for all new tests and when changes in equipment are initiated. The procedure is defined in 40 CFR Part 136, Appendix B (Federal Register).

  1. An estimate of the detection limit is established.
  2. A minimum of seven replicates of blank water are spiked at a level 1 to 5 times the estimated detection limit.
  3. The spiked samples are processed through every step of the analytical method.
  4. The standard deviation for the seven samples is multiplied by 3.143 (students t value at 99% confidence at N-1 degrees of freedom) to obtain the MDL.

  The validity of the MDL study is verified per CFR requirements by comparing the mean value of the measured MDL spikes to the calculated MDL. The MDLs shall be preparatory method-specific, and include any clean-up methods used.

- Method Reporting Limit. The method reporting limit is established at a factor of five to ten times the MDL for the majority of target analytes, but no lower than three times the MDL for any target analyte.

- The method reporting limit is set at the lowest standard used for the initial calibration curve (or low-level calibration verification standard) or higher for each target analyte. The lowest standard or low-level calibration verification standard must be at least three times the MDL or greater.

- All target analyte values detected and reported below the method reporting limit must be flagged as an estimated quantity (i.e., J-flag).

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8.2 Methods for Attaining Quality Control Requirements

Sample Batching

The basic unit for application of laboratory quality control is the batch. Samples shall be prepared, analyzed, and reported in batches and be traceable to their respective batches. Batch sizes are normally limited to twenty field samples of a similar matrix but can exceed this by incorporating additional QC samples. Each batch shall be uniquely identified within the laboratory. Samples taken from the same site would normally be grouped together for batching purposes within the constraints imposed by the method holding times. However, laboratories may find it necessary to group multiple clients samples into a single batch. Under these circumstances, additional batch QC samples may be needed that evaluate the effect of the matrix from each site on method performance. Field QC samples, i.e., trip blanks, rinsates, etc., shall not knowingly be used for batch QC purposes.

- Preparation Batch

  The preparation batch shall be defined as samples of the same or similar matrix that is prepared together by the same person, or group of people within the same time period or within limited continuous time periods, which follow the same method, using the same type of equipment and same lots of reagents. The laboratory shall have sufficient quantities of extraction/digestion labware to meet these requirements. Each preparation batch shall contain the requisite number and type of calibration solutions, blanks, quality control samples, and regular analytical samples as defined by the analytical method. The use of clean-up methods would be included as part of the preparation batch. All field and batch specific QC samples within the batch should be subjected to all preparatory and clean-up procedures employed.

- Analysis Sequence

  The analysis sequence or instrument run sequence shall be defined as samples that are analyzed together within the same time period or in continuous time periods on one instrument under the control of one continuing calibration verification. Analyses sequences would be bracketed by the appropriate continuing calibration verification standards and other QC samples as defined by the analytical method. In general, if an instrument is not used for periods of time or shut down (e.g., overnight, etc.), then a new analysis sequence shall be initiated. Each analysis sequence shall contain the requisite number and type of calibration solutions, quality control samples, and regular analytical samples as defined by the analytical method.

Quality Control Samples

Data quality is evaluated by the performance of quality control sample analysis, including:

- Method Blanks
- Surrogate Spikes
- Matrix Spikes and Duplicates (MS, MSD)
- Sample Duplicate Analysis
- Laboratory Control Samples (LCS)
- Calibration Check Samples
- Field Blank Samples
- Trip Blank Samples
- Storage Blank Samples

When the method of analysis contains definitive performance and acceptance criteria for quality control and calibration samples, the laboratory adheres to these criteria, unless different criteria are specified in the client's Quality Assurance Project Plan, or the client expressly demands that different (predefined) criteria are met.

When the method contains guidelines for quality control and calibration samples, and includes advisory acceptance criteria, the laboratory adheres to these criteria, unless different criteria are specified in the client's Quality Assurance Project Plan, or the client expressly demands that different (predefined) criteria be met.

When the method contains no specific or advisory acceptance criteria, or lacks detailed information concerning calibration and quality control, the laboratory will adopt QC criteria as listed in section 8000 of SW846. The particular types and frequency of QC samples processed with production samples are determined by the requirements of the client. Most common needs are those presented in the Contract Laboratory Program Statement of Work (CLP-SOW), EPA SW846, state requirements, project requirements, customer requirements, and those requirements specified in our SOPs.

Information obtained from the above listed quality control samples is used to assess the quality of the data generated and is useful in identifying problems in the sampling process, in the shipment of samples, in the storage of samples, in the analysis of samples and in identifying problems, in the analysis of the samples caused by the samples themselves. Specifically:

- Method Blanks

A blank is an artificial sample designed to monitor the introduction of artifacts into the process. For aqueous samples, reagent water is used as a blank matrix. Sodium sulfate is used, as a substitute blank for solid matrices. In certain methods (i.e., pest/PCB & BNA determinations) purified sand is used where applicable.

A method blank is defined as a volume of deionized, distilled laboratory water, or in some cases a purified solid matrix, which is carried through the entire analytical process. Data obtained from these samples will indicate the absence or presence of sample contamination during the analytical process. The method blank will be performed at least once with each preparation batch, with a minimum of once per 20 samples.

The acceptance criteria for method blanks are addressed by the individual method SOP and/or the initial protocol. When no criteria are given, the laboratory will accept no target analytes at concentrations greater than the MDLs present in the blank.

- Surrogate Spikes

Surrogates are organic compounds which are similar to analytes of interest in chemical composition, extraction, and chromatography, but which are not normally found in environmental samples. These compounds are spiked into all blanks, standards, samples and spiked samples prior to analysis. Percent recoveries are calculated for each surrogate.

Samples are spiked using a surrogate to monitor the preparation and analytical process of the samples. If the surrogate material(s) are not recovered in sufficient quantity from the sample, the preparation and/or analysis of the sample is suspected. When surrogates are used they are spiked into all samples including blanks. The acceptance ranges for surrogate recoveries are specified by:

a. The specific project plan, or
b. The method requirements, or
c. The GPL applicable SOP

- Matrix Spikes and Duplicates

In matrix/spike duplicate analysis, predetermined quantities of stock solutions of certain analytes are added to a sample matrix prior to sample extraction/digestion and analysis. Samples are split into duplicates, spiked and analyzed. Percent recoveries are calculated for each of the analytes detected. The relative percent difference between the samples is calculated and used to assess analytical precision. The concentration of the spike should be at the regulatory standard level or the estimated or actual method quantification limit. When the concentration of the analyte in the sample is greater than 0.1%, no spike of the analyte is necessary.

Matrix Spike and Matrix Spike Duplicate analysis are performed to evaluate the effect of the sample matrix upon the methodology and the precision of the method with the particular matrix. If matrix spike compounds are not adequately recovered or vary in recovery between duplicates some measure of matrix interference is suspected. The acceptable ranges for MS/MSD recoveries are specified by:

a. The specific project plan, or
b. The method requirements, or
c. The GPL applicable SOP

The MS/MSD will be performed at least once with each analytical batch, with a minimum of once per 20 samples. The laboratory will perform matrix spike and duplicate on specific samples as identified by clients field operations. Otherwise, the selected samples for matrix spike and duplicate will be rotated among client samples so that various matrix interference may be noted and/or addressed.

- Sample Duplicate Analysis

A duplicate sample is a sample prepared by dividing a sample into two or more separate aliquots. Duplicate samples are considered to be two replicates.

Sample duplicate analysis is used to assess sample preparation and analytical method precision. The precision acceptance criteria are specified by:

a. The specific project plan, or
b. The method requirements, or
c. The GPL criteria of ≤20% RPD

The duplicate (when no MSD applies) will be performed at least once with each analytical batch, with a minimum of once per 20 samples.

- Laboratory Control Samples (LCS)

  A blank, which has been spiked with the analyte(s) from an independent source in order to monitor the execution of the analytical method, is called a LCS.

  The LCS is analyzed to assess general method performance by the ability of the laboratory to successfully recover the target analytes from a control matrix. For aqueous analyses use analyte-free reagent water. For soil analyses, a purified solid matrix (e.g., Ottawa sand, sodium sulfate, or other purified solid) would typically be used. However, due to the difficulty in obtaining a solid matrix which is metals-free, analyte-free reagent water is taken through the appropriate digestion procedures for metals analyses. The LCS is spiked with all single-component target analytes before it is carried through the preparation, cleanup and determinative procedures. A subset of the (single-component) target analytes containing the specific analytes of interest can be substituted for the full list of target analytes if specified in project-specific contracts or workplans. When multi-component target analytes are reported, a separate LCS may be necessary if specified by project documents. For Method 8082, the LCS must be spiked with at least one PCB (e.g., 1016/1260 mixture), or any project-specified PCBs.

When samples are not subjected to a separate preparatory procedure (i.e., purge and trap VOC analyses, or aqueous Hg analysis), the CCV may be used as the LCS, provided the CCV acceptance limits are used for evaluation. The spiking levels for the LCS would normally be set between the low and mid-level standards. The results of the LCS are evaluated, in conjunction with other QC information, to determine the acceptability of the data generated for that batch of samples. The laboratory also maintain control limits for these samples to assess the precision and bias of an analytical method. The precision may be evaluated by comparing the results of the LCS from batch to batch, or by duplicate LCSs.

- Calibration Check Samples

A Calibration Check Sample is used as a method of determining the accuracy of an instruments calibration, by verifying the instrument response to analyte amount. The source of the material must be independent of the material used to calibrate the instrument and must be of a known quality and concentration.

- Field Blank Samples

Field blanks are aliquots of analyte-free water or solvents brought to the field in sealed containers and transported back to the laboratory with the sample containers. Field blank submission is solely upon the clients' discretion and/or requirements.

Analysis of field blank samples can furnish some measure of information into the possibility of contamination of samples occurring in the field during the sampling process.

- Trip Blank Samples

  Trip blanks are not opened in the field. They are a check on sample contamination originating from sample transport, shipping and from site conditions.

- Storage Blank (Refrigerator Blank) Samples

  Storage blank (refrigerator blank) sample analysis is used to determine if sample contamination may have occurred during the storage of the samples at our laboratory facility.

Blind Quality Control Samples

The QA unit, as well as outside regulatory agencies, periodically formulates blind samples for submission to the laboratory for analysis. Sample sets usually contain blanks, and replicates of known concentration. Analysis of the data produced from these samples are used to assess quality of data produced by the laboratory, particularly laboratory precision and accuracy.

Quality Control Charts

Precision and accuracy acceptance limits for CLP (Contract Laboratory Program) organic and inorganic analyses are contract-mandated. GPL also offers a variety of analytical services using EPA approved methodologies. The QC requirements for accuracy and precision and mandated by the method and of course the

clients' needs and the regulatory authority under which the work is being performed. In the October 31, 1984 F.R., it is recommended that the laboratory periodically update these control limits based on historical data. It is GPLs policy to update control limits yearly after every twenty new sample data points are accumulated.

Warning and control limits are based upon the following formula:

Upper Control Limit (UCL) = $X + 3s$
Upper Warning Limit (UWL) = $X + 2s$
Lower Warning Limit (LWL) = $X - 2s$
Lower Control Limit (LCL) = $X - 3s$

where:

X = Mean Percent Recovery
S = Standard Deviation

All QC sample results are tabulated following analysis and compared to the contract-mandated, method-mandated, or client-mandated control limits for precision and accuracy. Out-of-control results are cause for immediate generation of a nonconformance report as described in Section 9.5 and possible re-extraction and/or re-analysis. No outlying data are ever released until the laboratory has verified that unacceptable results are attributable to the sample matrix. An analysis may be considered out of control whenever, as a minimum, any one of the following conditions is demonstrated by a control chart used to monitor that analysis.

- Any one point is outside of the control limits.
- Any three consecutive points are outside the warning limits.
- Any eight consecutive points are on the same side of the plotted mean.
- Any six consecutive points are such that each point is larger (or smaller) than its immediate predecessor.
- Any obvious cyclic pattern is seen in the data points.

QC data is recorded by analytical methodology employed and instrumentation used. For all CLP analyses, precision and accuracy data are required to be tabulated and reported on the MS/MSD Form.

Policy

The management and staff of GPL makes every effort to generate data of the highest quality possible and will continue to apply state-of-the-art analytical methodologies to ensure that our data continues to be of the best quality available anywhere.

GPL makes every attempt to produce and deliver analytical data, which has been demonstrated to meet contract-, method-, or client-required quality control acceptance criteria. Should anomalies occur in the processing and/or analysis of samples, which affect that objective, this is fully documented in the data and described in the report narrative. Also, when required, a statement of the estimated uncertainty of the test results will be documented in the report narrative. In cases where method variances occur, GPL will present the method or SOP to the client for evaluation and approval, prior to the initiation of the sample analysis.

Laboratory Policy for Method Performance Determination

GPL consistently answers the need of its clients to provide specialized testing and develop additional analytical methods to meet specific project requirements. The method performance is determined by establishing the following parameters:

- A calibration curve of at least 5 points is developed.
- Method detection limit study is conducted, using at least seven replicate runs. The level spiked will be at least 10X the minimum peak detection level of instrument used.
- The resulting MDL must be approved by the lab director, the QA manager, and the general manager. No MDL will be approved, having a detection limit higher than the level spiked.
- Documentation of the MDL study must be filed with the QA manager and the department supervisor, including all approval signatures.
- A precision and accuracy (P&A) study must be developed and approved by the lab director, the QA manager and the general manager. No P&A study will be approved unless the RSD is ≤20%, and the accuracy is determined to be 70-130%. Exceptions will be handled and approved on a case by case basis, depending on the method and with the approval of lab director, QA manager and general manager.
- The P&A study will be filed with the QA manager and the department supervisor, including all approval signatures.

All of the above bullets in the method performance policy must be completed and approved by the QA manager, the lab director and the general manager, before a new method is used on any samples. Details on performing and approving MDL, IDL and P&A studies are discussed in SOP, "Determination of Accuracy – Precision, Instrument and Method Detection Limits".

8.3 Data Quality Objectives and Analytical Data Categories

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In the planning of projects for the investigation of environmental pollution Data Quality Objectives (DQOs) are established. Data Quality Objectives are qualitative and quantitative statements, which specify the quality of data, required to support decisions during remedial response activities. DQOs are applicable to all data collection activities including those performed for preliminary assessments/site investigations, remedial investigations, feasibility studies, remedial design, and remedial actions. The level of quality and detail will vary depending upon the intended use of the data.

To assist in the interpretation of data, the superfund program has developed the following two descriptive data catagories:

- Screening data with definitive confirmation;
- Definitive data.

These two data categories are associated with specific quality assurance and quality control elements, and may be generated using a wide range of analytical methods. The particular type of data to be generated depends on the qualitative and quantitative DQOs developed during application of the DQO process. The decision on the type of data to be collected should not be made prior to completion of the entire DQO process.

8.3.1 Screening Data

Screening data are generated by rapid, less precise methods of analysis with less rigorous sample preparation. Sample preparation steps may be restricted to simple procedures such as dilution with a solvent, instead of elaborate extraction/digestion and cleanup. Screening data provide analyte identification and quantification, although the quantification may

be relatively imprecise. At least 10% of the screening data are confirmed using analytical methods and QA/QC procedures and criteria associated with definitive data. Screening data without associated and confirmation data are not considered to be data of known quality.

Screening Data QA/QC Elements

- Sample documentation (location, date and time collected, batch, etc.);
- Initial and continuing calibration;
- Documentation of detection limits;
- Analyte(s) identification;
- Analyte(s) quantification;
- Analytical error determination: An appropriate number of replicate aliquots, as specified in the QAPP, are taken from at least one thoroughly homogenized sample, the replicate aliquots are analyzed, and standard laboratory QC parameters (such as variance, mean, and coefficient of variation) area calculated and compared to method-specific performance requirements specified in the QAPP;
- Definitive confirmation: at least 10% of the screening data must be confirmed with definitive data. As a minimum, at least three screening samples reported above the action level (if any) and three screening samples reported below the action level (or as non-detects, ND) should be randomly selected from the appropriate group and confirmed.

8.3.2 Definitive Data

Definitive data are generated using rigorous analytical methods, such as approved EPA reference methods. Data are analyte-specific, with confirmation of analyte identity and concentration. Methods produce tangible raw data (e.g., chromatograms, spectra, digital values) in the form of paper printouts or computer-generated electronic files. Data may be generated at the site or at an off-site location, as long as the QA/QC requirements are satisfied. For the data to be definitive, either analytical or total measurement error must be determined.

Definitive Data QA/QC Elements

- Sample documentation (location, date and time collected, batch, etc);
- Initial and continuing calibration;
- Documentation of detection limits;
- Analyte(s) identification;
- Analyte(s) quantification;
- QC blanks (trip, method, rinsate);
- Matrix spike recoveries;

GPL typically provides definitive data as required by our clients. Project managers work with our clients in determining the data quality level required for each project. Project managers have the responsibility to ensure that the proper analytical methodology is employed and that the appropriate data deliverables package is generated.

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9.0 Corrective Action

9.1 Introduction

The QA is responsible for conducting inspections (audits) of the quality systems, data generation, and support systems of the laboratory. The purpose of the internal audit is to assist management in identifying and correcting deficiencies and to reinforce acceptable practices. This ensures that services meet the requirements of the Laboratory Quality Assurance Program Plan as well as the requirements of the client.

These inspections help to ensure that the policies of the laboratory requiring production of high quality data are being followed, including laboratory standard operating procedures, instrument procedures, sample preparation procedures and data review policies. If discrepancies are found, corrective action is taken. Two types of audits are in place: systems and performance audits. Additionally, there are routine data audits, independent audits, and audits for subcontracted services.

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9.2 System Audits

A systems audit is an inspection and review of an entire data-generation and support system. Quality-related activities are reviewed, assessed, and compared against the quality assurance program requirements for compliance. The audit includes the evaluation of personnel, facilities, standard operating procedures (SOPs), and records. Systems audits generally follow performance audits (usually by state or client auditors, required for certification and contract awards), and may be instituted as part of corrective action monitoring programs. These audits are performed quarterly.

Systems audits may also focus on a single area or aspect of laboratory operations. These inspections may consist of an in-process inspection of a particular analytical procedure, review of data books or logbooks for compliance to SOPs, or an inspection of the laboratory facility. These audits may be performed at any time at the discretion of the QA manager. Management may also direct the initiation of an audit for cause.

Systems audits are documented in the form of an audit report. The audit report describes any findings of the audit, recommendations to correct the finding and identifies the person or persons responsible for correction implementation. The original of the audit report is maintained in a chronological file while a copy of the document is circulated to the laboratory supervisor, laboratory director and the president. Once circulation is completed and all items are responded to, the audit report is filed by quality assurance. Follow-up audits will be performed to verify correction implementation. Audit reports are considered confidential documents and shall not be shown to or discussed with those outside the company without the expressed consent of the laboratory director and the quality assurance manager.

If deficiencies are observed during a performance audit, the quality assurance manager evaluates the audit report and initiates a follow-up systems audit, with emphasis on actions necessary to correct the deficiencies. A corrective action report is completed, detailing all remedial actions to be taken, and issued to the laboratory director and the laboratory manager for approval. If corrective action cannot be taken immediately, the anticipated date of action is provided. Once approved, the report is forwarded to the performance auditing agency or client.

Many of the objectives of a routine systems audit are similar to those a client or independent auditor would hope to accomplish during an on-site laboratory evaluation and data audit. These goals ensure that:

- Necessary quality control (including corrective action measurement) is being applied.
- Adequate facilities and equipment are available to perform the client's required scope-of-work.
- Personnel are qualified to perform the assigned tasks.
- Complete documentation is available, including sample chain-of-custody.
- Proper analytical methodology is being applied.
- Acceptable data handling techniques area being used.
- Corrective actions identified in any previous on-site visits have been implemented, and
- The laboratory management continues to demonstrate a commitment to quality.

In response to performance audits, any corrective actions taken are noted with reference to the auditor's deficiency report and the lab's standard operating procedures. Should a quantitative or qualitative error be noted in a data audit, a blind performance evaluation (PE) sample may be entered into the system to test affected parameters. Additionally, laboratory proficiency tests may be scheduled if method performance is in question. Specifics of these two programs are outlined in the following sections.

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9.3 Performance Audits

A performance audit is a planned independent check of the operation of a measurement system with the purpose of obtaining a quantitative measure of the quality of the data generated. In practice, this involves analysis of standard reference samples or materials, which are certified as to their chemical composition or physical characteristics.

GPL participates in various proficiency testing programs for each analyte or analyte group. The proficiency testing program is evaluated to obtain or maintain approval to analyze an analyte or analyte group. GPL establish, maintain, and document the proficiency testing program.

The QA submits the performance evaluation samples to the laboratory periodically. These samples provide a check on all operations performed in the lab, including bottle preparation, sample holding, extraction, analysis, data validation, and reporting. The blind performance evaluation samples are prepared from EPA reference materials where available, or other independent sources. Findings reported by the laboratory are submitted to the laboratory managers. Unacceptable results require both investigation and documentation of corrective action by the laboratory manager.

If deficiencies are observed during an on-site assessment, the quality assurance unit will document the response to each deficiency noted on the on-site audit findings. Copies of the completed reports are filed by QA.

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9.4 Audits of Subcontractors

Analysis performed by subcontractors must conform with GPL quality control requirements. Subcontractors must meet the requirements of the GPL quality assurance program or have in place an equivalent program. Also, where applicable, the laboratory will cooperate with any program requirements concerning the use of subcontractors.

The QA is authorized when necessary to evaluate the QA program of the subcontractor through review of the laboratory's written quality assurance program plan, the quality assurance project plan (where applicable), quality control SOPs, typical SOPs, and latest applicable USEPA performance evaluation study results. An on-site audit of the facility can be performed as deemed necessary by the QA manager.

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9.5 Nonconformance Event Corrective Action and Documentation

Documentation of analytical problems and corrective action taken is an essential part of the data record for each project. Identification, implementation, and monitoring of the actions that could have prevented the analytical problem provide a method for improving the quality of laboratory performance. A nonconformance report sheet has been designed to document laboratory problems, corrective actions, impact on analytical results, and preventive actions for the future. (Section 9.5 page 3)

The nonconformance report must show complete background information about the event, including: date and time; analysis and phase; the client name; the sample identification number; and a description of the event that occurred. The report must further include: the corrective action taken; indication of the status of the system; an assessment of impact on analytical results; and recommendations for preventive action.

The nonconformance report should be initiated by the person experiencing or noticing the discrepancy and completed by the supervisor. For example, the initiator may provide the description of the event and corrective action taken; the supervisor addresses the impact and details future preventive action.

Copies of the completed reports should be distributed to the project manager, the laboratory director, and the original copy to the QA. The project manager should review the nonconformance report and place a copy of the report into the project file. If the event has caused any impact on the analytical results, the project manager will meet with the QA manager and communicate with the client personally.

The section manager should check that corrective action has been appropriate, confirm analytical impact, and ensure the implementation and monitoring of preventive action.

The QAM should review the nonconformance reports and file for follow-up action. On an as needed basis, a QA meeting is held with the QA manager, project managers, and laboratory management to evaluate corrective action and preventive action effectiveness. All effective preventive action will be documented for all appropriate laboratory sections. The laboratory managers and supervisors of each area will be responsible for any SOP revision to reflect these preventive actions.

Initial preventive action plans, which are evaluated as being ineffective, will be investigated to identify the origin of the problem and the effective preventive action. The supervisor of the area where the initial nonconformance occurred and section manager will participate in the investigation. Progress of the investigation and monitoring of the effectiveness of preventive action is documented by the supervisor and the information is filed by QA.

Nonconformance Report

(All items must be completed)

Distribution: NCR #: _____
Date: _____

_____ to Yemane Yohannes
Supervisor Lab Director

cc: Project Manager _____ ; QA (Original)

Client or Project Name: _____

Date of Nonconformance: _____ WO# & Fraction:: _____

Analysis Phase: _____ Analysis: _____

Description of Events: _____

Most Possible Cause(s) of Nonconformance: _____

Corrective Actions Taken: _____

Is the system now in control: (Yes or No) _____ (If no, circulate this report immediately without taking further action)

Preventative Actions to be taken: _____

Report Initiated by: _____ Date: _____

Responsible Supervisor: _____ Date: _____

Additional Actions Taken: _____

Action Taken By: _____ Date: _____

Lab. Director: _____ Date: _____

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10.0 Implementation Requirement and Schedule

The QAPP becomes effective on the first day after approval by the QA manager and laboratory director. Any questions regarding implementation should be addressed to the laboratory quality assurance manager or the laboratory director.

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11.0 References

Regulations

40 CFR 136.3e	Required containers, preservation techniques, and holding times
40CFR 136	Guidelines establishing test procedures for the analysis of pollutants under the Clean Water Act
40 CFR 136 Appendix A	Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater
40 CFR 136 Appendix B	Definition and procedures for the Determination of the Method Detection Limit
40 CFR 136 Appendix C	Inductively Coupled Plasma – Atomic Emission Spectrophotometer Method for Trace Element Analysis of Water and Wastes. Method 200.7
40 CFR 141	National Primary Drinking Water Regulations
40 CFR 143	National Secondary Drinking Water Regulations

Manuals

EPA 600/4-79-020	Method for Chemical Analysis of Water and Wastes (1983)
EPA 600/4-79-019	Handbook for Analytical Quality Control in Water and Wastewater Laboratories (1979)

EPA 540/R-93-071	Data Quality Objectives Process for Superfund, September 1993
ACOE	Shell for Analytical Chemistry Requirements, EM200-1-3, 1 February 2001
SW846	Test Methods for Evaluating Solid Wastes, Third Edition (1986)
Standard Methods	Standard Methods for the Examination of Water and Wastes, 17th and 18th Editions, American Public Health Association
EPA QA/R-5	EPA Requirements for Quality Assurance Project Plans for Environmental Data Operations, November 1999
NFESC QA	DOD Quality System Manual for Environmental Laboratories, Version 2 Final, June 2002

APPENDIX A

RESUMES – KEY PERSONNEL

(available upon request)

APPENDIX B

CERTIFICATIONS STATUS AS OF PUBLICATION DATE OF QAPP

(most current and detailed certification status is available upon request)

GPL Laboratories, LLLP

CERTIFICATIONS/VALIDATION/ACCREDITATION

Army Corps of Engineers (MRD)
Organic/Inorganic/Explosives (Current)

Navy CLEAN – NFESC Evaluated (Current)

Air Force AFCEE/IRPIMS Deliverables/ERPIMS Deliverables

USATHAMA/AEC IRDMIS Deliverables

Chemical Agent Degradation Analysis Capability
(Full List-USATHAMA/AEC Methods)

USDA Permit For Importing of Foreign
Soils For Chemical Analysis (Current)

State of Alabama (Current)
State of California (Current)
State of Connecticut (Current)
State of Delaware (Current)
State of Florida (Current)
State of Kansas (Current)
State of Louisiana (Current)
State of Maryland (Current)
State of Massachusetts (Current)
State of New Jersey (Current)
State of New York (Current)
State of North Carolina (Current)
State of Pennsylvania (Current)
State of Tennessee (Current)
State of Utah (Current)
Commonwealth of Virginia (Current)

US EPA CLP Laboratory (Routine Analytical Services 1980-1991)
US EPA CLP Laboratory (Special Analytical Services 1992-1994)
US EPA CLP Laboratory (Direct Analytical Services – 1996)

GPL Laboratories, LLLP
7210A Corporate Court
Frederick, MD 21703-8386
Phone (301)694-5310 / Fax (301)620-0731

APPENDIX C
EQUIPMENT LIST

EQUIPMENT LIST

The speed, accuracy, and capability of an analytical laboratory are dependent upon the quantity and quality of the equipment available for the analytical procedures. GPL possesses many of the most modern and sophisticated equipment available in the industry. The equipment is maintained under a thorough quality improvement program to assure its availability when needed. We have a continuing program of evaluation to schedule equipment for replacement, as better and more efficient equipment becomes available.

The following is a brief description and quantity of the major pieces of analytical equipment currently in use at GPL Laboratories, LLLP.

- Hewlett Packard Model 5970 Automated GC/MS Systems (5), 1989
  Hewlett Packard Model 5972 (4), 1996
  Agilent 6890N GC/MS System (1), 2002
  Systems consist of mass selective detectors with GC interface, electron impact ion source, hyperbolic quadruple mass filter, electron multiplier detector, and associated support equipment. The HP5890B Gas Chromatographs have capillary/packed injection systems and CO_2 cryogenic oven control. The systems incorporate the HP Chemstation and HP Enviroquant Data Systems.

- Tekmar Model LSC2000, ALS2016, Purge and Trap Autosamplers (5), 1989
  Equipped with Tekmar Turbo Cool VOC Cryogenic Trapping System.

- Tekmar Model LSC3000, ALS2016 Purge and Trap Autosampler (1), 1989
  Equipped with Tekmar TurboCool VOC cryogenic trapping system

- Tekmar LSC200 Varian, Archon Closed System Autosampler (3), 1999
  Units are equipped to perform automated soil volatile analyses for Method 5035

- Tekmar Model 3001 Purge and Trap liquid concentrator (1), 2002
  Equipped with rapid cool trapping system and silcosteel inert fittings

- Tekmar Model LSC-2 Liquid Sample Concentrator with ALS Autosampler (1), 1982

- Shimadzu Model GC-14 Gas Chromatograph (1), 1994
  System includes autosampler and cryogenics and is equipped with a flame ionization detector and photoionization detector

- HP Model 5890 GC (1), 1989
  The system is equipped with Tekmar purge and trap 50 position Aquatech auto sampler with flame ionization detector and photoionization detector.

- Hewlett Packard Model 5890 Gas Chromatographs (4), 1989
  Systems include HP 7673 autosamplers and dual electron capture detectors, interfaced to HP Enviroquant data handling software

- Agilent Model 6890N Gas Chromatograph (1), 2001
  System include HP 7673 autosampler and dual micro-electron capture detectors, interfaced to Agilent Enviroquant data handling software

- Agilent Model 6890N Gas Chromatograph (1), 2003
  System include HP 7673 autosampler and dual micro-electron capture detectors, interfaced to Agilent Enviroquant data handling software

- Hewlett Packard Model 5890 Gas Chromatograph (3), 1989
  Systems are equipped with HP 7673 autosamplers and HP Enviroquant Software and both flame ionization detector and flame photometric detectors

- Hewlett Packard Model 1100 Automated HPLC System (2), 1998 & 1999
  HPLC Systems are equipped with a variable wavelength UV detector, an isocratic pump, a heated column system, column switching valves, and a 100-position autosamplers. They are designed to handle large quantities of 8330 explosive analysis, as well as the

confirmation analysis. This HPLC system is connected to a HP Chemstation for data acquisition and to HP Enviroquant for data reporting.

- Waters High Pressure Liquid Chromatographs (3), 1994
  The systems have UV/VIS detectors each with Model 510 and 515 pumps, gradient controller, fluorescence detector and WISP autosamplers. The data is acquired and processed using HP Enviroquant software.

- Pensky-Martens Closed Cup Flashpoint Apparatus, 2000

- Thermo Jarrell Ash Trace ICAP 61 Inductively Coupled Plasma Spectrometer (ICP)(1)
  System includes autosampler and TJA data handling software system, 1996

- Thermo Jarrell Ash Trace ICAP 61E Inductively Coupled Plasma Spectrometer (ICP)(1)
  System includes autosampler and TJA data handling software system, 1995

- Thermo Jarrell Ash Trace ICP/MS, X series (1), 2002
  System includes Cetac ASX-510 autosampler and TJA data handling software

- Leeman Labs Model AS200/AP200 Automated Mercury Preparation/Analysis System (1), 1999

- Dionex Model DX-600 Ion Chromatograph System (1), 2003
  Chemical suppression IC equipped with autosampler and Dionex chromatography acquisition and processing software

- Dionex Model DX-500 Ion Chromatograph System (1), 1998
  Chemical suppression IC equipped with autosampler and Dionex chromatography acquisition and processing software

- Lachat Quikchem 8000 analyzer (1) equipped with XYZ sampler, auto-dilutor, multiple analytical channels, and omnion FIA software, 1999

GPL Laboratories, LLLP

- Dohrmann Model Phoenix 8000 UV-Persulfate TOC Analyzer, 2003

- Dohrmann Model DX-20 Total Organic Halogen Analyzer (3), 1988

- Autoprep 1000 System (1), 1995
  An automated system for processing up to 23 samples through GPC cleanup utilizing low pressure-high capacity Envirobeads S-X3 columns, high efficiency Envirosep ABC columns or Optima columns.

- Fluid Management System (1), 1995
  GPC preparation system. Processes up to 10 samples, automatically.

- Buck Scientific Infrared Spectrophotometer (1), 1998

- Alpkem Model RFA 300 Computerized Autoanalyzer (1), 1985

- Berthold 10 Channel Low-Level Gross Alpha-Beta Counter, model LB770 (1), 1995
  System includes windows software (LB 770Win-PC) for automated counting and calculation and data handling.

- High Speed digital copier/printer/scanner, Lanier Model LD060 (1), 2003
  60 pages per minute

- High Speed programmable digital copier/printer/scanner, Lanier Model 5685 (1), 2003
  85 pages per minute

APPENDIX D
METHOD DETECTION LIMITS/METHOD REPORTING LIMITS
(available upon request)

APPENDIX E

STANDARD OPERATING TABLES OF HOLDING TIMES AND PRESERVATION REQUIREMENTS FOR ROUTINE METHODS

APPENDIX F

STANDARD OPERATING PROCEDURE MANUAL INDEX

(as of publication date of QAPP)

GPL Laboratories, LLLP

Standard Operating Procedure

Manual Index

March 2004

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•	H.16	2	08/99	Inactive	Graphite Furnace for Se in Drinking Water (3113B)
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•	H.23	2	04/01	04/03	Standard Operating Procedure for Waste Extraction Test (Wet) Procedure
•	H.24	1	08/01	Inactive	Trace ICP Quantitation of TAL Metals According to ILM05.1
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•	H.31	2	04/03		Trace ICP Quantitation of HSL Metals plus Boron, Molybdenum, Silicon, Strontium, Titanium, and Tin According to Method 6020
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•	I.5	8	07/98	Inactive	Trace ICP Quantitation of HSL Metals plus, Boron, Molybdenum, Silicon, Strontium, Titanium, and Tin (6010A)
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•	J.8	8	04/03		Nitrogen, Nitrate-Nitrite-(Colorimetric Automated Cd Reduction) 353.2
•	J.9	6	11/00	11/02	Total Petroleum Hydrocarbons in H_2O by IR (418.1)
•	J.10	7	12/02		Total Petroleum Hydrocarbons in Soil by IR (418.1)
•	J.11	5	12/02		Analysis of Water and Soils for Sulfide According to MCAWW Method 376.1
•	J.12	4	11/00	11/02	Analysis of Waste Liquid and Solid Samples for Corrosivity As Defined by SW846 Volume IC, Chapter 7 (7.2.2-1.a only)
•	J.13	4	07/99	11/02	Analysis Waste Liquid and Solid Samples for Reactivity as Defined by SW846 Volume IC, Chapter 7(7.3)
•	J.14	3	03/01	04/03	Paint Filter Liquids Test
•	J.15	2	10/98	Inactive	Bromide - (Manual Colorimetric, Phenol Red) 4500-Br-B
•	J.16	4	12/02		Fluoride (Ion Selective Electrode)(340.2/4500C)
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•	J.20	4	12/02		Analysis of Sediment Samples for Acid Volatile Sulfides and Simultaneously Extractable Metals by EPA Draft Method, April 16, 1991 (AVS/SEM)
•	J.21	4	11/00	11/02	Total Dissolved Solids (TDS)(160.1/2540C)
•	J.22	4	12/02		Total Suspended Solids (160.2/2540D)
•	J.23	8	04/03		Alkalinity (310.1/2320B)
•	J.24	3	11/00	11/02	Hardness (130.2/2340C)
•	J.25	3	10/98	Inactive	Chemical Oxygen Demand (410.4/5220D)
•	J.26	2	10/98	Inactive	Silica (370.1)
•	J.27	5	04/03		Turbidity (180.1/2130B)
•	J.28	7	12/02		Nitrocellulose
•	J.29	4	11/00	11/02	Sulfite (377.1)
•	J.30	6	04/03		Ammonia-Nitrogen (350.2)
•	J.31	5	04/03		Phosphorus 365.3 (Two Reagent)
•	J.32	4	11/01	11/02	Free Carbon Dioxide (2310B/4500-CO_2C)
•	J.33	3	11/00	11/02	Acidity (305.1/2310B)
•	J.34	3	11/00	11/02	Specific Conductance SW846 (9050)
•	J.35	3	11/00	11/02	Conductance MCAWW (120.1/2510B)
•	J.36	2	10/98	04/03	Soil Organic Matter
•	J.37	2	10/98	Inactive	Total soluble Salt in Soil Samples
•	J.38	5	04/03		Ammonia-Nitrogen (Potentiometer) (350.3)
•	J.39	3	12/02		Cation-Exchange Capacity of Soils (9081)
•	J.40	4	10/98	Inactive	Particulate Matter Filter Analysis

Section	SOP No.	Ver. No.	Date	Reviewed Date	Title
•	J.41	7	04/03		Determination of Biological Oxygen Demand (BOD) In Wastewaters, Effluents and Polluted Waters (405.1/5210B)
•	J.42	4	04/02	04/03	TKN (Potentiometric) 351.3
•	J.43	3	04/03		Cyanide, (Colorimetric, manual Spec) by Method 9014
•	J.44	4	04/03		Cyanide, (Automatic colorimetric with off-line Distillation) by method 9012A
•	J.45	2	12/02		Nitrogen, Nitrite - Spectrophotometric (354.1)
•	J.46	1	03/97	Inactive	Phosphorus 365.2 (Single Reagent)
•	J.47	1	11/00	11/02	Cyanide(automated colorimetric with off-line distillation) by method 335.3
•	J.48	2	04/02	04/03	Color (Colorimetric-Platinum-Cobalt)
•	J.49	3	04/03		Chemical Oxygen Demand, Titrimetric (SM5220C/ MCAWW410.2)
•	J.50	3	04/03		Hexavalent Chromium (manual colorimetric) SW846 7196A
•	J.51	2	04/03		Settleable Solids (160.5)
•	J.52	1	03/01	04/03	Dissolved Oxygen
•	J.53	2	04/02	04/03	Cyanide, Amenable (manual distillation)
•	J.54	1	03/01	04/03	Total Solids (TS) (160.3)
•	J.55	3	02/04		Oil and Grease (Hexane Extraction, Gravimetric)
•	J.56	1	11/02		Hexavalent Chromium (Basic Digestion, Manual Colorimetric)

Section	SOP No.	Ver. No.	Date	Reviewed Date	Title
K	**Wet Chem – Miscellaneous**				
	• K.1	1	03/97	Inactive	Volatile Fatty Acids by Distillation SM (5560C)
	• K.2	1	05/97	Inactive	Heterotrophic Plate Count
	• K.3	1	05/97	Inactive	Coliform Analysis by the Membrane Filter Technique
L	**IC**				
	• L.1	7	04/03		Determination of Inorganic Anions in Water and Aqueous Extract Samples by Ion Chromatography by /MCAWW 300.0
	• L.2	9	04/03		Determination of Perchlorate in Soil and Water by IC (314.0)
	• L.3	7	03/03		Determination of Isopropylmethyl Phosphonic Acid (IMPA) and Methylphosphonic Acid (MPA) in Soil and Water Samples (UTO3/LT03)
	• L.4	10	11/03		TOC (9060)
	• L.5	9	11/03		Total Organic Carbon (TOC) Soils (Lloyd Khan)
	• L.6	5	11/01	11/02	Total Organic Halides - Method 9020B
	• L.7	1	05/00	11/02	Extractable Organic Halides, Method 9023
	• L.8	2	12/02		Determination of Inorganic Anions in Water and Aqueous Extract Samples by Ion Chromatography by MCAWW 300.1
	• L.9	4	11/03		Total Organic Carbon (TOC)(415.1)
	• L.10	3	04/03		Determination of Inorganic Anions in Water and Aqueous Extract Samples by Ion Chromatography (SW846 9056)
	• L.11	1	04/01	11/03	Total Organic Carbon in Soils (Walkley-Black Titration)

Section	SOP No.	Ver. No.	Date	Reviewed Date	Title
•	L.12	1	10/02		Determination of Volatile Fatty Acids in Water Samples by Ion Chromatography
•	L.13	1	04/03		Determination of Perchlorate in Water and Soil Samples by Ion Chromatography
M	**Volatile Analysis**				
•	M.1	4	4/98	08/02	GC/MS Analysis of Water, Soil and Sediment Samples for Volatile Compounds According to USEPA CLP SOW OLM03.2
•	M.2	7	01/04		524.2 Analytical
•	M.3	5	03/01	04/03	Volatile Organics-Method 624
•	M.4	7	10/97	12/02	Volatile Organics - Method 8260A
•	M.5	12	02/03		Volatile Organics - 8260B
•	M.6	8	12/02		The Determination of Volatile Petroleum Hydrocarbon (Gasoline Range)
•	M.7	4	10/02		Method 5035
•	M.8	5	04/03		Measurement of VOA Aromatic Compounds in H_2O and Soil by GC/PID (5030/8021B)
•	M.9	1	07/98	10/02	Dimethyl Mercury by Method 8260B
•	M.10	2	10/02		Measurement of Volatile Aromatic Compounds in Water and Soil by GC/PID (5030/602)
•	M.11	3	09/02		VOA Organics CLP SOW OLM 04.2A
•	M.12	3	07/02		The Determination of Volatile Petroleum Hydrocarbon (Gasoline Range) by California LUFT
•	M.13	2	11/02		GC/MS Analysis of Water Samples Containing Low Level Concentrations for Volatile Compounds According to the USEPA Contract Laboratory Program Statement of Work Low Concentration OLC03.2

Section	SOP No.	Ver. No.	Date	Reviewed Date	Title
	• M.14	1	09/02		Closed System Purge-and-Trap and Extraction for Volatile Organics in Soil and Sediment Samples – OLM04.2A
	• M.15	1	02/03		GC/MS Analysis of Water, Soil and Sediment Samples for Volatile Compounds According to the USEPA CLP SOW OLM04.3
N	**Extraction Procedures**				
	• N.1	6	07/02	07/03	Flashpoint (1010)
	• N.2	5	02/00	07/03	Extract Clean-up by Gel Permeation Chromatography (GPC)
	• N.3	4	02/00	09/02	Soil Extraction for Pesticides and PCBs by OLMO4.2
	• N.4	3	10/02		Continuous Liquid-Liquid Extraction for Pest/PCBs by CLP OLM04.2
	• N.5	3	09/02		Soil Extraction for Pesticides/PCB's Compounds by Method 3540C (Soxhlet Extraction)
	• N.6	7	09/02		Method 3520C,Continuous Liquid-Liquid Extraction for PEST/PCBs
	• N.7	8	09/02		Method 3550B, Ultrasonic Extraction for Pesticides/PCB s
	• N.8	5	09/02		Method 3510C, Separatory Funnel Liquid-Liquid Extraction for Pesticide/PCBs
	• N.9	4	10/02		Continuous Liquid-Liquid Extraction for Semivolatile Organics CLP SOW OLM04.2
	• N.10	5	10/02		Soil Extraction for Semivolatile Organics by OLM04.2
	• N.11	7	10/02		Method 3520C, Continuous Liquid-Liquid Extraction for Semivolatile Organics
	• N.12	8	10/02		Soil Extraction for Semivolatile Organics by Method 3550B (Sonication Extraction)

Section	SOP No.	Ver. No.	Date	Reviewed Date	Title
•	N.13	7	10/02		Method 3510C, Separatory Funnel Liquid-liquid Extraction for Semi-Volatiles
•	N.14	3	05/97	Inactive	Method 8150B Extraction and Esterification of Chlorinated Acid Herbicides
•	N.15	1	11/97	Inactive	525.2 Extraction Procedure
•	N.16	1	11/97	Inactive	515.1 Extraction Procedure
•	N.17	3	10/02		Method 8151A, Extraction and Esterification of Chlorinated Acid Herbicides
•	N.18	2	10/02		Extraction Procedure for method 608
•	N.19	3	10/02		Wipe Extraction for Pesticides/PCBs Compounds by Method 3550B (Sonication Extraction)
•	N.20	2	04/02	04/03	Ignitability of Solids (1030)
•	N.21	1	03/01	04/03	Soil Extraction for Semivolatile Organics by Method 3540C (Soxhlet Extraction)
•	N.22	2	11/02		Continuous Liquid-Liquid Extraction for Pesticides/ PCBs According to USEPA Low Concentration OLC03.2
•	N.23	2	11/02		Continuous Liquid-Liquid Extraction for Semivolatile Organics by EPA Low Concentration OLC03.2
•	N.24	2	07/02	07/03	Soil Extraction for Explosives by Method 3540C (Soxhlet Extraction)
•	N.25	1	11/02		Soil Extraction for Explosives by Method 3550B (Sonication Extraction)
•	N.26	1	11/02		Method 3520C Continuous Liquid-Liquid Extractions for Organosulfur Compounds
•	N.27	1	11/02		Soil Extractions for Organosulfur Compounds by Method 3550B (Sonication Extraction)
•	N.28	1	12/02		Soil Extraction for White Phosphorus by Method 3550B (Sonication Extraction)

Section	SOP No.	Ver. No.	Date	Reviewed Date	Title
•	N.29	1	01/03		Method 3510C, Separatory Funnel Extraction for White Phosphorus
•	N.30	1	02/03		Soil Extraction for Pesticides and PCBs by OLM04.3
•	N.31	1	02/03		Continuous Liquid-Liquid Extraction for Pesticides/PCBs According to USEPA SOW OLM04.3
•	N.32	1	02/03		Continuous Liquid-Liquid Extraction for Semivolatile Organics by OLM04.3
•	N.33	1	02/03		Soil Extraction for Semivolatile Organics by OLM04.3
•	N.34	1	02/03		Method 3520C Continuous Liquid-Liquid Extraction for Explosive Organics
O	**Extractions - Miscellaneous**				
•	O.1	1	12/91	Inactive	PUF Clean-up of Organochlorine Pesticides and PCBs in Ambient Air
•	O.2	Draft		Inactive	Extraction of Organochlorine Pesticides and PCBs in PUF
•	O.3	Draft		Inactive	Separatory Funnel Extraction for Method 508, Chlorinated Pesticides in H_20
P	**Semivolatile Analysis**				
•	P.1	5	08/02		GC/MS Analysis of Water, Soil and Sediment Extracts for Semivolatile Compounds According to the USEPA CLP SOW OLM03.2
•	P.2	4	10/02		Method 525.2 GCMS Analysis for Semivolatile Organic Compounds – Capillary Column Technique
•	P.3	6	02/03		Method 625, GC/MS Analysis of Semivolatile Organic Compounds (and Base/Neutrals) - Capillary Column Technique

Section	SOP No.	Ver. No.	Date	Reviewed Date	Title
•	P.4	8	10/98	Inactive	SOP for Method SW8270B
•	P.5	10	02/03		SOP for SW8270C – GC/MS Analysis of Semivolatile Organics
•	P.6	3	11/02		GCMS Analysis of Water, Soil and Sediment Extracts for Semivolatile compounds by CLP SOW OLM04.2
•	P.7	1	11/01	11/02	GC/MS Low Concentration Analysis of Water Extracts for Semivolatile Compounds According to the USEPA Contract Laboratory Program Statement of Work OLC03.2.
•	P.8	5	02/03		GCMS Analysis of Nitroaromatic and Nitramine Explosive Residues in Soil and Sediment Samples
•	P.9	1	11/02		GC/MS Analysis of Organosulfur Compounds
•	P.10	3	04/03		GCMS Analysis of White Phosphorus
•	P.11	1	02/03		GC/MS Analysis of Water, Soil, and Sediment Extracts for Semivolatile Compounds According to the USEPA CLP SOW OLM04.3
Q	**GC/ECD**				
•	Q.1	4	08/02		GC Analysis of Water, Soil and Sediment Extracts for Organochlorine Pesticides and Polychlorinated Biphenyls (PCBs) According to the USEPA CLP SOW OLM03.2
•	Q.2	2	11/02		Method 508 Determination of Chlorinated Pesticides in Water by Gas Chromatography Utilizing An Electron Capture Detector
•	Q.3	4	03/01	04/03	SOP for Method 608 Organochlorine Pesticides and PCBs
•	Q.4	6	01/98	Inactive	SOP for Method 8080A Organochlorine Pesticides and PCBs and PCTs
•	Q.5	5	12/98	Inactive	Method 8081 Organochlorine Pesticides and PCBs

Section	SOP No.	Ver. No.	Date	Reviewed Date	Title
•	Q.6	7	10/02		SOP for Method 8081A – Organochlorine Pesticides
•	Q.7	4	11/01	11/02	SOP for Method 8082 – Aroclor and PCB Congeners
•	Q.8	3	11/02		Method 515.1 Determination of Chlorinated Acids in Water by Gas Chromatography with an Electron Capture Detector
•	Q.9	3	05/97	Inactive	Analysis of Herbicide by Method 8150B
•	Q.10	4	02/01	04/03	Analysis of Herbicides by Method 8151A
•	Q.11	2	12/00	Inactive	Analysis of Nitroaromatics and Degradation Products in Ground and Drinking Water (CAD 8.1)
•	Q.12	2	11/01	Inactive	Analysis of Nitroamines in Ground and Drinking Water (CAD 4.2)
•	Q.13	1	03/95	Inactive	Determination of Organochlorine Pesticides and Polychlorinated Bi-phenyls in Polyurethane Foam (PUF) and/or Filters
•	Q.14	1	05/95	Inactive	SOP Method 608 for PCB Analyses for PUF
•	Q.15	3	11/02		SOP for PEST/PCBs by OLMO4.2
•	Q.16	2	05/03		Analysis of Explosives by GC/ECD in Water and Soil (8095)
•	Q.17	3	04/03		Method 8011 Analysis of EDB and DBCP in Water by Microextraction and GC
•	Q.18	3	04/03		GC Analysis of Water Extracts for Organo-chlorine Pesticides and Poly-Chlorinated Biphenyls (PCBs) According to the USEPA Contract Laboratory Program Statement of Work Low Concentration OLC03.2
•	Q.19	2	08/02		Analysis of Nitroaromatics and Nitramines in Ground and Drinking Water (CAD13.2)

Section	SOP No.	Ver. No.	Date	Reviewed Date	Title
	• Q.20	2	04/03		GC Analysis of Water, Soil and Sediment Extracts for Organo-chlorine Pesticides and Poly-Chlorinated Biphenyls According to the USEPA CLP SOW OLM04.3
R	**GC/FID/FPD**				
	• R.1	8	11/01	02/03	Determination of Petroleum Hydro-carbons in Soil and Water Samples (8015M) - FID
	• R.2	5	11/01	11/02	Measurement of Dissolved Gaseous Organic Compounds in Water by Head Space and GC Analysis (3810/8015/RSK175)
	• R.3	7	01/03		Determination of Organosulfur Compounds in Water and Soil Samples (UL04/LL03) - FPD
	• R.4	4	07/02		Determination of Organophosphonate Compounds in Water and Soil Samples, Methods T8 (Water) and TT9 (Soil) - FPD
	• R.5	4	02/03		Organophosphorus Pesticides by Method 8141A - FPD
	• R.6	4	11/02		Determination of Diesel Range Petroleum Hydrocarbons in Soil and Water (DRO)
	• R.7	1	06/01	07/02	Determination of Diesel Range Petroleum Hydrocarbons in Soil and Water Samples by California LUFT
	• R.8	2	08/02		Determination of Petroleum Hydrocarbons in Soil and Water Samples (FL-PRO)
S	**HPLC Analysis**				
	• S.1	15	02/03		HPLC Analysis of Nitroaromatic and Nitramine Explosive Residues in Water, Soil and Sediment Samples (8330)
	• S.2	6	06/03		HPLC Analysis of Thiodiglycol in Water and Soil Samples (UW22/LW18)

Section	SOP No.	Ver. No.	Date	Reviewed Date	Title
•	S.3	1	03/97	Inactive	Measurement of Formaldehyde in Water and Soil by High Performance Liquid Chromatography (8315)
•	S.4	3	03/03		HPLC Analysis of Nitroguanidine in Water and Soil Sample
•	S.5	2	11/01	11/02	HPLC Analysis of N,N-Bis Trichlorophenyl Urea (TCPU) in water and soil samples
•	S.6	5	12/02		HPLC Analysis of PAH in Water and Soil Samples (8310)
•	S.7	4	12/02		HPLC Analysis of Nitroglycerine in Water and Soil Samples (8332)
•	S.8	3	08/01	02/03	HPLC Screening of Nitroaromatic and Nitramine Explosive Compounds in Water, Soil and Sediment Samples
•	S.9	4	12/02		HPLC Analysis of Nitroaromatic and Nitramine Explosive Residues in Water, Soil, and Sediment Samples with Extended Analyte List
•	S.10	1	08/01	02/03	HPLC Screening of Nitroaromatic and Nitramine Explosive Compounds in Water by Solid Phase Extraction (SPE)
T	**Tissue and Air Analysis**				
•	T.1	2	11/01	11/02	Methods for Determination of Volatile (Purgeable) Organic Compounds in Air using Modified Method 18 (40 CFR part 60)
•	T.2	1	03/93	07/03	Biological Tissue Homogenization Procedures
•	T.3	4	06/03		Extraction/Preparation Procedures of Biological Tissue Samples for Pesticides/PCB and Base/Neutral/Acid (BNA) Analyses
•	T.4	3	06/03		Biological Tissue Digestion Procedure for Trace Metals Determinations
•	T.5	3	09/01	09/02	Extractions/Preparation Procedures Biological Tissue Samples for Explosives Analyses

Section	SOP No.	Ver. No.	Date	Reviewed Date	Title
	• T.6	2	01/00	07/03	Percent Lipid Determination in Biological Tissue Samples
	• T.7	1	04/93	Inactive	Preparation of Tenax Traps for the Analysis of Volatile Organic Compounds in Ambient Air
U	**Radiochemistry**				
	• U.1	Draft			Standard Operating Procedure for Radioactive Sample Control and Screening
	• U.2	Draft			Standard Operating Procedure for Personnel Radiation Dosimetry Monitoring
	• U.3	Draft			Standard Operating Procedure for Performing Daily Instrument Operation
	• U.4	Draft			Standard Operating Procedure for Radioactive Material Inventory Control
	• U.5	Draft			Standard Operating Procedure for Radiation Contamination Control Policy
	• U.6	1	01/03		Preparation of Water, Soil, and Sediment Extracts for the Measurement of Gross Alpha and Beta Activity
	• U.7	1	02/03		Measurement of Gross Alpha and Beta Activity
V	**Geotechnical**				
	• V.1	2	03/02		Standard Test Method for Particle-Size Analysis of Soils
	• V.2	2	03/02	04/03	Liquid Limit, Plastic Limit, and Plasticity Index of Soils

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Laboratory Method Detection Limits and Reporting Limits

Method: 314.0/SW9058 Low Level
Date: 02/14/03

Compound	Lab MDL Water ug/L	Lab Reporting Limit Water ug/L
Perchlorate	**0.132**	**1.00**

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Laboratory Method Detection Limits and Reporting Limits

Method:	6010B		
Date:	02/2003	Lab MDL	Lab Reporting Limit
		Soil	Soil
Compound		mg/Kg	mg/Kg
Aluminum		**1.44**	**20**
Antimony		**0.23**	**2.0**
Arsenic		**0.27**	**2.0**
Barium		**0.02**	**0.50**
Beryllium		**0.01**	**0.20**
Cadmium		**0.03**	**0.60**
Calcium		**7.30**	**100**
Chromium		**0.08**	**0.50**
Cobalt		**0.05**	**0.50**
Copper		**0.13**	**1.0**
Iron		**2.09**	**15**
Lead		**0.16**	**1.0**
Magnesium		**1.42**	**25**
Manganese		**0.06**	**0.50**
Mercury		**0.02**	**0.03**
Molybdenum		**0.10**	**0.5**
Nickel		**0.15**	**1.0**
Potassium		**1.89**	**25**
Selenium		**0.28**	**2.0**
Silver		**0.05**	**0.30**
Sodium		**9.02**	**250**
Thallium		**0.41**	**3.0**
Tin		**0.47**	**2.5**
Titanium		**0.02**	**2.5**
Vanadium		**0.07**	**1.0**
Zinc		**0.25**	**2.0**

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Laboratory Method Detection Limits and Reporting Limits

Method: 6010B
Date: 02/2003

Compound	Lab MDL Water ug/L	Lab Reporting Limit Water ug/L
Aluminum	**15.6**	**200**
Antimony	**1.9**	**20**
Arsenic	**4.9**	**20**
Barium	**0.20**	**5.0**
Beryllium	**0.10**	**2.0**
Cadmium	**0.30**	**6.0**
Calcium	**102**	**1000**
Chromium	**0.40**	**5.0**
Cobalt	**0.40**	**5.0**
Copper	**0.80**	**10**
Iron	**40.5**	**150**
Lead	**2.2**	**10**
Magnesium	**16.6**	**250**
Manganese	**0.30**	**5.0**
Mercury	**0.1**	**0.2**
Molybdenum	**0.40**	**5.0**
Nickel	**1.1**	**10**
Potassium	**55.2**	**250**
Selenium	**1.8**	**20**
Silver	**0.70**	**3.0**
Sodium	**208**	**2500**
Thallium	**5.0**	**30**
Tin	**2.1**	**25**
Titanium	**0.30**	**25**
Vanadium	**0.50**	**10**
Zinc	**3.0**	**20**

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Laboratory Method Detection Limits and Reporting Limits

Method:	8330		
Date:	04/07/03	Lab MDL Soil	Lab Reporting Limit Soil
Compound		ug/Kg	ug/Kg
HMX		**50.9**	**200**
1,3,5-Trinitrobenzene		**24.7**	**100**
Tetryl		**168.3**	**200**
2,4,6-Trinitrotoluene		**26.2**	**100**
4-Amino-2,6-Dinitrotoluene		**36.1**	**100**
2,6-Dinitrotoluene		**54.8**	**100**
4-Nitrotoluene		**73.9**	**200**
RDX		**76.2**	**200**
1,3-Dinitrobenzene		**10.2**	**100**
Nitrobenzene		**32.7**	**100**
2-Amino-4,6-Dinitrotoluene		**18.9**	**100**
2,4-Dinitrotoluene		**30.1**	**100**
2-Nitrotoluene		**153.6**	**200**
3-Nitrotoluene		**75.4**	**200**

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Laboratory Method Detection Limits and Reporting Limits

Method:	8330		
Date:	04/02/03	Lab MDL Water	Lab Reporting Limit Water
Compound		ug/L	ug/L
HMX		**0.128**	**0.52**
1,3,5-Trinitrobenzene		**0.051**	**0.26**
Tetryl		**0.092**	**0.52**
2,4,6-Trinitrotoluene		**0.086**	**0.26**
4-Amino-2,6-Dinitrotoluene		**0.135**	**0.26**
2,6-Dinitrotoluene		**0.096**	**0.26**
4-Nitrotoluene		**0.092**	**0.52**
RDX		**0.395**	**0.52**
1,3-Dinitrobenzene		**0.061**	**0.26**
Nitrobenzene		**0.139**	**0.26**
2-Amino-4,6-Dinitrotoluene		**0.129**	**0.26**
2,4-Dinitrotoluene		**0.074**	**0.26**
2-Nitrotoluene		**0.058**	**0.52**
3-Nitrotoluene		**0.194**	**0.52**

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Contract #/Billing Reference	of Pgs.

Project:	Turnaround Time
Client:	# of Containers
Send Results To:	Container Type
Address:	Preservative Used
	Type of Analysis
Phone:	

Sample ID#	Date Sampled	Time Sampled	Sample Matrix	Sampler's Initials	Lab Cooler No.	CLIENT COMMENTS

Relinquished By:	Date/Time	Received By:	Relinquished By:	Received for Laboratory By:	Date/Time
Relinquished By:	Date/Time	Received By:	Date/Time	Shipper:	Airbill No.:
Relinquished By:	Date/Time	Received By:	Lab Comments:		Temp:

G.P. W.O. _____

SOP No: H.8

Title: Acid Digestion of Aqueous Samples, EP and TCLP Extracts and Wastes that Contain Suspended Solids for ICP and ICPMS Analyses in Accordance with SW846 Method 3010A.

Scope: The method detailed in this procedure is performed to prepare aqueous samples and extracts for quantitation of certain metallic analytes using Inductively Coupled Plasma (ICP) and Inductively Coupled Plasma/Mass Spectrometer (ICPMS) in accordance with SW 846 method 3010A.

1.0 PURPOSE

1.1 The method detailed in this procedure is used to prepare aqueous samples and extracts for analysis using an Inductively Coupled Plasma (ICP) and (ICPMS) spectrophotometer. The sample holding time before digestion is 180 days. The elements to be analyzed using this procedure are:

Ag, Al, As, Ba, Be, Cd, Ca, Cr, Co, Cu, K, Fe, Pb, Na, Ni, Mg, Mn, Se, Sb, Tl, V, Zn, B, Sr, Ti, Sn, Mo.

2.0 REFERENCES

- SW846 method 3010A revision 1

3.0 EQUIPMENT AND SUPPLIES

- 150mL glass beakers
- 100ml volumetric flasks
- Hot plate
- Whatman No. 41 filter paper
- 125ml sample bottle (plastic)
- Watch glass (ribbed)
- Plastic disposable funnels
- Thermometer, calibrated, NIST traceable
- Fume hood
- Pipettors (calibrated)
- 100ml graduated cylinders

4.0 REAGENTS

- Concentrated Nitric Acid - trace metals grade
- Concentrated Hydrochloric Acid - trace metals grade
- 1:1 Hydrochloric Acid - to 500ml ASTM type II water (see below) add 500ml of Concentrated Hydrochloric Acid
- Metals Standards - (ICP spk 1,2,3) commercially prepared NBS traceable metals standards with documented concentrations, including impurities and expiration dates. (Vendor: High Purity Standards, Charleston, SC).
- Grade and quality of water required is ASTM Type II water (ASTM D1193): Water must be monitored for changes in conductivity by laboratory staff and is currently provided by a laboratory pure water system.

5.0 SAMPLE COLLECTION, PRESERVATION AND HANDLING

5.1 All sample containers must be prewashed with detergents, acid, and water. Plastic and glass containers are both suitable.

5.2 Nonaqueous samples shall be refrigerated upon receipt and analyzed as soon as possible.

5.3 For detailed information about preservation, storage and handling of samples, refer to GPL SOP F.2.

6.0 PROCEDURE (see Figure 1 for flow chart)

6.1 Sample Digestion Procedure

6.1.1 Mix the sample thoroughly to achieve homogeneity. Transfer 100ml of sample using a graduated cylinder to a beaker. Transfer 100ml of sample each for duplicate and matrix spike analysis and label as duplicate and matrix spike. For extracts of TCLP or highly contaminated wastes, reduce size to 10.0ml.

6.1.2 If aqueous samples are to be analyzed, to the matrix spike beaker, add 0.1ml of matrix spike solution (ICP spk 1,2,3).

6.1.3 If sample extracts are to be analyzed, to the matrix spike beaker, add 0.1mL of matrix spike solution (ICP spk 1,2,3).

6.1.4 Label one empty beaker "BKS" for the laboratory control sample. Add 100ml ASTM type II water to the beaker. Add 0.1mL of matrix spike solution (ICP spk 1,2,3).

6.1.5 Label one empty beaker "BLK" for the preparation blank. Add 100ml ASTM type II water.

6.1.6 To all beakers, add 3mls of concentrated nitric acid (HNO_3) and cover the samples with ribbed watch glasses.

6.1.7 Heat on a hot plate in the fume hood and evaporate until volume is approximately 5mls. Do not boil or allow beaker to go dry. Remove beaker from hot plate and allow to cool.

6.1.8 After cooling, add 3mls of concentrated nitric acid and cover samples with a non-ribbed watch glass. Return to hot plate and increase temperature to reflux gently.

6.1.9 Continue to heat, adding additional acid if necessary, until the digestate is light in color. Uncover the samples and evaporate to approximately 10mls.

6.1.10 Remove samples from hot plate and allow to cool. Add 10ml of 1:1 Hydrochloric acid.

6.1.11 Cover the beakers and reflux for 15 minutes.

6.1.12 Wash down beaker walls and filter sample, if necessary, through Whatman No. 41 filter paper (or equivalent) using disposable funnel. Dilute to 100ml in volumetric flask with Type II water.

NOTE: In place of filtering, the sample may be centrifuged or allowed to settle by gravity overnight to remove insoluble material. Filter or centrifuge the sample only when sample contains insoluble materials that may clog the nebulizer. The diluted digestate solution contains approximately 5% (v/v) HCL and 3% HNO3. Transfer to 125ml plastic sample bottle and label with GP work order, fraction, WFL (for water matrix, flame/ICP digestion) and date of digestion. Date of digestion may be put on the box of digestates instead of on each bottle. For analysis, withdraw aliquots of approximate volume, and add any required reagent or matrix modifier. The sample is now ready for analysis.

7.0 QUALITY CONTROL

7.1 Troubleshooting and corrective action.

ICP operators should report to his/her supervisor and lab manager any recoveries outside warning limits for LCS samples for analytes being determined or preparation blanks are above control limits. Sample recoveries for any element which are outside of the control established limits for the laboratory control sample or contaminated preparation blanks are deemed unacceptable. The digestion batch must be re-digested for those analytes. Document the incident on a re-digestion form and submit to supervisor.

8.0 SAFETY

8.1 Safety equipment required

- Fume hood - minimum flow of 100 linear feet/minute
- Safety glasses
- Safety gloves (unpowdered)
- Lab apron
- Face shield, if necessary

8.2 Potential hazards

The most hazardous chemical acids that laboratory personnel are likely to encounter are strong acids such as Hydrochloric Acid and Nitric Acid (HNO_3).

8.3 Special handling requirements

Analysts should always read the label on the bottle. Chemicals require handling with care to include wearing adequate garments for skin protection. Also, acid use should be performed under a ventilated hood.

9.0 DISPOSAL REQUIREMENTS

9.1 Acid wastes should be placed into the acid waste bottle which is located in the metals digestion lab. Any remaining samples should be returned to sample control. More details concerning disposal characteristics and procedures can be located in the SOP D.1 "Laboratory Waste Handling and Storage Procedure".

10.0 POLLUTION PREVENTION

10.1 GPL Laboratory operates in a safe manner to protect the air, water, and land by minimizing and controlling all releases from fume hoods and bench operations. For more detail on pollution prevention, refer to GPL SOP D.5.

11.0 DEFINITIONS

11.1 For definitions of terms used in this document, refer to GPL Laboratory SOP G.14.

12.0 REPORTING REQUIREMENTS

12.1 Documentation to include Work Orders and Work Sheets (see SOP "Sample Logging and Record Keeping"), Metal Digestion Log Forms must be submitted to the Metals Supervisor with the Digestion Technician's initials and the preparation date documented on each form for each case.

Sample Description Information must be filled out and should contain the following information for aqueous digestates. The fields for color and clarity, before and after digestion, must be completed. The following descriptive terms are recommended:

Color - red, blue, yellow, green, orange, violet, white, colorless, brown, gray, black

Clarity - clear, cloudy, opaque

Note any significant changes that occur during sample preparation (i.e., emulsion formation) in the Comments section. Enter any sample-specific comments concerning the analyte results in the comments section.

Metal Digestion Log Forms (Figure 2) must be documented completely by the Digestion Technician during digestion include the date of digestion, work order number, digestion technician signature, supervisor approval, identification of method used, GPL fraction ID, sample matrix (soil/water), amount of sample used in digestion and final volume of sample, identification of the matrix spiking solution used and the amount used.

12.2 QC records are maintained in the form of control charts to document percent recovery of analytes from EPA ICV and independent laboratory control samples subjected to the digestion procedure.

Figure 1

FLOW CHART

ACID DIGESTION OF AQUEOUS SAMPLES OR EXTRACTS
FOR ANALYSIS ICP/FLAME AA OR SB BY GFAA

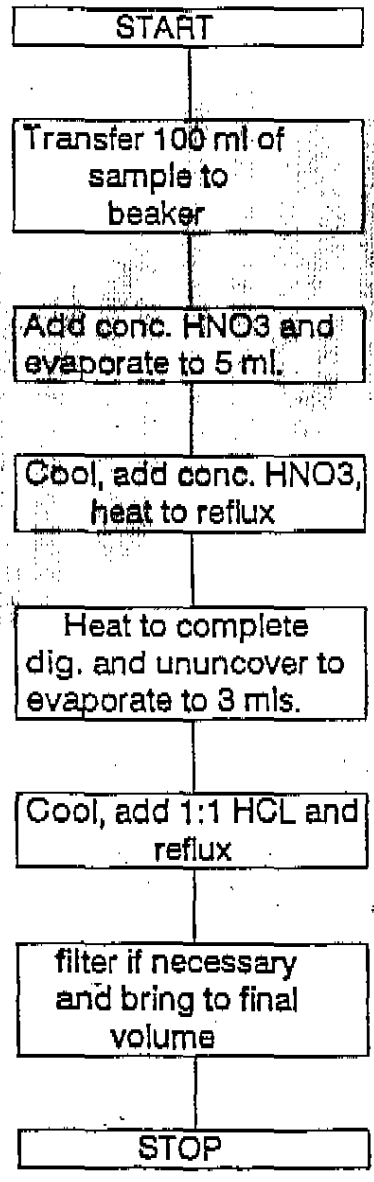

Figure 2

Metal Digestion Log Form

Date: Prep: 200.7 / 3005A / 3020A / 3050B / 3010A / ILC03.1 / ILM04.1 / ILM05.1 Batch No: 83-

Analyst: Comments:

Reviewed by: Date: Spike Witness: Prep. Seq:

	GPL Work Order No.	Sample	Frac	SIZE mL (g)	Final Vol. (mL)	Matrix S, W Other	Color Before	Color After	Clarity Before or Soil Texture	Clarity After Clear, Cloudy, Opaque	Soil Artifacts or Water pH
							R, Bl, Y, G, O, V, W, Colorless, Br, Grey, Bk.				
1											
2											
3											
4											
5											
6											
7											
8											
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23											
24											

LCS ID / Amt. Added (ml , g) :	HNO3(1+1) ID:
Spiking ID / Amt Added (ml):	HNO3(conc) ID:
	HCl(conc) ID:
Temperature, C:	HCl(1+1) ID:
	Peroxide ID:

SOP No: H.21

Title: Acid Digestion of Soil, Sludge, Sediment, and Other Solid Waste Samples for ICP by SW846 Method 3050B.

Scope: The method detailed in this procedure is performed to prepare soil, sediment, sludge and other solid samples for quantitation of certain metallic analytes using Inductively Coupled Plasma (ICP), in accordance with SW846 method 3050B.

1.0 PURPOSE

1.1 The method detailed in this procedure is used to prepare solid waste samples for analysis using an Inductively Coupled Plasma (ICP) spectrophotometer. The sample holding time before extraction is 180 days. Samples must be stored in refrigerator at 4°C until time of preparation. The elements to be analyzed using this procedure are:

ICP Elements
Al
Ba
Be
Cd
Ca
Cr
Co, Ag
Cu, As
Fe, K
Mg, Na
Mn, Pb
Ni, Sb
V, Se
Zn, Tl

This method is also applicable to other metals (B, Mo, Sr, Sn, Ti).

2.0 REFERENCES

- SW846 method 3050B revision 2, December 1996.

3.0 EQUIPMENT AND SUPPLIES

- 150ml beakers/or hot block vessels
- Analytical balance accurate to 0.001 grams
- 100ml volumetric flasks
- Hot plate, or hot block capable of maintaining temp. of 90-95 degrees C.
- Whatman No. 41 filter paper
- 250ml sample bottle (plastic)
- Watch glass, ribbed
- Plastic disposable funnels
- Thermometer, calibrated, NIST traceable
- Fume hood
- Pipetters (calibrated)
- Bottle top dispensers used to add all reagents
- Teflon coated spatula

4.0 REAGENTS

- Concentrated Nitric Acid - trace metals grade
- 1:1 Nitric Acid - trace metals grade
- Concentrated Hydrochloric Acid - trace metals grade
- Metals Standards - commercially prepared NIST traceable metals standards with documented concentrations, including impurities and expiration dates (Vendor: High Purity Standards, Charleston, SC).
- 30% Hydrogen Peroxide
- Grade and quality of water required is ASTM Type II water (ASTM D1193): Water must be monitored for changes in conductivity by laboratory staff and is currently provided by a laboratory pure water system.

5.0 PROCEDURE

5.1 Sample Digestion Procedure

5.1.1 Mix the sample thoroughly to achieve homogeneity using a spatula. For each digestion procedure, weigh (to the nearest .01g) 1-2g portion of sample and transfer to a beaker/vessel.

Note: A separate sample shall be dried for percent solids determination. See SOP "Percent Solids Determination Procedure".

5.1.2 Label two beakers/vessels, one as a sample and the second as a duplicate.

5.1.3 Label one beaker/vessel as matrix spike. To matrix spike beaker/vessel add 0.2mL each of spiking solution (ICP SPK1,2,3) after addition of 10mls of 1:1 nitric acid.

5.1.4 Take one beaker/vessel and label as prep blank (BLK).

5.1.5 Take beaker/vessel and label as BKS. To BKS beaker/vessel add 0.2mL each of spiking solution (ICP SPK1,2,3) after addition of 10mls of 1:1 nitric acid.

5.1.6 To all beakers/vessels, add 10ml of 1:1 nitric acid (HNO_3), mix the slurry, and cover with a watch glass. Heat the sample on a hot plate in the fume hood to 95°C (± 5°C) and reflux for 10 minutes without boiling. Allow the sample to cool, add 5ml of concentrated HNO_3, replace the watch glass, and reflux for 30 minutes. Repeat the concentrated HNO_3 addition until no brown fumes are given off by the sample. Maintain a covering of solution over the bottom of the beaker/vessel. Check the temperature achieved during the digestion with a beaker containing 50ml ASTM type II water. Record temperature in digestion log. Using a ribbed watch glass either allow the solution to evaporate to approximately 5mL withoug boiling OR heat at 95°C ± 5°C without boiling for two hours.

5.1.7 After the sample has cooled, add 2ml of 30% hydrogen peroxide (H_2O_2) and cover with watch glass. Return the beaker/vessel to the hot plate/hot block to start the peroxide reaction. Care must be taken to ensure that losses do not occur due to excessively vigorous effervescence. Heat until effervescence subsides, then cool the beaker.

5.1.8 Repeat step 5.1.7 until the effervescence is minimal or until the general sample appearance is unchanged. (NOTE: Do not add more than a total of 10ml 30% H_2O_2.).

5.1.9 Add 3ml of 30% hydrogen peroxide (H_2O_2.), heat the acid-peroxide digestate to 95°C ± 5°C until the volume has been reduced to approximately 5mL without boiling OR for two hours at 95°C ± 5°C without boiling.

5.1.10 Add 10ml of concentrated HCl, return the covered beaker to the hot plate, and heat for an additional 15 minutes at 95°C (± 5°). After cooling, filter through Whatman No. 41 filter paper (or equivalent) using disposable funnel and dilute in a 100ml volumetric flask with Type II water. The diluted sample has an approximate acid concentration of

10% (v/v) HCl and 5% (v/v) HNO_3. Transfer the sample diluted sample to a 125mL plastic sample bottle labeled with the work order, fraction, and date of digestion. Date of digestion may by put on the box of digestates instead of on each bottle. The sample is now ready for analysis.

6.0 METHOD PERFORMANCE

6.1 Per digestion method MDL limits are obtained by digestion of seven spiked replicates in the same way as samples and analyze them. MDL is defined as the minimum concentration of a substance that can be measured and reported with 99% confidence that the value is above zero. Precision and accuracy studies are performed once a year at a minimum.

7.0 METHOD DETECTION LIMIT

7.1 Method detection limits for this method are listed in the GPL Laboratory Method Detection Limit and Reporting Limit official book.

8.0 DEFINITIONS

8.1 For definitions of terms used in this document, refer to GPL Laboratory SOP G.14.

9.0 QUALITY CONTROL

9.1 Troubleshooting and corrective action.

9.1.1 The ICP operator should report to his/her supervisor and lab manager any recoveries outside warning limits for BKS samples for analytes being determined. Sample recoveries for any element which are outside of the control established limits for the laboratory control sample, are deemed unacceptable. The digestion batch must be re-digested for those analytes. Document the incident on a re-digestion form and submit to supervisor.

10.0 SAFETY

10.1 Safety equipment required

- Fume hood - minimum flow of 100 linear feet/minute
- Safety glasses
- Safety gloves (unpowdered)
- Lab apron
- Face shield, if necessary

10.2 Potential hazards

The most hazardous chemical acids that laboratory personnel are likely to encounter are strong acids such as Hydrochloric Acid and Nitric Acid (HNO_3).

10.3 Special handling requirements

Analysts should always read the label on the bottle. Chemicals require handling with care to include wearing adequate garments for skin protection. Also, acids should be handled only under a ventilated hood.

11.0 POLLUTION PREVENTION

11.1 GPL Laboratory operates in a safe manner to protect the air, water and land by minimizing and controlling all releases from fume hoods and bench operations. For more details on pollution prevention, refer to GPL SOP D.5."

12.0 DISPOSAL REQUIREMENTS

12.1 Acid wastes should be placed into the acid waste bottle which is located in the metals digestion lab. Any remaining samples should be returned to sample control. More details concerning disposal characteristics and procedures can be located in the SOP "Laboratory Waste Handling and Storage Procedure".

13.0 REPORTING REQUIREMENTS

13.1 Documentation to include Work Orders and Metals Preparation and Sample Description log, must be submitted to the Metals Supervisor with the Digestion Technician's initials and the preparation date documented on each form for each case.

Sample Description must be filled out and should contain the following information for aqueous digestates. The fields for color and clarity, before and after digestion, must be completed. The following descriptive terms are recommended:

Color - red, blue, yellow, green, orange, violet, white, colorless, brown, gray, black

Clarity - clear, cloudy, opaque

Texture - coarse, medium, fine

Note any significant changes that occur during sample preparation (i.e., emulsion formation) in the Comments section. Enter any sample-specific comments concerning the analyte results in the comments section. If ICP analysis is required, use color of ICP digests for sample description.

Metals Preparation and Sample Description Log Forms (Figure 1) must be documented completely by the Digestion Technician during digestion and include the date of digestion, work order number, digestion technician signature, supervisor initials, identification of method used, Lab Sample ID, sample matrix (soil/water), amount of sample used in digestion and final volume of sample, identification of the matrix spiking solution used, the amount used, and identifications of any reagents used during the digestion.

13.2 QC records are maintained in the form of control charts to document percent recovery of analytes. See SOP "Quality Control Charts" for more information.

Figure 1

Metals Digestion Logform

Date: Prep: 200.7 / 3005A / 3020A / 3050B / 3010A / ILC03.1 / ILM04.1 / ILM05.1 Batch No: 83-

Analyst: Comments:

Reviewed by: Date: Spike Witness: Prep. Seq:

	GPL Work Order No.	Sample	Frac	SIZE mL (g)	Final Vol. (mL)	Matrix S, W Other	Color Before	Color After	Clarity Before or Soil Texture	Clarity After Clear, Cloudy, Opaque	Soil Artifacts or Water pH
							R, Bl, Y, G, O, V, W, Colorless, Br, Grey, Bk.				
1											
2											
3											
4											
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24											

LCS ID / Amt. Added (ml , g) :	HNO3(1+1) ID:
Spiking ID / Amt Added (ml):	HNO3(conc) ID:
	HCl(conc) ID:
Temperature, C:	HCl(1+1) ID:
	Peroxide ID:

SOP No: L.2

Title: Determination of Perchlorate in Water and Soil Samples by Ion Chromatography

1.0 SCOPE AND APPLICATION

1.1 This method is used to quantify perchlorate in soil and water samples.

2.0 PURPOSE

2.1 To identify and quantify the level of perchlorate in soil and water samples.

3.0 SUMMARY OF METHOD

3.1 A known volume of sample is introduced into an ion chromatograph (IC). Perchlorate is separated and measured, using a system comprised of an ion chromatographic pump, sample injection valve, guard column, analytical column, suppressor device, and conductivity detector. To achieve lower reporting limits, water samples are pre-concentrated and analyzed.

4.0 REFERENCE

- EPA Method 314.0

5.0 EQUIPMENT AND SUPPLIES

- Ion Chromatograph (Dionex Model DX-500)
- Guard column (Dionex AG16)
- Anion separator column (Dionex AS16)
- Anion Self-Regenerating Suppressor (Dionex ASRS Ultra)'
- Anion Trap Column (Dionex ATC)
- Autosampler (Dionex AS40)
- Class A volumetric flasks (100ml, 25ml, 10ml)
- Pipettes (volumetric and mechanical, adjustable 10-100ul)

- Glass beakers, 400ml
- Class A Graduated Cylinders, 250ml and 10ml
- Plastic Centrifuge Tube (100ml, 50ml)
- Whatman 42 Filter Paper
- Hot Plate
- Wrist Action Shaker
- Polypropylene syringe filters (0.45um)
- Dionex autosampler w/5ml sample vials

6.0 REAGENTS

6.1 Eluent: 50mM NaOH

6.1.1 Prepare using carbonate free 50% NaOH solution: 5.23ml to 2L with deionized water. Degas with Helium 30 minutes prior to use. Prepare fresh eluent for every day's run.

6.2 H^+ Ag, and Ba type sample pre-treatment filter cartridges for removal of interfering metal cations, chloride and sulfate.

7.0 STANDARDS

7.1 Store all standards at 4°C, in plastic containers.

7.2 Stock Standard (1,000mg/L): Add 0.118g ammonium perchlorate to 100ml volumetric flask; bring to volume with deionized water. The solution expires after 1 year.

7.3 Working Solution (10mg/L): Add 1.00ml of stock standard to 100ml volumetric flask; bring to volume with deionized water. The expiration period is 1 year or at the expiration date of the stock solution, whichever is earlier.

7.4 QC solution (500mg/L): Add 0.0707g of $NaClO_4$ to a 100ml volumetric flask and bring to volume with deionized water. This solution expires after one year.

7.5 Mixed Common Anion Stock (25mg/ml each carbonate, chloride, sulfate): Add 1.0g sodium chloride, 0.93g sodium sulfate, and 1.1g sodium carbonate to a 25ml volumetric flask and bring to volume with deionized water. This solution is used to prepare the daily Instrument Performance Check sample.

7.6 Daily Instrument Performance Check Standard – ICP (25ug/L perchlorate in solution with MCT anion concentration – 600mg/L): Add 0.125ml Working Solution and 1.2ml of the Mixed Common Anon Stock to a 50ml volumetric flask and bring to volume with deionized water. Prepare this standard fresh daily.

Enough volume of this standard must be prepared to fill the IC autosampler vial and to be analyzed for conductivity.

7.7 Laboratory Control Sample (25ug/L perchlorate): Add 0.125ml Working Solution to a 50ml volumetric flask and bring to volume with deionized water. If any samples in the analytical batch are being filtered or pre-treated to remove interfering anions, a portion of this LCS solution must also be treated as the samples are and analyzed.

7.8 Laboratory Reagent Blank (LRB): This standard is deionized water taken through any filtration or pretreatment that the samples are subject to. If no samples in the analytical batch required filtration, this standard is simply deionized water.

7.9 Calibration Standards:

Standard	ml Working Sol'n	Final Volume	Std. Concentration
STD 1	0	10.0ml	0ug/L
STD 2	0.020	50.0ml	4ug/L
STD 3	0.020	20.0ml	10ug/L
STD 4	0.020	10.0ml	20ug/L
STD 5	0.050	10.0ml	50ug/L
STD 6	0.075	10.0ml	75ug/L
STD 7	0.100	10.0ml	100ug/L

8.0 SAMPLE PREPARATION

8.1 Water Samples

8.1.1 All samples must have the total conductivity determined before being loaded for analysis. Check and record all sample conductivities in the IC Sample Preparation Logbook.

8.1.2 If a sample's conductivity exceeds the MCT (determined to be 5300uS/cm), the sample can either be diluted until the conductivity falls below the MCT or it can be filtered through the three pretreatment filter cartridges in series. The filter cartridges must be used in Ba-Ag-H order.

8.1.3 If any sample conductivity exceeds the MCT, a portion of the pre-treated or diluted sample must also have the conductivity checked and recorded. If any samples are treated with the filter cartridges, a filtered Prep Blank and LCS sample must be analyzed along with the batch.

8.1.4 For each sample batch, analyze and record the conductivity for the LRB and the IPC along with the samples.

8.1.5 As a QC check for the conductivity meter, analyzed a 225mg KCl/L standard. The conductivity of this standard should be 447uS/cm.

8.2 Low Concentration Water Samples

8.2.1 To achieve a lower reporting limit, water samples are pre-concentrated through evaporation. A concentrated Prep Blank and LCS must be carried through the evaporation procedure along with each batch of 20 or fewer samples.

8.2.2 Add 200ml of sample to a 400ml beaker and place the beaker on a hot plate. Beakers should be loosely covered with perforated aluminum foil to avoid sample loss or cross contamination through spattering. Set the temperature to a low level and evaporate samples, without boiling, to between 10 and 15 ml. Alternatively, a shallow water bath may be used to heat beakers.

8.2.3 The level of the sample should be checked frequently during the evaporation, and should be carefully monitored once the sample has been reduced below 25ml. (Normally it takes about 2.5 hours to evaporate samples to 10-20ml using a hot plate at low setting).

8.2.4 Allow sample to cool, pour the content of the beaker into a 25ml graduated cylinder. Rinse the beaker with 5ml of deionized water and add the rinsate to graduated cylinder. Adjust the volume to 20ml and follow the preparation procedure described in 7.1.

8.2.5 The conductivity must be checked on the concentrated sample as in section 7.1.1

8.3 Soil Samples

8.3.1 Weigh 5.0 grams of sample into a 50ml plastic centrifuge tube. Add 50ml of deionized water. Gently shake tube on mechanical wrist-action shaker for 30 minutes. Allow the layers to separate (centrifuge if necessary). Filter the extract using Whatman 42 filter paper or equivalent, or use 0.45um syringe filters prior to adding the extract to the sample vial.

8.3.2 Samples extracts must have their conductivity checked and recorded and are treated the same as for water samples above.

8.3.3 A soil LRB and LCS should be extracted along with the soil samples using 5g of clean Ottowa sand or similar perchlorate-free soil matrix.

8.4 Low Concentration Soil Samples

8.4.1 To obtain a lower reporting limit for soil samples, weigh 25g of soil sample into a 100ml plastic centrifuge tube. Add 50ml of deionized water.

8.4.2 Shake the tube for a minute, then let the soil and water separate to distinguishable layers (centrifuge, if necessary). A minimum of 20ml water extract is required for analysis. If the soil sample is water absorbent and the desired extract volume is not achieved, add increments of 5ml water, shake and check for extract volume yield. Record the final volume of water added.

8.4.3 Proceed with the soil extraction as described in section 7.3.

9.0 ION CHROMATOGRAPHY

9.1 Instrument Parameters:

- Flow rate: 1.0ml/minute
- Detector range: 2.50uS full-scale
- Injection loop: 1000uL

9.2 Pump Program

Time	Eluent	Notes
Initial	100%	
0.0	100%	
2.40	100%	Inject on
3.40	100%	Inject off
17.0	100%	

9.3 Initial Calibration

9.3.1 Analyze seven standards (see Section 5.4) in order of increasing concentration. Calculate the linear correlation coefficient by plotting concentration vs. the area of the standard peaks. The correlation coefficient must be 0.995 or better.

9.3.2 After an acceptable calibration curve is obtained, the initial calibration must be checked using a second source initial calibration verification standard (ICV) near the mid point of the calibration curve. The acceptance range is 90% to 110% of the expected value. If the result falls outside the acceptance range, the instrument and standards must be checked for sources of error and the standard and/or calibration curve re-analyzed.

9.3.3 The method Minimum Reporting Level must be verified after calibration by analyzing a perchlorate standard at the MRL in a common anion solution at the MCT. The conductance of the standard must be within 10% of the MCT and the perchlorate recovery must be between 70 and 130%. If the MRL cannot be verified, it is necessary to either raise the MRL or lower the MCT as needed.

9.3.4 A new calibration curve must be analyzed when any of the instrument components are changed (the guard or analytical columns used for perchlorate analysis, the ATC, or the ASRS): when the retention time for perchlorate changes by more than 10%; or at least annually. A retention time shift of greater than 20% from the initial curve run on a set of columns indicates a need for a new separator/analytical column.

9.4 Continuing Calibration Verification

9.4.1 The continuing stability if the instrument and the analytical method with regard to the initial calibration curve must be verified at the beginning of each analytical batch by the analysis of:

- An Instrument Performance Check standard (IPC) must be analyzed initially, with perchlorate recovery of 80-120%. The conductance of the standard must fall within 10% of the MCT to be valid.

- A Laboratory Reagent Blank (LRB) must be analyzed after the ICP. If any samples in the analytical batch are filtered or pre-treated, a filtered/pre-treated and an unfiltered LRB must be analyzed. Perchlorate concentration in the LRB must be below ½ the Method Reporting Limit (MRL).

- An Initial Calibration Verification standard (ICV) must be analyzed after the LRB(s). The concentration of this standard is 4ppb for all sample analyses except low-level water analysis. For low level water analysis, where the final reporting limit is 1ppb, a 10ppb standard is analyzed for the ICV. This standard is prepared from the QC solution. Perchlorate recovery must be between 75 – 125%.

- A Laboratory Control Sample (LCS) must be analyzed after the ICV, at the same perchlorate concentration as in the IPC. If samples in the analytical batch are filtered or pre-treated, a filtered/pre-treated LCS and an unfiltered LCS must be analyzed. The retention time of perchlorate in the LCS should be monitored. When the retention time changes by more than 10%, a new calibration curve should be established. Perchlorate recovery must be between 85 – 115%.

- Continuing Calibration Verification standards must be run after every 10 samples in the batch. The CCV's must alternate in concentration between the mid-point and the highest calibration standard. CCV's are prepared from the QC solution. Perchlorate recovery in the CCV's must be between 85 – 115%.

9.5 Sample Analysis

9.5.1 After the calibration and instrument performance have been verified, the samples and/or sample extracts can be analyzed. The samples are analyzed under the same conditions as the standards. If the response of a sample is above the calibration curve, dilute the sample and re-analyze the dilution. Concentrations area calculated by comparing the peak area (of a peak with the proper retention time) of the sample to the calibration curve linear plot.

9.5.2 Sample analytical batches must not exceed 20 samples. QC samples (blanks, LCS's, MS/MSD) do not count toward the 20 samples. If more than 20 samples are to be analyzed on a day's run; a complete set of QC (IPC, LRB, ICV, LCS, MS/MSD) must be run with every 20 or fewer samples.

9.5.3 Samples that contain anions that interfere with the resolution of the target peak, must be diluted until the peaks are interpretable. The total sample conductivity test, performed before analysis should eliminate most of this type of interference problem.

9.6 Instrument Maintenance

Complex sample matrices may affect chromatography and warrant performing one or more of the following if changes in the baseline level or perchlorate detection or retention time occur.

9.6.1 Flushing the column with eluant or elevated concentrations of eluant to restore chromatographic response.

9.6.2 Performing a new initial calibration when conditions are permanently changed and stable.

10.0 QUALITY CONTROL

10.1 Preparation/Extraction Blank for soil samples

10.1.1 A preparation blank must be extracted with every set of 20 or fewer samples.

10.1.1 The prep blank is 5 grams of cleaned Ottowa sand for regular soil extraction and 25 grams for the low level soil extraction.

10.1.3 A method blank cannot contain any peak within the retention time window at a concentration greater than the MDL.

10.2 Laboratory Control Standard (LCS)

10.2.1 A laboratory control standard must be analyzed with every batch of 20 or fewer samples.

10.2.2 An untreated water LCS must be analyzed along with each sample batch. This LCS is 25ug/ L, prepared from the same source as the calibration standards.

10.2.3 If any sample in the batch is cartridge pre-treated, a pre-treated LCS must also be analyzed along with the batch.

10.2.4 If low level water samples (concentrated) are analyzed, a low level LCS must be concentrated and analyzed along with the batch. The low level LCS is 5ug/L, prepared from the same source as the calibration standards.

10.2.5 Soil and low level soils must have a soil LCS extracted along with each batch. The LCS is 5 grams (or 25 for low level) of cleaned Ottowa sand with 0.100ml of the 10ppm working standard (the standard used to prepare the calibration standards) added. The expected perchlorate concentration in the extract is 20ug/L.

10.2.6 The acceptance range for all LCS's is 85-115%.

10.2.7 If a batch LCS is outside these limits, all associated samples must be re-analyzed or re-extracted and re-analyzed as necessary.

10.3 Matrix Spike/Matrix Spike Duplicate

10.3.1 A matrix spike must be analyzed in duplicate for every 20 samples per matrix.

10.3.2 The matrix spike concentration for water samples is 20ug/L.

10.3.3 The matrix spike for low-level waters is 2ug/L, added prior to concentration.

10.3.4 For soil and low level soil extractions, 0.100ml of the 10ppm working standard is added to the MS/MSD designated sample prior to extraction. The expected perchlorate concentration in the extract is 20ug/L.

10.3.5 The acceptance range for all MS/MSD samples is 80-120%. The %RPD between MS and MSD must be less than 20%

10.4 Retention Time Window Establishment

The retention time window is determined by calculating the average retention time +/- three times the standard deviation of three CCV's analyzed during a 72 hour period. The retention time window is re-calculated whenever a new column is installed and when a new calibration curve is established.

10.5 Soil and water samples must be extracted/analyzed within 28 days of sampling.

11.0 SAFETY

11.1 A lab coat, safety glasses, and gloves must be worn at all times during the sample preparation steps.

11.2 Label all reagents and standards with the date prepared, expiration date, concentration, solution number and analyst's initials.

12.0 POLLUTION PREVENTION

12.1 GPL Laboratory operates in a safe manner to protect the air, water, and land by minimizing and controlling all releases from fume hoods and bench operations. For more detail on pollution prevention, refer to GPL SOP D.5.

13.0 WASTE MANAGEMENT

13.1 Several wastes that GPL generates can be handled in a fairly routine manner. The process of describing the method for waste disposal of chemicals including standards and reagent solutions, and process waste, and samples is described in Standard Operating Procedures D.1 and D.2.

14.0 METHOD DETECTION LIMIT

14.1 Method detection limits for this method is listed in the GPL Laboratory Method Detection Limit and Reporting Limit official book.

SOP No: S.1

Title: HPLC Analysis of Nitroaromatic and Nitramine Explosive Residues in Water, Soil, and Sediment Samples

Scope: This SOP describes the analytical methodology employed in the analysis of water, soil, and sediment extracts for explosive residues by Method 8330

1.0 METHOD SUMMARY

1.1 The purpose of this Standard Operating Procedure is to describe in detail the methodology used in the analysis of water, soil, and sediment extracts for explosive residue compounds. The methodology conforms with that specified in SW846 method 8330. The compounds to be analyzed in this method are listed in Table I.

TABLE I

COMPOUND NAME	CAS NO.
HMX	2691-41-0
1,3,5-TNB	99-35-4
Tetryl	479-45-8
TNT	118-96-7
4-ADNT	1946-51-0
2,6-DNT	606-20-2
4- Nitrotoluene	99-99-0
RDX	121-82-4
1,3-DNB	99-65-0
Nitrobenzene	98-95-3
2-ADNT	355-72-78-2
2,4-DNT	121-14-2
2-Nitrotoluene	88-72-2
3-Nitrotoluene	99-08-1
*PETN	78-11-5
*Nitroglycerine	55-63-0
*Picric Acid	88-89-1
*Diazodinitrophenol (DDNP)	

*Same Extract used but analyzed on different calibration parameters

2.0 REFERENCES

- SW846 Method 8330 revision 0 September 1994.

3.0 INTERFERENCES

3.1 Glassware and other sample processing hardware must be clean to minimize interferences.

4.0 APPARATUS AND MATERIAL

4.1 HPLC Instrument

- A Hewlett Packard HPLC system – HP1100 series

- A Waters Model 501 Solvent Delivery System (HPLC Pump), Waters WISP 712 Autosampler and Waters Variable Wavelength Detector Model #486 or LINEAR UVIS-201 absorbance detector is used as an analytical system complete with primary column LC-18 (4.6mm by 25cm) particle size 5um, confirmatory column LC-CN (4.6mm by 25cm) particle size 5um and pre-column Waters HPLC inserts (uBondapak C18/GuardPak).

5.0 OPERATING PARAMETERS

- Mobile Phase: 50% HPLC grade Methanol to 50% deionized H2O.
- Flow Rate: 0.9ml for primary and 1.0ml for confirmatory analyses.
- Injection volume: 100ul fixed loop.
- Wavelength: 250nm for primary and 254nm for confirmation.
- Mobile phase for CN column: 65% H_20, 12% M_eOH and 23% Acetonitrile

6.0 REAGENTS AND STANDARDS

- HPLC Grade methanol and Acetonitrile
- Calcium Chloride Desiccant (High Purity)
- .45 um PTFE filters
- Standards can be obtained as an ampule from Absolute and Restek
- Sodium Chloride, NaCl, Reagent Grade
- Tetrabutylammonium dihydrogen phosphate, 97%

7.0 SAMPLE COLLECTION, HANDLING AND HOLDING TIMES

7.1 Water samples may be collected in 1L or (quart) amber glass container. Soil samples may be collected in glass containers or closed end tubes.

7.2 All samples must be iced or refrigerated at 4°C (± 2°C) from the time of collection until extraction.

7.3 Extraction holding times for water is seven days from the date sampled and fourteen days from the date sampled for soil. Analysis holding time is 40 days from the date of extraction for both soil and water samples.

8.0 CALIBRATION AND STANDARDIZATION

8.1 For primary analysis, one mix (mix A + mix B) is used with the same concentration as listed on Tables II and III. For confirmation analyses, two mixes are used because of the close proximity of the retention times for certain compounds.

8.2 Tables IV, V, VI, and VII indicate the calibration levels for PETN, Nitroglycerine, Picric Acid and Diazodinitrophenol (DDNP), respectively. The same sample extract may be used but separate calibrations are required because of the differences in the operating parameters.

TABLE II

COMPOUNDS (MIX A)	1st LEVEL (ppb)	2nd LEVEL (ppb)	3rd LEVEL (ppb)	4th LEVEL (ppb)	5th LEVEL (ppb)	6th LEVEL (ppb)
HMX	20	100	500	1000	2000	5000
*4-Nitroanaline	20	100	500	1000	2000	5000
1,3,5-TNB	10	50	250	500	1000	2500
Tetryl	20	100	500	1000	2000	5000
TNT	10	50	250	500	1000	2500
4-ADNT	10	50	250	500	1000	2500
2,6-DNT	10	50	250	500	1000	2500
4-Nitrotoluene	20	100	500	1000	2000	5000
*Surrogate						

TABLE III

COMPOUNDS (MIX B)	1st LEVEL (ppb)	2nd LEVEL (ppb)	3rd LEVEL (ppb)	4th LEVEL (ppb)	5th LEVEL (ppb)	6th LEVEL (ppb)
*4-Nitroaniline	20	100	500	1000	2000	5000
RDX	20	100	500	1000	2000	5000
1,3-DNB	10	50	250	500	1000	2500
Nitrobenzene	10	50	250	500	1000	2500
2-ADNT	10	50	250	500	1000	2500
2,4-DNT	10	50	250	500	1000	2500
2-Nitrotoluene	20	100	500	1000	2000	5000
3-Nitrotoluene	20	100	500	1000	2000	5000
*Surrogate						

TABLE IV

COMPOUNDS	1st LEVEL (ppb)	2nd LEVEL (ppb)	3rd LEVEL (ppb)	4th LEVEL (ppb)	5th LEVEL (ppb)
*4-Nitroaniline	50	100	200	500	1000
PETN	50	100	200	500	1000
*Surrogate					

TABLE V

COMPOUNDS	1st LEVEL (ppm)	2nd LEVEL (ppm)	3rd LEVEL (ppm)	4th LEVEL (ppm)	5th LEVEL (ppm)
Nitroglycerine	1	5	10	20	50

TABLE VI

COMPOUNDS	1st LEVEL (ppb)	2nd LEVEL (ppb)	3rd LEVEL (ppb)	4th LEVEL (ppb)	5th LEVEL (ppb)
Picric Acid	100	500	1000	1500	5000

TABLE VII

COMPOUNDS	1st LEVEL (ppb)	2nd LEVEL (ppb)	3rd LEVEL (ppb)	4th LEVEL (ppb)	5th LEVEL (ppb)
DDNP	50	250	1000	2000	5000

8.3 Initial Calibration is performed by analyzing six calibration levels (five levels for Nitroglycerin, PETN and picric acid). Percent RSD (Relative Standard Deviation) must be below 20% for the 6 points, (5 points for Ng, PETN and picric acid. Calculate response factor (RF) for each level of standard using peak area. Peak heights will be used to calculate the response factors if it is required by specific project.

$$\%RSD = \frac{\text{Standard Deviation}}{\text{Average RF}} \times 100$$

$$RF(\text{Each Level}) = \frac{\text{Peak Area/Height of Analyte}}{\text{Concentration}}$$

8.3.1 Prior to use for sample analysis, the acceptability of the initial calibration curve must be verified through analysis of calibration verification (ICV) solutions obtained from a second source. Calibration verification analysis should meet the same acceptance criteria used for daily calibration.

8.4 A continuing Calibration is performed at the beginning of each shift by analyzing a mid-level standard. The calibration difference must be below 15%. When a Continuing Calibration is passed, the calibration is acceptable for a 12-hour period starting from the beginning of the injection of the first standard. Mid-point calibration standard is run every ten samples and a closing standard is run at the end of the batch or 24-hour period, whichever comes first. Each mid-point and closing standard must have a %D below 15. If the instrument does not meet the acceptance criteria, a new initial calibration must be constructed. A new initial calibration is also required if a column is replaced or major instrument maintenance like changing the lamp or pump is replaced. Also, after corrective action, if the absolute retention time of the daily calibration is not within the established retention time window, a new initial calibration must be constructed. Minor corrective action like changing pre-column filter or washing column and lines with pure methanol may not require performing a new initial calibration, provided the daily calibration that originally failed, now passes the acceptance criteria.

$$\%\ \text{Difference} = \frac{RF_c - RF_i}{RF_i} \times 100$$

where:

RF_i = Mean response factor from the most recent initial calibration

RF_c = Response factor from continuing calibration

9.0 METHOD DETECTION LIMIT

9.1 Method detection limits for this method are listed in the GPL Laboratory Method Detection Limit and Reporting Limit official book.

10.0 METHOD PERFORMANCE

10.1 The MDL concentrations listed in the GPL MDL book are generally obtained using organic-free reagent water. Results were also obtained by extracting seven spiked replicates the same way as the samples and analyzing them. MDL is defined as the minimum concentration of a substance that can be measured and reported with 99% confidence that the value is above zero. Precision and accuracy studies are performed once a year at a minimum. Single operator precision, overall precision and method accuracy were found to be directly related to the concentration of the parameter.

11.0 PROCEDURE

11.1 Aqueous Samples

11.1.1 Place 770ml aliquots of the aqueous sample, blank and blank matrix spike, in 1000ml erlenmeyer flasks. Add 1.00ml of 6ppm surrogate to each sample and 1.0ml of matrix spike to each LCS and sample matrix spike. Matrix spike solution, and surrogate solution prepared in methanol at 6 and 3ug/ml concentration using all target compounds.

11.1.2 Add 251.3g of NaCl plus a magnetic stir bar in to the flask and stir the sample using a magnetic stirrer, starting from medium to high speed until all of the NaCl is completely dissolved. Be sure to dissolve all salt before adding acetonitrile, or the dissolution process takes much longer.

11.1.3 Add a 164ml volume of acetonitrile using a glass erlenmeyer cylinder to each sample and stir on high speed for 20 minutes. Let the phases separate for about 10 minutes.

11.1.4 Collect the upper layer (Acetonitrile) in a 100ml erlenmeyer flask. Approximately 10ml should be collected.

11.1.5 Add another 10ml of acetonitrile into the 1000ml erlenmeyer flask containers sample and stir on high speed for 15 minutes. Allow the phases to separate for about 10 min. Collect the upper layer and combine with the first extract in the 100ml volumetric flask.

11.1.6 Prepare a salt water solution in a separate flask by dissolving 325g of NaCl in 1000ml of D.I. water. Add 84ml of the salt water solution to the extract, which was collected in a 125ml erlenmeyer flask. Place the 125ml erlenmeyer flask on the magnetic stirrer with a magnetic bar and stir on high speed for 15 min. Allow the separation of the layers. Collect the top layer (Acetonitrile), extract one more time with an additional 1ml of acetonitrile, adding this to the first extract and adjust the volume to 10ml using Class A graduated cylinder.

11.1.7 Before analysis dilute the sample 1:1 with DI water, (with pH<3 if tetryl is a suspected analyte) prior to analysis.

11.2 Soil and Sediment Samples

11.2.1 Sample homogenization: Air dry soil sample at room temperature for 24 hours, being careful not to expose the samples to direct sunlight. Visually inspect the sample to insure that no clumps exist. Weigh the sample and record the results in the extraction logbook. Continue to monitor the sample weight every two hours until constant weight is reached. The acceptance criteria is ± 1% variation in weight. Record the initial and subsequent results. Homogenize the dried sample thoroughly and grind clumps with a spatula so that it can pass through a 30 mesh sieve. Rinse spatula with acetonitrile and dry after every sample. To prevent cross contamination of samples, sieve must be cleaned thoroughly and dried after every use.

11.2.2 Place 2.0g subsample of each soil sample in a 40ml glass vial. Add 9.0ml of acetonitrile and 1.0ml of 6ppm surrogate to each sample. Add 8.0ml of acetonitrile and 1ml of 8330 matrix spike, 1.0ml surrogate to each LCS and sample matrix spike.

11.2.3 Place samples in a cooled ultrasonic bath for 18 hours. After sonication, allow sample to settle for 30 minutes. Remove 5.0ml of supernatant, and combine with 5.0ml of calcium chloride solution before filtering through a 0.45um teflon filter. Discard the first 1.0ml of extract and collect the remainder for HPLC analysis. Allow samples to equilibrate for 15 minutes before analysis.

12.0 SAMPLE ANALYSIS

12.1 Sample analysis may begin when calibration is complete.

12.2 Mid-Point standards are run every ten samples in order to examine both the variation of retention time and to check the calibration of the instrument.

12.3 A dilution must be performed when the peak response exceeds the calibration range of the compounds.

12.4 Peak identification is based on the comparison of the retention times using both the primary and confirmatory columns. A retention time window is calculated by using the average retention time ± three times the standard deviation of 3 mid points during 72 hours of analyses. The average retention time is determined whenever column change or equipment maintenance is performed.

12.5 The following explosive compounds can also be determined by modified 8330 procedure:

PETN: PETN can be identified and quantified by method 8330. Extraction procedure for PETN is the same as 8330 target compound list. Matrix and lab blank samples (LCS) are spiked at 0.4ml of 10ug/ml PETN for water and soil samples. Surrogate solution is spiked at 1ml of 6μg/ml concentration for water

and soil samples. Chromatographic conditions for the analysis of PETN includes:

- Mobil phase: acetonitrile/water 50/50
- Flow rate: 1.2ml/min
- Wavelength: 204nm
- Injection volume: 100ul

Nitroglycerine: Nitroglycerine can be identified and quantified by method 8330. Extraction procedure for Nitroglycerine is the same as 8330 target compound list. Matrix and lab blank samples (LCS) are spiked at 1.0ml of 200ug/ml nitroglycerine for water and soil samples. The following chromatographic conditions are used for Nitroglycerine analysis:

- Mobil phase: 50/50 Methanol/water
- Flow rate: 1.0ml/min
- Wavelength: 254nm
- Injection volume: 100ul

Picric Acid: Picric acid can be identified and quantified by method 8330. Extraction procedure for picric acid is the same as 8330 target compound list. Matrix and LCS are spiked at 0.2ml of 100ug/ml for water and soil samples. The following chromatographic conditions are used for picric acid analysis:

- Mobil phase: Tetrabutylammonium buffer at 1.7g in 0.5 lit acetonitrile and 0.5 lit water solution
- Flow rate: 1.5ml/min
- Wavelength: 365
- Injection volume: 50ul

Diazodinitrophenol (DDNP): DDNP can be identified by a modified method 8330. Extraction procedure for DDNP is the same as 8330 method for the target explosive compound list. Matrix spikes and LCS are spiked at 0.4ml of 10ug/ml DDNP for water and soil matrices. The following chromatographic conditions are used for DDNP analysis:

- Mobile phase: Acetonitrile/H_20, 50/50
- Flow rate: 1.2ml/min
- Wave length: 204nm
- Injection volume: 100ul
- Column: C_{18}

13.0 SAMPLE QUANTITATION

The concentration of all target compounds should be calculated using the following equations.

13.1 Water Sample:

$$\text{Conc. (ug/L)} = \frac{\text{(Peak Area/Height of Sample)(Final Volume in ml)(Dilution)}}{\text{(Avg RF of Std.)(Initial Volume in ml)}}$$

13.2 Soil Sample:

$$\text{Conc. (ug/Kg)} = \frac{\text{(Peak Area/Height of Sample)(Final Volume in ml)(Dilution)}}{\text{(Avg RF of Std.)(Initial Wt. in gm)}}$$

14.0 QUALITY CONTROL

14.1 A method blank is extracted and analyzed with every batch of 20 samples or less. The level of target analyte contaminants in the blank must be less than the reported detection limits.

14.1.1 If the contamination in the blank is not within the acceptable level, all samples associated with contaminated blank must be re-extracted and re-analyzed.

14.1.2 Blank must be spiked with surrogate specified in section 11.1.1. If the surrogate recovery in the method blank does not meet the in-house established acceptance criteria, first re-analyze the method blank. If the surrogate recovery does not meet the acceptance criteria after the re-analysis, the method blank and the sample associated with the blank must be re-extracted and re-analyzed.

14.2 Sample analysis

14.2.1 Sample must be extracted and analyzed with the holding times specified in section 7.0.

14.2.2 The samples must have associated method blank meeting the blank acceptance criteria.

14.2.3 Samples must be spiked with surrogate specified in section 11.1.1. If the surrogate recovery does not meet the in-house established acceptance criteria, first check calculation, sample preparation logs, and the instrument condition. If calculation was uncorrect, correct the calculation and verify that the surrogate compound recovery meets the acceptance criteria. If the instrument malfunctioned, correct the instrument problem and re-analyze the sample extract.

14.2.4 If the above action does not correct the problem, re-extract and re-analyze the sample.

14.2.5 If the surrogate compound recovery meets the acceptance criteria in the re-extraction, submit the data from the re-extraction.

14.2.6 If the surrogate compound recovery fails to meet the acceptance criteria in the re-extracted samples, then the problem may be due to matrix effect. To determine if there was matrix effect, review the surrogate recoveries of blank, LCS & MS/MSD analyzed and extracted in the same batch.

14.3 Laboratory Control Sample

Laboratory Control Sample (LCS) is extracted and analyzed for every batch of 20 samples or less. The recovery limits are determined by taking three standard deviations of 20 consecutively analyzed LCS's. Recovery limits are updated periodically. Data points used in the data set must not be selectively included or excluded.

The LCS is analyzed to assess general method performance. The LCS is spiked with all target analyses before it is carried through the sample preparation. For soil samples, a purified solid matrix (e.g., ottawa sand, sodium sulfate, or other purified solid) would typically be used. For aqueous analyses, use analyte-free reagent water. The concentration used to spike the LCS is the 3rd level of the initial calibration mix A and mix B (see tables II and III).

14.3.1 If any analytes fail to meet the laboratory established QC criteria, first re-analyze the LCS. Two LCS compounds can be outside the laboratory established QC limit. No compound can grossly exceed the acceptance limit in the LCS (50% - 150%). If the LCS does not meet the above criteria, then the LCS method blank and all associated samples of the batch would be re-prepared and re-analyzed.

14.4 Matrix spike and duplicate analyses are performed per batch of 20 samples or less.

The MS/MSD is evaluated by comparing the precision of target analytes to the recovery windows established. MS/MSD data evaluation is more complex than method blank or LCS data since MS/MSD measure matrix effect in addition to sample preparation and analysis error. MS/MSD that fail to meet the acceptance criteria would indicate that a potential matrix effect is present. The laboratory must assess the batch to determine whether the spike results are attributable to matrix affect, or the result of other problem in the analytical process. If all the QC batch elements which are not affected by the sample matrix are in control (e.g., method blank, LCS), and if there is no evidence that the spiking was not properly performed, the poor spike recovery may be attributed to matrix affect. If the LCS compounds that are not affected by the sample matrix are out of control, and if the same compounds in the MS/MSD are outside control limit, then matrix spiked sample(s) must be re-processed through the entire analytical sequence. RPD for the MS/MSD should be 25%.

14.5 Confirmation for all target compounds detected on the C18 column is performed on a CN column. CN column analysis is for qualitative purposes and depends on compound concentrations detected on C18 column. CN column is generally less sensitive in comparison with C18 column. Analytes are identified when peaks are observed in the retention time window for the analyte on both columns. Conformation of peak on the CN column is based on comparison of the retention times with corresponding peak of the standard analyzed before the samples. On the CN, for a peak to be confirmed, it must fall within the established retention time window of the standard obsolete retention time. When identification has been confirmed on the confirmation column, the analyst should evaluate the agreement of the quantitated results on both columns. Retention time window is established by analyzing the mid-level standard in over the period

of 72 hours. The window for that day will be plus or minus three times the standard deviation.

14.6 Surrogate recoveries are quantified for all blanks, samples, matrix spikes and lab control spikes. Surrogate recoveries should be established and monitored by plotting control charts. Recoveries of surrogate for the blank and samples should be within the specified ranges. If the recoveries of surrogate are outside the QC limits re-analyze the extract. Re-extraction of the sample should also be considered if re-injection of the sample produces similar results. The judgement of the experienced analyst is heavily relied upon when re-extraction and/or re-injection deem necessary.

15.0 SAFETY

15.1 Standard precautionary measures used for handling other organic compounds like safety glasses, laboratory coats, gloves should be sufficient for the safe handling of the analytes handled by this method. The only extra caution should be taken is when handling the analytical standard neat material.

15.2 Visual observation of soil sample is important when the sample is taken from a site expected to contain explosives lump of material that have a chemical appearance should be suspect and not ground. Explosives are generally a very finely ground grayish-white material.

16.0 POLLUTION PREVENTION

16.1 GPL Laboratory operates in a safe manner to protect the air, water, and land by minimizing and controlling all releases from fume hoods and bench operations. For more detail on pollution prevention, refer to GPL SOP D.5.

17.0 WASTE MANAGEMENT

17.1 Several wastes that GPL generates can be handled in a fairly routine manner. The process of describing the method for waste disposal of chemicals including standards and reagent solutions, and process waste, and samples is described in Standard Operating Procedures D.1 and D.2.

18.0 DEFINITIONS

18.1 For definitions of terms used in this document, refer to GPL Laboratory SOP G.14.

Appendix B: Figures

FIGURE 7-1 - Inorganic Analysis By Inductively Coupled Plasma (ICP) Methods 6010					
QC Check	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**	**Flagging Criteria**	**Comments**
Demonstrate acceptable analyst capability	Prior to using any test method and at any time there is a significant change in instrument type, personnel, or test method	QC acceptance criteria published by DoD, if available; otherwise method specified criteria	Recalculate results; locate and fix problem, then rerun demonstration for those analytes that did not meet criteria (see section C.1.f).	NA	This is a demonstration of analyst ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample (e.g., LCS or PT sample). No analysis shall be allowed by analyst until successful demonstration of capability is complete.
MDL study	At initial set-up and subsequently once per 12 months; otherwise quarterly MDL verification checks shall be performed (see box D-12).	See 40 CFR 136B. MDL verification checks must produce a response at least 3 times greater than instrument noise level.	Run MDL verification check at higher level and higher MDL set or reconduct MDL study (see box D-12).	NA	Samples cannot be analyzed without a valid MDL.
Instrument detection limit (IDL) study (ICP only)	Every 3 months	Detection limits established shall be ≤ MDL.	NA	NA	Samples cannot be analyzed without a valid IDL.
Linear range or high-level calibration check standard (ICP only)	Every 6 months	Within ± 10% of expected value	NA	NA	

FIGURE 7-1 - Inorganic Analysis By Inductively Coupled Plasma (ICP) Methods 6010					
QC Check	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**	**Flagging Criteria**	**Comments**
Initial calibration for all analytes (ICAL) (ICP: minimum one high standard and a blank; GFAA: minimum three standards and a blank; CVAA: minimum 5 standards and a blank)	Daily initial calibration prior to sample analysis	ICP: No acceptance criteria unless more than one standard is used, in which case r ≥ 0.995.	Correct problem and repeat initial calibration.	Flagging criteria is not appropriate.	Problem must be corrected. No samples may be run until ICAL has passed.
Second source calibration verification	Once after each initial calibration, prior to sample analysis	All analyte(s) within ± 10% of expected value	Correct problem and verify second source standard. If that fails, then repeat initial calibration	Flagging criteria is not appropriate.	Problem must be corrected. No samples may be run until calibration has been verified.
Continuing calibration verification (CCV)	After every 10 samples and at the end of the analysis sequence	ICP: within ± 10% of expected value	Correct problem, rerun calibration verification. If that fails, then repeat initial calibration. Reanalyze all samples since the last successful calibration.	Flagging criteria is not appropriate.	Problem must be corrected. Results may not be reported without a valid CCV.
Low level calibration check standard (ICP only)	Daily, after one-point initial calibration	Within ±30% of expected value	Correct problem, then reanalyze.	Flagging criteria is not appropriate.	No samples may be analyzed without a valid low-level calibration check standard. Low-level calibration check standard should be less than or equal to the reporting limit.
Method blank	One per preparatory batch	No analytes detected ≥ ½ RL For common laboratory contaminants, no analytes detected $ RL	Correct problem, then see criteria in box D-4. If required, reprep and reanalyze method blank and all samples processed with the contaminated blank.	Apply B to all results for the specific analyte(s) in all samples in the associated preparatory batch.	

FIGURE 7-1 - Inorganic Analysis By Inductively Coupled Plasma (ICP) Methods 6010					
QC Check	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**	**Flagging Criteria**	**Comments**
Calibration blank	Before beginning a sample run, after every 10 samples, and at end of the analysis sequence	No analytes detected ≥ MDL	Correct problem, then reprep and reanalyze calibration blank and previous 10 samples	Apply B to all results for specific analyte(s) in all samples associated with the blank.	
Interference check solutions (ICS) (ICP only)	At the beginning of an analytical run	Within ± 20% of expected value	Terminate analysis; locate and correct problem; reanalyze ICS.	Flagging criteria is not appropriate.	No samples may be analyzed without a valid ICS.
LCS containing all analytes required to be reported by the project or contract	One LCS per preparatory batch	QC acceptance criteria specified by DoD, if available; see box D-5 and Appendix DoD-D.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated batch for failed analytes in all samples in the associated preparatory batch (see full explanation in Appendix DoDD).	If corrective action fails, apply Q to specific analyte(s) in all samples in the associated preparatory batch.	
Dilution test	Each preparatory batch or when a new or unusual matrix is encountered	Five-fold dilution must agree within ± 10% of the original determination	ICP: Perform post-digestion spike (PDS) addition.	Flagging criteria is not appropriate.	Only applicable for samples with concentrations > 50 x MDL (ICP).
Post-digestion spike (PDS) addition (ICP only)	When dilution test fails or analyte concentration in all samples < 50 x MDL	Recovery within 75-125% of expected result.	Run samples by method of standard addition (MSA) or see flagging criteria.	Apply J to all sample results (for same matrix) for specific analyte(s) for all samples associated with the postdigestion spike addition.	The spike addition should produce a level between 10 and 100 x MDL.
MS	One MS per every 20 project samples per matrix (see box D-6)	For matrix evaluation, use QC acceptance criteria specified by DoD for LCS.	Examine the project-specific DQOs. Contact the client as to additional measures to be taken.	For the specific analyte(s) in the parent sample, apply J if acceptance criteria are not met.	For matrix evaluation only. If MS results are outside the LCS limits, the data shall be evaluated to determine the source of difference and to determine if there is a matrix effect or analytical error.

FIGURE 7-1 - Inorganic Analysis By Inductively Coupled Plasma (ICP) Methods 6010					
QC Check	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**	**Flagging Criteria**	**Comments**
MSD or sample duplicate	One per every 20 project samples per matrix	RPD ≤ 20% (between MS and MSD or sample and sample duplicate)	Examine the project-specific DQOs. Contact the client as to additional measures to be taken.	For the specific analyte(s) in the parent sample, apply J if acceptance criteria are not met.	The data shall be evaluated to determine the source of difference.
Results reported between MDL and RL	NA	NA	NA	Apply J to all results between MDL and RL	

FIGURE 7-2 - Organic Analysis By Gas Chromatography And High Performance Liquid Chromatography (Method 8330)					
QC Check	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**	**Flagging Criteria**	**Comments**
Demonstrate acceptable analyst capability	Prior to using any test method and at any time there is a significant change in instrument type, personnel, or test method	QC acceptance criteria published by DoD, if available; otherwise method specified criteria.	Recalculate results; locate and fix problem, then rerun demonstration for those analytes that did not meet criteria (see section C.1.f).	Not applicable (NA)	This is a demonstration of ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample (e.g., LCS or PT sample). No analysis shall be allowed by analyst until successful demonstration of capability is complete.
Method detection limit (MDL) study	At initial set-up and subsequently once per 12 month period; otherwise quarterly MDL verification checks shall be performed (see box D-12)	See 40 CFR 136B. MDL verification checks must produce a response at least 3 times greater than instrument's noise level.	Run MDL verification check at higher level and higher MDL set or reconduct MDL study (see box D-12).	NA	Samples cannot be analyzed without a valid MDL.
Retention time window width calculated for each analyte and surrogate	At method set-up and after major maintenance (e.g., column change)	Width is ± 3 times standard deviation for each analyte retention time from 72-hour study.	NA	NA	
Breakdown check (Endrin/ DDT Method 8081A only	Daily prior to analysis of samples	Degradation < 15% for both Endrin and DDT.	Correct problem then repeat breakdown check.	Flagging criteria is not appropriate.	No samples shall be run until degradation < 15%.

FIGURE 7-2 - Organic Analysis By Gas Chromatography And High Performance Liquid Chromatography (Method 8330)					
QC Check	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**	**Flagging Criteria**	**Comments**
Minimum fivepoint initial calibration for all analytes (ICAL)	Initial calibration prior to sample analysis	One of the options below: Option 1: RSD for each analyte < 20% Option 2: Grand mean2 RSD < 20%, with no individual analyte RSD > 30% Option 3: linear – least squares regression: r > 0.995 Option 4: non-linear regression: coefficient of determination (COD) r2 ≥ 0.990 (6 points shall be used for second order, 7 points shall be used for third order)	Correct problem then repeat initial calibration.	Apply J to all analytes with RSD > 20% and ≤ 30%. Identify in case narrative analytes with RSD > 20%, provide to client the actual RSD for those analytes, and document the grand mean.	Problem must be corrected. No samples may be run until ICAL has passed.
Second source calibration verification	Once after each initial calibration	Value of second source for all analytes within ± 20% of expected value (initial source)	Correct problem and verify second source standard. If that fails then repeat initial calibration.	Flagging criteria is not appropriate.	Problem must be corrected. No samples may be run until calibration has been verified.
Retention time window position establishment for each analyte and surrogate	Once per ICAL	The center of the retention time window shall be set at midpoint of initial calibration curve.	NA	NA	
Retention time window verification for each analyte and surrogate	Each calibration verification standard	Analyte within established window	Correct problem, then reanalyze all samples analyzed since the last acceptable retention time check. If they fail, redo ICAL and reset retention time window.	Flagging criteria is not appropriate for initial verification. For CCV, apply a Q-flag to all results for analytes outside the established window.	No samples shall be run without a verified retention time window at the initial verification.

FIGURE 7-2 - Organic Analysis By Gas Chromatography And High Performance Liquid Chromatography (Method 8330)					
QC Check	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**	**Flagging Criteria**	**Comments**
Calibration verification (initial [ICV] and continuing [CCV])	ICV: Daily, before sample analysis CCV: After every 10 field samples and at the end of the analysis sequence	All analytes within ± 15% of expected value (%D), or grand mean ≤ 15%D with no %drift/difference for any individual analyte > 20%D	ICV: Correct problem, rerun ICV. If that fails, repeat initial calibration. See section 9.4.2.2.e and box 41. CCV: Correct problem then repeat CCV and reanalyze all samples since last successful calibration verification	Identify in case narrative analytes with %D>15%, provide to client the actual %D for those analytes, and document the grand mean. ICV: Apply J to all results associated with the analytical batch for analyte(s) > 15% and < 20% of expected range. CCV: Apply Q to all results for the specific analyte(s) in all samples since the last acceptable calibration verification.	If an individual analyte is > 20% or the grand mean is > 15%, no samples may be analyzed until the problem has been corrected.
Method blank	One per preparatory batch	No analytes detected ≥ ½ RL. For common laboratory contaminants, no analytes detected > RL.	Correct problem, then see criteria in box D-4; if required, reprep then reanalyze method blank and all samples processed with the contaminated blank.	Apply B to all results for the specific analyte(s) in all samples in the associated preparatory batch	

FIGURE 7-2 - Organic Analysis By Gas Chromatography And High Performance Liquid Chromatography (Method 8330)					
QC Check	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**	**Flagging Criteria**	**Comments**
Laboratory control sample (LCS) containing all analytes required to be reported by the project or contract	One LCS per preparatory batch	QC acceptance criteria specified by DoD, if available; see box D-5 and Appendix DoD-D.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated batch for failed analytes in all samples in the associated preparatory batch, if sufficient sample material is available (see full explanation in Appendix DoD-D)	If corrective action fails apply Q to specific analyte(s) in all samples in the associated preparatory batch	
Matrix spike (MS)	One MS per every 20 project samples per matrix (see box D-6)	For matrix evaluation, use QC acceptance criteria specified by DoD for LCS.	Examine the project-specific DQOs. Contact the client as to additional measures to be taken.	For the specific analyte(s) in the parent sample, apply J if acceptance criteria are not met.	For matrix evaluation only. If MS results are outside the LCS limits, the data shall be evaluated to determine the source of difference and to determine if there is a matrix effect or analytical error
Matrix spike duplicate (MSD) or sample duplicate	One per every 20 project samples per matrix	RPD $\leq$ 30% (between MS and MSD or sample and sample duplicate)	Examine the project-specific DQOs. Contact the client as to additional measures to be taken.	For the specific analyte(s) in the parent sample, apply J if acceptance criteria are not met.	The data shall be evaluated to determine the source of difference.

FIGURE 7-2 - Organic Analysis By Gas Chromatography And High Performance Liquid Chromatography (Method 8330)					
QC Check	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**	**Flagging Criteria**	**Comments**
Surrogate spike (analytes identified in Appendix DoDD)	All field and QC samples	QC acceptance criteria for LCS specified by DoD, if available; otherwise method specified criteria or laboratory's own in-house criteria	For QC and field samples, correct problem then reprep and reanalyze all failed samples for failed surrogates in the associated preparatory batch, if sufficient sample material is available. If obvious chromatographic interference with surrogate is present, reanalysis may not be necessary.	For the specific analyte(s) in all field samples collected from the same site matrix as the parent, apply J if acceptance criteria are not met. For QC samples, apply Q to specific analyte(s) in all samples in the associated preparatory batch.	Alternative surrogates are recommended when there is obvious chromatographic interference.
Confirmation of positive results (second column or second detector)	All positive results must be Confirmed.	Calibration and QC criteria same as for initial or primary column analysis. Results between primary and second column RPD ≤ 40%.	NA	Apply J if RPD > 40% from primary column result or Qflag if sample is not confirmed. Discuss in the case narrative.	Report the higher of two confirmed results unless overlapping peaks are causing erroneously high results, then report the noneffected result and document in the case narrative.
Results reported between MDL and RL	NA	NA	NA	Apply J to all results between MDL and RL.	

FIGURE 7-3 - Common Anions Analysis (Method 9058)					
QC Check	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**	**Flagging Criteria**	**Comments**
Demonstrate acceptable analyst capability	Prior to using any test method and at any time there is a significant change in instrument type, personnel, or test method	QC acceptance criteria published by DoD, if available; otherwise use method-specified criteria.	Recalculate results; locate and fix problem, then rerun demonstration for those analytes that did not meet criteria (see section C.1.f).	NA	This is a demonstration of analyst ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample (e.g., LCS or PT sample). No analysis shall be allowed by analyst until successful demonstration of capability is completed.
MDL study	At initial set-up and subsequently once per 12-month period; otherwise quarterly MDL verification checks shall be performed (see box D-12).	See 40 CFR 136B. MDL verification checks must produce a response at least 3 times greater than instrument's noise level.	Run MDL verification check at higher level and higher MDL set or reconduct MDL study (see box D-12).	NA	Samples cannot be analyzed without a valid MDL.
Retention time window width calculated for each analyte	After method set-up and after major maintenance (e.g., column change)	Width is ± 3 times standard deviation for each analyte retention time over 24-hour period	NA	NA	
Multipoint calibration for all analytes (minimum three standards and one calibration blank)	Initial calibration prior to sample analysis	Correlation coefficient ≥ 0.995 for linear regression.	Correct problem, then repeat initial calibration.	Flagging criteria is not appropriate.	Problem must be corrected. No sample may be run until calibration has passed.
Second source calibration verification	Once after each multipoint calibration	Value of second source for all analytes within ± 10% of expected value (initial source).	Correct problem and verify second source standard. If that fails, then repeat initial calibration.	Flagging criteria is not appropriate.	Problem must be corrected. No samples may be run until calibration has been verified.
Retention time window position establishmentfor each analyte	Once per multipoint calibration	Position shall be at midpoint of calibration curve.	NA	NA	

FIGURE 7-3 - Common Anions Analysis (Method 9058)					
QC Check	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**	**Flagging Criteria**	**Comments**
Retention time window verification for each analyte	Each calibration verification	Analyte within established window.	Correct problem, then reanalyze all samples analyzed since the last retention time check. If they fail, redo ICAL and reset retention time window.	Flagging criteria is not appropriate.	No samples shall be run without a verified retention time window.
Initial calibration verification (ICV)	Daily before sample analysis; and when eluent is changed, and with every batch of samples	All analytes within ± 25% of expected value and retention times within appropriate windows	Correct problem, rerun ICV. If that fails, then repeat initial calibration (see section 9.4.2.2.e and box #41).	Flagging criteria is not appropriate.	No samples may be run without verifying initial calibration.
Midrange continuing calibration verification (CCV)	After every 10 field samples and at the end of the analysis sequence	Instrument response within ± 15% of expected value	Correct problem, then repeat continuing calibration verification and reanalyze all samples since last successful calibration verification	Apply Q to all results for the specific analyte(s) in all samples since the last acceptable calibration verification.	
Method blank	One per preparatory batch	No analytes detected ≥ ½ RL For common laboratory contaminants, no analysis detected $ RL	Correct problem, then see criteria in box D-4. If required, reprep and reanalyze method blank and all samples processed with the contaminated blank.	Apply B to all results for the specific analyte(s) in all samples in the associated preparatory batch.	
LCS containing all analytes required to be reported by the project or contract	One LCS per preparatory batch	QC acceptance criteria specified by DoD, if available; see box D-5 and Appendix DoD-D.	Correct problem then reprep and reanalyze the LCS and all samples in the associated batch for failed analytes in all samples in the associated prepatory batch, if sufficient sample material is available.	If corrective action fails apply Q to specific analyte(s) in all samples in the associated preparatory batch.	

FIGURE 7-3 - Common Anions Analysis (Method 9058)					
QC Check	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**	**Flagging Criteria**	**Comments**
MS	One MS per every 20 project samples per matrix (see box D-6)	For matrix evaluation, use QC acceptance criteria specified by DoD for LCS.	Examine the project-specific DQOs. Contact the client as to additional measures to be taken.	For the specific analyte(s) in the parent sample, apply J if acceptance criteria are not met.	For matrix evaluation only. If MS results are outside the LCS limits, the data shall be evaluated to determine the source of difference and to determine if there is a matrix effect or analytical error.
MSD	One per every 20 project samples per matrix	RPD ≤ 20% (between MS and MSD)	Examine the project-specific DQOs. Contact the client as to additional measures to be taken.	For the specific analyte(s) in the parent sample, apply J if acceptance criteria are not met.	The data shall be evaluated to determine the source of difference.
Sample Duplicate (replicate)	One per every 10 samples	%D ≤ 10%	Correct problem and reanalyze sample and duplicate.	If corrective action fails, apply Q to specific analyte(s) in the sample.	
Results reported between MDL and RL	NA	NA	NA	Apply J to all results between MDL and RL.	

Figure 7-4

QUALITY CONTROL FIELD AUDIT REPORT

SUMMARY INFORMATION

1. PROJECT NAME: _____

2. PROJECT ADDRESS: _____

_____

_____

3. PRELIMINARY ASSESSMENT _____ RI/FS _____ RD _____ CONSTRUCTION_____

OTHER _____

4. DATE(S) OF QC FIELD AUDIT _____

5. AUDITOR'S NAME _____PHONE_____

6. FACILITY CONTACT _____PHONE_____

7. CONTRACTOR CONTACT_____PHONE_____

8. PERSONNEL ON-SITE

NAME	REPRESENTING	PHONE

9. AUDITOR'S COMMENTS

_____

_____

_____

_____

10. WEATHER CONDITIONS

SUNNY ; PARTLY SUNNY ; PARTLY CLOUDY ; CLOUDY ; RAIN ; DRIZZLE ; SNOW ; SLEET

TEMPERATURE_____ WIND SPEED_____ WIND DIRECTION_____

11. LEVEL OF PERSONNEL PROTECTION REQUIRED IN WORK PLAN

A B C D

LEVEL OF PERSONNEL PROTECTION ACTUALLY DONNED:

A B C D

12. FIELD SURVEY EQUIPMENT

INSTRUMENT	MODEL	CALIBRATION CHECK	CALIBRATION STANDARD	SPAN SETTING
CONDUCTIVITY METER				
DISSOLVED O_2 METER				
PH METER				
COMBUSTIBLE GAS INDICATOR (LEL/O_2)				
FLAME IONIZATION DETECTOR (OVA)				
PHOTOIONIZATION DETECTOR (HNU)				
TOTAL GAS INDICATOR (CO,H_2S)				
OTHER				

OBSERVATIONS _____

_____

_____

13. DID THE SAMPLING TEAM TAKE PERIODIC SURVEYS OF THE AMBIENT AIR CONDITIONS?

YES NO N/A

14. DID THE SAMPLING TEAM PROVIDE A DECON ZONE DESIGNATING CLEAN AND CONTAMINATED AREAS?

YES NO N/A

15. WERE PHOTOGRAPHS TAKEN? YES NO

16. AUDITOR'S COMMENTS

_____

_____

_____

MONITORING WELL SAMPLING SETUP AND EVACUATION

EVACUATION PROCEDURES

1. WELL CASING CONSTRUCTION STAINLESS STEEL TEFLON PVC OTHER _____

2. DIAMETER OF WELL CASING 2" 4" 6" OTHER _____

3. LOCKING CAPS ON THE WELLS? YES NO N/A PROTECTIVE CASING? YES NO N/A

4. METHOD UTILIZED TO DETERMINE THE STATIC WATER LEVEL

WATER LEVEL INDICATOR OTHER _____

5. REFERENCE POINT THAT THE STATIC WATER LEVEL WAS MEASURED FROM:

SURVEY POINT	TOP OF INNER CASING	TOP OF PROTECTIVE CASING	HEIGHT OF CASING ABOVE GROUND SURFACE

6. WAS THE WATER LEVEL INDICATOR DECONTAMINATED ACCORDING TO STANDARD PROCEDURES BETWEEN EACH WELL?
YES NO N/A

IF NO, METHOD USED: _____

_____

_____

7. EVACUATION METHOD:

BAILER CENTRIFUGAL PUMP PERISTALTIC PUMP BLADDER PUMP SUBMERSIBLE PUMP

GAS DISPLACEMENT PUMP GAS LIFT PUMP OTHER _____

8. TYPE OF HOSE UTILIZED:

POLYETHYLENE TEFLON SILASTIC N/A OTHER _____

9. WAS THE HOSE DEDICATED TO EACH WELL LOCATION? YES NO N/A

IF NO, METHOD OF DECONTAMINATION _____

10. WAS THE PUMP DEDICATED TO EACH WELL LOCATION? YES NO N/A

11. WAS THE PUMP: LABORATORY DECONTAMINATED? FIELD DECONTAMINATED? N/A

12. WAS THE PUMP DECONTAMINATED ACCORDING TO STANDARD PROCEDURES?

YES NO IF NO, METHOD OF DECONTAMINATION _____

13. WAS THE PUMP HEAD OR END OF HOSE WITHIN 6 FEET OF THE DYNAMIC WATER LEVEL DURING EVACUATION?
YES NO N/A

14. WAS THE DECONTAMINATION AREA LOCATED AWAY FROM THE SOURCE OF CONTAMINATION?

YES NO N/A

15. AUDITOR'S COMMENTS

_____

_____

_____

AQUEOUS SAMPLING PROCEDURES

1. AQUEOUS MATRIX SAMPLED:

POTABLE WELL GROUND WATER SURFACE WATER LEACHATE RUNOFF STORM SEWER

SANITARY SEWER OTHER _____

2. TYPE OF SAMPLE: GRAB COMPOSITE IF COMPOSITE - SAMPLES/COMPOSITE _____

3. WAS THE VOA SAMPLE COLLECTED FIRST? YES NO N/A

4. TYPE OF SAMPLING EQUIPMENT:

	MATERIAL OF CONSTRUCTION			
	STAINLESS STEEL	TEFLON	GLASS	OTHER
BAILER	_____	_____	_____	_____
BLADDER PUMP	_____	_____	_____	_____
SAMPLER	_____	_____	_____	_____
COLIWASA	_____	_____	_____	_____
KEMMERER DEPTH SAMPLER	_____	_____	_____	_____
WHEATON DIP SAMPLER	_____	_____	_____	_____
TUB SAMPLER	_____	_____	_____	_____
BACON BOMB	_____	_____	_____	_____

5. TYPE OF LEADER LINE THAT COMES IN CONTACT WITH THE WELL WATER:

TEFLON TEFLON COATED STAINLESS STEEL N/A OTHER _____

6. LENGTH OF THE LEADER LINE _____

7. WAS THE SAMPLING EQUIPMENT DEDICATED? YES _____ NO _____

8. WAS THE SAMPLING EQUIPMENT: LAB DECONTAMINATED? FIELD DECONTAMINATED?

9. WAS THE SAMPLING EQUIPMENT DECONTAMINATED ACCORDING TO STANDARD PROCEDURES?

YES NO IF NO, METHOD OF DECONTAMINATION: _____

10. WAS THE DECONTAMINATION AREA LOCATED AWAY FROM THE SOURCE OF CONTAMINATION?

YES NO

11. ARE DISPOSABLE GLOVES WORN AND CHANGED BETWEEN EACH SAMPLE LOCATION? YES NO

12. AUDITOR'S COMMENTS:

_____

_____

_____

FIGURE 7-5

NONCONFORMANCE AND CORRECTIVE ACTION REPORT

Date _____

NCR No. _____

Description of Nonconformance and Cause _____
_____
_____
_____
_____
_____

Proposed Disposition _____
_____
_____
_____
_____
_____

Submitted by: _____ Date: _____
Approved by: _____

DISPOSITION (by Project Manager or Designee)

Implementation of Disposition Assigned to: _____

Actual Disposition _____
_____
_____
_____
_____
_____

Disposition completed on: _____
Date

_____
Signature

VERIFICATION
Disposition reviewed and work inspected by: _____ on _____
Disposition verified by: _____ on _____
(Use additional sheet or memo if necessary)

QA/QC INFORMATION

1. LABORATORY:

NAME _____ PHONE _____

CONTACT PERSON _____

CLP CLP CAPABLE CERTIFIED OTHER _____

3. SAMPLE INFORMATION:

MATRIX	PARAMETER	PRESERVATIVE	CONTAINER DESCRIPTION

3. WHAT ORDER BY ANALYTICAL PARAMETER ARE SAMPLES COLLECTED: _____

_____

4. FIELD BLANKS: YES NO N/A FREQUENCY _____

METHOD: _____

WAS IDENTICAL BOTTLE TO BOTTLE TRANSFER OF WATER UTILIZED? YES NO

5. TRIP BLANKS: YES NO N/A FREQUENCY _____

6. WHAT WAS THE SOURCE OF THE BLANK WATER? LABORATORY DEMONSTRATED ANALYTE-FREE
OTHER _____

7. SAMPLE PACKAGING AND HANDLING:

SAMPLE CONTAINERS LABELED	YES	NO	N/A
COC FORMS COMPLETED	YES	NO	N/A
CUSTODY SEALS	YES	NO	N/A
SAMPLES PRESERVED TO 4°C:	YES	NO	N/A

8. AUDITOR'S COMMENTS

_____

_____

_____

_____

FIGURE 10-1

DATE _____

MMRP: (Installation name)
DAILY QUALITY CONTROL REPORT

DAY	S	M	T	W	TH	F	S

WEATHER	BRIGHT SUN	CLEAR	OVERCAST	RAIN	SNOW
TEMPERATURE	< 32	32 - 50	50 - 70	70-85	>85
WIND	STILL	MODERATE	HIGH	REPORT NO.	
HUMIDITY	DRY	MODERATE	HUMID		

USACE PROJECT MGR. _____

PROJECT _____

JOB NO. _____

CONTRACT NO. _____

SUBCONTRACTORS ON-SITE:
EQUIPMENT ON SITE:
WORK PERFORMED (INCLUDING SAMPLING):
QUALITY CONTROL ACTIVITIES (INCLUDING FIELD CALIBRATIONS):
HEALTH AND SAFETY LEVELS AND ACTIVITIES:
PROBLEMS ENCOUNTERED/CORRECTIVE ACTION TAKEN:
SPECIAL NOTES:
TOMORROW'S EXPECTATIONS:

BY _____ TITLE _____

Appendix C: ERIS Database Format Example (One Sample One Analyte)

```
                                        eris file.txt
PREPARED=27APR20020000
PREPARATION_BATCH=VSCQ
Preparation_Type=
Procedure_ID=
Procedure_Name=
Comment=

 RECORD:Result
 ANALYTE_NAME=1,2,4-Trichlorobenzene
 Analyte_Type=
 Amount_Added=
 Amount_Added_Units=
 Detection_Limit=
 Detection_Limit_Type=
 Percent_Difference=
 Percent_Recovery=
 Percent_Recovery_Limit_High=
 Percent_Recovery_Limit_Low=
 Percent_Recovery_Limit_Type=
 Quantitation_Limit=
 Quantitation_Limit_Type=
 Relative_Percent_Difference=
 Relative_Percent_Difference_Limit_High=
 Relative_Percent_Difference_Limit_Type=
 Reporting_Limit=.167
 Reporting_Limit_Type=CONTRACT REQUIRED DETECTION LIMIT
 Retention_Time=
 Retention_Time_Units=
 RESULT=.167
 RESULT_UNITS=Micrograms per Gram
 Comment=

  RECORD:Qualifier
  LAB_QUALIFIER=Not detected
```

Appendix D: Site Specific QAPP

FINAL
SITE SPECIFIC QUALITY ASSURANCE PROJECT PLAN
FORT RUCKER
FORT RUCKER, ALABAMA

OCTOBER 2004

Prepared for:

U.S. ARMY CORPS OF ENGINEERS, BALTIMORE DISTRICT
P.O. Box 1715
Baltimore, Maryland 21203-1715

Prepared by:

MALCOLM PIRNIE, INC.
300 East Lombard Street, Suite 610
Baltimore, Maryland 21202

FINAL

SITE SPECIFIC QUALITY ASSURANCE PROJECT PLAN
FORT RUCKER
FORT RUCKER, ALABAMA

DoD Contract Number: DACA31-00-D-0043

Reviewed and Approved by:

_____

Gregory P. Matthews, P.E., Vice President
Program Officer
Malcolm Pirnie, Inc.

_____

John J. Nocera, P.E.
Project Manager
Malcolm Pirnie, Inc.

Malcolm Pirnie, 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 the 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.

OCTOBER 2004

TABLE OF CONTENTS

LIST OF TABLES

ACRONYMS

AL	Alabama
CCC	Criteria Continuous Concentration
CMC	Criteria Maximum Concentration
FSP	Field Sampling Plan
HASP	Health and Safety Plan
LQAM	Laboratory Quality Assurance Manager
MC	Munitions Constituents
MCL	Maximum Containment Level
MDL	Method Detection Limits
MEC	Munitions and Explosives of Concern
MMRP	Military Munitions Restoration Program
NOAA	National Oceanic and Atmospheric Administration
QA	Quality Assurance
QAO	Quality Assurance Objectives
QAPP	Quality Assurance Program Plan
QC	Quality Control
RL	Reporting Limit
SI	Site Inspection
SOP	Standard Operating Procedures
SQG	Sediment Quality Guideline
SSC	Site Safety Coordinator
SS-QAPP	Site Specific Quality Assurance Program Plan
U.S.	United States
USACE	United States Army Corps of Engineers
USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Agency
UXO	Unexploded Ordnance

1.0 INTRODUCTION

Malcolm Pirnie, Inc. (Malcolm Pirnie) has prepared the following Site Specific Quality Assurance Project Plan (SS-QAPP) for the Site Inspection (SI) of MMRP eligible sites at Fort Rucker, Alabama, under USACE Contract Number DACA31-00-D-0043, Delivery Order 53.

This document is a site specific supplement to the other site specific plans including the following documents: Work Plan, Field Sampling Plan, and Health and Safety Plan. Details that are presented in those documents are not repeated here. In addition this document is intended to supplement the overall MMRP SI Quality Assurance Program Plan (QAPP). The QAPP provides general information and standard operating procedures applicable to sampling and analytical activities to be performed at all installations that MMRP SIs are being conducted by Malcolm Pirnie (within USACE, North and South Atlantic Divisions). The information includes definitions and generic goals for data quality and minimum requirements for quality assurance/ quality control (QA/QC) samples. The procedures address sampling and decontamination protocols; geophysical investigation; field documentation; sample handling, custody, and shipping; instrument calibration and maintenance; field and laboratory auditing; data reduction, validation, and reporting; corrective action requirements; and quality assurance reporting. It should be noted that QAPP may include discussions on procedures or methods that are not applicable to a specific site since it is intended to encompass all sites.

This SS-QAPP will serve as an addendum to this QAPP. Per the contract, it is intended that once the QAPP is finalized, it will not be modified (except for programmatic changes) and will serve as a programmatic document. Site-specific sampling information and any exceptions or proposed changes to the QAPP are addressed and included in this SS-QAPP. This SS-QAPP should not be a stand-alone document from the QAPP. The QAPP will provide the majority of the QA/QC information; the SS-QAPP should simply supplement the information in the QAPP by providing for site-specific condition requirement.

2.0 SITE SPECIFIC INFORMATION

The data collected at Fort Rucker will be compared to Applicable Regulatory Standards (shown in Table 2-1 and Table 2-2).

TABLE 2-1: Applicable Regulatory Standards by Sampling Medial	
Sample Media	Applicable Standard
Soil	US EPA Region 9 PRG Table

TABLE 2-2 presents the contaminants of concern for soil and sediment with the applicable standards compared to the laboratory Method Detection Limits (MDLs) and Reporting Limits (RLs).

TABLE 2-2: Solid Laboratory Limits and Applicable Standards

Contaminant of Concern	MDLs[1]	Laboratory Reporting Limits	SOIL Region 9 Non-Residential PRGs[2]	SOIL Fort Rucker Background
Explosives (ug/kg)				
1,3,5-TNB	24.7	100	18	-
1,3-DNB	10.2	100	-	-
2,4,6-TNT	26.2	100	.057	-
2,4-DNT	30.1	100	1.2	-
2,6-DNT	54.8	100	.620	-
2-AM-4,6-DNT	18.9	100	-	-
2-NT	153.6	200	-	-
3-NT	75.4	200	-	-
4-AM-2,6-DNT	36.1	100	-	-
4-NT	73.9	200	-	-
HMX	50.9	200	31	-
NB	32.7	100	.620	-
RDX	76.2	200	.016	-
TETRYL	168.3	200	-	-

[1] MDL – Laboratory Method Detection Limit
[2] PRG – Preliminary Remediation Goals

3.0 REFERENCES

US Environmental Protection Agency Region 9, Preliminary Remediation Goals Table, October, 1, 2002.

Alabama Department of Environmental Management, Review and Comment, Final Post-Wide Human Health Risk Assessment for Arsenic in Soil, Fort Rucker, January 2004

Malcolm Pirnie, Inc., Quality Assurance Program Plan, MMRP SI, July 2004.

Appendix C: Health and Safety Plan

FINAL
SI HEALTH AND SAFETY PLAN
FORT RUCKER, ALABAMA

OCTOBER 2004

Prepared for:

U.S. ARMY CORPS OF ENGINEERS, BALTIMORE DISTRICT
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FINAL

SI HEALTH AND SAFETY PLAN
FORT RUCKER, ALABAMA

DoD Contract Number: DACA31-00-D-0043

Reviewed and Approved by:

_____

Gregory P. Matthews, P.E., Vice President
Program Officer
Malcolm Pirnie, Inc.

_____

John Nocera, P.E
Project Manager
Malcolm Pirnie, Inc.

Malcolm Pirnie, 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 the 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.

OCTOBER 2004

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ACRONYMS

AL	Alabama
ANSI	American National Standards Institute
CIH	Corporate Industrial Hygienist
EC	Emergency Coordinator
EOD	Explosive Ordnance Disposal
FPM	Field Project Manager
FSP	Field Sampling Plan
HSD	Health and Safety Director
MC	Munitions Constituents
MEC	Munitions and Explosives of Concern
MMRP	Military Munitions Restoration Program
MPPEH	Material Potentially Posing an Explosive Hazard
MSDS	Material Safety Data Sheet
OSHA	Occupational Safety and Health Administration
PM	Project Manager
PPE	Personal Protective Equipment
RCRA	Resource Conservation and Recovery Act
ROC	Record of Changes
SI	Site Inspection
SSO	Site Safety Officer
U.S.	United States
UXO	Unexploded Ordnance
UXOSS	UXO Health and Safety Supervisor

1.0 INTRODUCTION

1.1 Scope

The Malcolm Pirnie, Inc. (Malcolm Pirnie) Health and Safety Plan (HASP) has been developed for conducting site inspections (SI), at sites having a potential for munitions and explosives of concern (MEC) and munitions constituents (MC). This plan sets forth health and safety protocols to be used by Malcolm Pirnie employees and its subcontractors during field activities under contract number DACA31-00-D-0043. All work conducted under this contract should be in conformance with this plan unless formally modified and approved by the Malcolm Pirnie UXO Health and Safety Supervisor (UXOSS) and reviewed by the Contracting Officer via a formal record of change. The intent of this plan is to ensure the health and safety of all site personnel, the general public and the environment. Although it is impossible to eliminate all risks, adherence to this plan will help minimize incidents and accidents by promoting safety while maintaining productivity.

1.2 HASP Acceptance

This HASP and supporting documents will be provided at each site considered for a SI. Site employees and official visitors will be provided with a copy of this plan for review and are responsible for reading, understanding, and signing the acceptance page found in Attachment 1**.** In addition, an Installation Specific Health and Safety Addendum will be included as the installation-specific hazards are identified, and this information will be part of the daily safety briefing. The UXOSS and potentially the Corporate Industrial Hygienist (CIH) will provide an installation-specific orientation for site workers and visitors. The Site Safety Tailgate Meeting Form, enclosed at the end of this report, will be completed for each orientation. No personnel will be required to perform any activity at the site they believe will endanger their health and safety or that of others.

2.0 PROJECT ORGANIZATION AND RESPONSIBILITY

2.1 Project Organization of Safety Personnel

This program will be accomplished under the direction of the individuals identified below (or alternates) in accordance with the responsibilities assigned by their respective organizations. Specific personnel to fill these positions are included in the Site Specific HASP.

Title	Organization	Function
Corporate Health and Safety Director (HSD)	Malcolm Pirnie	Responsible to the President on all matters related to the health and safety of all Malcolm Pirnie employees and its subcontractors. Has final approval authority on HASPs and modifications recommended by the Field Project Manager.
Field Project Manager (FPM)	Malcolm Pirnie	Manages all on-site activities and responsible for maintaining a healthy work environment.
Unexploded Ordnance Health and Safety Supervisor (UXOSS)[1]	Malcolm Pirnie	Works closely with the FPM and HSD and assists with all on-site activities. Responsible for all safety related to MEC. Provides the daily tailgate safety brief, site orientation, and safe escort of non-UXO personnel.

2.2 Safety Responsibilities of Personnel

All Malcolm Pirnie and subcontracted personnel are responsible for compliance with this HASP. All on-site field personnel are expected to perform only those tasks they believe can be done safely and for which they have been adequately trained. They are responsible for taking all reasonable precautions to prevent injury to themselves and to their fellow employees; for being alert to potentially harmful situations; and for immediately reporting any accidents, near misses, and/or unsafe conditions to the HSD and UXOSS or designated field representative. Specific safety responsibilities of the safety staff are described below.

Corporate Health and Safety Director (HSD)
The HSD is responsible for development and implementation of the Programmatic HASP and for the health and safety of Malcolm Pirnie personnel assigned to the field investigation. The HSD will review and approve the HASP. Other duties of the HSD include:

- Initiating actions to provide any required initial installation-specific training;
- Being available for consult by telephone for the full duration of site activities;

[1] Also referred to as the Site Safety Officer.

- Being available to conduct on-site audits as necessary to observe the effectiveness of the HASP;
- Being available for emergencies;
- Providing on-site consultation as necessary to verify that the HASP is fully implemented;
- Being available for consultation with the FPM and the UXOSS, and the Contracting Officer regarding any modifications to the Site Specific HASP;
- Being available for consultation with the FPM to evaluate changing site conditions and to recommend changes to engineering controls, work practices and personal protective equipment (PPE);
- Being available for review of accident reports and results of daily inspections; and
- Serving as a member of the quality control staff.

Field Project Manager (FPM) – The FPM serves as the Project Manager and has responsibility and authority for directing field activities without exposing or endangering site personnel or the public. The FPM enforces safe work practices, removes unfit or unqualified personnel/visitors from the site, and verifies that machinery and mechanized equipment brought to the site have been certified safe to operate. He/she works closely with the UXOSS, and they both share emergency coordinator activities with the facility and assist with accident and incident investigations. The FPM assigns field tasks only to those on-site personnel who have received adequate instruction and training. He ensures that all site personnel understand their respective safety roles, responsibilities and recommends changes in the HASP if required due to changing site conditions.

UXO Health and Safety Supervisor (UXOSS) – The UXOSS is responsible for supervising all on-site MEC activities and has final authority on field activities involving MEC. She/he may also assist the FPM with general site safety matters. Duties include examining the support zones, work zones, and material potentially posing an explosive hazard (MPPEH) for potential live ordnance; providing MEC orientation and safe escort for site personnel. He or she is also responsible for certifying that all materials are positively identified, if this can be accomplished safely, and to ensure that the area around a MEC is marked.

The UXOSS will assist other team members in interpreting and documenting health and safety related data relevant to work activities at the site. As site data are obtained and evaluated, the UXOSS may modify this HASP with approval of the HSD. The levels of personnel protection outlined in this plan may be upgraded based on such information. The levels of personal protection outlined in this plan cannot be downgraded without the approval of the HSD. The UXOSS or designee will also conduct regular on-site briefings pertaining to health and safety requirements of the project.

Both the FPM and the UXOSS report to the HSD, and they have the responsibility and the authority to develop, implement, and verify compliance with the site HASP. These persons advise on all matters related to health and safety and have the authority to stop all work if conditions are judged to be hazardous to on-site personnel or the public. The UXOSS provides

the support to the FPM in the event of an emergency. The UXOSS is responsible for implementing the emergency response plan, supporting responding emergency services, and coordinating with the facility contact. He/she is responsible for conducting accident and near-miss investigations and for submitting the Accident Reports and First Aid Incident Report to the HSD within 24 hours of a significant incident or within eight hours of a serious incident. Additional duties of the FPM and the UXOSS are:

- Verifying personnel training and medical certifications;
- Regularly inspecting the site for hazardous conditions;
- Conducting and reporting accident and near-miss investigations;
- Documenting that all field personnel have read and understand the requirements set forth in the HASP, and verifying that these requirements are upheld during on-site work activities;
- Conducting daily tailgate health and safety meetings for all participants before starting a specific task;
- Arranging for and providing job safety training, as required;
- Establishing work zones, evacuation routes, and assembly areas;
- Determining whether to maintain or modify levels of protection provided in the HASP based on site conditions and monitoring data;
- Ensuring that protective clothing and equipment are properly selected, used, stored, and maintained;
- Maintaining a first aid kit and availability of a vehicle in the case of an emergency;
- Maintaining contact with the facility in the event of an imminent MEC hazard;
- Ensuring that the FPM and Project Manager are informed of any situations out of the norm that may be of concern regarding the investigation, audits, and/or reports; and
- Clearing the area prior to collection of environmental media samples.

2.3 Stop Work Authority

All employees have the right to work in a safe and healthful environment that is free from recognized hazards. Conditions or situations that are unsafe must be reported immediately to the FPM and/or the UXOSS. The FPM will evaluate the situation, in consultation with the UXOSS and the HSD, and determine which appropriate actions need to be taken to ensure a safe working environment. Work will be continued only after these actions have been implemented.

2.4 Required On-Site Documents

The following information (some of which will be included in the site specific HASP Addendum) must be available at the project site:

- Installation-specific HASP
- Emergency notifications, services, points of contact phone list and procedures

- Site Evacuation Plan (including routes)
- Site Hospital Route Map
- Material Safety Data Sheets (MSDSs), if needed
- Applicable Occupational Safety and Health Administration (OSHA) records (OSHA Forms 300 and 301)

2.5 Project Logs, Records, and Reports

The FPM (or designee) must carefully document the implementation of this HASP by maintaining the installation-specific Field Binder. The binder will contain the following documents, which shall be available for review by the facility or appropriate OSHA representative:

- Daily Employee Visitor Roster
- Daily Tailgate Safety Meeting Reports
- Supervisor's Report of Injury or Illness
- First Aid Incident Report
- Project Accident First Aid Log
- Incident Reports (for unanticipated MEC discovery, environmental incidents, equipment damage, evacuations, and near-miss events)
- Record of Changes (ROCs) to this HASP
- Signed Acceptance of HASP Form (signed by all routine on-site personnel).

3.0 SAFETY AND HEALTH RISK ANALYSIS

3.1 Project Tasks

The site specific HASP Addendum will address any additional project tasks not covered in Section 1.

3.2 Radiological Hazards

Given the extent to which radioactive material has been used in industry and government, there is always a possibility of encountering other sources of radioactive contamination. It is not anticipated that any radiological hazards will be encountered during this work. However, if any radiological contamination is suspected, work will cease immediately and both the FPM and the UXOSS will be contacted.

Radium nuclear decay emits ionizing radiation in the form of alpha particles. Alpha particles can travel a few inches in the air, but cannot penetrate the skin or other barrier. However, they can be particularly damaging if ingested or inhaled. The potential routes of entry include inhalation of contaminated dusts and ingestion of contaminated dusts from hand-to-mouth contact due to poor personal hygiene.

These techniques are employed to protect workers from ionizing radiation:

- Avoid any suspected radiation emitting devices and contact the FPM immediately.
- Limit time of exposure to radioactive materials.
- Specify safe working distances from sources.
- Shield against radioactive particles using barriers and/or PPE.

3.3 Explosives and Ordnance Hazards

Physical hazards associated with explosive compounds and MEC are anticipated at the ranges. These include reactive/explosive residues from spotting charges or phosphoric fillers associated with practice munitions and/or MEC. For the purposes of this HASP, all explosives are termed MEC. An UXO Technician(s) will first perform a visual MEC survey of the areas that need to be accessed by walking the site and closely observing and marking any surface MEC hazards. If non-MEC trained personnel must access an area, a safe access corridor will first be marked with flagging or pin flags or a UXO Technician will provide escort for any non-MEC trained personnel. It is critical that all personnel be briefed on both the initial identification of MEC and the steps to take if potential MEC is encountered. Specific hazards will be discussed in the tailgate safety briefing and included in the installation-specific safety orientation. MEC hazards,

precautions and procedures are discussed in the Malcolm Pirnie Standard Operating Procedures for Sites Contaminated with MEC.

3.4 MEC Awareness Training

The work being conducted for the preliminary assessment of ranges does not involve MEC operations as they relate to the excavation, moving and disposal of MEC. This is solely an **Anomaly Avoidance** project; no one under any circumstances shall touch or move any MEC or items that may resemble MEC. All personnel that are not UXO Trained Technicians will remain only in those areas that are marked as safe for access or will be under escort by a trained UXO Technician. At the initial on-site training, all personnel will receive an installation-specific MEC briefing by either a Malcolm Pirnie UXO Technician or Military Explosive Ordnance Disposal (EOD) Unit before beginning any site work. The briefing will include the following:

- Type of ordnance and/or explosive items that have been found in the past;
- Number of items that have been found at the project site and in the surrounding area;
- Telephone numbers to activate the MEC/EOD team;
- Safe refuge areas that will be used to retreat from the explosive areas (The safety areas are established based on the size of the explosive item encountered to ensure that no fragmentation reaches that area.);
- Specific steps to take if a worker encounters MEC (Additional MEC safety precautions and safe work practices are described in the Malcolm Pirnie Anomaly Avoidance Standard Operating Procedure.)

  Step 1: Make NO attempt to touch, move, uncover, recover, or disturb the item that has been found.

  Step 2: Call out to the UXOSS on-site. Do not make any quick moves. Wait for the MEC supervisor and point to identify the object. Then slowly move away from the object by retracing your footprints until you are again on a normally used path. Go immediately to the safe area and alert the team of the situation.

  Step 3: The UXOSS will ensure that others in the immediate area are alerted to the possible MEC and advise them to wait in a safe area until the item is inspected and clearly marked.

  Step 4: No MEC will be moved or repositioned unless requested and authorized by the Contracting Officer. The UXOSS will notify the facility of the location, type, and condition of the item.

  Step 5: The UXOSS will photograph (if possible) and document the item in the daily log.

Specific requirements while working in the area include the following:

- Entry to the area is restricted to daylight hours only;
- Vehicles must remain on roadways, designated jeep trails, or areas cleared by the MEC personnel;

- Vehicle must be positioned pointing out of the site with keys in the ignition in the event of an emergency;
- Personnel must remain in groups of two or more and remain within arms length of their partners;
- Personnel must maintain clear communications with MEC personnel and have a working knowledge of radio procedures;
- DO NOT transmit on the radio when within 35 feet of any ordnance item;

3.5 General Physical/Biological Hazards

Anticipated physical/biological hazards include:

- Heat stress (high ambient temperature);
- Noise;
- Slip, Trip and Fall;
- Equipment Operation;
- Electrical;
- Utility avoidance (overhead and underground);
- Falling objects; and
- Biological hazards.

3.5.1 Heat Stress

Exposure monitoring for heat stress is described in Section 6.2.

3.5.2 Noise

OSHA requires the use of hearing protection by all employees when noise levels exceed 85 decibels. This limit may be exceeded on or near heavy equipment. A sound level meter, operating in the dBA slow response mode, will be used to monitor noise levels when personnel are working near heavy equipment. Site workers will wear hearing protection when sustained noise levels exceed 85 decibels. In addition, all Malcolm Pirnie personnel must undergo initial employment, annual, and employment termination examinations, during which a hearing test is conducted.

3.5.3 Slip, Trip and Fall Hazards

Ground irregularities due to topography or protruding materials (e.g., nails in boards, broken glass) may pose a fall, slip or trip hazard to workers. Leather shoes with puncture proof inserts will be worn by personnel to protect against sharp objects which may be protruding from the surface or when using heavy equipment. There are potential hazards from the presence of wet areas, puddles, oil and grease, debris, loose or sandy soils, or other obstructions that may be

within the passageways or walkways. Field personnel will be briefed by the UXOSS each morning on the location and type of obvious hazards in the work areas. Site workers are to take care in areas where ground irregularities or protruding objects exist and may not be observed due to vegetation.

3.6 Equipment Operation

To prevent entrainment in moving machinery, Malcolm Pirnie employees will maintain a safe distance from heavy machinery. Malcolm Pirnie employees will remain outside the swing radius of heavy equipment. The UXOSS or designee will remind all site workers each morning about the hazards of moving equipment. Subcontractors will place a worker near moving heavy equipment to guide the operator and warn others.

3.6.1 Utility Avoidance (Overhead and Underground)

Underground utilities may pose an electrocution, explosion, or other hazard during activities. The location of underground utilities will be determined prior to intrusive activities. Utility companies and other responsible authorities will be contacted to locate and mark the locations. On commercial or industrial properties where underground utilities are expected and public utility companies may not have information on buried utilities, a Level 2 survey will be conducted to locate all above ground and below ground utilities. A Level 2 survey will consist of the use of remote sensing devices (e.g., electrical resistivity, ground penetrating radar, and magnetometer).

3.6.2 Electrical

Electrical storms (thunderstorms) may pose an electrocution hazard. During thunderstorms, all heavy equipment will be shut down, drilling activities will be terminated, and all personnel on-site will take refuge in buildings.

All electrical equipment, power tools, and extension lighting used on this site will be low voltage or protected by ground fault circuit interrupters.

3.6.3 Falling Objects

If there is a danger of falling objects on a property, the entire area inside the exclusion zone will be a hard hat area. Hard hats will also be worn within 50 feet of activities posing an overhead hazard.

3.6.4 Biological Hazards

Persons working on-site should be aware of the presence of biological hazards, including snakes, poisonous plants and poisonous insects. Non-poisonous snakes and poisonous snakes may be present. With the exception of some rare species of poisonous snakes, snakes will not attack unless provoked. All snakes encountered should be avoided. If a snake is discovered, the UXOSS should be immediately informed of the snake's location, size and type, if known. In most cases, only a brief interruption of work will be necessary to allow the snake to vacate the work area on its own.

Poison ivy is a climbing plant with ternate leaves (arranged in threes) and white berries. Poison oak is similar to poison ivy, but its leaves appear oak-like in form. The leaves of these poisonous plants produce irritating oil causing an intensely itchy skin rash and characteristic bullous lesions. These plants are to be avoided.

Working in tall grass, especially in or at the edge of wooded areas, increases the potential for ticks to bite workers. Ticks can be particularly numerous in the spring and fall. Ticks are vectors of many different diseases including Rocky Mountain spotted fever, Q fever, tularemia, Colorado tick fever and Lyme disease. Ticks attach to the skin and intravenously feed on blood, creating an opportunity for disease transmission. Covering exposed areas of the body and using insect repellent containing N,N-diethyl-m-toluamide (DEET) help prevent tick bites. Periodically during the workday, employees should inspect themselves for the presence of ticks. If a tick is discovered, the following procedure should be used to remove it:

- Do not try to detach a tick with your bare fingers; bacteria from a crushed tick may be able to penetrate even unbroken skin. Fine-tipped tweezers should be used.
- Grip the tick as close to your skin as possible and gently pull it straight away from you until it releases its hold.
- Do not twist the tick as you pull and do not squeeze its body. That may actually inject bacteria into your skin.
- Thoroughly wash your hands and the bite areas with soap and water. Then apply an antiseptic to the bite area.
- Save the tick in a small container with the date, the body location of the bite and where you think the tick came from.
- Notify the UXOSS of any tick bites as soon as possible.

Recently, Lyme disease has been the most prevalent type of disease transmitted by ticks in the United States. Ticks transmit other diseases that present similar symptoms and long-term consequences. All personnel sustaining a tick bite should consult a physician.

3.6.5 Trench Collapse or Cave-In

When working on sites that contain MEC, it is possible to encounter a camouflet. A camouflet is an underground cavity that may form when an explosive ordnance penetrates the earth's surface to a depth where the force of the explosion is not enough to rupture the surface. The atmosphere of the cavity is filled with carbon dioxide as well as other gasses that will not sustain life. There is a potential for a cave-in when sufficient pressure is applied to the surface.

Whenever possible, workers shall not enter trenches or test pits for any reason. If sampling is necessary, it shall be performed using remote equipment or devices (e.g., backhoe buckets, shovels, or equivalent).

If entry is required at depths greater than four feet, use OSHA protective systems (such as sloping, benching, shoring), a competent person to inspect the trench prior to entry, emergency retrieval systems, safe ladders, and a confined space entry permit, where required, to ensure safe atmospheres.

All simple slopes in excavations greater than 20 feet shall have a maximum allowable slope of 1 1/2:1 Horizontal: Vertical or 34°, as measured from the horizontal.

Store excavated materials/spoils greater than two feet from the edge of excavation and/or have retaining devices.

Properly sign and barricade all trenches/excavations to restrict unauthorized pedestrian and vehicular traffic.

As feasible, back-fill trenches upon completion of work. Do not leave open trenches unattended unless covered by steel traffic plates.

3.7 Task-Specific Hazards and Control Measures

A summarized activity hazard analysis will be prepared for all site-specific tasks and included in the installation-specific HASP in Attachment 1**.** The analysis will include a description of the hazards and the mitigating or control measures required to prevent accidents. New activities or tasks will require a new, written hazard analysis prior to conducting the task.

4.0 HEALTH AND SAFETY ORIENTATION TRAINING

Malcolm Pirnie and subcontractor personnel involved with the investigation activities are required to have completed the 40-hour hazardous materials health and safety training as specified in 29 CFR 1910.120. This training, designed to orient personnel potentially exposed to hazardous substances, health hazards, or safety hazards, includes the following:

- Safety and health risk analysis;
- Use of PPE;
- Work practices by which the employee can minimize risks from hazards;
- Safe use of engineering controls and equipment;
- Medical surveillance requirements, including recognition of symptoms and signs which might indicate overexposure to hazards;
- Procedures for environmental monitoring, site control and decontamination;
- Emergency response plans;
- Introductory Radiological Worker Training;
- Chain-of-command;
- MEC familiarization training;
- Hazard Communication Program, including installation-specific MSDSs; and
- How to respond to media inquiries.

All personnel will also have proof of attendance at an annual eight-hour Health and Safety refresher course if their 40-hour course was completed more than a year prior to the start of field activities.

A MEC orientation program (refer to Section 5.1) will be presented to all field personnel before any work begins. Hazardous work permits, developed for this investigation, are presented in Attachment 1.

"Tailgate" or "toolbox" safety meetings will be conducted each morning by the UXOSS for all phases of work during which all field teams will be provided with a daily work order that will include a checklist with utility clearance and known conditions on the property. Topics of discussion will include work tasks and associated hazards, work zones and designated PPE, emergency procedures, evacuation routes, and prior safety concerns. These meetings must be documented on the prescribed forms.

4.1 Specialized Training

Malcolm Pirnie, subcontractor, and other field personnel are to be knowledgeable in the particular hazards that may be encountered during this project and familiar with safe operating procedures. This will be accomplished through the review of this HASP, specialized training

prior to the commencement of the field work, an audit of field activities and safety meetings during the program, as discussed below.

Field personnel should have a minimum of three days of actual field experience under a skilled supervisor and be familiar with emergency response procedures outlined in this HASP. The UXOSS and all supervisory personnel will have additional training, including cardiopulmonary resuscitation (CPR), First Aid, and eight-hour Hazardous Waste Operations and Emergency Response Supervisor training. Subcontractors will be responsible for ensuring that their employees receive specialized training for their job functions and responsibilities.

4.1.1 Pre-Investigation Health and Safety Briefing

Malcolm Pirnie and subcontractor personnel involved with the project will attend an installation-specific health and safety briefing prior to initiation of the field activities. The topics to be discussed will include:

- Characteristics and potential hazards of contaminants known to be present at the site;
- Personal protective clothing function, donning/doffing, frisking;
- Respirators: selection, use, care;
- Personal hygiene;
- Environmental monitoring;
- Decontamination procedures;
- Site control and work zone designations;
- General safety concepts;
- Emergency recognition and prevention;
- Heat stress;
- Signs and symptoms of over exposure to site specific chemical hazards;
- Hazard communication
- Emergency response plan; and
- Site contingency plans.

4.1.2 Morning Safety Meetings

The UXOSS or designee shall conduct morning safety and health briefings on an as-needed basis. Problems relative to respiratory protection, inclement weather, heat stress, or the interpretation of newly available environmental monitoring data are examples of topics that might be covered during these briefings. An outline report of meetings giving the date, time, attendees, subjects discussed, and instructor shall be maintained. Visitors will be properly oriented to existing site conditions, planned activities, levels of personal protection, and other procedures outlined in this HASP.

4.1.3 Hazard Communication

Malcolm Pirnie has a written hazard communication program which was established to meet the requirements of 29 CFR 1910.1200, and field activities shall be implemented in accordance with that program, as described below.

MSDSs for hazardous chemicals introduced to the site by Malcolm Pirnie and their subcontractors will be present at the site, for review by all on-site personnel. Labels on containers used by Malcolm Pirnie are as originally received (not to be defaced) and are to contain the following information: (1) the identity of the hazardous chemical(s); (2) the appropriate hazard warnings; and (3) the name and address of the chemical manufacturer. If an employee transfers chemicals from a labeled container to a portable container, a label that contains those three items must be affixed to it. If the portable container is intended only for that employee's immediate use (during the same work shift), the product name only shall be clearly marked on the container. The employee will be responsible for properly emptying, cleaning or disposing of the portable container immediately after use.

As part of the installation-specific health and safety orientation conducted by the UXOSS, a review of our hazard communication program will be included to inform employees of hazardous chemicals to which they may be exposed during field activities. Subcontractors will also attend the hazard communication training session. If the chemical hazard changes or a new chemical hazard is introduced into the area after work begins, additional training will be provided by the UXOSS.

Installation-specific hazard communication training for hazardous chemicals introduced to the site by Malcolm Pirnie will include:

- Properties and hazards (chemical, physical, toxicological) of each hazardous chemical;
- Health hazards, including signs and symptoms of exposure and any medical condition known to be aggravated by exposure;
- Measures employees can take to protect themselves, including: appropriate work practices or methods for proper use and handling, procedures for emergency response, and the proper use and maintenance of PPE, as required;
- Work procedures for employees to follow to protect themselves when cleaning hazardous chemical spills and leaks; and
- Use of the container labeling system and the MSDSs including: where MSDSs are located, how to read and interpret the information on both labels and MSDSs, and how employees may obtain additional hazard communication information;

Installation-specific hazard communications training will also cover hazardous chemicals introduced by other employers and shall emphasize:

- Information about the hazardous chemicals to which Malcolm Pirnie's employees may be exposed;

- An explanation of the labeling system other employers are using;
- Information about the precautionary measures Malcolm Pirnie employees need to take to protect themselves during normal operating conditions and in emergencies; and
- Location of MSDSs for hazardous chemicals brought to the site by other employers.

The UXOSS shall document the training, including the agenda and list of attendees. This subsection of the HASP and the hazard communication training conducted as described above, shall be the mechanism for informing other employers planning to be on-site of hazardous chemicals introduced to the site by Malcolm Pirnie.

5.0 MEDICAL SURVEILLANCE AND EXPOSURE MONITORING

5.1 Medical Surveillance

Malcolm Pirnie personnel who may have potential exposure to hazardous materials will have initial employment, annual, and termination examinations. Medical evaluations will be performed by an approved occupational physician in accordance with Malcolm Pirnie's Medical Monitoring Program. All Malcolm Pirnie field personnel shall be enrolled in Malcolm Pirnie's Medical Monitoring Program, be medically approved to wear respirators, and fit-tested in accordance with OSHA requirements. Subcontractors are also required to meet medical surveillance requirements for this project.

Purpose - The purposes of the medical evaluation are to: 1) determine fitness for duty on hazardous waste sites; and 2) establish baseline data for future reference. Such an evaluation is based upon the employee's occupational and medical history, a comprehensive physical examination, and an evaluation of the ability to work while wearing protective equipment. The medical examinations include an evaluation of the workers' ability to use respiratory protective equipment according to protocol published in 29 CFR 1910.134.

Supplemental Examinations - Supplemental examinations may be performed whenever there is an actual or suspected excessive exposure to chemical contaminants or upon experience of exposure symptoms or following injuries or temperature stress.

5.2 Heat Stress Monitoring

Whenever feasible, the level of protection established for workers will be based upon quantitative determinations of the radiological and chemical agents and physical stresses present in the work environment. It is proposed that work will be conducted during the summer months; therefore, heat exposure is an issue of concern.

Heat stress is probably one of the most common and potentially serious illnesses at hazardous waste sites. The potential for heat stress is dependent on a number of factors, including environmental conditions, clothing, workload, physical conditioning, and age. The effects of heat stress can range from mild symptoms, such as fatigue, irritability, and decreased mobility, to death. The body's response to heat stress includes the following:

Heat Rash: A result of continuous exposure to heat and humidity, heat rash decreases the body's ability to tolerate heat.

Heat Cramps: A result of profuse perspiration with inadequate fluid intake and chemical replacement, heat cramps are signaled by muscle spasms and pain in the abdomen and the extremities.

Heat Exhaustion: A result of increased stress on various organs. The signs of heat exhaustion include shallow breathing; pale, cool, moist skin; profuse sweating; dizziness and lassitude.

Heat Stroke: The most severe form of heat stress, heat stroke must be relieved immediately to prevent severe injury or death. The signs of heat stroke are red, hot, dry skin; no perspiration; nausea; dizziness and confusion; strong, rapid pulse; and coma. The body must be cooled and medical attention sought immediately.

Measures to prevent heat stress include regular work breaks during field activity, regular fluid replenishment, and the availability of shelter (i.e., shaded area). All personnel will be made aware of the symptoms of heat stress. Should one or more symptoms be detected, the affected worker will be assisted to seek shade, drink plenty of fluids, and seek medical attention, if required.

Several screening techniques can be used to detect early warning signs of heat stress. The following method, based on body temperature measurements, is simple and straightforward and may be conducted by the UXOSS. Body temperature may be measured with a digital-readout clinical ear thermometer with disposable tips.

Body temperature may be measured for three minutes with an ear thermometer at the end of each work period and before drinking. Temperature at the end of the work period should not exceed 99.6°F. If the temperature does exceed 99.6°F, the next work period should be shortened by 10 minutes (or 33%), while the length of the rest period stays the same. If the temperature exceeds 99.6°F at the beginning of the next rest period, however, the following work cycle should be further shortened by 33%. Temperature should be measured again at the end of the rest period to make sure that it has dropped below 99.6°F. No worker may be permitted to continue wearing semi-permeable or impermeable garments when his/her temperature exceeds 100. 6°F.

6.0 PERSONAL PROTECTIVE EQUIPMENT

6.1 General Protection Levels

Personnel must wear protective equipment when work activities involve known or suspected radiological or chemical atmospheric contamination; when vapors, gases, or particulates may be generated; or when direct contact with dermally active substances may occur. Respirators can protect the lungs, the gastrointestinal tract and the eyes against air toxicants. Chemical-resistant clothing can protect the skin from contact with skin-destructive and skin adsorbable chemicals. Good personal hygiene limits or prevents the ingestion of materials.

Equipment designed to protect the body against contact with known or anticipated chemical hazards has been divided into four categories according to the degree of protection afforded, Levels A through D. For the site inspections, it is expected that only Level D PPE will be necessary. Level D is described below:

- Level D/Modified Level D: Level D should be selected only when there are no respiratory or skin hazards suspected or known to exist at the site. Modified Level D PPE is selected when no respiratory hazards are suspected or known to exist, yet the potential for dermal hazards including contact with contaminated soils, splashes or immersion exists. If the potential for splashes or immersion exists, coated-type chemical resistant coveralls (such as Saranex) and hard hats with face shields could be selected. If the only dermal hazards that existed were related to soil sampling, a non-coated semi-permeable-type coverall (such as Tyvek) could be selected, thereby avoiding the heat stress hazards associated with an impermeable coverall.

The level of protection selected is based primarily on:

- Types and measured concentrations of the contaminants in the ambient atmosphere and their associated toxicity; and
- Potential or measured exposure to substances in air, splashes of liquids or other indirect contact with material due to the task being performed.

In situations where the types of contaminants, concentrations, and possibilities of contact are not known, the appropriate level of protection must be selected based on professional experience and judgment until the hazards may be further characterized. The individual components of clothing and equipment must be assembled into a full protective ensemble to protect the worker from installation-specific hazards, while at the same time minimizing hazards and drawbacks of the personal protective gear itself. Ensemble components outlined in the following subsection are based on the widely used Environmental Protection Agency (EPA) Levels of Protection.

In general:

- All protective headgear shall meet the requirements of the American National Standards Institute (ANSI) Z89.1, Class A or ANSI Z89.2, Class B.
- Personnel will be provided with eye and face protective equipment when machines or operations present potential eye or face injury from physical, chemical or radiological agents. Eye and face protective equipment shall meet the requirements in ANSI Z87.1, Practice for Occupational and Educational Eye and Face Protection.
- Persons requiring corrective lenses in eyeglasses, when required by this regulation to wear eye protection, will be protected by one of the following:
- Eyeglasses whose protective lenses provide optical correction; or
- Goggles that can be worn over corrective lenses without disturbing the adjustment of the spectacles; or
- Goggles that incorporate corrective lenses mounted behind the protective lenses.
- If excessive noise levels are encountered, particularly around heavy equipment operation, noise protection shall be provided as appropriate.
- Persons handling rough, sharp-edged, abrasive materials or whose work subjects the hand to lacerations, punctures, burns, or bruises will use general-purpose outer hand protection in addition to the chemical resistant inner and outer gloves, as required.
- Employees will wear clothing suitable for the weather and work conditions. The minimum will be long sleeved shirt, long trousers, and protective work shoes or boots. Canvas tennis or deck shoes are not acceptable.
- Protective footwear will be worn by all persons who are engaged in the work. Steel-toed boots cannot be worn for the site inspections since the metal in the shoes will limit the effectiveness of the magnetometer and EM 61.
- PPE will be inspected regularly and maintained in serviceable and sanitary condition and, before being reissued to another person or returned to storage, will be cleaned, disinfected, inspected, and repaired.

6.2 Required Level Of Protection

Based upon current information regarding the hazard evaluation of the tasks to be completed (see Section 1.0), the required level of personal protection is Level D. A summary of the Level D PPE requirements can be found in Table 6-1. The *MP Corporate Health and Safety Program Guide* (June 1988) contains the protocol for PPE and Respiratory Protection, as required by OSHA (29 CFR 1910.120).

Level D

Equipment Requirements for Level D are as follows:

- Coveralls or suitable work uniform
- Gloves (optional)
- Boots/shoes with composite toe (steel toed boots should not be worn if using a magnetometer or other geophysical instrument), leather or chemical-resistant

- Safety glasses or chemical splash goggles (optional)
- Hard hat (face shield optional)
- Hearing protection

TABLE 6-1: Summary of Level D PPE Requirements

Level	When Required	Equipment
Level D	No contaminants are present or contaminants are present below the action level. Work functions preclude splashes, immersion, or potential for unexpected inhalation of any radionuclides.	Non high-static work shirt and full-length cotton pants or coveralls ANSI standard Z41.4 steel-toed work boots (unless conducting magnetometer operations) ANSI standard Z89.1 hard hat (when working around heavy equipment or overhead "bump" hazards) ANSI standard Z87.1 safety glasses EPA standard hearing protectors (when working in high noise areas [e.g., steam cleaners and heavy equipment]) Reflective safety vests when working around traffic areas Heavy duty leather work gloves (when appropriate)

6.3 Inspection of PPE

Before use of protective clothing, all personnel shall determine that the clothing material is correct for the specified task at hand. The clothing is to be visually inspected for imperfect seams, non-uniform coatings, tears and malfunctioning closures. It is to be held up to the light to check for pinholes. It is to be flexed to observe for cracks or other signs of shelf deterioration. If the product has been used previously, it should be inspected inside and out for signs of chemical deterioration, such as discoloration, swelling and stiffness. During work, the clothing should be periodically inspected for evidence of chemical deterioration, closure failure, tears, punctures and seam discontinuities.

6.4 PPE Doffing Guidelines

The recommended sequence for removing PPE is as follows:

- Wash/rinse (if necessary) excess mud or other debris from outer boots, gloves, and clothing;
- Remove inner latex/nitrile gloves and cloth liners;
- Wash hands; and
- Discard disposable PPE into a properly labeled container and handled as contaminated waste.

7.0 HAZARDOUS MATERIAL MONITORING

It is not anticipated that there will be chemical exposures that would require air monitoring. Potential chemical hazards are from discrete, identifiable sources, such as oil or cleaning substances used as part of the work. Biological and explosive hazards will be monitored visually. Monitoring is not required for this project and will be addressed as a task specific evolution in the event of a scope of work change.

7.1 Radiological Monitoring

Radiological monitoring is not a part of this project nor or are the site workers trained to handle this situation. In the event that any potential radiological devices are discovered, the situation will be avoided and reported immediately.

8.0 SITE CONTROL MEASURES

8.1 General

A daily log containing the names of personnel, site entry and exit times, and their levels of personal protection shall be maintained.

8.2 Site Control

Site Control is necessary to prevent unauthorized, untrained, or unprotected personnel or visitor from being exposed to the various hazards associated with the site. Level D or greater PPE will be observed at all times during the performance of field activities. Personnel performing field activities will always use the buddy system while at the site. If separation is absolutely necessary, a communication device such as cellular phone or radio will be required unless its use is restricted due to the safety. Other site control measures may include the following.

- Requiring all personnel and visitors to sign in and out on the Personnel Visitor Daily Roster.
- Requiring all site visitors to receive prior approval from the FPM. Visitors will be allowed on-site solely for the purpose of observing site conditions or operations. Upon arrival, visitors will report to the FPM or UXOSS, where he/she will receive and sign the Visitor Health and Safety Form. Visitors may not enter controlled work areas without producing documentation that training and medical requirements have been met. Visitors must be escorted in MEC areas by UXO technician.

8.3 Work Zones

In order to control the potential spread of contamination from MC and to prevent injury to Malcolm Pirnie field personnel, work zones will be classified according to two categories outlined below: a Controlled Work Zone and a Support/Clean Zone. The Support/Clean Zone will be established outside of the Controlled Work Zone and maintained as contamination free. The controlled work zone is the area inside of the site boundaries that has a potential for MEC or MC hazards. Primary functions of locations are:

- Support/Clean Zone
    - Site access for personnel, materials, and equipment;
    - Site egress for decontaminated personnel, materials, and equipment;
    - Storage area for clean work equipment;
    - An area for breaks, consumption of food and beverages, and other related activities; and
    - Vantage point for site visitors.

- Controlled Work Zone
    - Access for only those UXO trained personnel or those escorted by UXO trained personnel.

The specific location of work zone boundaries shall be determined jointly by the FPM, the UXOSS or designee and the subcontractor prior to field mobilization. Decontamination of personnel will be performed as outlined in Section 11.0 before entering the Support/Clean Zone. Only personnel who are essential to the completion of the limited visual survey will be allowed access to work areas, if they are wearing the prescribed level of protection.

9.0 STANDARD OPERATING PROCEDURES FOR SAFETY

A range of physical and explosive hazards exist that must be understood by all field personnel assigned to work on-site. At a minimum, the safe work practices to be followed at the site shall include:

- The number of personnel and equipment on the site shall be minimized, consistent with effective site operations.
- On-site personnel shall use the "buddy" system. No one may work alone (i.e., out of earshot or visual contact with other workers). In addition, each field team will be required to carry two-way radios and have access to a cellular phone.
- Because of potential safety issues associated with abandoned and/or uninhabited buildings, site workers must stay within their designated work areas. No one should enter restricted access areas without authorization of the UXOSS.
- Site activities will be performed to minimize dust production and soil disturbance.
- Contact with surfaces/materials either suspected or known to be contaminated will be avoided to minimize the potential for transfer to personnel, the need for decontamination, and cross contamination.
- Eating, drinking, chewing gum or tobacco, smoking, or any practice that increases the probability of hand-to-mouth transfer of contaminated material, is strictly prohibited in the work area outside the designated clean zone.
- Medicine and alcohol can potentiate the effects of exposure to toxic chemicals. Due to possible contraindications, use of prescribed drugs should be reviewed with the contractor or subcontractor occupational physician. Alcoholic beverage and illegal drug intake are strictly forbidden during site work activities.
- When it is necessary for a visitor to observe the fieldwork, that person will be issued appropriate PPE, briefed on potential hazards, safety practices, decontamination procedures and site communications. All site visitors must supply respiratory equipment and proof of training/fit testing to the UXOSS or designee.
- All employees have the obligation to correct or report unsafe work conditions.

10.0 DECONTAMINATION PROCEDURES

10.1 Personnel Decontamination

The decontamination procedures for this project will consist of a soap and water wash prior to eating, smoking, or drinking. The SI should not involve any direct personal exposure to any hazardous materials. Only materials that are not hazardous or are not regulated by the Resource Conservation and Recovery Act (RCRA) will be used to prevent the generation of mixed waste. Contaminated personnel shall be decontaminated using materials such as waterless hand cleaner and paper towels or rags, whenever possible, to minimize waste volumes. Good house keeping procedures as well as a common sense approach will be practiced during the SI.

10.2 Disposal Procedures

Disposal procedures for Investigation Derived Waste are presented in the Field Sampling Plan.

10.3 Confined Space Entry Procedures

There are no permit-required confined spaces anticipated for this project. If an area is suspected to be a confined space, the FPM shall halt work in the affected area and notify the facility concerned.

11.0 EMERGENCY RESPONSE PLAN

11.1 Emergency Planning

The UXOSS or designee shall implement this emergency response plan whenever conditions at the site warrant such action. The UXOSS will be responsible for assuring the evacuation, emergency treatment, and emergency transport of site personnel as necessary and notification of emergency response units and the appropriate staff.

The UXOSS or designee will inform the local fire department about the nature and duration of work expected on the site and the type of contaminants and possible health or safety effects of emergencies involving these contaminants.

11.2 Emergency Equipment

Emergency equipment will be readily accessible and distinctly marked. Malcolm Pirnie and subcontractor personnel will be familiar with the location and trained in the use of emergency equipment. Emergency equipment that will be available on-site includes:

First Aid Kits

- First Aid Kits will conform to Red Cross requirements and the requirements of 29 CFR 1910.151.
- First Aid Kits shall consist of a weatherproof container with individually sealed packages for each type of item.
- First Aid Kits will be fully equipped before being sent to the site. It will be checked weekly by the UXOSS or designee and expended items will be immediately replaced.
- First Aid Kits will be carried in the field vehicles, distinctly marked, and readily accessible.

11.3 Personnel Roles, Lines of Authority and Communication

Working on active and former active training ranges requires that site personnel be in constant communication via two-way radios with each other and with the range control tower or range operations. Operations shall cease if radio communication between each other and/or the range tower cannot be maintained when ranges are in use.

All work that involves potential exposure of personnel to explosive hazards or MC requires the use of the buddy system. The responsibility of workers utilizing the buddy system include:

- Providing his/her partner with routine and emergency assistance;
- Observing his/her partner for signs of chemical exposure or heat stress;
- Periodically checking the integrity of his/her partner's PPE; and
- Notifying others if emergency help is required.

Successful communication is essential to ensure the safety of each employee/visitor. The hand signals in Table 11-1 will be used on the job site.

TABLE 11-1: Hand Signals

Signal	Definition
Hands clutching throat	I cannot breathe
Hands on top of head	Need assistance
Thumbs up	I am OK; affirmative
Thumbs down	No/negative
Arms waving upright	Send backup support
Grip partners wrist	Exit area immediately
Horn - one long blast	Evacuate site
Horn - two short blast	All clear, return to site

11.4 Emergency Recognition and Prevention

As part of the initial installation-specific health and safety briefing, the UXOSS and the FPM will address emergency recognition and prevention. Topics will include hazard recognition regarding tasks to be performed in addition to hazards associated with site contaminants. Other topics relating to emergency recognition and prevention are mentioned in other chapters of the HASP.

11.5 Adverse Weather Conditions

In the event of adverse weather conditions, the FPM and UXOSS or designee will determine if work can continue without sacrificing the health and safety of site workers. Some of the items to be considered prior to determining if work should continue are:

- Potential for heat stress;
- Inclement weather-related working conditions;
- Limited visibility;
- Potential for electrical storms.

11.6 Emergency Medical Treatment/First Aid

In the event of personal injury, emergency first aid will be applied on site as deemed necessary. Decontaminate as appropriate and transport the individual to the nearest medical center if

needed. Appropriate medical data sheets will be provided by the Site Safety Officer (SSO) to the medical facility. A standard Malcolm Pirnie Accident Investigation Report will be filled out.

If any personnel have been directly exposed to chemicals or contaminants of concern, follow the procedures outlined below:

- 15 minutes. Decontaminate and provide medical attention. Eye wash stations will be provided on-site. If necessary, transport to the nearest medical facility.
- Inhalation: Move to fresh air and, if necessary, transport to the nearest medical facility.
- Ingestion: Decontaminate and transport to the nearest medical facility.

In the event of a serious medical emergency, the Site Specific HASP will include:

- Route to Emergency Medical Facility
- Maps to medical facility
  Emergency Numbers

11.7 Evacuation Procedures/Safe Distances

Evacuation procedures will occur at three levels: (1) withdrawal from immediate work area (100 feet or more upwind); (2) site evacuation; and (3) evacuation of surrounding area. Anticipated conditions that require these responses are described in the following subsections. If site evacuation is required, all field team members will be notified by cellular phone.

Withdrawal Upwind
Withdrawing upwind (100 feet or more) will be required when: (1) ambient air conditions contain greater contaminant concentrations than guidelines allow for the type of protection being worn (the work crew may return after donning greater protection and/or assessing the situation as transient and past) or (2) a breach in protective clothing or minor accident occurs.

The work crew will observe general wind directions while on-site. Upon observing conditions that warrant moving away from the work site, the crew will relocate upwind a distance of approximately 100 feet or farther, as indicated by the site monitoring instruments. The HSD, FPM, Installation point of contact and the Baltimore District Project Manager will be notified if a condition exists to withdraw. When access to the site is restricted and escape is thereby hindered, the crew may be instructed to evacuate the site rather than move upwind, especially if withdrawal upwind moves the crew away from escape routes.

Site Evacuation
Evacuation of the site will be required when: (1) ambient air conditions contain explosive and persistent levels of combustible gas, excessive levels of toxic gases, or excessive dust; (2) a fire or major collapse occurs; or (3) explosion is imminent or has occurred.

After determining that site evacuation is warranted, the work crew will proceed upwind of the work site and notify the UXOSS of site conditions. If the decontamination area is upwind and more than 500 feet from the work site, the crew will pass quickly through decontamination to remove contaminated outer suits. As more facts are determined from the field crew, they will be relayed to the appropriate agencies.

The evacuation route and an upwind gathering point will be determined by the UXOSS or designee each day and communicated to all field personnel prior to beginning work. Any modifications to the evacuation route or gathering point will be discussed at the morning safety meetings.

Surrounding Area Evacuation
The area surrounding the site will be evacuated when an explosive hazard is imminent.

11.8 Site Security and Control

A daily log containing the names of personnel, including site entry and exit times and their levels of personnel protection, shall be maintained by the UXOSS or designee. Site security may involve the use of security guards to protect equipment or field personnel during investigation activities.

After a site evacuation, the senior person will take a "head count" to match against the Employee/Visitor Daily Roster; search/account for missing persons; notify the emergency crews (as applicable); and limit access into the hazardous area to only necessary rescue and response personnel to prevent additional injury and possible exposures. Work shall not resume until all hazard control issues are resolved to the satisfaction of the FPM and UXOSS.

11.9 Fire or Explosion

In case of fire or explosion, sound the emergency alarm (using the radio) and contact the facility Fire Department for outside assistance, regardless of the size of the incident. The FPM will evacuate all non-response personnel and visitors to the Safe Refuge Area and conduct a head-count. Only trained Emergency Crews will control any large-scale or potentially unmanageable incident. The FPM will direct the off-site responding agencies to the site and will provide them with the site map and a hazard briefing. The FPM and or UXOSS will complete an Incident Report for submittal to the Corporate HSD.

11.10 Spill Containment Plan

As no hazardous products will be brought on-site during the SI, a spill is not anticipated.

11.11 Emergency Response Evaluation

11.11.1Pre-Planning and General Procedures

In the event of an emergency associated with the project activity, the UXOSS shall: 1) take immediate, diligent action to minimize the cause of the emergency; 2) alert the FPM and applicable facility personnel; and 3) institute measures necessary to prevent any repetition of the emergency. Emergency contact names, telephone numbers, and hospital route maps must be posted in the work area and/or support vehicle. At the beginning of project operations, at least the FPM and UXOSS will become familiar with the emergency route(s) and the travel time required. These procedures shall be thoroughly discussed in the initial "kick-off" briefing and in daily "tailgate" safety meetings. A cellular telephone, fully charged, will be available for any emergency.

Emergency Coordinator
The emergency coordinator (EC) will normally be the FPM or the UXOSS, with the others providing assistance as directed. First-aid and rescue duties will be shared between qualified team members. The EC will contact emergency response agencies and serve as the primary point of contact when they arrive.

Emergency Services
The EC must pre-determine the location and availability of the nearest base and civilian emergency facilities and services. Medical transport may be via ambulance or life flight, depending on response times and/or weather conditions. The EC will coordinate contractor access to base services through the range management and discuss it at the initial "kickoff" meeting.

Emergency Equipment
Maintain the following emergency equipment/supplies on-site: industrial first aid kit, portable eye washes capable of a 15-minute use, blanket or visqueen, and compressed air horn.

Store the emergency and first-aid equipment in an immediately accessible area (e.g., in the staging area). Protect equipment from the elements. The UXOSS will inspect the emergency equipment at the beginning of each field event.

12.0 RECORDKEEPING

Record keeping will include Medical Training Records, Site Safety and Health Plans and Incident Reports. In addition, records of meetings on health and safety matters will be maintained by the HSD.

12.1 Medical Surveillance Report

The employer or the employer's medical center will maintain the original medical monitoring record. 29 CFR 1910.20 requires retention of medical records until termination of employment plus 30 years. The employer shall maintain a copy of the employee's Disclosure Agreement and Physician's Statement.

12.2 Personnel Training Records

Personnel health and safety training records are maintained to document personnel qualifications and capabilities and to demonstrate compliance with company training requirements. Each installation-specific training session will be documented by a training report. The UXOSS will prepare the report and include the date of training, location, a list of attendees and a description of the material covered. The original report will be filed with the HSD. Copies of CPR/first aid training certificates will be retained.

12.3 Health and Safety Plan (HASP)

HASPs will be completed and in-place prior to each work assignment involving field activities. The HASP will be signed and approved by the HSD and FPM. The original of each completed HASP will be placed in the project file. A copy will accompany the field team and be readily available at the work site under the control of the UXOSS or designee. Copies of the HASP will be available to all employees when installation-specific training is provided.

In addition to the HASP, the following documents may also be prepared, as necessary, depending on site conditions and circumstances:

- Site Health and Safety Meeting Reports - will be documented in the field laptop that becomes part of the permanent project file. Telephone conversation records on health and safety decisions will be retained.
- Site Health and Safety Follow-up Report - will be completed by the FPM after completing work covered by the HASP. This report is an internal document only and will be maintained by the HSD.
- Health and Safety Audits - The HSD or his/her designee will periodically audit field activities to determine compliance with the HASP.

12.4 Incident Reports

In case of environmental incidents, fires, property damage, power disruption, or mandated work "shut-downs" (e.g., following storms, equipment failure), the UXOSS will complete and transmit an Incident Report to the FPM and facility management. Any damage, loss, or theft of government property (items/tools/equipment purchased for the contract) will be reported via an Incident Report or equivalent. Report damage, loss, or theft of company property to the FPM.

13.0 NEAR MISS REPORTING

Near-miss incidents that do not result in injury must also be recorded and investigated for accident prevention purposes. The FPM/UXOSS will submit completed Incident Reports to the HSD.

14.0 SUBCONTRACTOR REPORTING

The field supervisor of each subcontracting crew will investigate and complete an accident report that specifies preventive measures in accordance with their internal company policy. The FPM will ensure that this report is transmitted to the HSD within 24 hours of a significant mishap and eight hours of a serious mishap. The UXOSS will record the event on the project Accident/First-Aid Incident Summary Log.

SITE SAFETY TAILGATE MEETING

MALCOLM PIRNIE

PROJECT NAME:		CLIENT NAME:	
PROJECT NUMBER:		PROJECT LEADER:	
PREPARED BY:		DATE:	

ON-SITE SAFETY MEETING RECORD

LOCATION:

Task to be Performed:

I. Purpose for meeting: (check all that apply)

	DAILY SAFETY BRIEFING
	Begin New Task. Task:
	Periodic Safety Meeting
	New Site Procedures
	New Site Conditions / Information
	New Site Workers

MEETING ATTENDEES

NAME (Print)	SIGNATURE	COMPANY
1.		
2.		
3.		
4.		
5.		

Page 2 of 2

ON-SITE SAFETY MEETING RECORD

II. Topic (check all that apply)

	Site Safety Personnel		Decontamination
	Work Area Description		Emergency Response
	Site characterization		Hazard Communication
	Equipment Hazard(s)		On-site Emergency
	Biological Hazard(s)		On-site Injuries
	Chemical Hazard(s)		Evacuation Procedures
	Physical Hazard(s)		Rally Point
	Heat Stress		Emergency Communications
	Cold Stress		Directions to Hospital
	Site Control		Emergency Equipment
	Work and Support Zones		Drug and Alcohol Policies
	PPE		Medical Monitoring
	Air Monitoring		Task Training
	Safe Work Practices		Unexploded Ordnance (UXO)

III. Remarks

V. Verification

I certify that the personnel listed on this roster received the briefing described above. Site personnel not attending this meeting will be briefed before beginning their assigned duties.

_____

Field Project Manager Date

_____

UXO Health and Safety Supervisor Date

Attachment 1: Installation-Specific Health and Safety Addendum

Fort Rucker Health and Safety Addendum

Site Description:
Fort Rucker is located in southeast Alabama, approximately 20 miles northwest of Dothan, in Dale and Coffee Counties. The installation is approximately 160 miles east of Mobile, Alabama, 90 miles southwest of Columbus, Georgia, 80 miles southeast of Montgomery, Alabama, 10 miles east of Enterprise, Alabama, and a half-mile north of Daleville, Alabama. Currently, the installation encompasses nearly 98 square miles of land comprised of airfields, stagefields and tactical sites, as well as leased land for rotary-wing pads and fixed-wing airstrips. Fort Rucker is bordered to the north and west by agricultural land, to the south by the towns of Daleville and Enterprise, and to the east by the town of Ozark.

Health & Safety Personnel and Contact Information

Project Manager: John Nocera
Mobile Phone: (251) 689-7760

Field Project Manager: Al Larkins
Mobile Phone: (410) 801-7819

UXO Site Safety Officer: Dan Haines, UXO Technician III
Mobile Phone: (813) 404-3885

Corporate Health and Safety Manager: Mark McGowan, CIH
Work Phone: (914) 641-2484 or (410) 230-9954
Mobile Phone: (914) 523-6232

Primary Emergency Facility: Medical Center Enterprise
Address: 400 N. Edwards Street, Enterprise, AL 36330
Phone: 334-347-0584 Route to Emergency Facility attached

Other Emergency Numbers:
Fire: 911
Police: 911
Ambulance: 911
Fort Rucker POC: Jim Swift, 334-255-1899
EOD: Baltimore Corps of Engineers, Paul Greene 410-962-6741
Project Manager: Baltimore Corps of Engineers, Rick O'Donnell 410-436-7107

Site-specific health and safety concerns (e.g., poisonous snakes, vegetations):

Ticks, Poison Ivy/Oak, Copper Head snake, Diamond-back Rattle Snake

Directions to Medical Center Enterprise

- From Fort Rucker, exit installation on Red Cloud Road – go 2.1 mi
- Continue on AL-248 – go 6.9 mi
- Bear on E LEE ST – go 0.1 mi
- Turn on N EDWARDS ST – go 0.2 mi
- Turn on E BRUNSON ST – go < 0.1 mi
- Turn right on 10TH ST - go 0.2 mi
- Arrive at Medical Center Enterprise, 400 N. Edwards Street, Enterprise

ACTIVITY HAZARD ANALYSIS

1. Phase of Project: Site Inspection		
2. Location: Anniston Army Depot	3. Contract No.: DACA31-00-D-0043	4. Project: MMRP Site Inspection
5. Prime Contractor: Malcolm Pirnie.	6. Date of Preparation: 07/15/04	7. Est. of Start Date: 10/08/04
Potential Safety Hazard	Procedure to Control or Mitigate Hazard	
1. Magnetometer Assisted Site Walk/Geophysical Survey	Use only trails that have been cleared by the UXO Technician. No smoking, eating or drinking. Always use the buddy system. Always check for good radio communications. Report any findings and obtain a second opinion. Do not touch or move anything. Stay within an arms reach of the UXOSS. Wear the appropriate PPE.	
2. Sampling (soil)	Do not collect samples until the area has been property cleared by UXOSS.	
3. Slip/ Trip/ Fall	Maintain firm footing while walking on uneven surfaces. Avoid open excavations. Wear work boots that are in good condition. Watch where you walk. Only walk in areas that are marked as safe to walk in.	
4. Noise	Use hearing protection in designated areas. Maintain noise control devices: mufflers.	
5. Ticks	Check for ticks following field activities. Spray repellent around shoes, ankles and neck. Avoid rubbing against bushes and trees. Advise crew of tick borne disease symptoms. Advise crew of potential haunta virus areas.	
5. Mechanical Hazards (pinch points) for mechanical equipment including off-road vehicles	Maintain belt, chain, rotating shaft and other moving part guards in their proper position. Keep hands away from rotating/ moving parts. Conduct daily equipment safety inspections.	
6. Unexploded Ordnance	Always use trails that have been surveyed by a UXOSS. Do not pick up, move, step on or kick any objects. Immediately report if you observe potential MEC.	
7. Magnetometer Use	Always use firm footing. Pay attention to where you are walking. D o not use as a poker in animals holes.	

8. Contractor's Rep. (Signature and Date)	

Starting from: A Andrews Ave, Fort Rucker, AL 36322

Arriving at: B 400 N Edwards St, Enterprise, AL 36330-2510

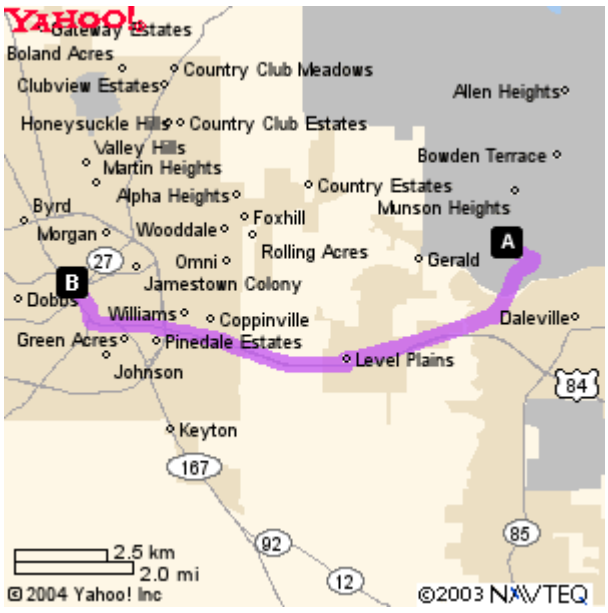
Distance: 9.4 miles **Approximate Travel Time:** 22 mins

Your Directions

1.	Start at **ANDREWS AVE, FORT RUCKER** - go **0.5** mi
2.	Turn R on **27 TH ST** - go **0.4** mi
3.	Turn L on a local road - go **0.3** mi
4.	Turn R on **TANK HILL RD** - go **0.5** mi
5.	Turn R on **CR-114** - go **2.6** mi
6.	Turn L on **DALE CO 1** - go **0.1** mi
7.	Turn R on **US-84 WEST** - go **3.1** mi
8.	Continue on **E PARK AVE** - go **1.1** mi
9.	Continue on **S MAIN ST** - go **0.1** mi
10.	Bear R on **S WATSON ST** - go **0.1** mi
11.	**S WATSON ST** becomes **N WATSON ST** - go **< 0.1** mi
12.	Continue on **S EDWARDS ST** - go **0.3** mi
13.	Continue on **N EDWARDS ST** - go **0.3** mi
14.	Arrive at **400 N EDWARDS ST, ENTERPRISE**

When using any driving directions or map, it's a good idea to do a reality check and make sure the road still exists, watch out for construction, and follow all traffic safety precautions. This is only to be used as an aid in planning.

Your Full Route



Your Destination

Address:
400 N Edwards St
Enterprise, AL 36330-2510

Appendix D: Technical Project Planning Session Results

Phase I MFR Worksheet

US Army Corps of Engineers®

Author(s): Malcolm Pirnie, Inc. **Reviewer(s):** _____
Latest Revision Date: June 24, 2004 **Review Date:** _____

Location: Fort Rucker, Alabama
Site: Fort Rucker – Anti-Tank Rocket/Grenade Range
Project: Site Inspection

(Attach Phase I MFR to PMP)

TPP TEAM	EM 200-1-2, Paragraph 1.1.1
Decision Makers	**USACE / AEC / Fort Rucker**
Customer	Mary Ellen Maly, US Army Environmental Center
Project Manager	Stephen Wood, USACE BAL John Nocera, Malcolm Pirnie
Regulators	Mark Harrison, ADEM
Stakeholders	Jim Swift, Environmental, Fort Rucker Mark Harrison, ADEM

CUSTOMER'S GOALS	EM 200-1-2, Paragraph 1.1.2

Future Land Use(s)	Issues and Regulatory Compliance Status	Site-Specific Site Inspection Goals (if applicable)
Anti-Tank Rocket/ Grenade Range **Current:** Golf Course and Undeveloped Land **Future:** Developable and Usable	Potential MEC presence / no significant evaluation of MC presence Confirmation of a practice round for anti-tank rifle grenade.	MEC – SI perform visual survey to determine if/where MEC is present MC – SI to determine presence of MC and to determine the need for further investigation

Site Closeout Statement

Land is safe for Unrestricted future use.

Customer's Schedule Requirements

Field Investigation and Reporting: Army wide goal: Site Inspection activities complete by FY10 and RC by 2017.

Fort Rucker wide goal: Site Inspection activities completed by April 2005.

Customer's Site Budget

Field Investigation and Reporting: CTC for MRP SI field work and reporting (includes magnetometer assisted surface sweep of 5.4 acres and 15 samples analyzed for explosives – 8330 and 15 samples analyzed for TAL Metals) =$117,933

IDENTIFY SITE APPROACH

EXISTING SITE INFORMATION & DATA	EM 200-1-2, Paragraphs 1.1.3 and 1.2.1

Attachment(s) to Phase I Memorandum For Record	Located at Repository	Preliminary Conceptual Site Model
Final Historical Records Review (and associated reports)	Fort Rucker	Yes
POTENTIAL POINTS OF COMPLIANCE	EM 200-1-2, Paragraph 1.2.1.3	
EPA Region IX – PRG Table		
MEDIA OF POTENTIAL CONCERN		
Soil		

PROJECT OBJECTIVES		
See project objectives worksheet		
REGULATOR & STAKEHOLDER PERSPECTIVES		
Regulators		**Community Interests**
		Others
PROBABLE REMEDIES	EM 200-1-2, Paragraph 1.2.4	
Treatment of soil if metal contamination is present; removal of MEC if present		
EXECUTABLE STAGES TO SITE CLOSEOUT		
Site Inspection		
Remedial Investigation		
Interim Removal Action (if required)		
Feasibility Study		
Remediation and/or Removal Actions		
SITE CONSTRAINTS AND DEPENDENCIES		
CURRENT EXECUTABLE STAGE		
No metals samples will be taken due to the fact that Fort Rucker soil has various metals in high background concentrations and leaching typically does not occur. Site walk will be done in areas that MEC are not expected to be found.		
Project Objectives		
Basic (Current Projects)	**Optimum** (Future Projects)	**Excessive** (Objectives that do not lead to site closeout)
See Project Objective worksheets	See Project Objective worksheets	See Project Objective worksheets

PROJECT OBJECTIVES WORKSHEET

SITE: Anti-Tank Rocket/Grenade Range

PROJECT: MMRP Site Inspection

Project Objective[a]					Data User(s)	Project Objective Classification[d]
Number	Executable Stage[b]		Description	Source[c]		
	Current	Future				
1	X		Identify boundaries and next steps for Anti-Tank Rocket/Grenade Range	Team Discussion / HRR/SI	X Risk X Compliance ____ Remedy ____ Responsibility	X Basic _____Optimum ____ Excessive
2	X		Determine concentration of munitions constituents (MC) in soil	SI	X Risk X Compliance ____ Remedy ____ Responsibility	X Basic _____Optimum ____ Excessive
3	X		Determine type of MEC present	HRR/SI	X Risk ____Compliance X Remedy ____ Responsibility	X Basic _____Optimum ____ Excessive
4	X		Determine if RI/FS is required	SI	X Risk X Compliance ____ Remedy ____ Responsibility	X Basic _____Optimum ____ Excessive
5	X		Provide information for (CTC) estimates	HRR/SI	X Risk X Compliance ____ Remedy ____ Responsibility	____Basic X Optimum ____ Excessive
6	X		Collect data to complete Prioritization Protocol	HRR/SI	X Risk X Compliance ____ Remedy ____ Responsibility	____Basic X Optimum ____ Excessive
7		X	Determine Nature and Extent of MEC/MC (RI), if appropriate	RI	X Risk X Compliance ____ Remedy ____ Responsibility	_____Basic _____Optimum X Excessive
8		X	Select remedial alternatives (FS), if appropriate	FS	____Risk ____Compliance X Remedy ____Responsibility	_____Basic _____Optimum X Excessive

Project Objective[a]					Data User(s)	Project Objective Classification[d]
Number	Executable Stage[b]		Description	Source[c]		
	Current	Future				
9		X	Implement remedial alternative, if applicable	RA	____Risk ____Compliance _X_Remedy ____Responsibility	_____Basic _____Optimum _X__Excessive

[a]Refer to EM 200-1-2, Paragraph 1.2.2. a
[b]Refer to EM 200-1-2, Paragraph 1.2.5. b
[c]For example, CERCLA ____, State Regulation _____, FFA Section _____, RCRA Permit, Meeting with Customer or Regulator. c
[d]Classification of project objectives can only occur after the current project has been identified. Refer to EM 200-1-2, Paragraph 1.3.3. d

SITE INFORMATION WORKSHEET

SITE: Anti-Tank Rocket/Grenade Range

PROJECT: MMRP Site Inspection

	Site Information Needed[a]	Potential Source(s) of Site Information	User of Site Information[b]	Suggested Means to Obtain Site Information	Obtaining Site Deadline for Information
1	Presence and types of MEC present	HRR / Site walk / Magnetometer Assisted Surface Sweep	Army Regulators Stakeholders	Site Data/Site Walk	12/2004
2	Presence, types, and concentration of MC present in soil	HRR / SI	Army Regulators Stakeholders	SI – sampling	12/2004
3	For cost to complete (CTC): Density (high 400-300, medium 300-50, low 50-1 per acre) of MEC and associated acreage	HRR / Site walk / Magnetometer Assisted Surface Sweep	Army Regulators Stakeholders	Site Data/ Site Walk - Magnetometer Assisted Surface Sweep	04/2005
4	For cost to complete (CTC): Percentage of Munitions Debris vs MEC	HRR / Site walk / Magnetometer Assisted Surface Sweep	Army Regulators Stakeholders	Review data from HRR/Site Walk-Surface only	04/2005
5	For cost to complete (CTC): Depth of MEC	HRR / Site walk / Magnetometer Assisted Surface Sweep	Army Regulators Stakeholders	Site Data/Army Munitions Guidance	04/2005
6	Metals Background Concentrations	IRP Reports	Army, Regulatory Agencies, Stakeholders	Obtain from Rucker	06/2004

[a]Refer to EM 200-1-2, Paragraphs 1.1.3 and 2.2. a
[b]Indicate a specific TPP team member (e.g., Risk Data User, Customer, Regulator, Sampling Data Implementer). B

DATA NEED WORKSHEET- RISK PERSPECTIVE

SITE: ___Anti-Tank Rocket/Grenade Range_____ DATA USER NAME(s):_____

PROJECT: MMRP Site Inspection

Data Need		Project Objective(s) & Data Need Group	Data Use(s)			Number of Samples			Risk Action Level(s)		Exposure Area(s) / Sample Location(s) and Depth
Contaminant of Concern, Characteristic of Interest	Media		Current or Future Use	Receptor Group(s)	Receptor's Exposure Route(s)	CL (%)	P (%)	MDRD (%)	Human, Health	Ecological	
MEC (presence, and type)	soil	1,3,4 Basic 5-6 Optimum 7-9 Excessive	Current (1-6) & Future (7-9)	*All	Handle / Tread & Intrusive	N/A	N/A	N/A	1 MEC Item or significant amount of MEC Scrap	N/A	Across the site / N/A
MC TCL-Explosives TAL-metals	soil	1, 2, 4 Basic 5-6 Optimum 7-9 Excessive	Current (1-6) & Future (7-9)	*All	Ingestion, dermal, inhalation	N/A	N/A	N/A	EPA Region IX – PRG Table	N/A	Bias locations (near or under MEC/scrap) where possible otherwise random distribution
MEC (depth)	soil	5-6 Optimum 7-9 Excessive	Current (5, 6) & Future (7-9)	*All	Surface/ intrusive	N/A	N/A	N/A	N/A	N/A	Across the site / N/A
MEC (density, and % of scrap)	soil	5 Optimum 7-9 Excessive	Current (5) & Future (7-9)	*All	Handle / Tread & Intrusive	N/A	N/A	N/A	N/A	N/A	Across the site / N/A

*Receptors – Authorized Installation personnel, escorted contractors, trespasser, hunter and biota

DATA NEED WORKSHEET- COMPLIANCE PERSPECTIVE

SITE: Anti-Tank Rocket/Grenade Range DATA USER NAME(s):_____

PROJECT: MMRP Site Inspection

Data Need		Project Objective(s) & Data Need Group	Data Use		Number of Samples	Compliance Reference Concentration	Point(s) of Compliance/ Sample Locations(s) and Depth
Contaminant of Concern, Characteristic or of Interest	Media		Regulatory Program or Statute, and Citation	Specific Use			
MEC (presence, and type)	Soil	1-4 Basic 5 Optimum 6-8 Basic	MMRP	Determine need for RI or NFA, and CTC/Prioritization	N/A	1 MEC Item or significant amount of Munitions Debris*	Site Walk aided with magnetometer
MC TCL-Explosives TAL-metals	Soil	1-4 Basic 5 Optimum 6-8 Basic	EPA Region IX PRG Table	Determine need for RI or NFA, and CTC/Prioritization	10-Explosives 10-Metals	EPA Region XI PRG Table	Bias locations (near or under MEC/scrap) where possible otherwise random distribution.

*Compliance point to determine NFA is inappropriate

DATA NEED WORKSHEET- REMEDY PERSPECTIVE

PAGE __1__ of __1__

SITE: Anti-Tank Rocket/Grenade Range DATA USER NAME(s): _____

PROJECT: MMPR Site Inspection

Data Need		Project Objective(s) & Data Need Group	Data Use		Number of Samples	Concentration of Interest or Sensitivity of Measurement(s)	Remediation Area(s) / Sample Locations(s) and Depth
Contaminant of Concern, Characteristic or of Interest	Media		Remedy Method(s) of Interest	Criteria to be Considered			
MEC (presence, and type)	Soil	1-4 Basic 5 Optimum 6-8 Basic	Fence and access controls	MEC presence, Safety	N/A	1 MEC Item or significant amount of MEC Scrap	TBD
MC TCL-Explosives TAL-metals	Soil	1-4 Basic 5 Optimum 6-8 Basic	Access controls soil removal (TBD)	EPA Region XI PRG Table	10-Explosives 10-Metals	EPA Region XI PRG Table	Bias locations (near or under MEC/scrap) where possible otherwise random distribution.
MEC (depth)	Soil	5 Optimum 8-9 Basic	N/A	N/A	N/A	N/A	N/A
MEC (density, and % of scrap)	Soil	5 Optimum 8-9 Basic	N/A	N/A	N/A	N/A	N/A

Summary Table of Data Collection Options

SITE: Anti-Tank Rocket/Grenade Range

PROJECT: MMPR Site Inspection

DATA IMPLEMENTORS

Sampling: Malcolm Pirnie

Analysis: Small Business Laboratory

DATE

Data Collection Option	Number of Samples						Order-of-Magnitude Cost (dollars)	Comments
	Air	Surface Water	Sediment	Soil	Ground Water	Other		
Excessive	N/A	N/A	N/A	>10	N/A	Intrusive investigation of subsurface anomalies	Out of scope	Composite samples (5 points, spoke configuration)
Optimum	N/A	N/A	N/A	10	N/A	Magnetometer assisted surface sweep	Within scope	Composite samples (5 points, spoke configuration)
Basic	N/A	N/A	N/A	0	N/A	No site walk	Within scope	

Phase I MFR Worksheet

US Army Corps of Engineers®

Author(s): Malcolm Pirnie, Inc. **Reviewer(s):** _____
Latest Revision Date: June 24, 2004 **Review Date:** _____

Location: Fort Rucker, Alabama
Site: Fort Rucker – Infiltration/Grenade Range
Project: Site Inspection

(Attach Phase I MFR to PMP)

TPP TEAM	EM 200-1-2, Paragraph 1.1.1
Decision Makers	**USACE / AEC / Fort Rucker**
Customer	Mary Ellen Maly, US Army Environmental Center
Project Manager	Stephen Wood, USACE BAL John Nocera, Malcolm Pirnie
Regulators	Mark Harrison, ADEM
Stakeholders	Jim Swift, Environmental, Fort Rucker

CUSTOMER'S GOALS	EM 200-1-2, Paragraph 1.1.2

Future Land Use(s)	Issues and Regulatory Compliance Status	Site-Specific Site Inspection Goals (if applicable)
Infiltration/Grenade Range **Current:** Golf Course and Undeveloped Land **Future:** Developable and Usable	Potential MEC presence / no significant evaluation of MC presence Confirmation of a practice round for anti-tank rifle grenade.	MEC – SI perform visual survey to determine if/where MEC is present MC – SI to determine presence of MC and to determine the need for further investigation

Site Closeout Statement

Land is safe for Unrestricted future use.

Customer's Schedule Requirements

Field Investigation and Reporting: Army wide goal: Site Inspection activities complete by FY10 and RC by 2017.

Fort Rucker wide goal: Site Inspection activities completed by April 2005.

Customer's Site Budget

Field Investigation and Reporting: CTC for MRP SI field work and reporting (includes magnetometer assisted surface sweep of 7.6 acres and 15 samples analyzed for explosives – 8330 and 15 samples analyzed for TAL Metals) =$117,933

IDENTIFY SITE APPROACH

EXISTING SITE INFORMATION & DATA	EM 200-1-2, Paragraphs 1.1.3 and 1.2.1

Attachment(s) to Phase I Memorandum For Record	Located at Repository	Preliminary Conceptual Site Model
Final Historical Records Review (and associated reports)	Fort Rucker	Yes
POTENTIAL POINTS OF COMPLIANCE	EM 200-1-2, Paragraph 1.2.1.3	
EPA Region IX – PRG Table		
MEDIA OF POTENTIAL CONCERN		
Soil		
PROJECT OBJECTIVES		

See project objectives worksheet		
REGULATOR & STAKEHOLDER PERSPECTIVES		
Regulators		**Community Interests**
		Others
	EM 200-1-2, Paragraph 1.2.4	
PROBABLE REMEDIES		
Treatment of soil if metal contamination is present; removal of MEC if present		
EXECUTABLE STAGES TO SITE CLOSEOUT		
Site Inspection		
Remedial Investigation		
Interim Removal Action (if required)		
Feasibility Study		
Remediation and/or Removal Actions		
SITE CONSTRAINTS AND DEPENDENCIES		
CURRENT EXECUTABLE STAGE		
No metals samples will be taken due to the fact that Fort Rucker soil has various metals in high background concentrations and leaching typically does not occur. Site walk will be done in areas that MEC are not expected to be found.		
Project Objectives		
Basic (Current Projects)	**Optimum** (Future Projects)	**Excessive** (Objectives that do not lead to site closeout)
See Project Objective worksheets	See Project Objective worksheets	See Project Objective worksheets

PROJECT OBJECTIVES WORKSHEET

SITE: Infiltration/Grenade Range

PROJECT: MMRP Site Inspection

Project Objective[a]					Data User(s)	Project Objective Classification[d]
Number	Executable Stage[b]		Description	Source[c]		
	Current	Future				
1	X		Identify boundaries and next steps for Anti-Tank Rocket/Grenade Range	Team Discussion / HRR/SI	X Risk X Compliance ____ Remedy ____ Responsibility	X Basic _____Optimum ____ Excessive
2	X		Determine concentration of munitions constituents (MC) in soil	SI	X Risk X Compliance ____ Remedy ____ Responsibility	X Basic _____Optimum ____ Excessive
3	X		Determine type of MEC present	HRR/SI	X Risk ____Compliance X Remedy ____ Responsibility	X Basic _____Optimum ____ Excessive
4	X		Determine if RI/FS is required	SI	X Risk X Compliance ____ Remedy ____ Responsibility	X Basic _____Optimum ____ Excessive
5	X		Provide information for (CTC) estimates	HRR/SI	X Risk X Compliance ____ Remedy ____ Responsibility	____Basic X Optimum ____ Excessive
6	X		Collect data to complete Prioritization Protocol	HRR/SI	X Risk X Compliance ____ Remedy ____ Responsibility	____Basic X Optimum ____ Excessive
7		X	Determine Nature and Extent of MEC/MC (RI), if appropriate	RI	X Risk X Compliance ____ Remedy ____ Responsibility	_____Basic _____Optimum X Excessive
8		X	Select remedial alternatives (FS), if appropriate	FS	____Risk ____Compliance X Remedy ____Responsibility	_____Basic _____Optimum X Excessive

Project Objective[a]					Data User(s)	Project Objective Classification[d]
Number	Executable Stage[b]		Description	Source[c]		
	Current	Future				
9		X	Implement remedial alternative, if applicable	RA	____Risk ____Compliance _X_Remedy ____Responsibility	_____Basic _____Optimum _X__Excessive

[a]Refer to EM 200-1-2, Paragraph 1.2.2. a
[b]Refer to EM 200-1-2, Paragraph 1.2.5. b
[c]For example, CERCLA ____, State Regulation _____, FFA Section _____, RCRA Permit, Meeting with Customer or Regulator. c
[d]Classification of project objectives can only occur after the current project has been identified. Refer to EM 200-1-2, Paragraph 1.3.3. d

SITE INFORMATION WORKSHEET

SITE: Infiltration/Grenade Range

PROJECT: MMRP Site Inspection

	Site Information Needed[a]	Potential Source(s) of Site Information	User of Site Information[b]	Suggested Means to Obtain Site Information	Obtaining Site Deadline for Information
1	Presence and types of MEC present	HRR / Site walk / Magnetometer Assisted Surface Sweep	Army Regulators Stakeholders	Site Data/Site Walk	12/2004
2	Presence, types, and concentration of MC present	HRR / SI	Army Regulators Stakeholders	SI – sampling	12/2004
3	For cost to complete (CTC): Density (high 400-300, medium 300-50, low 50-1 per acre) of MEC and associated acreage	HRR / Site walk / Magnetometer Assisted Surface Sweep	Army Regulators Stakeholders	Site Data/ Site Walk - Magnetometer Assisted Surface Sweep	04/2005
4	For cost to complete (CTC): Percentage of Munitions Debris vs MEC	HRR / Site walk / Magnetometer Assisted Surface Sweep	Army Regulators Stakeholders	Review data from HRR/Site Walk-Surface only	04/2005
5	For cost to complete (CTC): Depth of MEC	HRR / Site walk / Magnetometer Assisted Surface Sweep	Army Regulators Stakeholders	Site Data/Army Munitions Guidance	04/2005
6	Metals Background Concentrations	IRP Reports	Army, Regulatory Agencies, Stakeholders	Obtain from Rucker	06/2004

[a]Refer to EM 200-1-2, Paragraphs 1.1.3 and 2.2. a
[b]Indicate a specific TPP team member (e.g., Risk Data User, Customer, Regulator, Sampling Data Implementor). B

DATA NEED WORKSHEET- RISK PERSPECTIVE

SITE: Infiltration/Grenade Range DATA USER NAME(s):_____

PROJECT: MMRP Site Inspection

Data Need		Project Objective(s) & Data Need Group	Data Use(s)			Number of Samples			Risk Action Level(s)		Exposure Area(s) / Sample Location(s) and Depth
Contaminant of Concern, Characteristic of Interest	Media		Current or Future Use	Receptor Group(s)	Receptor's Exposure Route(s)	CL (%)	P (%)	MDRD (%)	Human, Health	Ecological	
MEC (presence, and type)	soil	1,3,4 Basic 5-6 Optimum 7-9 Excessive	Current (1-6) & Future (7-9)	*All	Handle / Tread & Intrusive	N/A	N/A	N/A	1 MEC Item or significant amount of Munitions Debris	N/A	Across the site / N/A
MC TCL-Explosives TAL-metals	soil	1, 2, 4 Basic 5-6 Optimum 7-9 Excessive	Current (1-6) & Future (7-9)	*All	Ingestion, dermal, inhalation	N/A	N/A	N/A	EPA Region IX – PRG Table	N/A	Bias locations (near or under MEC/scrap) where possible otherwise random distribution
MEC (depth)	soil	5-6 Optimum 7-9 Excessive	Current (5, 6) & Future (7-9)	*All	Surface/ intrusive	N/A	N/A	N/A	N/A	N/A	Across the site / N/A
MEC (density, and % of scrap)	soil	5 Optimum 7-9 Excessive	Current (5) & Future (7-9)	*All	Handle / Tread & Intrusive	N/A	N/A	N/A	N/A	N/A	Across the site / N/A

*Receptors – Authorized Installation personnel, escorted contractors, trespasser, hunter and biota

DATA NEED WORKSHEET- COMPLIANCE PERSPECTIVE

SITE: Infiltration/Grenade Range DATA USER NAME(s): _____

PROJECT: MMRP Site Inspection

Data Need		Project Objective(s) & Data Need Group	Data Use		Number of Samples	Compliance Reference Concentration	Point(s) of Compliance/ Sample Locations(s) and Depth
Contaminant of Concern, Characteristic or of Interest	Media		Regulatory Program or Statute, and Citation	Specific Use			
MEC (presence, and type)	Soil	1-4 Basic 5 Optimum 6-8 Excessive	MMRP	Determine need for RI or NFA, and CTC/Prioritization	N/A	1 MEC Item or significant amount of Munitions Debris*	Site Walk aided with magnetometer
MC TCL-Explosives TAL-metals	Soil	1-4 Basic 5 Optimum 6-8 Excessive	EPA Region IX PRG Table	Determine need for RI or NFA, and CTC/Prioritization	10-Explosives 10-Metals	EPA Region XI PRG Table	Bias locations (near or under MEC/scrap) where possible otherwise random distribution.

*Compliance point to determine NFA is inappropriate

DATA NEED WORKSHEET- REMEDY PERSPECTIVE

SITE: Infiltration/Grenade Range DATA USER NAME(s): _____

PROJECT: MMPR Site Inspection

Data Need		Project Objective(s) & Data Need Group	Data Use		Number of Samples	Concentration of Interest or Sensitivity of Measurement(s)	Remediation Area(s) / Sample Locations(s) and Depth
Contaminant of Concern, Characteristic or of Interest	Media		Remedy Method(s) of Interest	Criteria to be Considered			
MEC (presence, and type)	Soil	1-4 Basic 5 Optimum 6-8 Excessive	Fence and access controls	MEC presence, Safety	N/A	1 MEC Item or significant amount of Munitions Debris	TBD
MC TCL-Explosives TAL-metals	Soil	1-4 Basic 5 Optimum 6-8 Excessive	Access controls soil removal (TBD)	EPA Region XI PRG Table	10-explosives 10-metals	EPA Region XI PRG Table	Bias locations (near or under MEC/scrap) where possible otherwise random distribution.
MEC (depth)	Soil	5 Optimum 8-9 Excessive	N/A	N/A	N/A	N/A	N/A
MEC (density, and % of scrap)	Soil	5 Optimum 8-9 Excessive	N/A	N/A	N/A	N/A	N/A

Summary Table of Data Collection Options

SITE: Infiltration/Grenade Range

PROJECT: MMPR Site Inspection

DATA IMPLEMENTORS

Sampling: Malcolm Pirnie

Analysis: Small Business Laboratory

DATE

Data Collection Option	Number of Samples						Order-of-Magnitude Cost (dollars)	Comments
	Air	Surface Water	Sediment	Soil	Ground Water	Other		
Excessive	N/A	N/A	N/A	>10	N/A	Intrusive investigation of subsurface anomalies	Out of scope	Composite samples (5 points, spoke configuration)
Optimum	N/A	N/A	N/A	10	N/A	Magnetometer assisted surface sweep	Within scope	Composite samples (5 points, spoke configuration)
Basic	N/A	N/A	N/A	0	N/A	No site walk	Within scope	

Phase I MFR Worksheet

US Army Corps of Engineers®

Author(s): Malcolm Pirnie, Inc. **Reviewer(s):** _____
Latest Revision Date: June 24, 2004 **Review Date:** _____

Location: Fort Rucker, Alabama
Site: Fort Rucker – .22 Caliber Target Butt
Project: Site Inspection

(Attach Phase I MFR to PMP)

TPP TEAM	EM 200-1-2, Paragraph 1.1.1
Decision Makers	**USACE / AEC / Fort Rucker**
Customer	Mary Ellen Maly, US Army Environmental Center
Project Manager	Stephen Wood, USACE BAL John Nocera, Malcolm Pirnie
Regulators	Mark Harrison, ADEM
Stakeholders	Jim Swift, Environmental, Fort Rucker

CUSTOMER'S GOALS	EM 200-1-2, Paragraph 1.1.2

Future Land Use(s)	Issues and Regulatory Compliance Status	Site-Specific Site Inspection Goals (if applicable)
.22 Caliber Target Butt **Current:** Part of Cantonment Area **Future:** Developable and Usable	No potential MEC presence / no significant evaluation of MC presence	MEC –None (perform visual survey to determine boundaries/firing points/target butt) MC – SI to determine presence of MC and to determine the need for further investigation

Site Closeout Statement

Land is safe for Unrestricted future use.

Customer's Schedule Requirements

Field Investigation and Reporting: Army wide goal: Site Inspection activities complete by FY10 and RC by 2017.

Fort Rucker wide goal: Site Inspection activities completed by April 2005.

Customer's Site Budget

Field Investigation and Reporting: CTC for MRP SI field work and reporting (includes magnetometer assisted surface sweep of 7.6 acres and 15 samples analyzed for explosives – 8330 and 15 samples analyzed for TAL Metals) =$117,933

IDENTIFY SITE APPROACH

EXISTING SITE INFORMATION & DATA	EM 200-1-2, Paragraphs 1.1.3 and 1.2.1

Attachment(s) to Phase I Memorandum For Record	Located at Repository	Preliminary Conceptual Site Model
Final Historical Records Review (and associated reports)	Fort Rucker	Yes
POTENTIAL POINTS OF COMPLIANCE	EM 200-1-2, Paragraph 1.2.1.3	
EPA Region IX – PRG Table		
MEDIA OF POTENTIAL CONCERN		
Soil		
PROJECT OBJECTIVES		

See project objectives worksheet	

REGULATOR & STAKEHOLDER PERSPECTIVES

Regulators		**Community Interests**
Concern with magnetometer picking up iron ore deposits.		**Others**
GPS all anomalies.		
PROBABLE REMEDIES	EM 200-1-2, Paragraph 1.2.4	

Treatment of soil if lead projectile is present.	

EXECUTABLE STAGES TO SITE CLOSEOUT

Site Inspection	

Remedial Investigation
Interim Removal Action (if required)
Feasibility Study
Remediation and/or Removal Actions

SITE CONSTRAINTS AND DEPENDENCIES

CURRENT EXECUTABLE STAGE

No metals samples will be taken due to the fact that Fort Rucker soil has various metals in high background concentrations and leaching typically does not occur.	
Shovel tests may have to be done to determine if lead projectiles are present in the backstop.	
Site walk will be done in areas that MEC are not expected to be found.	

Project Objectives

Basic (Current Projects)	**Optimum** (Future Projects)	**Excessive** (Objectives that do not lead to site closeout)
See Project Objective worksheets	See Project Objective worksheets	See Project Objective worksheets

PROJECT OBJECTIVES WORKSHEET

SITE: .22 Caliber Target Butt

PROJECT: MMRP Site Inspection

Project Objective[a]					Data User(s)	Project Objective Classification[d]
Number	Executable Stage[b]		Description	Source[c]		
	Current	Future				
1	X		Identify boundaries and next steps for .22 Caliber Target Butt	Team Discussion / HRR/SI	X Risk X Compliance ____ Remedy ____ Responsibility	X Basic _____Optimum ____ Excessive
2	X		Determine concentration of munitions constituents (MC) in soil	SI	X Risk X Compliance ____ Remedy ____ Responsibility	X Basic _____Optimum ____ Excessive
3	X		Determine if RI/FS is required	SI	X Risk X Compliance ____ Remedy ____ Responsibility	X Basic _____Optimum ____ Excessive
4	X		Provide information for (CTC) estimates	HRR/SI	X Risk X Compliance ____ Remedy ____ Responsibility	____Basic X Optimum ____ Excessive
5	X		Collect data to complete Prioritization Protocol	HRR/SI	X Risk X Compliance ____ Remedy ____ Responsibility	____Basic X Optimum ____ Excessive
6		X	Determine Nature and Extent of MC (RI), if appropriate	RI	X Risk X Compliance ____ Remedy ____ Responsibility	____Basic _____Optimum X Excessive
7		X	Select remedial alternatives (FS), if appropriate	FS	____Risk ____Compliance X Remedy ____Responsibility	____Basic _____Optimum X Excessive
8		X	Implement remedial alternative, if applicable	RA	____Risk ____Compliance X Remedy ____Responsibility	____Basic _____Optimum X Excessive

[a]Refer to EM 200-1-2, Paragraph 1.2.2. a
[b]Refer to EM 200-1-2, Paragraph 1.2.5. b
[c]For example, CERCLA ____, State Regulation _____, FFA Section _____, RCRA Permit, Meeting with Customer or Regulator. c
[d]Classification of project objectives can only occur after the current project has been identified. Refer to EM 200-1-2, Paragraph 1.3.3. d

SITE INFORMATION WORKSHEET

SITE: .22 Caliber Target Butt

PROJECT: MMRP Site Inspection

	Site Information Needed[a]	Potential Source(s) of Site Information	User of Site Information[b]	Suggested Means to Obtain Site Information	Obtaining Site Deadline for Information
1	Presence, types, and concentration of MC present	HRR / SI	Army Regulators Stakeholders	SI – sampling	12/2004
2	Metals Background Concentrations	IRP Reports	Army, Regulatory Agencies, Stakeholders	Obtain from Rucker	06/2004

[a]Refer to EM 200-1-2, Paragraphs 1.1.3 and 2.2. a
[b]Indicate a specific TPP team member (e.g., Risk Data User, Customer, Regulator, Sampling Data Implementor). B

DATA NEED WORKSHEET- RISK PERSPECTIVE

SITE: .22 Caliber Target Butt DATA USER NAME(s):_____

PROJECT: MMRP Site Inspection

Data Need		Project Objective(s) & Data Need Group	Data Use(s)			Number of Samples			Risk Action Level(s)		Exposure Area(s) / Sample Location(s) and Depth
Contaminant of Concern, Characteristic of Interest	Media		Current or Future Use	Receptor Group(s)	Receptor's Exposure Route(s)	CL (%)	P (%)	MDRD (%)	Human, Health	Ecological	
N/A	N/A	1-3 Basic 4-5 Optimum 6-8 Excessive	N/A	*All	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Receptors – Authorized Installation personnel, escorted contractors, trespasser, hunter and biota

DATA NEED WORKSHEET- COMPLIANCE PERSPECTIVE

SITE: .22 Caliber Target Butt DATA USER NAME(s): _____

PROJECT: MMRP Site Inspection

Data Need		Project Objective(s) & Data Need Group	Data Use		Number of Samples	Compliance Reference Concentration	Point(s) of Compliance/ Sample Locations(s) and Depth
Contaminant of Concern, Characteristic or of Interest	Media		Regulatory Program or Statute, and Citation	Specific Use			
N/A	N/A	N/A	N/A	N/A	No samples will be collected.	N/A	N/A

*Compliance point to determine NFA is inappropriate

DATA NEED WORKSHEET- REMEDY PERSPECTIVE

SITE: .22 Caliber Target Butt DATA USER NAME(s): _____

PROJECT: MMPR Site Inspection

Data Need		Project Objective(s) & Data Need Group	Data Use		Number of Samples	Concentration of Interest or Sensitivity of Measurement(s)	Remediation Area(s) / Sample Locations(s) and Depth
Contaminant of Concern, Characteristic or of Interest	Media		Remedy Method(s) of Interest	Criteria to be Considered			
N/A	N/A	N/A	N/A	N/A	No samples will be collected.	N/A	N/A

Summary Table of Data Collection Options

SITE: .22 Caliber Target Butt

PROJECT: MMPR Site Inspection

DATA IMPLEMENTORS

Sampling: Malcolm Pirnie

Analysis: Small Business Laboratory

DATE

Data Collection Option	Number of Samples						Order-of-Magnitude Cost (dollars)	Comments
	Air	Surface Water	Sediment	Soil	Ground Water	Other		
Excessive	N/A	N/A	N/A	>10	N/A	Intrusive investigation of subsurface anomalies	Out of scope	
Optimum	N/A	N/A	N/A	10	N/A	Magnetometer assisted surface sweep	Within scope	
Basic	N/A	N/A	N/A	0	N/A	No site walk	Within scope	

Phase I MFR Worksheet

US Army Corps of Engineers®

Author(s): Malcolm Pirnie, Inc. **Reviewer(s):** _____
Latest Revision Date: June 24, 2004 **Review Date:** _____

Location: Fort Rucker, Alabama
Site: Fort Rucker – "A" Grenade & Bayonet Court
Project: Site Inspection

(Attach Phase I MFR to PMP)

TPP TEAM	EM 200-1-2, Paragraph 1.1.1
Decision Makers	**USACE / AEC / Fort Rucker**
Customer	Mary Ellen Maly, US Army Environmental Center
Project Manager	Stephen Wood, USACE BAL John Nocera, Malcolm Pirnie
Regulators	Mark Harrison, ADEM
Stakeholders	Jim Swift, Environmental, Fort Rucker

CUSTOMER'S GOALS	EM 200-1-2, Paragraph 1.1.2

Future Land Use(s)	Issues and Regulatory Compliance Status	Site-Specific Site Inspection Goals (if applicable)
"A" Grenade & Bayonet Court **Current:** Part of cantonment area **Future:** Developable and Usable	Potential MEC presence / no significant evaluation of MC presence	MEC – SI perform visual survey to determine if/where MEC is present MC – SI to determine presence of MC and to determine the need for further investigation

Site Closeout Statement

Land is safe for Unrestricted future use.

Customer's Schedule Requirements

Field Investigation and Reporting: Army wide goal: Site Inspection activities complete by FY10 and RC by 2017.

Fort Rucker wide goal: Site Inspection activities completed by April 2005.

Customer's Site Budget

Field Investigation and Reporting: CTC for MRP SI field work and reporting (includes magnetometer assisted surface sweep of 7.6 acres and 15 samples analyzed for explosives – 8330 and 15 samples analyzed for TAL Metals) =$117,933

IDENTIFY SITE APPROACH

EXISTING SITE INFORMATION & DATA	EM 200-1-2, Paragraphs 1.1.3 and 1.2.1

Attachment(s) to Phase I Memorandum For Record	Located at Repository	Preliminary Conceptual Site Model
Final Historical Records Review (and associated reports)	Fort Rucker	Yes
POTENTIAL POINTS OF COMPLIANCE	EM 200-1-2, Paragraph 1.2.1.3	
EPA Region IX – PRG Table		

MEDIA OF POTENTIAL CONCERN	
Soil	

PROJECT OBJECTIVES

See project objectives worksheet		
REGULATOR & STAKEHOLDER PERSPECTIVES		
Regulators	**Community Interests**	
		Others
	EM 200-1-2, Paragraph 1.2.4	
PROBABLE REMEDIES		
removal of MEC if present		
EXECUTABLE STAGES TO SITE CLOSEOUT		
Site Inspection		
Remedial Investigation		
Interim Removal Action (if required)		
Feasibility Study		
Remediation and/or Removal Actions		
SITE CONSTRAINTS AND DEPENDENCIES		
CURRENT EXECUTABLE STAGE		
No metals samples will be taken due to the fact that Fort Rucker soil has various metals in high background concentrations and leaching typically does not occur. Site walk will be done in areas that MEC are not expected to be found.		
Project Objectives		
Basic (Current Projects)	**Optimum** (Future Projects)	**Excessive** (Objectives that do not lead to site closeout)
See Project Objective worksheets	See Project Objective worksheets	See Project Objective worksheets

PROJECT OBJECTIVES WORKSHEET

SITE: "A" Grenade & Bayonet Court

PROJECT: MMRP Site Inspection

Project Objective[a]					Data User(s)	Project Objective Classification[d]
Number	Executable Stage[b]		Description	Source[c]		
	Current	Future				
1	X		Identify boundaries and next steps for "A" Grenade & Bayonet Court	Team Discussion / HRR/SI	X Risk X Compliance ____ Remedy ____ Responsibility	X Basic _____Optimum ____ Excessive
2	X		Determine concentration of munitions constituents (MC) in soil	SI	X Risk X Compliance ____ Remedy ____ Responsibility	X Basic _____Optimum ____ Excessive
3	X		Determine type of MEC present	HRR/SI	X Risk ____Compliance X Remedy ____ Responsibility	X Basic _____Optimum ____ Excessive
4	X		Determine if RI/FS is required	SI	X Risk X Compliance ____ Remedy ____ Responsibility	X Basic _____Optimum ____ Excessive
5	X		Provide information for (CTC) estimates	HRR/SI	X Risk X Compliance ____ Remedy ____ Responsibility	____Basic X Optimum ____ Excessive
6	X		Collect data to complete Prioritization Protocol	HRR/SI	X Risk X Compliance ____ Remedy ____ Responsibility	____Basic X Optimum ____ Excessive
7		X	Determine Nature and Extent of MEC/MC (RI), if appropriate	RI	X Risk X Compliance ____ Remedy ____ Responsibility	_____Basic _____Optimum X Excessive
8		X	Select remedial alternatives (FS), if appropriate	FS	____Risk ____Compliance X Remedy ____Responsibility	_____Basic _____Optimum X Excessive

Project Objective[a]					Data User(s)	Project Objective Classification[d]
Number	Executable Stage[b]		Description	Source[c]		
	Current	Future				
9		X	Implement remedial alternative, if applicable	RA	____Risk ____Compliance _X_Remedy ____Responsibility	_____Basic _____Optimum _X__Excessive

[a]Refer to EM 200-1-2, Paragraph 1.2.2. a
[b]Refer to EM 200-1-2, Paragraph 1.2.5. b
[c]For example, CERCLA ____, State Regulation _____, FFA Section _____, RCRA Permit, Meeting with Customer or Regulator. c
[d]Classification of project objectives can only occur after the current project has been identified. Refer to EM 200-1-2, Paragraph 1.3.3. d

SITE INFORMATION WORKSHEET

SITE: "A" Grenade & Bayonet Court

PROJECT: MMRP Site Inspection

	Site Information Needed[a]	Potential Source(s) of Site Information	User of Site Information[b]	Suggested Means to Obtain Site Information	Obtaining Site Deadline for Information
1	Presence and types of MEC present	HRR / Site walk / Magnetometer Assisted Surface Sweep	Army Regulators Stakeholders	Site Data/Site Walk	12/2004
2	Presence, types, and concentration of MC present	HRR / SI	Army Regulators Stakeholders	SI – sampling	12/2004
3	For cost to complete (CTC): Density (high 400-300, medium 300-50, low 50-1 per acre) of MEC and associated acreage	HRR / Site walk / Magnetometer Assisted Surface Sweep	Army Regulators Stakeholders	Site Data/ Site Walk - Magnetometer Assisted Surface Sweep	04/2005
4	For cost to complete (CTC): Percentage of Munitions Debris vs MEC	HRR / Site walk / Magnetometer Assisted Surface Sweep	Army Regulators Stakeholders	Review data from HRR/Site Walk-Surface only	04/2005
5	For cost to complete (CTC): Depth of MEC	HRR / Site walk / Magnetometer Assisted Surface Sweep	Army Regulators Stakeholders	Site Data/Army Munitions Guidance	04/2005
6	Metals Background Concentrations	IRP Reports	Army, Regulatory Agencies, Stakeholders	Obtain from Rucker	06/2004

[a]Refer to EM 200-1-2, Paragraphs 1.1.3 and 2.2. a
[b]Indicate a specific TPP team member (e.g., Risk Data User, Customer, Regulator, Sampling Data Implementor). B

DATA NEED WORKSHEET- RISK PERSPECTIVE

SITE: "A" Grenade & Bayonet Court DATA USER NAME(s):_____

PROJECT: MMRP Site Inspection

Data Need		Project Objective(s) & Data Need Group	Data Use(s)			Number of Samples			Risk Action Level(s)		Exposure Area(s) / Sample Location(s) and Depth
Contaminant of Concern, Characteristic of Interest	Media		Current or Future Use	Receptor Group(s)	Receptor's Exposure Route(s)	CL (%)	P (%)	MDRD (%)	Human, Health	Ecological	
MEC (presence, and type)	soil	1,3,4 Basic 5-6 Optimum 7-9 Excessive	Current (1-6) & Future (7-9)	*All	Handle / Tread & Intrusive	N/A	N/A	N/A	1 MEC Item or significant amount of Munitions Debris	N/A	Across the site / N/A
MC TCL-Explosives	soil	1, 2, 4 Basic 5-6 Optimum 7-9 Excessive	Current (1-6) & Future (7-9)	*All	Ingestion, dermal, inhalation	N/A	N/A	N/A	EPA Region IX – PRG Table	N/A	Bias locations (near or under MEC/scrap) where possible otherwise random distribution
MEC (depth)	soil	5-6 Optimum 7-9 Excessive	Current (5, 6) & Future (7-9)	*All	Surface/ intrusive	N/A	N/A	N/A	N/A	N/A	Across the site / N/A
MEC (density, and % of scrap)	soil	5 Optimum 7-9 Excessive	Current (5, 6) Future (7-9)	*All	Handle / Tread & Intrusive	N/A	N/A	N/A	N/A	N/A	Across the site / N/A

*Receptors – Authorized Installation personnel, escorted contractors, trespasser, hunter and biota

DATA NEED WORKSHEET- COMPLIANCE PERSPECTIVE

SITE: "A" Grenade & Bayonet Court DATA USER NAME(s): _____

PROJECT: MMRP Site Inspection

Data Need		Project Objective(s) & Data Need Group	Data Use		Number of Samples	Compliance Reference Concentration	Point(s) of Compliance/ Sample Locations(s) and Depth
Contaminant of Concern, Characteristic or of Interest	Media		Regulatory Program or Statute, and Citation	Specific Use			
MEC (presence, and type)	Soil	1-4 Basic 5 Optimum 6-8 Excessive	MMRP	Determine need for RI or NFA, and CTC/Prioritization	N/A	1 MEC Item or significant amount of Munitions Debris*	Site Walk aided with magnetometer
MC TCL-Explosives	Soil	1-4 Basic 5 Optimum 6-8 Excessive	EPA Region IX PRG Table	Determine need for RI or NFA, and CTC/Prioritization	3-Explosives	EPA Region XI PRG Table	Bias locations (near or under MEC/scrap) where possible otherwise random distribution.

*Compliance point to determine NFA is inappropriate

DATA NEED WORKSHEET- REMEDY PERSPECTIVE

PAGE __1__ of __1__

SITE: "A" Grenade & Bayonet Court DATA USER NAME(s): _____

PROJECT: MMPR Site Inspection

Data Need		Project Objective(s) & Data Need Group	Data Use		Number of Samples	Concentration of Interest or Sensitivity of Measurement(s)	Remediation Area(s) / Sample Locations(s) and Depth
Contaminant of Concern, Characteristic or of Interest	Media		Remedy Method(s) of Interest	Criteria to be Considered			
MEC (presence, and type)	Soil	1-4 Basic 5 Optimum 6-8 Excessive	Fence and access controls	MEC presence, Safety	N/A	1 MEC Item or significant amount of Munitions Debris	TBD
MC TCL-Explosives	Soil	1-4 Basic 5 Optimum 6-8 Excessive	Access controls soil removal (TBD)	EPA Region XI PRG Table	3-Explosives	EPA Region XI PRG Table	Bias locations (near or under MEC/scrap) where possible otherwise random distribution.
MEC (depth)	Soil	5 Optimum 8-9 Excessive	N/A	N/A	N/A	N/A	N/A
MEC (density, and % of scrap)	Soil	5 Optimum 8-9 Excessive	N/A	N/A	N/A	N/A	N/A

Summary Table of Data Collection Options

SITE: "A" Grenade & Bayonet Court

PROJECT: MMPR Site Inspection

DATA IMPLEMENTORS

Sampling: Malcolm Pirnie

Analysis: Small Business Laboratory

DATE

Data Collection Option	Number of Samples						Order-of-Magnitude Cost (dollars)	Comments
	Air	Surface Water	Sediment	Soil	Ground Water	Other		
Excessive	N/A	N/A	N/A	>3	N/A	Intrusive investigation of subsurface anomalies	Out of scope	Composite samples (5 points, spoke configuration)
Optimum	N/A	N/A	N/A	3	N/A	Magnetometer assisted surface sweep	Within scope	Composite samples (5 points, spoke configuration)
Basic	N/A	N/A	N/A	0	N/A	No site walk	Within scope	

Phase I MFR Worksheet

US Army Corps of Engineers®

Author(s): Malcolm Pirnie, Inc. **Reviewer(s):** _____
Latest Revision Date: June 24, 2004 **Review Date:** _____

Location: Fort Rucker, Alabama
Site: Fort Rucker – "B" Grenade & Bayonet Court
Project: Site Inspection

(Attach Phase I MFR to PMP)

TPP TEAM	EM 200-1-2, Paragraph 1.1.1
Decision Makers	**USACE / AEC / Fort Rucker**
Customer	Mary Ellen Maly, US Army Environmental Center
Project Manager	Stephen Wood, USACE BAL John Nocera, Malcolm Pirnie
Regulators	Mark Harrison, ADEM
Stakeholders	Jim Swift, Environmental, Fort Rucker

CUSTOMER'S GOALS	EM 200-1-2, Paragraph 1.1.2

Future Land Use(s)	Issues and Regulatory Compliance Status	Site-Specific Site Inspection Goals (if applicable)
"B" Grenade & Bayonet Court **Current:** Part of cantonment area **Future:** Developable and Usable	Potential MEC presence / no significant evaluation of MC presence	MEC – SI perform visual survey to determine if/where MEC is present MC – SI to determine presence of MC and to determine the need for further investigation

Site Closeout Statement

Land is safe for Unrestricted future use.

Customer's Schedule Requirements

Field Investigation and Reporting: Army wide goal: Site Inspection activities complete by FY10 and RC by 2017.

Fort Rucker wide goal: Site Inspection activities completed by April 2005.

Customer's Site Budget

Field Investigation and Reporting: CTC for MRP SI field work and reporting (includes magnetometer assisted surface sweep of 7.6 acres and 15 samples analyzed for explosives – 8330 and 15 samples analyzed for TAL Metals) =$117,933

IDENTIFY SITE APPROACH

EXISTING SITE INFORMATION & DATA	EM 200-1-2, Paragraphs 1.1.3 and 1.2.1

Attachment(s) to Phase I Memorandum For Record	Located at Repository	Preliminary Conceptual Site Model
Final Historical Records Review (and associated reports)	Fort Rucker	Yes
POTENTIAL POINTS OF COMPLIANCE	EM 200-1-2, Paragraph 1.2.1.3	
EPA Region IX – PRG Table		
MEDIA OF POTENTIAL CONCERN		
Soil		
PROJECT OBJECTIVES		

See project objectives worksheet	

REGULATOR & STAKEHOLDER PERSPECTIVES

Regulators		**Community Interests**
		Others
PROBABLE REMEDIES	EM 200-1-2, Paragraph 1.2.4	

Treatment of soil if metal contamination is present; removal of MEC if present	

EXECUTABLE STAGES TO SITE CLOSEOUT

Site Inspection	
Remedial Investigation	
Interim Removal Action (if required)	
Feasibility Study	
Remediation and/or Removal Actions	

SITE CONSTRAINTS AND DEPENDENCIES

CURRENT EXECUTABLE STAGE

No metals samples will be taken due to the fact that Fort Rucker soil has various metals in high background concentrations and leaching typically does not occur. Site walk will be done in areas that MEC are not expected to be found.	

Project Objectives

Basic (Current Projects)	**Optimum** (Future Projects)	**Excessive** (Objectives that do not lead to site closeout)
See Project Objective worksheets	See Project Objective worksheets	See Project Objective worksheets

PROJECT OBJECTIVES WORKSHEET

SITE: "B" Grenade & Bayonet Court

PROJECT: MMRP Site Inspection

Project Objective[a]					Data User(s)	Project Objective Classification[d]
Number	Executable Stage[b]		Description	Source[c]		
	Current	Future				
1	X		Identify boundaries and next steps for "B" Grenade & Bayonet Court	Team Discussion / HRR/SI	X Risk X Compliance ____ Remedy ____ Responsibility	X Basic _____Optimum ____ Excessive
2	X		Determine concentration of munitions constituents (MC) in soil	SI	X Risk X Compliance ____ Remedy ____ Responsibility	X Basic _____Optimum ____ Excessive
3	X		Determine type of MEC present	HRR/SI	X Risk ____Compliance X Remedy ____ Responsibility	X Basic _____Optimum ____ Excessive
4	X		Determine if RI/FS is required	SI	X Risk X Compliance ____ Remedy ____ Responsibility	X Basic _____Optimum ____ Excessive
5	X		Provide information for (CTC) estimates	HRR/SI	X Risk X Compliance ____ Remedy ____ Responsibility	____Basic X Optimum ____ Excessive
6	X		Collect data to complete Prioritization Protocol	HRR/SI	X Risk X Compliance ____ Remedy ____ Responsibility	____Basic X Optimum ____ Excessive
7		X	Determine Nature and Extent of MEC/MC (RI), if appropriate	RI	X Risk X Compliance ____ Remedy ____ Responsibility	_____Basic _____Optimum X Excessive
8		X	Select remedial alternatives (FS), if appropriate	FS	____Risk ____Compliance X Remedy ____Responsibility	_____Basic _____Optimum X Excessive

Project Objective[a]						
Number	Executable Stage[b]		Description	Source[c]	Data User(s)	Project Objective Classification[d]
	Current	Future				
9		X	Implement remedial alternative, if applicable	RA	____Risk ____Compliance _X_Remedy ____Responsibility	_____Basic _____Optimum _X__Excessive

[a]Refer to EM 200-1-2, Paragraph 1.2.2. a
[b]Refer to EM 200-1-2, Paragraph 1.2.5. b
[c]For example, CERCLA ____, State Regulation _____, FFA Section _____, RCRA Permit, Meeting with Customer or Regulator. c
[d]Classification of project objectives can only occur after the current project has been identified. Refer to EM 200-1-2, Paragraph 1.3.3. d

SITE INFORMATION WORKSHEET

SITE: "B" Grenade & Bayonet Court

PROJECT: MMRP Site Inspection

	Site Information Needed[a]	Potential Source(s) of Site Information	User of Site Information[b]	Suggested Means to Obtain Site Information	Obtaining Site Deadline for Information
1	Presence and types of MEC present	HRR / Site walk / Magnetometer Assisted Surface Sweep	Army Regulators Stakeholders	Site Data/Site Walk	12/2004
2	Presence, types, and concentration of MC present	HRR / SI	Army Regulators Stakeholders	SI – sampling	12/2004
3	For cost to complete (CTC): Density (high 400-300, medium 300-50, low 50-1 per acre) of MEC and associated acreage	HRR / Site walk / Magnetometer Assisted Surface Sweep	Army Regulators Stakeholders	Site Data/ Site Walk - Magnetometer Assisted Surface Sweep	04/2005
4	For cost to complete (CTC): Percentage of Munitions Debris vs MEC	HRR / Site walk / Magnetometer Assisted Surface Sweep	Army Regulators Stakeholders	Review data from HRR/Site Walk-Surface only	04/2005
5	For cost to complete (CTC): Depth of MEC	HRR / Site walk / Magnetometer Assisted Surface Sweep	Army Regulators Stakeholders	Site Data/Army Munitions Guidance	04/2005
6	Metals Background Concentrations	IRP Reports	Army, Regulatory Agencies, Stakeholders	Obtain from Rucker	06/2004

[a]Refer to EM 200-1-2, Paragraphs 1.1.3 and 2.2. a
[b]Indicate a specific TPP team member (e.g., Risk Data User, Customer, Regulator, Sampling Data Implementor). B

DATA NEED WORKSHEET- RISK PERSPECTIVE

SITE: "B" Grenade & Bayonet Court DATA USER NAME(s):_____

PROJECT: MMRP Site Inspection

Data Need		Project Objective(s) & Data Need Group	Data Use(s)			Number of Samples			Risk Action Level(s)		Exposure Area(s) / Sample Location(s) and Depth
Contaminant of Concern, Characteristic of Interest	Media		Current or Future Use	Receptor Group(s)	Receptor's Exposure Route(s)	CL (%)	P (%)	MDRD (%)	Human, Health	Ecological	
MEC (presence, and type)	soil	1,3,4 Basic 5-6 Optimum 7-9 Excessive	Current (1-6) & Future (7-9)	*All	Handle / Tread & Intrusive	N/A	N/A	N/A	1 MEC Item or significant amount of Munitions Debris	N/A	Across the site / N/A
MC TCL-Explosives	soil	1, 2, 4 Basic 5-6 Optimum 7-9 Excessive	Current (1-6) & Future (7-9)	*All	Ingestion, dermal, inhalation	N/A	N/A	N/A	EPA Region IX – PRG Table	N/A	Bias locations (near or under MEC/scrap) where possible otherwise random distribution
MEC (depth)	soil	5-6 Optimum 7-9 Excessive	Current (5, 6) & Future (7-9)	*All	Surface/ intrusive	N/A	N/A	N/A	N/A	N/A	Across the site / N/A
MEC (density, and % of scrap)	soil	5 Optimum 7-9 Excessive	Current (5, 6) Future (7-9)	*All	Handle / Tread & Intrusive	N/A	N/A	N/A	N/A	N/A	Across the site / N/A

*Receptors – Authorized Installation personnel, escorted contractors, trespasser, hunter and biota

DATA NEED WORKSHEET- COMPLIANCE PERSPECTIVE

SITE: "B" Grenade & Bayonet Court DATA USER NAME(s): _____

PROJECT: MMRP Site Inspection

Data Need		Project Objective(s) & Data Need Group	Data Use		Number of Samples	Compliance Reference Concentration	Point(s) of Compliance/ Sample Locations(s) and Depth
Contaminant of Concern, Characteristic or of Interest	Media		Regulatory Program or Statute, and Citation	Specific Use			
MEC (presence, and type)	Soil	1-4 Basic 5 Optimum 6-8 Excessive	MMRP	Determine need for RI or NFA, and CTC/Prioritization	N/A	1 MEC Item or significant amount of Munitions Debris*	Site Walk aided with magnetometer
MC TCL-Explosives	Soil	1-4 Basic 5 Optimum 6-8 Excessive	EPA Region IX PRG Table	Determine need for RI or NFA, and CTC/Prioritization	3-Explosives	EPA Region XI PRG Table	Bias locations (near or under MEC/scrap) where possible otherwise random distribution.

*Compliance point to determine NFA is inappropriate

DATA NEED WORKSHEET- REMEDY PERSPECTIVE

PAGE __1__ of __1__

SITE: "B" Grenade & Bayonet Court DATA USER NAME(s): _____

PROJECT: MMPR Site Inspection

Data Need		Project Objective(s) & Data Need Group	Data Use		Number of Samples	Concentration of Interest or Sensitivity of Measurement(s)	Remediation Area(s) / Sample Locations(s) and Depth
Contaminant of Concern, Characteristic or of Interest	Media		Remedy Method(s) of Interest	Criteria to be Considered			
MEC (presence, and type)	Soil	1-4 Basic 5 Optimum 6-8 Excessive	Fence and access controls	MEC presence, Safety	N/A	1 MEC Item or significant amount of Munitions Debris	TBD
MC TCL-Explosives	Soil	1-4 Basic 5 Optimum 6-8 Excessive	Access controls soil removal (TBD)	EPA Region XI PRG Table	3-Explosives	EPA Region XI PRG Table	Bias locations (near or under MEC/scrap) where possible otherwise random distribution.
MEC (depth)	Soil	5 Optimum 8-9 Excessive	N/A	N/A	N/A	N/A	N/A
MEC (density, and % of scrap)	Soil	5 Optimum 8-9 Excessive	N/A	N/A	N/A	N/A	N/A

Summary Table of Data Collection Options

SITE: "B" Grenade & Bayonet Court

PROJECT: MMPR Site Inspection

DATA IMPLEMENTORS

Sampling: Malcolm Pirnie

Analysis: Small Business Laboratory

DATE

Data Collection Option	Number of Samples						Order-of-Magnitude Cost (dollars)	Comments
	Air	Surface Water	Sediment	Soil	Ground Water	Other		
Excessive	N/A	N/A	N/A	>3	N/A	Intrusive investigation of subsurface anomalies	Out of scope	Composite samples (5 points, spoke configuration)
Optimum	N/A	N/A	N/A	3	N/A	Magnetometer assisted surface sweep	Within scope	Composite samples (5 points, spoke configuration)
Basic	N/A	N/A	N/A	0	N/A	No site walk	Within scope	

Phase I MFR Worksheet

US Army Corps of Engineers®

Author(s): Malcolm Pirnie, Inc. **Reviewer(s):** _____
Latest Revision Date: June 24, 2004 **Review Date:** _____

Location: Fort Rucker, Alabama
Site: Fort Rucker – "C" Grenade & Bayonet Court
Project: Site Inspection

(Attach Phase I MFR to PMP)

TPP TEAM	EM 200-1-2, Paragraph 1.1.1
Decision Makers	**USACE / AEC / Fort Rucker**
Customer	Mary Ellen Maly, US Army Environmental Center
Project Manager	Stephen Wood, USACE BAL John Nocera, Malcolm Pirnie
Regulators	Mark Harrison, ADEM
Stakeholders	Jim Swift, Environmental, Fort Rucker

CUSTOMER'S GOALS	EM 200-1-2, Paragraph 1.1.2

Future Land Use(s)	Issues and Regulatory Compliance Status	Site-Specific Site Inspection Goals (if applicable)
"C" Grenade & Bayonet Court **Current:** Part of cantonment area **Future:** Developable and Usable	Potential MEC presence / no significant evaluation of MC presence	MEC – SI perform visual survey to determine if/where MEC is present MC – SI to determine presence of MC and to determine the need for further investigation

Site Closeout Statement

Land is safe for Unrestricted future use.

Customer's Schedule Requirements

Field Investigation and Reporting: Army wide goal: Site Inspection activities complete by FY10 and RC by 2017.

Fort Rucker wide goal: Site Inspection activities completed by April 2005.

Customer's Site Budget

Field Investigation and Reporting: CTC for MRP SI field work and reporting (includes magnetometer assisted surface sweep of 7.6 acres and 15 samples analyzed for explosives – 8330 and 15 samples analyzed for TAL Metals) =$117,933

IDENTIFY SITE APPROACH

EXISTING SITE INFORMATION & DATA	EM 200-1-2, Paragraphs 1.1.3 and 1.2.1

Attachment(s) to Phase I Memorandum For Record	Located at Repository	Preliminary Conceptual Site Model
Final Historical Records Review (and associated reports)	Fort Rucker	Yes
POTENTIAL POINTS OF COMPLIANCE	EM 200-1-2, Paragraph 1.2.1.3	
EPA Region IX – PRG Table		

MEDIA OF POTENTIAL CONCERN

Soil

PROJECT OBJECTIVES

See project objectives worksheet	

REGULATOR & STAKEHOLDER PERSPECTIVES

Regulators		**Community Interests**
		Others
	EM 200-1-2, Paragraph 1.2.4	

PROBABLE REMEDIES

Treatment of soil if metal contamination is present; removal of MEC if present	

EXECUTABLE STAGES TO SITE CLOSEOUT

Site Inspection	
Remedial Investigation	
Interim Removal Action (if required)	
Feasibility Study	
Remediation and/or Removal Actions	

SITE CONSTRAINTS AND DEPENDENCIES

CURRENT EXECUTABLE STAGE

No metals samples will be taken due to the fact that Fort Rucker soil has various metals in high background concentrations and leaching typically does not occur. Site walk will be done in areas that MEC are not expected to be found.	

Project Objectives

Basic (Current Projects)	**Optimum** (Future Projects)	**Excessive** (Objectives that do not lead to site closeout)
See Project Objective worksheets	See Project Objective worksheets	See Project Objective worksheets

PROJECT OBJECTIVES WORKSHEET

SITE: "C" Grenade & Bayonet Court

PROJECT: MMRP Site Inspection

Project Objective[a]					Data User(s)	Project Objective Classification[d]
Number	Executable Stage[b]		Description	Source[c]		
	Current	Future				
1	X		Identify boundaries and next steps for "C" Grenade & Bayonet Court	Team Discussion / HRR/SI	X Risk X Compliance ____ Remedy ____ Responsibility	X Basic _____Optimum ____ Excessive
2	X		Determine concentration of munitions constituents (MC) in soil	SI	X Risk X Compliance ____ Remedy ____ Responsibility	X Basic _____Optimum ____ Excessive
3	X		Determine type of MEC present	HRR/SI	X Risk ____Compliance X Remedy ____ Responsibility	X Basic _____Optimum ____ Excessive
4	X		Determine if RI/FS is required	SI	X Risk X Compliance ____ Remedy ____ Responsibility	X Basic _____Optimum ____ Excessive
5	X		Provide information for (CTC) estimates	HRR/SI	X Risk X Compliance ____ Remedy ____ Responsibility	____Basic X Optimum ____ Excessive
6	X		Collect data to complete Prioritization Protocol	HRR/SI	X Risk X Compliance ____ Remedy ____ Responsibility	____Basic X Optimum ____ Excessive
7		X	Determine Nature and Extent of MEC/MC (RI), if appropriate	RI	X Risk X Compliance ____ Remedy ____ Responsibility	_____Basic _____Optimum X Excessive
8		X	Select remedial alternatives (FS), if appropriate	FS	____Risk ____Compliance X Remedy ____Responsibility	_____Basic _____Optimum X Excessive

Project Objective[a]						
Number	Executable Stage[b]		Description	Source[c]	Data User(s)	Project Objective Classification[d]
	Current	Future				
9		X	Implement remedial alternative, if applicable	RA	____Risk ____Compliance _X_Remedy ____Responsibility	_____Basic _____Optimum _X__Excessive

[a]Refer to EM 200-1-2, Paragraph 1.2.2. a
[b]Refer to EM 200-1-2, Paragraph 1.2.5. b
[c]For example, CERCLA ____, State Regulation _____, FFA Section _____, RCRA Permit, Meeting with Customer or Regulator. c
[d]Classification of project objectives can only occur after the current project has been identified. Refer to EM 200-1-2, Paragraph 1.3.3. d

SITE INFORMATION WORKSHEET

SITE: "C" Grenade & Bayonet Court

PROJECT: MMRP Site Inspection

	Site Information Needed[a]	Potential Source(s) of Site Information	User of Site Information[b]	Suggested Means to Obtain Site Information	Obtaining Site Deadline for Information
1	Presence and types of MEC present	HRR / Site walk / Magnetometer Assisted Surface Sweep	Army Regulators Stakeholders	Site Data/Site Walk	12/2004
2	Presence, types, and concentration of MC present	HRR / SI	Army Regulators Stakeholders	SI – sampling	12/2004
3	For cost to complete (CTC): Density (high 400-300, medium 300-50, low 50-1 per acre) of MEC and associated acreage	HRR / Site walk / Magnetometer Assisted Surface Sweep	Army Regulators Stakeholders	Site Data/ Site Walk - Magnetometer Assisted Surface Sweep	04/2005
4	For cost to complete (CTC): Percentage of Munitions Debris vs MEC	HRR / Site walk / Magnetometer Assisted Surface Sweep	Army Regulators Stakeholders	Review data from HRR/Site Walk-Surface only	04/2005
5	For cost to complete (CTC): Depth of MEC	HRR / Site walk / Magnetometer Assisted Surface Sweep	Army Regulators Stakeholders	Site Data/Army Munitions Guidance	04/2005
6	Metals Background Concentrations	IRP Reports	Army, Regulatory Agencies, Stakeholders	Obtain from Rucker	06/2004

[a]Refer to EM 200-1-2, Paragraphs 1.1.3 and 2.2. a
[b]Indicate a specific TPP team member (e.g., Risk Data User, Customer, Regulator, Sampling Data Implementor). B

DATA NEED WORKSHEET- RISK PERSPECTIVE

SITE: "C" Grenade & Bayonet Court DATA USER NAME(s):_____

PROJECT: MMRP Site Inspection

Data Need		Project Objective(s) & Data Need Group	Data Use(s)			Number of Samples			Risk Action Level(s)		Exposure Area(s) / Sample Location(s) and Depth
Contaminant of Concern, Characteristic of Interest	Media		Current or Future Use	Receptor Group(s)	Receptor's Exposure Route(s)	CL (%)	P (%)	MDRD (%)	Human, Health	Ecological	
MEC (presence, and type)	soil	1,3,4 Basic 5-6 Optimum 7-9 Excessive	Current (1-6) & Future (7-9)	*All	Handle / Tread & Intrusive	N/A	N/A	N/A	1 MEC Item or significant amount of MEC Scrap	N/A	Across the site / N/A
MC TCL-Explosives	soil	1, 2, 4 Basic 5-6 Optimum 7-9 Excessive	Current (1-6) & Future (7-9)	*All	Ingestion, dermal, inhalation	N/A	N/A	N/A	EPA Region IX – PRG Table	N/A	Bias locations (near or under MEC/scrap) where possible otherwise random distribution
MEC (depth)	soil	5-6 Optimum 7-9 Excessive	Current (5, 6) & Future (7-9)	*All	Surface/ intrusive	N/A	N/A	N/A	N/A	N/A	Across the site / N/A
MEC (density, and % of scrap)	soil	5 Optimum 7-9 Excessive	Current (5, 6) Future (7-9)	*All	Handle / Tread & Intrusive	N/A	N/A	N/A	N/A	N/A	Across the site / N/A

*Receptors – Authorized Installation personnel, escorted contractors, trespasser, hunter and biota

DATA NEED WORKSHEET- COMPLIANCE PERSPECTIVE

SITE: "C" Grenade & Bayonet Court DATA USER NAME(s): _____

PROJECT: MMRP Site Inspection

Data Need		Project Objective(s) & Data Need Group	Data Use		Number of Samples	Compliance Reference Concentration	Point(s) of Compliance/ Sample Locations(s) and Depth
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DATA NEED WORKSHEET- REMEDY PERSPECTIVE

PAGE __1__ of __1__

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